ANNUAL REPORT

Editorial

Two health alerts, etched on the history of health surveillance and InVS, profoundly marked 2003: SARS and the heat wave. They highlighted from every viewpoint the importance of health surveillance for health security, for the health of our fellow citizens, but also, more broadly, for the health of the world.

SARS illustrated for the first time how a totally new infectious agent could be disseminated across almost every continent within just a few days. Air transportation was a key element in this planetary spread. For the first time, officials conducted health checks of passengers as they boarded their aircraft. The complexity of the measures imposed at departure and arrival makes us wonder how effective they would be if they were not the object of international—or at least European—consensus. More than ever, the need for procedures to trace exposed travelers appears essential, to be implemented each time follow-up measures or even quarantines are required to prevent secondary transmission.

Although prejudicial delay in cooperation by the Chinese health authorities at the beginning of this epidemic marred the initial management of SARS, international mobilization and cooperation were thereafter exemplary, with WHO playing an essential coordinating role. InVS was able to create the operational and other necessary links to manage this alert in France; it worked with the Directorate-General of Health, as well as with the laboratories and hospitals concerned, and handled follow-up procedures of cases and their contacts. Several cases of SARS were identified early in France, all imported; no case of secondary transmission was observed on our territory. We can therefore conclude that the health surveillance system dealt effectively with this completely new emerging risk.

InVS was able to sound the alert very early because we knew that the risk of virus importation needed monitoring, and our information networks alerted us to the worrisome nature of this strange epidemic of lung disease, at the other end of the planet. We drew many lessons from this new disease epidemic, including the need to be able to mobilize high-level microbiological expertise rapidly.

The experience of the heat wave was very different.

In a temperate country such as France, an extreme heat wave had not been identified as a risk likely to entail dramatic consequences in our population. Several reasons explain this lack of foresight: a heat wave of such an intensity and such a duration had never been observed here, and the health consequences of earlier heat waves (France 1976, Marseille 1983) had not been sufficiently analyzed for the reality and seriousness of the risk to be recognized. International data of this type of event (Chicago, Athens) have probably also been insufficiently studied. InVS and Inserm measured the consequences: nearly 15 000 deaths more than during the same period in preceding years. No one knows how many of these deaths might have been avoided by an action plan. Today such a plan exists: the "national heat wave plan" provides that the French national weather bureau (Météo France) will transmit meteorologic data to InVS, which will analyze it and inform the Minister of Health of the risks of a heat wave. This alert will make it possible to trigger an action plan, directed especially toward those most vulnerable.

We have learnt many lessons from this major crisis. The first lesson, of course, was the need to take climatic events into account when assessing health risks. We also expanded our alert system with new surveillance systems involving data from emergency response services, including ambulances, hospitals, private practitioners, and security forces. Another lesson is the need for "real time" mortality data. The system by which Inserm (CépiDc) collects cause-of-death data even today allows only a delayed analysis of the results. Mortality data must be integrated into our surveillance and alert systems. This presupposes the very rapid transmission capacity available only with computerized systems. We are working with INSEE in this domain: computerizing vital statistics data at the municipal level is an essential prerequisite for this objective.

More generally, we note that the vastness of the fields covered by health surveillance and the reinforcement of alert systems both presuppose a multiplicity of information systems, some very specific (for monitoring specific diseases), others more global (surveillance of syndromes, emergency medicine services, vulnerable population groups). These systems must thus be compatible and consistent within the framework of a master plan of information systems. Much room for progress and development remains, especially with the many partners involved in surveillance: other agencies, hospitals, healthcare professionals, and of course physicians.

Furthermore, these systems must be made secure and ensure that the epidemiologic information transmitted telemetrically is compatible with protection of the circuits and the data and remains confidential and anonymous.

Finally, proactive promotion and organization of health surveillance and alert must continue at the regional level. The new public health policy law will make it possible to define regional public health programs, which must include health alerts and have the resources to ensure expertise and intervention. Development of regional epidemiology units, which began several years ago, must actively continue, especially since the regional level is probably the most efficient level for validation of alert signals and implementation of the necessary studies and expert examinations. These programs and resources are already planned as part of the national heat wave plan. However, they are also needed for other regional surveillance programs, as we saw in 2003 with the resurgence of West Nile disease in southern France and with the frightening epidemic of legionellosis in Nord-Pas-de-Calais. This report describes and analyzes these unfortunate events, which also enriched our experience at InVS during 2003.

Nonetheless, we must not let the trees block our view of the woods and decide that health alert systems are the alpha and omega of health surveillance. We must also reaffirm that health surveillance requires permanent and continuous collection and analysis of data and the use of these analyses to identify changes in diseases and epidemiologic trends, to prioritize health problems, and to assess health policies.

Massive media coverage of emergency and alert situations may prevent us from seeing—or at least cause us to underestimate—the breadth and depth of the currents that in our shifting societies modify our behavior and our environment and expose us to risks not always immediately perceived because of the time required for them to become visible or for the morbidity they cause to be expressed.

This is true for:

- *dietary risks, ranging from obesity to diabetes, cardiovascular diseases, and even some cancers;*
- *workplace risks, especially by exposure to known or unknown carcinogens, which are insufficiently monitored, detected, or imputed to occupational exposure, and which can even lead to actual cancer epidemics, as we observed in one factory in 2003;*
- *infectious risks, due especially to two causes: poorly controlled technological developments, as demonstrated by the multiple epidemics of legionellosis due to cooling towers, and the slackening of prevention behaviors vis-à-vis sexually transmitted diseases, as shown by the worrisome persistence of very active HIV transmission and the resurgence of syphilis and venereal lymphogranuloma.*

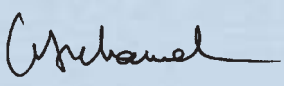
Risk can seem to be everywhere; and sometimes the evidence shows it really is–in the air we breathe and in the food and water we ingest. Nonetheless, we must not forget that it is never equitably distributed and that those among us who are most fragile, most vulnerable, most isolated, and especially poorest, pay the highest price.

Accordingly, we must also direct our surveillance systems towards the goals of detecting hidden diseases and protecting disenfranchised populations. This is the case for these isolated populations, as well as for orphan diseases: we think they are rarities, but they are actually numerous... inside housing projects and in devastated inner cities, in the heart of rural areas. They are also in our overseas districts and territories, far away, where, although we do not always see, treat, or prevent them well enough, there are too many cases of AIDS, measles, malaria, tuberculosis, and even nutritional deficiencies, which we might have thought long past, but which led to a recent beriberi outbreak...

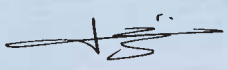
Since we cannot know, see, or foresee everything, we must develop our information systems to ensure health surveillance that is capable of monitoring in priority the most exposed and most fragile groups.

Surveillance and alerts are not opposed in this initiative: each complements the other and they are interwoven. Alerts make sense only when they are based on an expert reading of signals that stem from surveillance.

Gilles Duhamel
Chairman of the InVS Board



Gilles Brücker
InVS Managing Director



Summary

2003, extensive alerts

- **Introduction**
- **SARS, international alert**
- **Health consequences of the heat wave, national alert**
- **Local alerts**

Introduction

Five years after the Institute of Public Health Surveillance (InVS) was created, the year 2003 confronted it with important health alerts that were entirely new in their nature, origin, and spread. These events caused InVS to examine the procedures for transmission and analysis of health information and its use for decision-making in France.

The health alerts in 2003 were diverse. Infectious disease epidemics occupied the forefront of the stage at the beginning of the year. A serious respiratory syndrome, unknown until then and called severe acute respiratory syndrome (SARS), emerged on the international scene. There was also a legionellosis epidemic in northern France. Although the latter might seem to be a routine problem, it turned out to be especially serious and involved new modes of diffusion.

Environmental phenomena took over the leading role during the first weeks of August: a brutal heat wave caused dramatic health consequences in France.

The health alerts of 2003 also had varied origins and modes of diffusion. The SARS epidemic involved many countries across the world: it came from a source in Asia, but the fight to understand and control it mobilized North America and Europe as well, and France participated substantially in this movement even though the epidemic did not spread here.

Europe also experienced a major heat wave that shook French health institutions hardest. Their responses included estimating its impact and identifying and applying the organizational lessons learnt.

The importance of these events to InVS led us to focus our 2003 annual report on describing and analyzing them.

SARS, international alert

SARS emerged in China in 2003. This epidemic rapidly became international: more than 8000 persons fell ill and 774 died, in some 30 countries. The response to this emergence was particularly remarkable and pooled scientific capabilities through international networks coordinated by the World Health Organization (WHO). It contributed to the progress and rapid dissemination of knowledge and thus facilitated the implementation of appropriate prevention and control measures and led to the control of this pandemic within four months (from the official international alert issued by WHO on 12 March to its official end on 5 July).

In France, the response, based largely on existing plans for response to bioterrorism threats (Biotox plan) and to the risk of an influenza pandemic, enabled us to cope with the introduction of the first SARS cases and to limit secondary transmission: overall, seven probable cases were identified in France and the consequences of the epidemic remained limited.

How it began

During the last week of February 2003, WHO received reports of two outbreaks of a respiratory syndrome, one in Hanoi (Vietnam) and the other in Hong Kong SAR (China). These outbreaks were linked to the epidemic of atypical pneumonia of unknown etiology that had been ravaging the province of Guangdong, China, since November 2002. The initial hypothesis of avian influenza was rapidly supplanted by that of an unknown infectious agent that caused a new nosological entity named severe acute respiratory syndrome (SARS).

The origin of the outbreaks in Hanoi and Hong Kong was the same: contamination, around 20 February 2003, of a group of guests at a Hong Kong hotel by a Chinese physician from Guangdong. Other contaminated hotel guests were at the origin of outbreaks in Singapore and Toronto (Canada) and accounted for isolated cases in Germany, the United States, and Ireland.

In Hanoi, the epidemic developed in early March among staff and patients at the French Hospital where the index case, from the Hong Kong hotel, had been admitted. A physician from this hospital returned to France on 22 March to become the first patient reported here. Other cases were exported from different cities in Asia to many other countries.

Beginning on 28 February, WHO mobilized GOARN, its global outbreak alert and response network. Events sped up within days, in Southeast Asia and elsewhere. On 12 March 2003, WHO issued an international alert for these epidemics, marked by a high proportion of cases among hospital personnel, a severe clinical picture, a rising mortality rate, and an increasing number of countries affected.

This was the beginning of an unprecedented international collaboration in which the swift exchange of information between countries enabled WHO to coordinate the response. At a scientific level, this cooperation led to the identification of the coronavirus responsible for SARS (SARS-CoV) and the development of a diagnostic test in the weeks following the international alert.

France immediately set up an interministerial management procedure, aimed at reducing the risk of secondary transmission of SARS nationwide. It relied on the combined mobilization of InVS, the Directorate-General of Health (DGS), biologists, especially from the Pasteur Institute, reference hospitals and clinicians in each region, emergency services (SAMU), and others.

InVS participation at the international level

InVS conducts health surveillance of events abroad and participates in the WHO network for epidemic alert and response. From mid-February, several signals attested to the development of an epidemic of atypical respiratory disease in China, Hong Kong, and then Vietnam. A week before the WHO alert of 12 March, InVS informed the Ministry of Health of the situation and mobilized for international cooperation. It sent an epidemiologist to Hanoi with a WHO multidisciplinary team that went to help control the epidemic reported at the French Hospital. A month later, another InVS epidemiologist left for Beijing to conduct the same work, this time to support the Chinese authorities. These field missions, under the aegis of WHO, together with those of other teams in Singapore, Hong Kong, and Toronto, documented the epidemiologic characteristics of this new disease and set up early and appropriate preventive measures, including in France.

Epidemiologic bases of SARS transmission

- *On the basis of information* from the first outbreaks, the incubation period of SARS was estimated at 2 to 10 days. This estimate has since been confirmed. This characteristic is important for several reasons:
  - it is essential for the definition of cases: the diagnosis of suggestive signs must be based on the identification of exposure to the pathogenic agent in a time frame compatible with the incubation period;
  - it also makes it possible to define the quarantine period necessary for contacts of probable cases before risk of disease can be ruled out.
- it rapidly became clear that *contagiousness began* at the same time as the clinical symptoms (for each new case, exposure to a patient with SARS in the 10 days before signs began was almost always found). It was thus hypothesized that the disease was not contagious during the incubation period (a hypothesis not challenged since); in other terms, only symptomatic patients are likely to transmit the infection.
- *a direct mode of transmission*, from person to person by close contact, was rapidly suspected because of the high number of cases among personnel caring for patients in the first outbreaks. Study of the contamination of 125 inhabitants of the Amoy Garden building in Hong Kong then suggested an environmental type of transmission (from aerosols containing the virus). This information was of major importance because the mode of transmission determines the measures necessary to prevent contacts likely in their turn to transmit the infection (for example, protective measures for healthcare staff).

– Participation in the WHO mission to Hanoi

Arriving in Hanoi on 14 March 2003, the WHO mission very rapidly set up emergency measures aimed at keeping all the patients from the second wave (which started 12 March among family and friends of the medical personnel affected) together in a single isolation center (Bach May Hospital), to organize the management of patients and suspected cases, to reinforce hospital hygiene measures, and to monitor follow-up of case contacts in the community. The first clinical and epidemiologic observations allowed rapid formulation of hypotheses about the disease's incubation period and modes of transmission (Figures 1 and 2). These clinical and epidemiologic elements became the basis of the case definition developed in France to control the epidemic and, from 16 March onward, of the protective measures recommended for monitoring exposed persons in France:

– only taking samples, especially nasopharyngeal, in a strictly protected environment, because of the risk of infection;
– isolation of all symptomatic patients;
– wearing a mask (type N95) as the minimum level of protection during contacts (except for medical procedures) with symptomatic patients (mask to be worn by the contact and the patient).

Figure 1: SARS cases (N=63) by date of onset of symptoms and estimated incubation period, Hanoi, February-March 2003

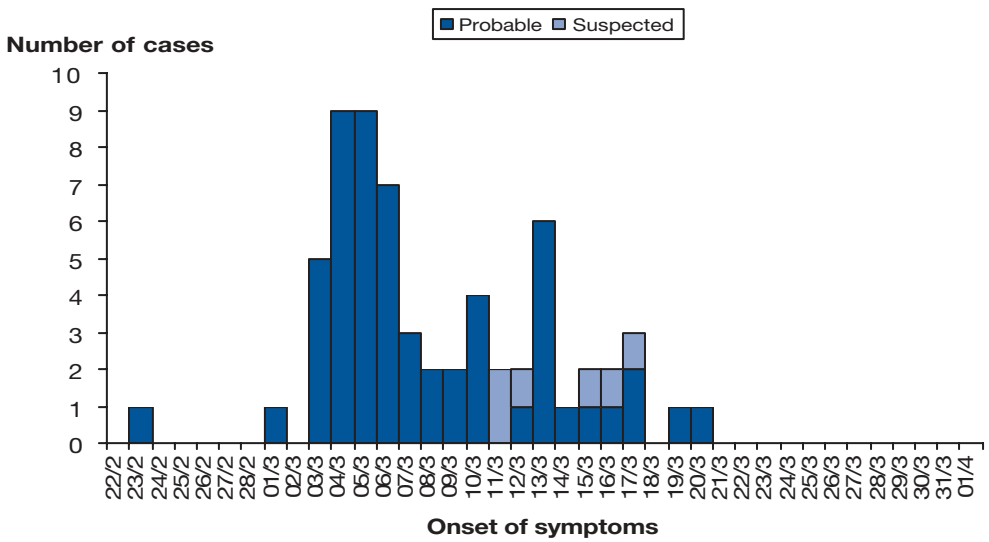
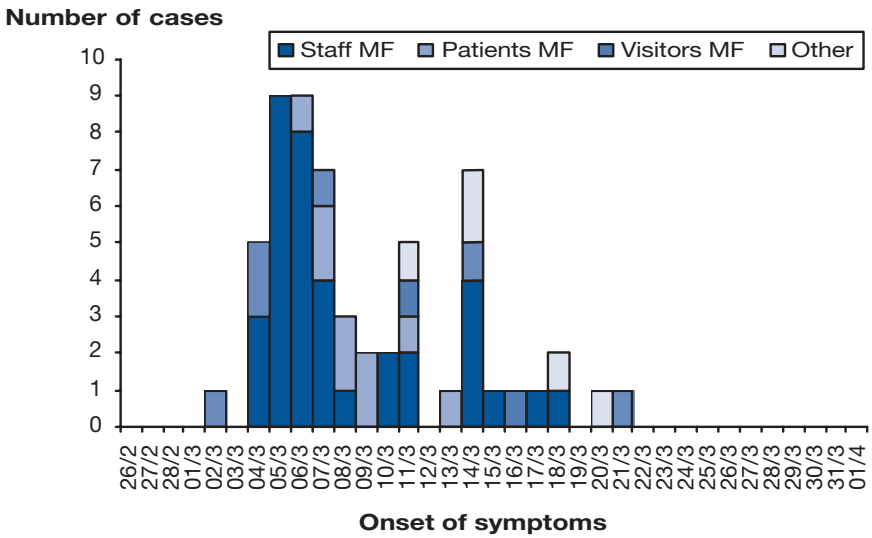


Figure 2. Probable SARS cases (N=57) by date of onset of symptoms and exposure at the French Hospital, Hanoi, February-March 2003



– Participation in the WHO mission to China

The mission to China, from 23 April to 17 May, took place under difficult conditions, in view of the political and media context of the crisis, the complexity of the Chinese healthcare system, and the differences in language (databases in Chinese). Nonetheless collaboration began, as did the epidemiologic analysis of the data available for Beijing. The trip also permitted the exchange of information about SARS and the situation in Beijing with the embassy staff, including scientific and medical personnel, and helped to assess needs for bilateral aid, both for the emergency and over a longer term. Finally, it underlined the determinant and very positive role played by WHO in this crisis that shook China in 2003.

– International surveillance

At the same time, InVS collected, analyzed, synthesized, and disseminated on a daily basis the information available about the characteristics and progress of the epidemic and about this new disease. This monitoring was conducted from sources of information mostly accessible by internet, in particular, the websites of WHO and of the ministries of health of the affected countries.

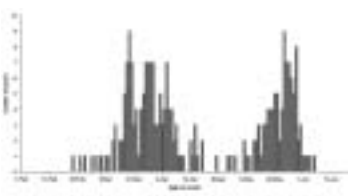
Example of the daily note published by InVS's International and Tropical Department

I. ELEMENTS OF INFORMATION ABOUT THE CURRENT EPIDEMIC

China As of 18 June, 5326 probable cases and 47 suspected cases had been reported.
- No new probable case has been reported since 7 June.
- On 18 June, a total of 347 deaths had been reported (+ 4 since 11 June).
- As of today, lethality, calculated from the number of reported probable cases, is 6.5%.
- The proportion of healthcare staff among the probable cases is 18.3% (977 persons).
- On 11 June, 327 suspected cases were under observation in China. On 18 June, this figure fell to 47.
- In its 13 June update, WHO announced the removal of the provinces of Hebei, Inner Mongolia, Shanxi, and Tianjin from the list of regions to which nonessential travel should be postponed. Moreover, WHO removed Guangdong, Hebei, Hubei, Inner Mongolia, Jilin, Jiangsu, Shaanxi, Shanxi, and Tianjin from the list of regions with recent local transmission: more than 20 days (more than twice the incubation period) has passed with no new cases.
- WHO continues to recommend postponing all except essential travel to Beijing.

Canada As of 18 June, 245 probable cases had been reported, 241 of them in Ontario - (+3 cases since 11 June) and 4 in British Colombia.
- On 18 June, 193 suspected cases (134 of them in Ontario) had been reported.
- As of today, 34 deaths have been reported (+ 1 since 11 June), for a lethality of 13.9%.
- On 13 June, a probable case for which exposure appeared to have occurred in a school was reported in Ontario. Insofar as no epidemiologic link has been found with a case of SARS, a doubt remains as to the possible existence of community-based transmission.
- The MMWR dated 13 June summarizes the situation in Canada: · A link has been established between the first and second clusters in Toronto.
- The second cluster was identified on 20 May, after diagnoses of 5 patients from a rehabilitation hospital in Toronto with febrile syndromes. Two of these 5 patients were hospitalized in the orthopedics department of North York General Hospital in Toronto between 22-28 April.
- Retrospective investigation of this orthopedics department determined that 8 cases of respiratory diseases were probably SARS cases.
- Overall, this new cluster includes 105 cases.
- In its 13 June update, WHO reevaluated the level of SARS transmission in Toronto from level B to level C. Level C designates a region where local probable cases have appeared among persons who were not previously identified as known contacts of probable SARS cases.

Number of probable SARS cases in Canada by date of onset of symptoms
1 February-13 June (n = 242) (Source Health Canada)



Taiwan
- As of 19 June, 695 probable cases (+ 7 cases since 12 June) and 1453 suspected cases (-2 since 12 June) had been reported.
- 83 deaths attributable to SARS have been reported overall (+2 since 12 June).
- As of today, based on the reported probable cases, lethality is 11.9%.
- On 17 June, WHO removed Taiwan from the list of regions to which all but essential trips should be postponed.

Hong-Kong
- As of today, 1755 probable cases have been reported.
- No new case has been reported for 8 days.
- Since 16 May, that is, for 35 consecutive days, the daily number of new probable cases reported has remained below 5.
- The report of the last SARS case among healthcare personnel dates back to 4 June.
- 296 deaths have been reported overall (+5 deaths since 12 June); lethality is 16.8%.

II. COMMENTS :

- 19 June was the 100th day since WHO issued a worldwide alert about the SARS epidemic on 12 March. On this occasion, WHO update no. 83 summed up the SARS situation and discussed the difficulties encountered.
- Because of the characteristics of this epidemic and the difficulties that it could have engendered, WHO recommends maintaining the level of vigilance and surveillance for a year

Each day, InVS collected, sorted, validated, analyzed, and distributed information to multiple national stakeholders affected by the epidemic. Nearly 50 daily updates were distributed between 10 March and the end of June.

International health surveillance contributed to the early alert of the French system and to the dissemination of scientific knowledge that allowed control measures to be adapted appropriately throughout the epidemic.

– International SARS epidemic: final findings

By 31 December, 2003, WHO had received reports of 8096 probable SARS cases from 29 countries; 774 (9.6%) of these patients had died and 7322 (90.4%) were considered cured. Lethality increased with age and reached 50% among those older than 65 years. SARS took a heavy toll on healthcare staff, who accounted for 21% of the probable cases.

Three epidemiologic situations can be distinguished in the affected regions (Figure 3).

- **Mainland China**

The epidemic probably originated in China. In the province of Guangdong, primary transmission from a still unidentified reservoir is thought to have led to the introduction of the virus into the human population. By 31 December 2003, China had reported 5327 probable cases to WHO—65.8% of the cases worldwide. It is feared, however, that the extent of the epidemic in China has been underestimated. These concerns arise from the Chinese authorities' absence of transparency until quite recently, as well as from the weight and complexity of the surveillance system they established.

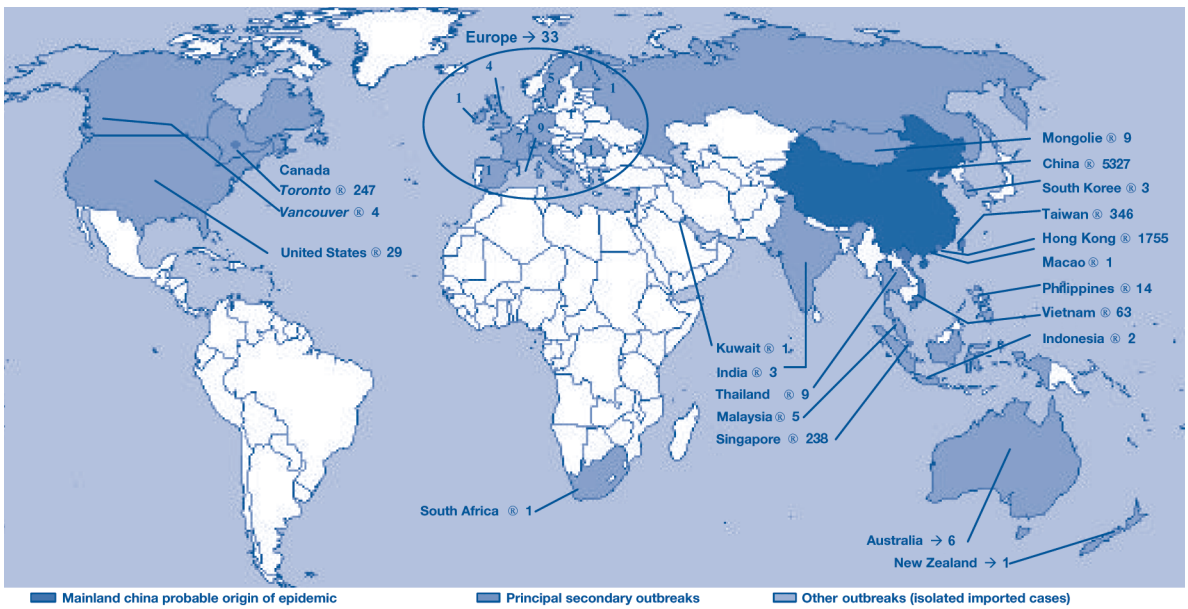
- **Outbreaks in Hanoi, Hong Kong, Singapore, Taiwan, and Toronto**

In these areas, imported index cases (one or more) spread the disease in the hospitals to which they were admitted, thereby causing secondary epidemics. Those initially affected were mainly healthcare personnel and their families and friends. In Hanoi, the epidemic included 63 cases and lasted approximately one month before finally being controlled. Other outbreaks subsided, except in Taiwan, where the epidemic developed last. The number of probable cases reported to WHO as of 31 December 2003 was 1755 in Hong Kong, 238 in Singapore, 346 in Taiwan, and 251 in Canada (including 247 in Toronto).

- **Other countries reporting imported cases, with no secondary transmission**

Imported cases were identified in 24 countries, including France. Reports from South Africa and Australia show that no continent was spared. These countries reported from one to several dozen cases.

Figure 3. Probable SARS cases reported to WHO by 31 December 2003



– International response

On 12 March 2003, WHO issued an international epidemic alert for the first time in its history. This alert was accompanied by recommendations for the movement of people and goods. Because of the risk of contamination on international airplane flights, WHO recommended that the countries affected conduct rigorous health checks of people leaving their territory, and most countries set up procedures for medical checks of passengers arriving from the affected areas. The airlines were responsible for ensuring that travelers arriving from these areas could be traced.

WHO organized under its aegis a network of 13 international laboratories engaged in research on the etiology of the new disease and in the development of diagnostic tests; it also coordinated epidemiologic studies. Reinforcement of hospital hygiene and sometimes drastic quarantine measures made it possible to control the principal SARS outbreaks throughout the world and to stop the progression of the pandemic. Nonetheless, many unknowns remain about the virus's modes of transmission and its reservoirs.

Perspectives and recommendations

SARS, the first pandemic of the 21st century, emerged in one of the most populous regions of the planet. The disease spread within a few weeks—with unprecedented rapidity—because of the population density and because of air travel. The principal outbreaks (Hong Kong, Singapore, Taiwan) occurred in the major economic centers and communication nodes of Asia. The SARS epidemic illustrates a new type of health risk in a globalized world and underlines the importance of international collaboration.
In this new world context, France must reinforce its participation in the alert network coordinated by WHO. The ongoing revision of international health regulations, to which InVS contributes, should eventually provide a legal framework for the exchange of health information between countries. In the face of these new stakes, Europe is building an operational European system of disease control (European Centers for Disease Control and Prevention), in which France participates.

Case management in France

– Organization of SARS surveillance and management in France

Using its emergency plans for an influenza pandemic or a bioterrorism attack (Biotox) as a basis, France quickly established an operational response.

To meet its objective of reducing the risk of secondary transmission in France from one or more possible cases, this response applied the following priority measures:

– early detection of cases, through the provision of information to all healthcare professionals and to the public, as well as specific information for passengers arriving from affected areas;
– medical management of possible cases, including strict isolation and transfer to the infectious disease department of the relevant Biotox reference hospital (11 hospitals across the country) and protective measures for healthcare personnel;
- identification and surveillance of the contacts of the patients determined to be probable cases, including the quarantine of these contacts for 10 days, at their homes. All healthcare professionals nationwide received the official definitions of possible and probable SARS cases.

Operationally, the healthcare response was organized around the following plan:

– national and international health surveillance by InVS;
– early detection of possible cases by the emergency medical service (SAMU) centers for transfer in secure ambulances;
– preferential hospitalization of possible cases in Biotox plan reference hospitals or in the infectious disease departments of university hospital centers (UHCs);
– investigation and epidemiologic follow-up of contacts of probable cases by InVS, district health and welfare bureaus (DDASS), and the regional epidemiology units (CIRE);
– medical follow-up of contacts initially conducted by general practitioners belonging to the regional networks for influenza observation (GROG).

Definition of SARS cases (DGS protocol dated 22 May 2003)

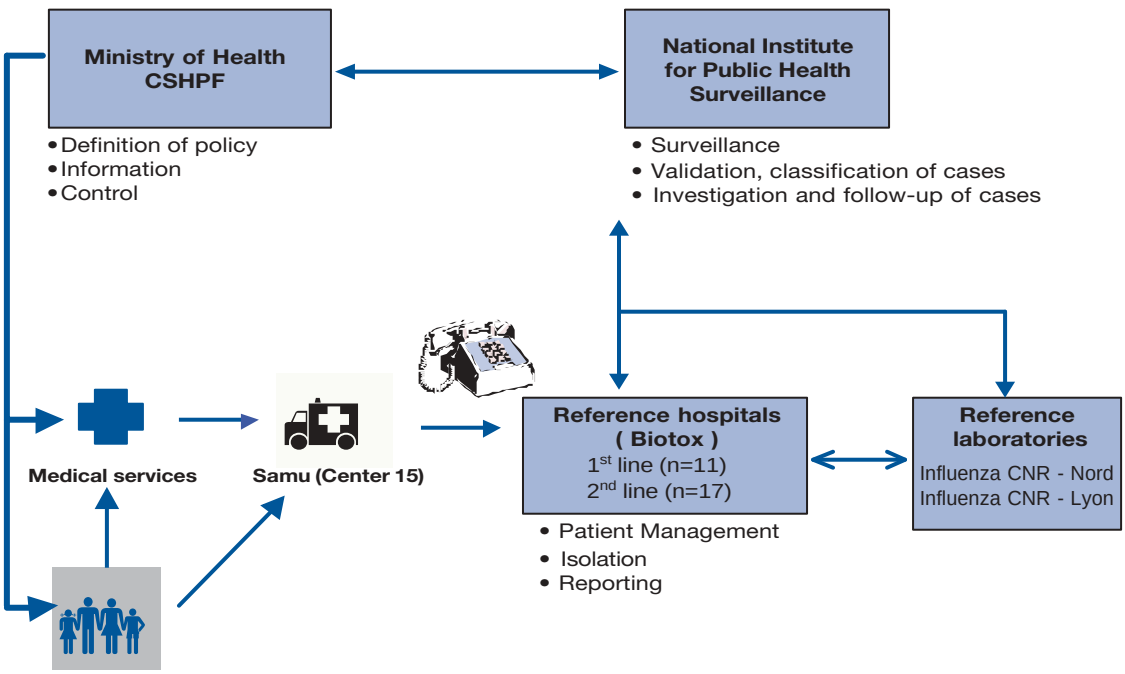
– *Possible case:* any person with all of the following signs: fever > 38°C and one or several lower respiratory signs (coughing, dyspnea, respiratory discomfort, abnormal sounds on auscultation, radiologic abnormalities if the chest x-ray has already been taken, or oxygen desaturation if oximetric measurements were taken) and exposure within the 10 days preceding the onset of signs by either hospitalization in an area considered by WHO to have active local SARS transmission or by close contact with a probable case.

– *Probable case*: all possible cases with signs of respiratory disease on radiography or pulmonary scanner, in the absence of another diagnosis.

– *Excluded case:* all possible cases for which another diagnosis explains the symptoms or for which the following four criteria are met: good clinical condition, negative findings on chest radiography or pulmonary scanner, no reduction in lymphocytes (white cell subpopulation), no contact with a probable case.

Epidemiologic surveillance according to a simplified plan centralized at InVS (Figure 4). The urgency of the situation of this severe disease, the modes of transmission of which remain hypothetical, made it essential for a rapid and direct system of information communication and management to be centralized at InVS. Physicians in the public and private sectors were required to report any suspected case promptly by telephone to InVS. The telephone number for the hotline, available 24 hours daily at InVS (01 41 79 67 15), was distributed to all concerned. An InVS epidemiologist and the patient's physician assessed each **possible case** reported to classify it according to the criteria chosen: **probable, excluded, or under investigation**. All probable cases and any cases that raised a particular problem or otherwise required discussion were reported to the DGS. Once a probable case was identified, this person's contacts were quarantined (isolated in their homes), for 10 days following the last at-risk contact; InVS managed their daily epidemiologic follow-up, in liaison with the DDASS and the applicable regional epidemiology unit.

Figure 4. Simplified diagram of the SARS surveillance system in France, 2003



– Summary of the SARS epidemic in France in 2003

From the initial alert through 5 July 2003, the surveillance system centralized at InVS identified 437 possible cases, all of which were investigated; there were finally seven probable cases (1.6%), four of which were confirmed (1%). One patient died (lethality = 14%).

The seven cases classified as probable and reported to WHO and the European Union were all imported from Asia, in two distinct groups (Table 1):

– in the first group (group A), four persons were exposed to one index case—a French physician at the French Hospital in Hanoi, returning to France; three were exposed during the doctor's journey on AF flight 171 from Hanoi to Bangkok and Paris during the night of 22-23 March 2003;

– in the second group (group B), two people were exposed in Nanjing (China) in April during a business trip.

Of these seven probable cases, four were confirmed by the diagnostic tests available during the epidemic (serology and/or PCR).

PCR (Polymerase Chain Reaction): a special biological technique that makes it possible to detect the virus's genetic material. This test, developed by the Pasteur Institute, detects the presence of the SARS coronavirus in possible or probable cases.

Serology: technique to search the blood for antibodies directed against the agent that causes SARS.

Table 1: SARS epidemic in France - number of probable cases and classification, March-July 2003

Group	N° Cases	Onset of signs	Exposure	Outcome	Classification
A	**1** index case, group A	20/03/03	Hanoi	Death	Confirmed
	2	26/03/03	Hanoi-Paris airplane flight	Favorable	Confirmed
	3	27/03/03	Hanoi-Paris airplane flight	Favorable	Confirmed
	4	29/03/03	Hanoi-Paris airplane flight	Favorable	*Probable, not confirmed*
	5	01/04/03	Hanoi	Favorable	Confirmed
B	6	30/04/03	Nanjing (China)	Favorable	*Probable, not confirmed*
	7	03/05/03	Nanjing (China)	Favorable	*Probable, not confirmed*

InVS and then the appropriate regional epidemiology unit followed four cohorts of contacts of these probable cases, 77 persons in all, daily for ten days:

– one cohort of 24 subjects, all hospital staff returning to France from work at the French Hospital of Hanoi (March 2003);

– the 7 passengers who traveled on AF flight 171 on 22-23 March, in the two rows in front of and behind the seat of the group A index case;

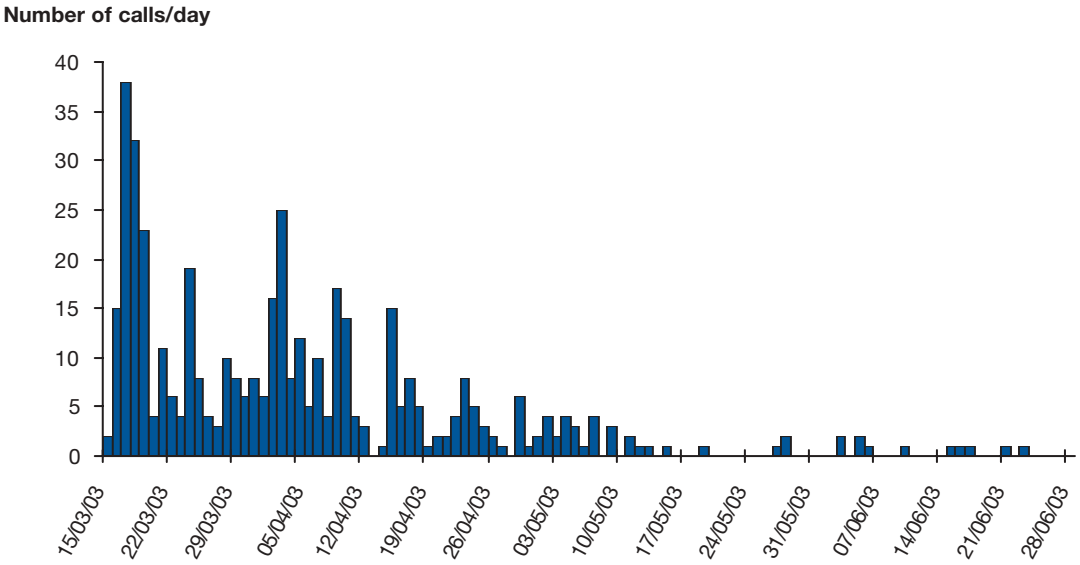
– 32 contacts of the 2 probable cases from Nanjing in April-May 2003;

– and the 14 contacts of a final probable case, later excluded.

No cases of secondary transmission were identified in France, among either the close contacts of probable cases or their healthcare providers.

Of the 430 cases excluded, 175 (40%) were ruled out within 24 hours, as soon as the epidemiologists confirmed that they had not been exposed. These rapid exclusions were most numerous during the first week following the alert; as general practitioners and SAMU supervisors gained experience, they were able to evaluate exposure better before classifying and reporting possible cases. Because of a strong suspicion of exposure, 86 possible cases (20%) remained under observation for 24 to 72 hours before the SARS diagnosis could be excluded. Finally, 24 possible cases (5%), for whom exposure to a probable SARS case was strongly suspected or definite, remained in isolation for more than 72 hours before a differential diagnosis was established. Data were missing for 145 possible cases.

Figure 5. SARS epidemic in France - daily reports to InVS between 15 March and 5 July 2003



– Results of specific investigations

Aside from surveillance, specific studies were also conducted. These included a survey to investigate the circumstances of the introduction of SARS into France and another to assess the possibility of asymptomatic transmission of the SARS coronavirus to persons who had contact with confirmed cases.

- **Survey to investigate the introduction of SARS in France in March 2003**

This survey demonstrated the transmission of the SARS-CoV during a long-haul airplane flight based on data collected from five probable cases and passengers exposed to the group A index case in the cohort of AF flight 171 from Hanoi to Paris on 22-23 March 2003. Exposure to the index case for two of the three confirmed cases occurred while he was symptomatic, during this flight (Table 1):

– one was part of the group of seven passengers sitting near the index case (two rows in front of and behind him);
– the other was seated several rows back and had no documented close contact with the index case.

- **Seroepidemiologic study among subjects exposed to a probable SARS case**

This study of the subjects exposed to the first probable SARS case in France (group A index case) was intended to assess the possibility of asymptomatic transmission of the SARS coronavirus to contacts of a confirmed case.

The results of this survey, conducted and coordinated by InVS and the influenza CNR-Nord at the Pasteur Institute, are not yet available. Because this study required a rapid ethical opinion from the French Ethics Committee (CCPPRB), a special emergency meeting took place to reduce the application deadlines. This procedure will henceforward be applied for other studies conducted on an emergency basis by InVS as part of its epidemiologic surveillance activities.

– Workload

SARS surveillance mobilized 19 persons within InVS, including 15 epidemiologists in the department of infectious diseases (DMI) and two in the international and tropical department. In the first weeks, the team met daily, and then twice a week to discuss the cases, their classification, and problems related to their management. Night and weekend on-call duty was also reinforced. Two regional epidemiology units were mobilized to follow up the contacts of probable cases. One coordinating team (three persons) managed liaison with the DGS, the Pasteur Institute (the influenza reference center in the Nord), general practitioners, district health and welfare bureaus, the regional epidemiology units, occupational physicians for airlines, and other companies with commercial ties to the affected areas. InVS participated actively in three sessions of the High Council of Public Health of France (CSHPF). International telephone conferences took place with WHO, the European Commission, and the other

member states.

– Qualitative aspects of the epidemiologic management of SARS in France

The team of epidemiologists responsible for SARS management in France also made qualitative assessments that went beyond the framework of this surveillance.
Because the follow-up of possible cases until classification can be relatively long, the epidemiologists needed to consider the operational constraints of the clinicians in hospitals, as well as the constraints of access to laboratory diagnoses (confirmation of SARS diagnosis or differential diagnosis of another respiratory disease).
Moreover patients or their families sometimes objected to the consequences of classification, and the experience of isolation or quarantine was particularly difficult for some. The epidemiologists were confronted with these problems on several occasions, as well as with incidents involving the lifting of the patient's anonymity or failure to respect the confidentiality of medical information.

Lessons from the 2003 SARS epidemic

The system set up in France identified seven probable SARS cases, 1.6% of the possible cases reported. While a cost-benefit ratio for the measures implemented could be calculated from this result, the essential point is that no cases of secondary transmission occurred.

Overall, the effectiveness of the response to SARS demonstrated the advantages of multidisciplinary advance planning and preparation. The updated version of the "SARS response plan" drafted in December 2003 by the DGS and available on its website has been distributed to our European partners. This plan, conceived as a prototype, can be adapted to other infectious epidemic phenomena.

Similarly, the SARS experience has helped to identify some useful improvements for this management system. The application of these improvements goes beyond the framework of SARS and should improve our response to all other emerging infections.

Anticipation of the risk is essential, through epidemiologic surveillance that includes monitoring of infections outside France or Europe.
This surveillance must be complemented by a reactive alert system that can detect emerging infections in France. Such a system should involve participation of physicians from hospital infectious disease departments and the epidemiologic expertise of InVS. It is currently being developed.

– It is also essential to strengthen the capacities for and quality of patient management in these departments, by decentralizing the management of these patients to university hospitals not included in the Biotox plan. In the event of a larger-scale epidemic, hospital capacity would require enlargement, in terms of both the number of patients expected and the management of isolation as well as, more generally, nosocomial transmission risks.

– SARS has clearly shown that a rapid etiological diagnosis of respiratory diseases is needed. One of the major research issues is thus the development of techniques permitting the diagnosis of SARS-CoV and some differential diagnoses, with sufficient specificity. At the end of 2003, after the epidemic, the reference laboratories authorized to conduct research on the SARS coronavirus were decentralized. This decentralization must nonetheless be accompanied by strict precautionary measures to avoid any risk of infection in the laboratory.

– Different research topics must be developed, for SARS and for other emerging infections. Epidemiologic research will help elucidate the reservoirs and modes of transmission of these emerging infections, and modeling studies

can specify how these infections are imported and disseminated.

– Finally, SARS illustrated the need to take into account and anticipate the social characteristics of such an epidemic (for example, representations, emergency communication, rumors, and the consequences of panic). The implementation of drastic isolation measures raised numerous ethical questions, especially about the possible effect of these measures on private and work life and about respect for confidentiality.

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Desenclos JC, van der Werf S, Bonmarin I *et al.* Introduction of SARS in France, March-April, 2003. Emerg Infect Dis 2004; 10(2):195-200

Alerte et conduite à tenir en cas de résurgence du Sars (http://www.invs.sante.fr)

Health consequences of the heat wave, national alert

The heat wave that scorched France in the first weeks of August 2003 was exceptional in its duration, in the increases in maximum as well as minimum temperatures, and in the ozone pollution levels that accompanied these temperature peaks. Even though the summer of 2003 had already been the hottest in France for 53 years, the August heat wave occurred so abruptly that it has been described as a "heatquake".

It induced a wave of excess short-term mortality estimated at approximately 15 000 deaths, especially among those older than 75 years. This dramatic toll, which places this heat wave among the gravest health catastrophes France has ever known, cast doubt on the capacity of our public healthcare system to anticipate this type of crisis. The work begun during the heat wave, at the request of the Ministry of Health, led to the development of a national heat wave plan.

InVS also conducted several case-control studies to identify the risk factors for mortality among the elderly; these factors can be used to define profiles of the most vulnerable and thus facilitate their identification and prevent health consequences to them in another heat wave. Moreover, InVS and the French weather bureau (Météo France) together developed a biometeorological alert system that was operational for the summer of 2004.

How it began

According to Météo France data, the summer of 2003 was the hottest since record-keeping began, not only for daily maximum but also for the minimum temperatures. The high heat began on 15 July. At the beginning of August, the onset of a heat wave of exceptional intensity led Météo France to issue press bulletins on 1 August and again on 7 August; these communiqués stressed especially the risks of drought that accompany these weather conditions; the second also mentioned the health risks to the population, especially the elderly.

On 6 August InVS and DGS simultaneously received the first report of a health alert: a public health physician from the Morbihan district health bureau forwarded a report from the emergency medical service center of deaths, probably related to heat, of people aged 35, 45, and 56 years, at their workplace on 5 August. Similar reports arrived at InVS directly or were forwarded from DGS from 6 through 8 August but the seriousness of the situation, probably already measurable, was not perceptible at InVS at this point.

On Friday 8 August, the DGS requested InVS to plan surveillance of these events. InVS proposed the first guidelines for these emergency investigations to the DGS that day.

On Monday 11 August, the office of the Minister of Health asked InVS to monitor deaths due to heatstroke occurring in hospitals across the country. The next day, InVS proposed a general protocol for the studies to be undertaken. It planned:

- a review of the literature about heat waves;
- three short-term studies:
  - a descriptive study of the activity of the different health stakeholders;
  - a study of the deaths in several large French cities, including their correlation with the meteorologic data (the "13-cities survey");
  - a study of deaths from heatstroke occurring in hospitals;
- as well as longer-term studies:
  - a study in the 9 cities in the PSAS-9 (9-city Air and Health Surveillance Program, by InVS) of the mortality attributable to heat and to ozone;
  - European study with partners from the European Union's PHEWE (Assessment and Prevention of Acute Health Effects of Weather Conditions in Europe) program.

On 13 August, hospital mortality data from the Paris public hospital system (AP-HP) led to the conclusion that a major epidemic was developing. InVS also collected data from a chain of funeral homes (PFG) that normally organizes funerals for approximately 25% of the deaths in France (unequally distributed across

Characteristics of the August 2003 heat wave

The summer of 2003 and especially the first two weeks of August were exceptionally hot, in terms of both maximum (+ 2°C relative to the next three hottest summers: 1976, 1983, and 1994) and minimum (+ 3.5°C more than the mean for 1950-1980 and +1.4°C over 1994) temperatures. The entire country was affected. Two-thirds of the 180 weather stations recorded temperatures above 35°C; temperatures above 40°C were observed in 15% of the weather stations, including in Brittany. More than 80 districts endured a temperature above 35° for at least 1 day and 61 districts for at least 9 days. In Paris, temperatures exceeded 35°C for 10 days including 4 consecutive days from 8-11 August, for the first time since record-keeping began in 1873. The absolute record for daily low temperatures was broken in Paris on the 11 and 12 of August, with two consecutive nights of temperatures above 25.5°C. Other cities, including Nice, Marseille, and Lyon, endured very elevated minimum temperatures and the persistence of high maximum temperatures for several consecutive days.

The chronology of mean maximum temperatures for all Météo-France weather stations shows that the maximum temperatures rose progressively from 1 to 5 August, from a value near the norm (25°C) to 37°C, remained between 36°C and 37°C through 13 August, then regressed rapidly in the days that followed (28°C on 16 August).

At the same time, the high temperatures and the sunny skies combined with pollutant emissions to augment atmospheric ozone levels markedly. InVS thus had to take into account the effects of air pollution in its assessment of the heat wave's health consequences.

the country) and found a substantial increase in their activity that week.

It was thus decided to conduct a study to quantify the short-term excess crude mortality in continental France and Corsica, that is, to assess how many more deaths occurred than would have normally been expected. InVS in collaboration with the Ministry of the Interior began the first study on 13 August. It encountered a number of difficulties and was complemented, as of 20 August, by a descriptive mortality study conducted by the National Institute of Health and Medical Research (Inserm) with the active participation of InVS and each district health bureau. This study was based on the death certificates recorded at the vital statistics office of each municipality in France. By 13 August, then, four epidemiologic surveys had begun on an emergency basis to assess the short-term health consequences of the heat wave in France, both directly and indirectly (that is, measured by the activity of the emergency services). On 21 August, a fifth survey began, to assess the health consequences of the heat wave's immediate aftermath, based on emergency services activity data. Finally a sixth survey of European experts sought to determine the health impact of this heat wave in other European countries. These surveys provided preliminary information and initiated the collaborations necessary to improve our alert system for such risks.

Analysis of the excess mortality associated with the August 2003 heat wave

Analysis of the mortality in France in August 2003 is based on counting each death recorded. This was done by comparing information from Inserm (death certificates and vital status "7" bulletins), INSEE (vital status "7-bis" notices), and InVS (death counts from the district health bureaus).

Circulation of death data

Since the sharing of responsibility for monitoring deaths between INSEE and Inserm was implemented in 1968, documents related to these reports circulate as follows:

- the death certificate, stating the cause of death, is completed and transmitted to the municipal vital statistics office by the physician who certifies the death;
- the "7" bulletin is completed by that same office when the death is reported. It omits the decedent's name, but does include his or her social and demographic characteristics: sex, date of birth and death, and place of death. The municipality sends both the nominative death certificate and the anonymized "7" bulletin to the DDASS, which forwards them to Inserm;

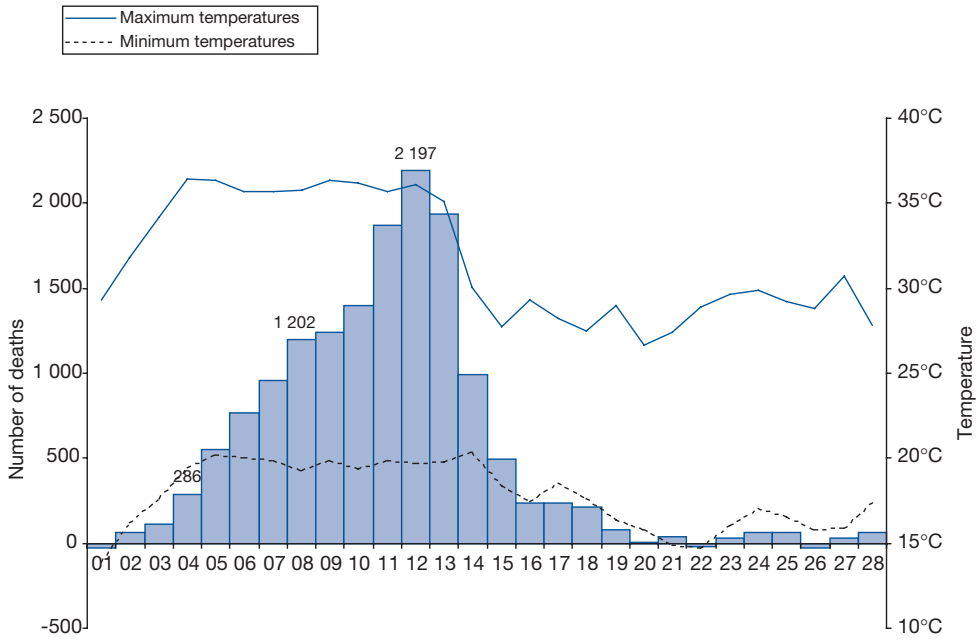
It also transmits the "7-bis" notice, which includes the subject's name but is otherwise identical to the "7" bulletin, to INSEE.

At the beginning of the third week of August, transmission of all these documents was accelerated, and the DDASS transmitted death counts daily for the rest of the month.

By mid-September, information from these sources was centralized and used to validate about 56 000 deaths from more than 36 000 municipalities. Comparison of these data with the deaths expected over the same period based on the number of deaths observed during the months of July, August, and September in 2000, 2001, and 2002 made it possible to estimate the excess mortality associated with the heat wave.

The results indicate cumulative excess mortality estimated at 14,802 deaths between 1 and 20 August 2003, for a 60% increase above the expected number of deaths. The wave of excess mortality began on 4 August over most of the country with nearly 300 excess deaths for that day alone, relative to the previous three years. The daily excess increased regularly and massively, reaching 1200 on 8 August and nearly 2200 on 12 August (Figure 6). It began to regress on 13 August. There were roughly 2000 excess deaths on the 13th and 1000 the next day. Mortality levels progressively declined and returned to their normal value on 19 August. The period of excess mortality thus matched the period of the heat wave that scorched France from 4-13 August, and its decrease followed the fall in temperatures.

Figure 6. Excess deaths observed daily during August 2003 and exterior temperatures (source Inserm)



Excess mortality was highest among those aged 75 years or older (+ 70%) but was also evident among those aged 45-74 years (+ 30%).

Women were struck much harder than men. The mortality ratio was 15-20% higher among women than men in all age groups. Because of this gap and women's generally greater longevity, excess mortality was more than 80% higher among women (+ 9510 deaths) than men (+ 5292 deaths).

The excess deaths were distributed unequally across the country, with the Centre and Ile-de-France regions struck hardest (Figure 7). It was generally less marked in rural areas and small towns. On the other hand, it was substantial in mid-sized and large cities (approximately +40%) and very strong in the Paris region (+141%). The tragedy of summer 2003 was thus essentially an urban phenomenon, as the "13 cities" study corroborated. The four cities with the highest excess mortality were distinguished by the extent to which their temperatures during the heat wave exceeded seasonal norms (+6.7°C to +7.4°C); this finding confirmed the idea of a critical temperature as a potential alert threshold.

The excess mortality observed in the districts of continental France was clearly associated with the number of days of very hot weather (maximum daily temperature of at least 35°C and

Supplementary data from the other emergency epidemiologic studies conducted by InVS

Some early descriptions of those who died during the heat wave suggest that those who were least independent —the elderly, those with a physical handicap or mental illness—were most vulnerable to excessive heat.

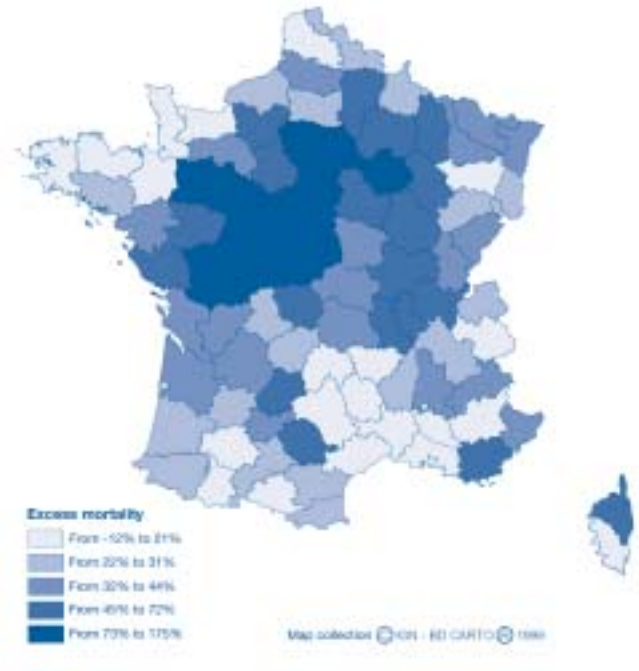
The first study conducted with the emergency services, both hospital- and prehospital-based services (emergency medical services, firefighters/rescue workers, physician house-call services), provided information which was important in assessing the feasibility and utility of a health alert system linked to the computer-equipped emergency rooms; the second allowed the testing of such a system for a short period, in the immediate aftermath of the August heat wave. The data furnished by these services permit regular monitoring of very sensitive indicators (for example, number of reports of malaise, interventions among those older than 80 years). The prehospital services appeared somewhat more reactive and could furnish their activity data fairly easily. Hospital emergency medicine departments seemed to find it harder to provide daily data, including medical activity data. Diagnosis data were particularly difficult to collect and were rarely complete.

minimum daily temperature of at least 20°C) observed between 1 and 20 August: + 30% in the districts with 0 or 1 day of very hot weather, + 50% for 2-5 days and + 80% for 6 days or more.

Overall, 42% of deaths occurred in hospitals, 35% at home, 19% in retirement homes or hospices, and 3% in private clinics. Deaths in retirement and nursing homes and at home increased the most, roughly doubling.

The principal causes of these deaths were directly associated with heat: 29% were due to heatstroke, dehydration, or hyperthermia; next came diseases of the circulatory system (21% of the deaths) and the respiratory system (8%).

Figure 7. Analysis of excess mortality by district in France between 1 and 20 August 2003, compared with the mean deaths in 2000-2002 (data collected on 30 September 2003)



Analysis of risk factors: case/control studies in institutions and among the non-institutionalized elderly

Once the extent of the dramatic health consequences of the heat wave was understood, it was essential to ascertain the risk factors for the deaths during this episode to orient future prevention efforts. Because the excess mortality concerned mainly the elderly, both community-dwelling and in institutions, research concentrated on risk factors in these populations. InVS thus conducted several case/control studies in institutions and among the non-institutionalized elderly; these started at the end of August and were meant to be completed rapidly to limit any memory bias.

Implementation, however, turned out to be longer and more difficult than initially thought, so that the data collection and preparation for analysis were not completed until March 2004. The results presented here are therefore provisional: **they pertain to only the very marked risk factors linked to individual characteristics**. Other risk factors associated with dwelling, municipality, and behavior during the heat wave will also be studied, and the relation between each risk factor and death will be quantified.

Population at risk: the elderly living in large cities

Several physiological reasons explain the excess mortality from heatstroke among the elderly:

- the elderly perceive heat and feel a need to protect themselves only after their skin temperature rises 5°C, compared with 0.5°C among younger adults;
- the need to drink is perceived increasingly less with age, and moderate dehydration produces no or little sensation of thirst after 70 or 75 years.

The phenomenon of heat islands in large cities.

Human activities are heat sources and can create heat islands where air does not circulate and nighttime temperatures remain elevated. Normally, changes in the amount of sunlight and in air circulation cause temperature variations. In heat islands, vertical façades slow nocturnal heat loss by radiating the heat stored by highly-absorbent walls (such as the brick walls in North American cities) and road surfaces during the daytime. Moreover, air pollution forms a layer above the city and reflects heat back down. The absence or rarity of vegetation reduces evapotranspiration and the buildings slow the wind down. These factors, combined, contribute to the creation of heat islands.

In any case, these preliminary data, combined with the information from the literature review of the health effects of other heat waves, helped to refine the profile of the people most vulnerable to heat waves so that they can be identified, as required by the national heat wave plan and the statute proposed to implement it. Both call for a census by each municipality of the elderly or handicapped residents whose situation justifies their identification and who so request. Prefects have received a circular with the district plan for model interventions; it includes an appendix listing the methods for identifying people at risk and the activities expected to be taken by local authorities and home aides.

Case/control study: study comparing the frequency of past exposure among a group of subjects affected by the disease under study ("cases") and a group of subjects who do not have the disease ("controls"), with the aim of assessing a possible association between the disease studied and exposure.

- Surveys of the institutionalized elderly

InVS, working with the department of research studies, evaluation, and statistics (DREES) and Inserm unit 500 (epidemiology of chronic diseases and aging), conducted two studies simultaneously:

- one case-control study of mortality in institutions, intended to identify the risk and protective factors directly associated with the facility and independent of the decedents' characteristics;
- a case-control study of individual mortality, intended to identify the individual risk and protective factors, independent of those associated with the facility.

The "institution" study was conducted in 172 case-facilities (nursing homes, long-term care units, other assisted living facilities with medical care available) in the area with the highest excess (regions of Alsace, Burgundy, Centre, Champagne-Ardenne, Franche-Comté, Ile-de-France, Limousin, and Lorraine, as well as parts of the regions of the Loire, Poitou-Charente, and Rhône-Alpes) and which experienced high mortality levels during the heat wave (district health bureau data, 14 August, 2003). They will be compared with the same number of control facilities matched for geographic zone and level of mobility of its client population.

The individual survey concerned 317 cases and 317 controls, recruited in these 172 facilities. The cases were residents of these institutions who died between 5-15 August and had spent at least 24 hours in the institution during this period. The controls are also residents of the institution, of the same age and sex, and alive on 1 September 2003.

The sample is composed of 75% women and 25% men. Age was not studied as such, since controls were chosen to be as close as possible in age to cases. Data were collected by interviews with the staff during a visit to each facility.

Analysis shows that **vital prognosis** was closely associated with degree of mobility, defined by the GIR, or by the ability to leave one's room (compared with confinement to bed). Adjusting the other variables for degree of independence thus made it possible to identify the **following other individual risk and protective factors**:

- of the chronic diseases studied, Parkinson disease, bedsores, malnutrition, respiratory diseases (excluding asthma), and renal diseases were associated with dying during the heat wave;
- taking either medication for Parkinson disease or cardiac, cerebral, or peripheral vasodilators was associated with death;
- taking a shower at least once a week was highly related to better vital prognosis;
- receiving a visit or a telephone call during the heat wave or participating in group activities was associated with better vital prognosis.

GIR: according to the law of 24 January 1997, dependence is defined as the "condition of persons who, notwithstanding the care they are likely to receive, need assistance to accomplish the activities of daily living or require regular surveillance". This degree of dependence is assessed with the Aggir national checklist, which classifies dependence of the elderly in six categories, from most dependent (GIR 1) for an elderly person with no independence for whom the continuous presence of a third person is essential to the least dependent (GIR 6) for an elderly person able to handle the activities of daily living on an almost independent basis.

– Survey among the community-dwelling elderly

This case-control survey was set up to study the risk factors for heat-wave-related deaths among those aged 65 years or older who lived in individual dwelling units in one of the urban areas most hard-hit by the heat wave: Paris, Val-de-Marne, Orleans, or Tours.

It included 259 cases and 259 controls. Cases were persons who died from 8-13 August 2003, who lived at home, and had spent at least 24 hours there during the heat wave (CépiDc data; deaths by accident, suicide or surgical complications were excluded). Controls were persons of the same sex, in the same five-year age group, who lived at home in the same urban area; they were selected by random drawing from telephone directories.

Data were collected by interview with a friend or family member of the cases and directly with control subjects (or a friend or family member if necessary).

The mean age of the cases was 83 years (range: 66-102 years); because of matching for five-year age groups, the controls were slightly younger (6 months) on average. The **age factor** could thus be studied as such; as expected, it was highly associated with death, even after adjustment for age.

The analysis also revealed the following **risk factors**:

- lack of mobility, defined as confinement to bed or an armchair, was closely associated with death, as was "home hospitalization";
- of the chronic diseases studied, Parkinson disease, dementia, cardiac diseases, and obesity were associated with death;
- of the drug treatments (participation of general practitioners allowed us to study this in 118 case/control pairs), anti-Parkinson drugs, neuroleptics, and antidepressants were associated with death.

Study of the associations with social characteristics is complicated by the relation between level of dependence (associated with

Several other risk or protective factors will be investigated by these studies

- number and quality of staff and the size of the facility
- air conditioning, architectural characteristics, and type of housing
- hospitalization
- existence of specific prevention policies.

mortality) and the fact of being looked after, by medical and social stakeholders in particular. Although living alone appears to be associated with a good vital prognosis in the crude analysis, it is probably because living alone at home is associated with a high level of physical mobility. On the other hand, it appeared to the investigators that living with a partner was not as protective a factor as initially thought.
Several other risk or protective factors will be investigated by these studies:
- number and quality of staff and the size of the facility
- air conditioning, architectural characteristics, and type of housing
- hospitalization
- existence of specific prevention policies.

– Risk factors and prevention

Many factors can combine in different ways to precipitate an elderly person towards a morbid state and then towards death, or, on the contrary, help him or her to overcome the pathophysiologic effects of heat on the body. These factors are of several different kinds; they are certainly associated with subjects' individual characteristics but also with their physical environment, behavior, and adaptation of this behavior to excess heat. Early results of the studies conducted in France during the aftermath of the August 2003 heat wave confirmed the influence of these different types of factors on mortality. Besides characteristics such as independence, the presence of underlying disease, and some drug treatments, these studies will analyze other factors, equally determinant:
- adaptive behavior: judicious management of open windows, appropriate hydration, and seeking cool or air conditioned places are known protective factors;
- dwellings: access to air conditioning is protective while living on the top floor is a risk factor;
- urban characteristics of the nearby area (within 200 m): greenery in particular plays an important role in the "heat island" effect around the dwelling.

The overlap of multiple factors makes it both complex and perilous to define the persons who are most vulnerable based on characteristics that can be assessed by local authorities, that is, essentially social and demographic characteristics.
At first glance, old age is itself an essential risk factor. The median age in our sample of

Another study underway: descriptive approach to the characteristics and behavior during the August 2003 heat wave of the elderly subjects included in the "3-cities" and Paquid cohorts

Set up in 1999 in three French cities (Bordeaux, Dijon, and Montpellier), the "3 cities" cohort, also known as "3C", includes 9294 elderly persons aged 65 years or older, recruited from voting rolls. Data from this cohort have been collected to study the risk factors for cognitive (dementia) or cerebrovascular (cerebrovascular accidents) events. This cohort represents a database containing extensive individual information about possible risk factors among the elderly that affect their response to heat in cities where the impact of the August 2003 heat wave varied.

The Paquid (Personnes âgées QUID) cohort was created in 1988 to study the functional and cerebral factors of aging in a randomized sample of 3777 subjects aged 65 years or older at inclusion and living at home in the Dordogne and Gironde districts. Subjects were randomly selected from the voting rolls after stratification for age, sex, and urban unit. During the inclusion of subjects in 1988, psychologists visited their homes and completed a detailed questionnaire about their social and demographic characteristics and health condition.

In collaboration with Inserm (Unit 593) and INSEE, InVS seeks to describe the characteristics of the subjects in these cohorts and the behavior during the August 2003 heat wave of those with and without heat-wave-related health problems and to identify the risk factors for morbidity and mortality associated with the heat wave. At completion, this study should let us identify behaviors that may be useful in terms of public health, especially for developing prevention messages for the elderly during future heat waves.

community-dwelling elderly cases was 83.5 years, which is representative of those older than 65 years who died during the heat wave and lived in their own home. In younger age groups, loss of autonomy is probably the most important factor; in institutions, this corresponds to GIR 1 and 2 (measured recently).

Median: a statistical indicator that represents the central value of a data series and separates the study sample into two equal parts. If the median age of a given population is 30 years, half the people in the population are younger than 30 years.

Analysis of the effect of underlying morbid conditions is difficult, because it cannot always be distinguished from that of their drug treatment.

In any case, planning for heat waves must include suitable medical management of elderly patients with mental illness or cardiovascular, cerebrovascular, and neurodegenerative diseases (dementia or Parkinson disease, in particular).

Many assigned a leading role to isolation during this heat wave, but its direct association with mortality is difficult to assess. This issue requires supplemental analyses. It is, under all circumstances, primordial to promote contacts with the elderly and warnings and advisories to them, before and especially during any future heat wave. They need to be made aware of the essential protective measures (drink enough water, keep as cool as possible, go out to find a cooler location, insulate the dwelling from the heat as much as possible) and encouraged to apply them.

InVS's collaboration with Météo France: how to use meteorologic forecasts to determine a state of alert

In the aftermath of the August disaster, InVS and Météo France launched a joint project for the permanent transmission of meteorologic data for an alert system to cope with future heat waves, to be operational by the summer of 2004.

Although prevention systems for local heat waves have been set up in several cities around the world, none function on a national level. Nor is there any reliable international study on the cut-off points for health alerts as a function of outdoor temperatures. The principal difficulties of this project were therefore:

- to identify and select biometeorological indicators for predicting excess mortality
- and to define cut-off values—above which an alert will be issued—that are appropriate for all the climatic zones in France. This geographic extension constitutes the originality of this first French heat wave alert system.

The system, as part of the **national heat wave plan**, is designed to alert the authorities three days before the possible onset of a large-scale epidemic phenomenon related to a summer heat wave.

– Choice of biometeorological indicators for monitoring

InVS selected the biometeorological indicators to be monitored by analyzing meteorologic data (source: Météo France) and all-cause mortality (INSEE data) recorded from 1973 through 2003 in 14 cities of varying climates across France (Paris, Marseille, Lyon, Toulouse, Nice, Nantes, Strasbourg, Bordeaux, Lille, Grenoble, Tours, Le Havre, Limoges, and Dijon). We tested the following biometeorological indicators:

– indicators associated only with temperature: minimum, maximum, and mean temperatures, diurnal temperature amplitude, temperature deviation from the mean over the past thirty years, and a mixed indicator combining the minimum and maximum temperatures;
– indicators incorporating relative humidity, which can be an additional risk factor during

heat waves: dew point and temperature-humidity index.

To test these indicators, we used different values for them, averaged from 1 June through 31 August for 1972 through 2003, and different percentages of daily excess mortality (50%, 100% or more), calculated by using a retrospective reference mean over the past thirty years. For each value of each indicator and for each percentage of excess mortality, we calculated retrospectively the number of alerts, as well as the number of true, false, and missed alerts. An analysis of the system's sensitivity and specificity made it possible to determine, for a given percentage of excess mortality, the indicator and cut-off point that minimized the number of missed and false alerts.

Given the strong daily variability of mortality, especially in the smaller cities, it was finally necessary to use three-day cumulative mortality data and, thus, biometeorological indicators averaged for the same period. This method has the additional advantage of taking into account the persistence of the heat wave.

The results showed that:

– relative humidity was rather unimportant, probably because earlier heat waves in France were quite dry; this variable nonetheless constitutes a supplementary risk factor;
– **the most effective indicator was a mixed indicator involving daytime and nighttime temperatures.** Therefore the daily maximum temperatures and the nightly minimum will both be monitored for the national heat wave plan;
– the variability and small number of daily deaths in most of the cities studied did not allow an alert threshold for excess mortality less than 50%.

– Definition of alert thresholds

InVS has established sensitive and specific threshold values above which alerts will be activated in 13 of the 14 pilot cities (threshold values could not be established for Le Havre, which appears not to have experienced a heat wave of any consequence over the past thirty years; Rouen was chosen as the reference city for Seine-Maritime). Extension of the system has made it possible to set alert thresholds for 90 weather stations covering the 96 districts in metropolitan France (Table 2).

– Conclusion and perspectives

It is important to note that this system was built from observed meteorologic data and that it will function on forecast data: some imprecision will inevitably proceed from that change, and at least a year is needed for fine-tuning the system. It will nonetheless be tested by Météo France before the summer of 2004, with forecasts for 2003.

This project was developed on an urgent basis to be operational by the summer of 2004. This work must be continued and improved by taking other factors into account, including air masses and temporal events (trend, seasonality), to improve the system's performance.

Finally, the choice of cut-off points intended to identify the risk of excess mortality raises the standard issues of sensitivity and specificity:
- the positive predictive value of a model cannot be 100%: in other words, it is possible that exceeding the meteorologic threshold does not by itself mean that the predicted risk will occur;
- similarly, the negative predictive value will never be 100%, and the risk may occur even if the threshold is not exceeded.

Table 2: Thresholds defined for the alert system for France

The cut-off points from the InVS study are shown in bold. Elsewhere, the cut-off points are calculated by Météo-France as the 98th percentile over 30 years for the Tmin and Tmax measured in a reference weather station. For stations for which 30 years of data are not available, the 98th percentile was calculated for a station from the same district with 30 years of available data as well as for the limited period available for the station in question; the mean deviation of the 98th percentile between these two periods was calculated to correct the 98th percentile calculated for the short period. Source: Météo France.

District	Reference municipality	Threshold values	
		Tn	Tx
Ain	Ambérieu (Château-Gaillard)	21	35
Aisne	St-Quentin (Fontaine-Les-C.)	18	32
Allier	Vichy (Charmeil)	18	35
Alpes-de-Haute-Provence	St-Auban-sur-Durance	19	35
Hautes-Alpes	Embrun	18	33
Alpes-Maritimes	**Nice**	**24**	**30**
Ardèche	Aubenas (Lanas)	21	36
Ardennes	Charleville	17	32
Ariège	St-Girons (Lorp-Sentaraill)	19	35
Aube	Troyes (Barberey-St-S.)	18	34
Aude	Carcassonne	22	35
Aveyron	Salles-la-Source (Rodez)	19	34
Bouches-du-Rhône	**Marseille (Marignane)**	**22**	**34**
Calvados	Caen (Carpiquet)	18	31
Cantal	Aurillac	18	32
Charente	Cognac (Chateaubernard)	20	35
Charente-Maritime	La Rochelle	21	33
Cher	Bourges	19	34
Corrèze	Brive-la-Gaillarde	20	36
Haute-Corse	Bastia (Lucciana)	23	33
Corse-du-Sud	Ajaccio	22	34
Côte-d'Or	**Dijon (Ouges)**	**19**	**34**
Côtes-d'Armor	St-Brieuc (Tremuson)	17	29
Creuse	Guéret	22	33
Dordogne	Périgueux	19	35
Doubs	Besançon	19	33
Drome	Montélimar	22	36
Eure	Evreux (Huest)	18	32
Eure-et-Loir	Chartres (Champhol)	18	33
Finistère	Quimper (Pluguffan)	18	30
Gard	Nîmes (Courbessac)	23	36
Haute-Garonne	**Toulouse (Blagnac)**	**21**	**38**
Gers	Auch	20	36
Gironde	Bordeaux (Mérignac)	22	36
Hérault	Montpellier (Mauguio)	23	35
Ille-et-Vilaine	Rennes (St-Jacques-de-la-L.)	19	33
Indre	Châteauroux (Deols)	20	34
Indre-et-Loire	**Tours (Parcay-Meslay)**	**17**	**34**
Isère	**Grenoble (Le Versoud)**	**15**	**35**
Jura	Lons-le-Saunier (Montmorot)	21	33
Landes	Mont-de-Marsan	20	36
Loir-et-Cher	Blois	18	34
Loire	St-Etienne (Boutheon)	20	35
Haute-Loire	Le Puy (Chaspuzac)	16	32
Loire-Atlantique	**Nantes (Bouguenais)**	**20**	**33**
Loiret	Orléans (Bricy)	19	34
Lot	Gourdon	20	36
Lot-et-Garonne	Agen (Estillac)	20	35

District	Reference municipality	Threshold values Tn	Tx
Lozère	Mende (Brenoux)	15	31
Maine-et-Loire	Angers (Beaucouze)	19	34
Manche	Valognes	17	28
Marne	Reims (Courcy)	18	33
Haute-Marne	Langres	19	31
Mayenne	Laval (Entrammes)	18	33
Meurthe-et-Moselle	Nancy/Essey (Tomblaine)	19	33
Meuse	Nancy/Essey (Tomblaine)	19	33
Morbihan	Vannes (Séné)	19	32
Moselle	Metz/Frescaty (Augny)	19	34
Nièvre	Nevers (Marzy)	18	34
Nord	**Lille (Lesquin)**	**15**	**32**
Oise	Beauvais (Tille)	18	33
Orne	Alençon	18	33
Pas-de-Calais	Cambrai (Epinoy)	18	32
Puy-de-Dôme	Clermont-Ferrand	19	35
Pyrénées-Atlantiques	Pau (Uzerche)	20	34
Hautes-Pyrénées	Tarbes (Ossun)	19	34
Pyrénées-Orientales	Perpignan	24	35
Bas-Rhin	**Strasbourg (Entzheim)**	**17**	**35**
Haut-Rhin	Colmar (Meyenheim)	19	35
Rhône	**Lyon (Bron)**	**20**	**34**
Haute-Saône	Luxeuil (St-Sauveur)	18	34
Saône-et-Loire	Macon (Charnay-les-Macon)	20	34
Sarthe	Le Mans	20	34
Savoie	Chambéry (Voglans)	19	34
Haute-Savoie	Chamonix	14	31
Paris	**Paris Montsouris**	**21**	**31**
Seine-Maritime	Rouen (Boos)	18	32
Seine-et-Marne	Melun (Montereau-sur-le-J.)	18	34
Yvelines	Trappes	20	33
Deux-Sèvres	Niort	20	35
Somme	Abbeville	18	31
Tarn	Albi (Le-Sequestre)	21	37
Tarn-et-Garonne	Montauban	21	37
Var	Toulon	23	35
Vaucluse	Avignon	22	36
Vendée	La Roche-sur-Yon	19	33
Vienne	Poitiers (Biard)	19	34
Haute-Vienne	**Limoges**	**16**	**36**
Vosges	Epinal (Dogneville)	18	32
Yonne	Auxerre (St-Georges-sur-B.)	20	35
Territoire de Belfort	Belfort	19	33
Essonne	Paris/Orly	20	34
Hauts-de-Seine	**Paris Montsouris**	**21**	**31**
Seine-Saint-Denis	**Paris Montsouris**	**21**	**31**
Val-de-Marne	**Paris Montsouris**	**21**	**31**
Val-d'Oise	Paris/Le Bourget	19	34

InVS and the development of the national heat wave plan

The catastrophic health impact of the August 2003 heat wave and our growing knowledge about global climate changes, which suggests that such events may recur with increasing frequency, led the Ministry of Health and Social Protection to establish a national heat wave plan, operational in the summer of 2004.

InVS participated actively in developing this plan—as part of the national "emergency preparedness" working group established in November 2003 by the directors of the DGS, of the hospitalization and healthcare organization office (DHOS), and of the directorate-general of social action (DGAS), and as part of the committee charged with drafting the heat wave plan.

The objective of this plan is to draw lessons from past heat waves to define short-term and intermediate-term activities in the area of prevention and crisis management that will reduce the health effects of the inevitable next heat wave.

The plan, as drafted, included all of the activities already announced to combat heat waves (for example, the "dependence" law) and was linked as well to international initiatives (Budapest conference) and other related national plans (drought, air conditioning, electricity, emergency services).

The heat wave plan specifies InVS's responsibilities, the national alert system decided upon, and its organizational flow chart. The plan also includes a list of the national organizations concerned by a heat wave, a list of activities for each, a model district plan for adaptation, model advisory messages for the various populations at risk, and procedures the prefect can implement. Finally, it foresees a system for assessing prevention activities and crisis management to facilitate their continuous adaptation.

– InVS's new responsibilities

The heat wave plan specifies that InVS is responsible for collecting the health data, to be supplemented by information collected from Météo France, emergency departments, firefighters, and other rescue workers. Its director is personally responsible for warning the Minister of Health, who then declares a state of alert.

– Practical implementation of the heat wave alert system

The system includes four levels of alert.

• **The first level** (level 1 or vigilance) corresponds to the activation of normal seasonal surveillance. It takes effect 1 June each year so that each office concerned, at the national, district, and municipal levels, can verify that the alert interfaces and the procedures for identification of vulnerable persons are working and the measures foreseen for higher alert levels are operational, in case they are needed. It is deactivated on 1 October. **InVS and Météo France conduct their meteorologic surveillance procedures throughout this period**.

The other three levels (levels 2, 3, and 4) provide graduated responses to increasing heat and are based on regional biometeorological thresholds.

• **Level 2** (alert) mobilizes local and national public services, principally in the health and social areas.

It is activated when Météo France's three-day advance forecast calls for the temperature to exceed the biometeorological thresholds for three consecutive days in at least one district.

SARS plan and heat wave plan: a new generation of plans to respond to new public health threats

InVS considers that the SARS and heat wave plans represent a new generation of emergency preparedness plans for three principal reasons:

- they are based on scientific data from health surveillance;
- they plan to begin data collection for management purposes as soon as the alert is issued;
- they plan for their own evaluation, in which InVS will participate.

• **Level 3** (intervention) activation relies principally on the InVS alert bulletin (**biometeorological threshold actually exceeded in at least one district, with forecasts for similar levels for the next two days**) or other available findings (excess human or animal mortality observed and associated with high heat, etc.). Local and national authorities then implement the plan's health and social measures: advisories for and specific care of persons.

• **Level 4** (requisition) is activated principally **when the biometeorological indicators forecast for the next 24 hours exceed the thresholds in several regions and/or for a long period, with collateral effects** (such as blackout, drought, or saturation of hospitals). Heat waves can induce crises with consequences that go beyond health and social effects. Exceptional measures must be applied to cope with such events.

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• Local alerts

Epidemic of community-acquired legionellosis around Lens

On 28 November 2003, the Lens hospital informed the Pas-de-Calais district health bureau of two cases of community-acquired legionellosis. Both patients were residents of the municipality of Harnes and lived 400 m apart. Their clinical signs began on the 11th and 15th of November. The DDASS contacted the regional office of industry, research, and the environment (DRIRE) the same day and learned that it had been notified in mid-November of a substantial *Legionella pneumophila* contamination (>106 colony-forming units per liter or CFU/L) in Harnes. A petrochemical company there had detected contamination of its cooling towers during two regular in-house inspections, on 15 October and 20 November, and had implemented a plan to combat it as soon as it learned of the results. This news led DDASS to look for other cases at the Lens hospital and from local general practitioners. By 2 December, nine cases of legionellosis had been identified, all residents of Harnes and the towns bordering it and with an onset in November 2003. DDASS and the regional epidemiology unit (CIRE) immediately began an epidemiologic investigation to confirm the epidemic nature of this phenomenon, to measure its importance, identify the origin and source of the contamination, and implement appropriate control measures.

Community-acquired (infection): describes infections acquired in the community (that is, to which exposure occurred in the community) as opposed to nosocomial infections, acquired in a hospital.

Data from this epidemiologic study revealed that this legionellosis epidemic was the largest community-acquired epidemic ever described in France—in terms of duration, geographic scope, and the number of cases involved. Retrospective and prospective case-seeking in hospitals around Lens and other regional reference hospitals counted a total of 86 confirmed legionellosis cases due to *L. pneumophila* serotype 1, all with an onset between 5 November 2003 and 22

January 2004, in people living or having traveled in the Lens region; 17 people (20%) died.

The two-humped shape of the epidemic curve (Figure 8) suggests as a working hypothesis an intermittent and persistent source of contamination. No single location could be identified as having been visited by all the cases. With 23 cases and the highest attack rate of the 22 municipalities where cases lived, Harnes appeared to be the epicenter of the epidemic (Figure 9).

Attack rate: proportion of those becoming ill among the population exposed to an epidemic.

Figure 8. Three-day distribution of legionellosis cases according to the date symptoms began (legionellosis epidemic, Pas-de-Calais, November 2003-January 2004)

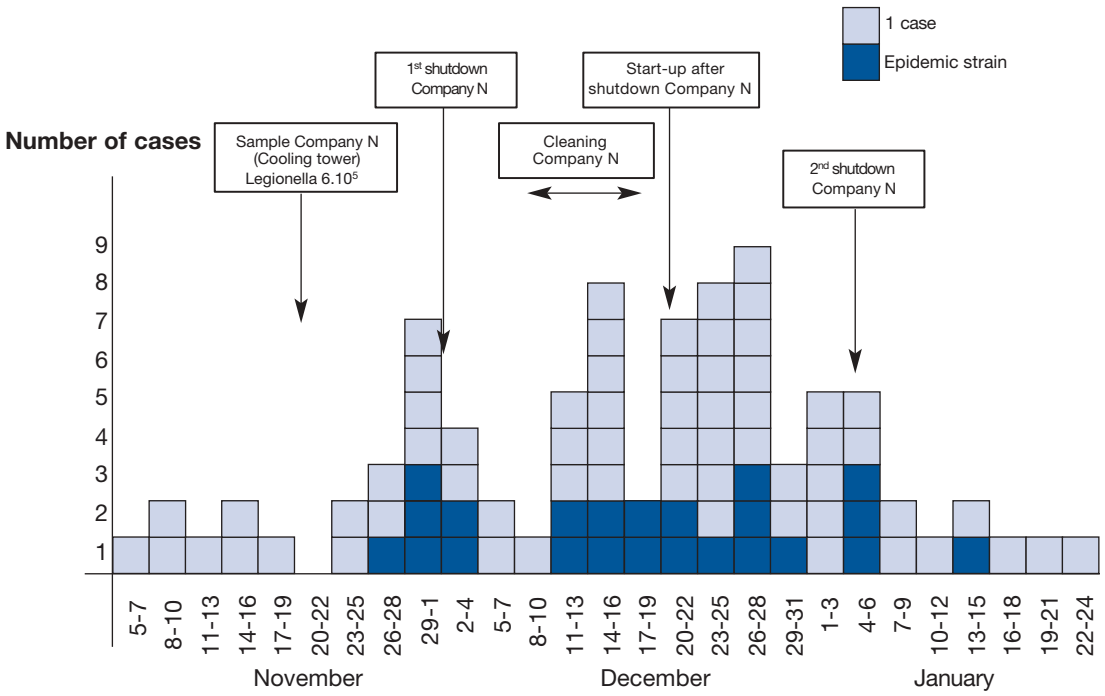
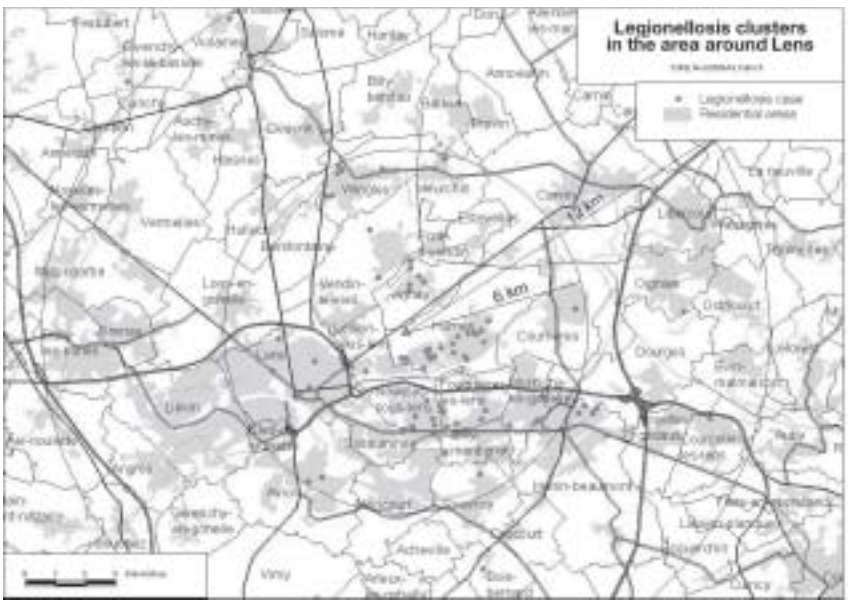


Figure 9. Georeferenced distribution of cases according to home address (legionellosis epidemic, Pas-de-Calais, November 2003-January 2004)



Source : © IGN - BD carto®, Paris (1999)

– Bacteriological and environmental testing

L. pneumophila serogroup 1 was isolated in 23 (47%) of the 49 patients from whom bronchial samples were obtained. All the clinical strains presented the same genomic profile after pulsed-field electrophoresis, and this strain was isolated in cases throughout the epidemic. This profile had not previously been identified in the strain collection of the legionella national reference center (CNR).

Serogroup or serotype or serovar: category in which bacteria or viruses are classified according to their reaction in the presence of serum containing specific antibodies. This serologic variety is a subdivision of the species.

At the same time, the DRIRE and the DDASS conducted environmental studies in 53 municipalities around Lens and at 33 companies that operated cooling towers; they identified **two environmental sources emitting the epidemic strain in Harnes besides company N**: an agri-food company and a car wash. Legionella concentrations at company N (cooling towers and waste lagoon) were clearly higher than those at the other sites (Table 3), and their involvement in the onset of the epidemic appears improbable (because the epidemic strain was not found in the cooling towers of the agri-food company at the initial stages of the investigation and because of the architectural configuration of the car wash). Their proximity to company N (less than 1 km as the crow flies) may explain their secondary colonization by the epidemic strain it emitted.

Company N shut down completely on 3 December and disinfected again. Nonetheless, an upsurge in the epidemic began in mid-December and studies showed persistent contamination of company N's cooling systems. This persistence, which probably contributed to the continuation of the epidemic, may have resulted from high-pressure cleaning operations, the difficulties of disinfecting the entire system (oxbows, or abandoned channels), or recontamination of the cooling towers from the system aerating the waste lagoon surface, which was seeded with biological sludge contaminated by the epidemic strain.

Table 3. Sites from which the epidemic strain was isolated (legionellosis epidemic, Pas-de-Calais, November 2003-January 2004)

Site		Sampling date	Sampling location	Result date	CFU *Legionella* / L	CFU *L. pneumophila* serogroup 1/L
Company N	Cooling towers	28/11/03	Hot pond	23/12/03	2400	2100
		30/12/03	Cooling pond	14/01/04	1000	1000
	Effluents	01/12/03	Entry to containment pond	23/12/03	910 000	340 000
		08/01/04	Waste lagoon	30/01/04	210 000 000	5 000 000
		08/01/04	Waste lagoon seeds	30/01/04	11 000 000 000	1 000 000 000
Car wash		19/12/03	Manifold nozzle	05/01/04		1600
Agri-food company	Cooling towers	29/12/03	Hot water tank	19/01/04	100	100

CFU: colony-forming unit

The combination of descriptive epidemiology, environmental studies, and molecular biology (determination of serogroup and genomic profile of the epidemic strain) made it possible to reconstruct the chain of transmission. Suspicion thus fell on airborne contamination from company N's legionella-contaminated cooling system. The progressive extinction of the epidemic after the complete shutdown of all identified at-risk activities at company N reinforced these hypotheses.

This epidemic was the first in France with an industrial facility involved in the onset of community-acquired legionellosis. The extensive geographic dispersion of the cases observed in this epidemic had never before been reported. The regional weather conditions (wind and humidity) and topology (semiurban plain) probably contributed to the extensive diffusion of legionella-contaminated aerosols. The national institute of the environment and industrial risks (INERIS) used statistical modeling techniques to evaluate the aerosol emissions from Company N; their findings suggest that although the risk of population exposure to legionella aerosols clearly diminishes beyond 2 km from the source, it may exist in an area on the order of 10 km around the factory. Ongoing analytic studies and consideration of the meteorologic factors may provide additional support for these hypotheses.

The onset of this epidemic in winter was also unusual. All other legionellosis epidemics so far reported in France and caused by cooling towers began during the summer (June–September). The strain responsible for the epidemic in the Lens region thus seems particularly resistant to climate conditions unpropitious to legionella development.

Recommendations:

The lessons from the investigation of this epidemic are that prevention activities must be reinforced and that improved risk assessment and risk management are essential for legionellosis associated with industrial cooling towers. Collective prophylaxis requires:

– an exhaustive census of the systems at risk
– improvement of good maintenance practices and their diffusion to owners and companies providing maintenance of cooling towers
– reinforced monitoring of systems at risk
– strict application of official recommendations in cases of contamination
– notification of health authorities in cases of substantial contamination of facilities at risk
– reinforced vigilance by health authorities of possible sources of community-acquired contamination.

Human and equine infection with West Nile virus in the Var

On 6 October 2003, the arbovirus national reference center reported West Nile meningoencephalitis in a resident of the Var district who was hospitalized in Nice. On 9 October, a case of equine West Nile encephalitis was reported by AFSSA, the French food safety agency, in a horse living in another area of the Var. On 17 October, the arbovirus CNR confirmed that the patient's wife, who had not left the district, was also infected by West Nile virus. The surveillance for West Nile virus already covering Camargue and Corsica was then extended to the Var and all other French districts along the Mediterranean (Pyrénées-Orientales, Aude, Alpes-de-Haute-Provence, Alpes-Maritimes), with (human and equine) epidemiologic and entomological studies conducted to explore virus circulation in these districts.

– A retrospective and prospective study was conducted in healthcare facilities to identify cases of meningitis, meningoencephalitis, and polyradiculoneuropathy with no known cause. It found seven confirmed cases of West Nile virus infection. The patients all lived in the eastern Var and felt their first symptoms during the last half of August (Figure 10); three patients had neurological forms of the disease, while the other four had influenza-like illnesses. The infection resolved favorably in all cases.

No human case with an onset of symptoms after 28 August was identified in the Var or any district along the Mediterranean in 2003.

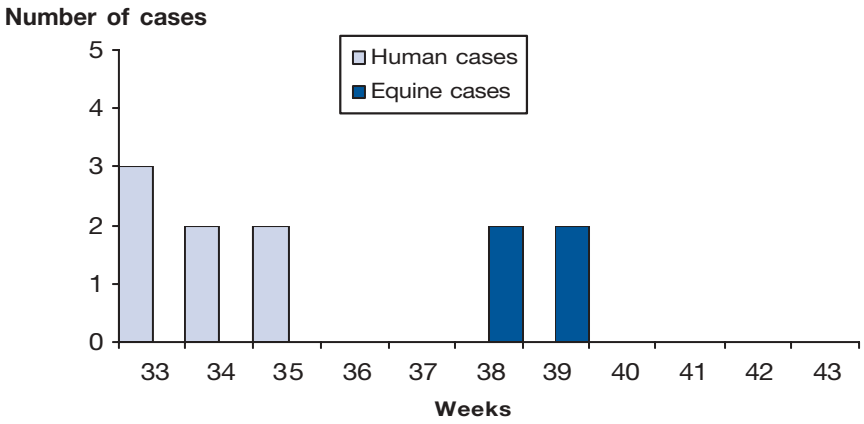
– Active surveillance of equine encephalitis ascertained four confirmed cases in western Var, all with symptoms that began in September (Figure 10). A probable equine case with no symptoms was identified in the herd of one of the other equine cases.

– The Mediterranean interdistrict antimosquito group (EID) conducted entomological field surveys on the premises where the human and equine cases lived. Because not many mosquitoes remain in early October, few were captured. The "emerging virus" unit at the University of Marseille tested them for West Nile virus, with negative results.

These studies showed that viral circulation was limited to the Var and to the months of August and September 2003. The Var district veterinary bureau took blood samples from approximately 1000 horses in the district, to study the circulation of West Nile virus in this equine population.

The French blood agency also surveyed blood donors in the Var and other Mediterranean districts to estimate the risks of virus transmission by transfusion of blood from asymptomatic contaminated donors.

Figure 10. Date of onset of signs in human and equine cases, confirmed and probable (West Nile virus infections, Var, August-September 2003)



Infection and colonization by multidrug-resistant *A. baumannii* in healthcare facilities in several districts

During the second half of 2003, several healthcare facilities, located mainly in the districts of Nord and Pas-de-Calais, reported cases of *Acinetobacter baumannii* infection or colonization that were resistant to several antibiotics; all the strains isolated had the same resistance profile. The national alert that followed these reports led to the identification of similar cases in other facilities in France. It also resulted in reinforcing measures for the prevention and control of multidrug-resistant bacteria diffusion, especially during the transfer of patients from one healthcare facility to another.

– Alert

From 30 July through 19 September 2003, four healthcare facilities in the Nord district transmitted five reports of nosocomial infections by *A. baumannii* to the nosocomial infection control coordinating center (CClin), the DDASS, and InVS; these concerned 23 patients, 8 of whom had died by the time of the report. The *A. baumannii* strain responsible, with its worrisome resistance to multiple antibiotics, had been isolated and identified for the first time in the Nord in July 2001. However, these resistance characteristics facilitate its identification (sidebar). It produces an

enzyme (extended-spectrum beta lactamase, or ESBL, VEB-1 type) that makes it resistant to all beta-lactams. The strain is now sensitive to only two antibiotics: imipenem and colistin.

While *A. baumannii* is not pathogenic in healthy individuals, it is frequently resistant to numerous antibiotics and responsible for nosocomial infections in units that treat vulnerable patients (intensive care, for example). In weakened patients, it causes various infections, sometimes severe (pulmonary infections, septicemia, and wound or burn infections). It does not always cause infection and may simply be present on the patient's skin or mucous membranes (colonization or carriage rather than infection). It can persist for a long time in the environment and its transmission is hand-to-hand.

In an uncontrolled epidemic context, the appearance of a strain that might become resistant to imipenem was a distressing possibility that justified a national alert to identify all of the facilities affected and to reinforce the measures for prevention and control of the diffusion of multidrug-resistant bacteria.

– Methods

The alert network for the investigation and surveillance of nosocomial infections (RAISIN) notified all healthcare facilities of the emergence of this strain of *A. baumannii* in France and of its characteristics; all cases of infection or colonization with this strain were to be reported.

• Case definition

A probable case was defined as any patient infected or colonized since April 2003 by a strain of *A. baumannii* with an antibiotic resistance profile similar to that of the strain isolated in 2001; its characteristics were widely distributed to microbiology laboratories to help them identify it; its resistance phenotype is reviewed below (sidebar). The definite cases were those for which the expert laboratory confirmed VEB-1-type ESBL production. The distinction between colonization and infection relied on the clinical information available and on the definitions contained in the "100 recommendations for surveillance and prevention of nosocomial infections" manual.

• Investigation

The investigation received support by RAISIN (CClin and InVS), help from the DDASS, and expertise from the bacteriology-virology-hygiene department at the Bicêtre UHC (Le Kremlin-Bicêtre, 94). Each report was investigated by the facility's operating hygiene team, assisted if necessary by the CClin or the DDASS. The aim of these studies was to confirm the cases and implement the appropriate control measures. The data collected were transmitted to InVS to enable monitoring of the diffusion of this strain nationwide.

– National assessment as of 2 June 2004

As of 2 June 2004, 54 healthcare facilities in 15 districts (covering 8 regions) had reported 290 probable cases of infection or colonization by *A. baumannii* presenting the same antibiotic resistance profile and diagnosed between 22 April 2003, and 14 May 2004 (Figure 11); 255 (88%) cases were identified by the nosocomial infection reporting system and 35 (12%) additional cases by the expert laboratory.

The phenotype of antibiotic resistance of the extended-spectrum ß-Lactamase VEB-1-producing isolates of *A. baumannii* (reference: *Journal of Clinical Microbiology* 2003; (41): 3542-7)

a) Disk diffusion susceptibility testing on agar plates showed the following phenotype:

- S to imipenem (IPM) and colistin (CS);
- I or R to the combinations of ticarcillin/clavulanic acid (TCC) and piperacillin/tazobactam (TZP);
- R to ticarcillin (TIC) and to third-generation cephalosporins: ceftazidime (CAZ), cefotaxime (CTX), and cefepime (FEP).

Comment: no inhibition diameter for TIC, CAZ, CTX, or FEP;

- R to ciprofloxacin (CIP), cotrimoxazole (SXT), tetracycline (TE), gentamicin (GM), tobramycin (TM), netilmicin (NET), and amikacin (AN).

Comment: sensitivity to aminoglycosides can vary according to the strain.

b) Demonstration of synergy between the FEP and/or CAZ and TCC disks, suggestive of ESBL.

Of 290 cases, 217 (75%) were clinically documented: 73 (33%) were infections and 144 (67%) colonizations. Of 288 strains of *A. baumannii* transmitted to the expert laboratory in addition to the reported cases, 275 (95%) were confirmed to be ESBL VEB-1-producing isolates. All the strains studied were still sensitive to imipenem.

Among the 290 cases reported, 34 patients (11%) had died by the date of the report. These deaths were not all associated with the infection; in December 2003, Paris-North CClin data showed that 57% of the deaths could be attributed to the infection, and then it was not always the only short-term cause of death.

Figure 11. Number of facilities reporting at least one case of infection or colonization with EBSL-producing *A. baumannii* in France, April 2003-May 2004 (N=54)

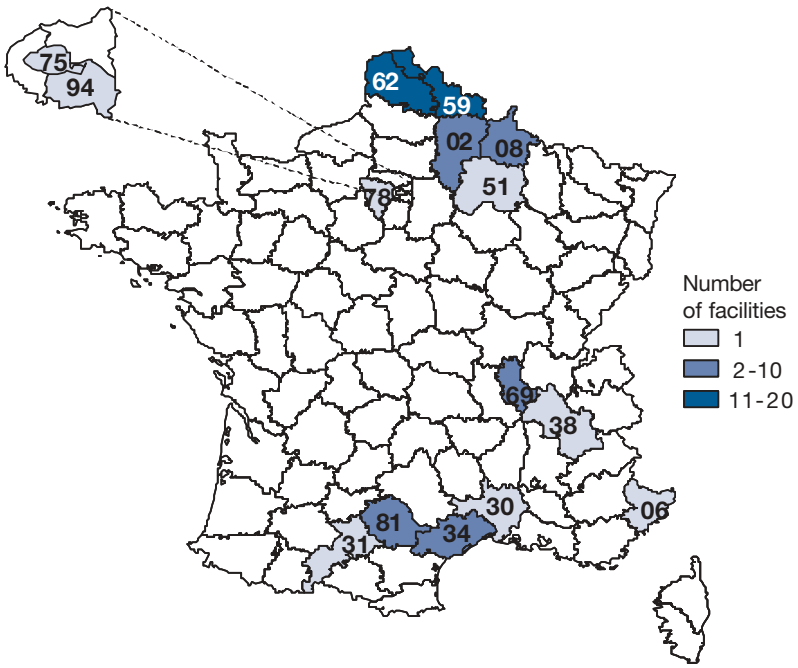


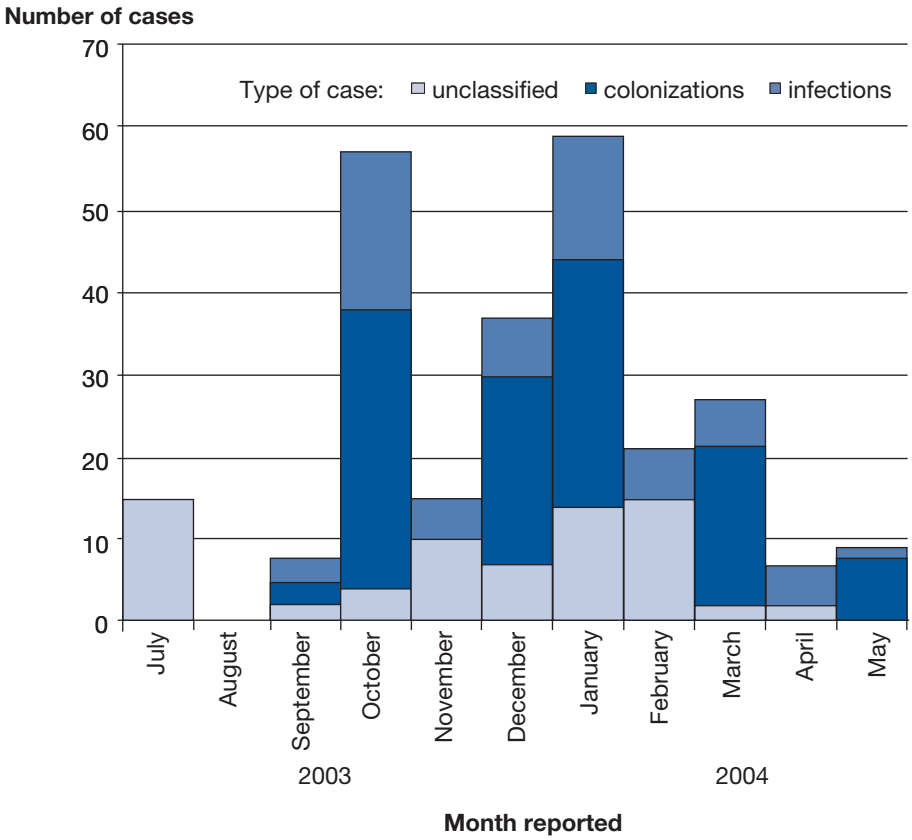
Table 4: Infections or colonizations with ESBL VEB-1-producing *A. baumannii*. Number of facilities, number of cases reported and date of last case, by district, France, July 2003-May 2004

District	Facilities (N)	Cases reported (N)				Death (N)	Date of last case
		Total	By status				
			Infected	Colonized	Unknown		
59 - Nord	20	124	19	60	45	24	13/05/04
62 - Pas-de-Calais	14	111	32	55	24	7	14/05/04
02 - Aisne	2	2	0	0	2	0	05/11/03
75 - Paris	1	1	1	0	0	0	31/01/04
78 - Yvelines	1	1	0	1	0	0	08/03/04
94 - Val-de-Marne	1	1	1	0	0	0	03/05/04
08 - Ardennes	2	14	6	8	0	0	02/02/04
51 - Champagne	1	11	2	9	0	1	15/03/04
31 - Haute-Garonne	1	5	1	2	2	1	15/04/04
81 - Tarn	2	2	1	1	0	0	05/01/04
34 - Hérault	2	7	5	2	0	1	09/04/04
30 - Gard	1	1	1	0	0	0	10/04/04
69 - Rhône	4	8	4	4	0	0	07/02/04
38 - Isère	1	1	0	1	0	0	02/12/03
06 - Alpes-Maritimes	1	1	0	1	0	0	03/01/04
Total	54	290	73	144	73	34	14/05/04

Note: districts reporting new cases diagnosed since 1 April 2004 appear in blue rows.

Table 4 summarizes the distribution of the cases reported by district. Most of the cumulative cases (235/290, or 81%) came from the Nord-Pas-de-Calais region. The national alert nonetheless enabled early identification of new outbreaks in Midi-Pyrénées, Languedoc-Roussillon, Rhône-Alpes, PACA, and Ile-de-France: the isolation of similar strains in the regions that had not previously reported any cases retrospectively justified the national alert. While the transfer of patients between healthcare facilities explained the substantial diffusion of this strain in Nord-Pas-de-Calais, no documented transfers explain its diffusion to the other regions. By June of 2004, the diffusion of this multidrug-resistant strain had clearly slowed; since January, the number of new cases reported fell regularly (Figure 12). Several residual outbreaks persisted in the districts of Nord, Pas-de-Calais, Haute-Garonne, Hérault, and Gard and justify the maintenance of a minimal level of vigilance as part of the regular reporting channel. The last reported case came from Pas-de-Calais.

Figure 12. Number of infections and colonizations by ESBL VEB-1-producing *A. baumannii*-1 in France, by month reported, July 2003-May 2004 (N=255)



– Control and prevention measures

Controlling an epidemic of *A. baumannii* requires major efforts: strict compliance with standard hygiene procedures (hand washing), careful cleaning of surfaces, implementation of protocols for isolation, systematic screening of carrier patients, reporting these patients on transfer, and, in extreme cases, temporary shutdown of the department.

In October the Paris-North CClin distributed recommendations for the surveillance and control of these infections to all healthcare facilities in the Nord-Pas-de-Calais region; also in October, InVS transmitted through RAISIN recommendations to the other CClins for surveillance, alert, and control.

Recommendations of the Paris-North CClin to healthcare facilities in the Nord-Pas-de-Calais region, September 2003

1. Report (decree of 26/07/01) all cases of infection and/or colonization by BLSE-producing *A. baumannii* to the CClin and the DDASS and attach the antibiogram results to the report form.
2. Conserve suspicious strains and contact the expert laboratory to decide whether they should be sent for microbiological expertise.
3. Inform the facility's medical and paramedical teams that this epidemic strain is circulating in the region.
4. Plan systematic screening (axillary, pharyngeal, and rectal) in high-risk departments (such as intensive care).
5. Limit internal movement of patients as well as their transfer to other units, unless necessary.
6. Report on the transfer form and in the patient's medical file at transfer the status as a carrier of multidrug-resistant *A. baumannii* (as recommended for other multidrug-resistant bacteria, including MRSA and ESBL-producing enterobacteria).
7. Reinforce measures of isolation and compliance with standard precautions for infected or colonized patients in any department.
8. Reinforce procedures for biocleaning in the departments in which cases were identified.
9. Monitor appropriate usage of antibiotics in the departments at risk (intensive care and pulmonary medicine).

RAISIN recommendations to the CClin, October 2003

The Institute of Public Health Surveillance recommends to the CClin and to the coordinators of their multidrug-resistant bacteria surveillance networks that they:

1. inform their standard distribution lists (Clin president, operational hygiene team, microbiology laboratories) of the epidemic of *A. baumannii* identified in northern France
2. request healthcare facilities in their region to report (decree of 26/07/01) all cases of infection and/or colonization by ESBL-producing *A. baumannii* to the CClin and the DDASS, attaching an antibiogram to the report form
3. inform InVS without delay of any new case
4. request healthcare facilities to conserve suspicious strains and contact their usual reference laboratory for advice;
5. distribute to the healthcare facilities in their region recommendations for prevention and control of *A. baumannii* infections appropriate for the regional or national epidemic situation.

– Conclusion

The recent emergence and diffusion of this strain of multidrug-resistant *A. baumannii* is worrisome. It underlines the usefulness of the alert (reporting) networks established several years ago for detection of emerging nosocomial infections and of compliance by healthcare facilities with existing recommendations for control of multidrug-resistant bacteria.

Clusters of kidney cancer cases among employees of the Adisseo factory at Commentry (Allier)

In early January 2003, the Ministries of Health and of Labor jointly referred to InVS for investigation the reports of kidney cancer cases among employees of a chemical plant that manufactures vitamins A and E as well as methionine, an additive for animal food supplements. This plant, which dates back to the beginning of the last century, is located at Commentry, in the Allier district. It did and does use many products and generates intermediate chemical substances at various stages of synthesis; these include chloracetal C5, which is used to fabricate vitamin A and is thought by some experts to be the causal agent for the cancers observed.

InVS first verified the reality and size of the kidney cancer cluster observed at Adisseo. InVS's department of occupational health (DST) then launched epidemiologic investigations in several stages to verify the plausibility of a workplace origin for these cases. The Pasteur Institute of Lille—at the company's initiative, with advice from the national research and safety institute (INRS)—conducted toxicological studies, especially of chloracetal C5.

Kidney cancers accounted for 3% of new cancer cases diagnosed in France in 2000. Estimates indicate new cases are diagnosed annually in 5306 men and 2987 women, while 2329 men and 1278 women die of this cancer in a year. The incidence rates of kidney cancers are rising substantially in most developed countries, although mortality remains stable. The fortuitous discovery of kidney tumors during imaging examinations for reasons other than suspected kidney cancer probably explains this increased incidence, but the role of other factors in this increase has not been ruled out.

Currently, smoking, obesity, and hypertension are the only suspected risk factors for kidney cancer. Epidemiologic studies of occupational risk factors observe an increased, albeit inconsistently, risk of kidney cancer with diverse occupations and hazards, including asbestos, polycyclic aromatic hydrocarbons, trichloroethylene, gasoline, other petroleum derivatives, lead, and cadmium. One study showed a statistically significant association with an exposure-effect relation between kidney cancer and exposure to vinyl chloride monomer.

– Initial verification

• Verifying the reality of the cases reported

The company's occupational physician provided documentation that the 10 cases of kidney cancers between 1994 and 2002 were indeed real. All were confirmed by cytopathologic examinations that showed adenocarcinoma in all the cases. The tumors were all identified at an infraclinical stage; the patients all underwent surgery (total or partial nephrectomy), and all remain alive to date.

It should be noted that this screening took place as part of medical monitoring by the occupational physician: systematic abdominal ultrasound, initially intended as medical surveillance for workers exposed to vinyl chloride monomer, a known hepatic carcinogen (group 1 of the International Agency for Research on Cancer or IARC), and then extended to other populations after the first kidney cancers were identified by the occupational physician.

Cytopathology: branch of medicine that examines organs or tissues microscopically to study the lesions caused by diseases. Today it uses many techniques (electronic microscopy, tissue culture, histochemistry, histoenzymology, immunology, radioisotope labeling).

• Verifying that there were more kidney cancers than expected

The DST calculated the standardized incidence ratio (SIR) from information provided by the company's occupational medicine department about the incident cases observed (date of birth, date of diagnosis, sex) and by the company about its employee population (number of employees by age group and by sex, for every year from 1994 through 2002). These calculations concerned only men, since no cancer had been reported among the women at the company at that point.

When the national incidence rates for kidney cancer in men, estimated from French cancer registry data, are applied to the population of men at the company, less than one case of kidney cancer (0.76) is expected over the entire period. The SIR was 13.1 (95% CI: 6.28–24.10). This very high SIR is statistically significant and confirms the excess of cases among the men working at this factory.

Standardized incidence ratio (SIR): comparative incidence ratio: relation between the number of cases observed and the number of cases expected. This is the indirect standardization method in which we calculate the number of events expected in the study population by applying to it (for each age group) the specific rates of a reference population.

– Cohort study

The objective of this study is to analyze the mortality from cancer (and specifically from kidney cancer) in this company compared with the French

population and with other company employees, according to specific occupational characteristics (for example, social and occupational category, worksite, occupation, specific hazards), to identify possible company activities or sectors more particularly at risk.

This historic cohort was defined as all employees who had worked at this site for at least six months in 1960 or after. Examination of the different data sources available about the plant site led to the decision to reconstruct the cohort to use the information from the annual social data declarations, available as of 1952. Pay slips from the various employment periods since 1960 will make it possible to collect additional information about the specific departments to which employees with non-administrative jobs (production, maintenance, and laboratory) were assigned. This will enable us to establish a more detailed occupational history and to analyze the causes of death as a function of specific job sites and possible hazards particular to them.

The data collected from these two sources should make it possible to reconstruct **the cohort, which should include approximately 2800 subjects**.

– Nested case-control study in the cohort study
The objective of this nested case-control study is to identify possible occupational factors and exposures associated with the excess of kidney cancers observed among these employees and to suggest etiological hypotheses. This type of study requires interviewing relatively few subjects, limits the selection bias of the control population, and obtains detailed information about occupational and non-occupational exposures.
The study will consider cases of kidney cancer already identified by the occupational medicine department and those that may be found by further specific research. Because systematic screening for kidney cancers by abdominal ultrasound is part of the standard occupational medicine examinations of some groups of employees exposed to chemical hazards, supplementary cases must also be sought among employees not subject to this screening or before it was implemented (1986 for some occupational groups).

This research involves three regional sources:
– hospitals: research from the PMSI (medical informatics system) database for the 1997-2001 period, from medical files for previous years, in four hospitals in the Allier and Puy-de-Dôme districts in which subjects living in the same area as the current employees have frequently been treated for kidney cancer;
– pathology laboratories: through the president of the national federation of pathology statistics and data centers (CRISAP), the DST obtained a list of subjects diagnosed with kidney cancer in the five regional pathology laboratories that specialize in this diagnosis;
– and the regional health insurance fund: after approval by the national consulting physician at the CnamTS, DST obtained the list of subjects receiving complete reimbursement for kidney cancer as a "long-term disease" (ALD30) in Allier and Puy-de-Dôme.

The population of controls will be composed of employees of or retirees from the factory who do not have kidney cancer, chosen from within the cohort and matched for sex, age, and vital status.

The information for cases and controls will be collected with a standardized questionnaire including one occupational and one general section.

Analysis of the causes of death of the reconstructed cohort will begin in late 2004. Analysis of the nested case-control study is planned for 2005. The feasibility of conducting a study of the impact of active screening for kidney cancer by systematic abdominal ultrasound will be studied in 2004.

Development of the surveillance and alert functions of InVS after these events

- **Introduction**
- **Structuring international surveillance**
- **Science watch for foreseeable emerging phenomena and broad prospective multidisciplinary monitoring for unidentified risks**
- **Building new surveillance systems: emergency response and mortality data**
- **Regionalization in alert procedures**
- **InVS's new mission: participation in emergency response management**

Introduction

As seen in the preceding section, InVS and its response capacity were heavily challenged by health alerts in 2003. The sequence of events and how the agency dealt with them allowed it to conduct scientific analyses and to draft proposals that can be used to improve the implementation of health policies.

This process led InVS to two primary conclusions.
First, many events that occur in the world can affect the health of France's inhabitants. While this appears obvious for infectious diseases, such as SARS and influenza, it is also true of other phenomena, especially environmental. Developing international surveillance is therefore essential. At the same time, accelerated exchanges taking place across the planet, climate change, increased pollution, dietary changes, and the aging of the population are causing appreciable changes in human health. We must anticipate the occurrence of these "emerging" phenomena.
A broad multidisciplinary viewpoint that brings medical science together with the social sciences and numerous other disciplines would improve our understanding of the evolution of our environment, its implications for human health, and more long-term forecasting of health phenomena.
This describes the "prospective monitoring" that must be implemented in the years to come. International surveillance, surveillance of emerging phenomena, and prospective monitoring together will define the priorities of InVS's work in the intermediate and long term.
Second, and in a more rapidly operational manner, InVS must improve its alert response and its participation in crisis management situations.
InVS moved to meet this objective in 2003 by setting up a specific surveillance system based on mortality and emergency response data, and it has sought to ameliorate the regional organization of this alert function by strengthening the regional epidemiology units. Their reinforcement will continue in the years to come.

Structuring international surveillance

In a globalized world where the movement of people and goods is constantly accelerating, health risks are also globalized. The 2003 SARS epidemic simultaneously illustrated the type and possible dimension of these new threats. To carry out its public health mission, InVS must not only monitor the health status of the French population continuously but must also be able to identify any health risk emerging anywhere in the world that might affect France, and do so before it reaches our country. This international health surveillance is one major component of the program of the Institute's international and tropical department (DIT). Throughout 2003, SARS and the other crises that we dealt with made it possible to test the organization that InVS had presented to the Ministry of Health in December 2002 and to progressively fine-tune it.

The new context created by the summer 2003 heat wave reinforced the expectations of InVS's partners about health alert information, including international alerts. For example, in a letter dated 15 September 2003 about the reinforcement of health alerts after the heat wave, the Minister of Health, the Family, and the Handicapped asked InVS to produce a health alert bulletin that includes international alerts when they are relevant to France.

The international health watch system proposed by DIT and tested and structured during 2003 must now be adapted to this new situation.

International watch: framework and objective

International health watch supplements the epidemiologic surveillance of the French population. Its primary aim is to identify potential health risks for this population.

InVS has neither the authorization nor the resources to collect international epidemiologic information directly and it is even less able to identify alert signals with the exhaustiveness it is mandated to apply on a national scale. Nor is such collection necessary: there are now numerous supranational (of at least several countries) or international networks that collect, analyze, and disseminate this type of information, making it accessible on the Internet in most cases. The participants in these networks are all potential correspondents who can help to validate or complete the accessible first-line information.

The international watch thus treats information already collected and circulating in these networks. **It involves sorting, verifying, analyzing, and then, when relevant, disseminating it in appropriate form**. This information processing is the value InVS adds.

It thus differs from the science watch conducted by each InVS specialist in his or her own domain, as well as from prospective monitoring. These three activities, sometimes conducted from the same sources of information, are nonetheless complementary and intertwined. They differ essentially by their purpose: the aim of the international watch is the **dissemination of information to InVS's partners for immediate action.**

The international watch system

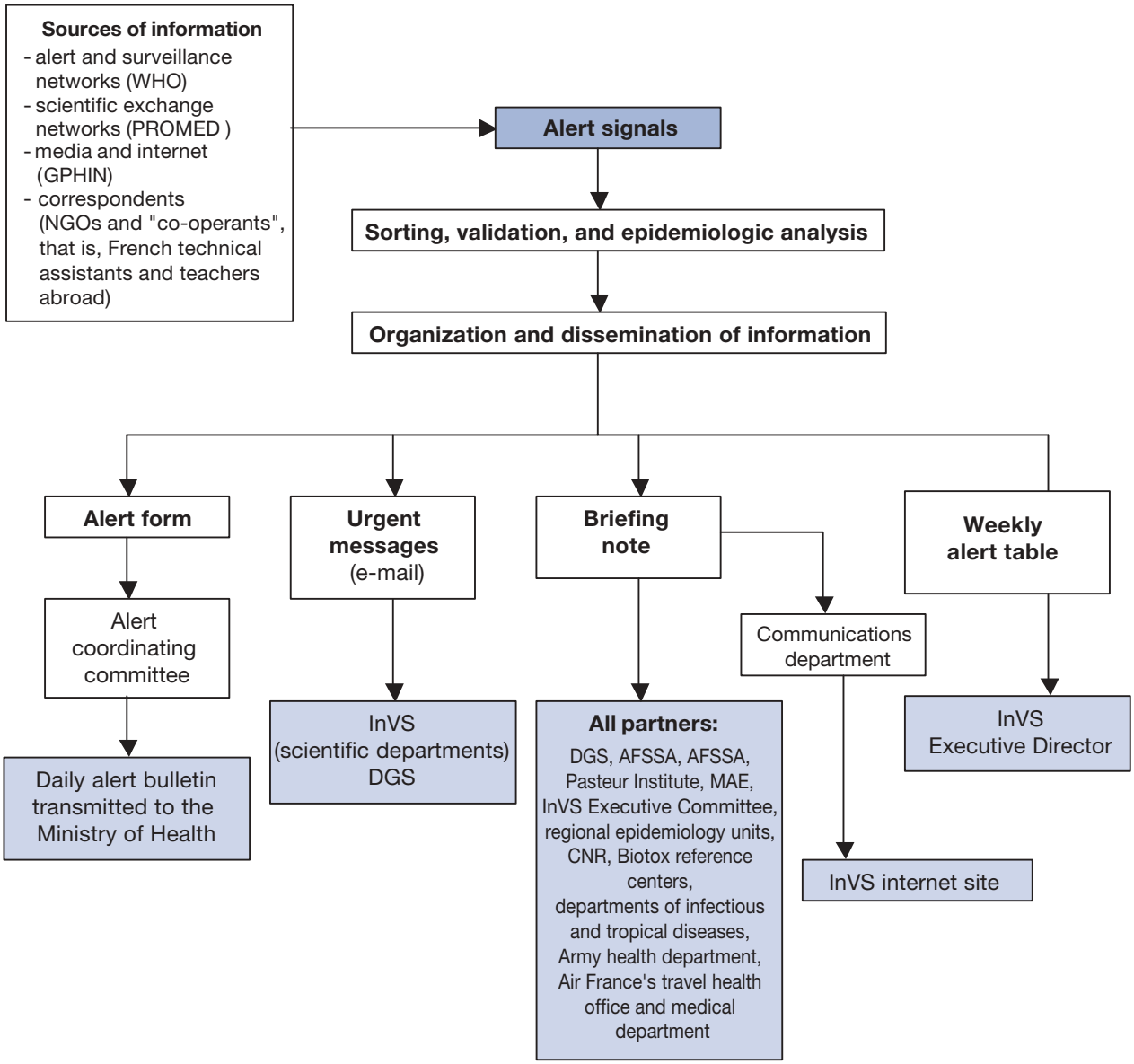
Because international watch cannot be exhaustive, the events to be analyzed and followed must be selected (Table 5). By their nature, communicable diseases are at the foreground of international surveillance, but other health events, especially environmental, must not be automatically excluded from its scope.

Table 5: Criteria for selecting health events to be considered by the international watch, illustrated by recent examples

1- Health crisis that may reach France	*SARS epidemic (2003)* *Accident at Chernobyl (1986)*
2- Epidemic that risks importation into France	*Ebola fever in central Africa (2000-2003)* *Bubonic fever in Algeria (2003)*
3- Health crisis in French overseas territories and regions of the overseas districts and territories	*Cholera in the Comoro Islands (1999)* *Dengue in Walis and New Caledonia (2003)*
4- Health crisis in a country with a large expatriate community in France	*W135 meningitis in Burkina Faso (2002)* *Yellow fever in Côte d'Ivoire (2001)*
5- Health crisis in tourist areas	*Dengue in the Caribbean (2001)* *Pericarditis in Greece (2002)*
6- Event not meeting the preceding criteria but the subject of an alert from the Ministry of Foreign Affairs (MAE) or the Ministry of Health or receiving particular media attention	*Pneumonia in Salvador (2003)* *Viral meningitis in Algeria (2003)*

Figure 13 outlines the organization of the procedures for the international surveillance of these health events. It is coordinated by DIT's alert committee, which is responsible for monitoring, treating, and organizing the form of this information.

Figure 13. Flow chart of the international watch system proposed by DIT



– Primary sources of information

Three principal groups of sources provide information about health events of international importance:

– the standard supranational epidemiologic alert networks, either regional, such as PACNET (for the Pacific), or international, such as GOARN, the WHO network. Networks specific for a disease, such as DENGUE-NET (dengue) or FLU-NET (influenza), also belong to this category.

The European Union alert network and European thematic networks (for example, EWGLI for legionellosis associated with traveling) are particular cases at the intersection of national and international activity, and DMI is the French correspondent for all of them;

– scientific networks, at the forefront of which is PROMED;
– the media and other informal sources. DIT's alert committee currently monitors PROMED, WHO's Outbreak Verification List, the Ministry of Foreign Affairs's website, and the Global Public Health Information Network (GPHIN), to which InVS has had access since November 2003. It is a semi-automatic expert system, developed for WHO by Health-Canada, which permanently scans the worldwide web and thus surveys international media in English and French, and soon in Russian, Chinese, and Spanish. Other sources of information are under study, such as, for example, the Pasteur Institutes' alert network.

For exhaustiveness, we add to these organized systems some informal sources: direct reports, when possible, from some correspondents, including French co-operants, embassies (diplomatic telegrams), and NGOs.

Experience shows that the information that interests InVS circulates rapidly in these networks and is relatively easily accessible there. Because important information is often taken by one source from the next, consulting many primary sources at the same time is not especially useful. The value added by InVS is at the level of validation, synthesis, analysis (interpretation), and follow-up over time.

– Information validation and analysis

This stage involves the sorting of alert signals on the basis of the selection criteria proposed above and then verifying the information and completing it by various other sources, including institutes and health ministries of the countries concerned, WHO experts, surveillance network coordinators, French co-operants, our embassies in the country concerned, laboratories such as the Pasteur Institute, and NGO representatives.

At this stage, a report or signal that has been validated and meets the selection criteria above is described as an "international alert". A signal so labeled must undergo epidemiologic analysis, be reported, and be followed up. This analysis presupposes the existence of usable, albeit fragmentary, data. It may involve:

– constructing epidemic curves to contextualize an ad hoc event
– calculating incidence rates or lethality
– identifying groups at risk
– mapping.

At the end of this stage, InVS drafts a written interpretation of the event, its public health significance, and its implications for France.

– Organization and diffusion of information

• **The alert form,** created for each validated international alert, is then transmitted to InVS's Alert Coordinating Committee (CCA) and treated by it as a national alert would be. The CCA decides if this form should be included in the "daily alert bulletin" transmitted by InVS to the Ministry of Health.

• **Emergency messages** are intended to inform InVS's scientific departments and the DGS as rapidly as possible of health events that either present possible risks for the French population or are especially interesting from a scientific point of view.

• **Briefing notes** are the most complete format for distributing information about international alerts and are drafted for situations that, due to the type of problem, require the dissemination of the mass of information available, including the possible consequences for France, and deeper analysis. Successive notes follow the course of major crises over time (as during the SARS epidemic). Their contents aim these notes at a larger public that includes InVS's partners (Figure 13).

The content of some briefing notes (isolated SARS case in Singapore in September 2003, for example) may be placed online, at InVS's website, after discussion with the DGS; the message is drafted by the department of communication and validated by the executive director before uploading.

• **The weekly alert table** is intended to inform the InVS executive director of health events abroad before the weekly health security meeting (health agencies, DGS, and Ministry of Health). It is also sent to the DGS and the regional epidemiology units.

Alert coordinating committee (CCA)

Built upon the past experience of the "Alert and Biotox plan" representative, the Alert coordinating committee is responsible for the cross-sectional management of the Biotox plan and of vague alerts of undetermined origin. It works in liaison with all of InVS's departments; it manages the surveillance system for non-specific events based on emergency response and mortality data. It produces the daily alert bulletin, which is transmitted to the Minister of Health and the Director-General of Health.

• Science watch for foreseeable emerging phenomena and broad prospective multidisciplinary monitoring for unidentified risks

The events of 2003—the onset of an international epidemic of a new infectious disease and a dramatic epidemic of deaths associated with an exceptional climatic event—led us to review our systems for the surveillance and detection of abnormal signals that may require alerts to be issued.

Similarly, as explicitly mandated by the upcoming law on public health policy, InVS's functions include the prospective detection of "risk factors likely to modify or alter the health of all or some parts of the population either suddenly or more diffusely".

InVS must therefore anticipate health threats and possible health crises to be able to detect them early.

This anticipatory exercise is conducted at two levels:

– the first aims at enumerating probable situations that have not occurred but are expected, given existing knowledge in the field: "emerging phenomena"
– the second puts into perspective broader areas of scientific knowledge in different disciplines and leads to envisioning possible health phenomena over a more distant future as a function of developing hypotheses reported as plausible by researchers in these different disciplines. It involves working with research groups to determine themes for prospective monitoring that will have intermediate or long-term implications for InVS's surveillance programs.

Science watch for emerging phenomena

In the area of infectious diseases, the watch for emerging phenomena involves assessment of existing surveillance systems, working with expert clinicians or clinical pathologists at the CNRs or researchers in the field to analyze possible threats, and deducing from these steps what new types of surveillance are needed.

Zoonoses, such as avian influenza, provide one example. We know that they can be transmitted to humans in some conditions and can thus cause epidemics. Conditions of surveillance and detection of alerts must be adapted to these circumstances.
Some of the perceived emerging risks—climate

change, fertility problems, and congenital anomalies related to toxic endocrine disrupters—lie within the domain of environmental health, and the department of environmental health (DSE) is working to take them into account.

InVS has therefore decided, on the basis of findings from the science watch in each area, to bring together groups of experts, and especially members of its scientific council, to reexamine the priorities for surveillance and organize them into a work program for the years to come.

Prospective monitoring

An InVS working group on the topic of prospective monitoring proposed the following definition (January 2004): "Prospective health watch is a comprehensive multidisciplinary open analysis aimed at identifying major trends over time—but also weaker signals that can modify the course of the population's health status—by examining causal factors with the objective of enhancing consideration of these changes in the definition of InVS's surveillance priorities. This procedure is distinguished from forecasting by its multidisciplinary and systemic nature, which integrates the dimension of long periods of time, past and future, and ruptures, that is, discontinuities, either experienced or intended (threshold effects, irruption of innovations, human willingness to change the rules of the game). Its objective is not to predict the future but to help build it, on the basis of a rational systemic analysis of a range of possible futures based in turn on existing quantitative and qualitative data."

In this sense, according to the working group, prospective monitoring is only justified for questions that are on the face of it transversal or sufficiently comprehensive to affect InVS's organization and work priorities. For the same reasons, it can be envisioned only through multidisciplinary and profound analysis.

It is therefore not a routine activity, but rather several "construction sites" built over fairly long periods, with ad hoc working groups that call in outside specialists as needed. One example is the study of consequences of the population's aging on the priorities of health surveillance: by its need for joint assessments by epidemiologists of different disciplines, as well as demographers, gerontologists, and health economists, it seems to us to constitute prospective monitoring.

– Proposals for the organization of prospective monitoring

Prospective monitoring should therefore be the fruit of multidisciplinary comprehensive analyses that should orient the Institute's work.

It requires the participation of each of InVS's scientific departments and must be connected to its scientific council, which should be its central axis (the scientific council is responsible for monitoring the consistency of InVS's scientific policy and expressing opinions about it).

A permanent prospective surveillance group, bringing together experts from a variety of disciplines and horizons, will explore these possible futures and examine the scenarios that affect human health. The usefulness of a joint analysis with the other health agencies must be considered.

Moreover, InVS's scientific council should meet each year with each department and its groups of experts to validate their analyses. The scientific council could then use these analyses to identify the themes requiring prospective analyses (example: health impact of global warming).

Ad hoc working groups would then be set up with experts to translate the scenarios and the analyses of each scientific department about these emerging fields into operational programs for InVS.

• Building new surveillance systems: emergency response and mortality data

Surveillance of emergency response to non-specific events

The mortality levels observed during the summer 2003 crisis—severe, brief, and completely unexpected—showed the need for an alert system able to manage signals from the health first responders (prehospital and hospital emergency departments) and to react rapidly to mobilize and optimize existing health resources. InVS has been assigned to set up such a system, as rapidly as possible.
Conceiving such an alert system appears to be an original initiative not only within InVS but in the public health practice in the developed world. Until now no industrialized country has established a centralized health alert system based on emergency response data, except during crisis situations or natural catastrophes. There are therefore no international references. And it is likely that practical difficulties in setting up such a system are at least one reason none yet exists.

Current context: emergency medicine

All evidence indicates that the organization of emergency services has undergone profound structural changes in the past decade. Prehospital and hospital emergency response is called for at regularly increasing rates in France. This increase is related in part to the redistribution of healthcare providers—a reduction in the proportion of outpatient care compared with hospital-based services—and growth in the indications for recourse to emergency services for many health conditions. At the same time, emerging health phenomena—including response to global warming, to which the heat wave can be related—will further increase use of first-line emergency services. Emergency responders are thus in a privileged position for observing population health. The same is true for other health stakeholders, including private-practice physicians.
The importance of prehospital and hospital emergency medical response today cannot be understated. Nearly 600 emergency departments see 13 million visitors annually, for an average of 35 000 per day, with fluctuations over time.

Work on emergency response data

Use of health data from the emergency medical response system for public health purposes appears to be minimal today and their analysis essentially nonexistent.

Nonetheless they may provide the basis for a descriptive epidemiologic analysis of demand for emergency medical care. Variations in this demand could therefore serve as alert signals. Establishment of a surveillance and alert system based on emergency response data requires the following preliminary steps:

– standardization and validation of the data collected, automation of their transfer to a database of emergency responses

– Real-time identification of pertinent health signals and their analysis according to scientific criteria
– determination of critical thresholds, cut-off points that may define a pre-alert or alert, and their validation.

These data must be updated daily and correlated with earlier reference data for comparison; in composite form, they must be able to serve as information feedback. The reactivity of the health care system to this feedback appears to be a key point of the system. The data thus collected and analyzed may also help improve management of emergency capacity, when combined with demand forecasting, also based on these data.

Building a pilot surveillance network

The initial proposal planned for surveillance from reference facilities in territorial defense zones. But an InVS survey of the computerized data of hospital emergency medicine departments showed it to be unsatisfactory for rapid collection.

InVS and DHOS thus decided to base the initial network on facilities that use one of the following two systems for data collection: Urqual or ResUrgences. The developers of these software programs, contacted by DHOS and InVS, prepared a program to extract the desired data. Validation of information automatically transmitted by two pilot hospitals (Le Mans and Cochin Paris) justified the progressive extension of this data extraction software to the other hospitals (10 in the Paris region, 10 throughout the rest of the country) that participate in this experimental network. By June 2004, it should be operational and transmit data daily to InVS.

This project is conducted with DHOS in these hospitals. After evaluation, this network will be extended to other establishments. It already includes some prehospital emergency services: Samu and Smur (emergency medical services, including ambulances with life-support equipment), district firefighter and rescue units (SDIS), and groups such as SOS Medecins (emergency house calls).

The national commission for information technology and privacy (CNIL) approved the protocol for this project.

Emergency service providers can reach InVS at all times (24/7).

Given the complexity of a permanent system for this purpose, InVS and the emergency responders decided to set up alternative methods of access, 7 days a week, 24 h a day. These became operational in October 2003:

– email alert: alerte@invs.sante.fr

– fax for alert: 01 43 75 88 36

– and a dedicated telephone number already in operation and active 24/24: 01 41 79 67 15.

The email and fax are checked on weekends.

This information has been transmitted to all stakeholders, who are to post it permanently and visibly on all premises.

Proposal for a surveillance system based on mortality data from INSEE

After the events of the summer of 2003, InVS was also assigned responsibility for establishing a health surveillance system based on the daily collection of mortality data transmitted by INSEE. Operational systems of weekly mortality surveillance exist abroad (England-Wales, USA). In France, this system must fit into the national heat wave plan to allow the early detection of any significant modification in mortality and generate an alert if appropriate.

Scheme selected

Mortality data will be collected from those municipalities that already submit their information electronically (842 including 41 in overseas districts and territories). They account for 2.3% of all French municipalities but approximately 63% of the deaths. They transmit 70% of the "7 bis" notices within one to eight days. One of INSEE's objectives for 2004 is to continue the process of computerizing vital status data transmission, especially from municipalities reporting more than 1000 deaths per year; at the end of the year, this improvement should result in coverage of more than 70% of deaths.
After some data checking and coding, INSEE will transmit the necessary data to InVS daily: sex, date of birth, municipality of residence, date of death, municipality (and district) of death, site of death (home, public or private medical facility, retirement home, public place, other), and occupation.

InVS will systematically analyze these data on a weekly basis, with daily analysis possible if necessary.

Feasibility study

InVS selected from INSEE's list 147 computerized municipalities to participate in the initial pilot phase of this system in 2004. Given the nonspecific nature of mortality as an indicator, this choice was guided by the need to link the surveillance systems for mortality information, emergency response, and the heat wave alert.
We therefore selected municipalities:
– whose hospital participates in the emergency response information system;
– or for which the regional epidemiology units will initiate daily collection of mortality data on the declaration of a level 2 alert under the national heat wave plan.

A memorandum of understanding with INSEE, the establishment of an InVS-INSEE working group, and application for CNIL approval are all underway.

• Regionalization in alert procedures

Under the proposed new public health statute, responsibility for implementing the programs of the regional public health plans (PRSP) is assigned to the regional public health consortia (GRSP). The statute thus defines the region as the operational level for public health policies, the level at which public health action, coordination, and decision-making must take place. InVS's future development thus depends on the priority it gives to the regions: it must rely on and develop its field relays, the regional epidemiology units, for its alert and health surveillance duties.

Moreover, article 10 bis of the pending public health law specifies that the PRSP must include a plan of actions for alerts and management of emergency health situations. As it is InVS's responsibility to organize and provide leadership for health surveillance and alerts, this statutory proposal implies that InVS and the regional epidemiology units must participate in the definition of this plan. A national plan for surveillance and alert, defined at the national level by InVS, will be adapted at the regional level through the regional epidemiology units, with the necessary authority and legitimacy.

Example of the 2004 national heat wave plan

The national heat wave plan shows the operational importance of regionalization in the processes involved in alerts. It also illustrates for a particular risk, that associated with a possible heat wave, what will be demanded of InVS and the regional epidemiology units for all health risks after the new public health law is enacted.

The national heat wave plan requires the development of an effective surveillance system that can rapidly measure the health consequences of a heat wave. InVS is assigned the clear responsibility for and control of this surveillance and alert system. The national heat wave plan provides for the following organization of this surveillance and alert system and of its regional application and adaptation (as seen in its decision support forms for national and local bodies):

– level 1: InVS ensures that the regional epidemiology units are organized to meet their duties of data collection, treatment, and transmission;
– level 2: InVS places the relevant regional epidemiology units on standby status and they begin daily surveillance of health indicators; they transmit these data to InVS and to the district heat wave committee (number of: deaths reported to the vital status office, firefighter/rescue worker and Samu responses, hospital deaths and transfers, consultations at hospital emergency medicine departments, including deaths and admissions, and bodies transferred to funeral homes) and participate in the regional coordination committee;
– levels 3 and 4: InVS is mandated to coordinate with the regional epidemiology units; InVS and these units estimate health impact with the indicators collected daily by the latter in the largest city or cities of the regions concerned; InVS mobilizes a full-time investigation team (level 4); the regional units mobilize with InVS's aid to provide another investigation team and start ad hoc epidemiologic studies with InVS (level 4);
– at the end of the crisis, the regional unit summarizes the information flow, assesses the event's regional health impact, and participates in assessing the effectiveness of the measures applied.

The national heat wave plan imposes on the regional units, from level 2 onward, the daily collection of information (from hospitals, prehospital emergency responders, vital statistics offices, and funeral homes) in each district of the region on alert, regardless of the day the alert is ordered, even weekends or holidays. In view of its importance, this work can be performed satisfactorily only by teams already in the region and sufficiently well staffed to provide more than a skeleton staff during annual leave periods and on-call staff on weekends.

The duties of regional epidemiology units imposed by the national heat wave plan anticipate, in some respects, the work they will need to conduct to implement the plan for emergency health alert and management foreseen by the PRSP.

Regional epidemiology units in 2004 and InVS's regional development

In 2004, InVS's regional system is still incomplete. It can rely on only 16 regional epidemiology units and 71 scientists (Table 6): 32 public health inspector-physicians (Misp) and health engineers (IGS), 13 district health workers, and 26 InVS epidemiologists (including 11 InVS scientific coordinators).

Table 6: Regional epidemiology units, InVS's regional relays in 2004

Current CIRE in 2004	Number Staff	Year founded	Regions currently covered	District
Cire-Antilles-Guyane (Fort-de-France)	5	1996	Martinique / Guadeloupe / French Guyane	3
Cire Aquitaine (Bordeaux)	5	2002	Aquitaine	5
Cire Auvergne (Clermont-Ferrand)*	2	2003	Auvergne	4
Cire-Centre-Est (Dijon)	5	1996	Burgundy / Franche-Comté	8
Cire-Centre-Ouest (Orléans)	5	1996	Centre / Poitou-Charente / Limousin	13
Cire-Est (Nancy)	5	1996	Champagne-Ardennes / Lorraine / Alsace	10
Cire-Haute-Normandie (Rouen)	3	2002	Haute-Normandie	2
Cire-Ile-de-France (Paris)	6	2002	Ile-de-France	7
Cire-Languedoc-R. (Montpellier)	3	2003	Languedoc-Roussillon	5
Cire-Réunion-Mayotte (St-Denis)	4	2002	La Réunion / Mayotte	2
Cire-Midi-Pyrénées (Toulouse)	5	1996	Midi-Pyrénées	8
Cire-North (Lille)	5	1996	Nord-Pas-de-Calais / Picardie	5
Cire-West (Rennes)	5	1996	Brittany / Lower-Normandy	7
Cire-Pays-de-la-Loire (Nantes)	3	2003	Loire region	7
Cire-South (Marseille)	5	1996	PACA / Corsica	8
Cire-Rhône-Alpes (Lyon)	5	1996	Rhône-Alpes	8
Total	**71**			

* opening September 2004

To perform the tasks required by the national heat wave plan and those that will predictably be implemented for the regional plan's health emergency alert and management section, InVS's regional development must continue simultaneously consolidating the teams in the existing units and extending the regional system, that is, continuing the regionalization process and establishing an InVS presence in each region. This extension must take into account regional differences such as size and issues. It must be structured, as the existing national plans (Biotox, Piratox, Piratome) are and the regional plans will be, according to the civil defense zone network. For this reason, analysis already begun within InVS and the CIRE foresees an organization in three levels, with area epidemiology units, regional epidemiology units, and branches (or representatives), and a reinforcement of the teams to provide approximately two epidemiologists per million inhabitants in each civil defense zone.

The new tasks of the regional epidemiology units

The fundamental task of the regional epidemiology units is changing: from simple technical support to decentralized national departments, their task has expanded to the full adaptation and application of national health surveillance and alert duties at the regional level. Their institutional role must evolve at the same time: they represent InVS in each region.

In this framework, on behalf of each regional consortium, the epidemiology unit will run the region's health emergency alert and management plan. It will also participate in the consortium's development of plans and work. Within the consortium, InVS, through the CIRE, will focus on regional diagnosis and the identification of regional health problems and indicators that will make it possible to monitor the programs. The CIRE will provide methodological and scientific standards for this work by the consortium, as well as its skills and know-how.

InVS's new mission: participation in emergency response management

The law on public health policy, which should be enacted during the summer of 2004, will reformulate InVS's duties by amplifying its role in the health surveillance and vigilance of identified or predictable risks, especially for fragile or threatened populations.

The short chain of command from InVS to the Minister of Health stresses the importance in the eyes of the legislature of issuing alerts. Finally, a new mandate was added: "contribution to the management of health emergencies".

Expertise and recommendations

The health and safety agencies were established in 1998 on the principle of separating expert assessment, conducted independently by these agencies, from decision-making by public authorities, including implementation of activities and plans to control or prevent specific problems.

Since its creation, InVS's expertise has had as its focus and purpose the making of recommendations to the authorities about "any appropriate activity or measure." That is, InVS has provided essential decision support.

The new public health law takes a further step in this direction by mandating InVS to contribute to the management of health emergencies; this implies a direct and close relation between experts and policy-makers to draw up measures to end the crisis.

Development of national health plans

Although the law has not yet been enacted, implementation of this new responsibility flowed naturally from the alerts of 2003.

InVS participated in all phases of planning the French response to the threat of SARS. The early detection of cases is obviously a part of surveillance and alert duties, as is the interventional epidemiology phase, which involves identification and monitoring of contacts; but InVS was also present and active in the definition of the management protocols because its epidemiologists were among those who knew this new disease best.

InVS's role was also central to the development of the national heat wave plan. Its expertise in time series techniques allowed it to work with Météo France on past heat waves to define operational thresholds that can be used to transform a meteorologic alert into a health alert.

The epidemiologic studies conducted in the wake of the 2003 summer heat wave identified the health and social risk factors as well as the elements of the environment and the home that should be taken into account in the national heat wave plan, to optimize prevention and management of a future crisis.

For local alerts, InVS can collaborate closely with prefects through the regional epidemiology units, to help define, on the basis of scientific factors, the measures to take to stop an epidemic or manage an environmental crisis.

Conclusion

InVS's new responsibility to participate in managing health emergencies is an amplification of its earlier decision support functions, which required it to formulate recommendations to the authorities.

For InVS to fulfill these duties, it is essential for the authorities to recognize the time required for expert assessments and for the expression of their results.

On these conditions, the conclusions of these assessments can provide a basis for decisions and development of pertinent plans for prevention and control.

Synthesis of health surveillance data

- **Cancer surveillance: recent epidemiologic data**
- **Surveillance of drownings during the summer of 2003**
- **National mesothelioma surveillance program: risk estimates by occupation and by industry**
- **Surveillance of musculoskeletal diseases in the Loire region**
- **Building a cohort of AZF workers**
- **Surveillance of mental health in the workplace**
- **Investigation of disease clusters in the workplace**
- **Assessment of regional air quality plans**
- **Aluminum: health risks?**
- **Evaluation of the health consequences after the explosion of the AZF factory explosionin Toulouse**
- **Malaria surveillance in French Guyana**
- **Surveillance of HIV infection: early results of the mandatory reporting system**
- **Measles surveillance: towards mandatory reporting**
- **Nosocomial infections: constructing summary indicators**
- **Surveillance of foodborne illness outbreaks since 1987: impact of control and prevention measures**

Cancer surveillance: recent epidemiologic data

As part of the governmental cancer plan for 2003-2007, the lawmakers gave InVS responsibility for the epidemiologic surveillance of cancer. This task is essential for directing and assessing both prevention measures and cancer management. To do so InVS relies on a network made up principally of the cancer registries and CépiDc. The network's most recent achievements include drafting the epidemiology section of the report to the Cancer Commission [1] and publishing articles on national trends in cancer incidence and mortality from 1978 through 2000 [2,3], premature mortality from cancer in France [4], and estimates of lung cancer incidence and mortality in women [5] and of cutaneous melanoma [6]. Most of these results were reported during a conference on cancer surveillance organized in Paris by InVS on 21 October 2003 and in the simultaneous theme issue of the weekly epidemiologic bulletin [7].

– Material and methods

Incidence data (that is, the new cases each year) are collected by 14 cancer registries. Together they cover only a part of the country:
– nine general registries covering the districts of Bas-Rhin, Calvados, Doubs, Haut-Rhin, Hérault, Isère, Loire-Atlantique, Manche, Somme, Tarn, and Vendée, for a total of 6 239 000 inhabitants in 1999;
– five specialized registries (gastrointestinal in Calvados and Côte-d'Or/Saône-and-Loire, hematology in Côte-d'Or, thyroid in Marne/Ardennes, colon-breast in Loire-Atlantique).

The period covered varies, ranging from 1978, (the first year of availability in the oldest registries) through 1997 (the last year of validated data available for the last national estimates). CépiDc furnishes the mortality data.

The data discussed here concern cancers diagnosed in France between 1978 and 1999 (last year available at the time of the analyses). As in international studies, the cut-off point for premature deaths was set at 65 years because of its relevance for prevention.

The population data are provided by INSEE censuses in 1975, 1982, 1990, and 1999 and available by district.

Statistical modeling estimated the national incidence of each cancer from 1978 to 2000 [2, 3], using an age-cohort model to smooth age and cohort effects. This estimate, by the biostatistics department of the Hospices Civils in Lyon and the members of the French Registry Association (Francim), covered 21 cancer sites for men and 24 for women. It includes all cancer cases diagnosed between 1 January 1978 and 31 December 1997. Projections estimated the incidence for the years 1998-2000. The modeling is based on data from districts covered by a registry, the only geographic areas for which incidence and mortality are both known. These models furnish an estimate of the incidence/mortality ratio, which is then applied to the mortality rate predicted by an age-cohort model based on mortality data for the entire French population.

– Results

National cancer mortality: overall and premature (before 65 years).

With 148 584 deaths observed in 1999, cancer is the second leading cause of death in France, behind cardiovascular diseases; it accounts for approximately 28% of deaths. It is the leading cause among men (32% of male deaths) and the second among women (22%). From 1980 through 1984, cancers accounted for only 27% of the general mortality among men and 19% in women.

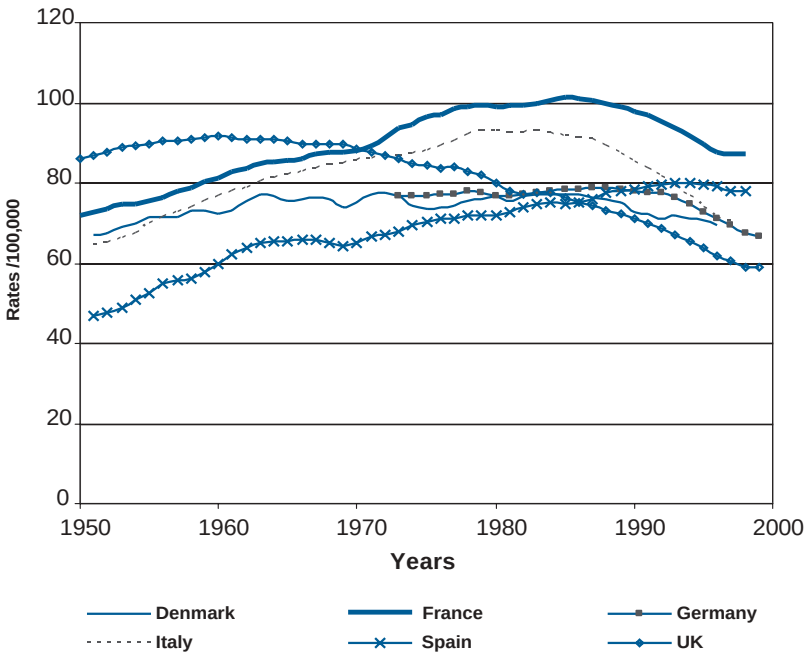
Cancer is the leading cause of premature mortality in France, responsible for 42 000 deaths per year of people younger than 65 years. From 1995 through 1999, it accounted for 28% of all-cause mortality in men and only 13% in women. It is by far the leading cause of premature deaths (36% in men, 44% in women), followed by violent deaths (accidents: 21%; suicides: 16%), and then diseases of the circulatory system. The proportion of premature mortality from cancer varies according to sex (slightly less than one–third of deaths in men and one in four in women) and anatomical site (Table 7).

Lung and upper aerodigestive tract (UADT) cancers are predominant in men; they occur early, have a poor prognosis, and are associated with the risk factors of smoking and alcohol. We note that premature mortality from cancer in France among men, associated with alcohol and tobacco exposure, is higher than elsewhere in Europe, while French women rank well in these comparisons. Although the size of its lead has been diminishing since 1985, France has topped the list of European countries for premature cancer deaths in men since 1975 (Figure 14).

Table 7: Death by cancer site, all ages and premature (< 65 years) – in both sexes – annual mean for 1995–1999

	Number of deaths All ages		Number of deaths 1-64 ans		Portion of premature mortality (%)	
	Men	Women	Men	Women	Men	Women
Lung	20 606	3935	8140	1321	39.5	33.6
UADT	10 126	1566	5261	544	51.9	34.7
Breast	-	10 913	-	4276	-	39.2
Colon-rectum	8460	7733	1797	1191	21.2	15.4
Prostate	9331	-	617	-	6.6	-
Cutaneous melanoma	615	600	312	243	50.7	40.5
Cervix	-	742	-	383	-	51.6
All cancers	**86 651**	**56 170**	**28 048**	**14 385**	**32.4**	**25.6**

Figure 14. Premature cancer mortality rates (0-64 years) in men, from 1950 through 1999 in 6 European countries (source: IARC)



Cancer mortality in France is characterized by:
– high avoidable mortality in men, for cancers associated with individual risks (UADT and lung cancers related to alcohol and smoking)
– low avoidable mortality in women, for cancers managed by the healthcare system and screening (breast cancer among those aged 25-64 years, uterine cancer in those 15-64 years, with earlier diagnoses and better treatment results).

National incidence between 1978 and 2000

In 2000, there were 278 000 new incident cancer cases in France, for an increase of 63% since 1978. This was due in part to the aging of the population, but also to an increase in cancer risks estimated at more than 35%.

The prostate and the breast account for most of this augmentation. The sites with the largest increases are non-Hodgkin lymphoma (NHL), melanoma, and thyroid cancers in both sexes and lung cancer in women.

Cancers associated with alcohol and smoking exacted and especially heavy toll from men (Table 8). We nonetheless note an encouraging deceleration of the increase in lung cancers and a notable diminution in cancers linked to alcohol.

Preventable cancers top the list of sites for women, accounting for 47% of new cases in 2000 (Table 9).

– Discussion

Although premature deaths have been diminishing since the 1990s, France has led European countries in this category among men for the past 30 years, mainly because of lung and UADT cancers. Socioeconomic status (SES) is correlated with the risk of premature death for

Table 8: Number of incident cancer cases in men, 95% confidence interval, annual age-standardized rate per 100 000 person-years, in France

Cancer site	Estimated national incidence in 2000			Rate of change of the annual mean incidence between 1978 and 2000 (in %)
	Number of cases	95% confidence interval	Standardized rate (pop. World)	
Prostate	40 309	34 168-46 450	75.3	+5.33
Lung	23 152	20 892-25 412	52.2	+0.58
Colon-rectum	19 431	18 718-20 144	39.1	+0.99
Lip-mouth-pharynx	12 990	11 716-14 264	32.2	-1.00
Bladder	8986	7651-10 321	18.3	+1.14
Non-Hodgkin lymphoma	5527	4733-6321	13.3	+3.82
Kidneys	5306	4658-5954	12.2	+2.70
Liver	5014	3927-6101	11.0	+4.84
Stomach	4520	3940-5100	9.0	-2.01
Esophagus	4040	3477-4603	9.3	-2.13
Larynx	3865	3008-4722	9.3	-1.66
Leukemia	3609	3077-4141	8.9	+0.04
Cutaneous melanoma	3066	2625-3507	7.6	+5.93
Pancreas	2701	2199-3203	5.8	+1.27
Central nervous system	2697	1706-3688	7.4	+2.25
Multiple myeloma and immunoproliferative diseases	1942	1411-2473	4.0	+2.65
Thyroid	821	563-1079	2.2	+2.89
Hodgkin disease	736	545-975	2.2	-1.37
Mesothelioma	671	535-807	1.4	+4.76
Total bladder cancers[1]	**161 025**		**349.4**	**+1.31**

[1] skin tumors other than melanoma are excluded

Table 9: Number of incident cancer cases in women, 95% confidence interval, annual age-standardized rate per 100 000 person-years in France

Cancer site	Estimated national incidence in 2000			Rate of change of the annual mean incidence between 1978 and 2000 (in %)
	Number of cases	95% confidence interval	Standardized rate (pop. World)	
Breast	41 845	37 731-45 959	88.9	+2.42
Colon-rectum	16 826	15 572-18 080	24.6	+0.83
Cervix	5064	4222-5906	9.2	+0.25
Lung	4591	4182-5000	8.6	+4.36
Ovary	4488	4091-4885	9.0	+0.55
Non-Hodgkin lymphoma	4381	3755-5007	7.8	+3.46
Cutaneous melanoma	4165	3103-5227	9.5	+4.33
Cervix	3387	2874-3900	8.0	-2.88
Kidneys	2987	2501-3473	5.7	+3.74
Thyroid	2890	1532-4248	7.5	+4.80
Leukemia	2634	1900-3368	5.5	0.00
Stomach	2606	2238-2974	3.4	-2.52
Central nervous system	2602	1093-4111	6.4	+3.01
Lip-mouth-pharynx	2395	2079-2717	4.7	+1.73
Pancreas	2186	1569-2803	3.2	+2.07
Bladder	1785	1475-2095	2.3	-0.50
Multiple myeloma and immunoproliferative diseases	1645	1063-2227	2.5	+1.96
Liver	962	654-1270	1.5	+3.38
Esophagus	928	815-1041	1.5	+2.35
Hodgkin disease	631	399-863	2.0	-0.50
Larynx	361	271-451	0.7	0.00
Mesothelioma	200	123-277	0.4	+6.83
Total bladder cancers[1]	**117 228**		**226.3**	**+1.36**

[1] skin tumors other than melanoma are excluded

all these cancers, and they explain in part the social inequalities in premature mortality, which are greater in France than in most other developed countries. French women rank in the middle of the European standings for premature deaths. Unlike in other countries, however, these rates have diminished in France regularly over the past four decades. The French situation is better when we consider cancer deaths preventable by adequate health care.
Nonetheless, premature deaths from lung cancer currently account for 9% of premature deaths among women and these are rising at a very alarming rate.
The prevention of smoking in the young is a priority objective for the government, and its success is essential.

Changes in diagnostic and treatment practices may explain some portion of the increase in new cancer cases between 1978 and 2000. These changes include the introduction of ultrasound-guided biopsies and serum markers for prostate cancer, use of Hemoccult® testing for colorectal cancer, breast cancer screening, melanoma, prevention activities, and diagnostic tools for thyroid cancer.

The incidence of lung cancer in women grew strongly between 1978 and 2000, and more for the younger cohorts; its relation with smoking practices is obvious. A recent InVS study [5] estimates at 59 000 the number of lung cancer deaths among women in France in the period 2015-2019. France may thus see a development

similar to that witnessed by countries where smoking developed earlier (USA and Great Britain) and where mortality from lung cancer equals or exceeds that of other cancers (breast, colorectal). Smoking prevention must thus be intensified, even though its effects will not be immediately perceptible. The increased incidence of cutaneous melanoma, associated with exposure to the sun and changes in leisure practices, is smaller than among men.

– Conclusion

Cancer is one of the government's three public health priorities, along with traffic safety and fighting handicaps. President Chirac affirmed that this 5-year plan "has three ambitions: to catch up in prevention and screening, to offer all patients the quality of medical and supportive care that they deserve, and to give a decisive impetus to research." Premature mortality from cancer in France should be monitored to see whether these measures have the effects we hope for.

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• Surveillance of drownings during the summer of 2003

Drowning is secondary acute asphyxia, most often due to the penetration of water in the respiratory airways. Strictly speaking, drowning involves death; when the victim survives the accident, it is a near-drowning. In this section, "drowning" is used in the broad sense to designate an event of "suffocation due to immersion in water" that led to hospitalization or death. Drownings are an important public health problem in France, causing more than 500 deaths each year; among children younger than 15 years, it is the second leading cause of accidental death. Since 2001, surveillance of these events has relied on an annual survey conducted jointly by InVS and the Ministry of Interior's office of civil defense and safety. The epidemiologic survey "Drownings 2003" covers all the drowning incidents in France during the summer of 2003: in private and public pools, in rivers, lakes, the sea, and elsewhere (for example, bathtubs and tanks).

– Material and methods

The objective of this cross-sectional national survey conducted between 1 June and 30 September 2003 was to track the number of drowning victims and describe both their demographic characteristics and the circumstances of the accident. It included all drownings followed by hospitalization or death, if they involved the intervention of any organized rescue crew or emergency responder in France

(including overseas districts). The questionnaires, completed on the day of the drowning by the intervention team (district fire and rescue department, emergency ambulance crews, lifeguards, etc.), were processed at InVS.

– Results

Reports from 1 June through 30 September 2003 detail 1154 accidental drownings in France, 435 of them fatal. They involve victims of all ages, especially children younger than 6 years and adults older than 45 years, who represent, respectively, 15.7% and 42.3% of all victims (Figure 15); 69% were men.

The incidence and mortality rates for accidental drowning during the summer of 2003 were estimated, respectively, at 1.9/100 000 and 7/100 000 in metropolitan France. These rates were highest for children younger than 5 years, 4.0/100 000 and 1.3/100 000, respectively. Among those older than 65 years, the rates were 2.7/100 000 and 1.1/100 000.

Figure 15. Accidental drownings, whether or not death ensued, according to victim's age, France, Summer 2003

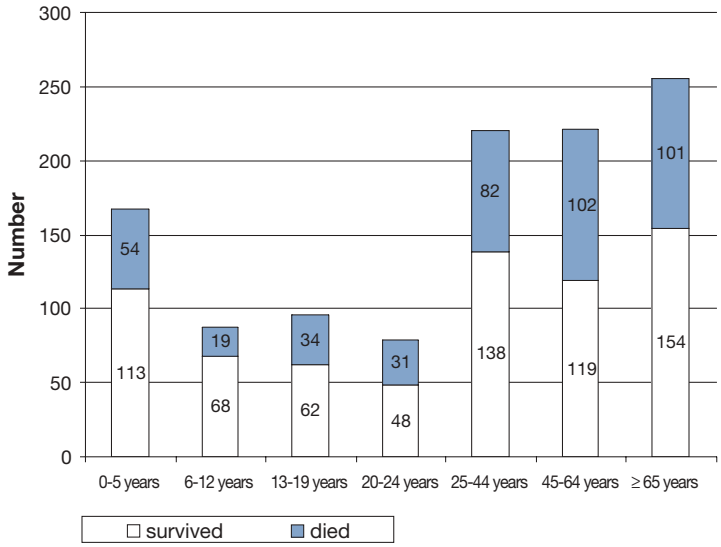
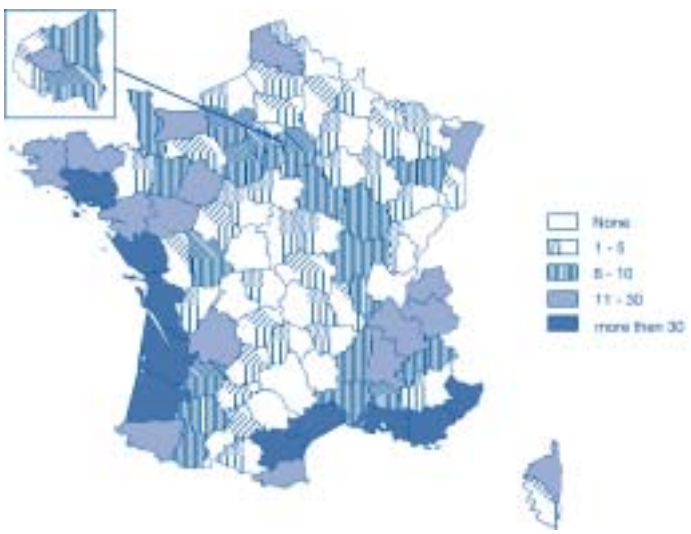


Figure 16. Accidental drownings, whether or not death ensued, by region, metropolitan France, Summer 2003



Drownings occurred in all the locations in which people swim: 48.5% in the sea, 14.9% in private pools (that is, private family and private institutional pools), 13.5% in lakes and ponds, 5.7% in public or private fee-entry pools, and 1% in other premises. Figure 16 presents the regional distribution of drowning incidents.

The principal circumstances differed according to age:
– for children younger than 13 years: did not know how to swim (43%), not supervised (31%), or fell (30%);
– in youth aged 13 to 24 years: health problem (malaise, cold-water shock, epilepsy: 26%), exhaustion (19%), current (18%), swimming in a forbidden area (11%);
– in those aged 25 to 44 years: disease (malaise, cold-water shock: 35%), alcohol consumption (19%), or exhaustion (13%);
– in those older than 45 years: health problem (malaise or cardiac malaise 46%).

– Comparison between 2002 and 2003

During the summer of 2003, the number of accidental drownings increased by 45% from the summer before, and the number of fatal drownings by 73% (Figure 17). This increase was noted in all age groups and ranged from 26% among children younger than 12 years to 113% among those older than 65. Deaths increased by 47% among the former and 106% among the latter.

The increase was also observed at all kinds of premises:
– pools (+ 47% drowning incidents and + 58% deaths)
– river (+ 25% drowning incidents and + 40% deaths)
– lakes and ponds (+ 73% drowning incidents and + 121% deaths)
– in the ocean or sea (+ 44% drowning incidents and + 84% deaths)
– at other sites (+ 42% drowning incidents and + 82% deaths).

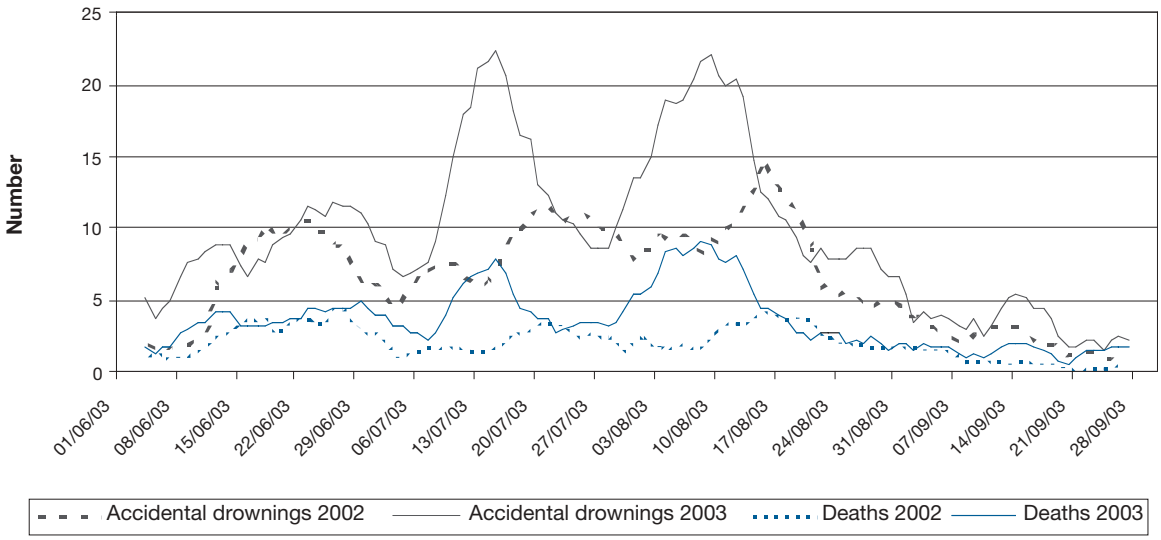
Of the 1154 victims of accidental drownings, 369 (32%) died on the spot and 785 (68%) were hospitalized. Of the 471 persons hospitalized for whom outcome is available, 66 died in the hospital, 22 had permanent damage, and 383 were discharged without sequelae.

Table 10 details the results according to swim site and victim's age.
This increase was particularly marked during two periods: between 9 and 22 July and between 1 and 17 August (Figure 17). The relatively small numbers and the absence of specific data about swimming habits and tourism from one year to the next limit the possibility of regional comparisons.

Table 10: Accidental drownings, whether or not death ensued, by swim site and age, France, Summer 2003

	<1 year	1-5 years	6-12 years	13-19 years	20-24 years	25-44 years	45-64 years	≥ 65 years	Unknown	Total
Pools	1	98(28)	32(1)	20(4)	5(1)	33(4)	16(9)	31(10)	2	238(57)
• private family	1	71(21)	7(1)	4(2)	2(1)	13(2)	11(7)	22(9)	21	33(43)
• private institutional	-	12(4)	9	4(1)	-	7(2)	3(2)	4	-	39(9)
• public	-	15(3)	16	12(1)	3	13	2	5(1)	-	66(5)
River	-	8(5)	8(8)	13(10)	23(13)	39(25)	36(27)	17(13)	9(4)	153(105)
Lake/pond	-	19(9)	15(7)	21(14)	19(11)	37(21)	24(13)	17(15)	4(3)	156(93)
Sea	-	13	29(3)	40(5)	32(6)	108(31)	143(51)	182(60)	13(4)	560(160)
Other	9(4)	19(8)	3	2(1)	-	3(1)	2(2)	8(3)	1(1)	47(20)
Total	**10(4)**	**157(50)**	**87(19)**	**96(34)**	**79(31)**	**220(82)**	**221(102)**	**255(101)**	**29(12)**	**1154(435)**

Figure 17. 2002-2003 comparison of the daily distribution of accidental drownings followed by hospitalization or death, France



– Discussion and conclusion

As in earlier years, the Drownings 2003 survey showed the extent of this public health problem: 435 accidental deaths in four months, an appreciable number of which could have been avoided by measures of prevention and prudent behavior. During the summer of 2003, young children and the elderly were hit hardest by accidental drownings.

The particularity of 2003 is the substantial increase in both accidental drownings and deaths compared with the summer of 2002, especially among the elderly and in lakes and ponds. Different factors may have contributed to this increase. On the one hand, the heat wave that summer in some regions may well have increased the amount of swimming (that is to say, the number of swimming "episodes") compared with earlier years, including at unsupervised or unauthorized sites and thereby increased the risk of drownings. The ever-increasing number of private pools in France (approximately + 50 000 new pools each year) has a similar effect.

On the other hand, an increase in risk behaviors associated with the absence of a large-scale drowning prevention campaign in 2003, as there had been in earlier years, may also have contributed to this increase.

In any case, there are arguments in favor of conducting such a national campaign again, to make the following recommendations to the public:

– supervise young children around water closely and constantly
– install standardized safety devices around private pools
– teach children to swim at 6 years of age
– do not practice apnea, do not swim in forbidden areas
– avoid drinking alcohol before swimming and enter the water progressively
– do not overestimate your physical capacity
– do not swim alone
– take basic lifesaving and CPR training to be able to help in cases of accident.

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Institut de veille sanitaire - Département maladies chroniques et traumatismes, ministère de l'Intérieur, de la Sécurité intérieure et des Libertés locales - Direction de la défense et de la sécurité civiles. Surveillance des noyades. Enquête Noyades 2003, 1er juin – 30 septembre. Rapport juillet 2004 (http://www.invs.sante.fr/)

National mesothelioma surveillance program: risk estimates by occupation and by industry

Mesothelioma is a malignant tumor most often localized in the pleura. Its only known etiology is asbestos exposure. This cancer generally occurs some 30 to 40 years after the onset of exposure. Because of the intensification of asbestos use in various industries since the beginning of the 20th century, its incidence has been rising strongly since the 1950s in industrialized countries. In 1996, an Inserm expert advisory group estimated the number of mesothelioma deaths in France from 1965 through 2000 at between 32 000 and 38 000. Theoretical models forecast that the epidemic will continue in the decades to come and predict approximately 50 000 deaths in France over the next 50 years. Until the end of the 1990s, sources of asbestos exposure were extremely varied; they were not limited to the industry of asbestos production and processing, but also involved shipbuilding and repair, the vast sector of construction and public works, and thus all the related building trades (for example, plumbers, pipe fitters, electricians, and carpenters). The Espaces study (coordinated by the DST at InVS in collaboration with Inserm U88 and CeTAF) found that 25% of retired male employees (aged 60 years and older) in France had been exposed to asbestos during their working life. The national mesothelioma surveillance program (PNSM), established at the request of the public authorities (labor relations office and DGS), began operation in 1998. This concerted action calls on specialists of diverse domains: epidemiology, anatomopathology, pulmonary medicine, oncology, occupational medicine, and industrial hygiene. It has the following principal objectives: to estimate the incidence of mesothelioma in France and its changes over time; to study the proportion of mesothelioma cases attributable to asbestos exposure and explore other etiological factors (such as man-made mineral fibers, ionizing radiation, and simian virus 40); to improve anatomopathologic diagnosis of mesothelioma; and to assess its recognition as an occupational disease.

– Objective

This review is intended to present some results from the case-control survey conducted to study the etiology of mesothelioma; to be precise, we report the estimated risk of pleural mesothelioma by occupation and by industry.

The initial epidemiologic results among men show that 82% of the cases of pleural mesothelioma are attributable to occupational asbestos exposure. Specifying the occupations and industries for which men are most at risk of pleural mesothelioma would thus be useful from a public health perspective.

– Methods

Between 1998 and 2002, in collaboration with the FRANCIM network of cancer registries, the PNSM conducted a multicenter case-control study in the general population, in 19 mainland districts: 14, 21, 24, 25, 33, 34, 38, 40, 44, 47, 50, 61, 64, 67, 68, 80, 81, 93, and 94. Only two districts (13, 83) in the zone covered by the PNSM did not participate in the survey. The study included all case subjects residing in one of the 19 participating districts, with a diagnosis of primary pleural tumor (most often pleural mesothelioma) confirmed either by histologic validation (Mesopath group) or by clinical examination of the available radiographic evidence. Two controls (without mesothelioma) were selected from voting rolls for each case.

Data collection

The etiological survey used a standardized questionnaire and took place in two stages, preferably at the subject's home:
1) the subject completed a self-administered questionnaire that enabled us to trace his complete occupational history;
2) later, an experienced investigator met the subject to ask additional questions.

Coding of occupational history
Each episode of each subject's occupational history was coded according to the international and European community nomenclatures. To improve coding quality, correspondence tables for the different nomenclatures were constructed.

Risk estimates by occupation and by industry
The risk of pleural mesothelioma in men by occupation and by industry was estimated with the following method: for each occupation and each industry, an odds ratio (OR) and its 95% confidence interval (95%CI) were calculated by comparing subjects (cases and controls) who had had at least one job in that occupation or industry with subjects who had never worked in it. Other methods of risk estimation were also used, in which subjects were defined according to the job they held longest or according to total duration in that job; these analyses are underway, and their results will be reported later.

– Results

These results were presented at the symposium on recent epidemiological studies of asbestos and occupational risks held at the Ministry of Health in Paris on 17 November 2003. It was open to healthcare professionals, labor and employer organizations, government workers, and patient associations. Because data collection and treatment are in the process of finalization, these results are still provisional.

From January 1998 through November 2003, a total of 469 cases and 757 controls, all living, were surveyed (Table 11). Men accounted for 80.4% (377) of the cases and 84.8% (642) of the controls. Cases had a mean age of 68 years and controls of 70. More than 45% of the cases were blue-collar workers, compared with less than 25% of the controls. Mean working life for subjects (cases and controls) was 40 years.

The analysis on which the estimation of risk by occupation and industry was based involved 879 men (360 cases and 519 controls) whose work history was coded and validated with correspondence tables relating the various nomenclatures.
Here we present the results according to the international nomenclatures of occupations and economic activities (Figures 18 and 19):

– **By occupation:** the highest risks of pleural mesothelioma were observed for the plumbers-pipe fitters (OR=5.9; 95%CI: 2.7-12.8), the welders-flame-cutters (OR=4.5; 95%CI: 1.7-11.7), sheet metal workers-boilermakers (OR=4.4; 95%CI: 2.5-7.7), and finally, the otherwise unclassified laborers (OR=3.4; 95%CI 2.0-6.0).

– **By industry:** the risks were highest among workers in shipbuilding and repair (OR=12.2; 95%CI: 6.1-24.4), asbestos processing and manufacture of products containing asbestos

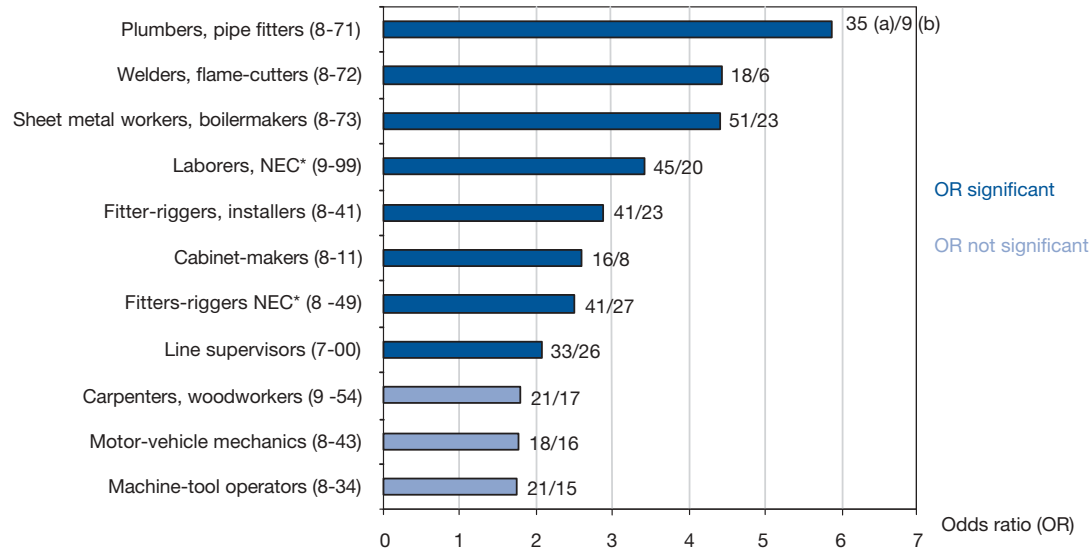
Table 11: Principal characteristics of cases and controls

	Cases (N = 469)		Controls (N=757)	
	N	%	N	%
Men	377	80.4	642	84.8
Mean age (min-max)	68 (42-94)		70 (45-93)	
INSEE socio-occupational category				
Workers	214	45.6	180	23.8
Managers, intermediate occupations	126	26.9	317	41.9
Others	129	27.5	260	34.3
Mean working life, in years (min-max)	39.3 (01-66)		40.9 (01-67)	

[1] Among the women, three cases and five controls had never been gainfully employed

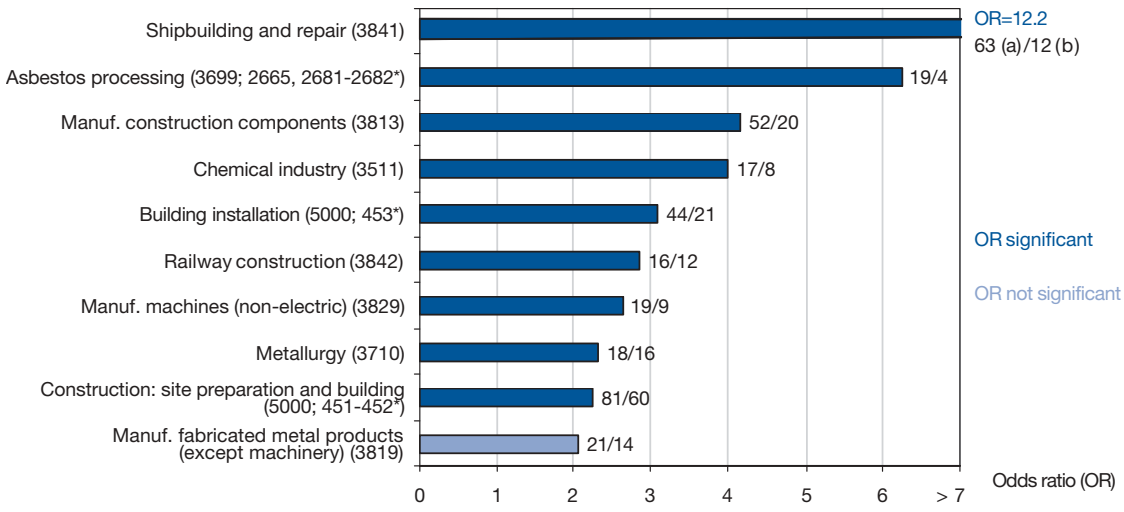
(OR=6.2; 95%CI: 2.0-19.0), manufacture of industrial and architectural metalwork (for example, bridges, tanks, pipes, scaffolding, framing, and staircases) (OR=4.2; 95%CI 2.4-7.3), and the chemical industry (OR=4.0; 95%CI 1.7-9.6). We noted no significant excess risk for the motor-vehicle mechanics (OR=1.8; 95%CI 0.9-3.7).

Figure 18. Risk of pleural mesothelioma by occupation (879 men: 360 cases and 519 controls; nomenclature of occupations, ISCO 1968)



* NEC: not elsewhere classified
(a) and (b): number of cases and controls who ever worked in this occupation

Figure 19. Risk of pleural mesothelioma by industry (879 men: 360 cases and 519 controls; nomenclature for industries: ISIC Rev.2)



* NACE Rev.1
(a) and (b): number of cases and controls who ever worked in the sector

– Conclusion

The highest risks of pleural mesothelioma were observed for the occupations and industries in which asbestos was widely used in recent decades. These risks were found not only in the asbestos processing industry but also in sectors such as shipbuilding and naval repair (which made massive use of products containing asbestos to insulate boilers, steam pipes, hot water pipes, and incinerators), manufacture of metal construction components, the chemical industry, and public works. All these used enormous quantities of asbestos. The occupations at greatest risk include those known to have been exposed to asbestos (such as plumbers, welders, and sheet metal workers), but whose elevated risk of pleural mesothelioma had not previously been documented.

Overall, these results confirm that the PNSM can provide new information important for public health. These results should facilitate preventive activities targeted at the occupations identified as at greatest risk, where exposure has remained widespread in recent years, in the various industries where materials containing asbestos persist.

– Perspectives

Beyond its surveillance of a specific risk, the PNSM is the first real nationwide epidemiologic surveillance program for an occupational risk.

After presentation of the summary of the program's first five years at the November symposium, four principal work objectives remain: perpetuate the continuous surveillance of pleural mesothelioma incidence in collaboration with the FRANCIM network; assess the changes in risk by occupation and industry; contribute to improving the anatomopathologic and clinical diagnosis of pleural mesothelioma; and help improve the percentage of pleural mesotheliomas that are recognized as occupational diseases.

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• Surveillance of musculoskeletal diseases in the Loire region

In 2002, in partnership with the Medical School of Angers, InVS set up a three-year (2002-2004) three-part experimental program to develop a tool for epidemiologic surveillance of musculoskeletal diseases in the Loire River region.

Part 1: Epidemiologic surveillance of tracer diseases in the general population

Carpal tunnel syndrome (CTS) was chosen as the tracer for upper limb musculoskeletal diseases in this study. Its surveillance during the first year provided an estimate of CTS incidence, regardless of its occupational origin. It also allowed us to determine the proportion of cases attributable to occupational factors. The second-year (2003) data are currently being analyzed.

– Methods

Calculations of the CTS incidence rate used 1999 INSEE census data (population of the Maine-et-Loire and its distribution by age and sex). The relative risks were estimated by standardized incidence ratios (SIR) and calculated with a reference population for each industry and each occupation with reference populations comprised of all the industries and occupations.

Two indicators quantified the contribution of occupational factors to CTS incidence:
– the population attributable risk fraction (PAF) for CTS due to working in a particular industry or occupation represents the proportion of cases in the overall population that would be avoided if that sector or occupation did not have an excess risk;
– the etiologic fraction (EF), or the attributable risk fraction among the exposed, represents the proportion of CTS cases that can be attributed specifically to work in an industry or occupation among the cases who work in the industry or occupation.

– Results

Based on the 420 cases reported by the neurophysiologists' network between 1 February 2002 and 30 January 2003, annual CTS incidence is 1.08 cases per 1000 Maine-et-Loire residents aged 20 to 59 years. The study confirmed that CTS incidence is higher in women (1.54) than men (0.62) and increases with age in both sexes.

The activity sectors characterized by excess risk include:
– for women: agriculture, the food processing industry, retail sales, health and social work, personal services;
– for men: quarries, construction, and public works.

The occupations or occupational categories characterized by significant excess risk are:
– for women: low-level civil servants (especially nurses' aides), administrative employees in private companies, sales personnel (especially salesclerks in retail food shops), personal service workers, skilled handling, stock, and transport workers, unskilled industrial workers (especially in electricity and electronics; in mechanical assembly and manufacturing; and in sorting, packing and shipping), agricultural workers (in particular, in livestock and market farming, horticulture, vineyards, and fruit orchards);
– for men: show artists, supervisory employees in electric or electronic manufacturing, personal service workers, plumbers and heating engineers, skilled handling, stock and transportation workers (especially operators of heavy lifting gear), unskilled industrial workers (especially in mechanical assembly, quarries, food processing, and leatherwork), unskilled artisans (especially construction workers), agricultural workers (especially in vineyards or fruit orchards).
The PAF was elevated among women in some sectors, especially agriculture (21%). The EF was particularly elevated in the food-processing (52%) and personal service (75%) sectors. In construction, the PAF for men reached 14%, and the corresponding EF 61%.

In women, the PAF for the occupational categories and occupations characterized by a significantly elevated SIR was calculated at:
– between 20 and 40% for unskilled workers (in electricity and electronics, mechanical assembly and manufacturing, sorting, packing, and shipping);
– between 10 and 20% for nurses' aides and livestock farm workers;
– less than 10% for the other occupations (administrative employees, sales clerks, especially in the food industry, other unskilled industrial workers, market farm and vineyard workers).
The EF was elevated in workers and nurses' aides:
– above 80% for some unskilled workers (mechanical assembly and manufacturing, sorting, packing, and shipping);
– between 60 and 80% for agricultural workers on livestock farms, vineyards, and fruit orchards;
– between 40 and 60% for market farm and horticultural workers, unskilled workers in electricity and electronics, and nurses' aides.

In men, the PAF was:
– between 10 and 20% for direct service workers, skilled handling, stock, and transportation workers, unskilled industrial

workers, unskilled artisans (especially construction workers), agricultural workers in vineyards and orchards;
– less than 10% for the other occupations (variety artists; plumbers; operators of heavy lifting gear; unskilled assembly-line and mechanical control workers; unskilled workers in the food-processing and extraction (quarries) industries; other agricultural workers).

For men, as for women, the EF was especially elevated among blue-collar workers:
– 80% or higher for skilled handling workers (notably for operators of heavy lifting gear), unskilled workers in mechanical assembly and manufacturing, quarries, the food-processing industry and construction, and farm workers in vineyards and orchards;
– between 60 and 80% for the categories of unskilled industrial, artisan, and agricultural workers.

– Discussion and conclusion

This epidemiologic surveillance of the general population of a French district fills an important gap in data about musculoskeletal diseases and provides an estimate of CTS as well as the fraction attributable to certain occupations and to work in certain sectors.

Nonetheless, the incidence estimates from this first year are probably too low. We will study the coverage of the network reporting system by comparing it with the cases reported to other sources.

This study has identified the economic activities and the occupations at increased risk. This is the first time that such results have been obtained in the French general population, except from insurance and workers' compensation claim data.

Priorities for CTS prevention activities should concentrate on these sectors and occupations. The three-year duration of this study will clarify the case distribution as a function of industry and occupation and enable us to monitor fluctuations in CTS incidence as a function of the job market and possible prevention activities.

Moreover, we have begun to consider how to simplify these procedures so that we can determine whether CTS surveillance can be extended to other districts or regions.

Section 2: Epidemiologic surveillance of musculoskeletal diseases in the workplace

Our objective here is to describe the prevalence of the principal musculoskeletal diseases of the upper extremities and spine and of exposure to risk factors by industry, occupation, and task.

Because so many occupational physicians participated in this study, the sample of employees included in 2002 is globally representative of the population of employees in the region. Despite the underrepresentation of some sectors with high proportions of female workers, it is reasonable to conclude that the results of this first year of network operation accurately reflect the prevalence of musculoskeletal symptoms and their risk factors in the Loire River region. The first assessment of the epidemiologic data shows the extent of morbidity from musculoskeletal diseases: more than half the subjects questioned reported symptoms during the past year and nearly one-fifth of them for at least 30 days. The high prevalence of symptoms is probably explained by the level of exposure to risk factors, either biomechanical or psychosocial.

Continuation of this surveillance for two more years will hone the precision of the estimates and let us monitor changes. Here again, consideration of how to simplify this protocol has begun to see whether it can be extended to other districts or regions.

Section 3: Medicosocial

Analysis of the reports of occupational diseases for 1999 through 2001 showed that the objectives for epidemiologic surveillance of the workplace in this section cannot be met with the available data. Both the coverage of the reporting system and the use of data collected for surveillance purposes required improvement.

– Assessment methods

Because of the limited availability of occupational physicians for research studies, we adopted, after discussion with them, the principle of a campaign of systematic reporting of all occupational diseases—not just musculoskeletal diseases. A pilot project based on a network of volunteer occupational physicians in five districts thus began exhaustive recording of occupational disease reports for one week every six months for three semesters.

– Results

The first recording week took place in October 2003: 175 occupational physicians in the five districts (36%) participated. During this week, these physicians saw 8779 employees, 60% of them men. Participants recorded 440 occupational disease reports of 461 diseases, for an average rate of 5%. Musculoskeletal diseases accounted for 68.6% of these diseases, followed by mental distress (23.6%), skin diseases (4.2%), and respiratory diseases (1.4%). That week, prevalence of occupational diseases of all types was 5.2%, that of musculoskeletal diseases 3.4%, and that of psychological disorders 1.2%. Musculoskeletal disease reports concern 297 subjects (59% of those with reported occupational diseases). The report mentioned at least two musculoskeletal diseases for 20%. According to the occupational physician, 55% of the musculoskeletal diseases reported as occupational diseases could have been reported instead as compensable occupational diseases (MPI), but were not because employee refused. The highest prevalence rates for musculoskeletal diseases were observed in the following industries: paper and cardboard (14%), rubber and plastic (11%), apparel and fur (9%), automobile (8%), and food (7%). Constraints of posture and work pace as well as carrying loads were by far the most common exposure factors. The three most frequent sites of musculoskeletal diseases were the lumbar spine (25.2%), shoulder (21%), and elbow (20%) in men, and the shoulder (35%), hand/wrists (28%), and lumbar spine (25%) in women.

– Discussion and conclusion

During this week, the participating occupational physicians reported 440 occupational diseases, compared with 922 for the same week in 2000 and 845 in 2001, for the entire region and all the occupational physicians. The results from this first week must be interpreted with prudence. The representativeness of the employees seen during this period will be studied by comparing their distribution by industry with those of all the employees monitored by the participating occupational physicians and with that of all the employees of the region.

Repetition of this recording week at regular intervals will allow us to monitor changes in the prevalence of occupational diseases by industry for the most frequent diseases and to improve our targeting of prevention activities. Other recording systems may be established for the rarer diseases. Another topic is to study the impact of these weeks on the participants' usual reporting practices. Again this experience is intended to be extended to other regions so that these reports can be used more efficiently for epidemiologic surveillance of the workplace in France.

Building a cohort of AZF workers

A cohort study began in 2003 to assess blue-collar workers in Toulouse employed at the time of the AZF petrochemical factory explosion on 21 September 2001. This project is conducted in collaboration with the technical support and training center (CeTAF) for health examination centers (CES) and the Toulouse CES.

– Objective

The principal objective is to study the disaster's effects on health, especially the subjects' mental health. It will also examine the socio-occupational effects, in terms of the course of their careers.

– Description

This year was devoted to the inclusion phase: 5000 people volunteered to participate in a five-year follow-up. Beginning in May 2003, these subjects received two questionnaires (one occupational and one covering mental health) for self-administration and a letter asking them to go to the Toulouse health examination center for a consultation (the standard free CES consultation) and to complete a supplementary medical questionnaire on any sensorineural symptoms.

Their follow-up over these five years will be simultaneously active and passive. The active follow-up will comprise annual mail contact, with a self-administered questionnaire asking for social, demographic, occupational, and health data, principally in the area of mental health (well-being, depressive symptoms, and post-traumatic stress in alternate years). Passive follow-up will rely on access to health-related administrative databases (health insurance and pensions). These databases make it possible to obtain information about their working life, their use of pharmaceutical products, and their consumption of health care, from private practitioners and hospital-based personnel.

– Perspectives

This study will also allow us to test the difficulty and pertinence of the use of already existing health-related administrative data, such as national health insurance data, in the framework of cohort follow-up. It thus constitutes a feasibility study for a project for a national follow-up of a cohort of workers representative of the French working population (Coset proposal).

Surveillance of mental health in the workplace

– Context

Mental health problems are common in France, as elsewhere, and they can have serious consequences. The lifetime prevalence of depressive episodes is estimated at 17% to 20%; these are thought to account for 21% of all medical consultations and to play a role in 18% of work absences and 25% of suicide attempts. Despite this worrisome situation, epidemiologic surveillance in this area remains undeveloped and study of risk factors, especially those related to work, is inadequate.

The specific role of occupational factors is still the object of debate, although it is generally agreed today that psychosocial factors at work may explain a high proportion of negative changes in mental health. These psychosocial factors are included in various models of "stress" at work. Two important such models are those of Karasek, which is based on the imbalance between qualitative and quantitative demand and decision latitude at work, and of Siegrist, based on the imbalance between effort and reward. Moreover, new forms of work organization, often characterized by its increased pace and high mental demand, are creating new risks. Until now, their identification and social recognition have been practically nonexistent.

– Proposal for surveillance

An exploratory project (the SAMOTRA-CE proposal) is under development in InVS's department of occupational health. Its objective

is to test at a regional level (the Centre region) the implementation of an epidemiologic surveillance system, or observatory, of work-related mental health. The long-term hope is that this system can be perpetuated and extended nationally.

The observatory's activities will grow in three separate directions:
– **epidemiologic—**to obtain—from the employees and volunteer occupational physicians in the geographic zone studied—indicators of mental health in the workplace, regardless of industry, and estimates of risk factor exposure;
– **monographic collection** of situations of mental distress or psychopathological decompensation, including a qualitative detailed analysis by a network of occupational physicians experienced in the domain of mental health;
– **a health-related administrative** initiative, to identify all cases of employees judged to be totally disabled (unable to perform remunerated work) because of mental health or motor problems, by medical officers of the health insurance fund covering this geographic zone.

Investigation of disease clusters in the workplace

The DST is receiving an ever-increasing number of reports from occupational physicians, members of company hygiene and working condition committees, prevention advisors, and personnel delegates who believe that cases of diseases are occurring in greater numbers than expected in their company population. The presumed cause of this excess is sometimes known or suspected by the employees or physicians (current or past use of specific products or processes at risk). Most often, there is no precise hypothesis. These observations frequently concern cancers or other serious diseases.

This review describes the principal requests that led to epidemiologic analyses during 2003.

– Incidence study in a food-processing company

The occupational physician in this 100-employee company reported six cases of cancer (two of the pancreas and one each of the tongue, stomach, liver, and testes) diagnosed between 1986 and 2002. These employees may have been exposed to cleaning and disinfection products.

Analysis of the incidence data found a standardized incidence ratio not significantly different from 1 (SIR = 1.98, with a 95% confidence interval = [0.72 - 4.31]). Given the multiple sites of these cancers and the SIR not significantly different from 1, we had no specific recommendations to make to the occupational physician.

– Incidence study among the personnel of a surgical operating suite

The occupational physician, at the request of the hospital working conditions committee, reported a suspected excess of cancer cases (six cases observed between 1995 and 2002):
– two cases (kidney cancer and lung cancer) among approximately ten men;
– four cases (three of breast cancer and one of kidney cancer) among roughly forty women.

The calculations found an incidence ratio statistically different from one for men (SIR = 10.8; 95%CI = [1.20 - 29.90]) and women (SIR = 4.70; 95%CI = [1.30 - 10.30]).

These results must be interpreted with extreme caution, since the statistical analyses pertain to very small numbers (two cases observed among 10 men and four in roughly 40 women during an eight-year period). These ratios, although significantly different from one, therefore have very wide confidence intervals.

Nonetheless, we note that an excess of breast cancers has been observed in numerous studies,

especially among women with high socioeconomic status; such an excess is currently being debated after inconsistent results for several occupations including healthcare professionals, managers, teachers, and those working in science.

Because this sector (healthcare) is one of the risk factors for breast cancer discussed in the literature, the DST recommended that the occupational physician continue surveillance of these staff members, by simultaneously documenting incident cases (exhaustive collection of incident cases) and occupational exposure (including specific jobs held and products handled).

– Incidence study in a bank department

The occurrence of three cases of cancer (two of breast cancer and one of the pancreas) among 30 women and two cases (lung cancer and leukemia) among 25 men between 1995 and 2003 concerned the occupational physician.

The calculations obtained ratios no different from one:
– for men:
SIR = 1.9 with 95%CI = [0.2 - 7.0]
– and in women:
SIR = 3.7, with 95%CI [0.7 - 10.7].

These data did not show any clear excess.

– Other studies

Several other requests are currently undergoing expert assessment: an "epidemic" of "malaise" among personnel in a hospital (statistical analysis of data underway, as back-up to a team of local epidemiologists), increased liver function disorders among the employees of a painting company, a suspected excess of cancers in an administrative facility, a suspected excess of cancers among teachers in several schools, and an "epidemic" of "malaise" among the personnel at a town hall. This partial list shows how diverse the requests are.

– Conclusion

Occupational physicians are most often ill-equipped to explore and verify these observations, in the absence of an epidemiologic surveillance system in the company, industry, or sector concerned. In partnership with INRS, InVS therefore developed a manual for investigating these clusters. As an exhaustive enumeration of incident cases among company personnel is usually very difficult (because the occupational physician is not systematically informed of incident cases), the manual recommends conducting a mortality study (of causes of death). This surveillance system prevents losing track of the health status of employees when they leave the company and does not depend on the always complex collection of incidence data. This manual helps occupational physicians to identify all of the data they must collect if an epidemiologic analysis of mortality or incidence is to be conducted.

Reference:

Surveillance épidémiologique de la mortalité et investigation d'agrégats spatio-temporels en entreprise : principes généraux et données nécessaires. Rapport InVS-INRS. Juin 2004

• Assessment of regional air quality plans

The 1996 statute on air and rational energy use (L. 30 December 1996) requires each region in France to develop a regional air quality plan that must be based, among other things, on an assessment of the health effects of atmospheric pollution. To assist local health authorities in this mission, InVS and the West regional team wrote a methodological guide for health impact assessments of urban air pollution (HIA-AP) in different local contexts. The manual, based largely on the results of the "Air and Health" surveillance program in nine French cities (PSAS-9), addresses the short-term health effects of urban air pollution. It was updated in March 2003.

Once most of the first regional plans were completed, InVS and the regional teams sought to determine whether this manual aided the decision-making process and to examine the influence of local health- and pollution-related factors. We collected information about the expectations of local participants to improve the methodological support that InVS and the regional teams can provide.

– Methods

Between September 2002 and January 2003, we analyzed the 21 published regional air quality plans and surveyed local officials involved in the area of health and air in all 21 regions. This included staff at the regional health bureaus, InVS's regional epidemiology teams, the regional offices of industry, research, and the environment (DRIRE), the approved air quality surveillance groups (AASQA), the regional offices of the environmental and energy agency (ADEME), the regional health observatories (ORS), regional councils, and some advocacy groups for environmental protection. The survey asked for a description of the local situation, a list of the institutional partners, an assessment of how they structured their work together to formulate the plan, and an inventory of the various studies performed or planned. Finally, examination of the difficulties and expectations reported by local participants allowed us to assess the pertinence and quality of the support from InVS.

– Results

Analysis of the regional plans

The regional air quality plans, published between 1999 and 2003, were often the first regional approach to the connection between air and health, especially for rural regions, which had not felt that air pollution was an issue for them.

These plans, which took an average of 20 months to write, compiled the knowledge available for the region and issued guidelines about emissions, air quality, and the health and environmental effects of air pollution.

This process brought together numerous regional actors who had only rarely collaborated before. This mobilization often waned, however, in regions without follow-up because these plans are only tools to guide the development of a local consensus: they are not mandatory. For regions already involved in this issue, the plans provided an opportunity to reaffirm regional policies already begun.

Regional air quality plans and health

These inventories of health impacts were rather vague. Regional particularities were not always highlighted. When no regional or local study was available, it was not always clear how national or European knowledge had been adapted or applied to the regional level.

The guidelines show that substantial gaps in local knowledge and data, essentially health data, remain to be filled in before any regional assessment is possible. Accordingly, they are general and essentially involve acquiring basic information: literature watch, creation of health-indicator databases, and census of sensitive or vulnerable residents. The willingness to continue both this work and the collaborations begun with the "air and health" working groups is evident in many of these plans. Although all regions did not conduct local studies, the different plans included findings for France generally or other regions and these encouraged the "air and health" groups to recommend the implementation of steps to reduce mean population exposure levels and not only pollution peaks.

Other focal points in these plans are more specific to one or several regions: willingness to conduct a health impact assessment of pesticide or pollen exposure and to identify sensitive areas, such as industrial zones, around which residents are especially at risk of exposure to air pollution.

Nonetheless, few monitoring groups were finally established, and the guidelines actually implemented mainly involved health impact assessments for urban air pollution, according to the InVS methodological manual, and the continuation of steps already taken in other programs, such as pesticide studies.

Regional investment and translating studies into action

Many factors affected how health was considered and what steps were implemented in the regions. Pollution levels were not the only influence on local policies because regions with low levels were sometimes as active as the others. Two other factors were also important: awareness by elected officials and healthcare professionals of the issue and the population's perception of air pollution. Both were often associated with the region's geographic situation.

Accordingly, factors that promote consideration of health effects in local management of air quality include constant communication, epidemiologic knowledge production, tools directly useful for decision aid purposes, and the inclusion of this topic in regional public health activity budget planning. The primary contacts for both elected officials and the general public on this topic are the local air quality surveillance groups (AASQA); they appear to be essential partners for communicating the health effects of pollution to public officials and the public.

What local partners expect from InVS

Local expectations of InVS relate to specific topics including pesticides, pollens, and especially polluted areas, as well as the more general aspects of information, collaboration, and methodology. They can be summarized in four points:

– simplification of information about InVS study results to make them more accessible to a wider audience (general public and elected officials)
– continuation and reinforcement of the collaboration between the AASQA and public health agencies (InVS, regional epidemiology units, and DRASS) to promote data on air quality and optimize communication
– information about the health impact of new pollutants (including pesticides, benzene, volatile organic compounds, and fine particles)
– definition of new indicators to assess the health aspects of urban pollution and to reflect effects (morbidity linked to asthma, allergy, bronchitis) that are less dramatic than those currently studied (mortality and hospitalization).

Health impact assessments of urban pollution

At the time of the survey, 13 of these assessments had been completed, 10 were underway, and 7 planned for 2003 or 2004. Most were performed during the drafting of the regional air quality plans or to apply its guidelines (Table 12). Few problems were noted in conducting these assessments.

According to this survey, the principal impact of these local studies was to make elected officials more sensitive to the issue of air and

Table 12: Reasons health impact assessments of urban pollution were or were not performed

	Number of assessments involved
These assessments were or are being conducted as part of:	
- drafting the regional air quality plan	7
- applying its guidelines	10
- drafting the air protection plan (PPA)	1
- State-region contract	2
- clean air law	3
Reasons for not conducting this assessment:	
- city air quality not monitored long enough	5
- different type of study already performed	7
- pollution not at all homogeneous, because of industry influence	1
- no DRASS* engineer available to start it	2
- not considered useful because region already sensitized	3
- other assessments underway in the region with priorities already established	7

* DRASS: regional health and welfare bureau

health. They were apparently more effective than national studies because they relate directly to the region.

– Conclusion

The procedure proposed by InVS to assess the health impact of atmospheric pollution proved useful in sensitizing local authorities and improving regional knowledge on this subject. InVS must continue to develop its expertise about other pollution and health indicators to be able to respond to new regional worries and improve regional consideration of environmental impact results for policy purposes.

Reference:

Bilan des Plans régionaux pour la qualité de l'air : prise en compte des aspects sanitaires - bilan des études d'impact de la pollution atmosphérique urbaine réalisées. Rapport InVS, mai 2004

• Aluminum: health risks?

Following publication of a French epidemiologic study that observed an excess risk of Alzheimer's disease associated with aluminum levels in drinking water, the DGS asked the InVS, the food safety agency (AFSSA), and the drug agency (AFSSA) to organize a national expert assessment of the health risks engendered by daily exposure to aluminum in France to determine whether and how to revise any relevant regulations.

– Methods

Five national expert groups were set up: three (food, water, and health products) quantified the aluminum intake of the French population from bibliographic data and environmental studies and two others (toxicology, epidemiology) analyzed the effects of aluminum in animals and humans from the literature and regulatory reports.

– Results

Exposure

For 99% of the French population, aluminum intake from food ranges from 2 to 19 mg; intake from water is less than 0.4 mg. Less than 1% of this intake enters the blood. The highest aluminum exposure levels were found in aluminum industry workers (2 to 3000 times greater than in food), patients receiving dialysis (6 to 500 times greater), and patients on long-term antacid treatment (2 to 2500 times greater). Transcutaneous exposure from antiperspirants was estimated to be close to the level from food exposure, but these results are based on only one study, which is yet to be validated.

Effects of aluminum

The known effects of aluminum, as revealed during high chronic exposures, are essentially neurological (encephalopathy, psychomotor disorders), bone-related (osteomalacia), and hematologic (microcytic anemia). Aluminum can also cause immunological and allergic reactions (vaccines). Other effects, such as Alzheimer's disease, have not been and may not be confirmed, given: 1) the absence of pathologic and relevant epidemiologic findings in highly exposed populations; 2) the failure of general population-based studies to consider food intake, which is the principal source of aluminum, although the most recent toxicological studies show no difference in the bioavailability of aluminum from treated water and different kinds of food.

– Conclusion

There has been no clear evidence showing that toxic effects ensue from the use of aluminum at the exposure levels encountered daily in the French diet and environment. Nonetheless, neurological and bone risks exist when large quantities of aluminum enter the blood

(parenteral pathway) and when aluminum accumulates in the body (as in the case of renal failure). Careful attention is required in the choice of treatments for patients with renal failure, and regulations should restrict aluminum use in parenteral nutrition solutions. Moreover, additional studies of aluminum industry workers should be encouraged.

References:

Gourier-Fréry C, Fréry N, Berr C, *et al.* Aluminium : quels risques pour la santé ? Synthèse des études épidémiologiques - Volet épidémiologique de l'expertise collective InVS-Afssa-Afssaps. Rapport InVS. Juin 2004. (http://www.invs.sante.fr)

InVS, Afssa – Afssaps. Evaluation des risques sanitaires liés à l'exposition de la population française à l'aluminium : eaux, aliments, produits de santé Novembre 2003. 191 p

Gourier-Fréry C, Fréry N. Aluminium. Encyclopédie médico-chirurgicale. 2004 (à paraître)

• Evaluation of the health consequences of the AZF factory explosion in Toulouse

InVS and the Midi-Pyrénées regional epidemiology unit set up procedures for epidemiologic follow-up the day after the AZF factory exploded in Toulouse, and a first look at the intermediate-term health consequences of this catastrophe is now available. This assessment primarily covers its effects on mental health, especially symptoms of posttraumatic stress (including memories, repetitive and invasive nightmares, avoidance behavior of everything associated with the disaster, and signs of extreme irritability or hypervigilance).

– Methods

This evaluation included several surveys conducted in 2002 and 2003:

– two surveys among children and adolescents attending school: the first, a collaboration with the medical department of the rectorate of Toulouse, took place nine months after the explosion, and an InVS survey followed seven months later, 16 months after the disaster. Exposure was defined at nine months by geographic location during the survey (all the students enrolled in schools near the site were considered exposed) and at 16 months by factors associated with the explosion (damage to home, physical injuries, injured family members, death of a friend). In both studies, the multivariate analysis found that exposure was independently associated with posttraumatic stress.

– a cross-sectional survey conducted a year after the explosion among workers in the Toulouse metropolitan area and rescue workers. Among workers, this study focused particularly on those working in the area near the explosion (onsite or within a radius of three kilometers), regardless of work category (artisan, shopkeeper, independent or professional, company with at least one employee). The unexposed zone is the rest of the Toulouse metropolitan area.

– a cross-sectional survey of a representative sample of inhabitants of Toulouse (aged 18 years or older), conducted with INSEE 18 months after the explosion.

– Results

Among children and adolescents attending school:

Nine months after the explosion, 45% of children aged 11–13 years attending school in the area near the explosion site reported posttraumatic stress symptoms. Sixteen months after the explosion, 35% still had symptoms. Given the relatively high frequency of posttraumatic stress associated with other events in a population of

children, we can estimate at approximately 400 the number of middle school students in the exposed area whose symptoms 16 months after the explosion may be attributable to it.
Some factors, either associated with the explosion (damage to the home and injuries to self or close family and friends) or personal (vulnerability, past traumatic events), heightened the expression of posttraumatic stress in these children and adolescents. More girls were affected than boys, and the decrease in symptoms over time was clearer among boys.

Survey of workers and rescue workers in the Toulouse metropolitan area
Almost 14 000 subjects completed this questionnaire.

Of those persons who worked in the exposed area, 12% of the men and 17% of the women reported posttraumatic stress symptoms, which were more prevalent among workers and employees (20%) than managers (7%). Physical injuries to self, family, and friends were associated with these symptoms, as was the extent of damage to the workplace and whether or not it closed temporarily.
Among the rescue workers, 5% of men and 7% of women reported symptoms of posttraumatic stress.

These still preliminary results indicate that this catastrophe had mental health repercussions on Toulousans, associated with its impact on both their personal and work lives. Follow-up of 5000 volunteers from this sample began in May 2003 and will continue for five years, in a collaboration between the occupational health department of InVS, the technical advisory center for health evaluation centers (CeTAF), and the Toulouse health evaluation center (CES).

Survey of Toulouse inhabitants
Nearly 1200 adults were questioned at their homes. Those living nearest to the explosion site had the least favorable socioeconomic characteristics; specifically, the proportion of unemployed persons and of those with no high school diploma was higher than in the rest of the city.

Preliminary results indicate that one in ten inhabitants in the "near" area reported injury, and one in five that a close friend or family member had been injured. Nearly 30% of the women and 13% of the men living in this area reported using sleeping medication, anxiolytics, or antidepressants since 21 September 2001 because of the explosion. Those farther away were one third as likely to report this type of treatment.

Posttraumatic stress symptoms affect 9% of the men and 19% of the women living near the explosion, rates clearly higher than among those living farther away (2% and 8% respectively). The effects on these psychological problems of the family, social, and job disruptions caused by the explosion will be analyzed in the near future.

– Conclusion

These results underline the importance of the mental health consequences of this explosion among the different populations studied several months after the event, especially in the nearby neighborhoods, where the residents were already socioeconomically disadvantaged. Beyond the physical wounds, the disruption of their living conditions, social life, daily family life, and work activity probably contributed to these measurable mental health repercussions. These findings reinforce the need for post-catastrophe management to be maintained over a long period.

Malaria surveillance in French Guyana

French Guyana is, with Mayotte, the only French district where malaria is endemic. Except in the coastal area, disease transmission is perennial, especially along the Oyapock and Maroni rivers. In this area, 4000 to 5000 cases are reported each year, with indicators the highest in South America: the annual parasite index (API) exceeds 300, while the high-risk threshold is set at 100. On the coast (where transmission is now only sporadic), health departments must remain permanently mobilized to prevent new outbreaks.

The anarchic expansion of gold mining, the ever increasing flow of migration, and the high levels of mobility among the inhabitants dispersed over an extended territory—all these make malaria control particularly difficult in French Guyana. These geographic and human factors require constant adjustment of the methods for fighting malaria and excellent stakeholder coordination in the domains of surveillance, treatment, and prevention.

In 2003, the international and tropical department (DIT) and the West Indies-French Guyana regional epidemiology unit worked onsite in French Guyana to inventory the malaria situation, assess the current surveillance system, and propose improvements to it.

– Methods

The evaluators analyzed the district vector control department's database of malaria cases in French Guyana from 2000 through 2003. They described the surveillance system based on documents from the health and social development bureau, the vector control department, and the Cayenne central hospital's parasitology department. Working with the health bureau, they interviewed representatives of these institutions as well as health center physicians. Interviewees discussed the system's efficiency, its constraints, the problems encountered, and some desirable modifications.
The assessment used the analytic framework proposed by the US Centers for Disease Control and Prevention (CDC).

– Results

Malaria situation

Tables 13 and 14 and Figure 20 present the findings on the malaria situation in Guyana.

Table 13: Geographic distribution of 12 120 malaria cases reported in French Guyana between 1 January 2000 and 31 December 2002

	Entire territory	Perennial-transmission zones:			Coastal sporadic transmission zone
		Maroni	Oyapock	back-country	
N (%)	12 120	7255 (76.5%)	1520 (16%)	548 (6%)	160 (1.5%)
Cumulative incidence */1000 inhab.	77	615.6	471.9	1373.3	1.1

* from 1 January 2000 to 31 December 2002

Figure 20. Incidence of malaria in French Guyana by age and by sex, 2000-2002

Age	Cumulative incidence */1000 inhab.		RR M/W	95%CI
	Men	Women		
00-14	57.2	50.2	1.14	[1.06-1.22]
15-24	39.9	35.6	1.12	[0.99-1.27]
25-39	38.1	21.8	1.75	[1.37-2.24]
40-59	17.0	11.4	1.50	[1.24-1.82]
>60	7.9	5.0	1.59	[0.95-2.66]
Total	39.0	30.6	1.28	[1.21-1.34]

* from 1 January 2000 to 31 December 2002

Distribution by nationality in the group aged 25-59 years
(n = 1556)

** Haiti and French Guyana

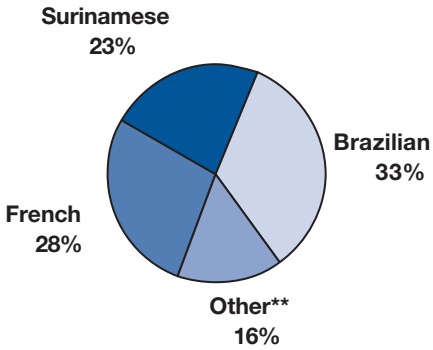


Table 14: Chemoresistance of *Plasmodium falciparum* in French Guyana, 1998-2001

Antimalarials	Sensitive strains %	Sensitivity (S)-Resistance (R) Intermediate (I) 2002	1998-2001	Progression of resistance (1998-2002)
"Classic" antimalarials				
Chloroquine	21.4	R limited	R	- 4.7
Quinine	95.3	S	S	- 9.0
Amodiaquine	97.4	S	S	- 1.1
Mefloquine	83.3	I	S	- 12.4
Halofantrine	50.0	I	I limited	- 1.8
Doxycycline	84.6	R	S	- 4.1
"New" antimalarials				
Artemether	97.4	S	S	+ 0.5
Atovaquone	99.2	S	S	- 9.9

Source : Institut Pasteur de Cayenne, CNR de la chimiorésistance du paludisme dans la région Antilles-Guyane

Assessment of the surveillance system
Case reporting, because it is based on direct microscopy and validation of slides by two different institutions, depending on the health center (the district vector control department and the hospital), is complex and insufficiently reactive. The system is sometimes not sensitive enough, especially in municipalities with no pest office; disease prevalence is thus underestimated. Too few lessons are drawn from information about the cases, centralized by the vector control department .Finally, the current system is unsuited to migrant populations and cannot identify new epidemic outbreaks when their extent is limited.

– Conclusions and proposal

The high incidence of malaria in French Guyana makes it a continuing public health problem that affects mainly young foreign men. The surveillance system probably underestimates prevalence, and the many uncertainties associated with the social situation (such as "out-of-status" subjects) complicate the assessment of the problem.

Proposals:
– increase the sensitivity of the case definition with rapid diagnostic tests
– increase the geographic resolution of the surveillance
– increase reactivity to facilitate and accelerate case reporting
– integrate an alert component
– centralize surveillance in the local health department
– harmonize definitions and tools with those of bordering countries
– reinforce regional collaboration within WHO (PAHO).

Finally, malaria surveillance must be included in a more general reinforcement of the alert system for communicable diseases, which is a major priority in French Guyana.

Surveillance of HIV infection: early results of the mandatory reporting system

Since the advent of highly active antiretroviral treatment and the improvement in survival that followed, it has become clear that mandatory reporting of full-blown AIDS only is no longer adequate for following epidemic trends. Surveillance of human immunodeficiency virus (HIV) infection by a mandatory reporting system has become an essential tool for monitoring the dynamics of the epidemic in France.
A mandatory reporting system for HIV was therefore established in March 2003. This system also includes a test of recent infection—the nationwide use of which is unique in the world—and surveillance of viral subtypes. It is now the cornerstone of our epidemiologic surveillance and enables us to adapt prevention policies and fight the disease on the basis of more specific and reactive information.
The new system, which simultaneously involves private practitioners, hospital-based physicians, and the entire corps of clinical pathologists, also strengthens the protection of patients' privacy by introducing double anonymization of data.

– Methods

Mandatory reporting of HIV is initiated by the clinical pathologist, who uses software furnished by InVS to create a single irreversible code to "anonymize" patient information. Another this report is then completed by clinicians, who add specific epidemiologic and clinical information. These reports go next to the physicians serving as public health inspectors at the DDASS (which links the "clinical pathologist" and "clinician" reports) and are then transmitted to InVS.

Virologic surveillance of the new diagnoses of HIV infection makes it possible to determine the type of virus (HIV-1 or HIV-2) and the group and subtype for HIV-1 infections. For the latter, a detuned assay can assess whether infection is recent (within 6 months) or not. The HIV reference center conducts these examinations and forwards the virologic results to InVS.
This surveillance is voluntary: the physician must report the infection, but patients decide whether these additional tests are performed.

– Results

Mandatory reporting of HIV

By 30 September 2003, InVS had analyzed 1301 reports of new diagnoses of HIV infection. Women accounted for 43% of these cases. The mean age at diagnosis was 37 years (34 in women and 39 in men).

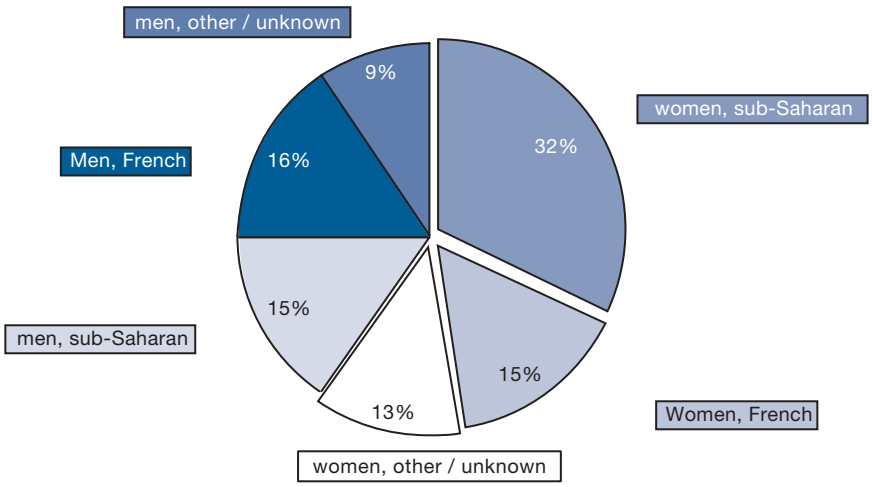
In 2003, transmission by men having sex with men accounted for 27% of the new diagnoses, injecting drug use 4% (excluding the unknowns), and heterosexual transmission more than half the new diagnoses (Table 15). The epidemic among heterosexuals exacted a heavy toll on the population originating from sub-Saharan Africa: nearly half of the heterosexuals diagnosed in France come from countries in that region. Women account for 60% of the new diagnoses among those infected by heterosexual relations (Figure 21).

Table 15: New diagnoses of HIV infection in 2003 according to mode of transmission and sex (France, provisional data as of 30 September 2003)

Mode of transmission	Sex					
	Women		Men		Total	
	N	%	N	%	N	%
Homosexual relations	0	0.0	269	36.0	269	20.7
Heterosexual relations	412	74.4	278	37.2	690	53.0
Injecting drug use	7	1.2	30	4.0	37	2.8
Other*, unknown	135	24.4	170	22.8	305	23.4
Total	554	100.0	747	100.0	**1301**	100.0

* includes 8 cases with a mode of transmission other than those mentioned above

Figure 21. Distribution of persons infected by heterosexual relations according to sex and nationality (N = 690) (France, provisional data as of 30 September 2003)



Slightly more than half the new diagnoses of HIV infection (53%) involved persons with no clinical signs of the disease. The clinical stage at screening nonetheless varied substantially by mode of transmission. Homosexuals were more often diagnosed at the moment of primary infection (22%) than were heterosexuals (5%), and the heterosexuals more often at an asymptomatic stage (61%) than homosexuals (48%). On the other hand, the proportion of

persons not diagnosed until they had AIDS was identical for these two modes of transmission (10%), while 22% of the drug users were diagnosed at this stage.

Virologic surveillance

Only 5% of the patients refused virologic surveillance. Early results with the detuned assay indicate that the proportion of persons recently infected varies strongly according to age, mode of transmission, and nationality. New transmission continues to occur, especially among those younger than 40 years and those 30–39 years (42% of new diagnoses in 2003 in this age group were recent infections), among men having sex with men (58% recent infections), and among French nationals infected during heterosexual relations (44%), especially women (52%) (Table 16).

Finally, identification of the viral subtypes indicates higher circulation of the non-B subtype of HIV-1 among the heterosexual population than older studies showed.

– Conclusion

Results in 2003 showed that the new surveillance system works, even though the handling of the report forms is cumbersome and complicated (because of the constraints linked to protection of anonymity) and although the completeness of the information requires improvement. Clinicians and clinical pathologists must be encouraged to participate in this surveillance. Evaluation of the system is planned for early 2005.

These early results confirm that HIV infections associated with injecting drug use were infrequent in 2003. They also confirm and quantify the extent of sexual transmission of the epidemic, which affects mainly men having sex with men and people from sub-Saharan Africa, especially women. These two populations must be the prime targets of prevention efforts.

The large proportion of recent infections in French nationals infected by heterosexual relations, especially women, requires that we

Table 16: Proportion of recent infections among new diagnoses of HIV infection (France, provisional data as of 30/09/2003)

		Recent infections		p*
	N	%	[95% CI]	
Sex				*NS*
Men	192	39.8	[35.5-44.4]	
Women	130	36.4	[31.5-41.7]	
Age group				*0.04*
< 30 years	96	42.1	[35.7-48.8]	
30-39 years	128	41.6	[36.0-47.3]	
40-49 years	65	34.6	[27.9-41.9]	
≥ 50 years	33	28.7	[20.8-38.0]	
Mode of transmission				*0.0001*
Homosexual relations	111	58.1	[50.8-65.2]	
Heterosexual relations	156	32.2	[28.1-36.6]	
Injecting drug use	4	22.2	[7.4-48.1]	
Other/Unknown	51	34.9	[27.4-43.3]	
Nationality				*0.0001*
France	182	48.9	[43.7-54.1]	
Europe (except France)	5	41.7	[16.5-71.4]	
Sub-Saharan Africa	71	26.0	[21.0-31.7]	
North Africa	1	7.1	[0.4-35.8]	
Other/Unknown	63	37.5	[30.3-45.3]	

* Chi-2 Test

improve our understanding of this population's sexual behavior and partner networks. Some useful information comes from items in the mandatory reporting form, but specific surveys are needed. One such study, "Context of sexuality in France," will take place in 2005.

Another major advantage of these early results is that they will be followed by others, so that we will have data about trends and thus be able to learn about possible changes in risk behavior in some population subgroups and adapt prevention campaigns to them.

Reference:

Institut de veille sanitaire, avec la collaboration du Centre national de référence pour le VIH. Premiers résultats du nouveau dispositif de surveillance de l'infection à VIH et situation du sida au 30 septembre 2003. BEH 2004; n°24-25:102-10

Measles surveillance: towards mandatory reporting

France has committed itself to eliminating transmission of the measles virus by 2010. Accordingly and in view of the decreased incidence observed since the introduction of measles vaccination in France, InVS proposed to the High Council of Public Health (CSHPF) that measles surveillance be reinforced by mandatory reporting as well as by laboratory confirmation of all clinically suspected cases. This new system should help us not only to assess progress towards elimination but also to detect situations of case clusters that require appropriate preventive measures.

– Context

The European region of WHO is aiming to eliminate the measles virus by 2010 [1]. The total number of cases reported to WHO for Europe has fallen from 304 184 cases in 1991 to approximately 67 759 in 2001, more than 16 000 of which occurred in Western Europe. Some European countries have demonstrated the feasibility of interrupting virus transmission. One such country is Finland, which has done so since 1996 [2].

The level of vaccination coverage necessary to interrupt virus transmission is estimated at greater than 95%, with two doses [3]. France's vaccination program is appropriate for meeting this objective. Since 1997, the official recommendation in France is a first dose of vaccine at the age of 12–15 months, and a second dose of triple vaccine at 3–6 years.

The CSHPF has set up a working group to develop a national plan by the end of 2004 to eliminate measles by the end of the decade. This plan will define strategies for vaccination policy, epidemiologic surveillance, and vaccination promotion. Modification of the vaccination schedule, including enlargement of the age groups targeted by vaccination, is planned to eliminate measles faster.

– Current epidemiologic situation in France

Mandatory reporting of measles ended in 1985. It is monitored by a sentinel network of private general practitioners (Inserm, Unit 444), who report cases on a weekly basis according to clinical criteria. The introduction of the measles vaccine in 1983 reduced its incidence substantially. From approximately 300 000 cases in 1985, annual incidence has progressively fallen to an estimated 10 500 cases in 2003, for an incidence rate of 16 cases per 100 000 (Figure 22). At the same time, the network also observed an increase in mean age at onset: from 1985 through 2002 the proportion of patients older than 10 years rose from 13% to 62%. This observation is explained by the reduction of viral circulation, so that the cohorts of children unvaccinated in previous years or who did not respond to the vaccination, could reach a relatively high age before encountering the virus.

This situation is worrisome because the seriousness and complication rate of measles increase with age.

Measles vaccination coverage at 24 months has stalled at slightly less than 85% since 1994 and was estimated in 2001 for the first dose at 84.6% at 24 months and 92% at 4 years. Disparities between districts could promote the emergence of outbreaks in pockets of unvaccinated populations [4].
One example comes from the active virus circulation observed between 1 January and 30 June 2003, in the PACA region. After five cases in young adults were reported to InVS by Timone University Hospital in Marseille in early June, an investigation by the PACA regional epidemiology unit identified 259 cases [5]. Viral typing found the D7 genotype, which showed that this epidemic was not associated with the epidemic occurring in Switzerland over the same period, with more than 500 cases [6].

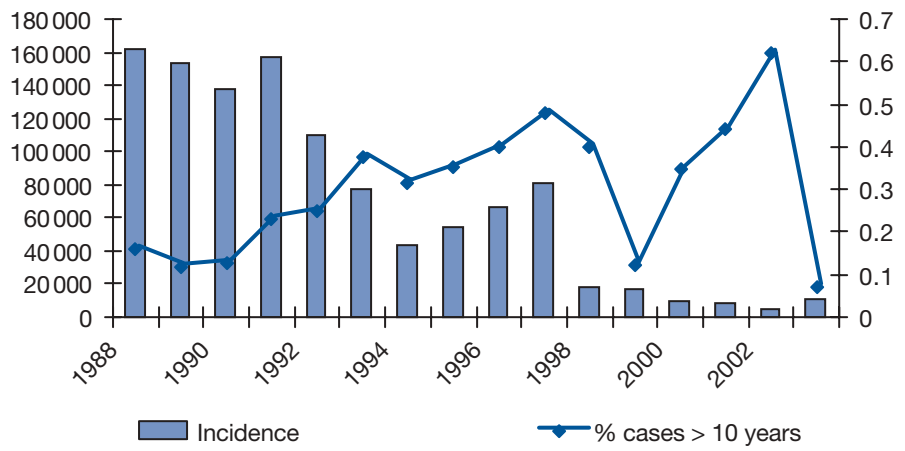
– Limitations of the current surveillance system in France

The investigation conducted by InVS's PACA regional bureau met with difficulties characterizing this episode because of the absence of systematic case reporting; only active case-seeking directed at all physicians in the region (which is extremely difficult to set up) could have determined the actual number of cases (a figure probably much higher than the number identified).

In view of the decreased participation of physicians in the sentinel surveillance network in recent years and the very few cases of measles they have seen (18 cases reported in 2003), the system no longer provides a representative picture of the situation in France, does not enable the virus transmission zones to be identified (it has reported no cases in PACA since 2000), and produces a very wide confidence interval for estimates (95% CI of the incidence in 2003 = 6000-15 000).

Finally, it did not allow a determination of the proportion of true measles cases among those reported. The proportion of true cases among the cases that meet a given clinical definition diminishes substantially when the actual prevalence of the disease diminishes. For example, in 1994, 12 000 suspected measles cases were reported in the United Kingdom and 38% of those cases tested were confirmed by the laboratory; in 2001, the number of suspected cases fell to 2307 and only 3% of those tested were confirmed [7].
Thus in France in 2003, of the 10 500 cases estimated by the sentinel surveillance network, an unknown proportion—but certainly lower than in 1997, when it was estimated at 50%—corresponded to true measles cases.

Figure 22. Trends in the incidence of measles and the proportion of cases among persons aged 10 years or older (Source: Sentinel surveillance network - Inserm U444, 1988-2003)



– Trends and reinforcement of surveillance In France

As part of the national plan to eliminate measles by 2010, InVS proposed that measles surveillance be reinforced to meet a three-part objective for the years to come: 1) detection of case clusters and epidemics, so that appropriate control measures can be implemented;
2) classification of all cases according to clinical, biological, and epidemiologic (vaccination status, indigenous, imported, or related to an importation) criteria, and monitoring of progress towards elimination; 3) laboratory investigation of clinical cases.

Because the two first points correspond to the "description/reporting" components of the mandatory reporting (MR) system, France's High Council for Public Hygiene (CSHPF) has approved the addition of measles to the mandatory reporting list and the establishment of a system for laboratory confirmation of cases.

Implementation of mandatory reporting
Only cases meeting the criteria for a clinical or confirmed case are subject to mandatory reporting. Each clinical case should be reported to DDASS on a MR form at the first consultation, without awaiting the laboratory results. This procedure ensures that detection occurs as early as possible, even though most measles cases are seen by private practitioners.

The national plan also includes an investigation manual, drafted by InVS and revised after discussion by the CSHPF working group, to help in the investigation of case clusters and the implementation of control measures.

Laboratory confirmation of clinical cases
The principal objective is to obtain laboratory results for at least 80% of reported cases. Serology from a serum sample is the reference test for confirming clinical cases, and it is the preferred technique for cases seen in hospitals.

Nonetheless, in view of the invasiveness of blood sampling, it was decided to offer private practitioners the possibility of taking samples for diagnostic use in their office (in France, patients go to a laboratory to have blood samples taken for the tests ordered by their private practitioner). Possibilities used by other countries for measles surveillance programs include saliva samples or finger-prick blood drops onto filter paper for detection of specific IgM. The samples will be transported to the laboratory associated with the measles CNR. Initially, the CNR laboratory will also conduct RT-PCR to detect viral RNA. The samples identified, as well as the viral strains isolated by hospital laboratories, will be transmitted to the measles CNR for genotyping and phylogenetic analysis of the strains, to document the geographic origin of the circulating viruses.

– Conclusion

The objective of measles elimination can be met under current epidemiologic conditions, combined with a reinforcement of measles vaccination policy. In this framework, strengthening measles surveillance in France by mandatory reporting and laboratory investigation of cases is essential for monitoring progress towards elimination of the virus and for eventually demonstrating that the objective has been met.

Reporting criteria

• Clinical case:
fever 38.5°C, maculopapular eruption, and at least one of the following signs: coughing, or coryza, or conjunctivitis, or Koplik spots.

• Laboratory-confirmed case:
presence of at least one of the following criteria:
- – seroconversion or at least fourfold elevation of the IgG serum titer between the acute and convalescent phases
- – serologic or salivary detection of measles-specific IgM
- – virus detection by PCR of blood, saliva, or urine samples
- – positive culture from blood, rhinopharyngeal (or saliva), or urine samples.

• Epidemiologically confirmed case:
clinical signs in a person in contact 7 to 18 days before the onset of signs with a person with a case of measles that has been confirmed either epidemiologically or by a laboratory.

Other tools that will aid in progress towards this goal include surveillance of vaccination coverage and of measles susceptibility levels in the population. The new measles surveillance system should be modifiable at strategic stages, which will be defined as part of the national measles elimination plan.

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• Nosocomial infections: constructing summary indicators

In March 2003, the Minister of Health asked InVS to define indicators to assess progress against nosocomial infections with the aim of constructing summary indicator charts that all healthcare facilities, public and private, could use. After reviewing the substantial efforts devoted in France to combatting nosocomial infections, it was noted that these infections remain too frequent, especially those associated with multidrug-resistant bacteria. The development of these summary indicators for each health facility should make it possible to monitor progress against these infections, to adapt efforts and resources as appropriate, and to inform patients.

Accordingly, the request specifies that French healthcare facilities need tools that:
– allow continuous and reactive surveillance targeting significant infections, relevant to prognosis, and identifiable by the laboratory or by simple clinical criteria
– reflect the quality of care and prevention efforts
– enable comparisons within each facility over time and help it to see how it compares with others.
The current system for surveillance of nosocomial infections is organized on an interregional basis, led by supraregional coordinating committees. InVS provides national direction within RAISIN (the alert network for the investigation and surveillance of nosocomial infections). This national system relies on the following tools:
– prevalence surveys (so far two have been conducted, in 1996 and 2001);
– surveillance networks of the incidence of some priority infections (surgical site infections, multidrug-resistant bacteria, nosocomial bacteremia, accidents involving blood exposure in healthcare workers, infections in intensive care units). Each facility participates voluntarily in these networks for limited periods (usually several months per year) and computes its own results; results are aggregated for analysis at the interregional and national levels;
– reporting of nosocomial infections is mandatory as defined by the governmental decree of 26/07/2001.

The Ministry of Health's request indicates a desire to supplement and complete the current surveillance system.

The system, which remains to be defined, should be continuous and exhaustive (concerning all healthcare facilities), strongly associated with quality of care and prevention, and allow each facility to compare its progress over time but also to compare itself with other facilities.
Another goal of this system is to provide information to users of each facility, although without specifying the form this information must take (summary indicators available on request or displayed in public view).

– Methods

To respond to this referral, InVS set up a procedure by which scientific experts identified indicators that are sufficiently robust and reliable, acceptable to healthcare facilities, and understandable by users.

This procedure called upon:
– a group of approximately 30 independent experts (specialists in hygiene and nosocomial infections), mainly from public or private healthcare facilities;
– two joint meetings: one with representatives of users of healthcare facilities and the other with representatives of their administration and staff;
– a steering committee to monitor and validate the procedure for this expert committee, discuss the results and put them in perspective, and validate the final proposals.

The results were delivered in the form of a report to the Minister in February 2004.

– Results

The expert group first circumscribed the field of its assessment. It sought to identify indicators of results, resources, and practices in nosocomial infection control. Antibiotics were not considered because indicators of their consumption and curative use were assessed by another working group.

It based its work on an initial list of 162 indicators proposed in the literature and then sought group consensus (Delphi method) to develop recommendations to structure the committee's work and determine the indicators approved by expert consensus.

Four types of indicators were proposed:
– two pertained to the surveillance of specific infections:
  • surveillance of surgical site infections (SSIs) in each department or surgical specialty, according to a standardized national method (SSI-Raisin network methods, either adapted to selected surgical procedures or to general surgery)
  • surveillance of methicillin-resistant *Staphylococcus aureus* (MRSA) for the entire facility
– two others assess the facility's practices and resources for the control of nosocomial infections:
  • one composite indicator, including a global score based on information extracted from the annual report of the nosocomial infection committees (for example, number of equivalent full-time personnel working on hygiene, program of hygiene activity, existence of protocols, training)
  • an indicator focused on hand washing: measuring the annual consumption of alcohol-based products (gels or liquid) used to reduce bacterial cross-transmission.

These proposals were selected by the steering committee as the basis for a definition of the content and implementation of summary indicators in each healthcare facility.

Consultations with representatives of both patients and facilities showed that these proposals were acceptable and met their expectations. Patient representatives asked, however, that two of the indicators be expressed semi-quantitatively (in three or four categories to be determined, for example: unacceptable / questionable / acceptable / excellent).
Finally, patient and facility representatives agreed about the interest of such a procedure and its innovative character. They also converged in their analyses of the conditions necessary to produce them.

These conditions include:
– verification of their feasibility
– supervision of the methods used to produce them
– preliminary definition of a communication policy (idea of an ethical charter in which each facility could agree to the parts relevant to it)
– their evaluation.

– Recommendations

Based on the proposals of the expert group, the meetings with the representatives of users and healthcare facilities, and the discussion within the steering committee, InVS made the following recommendations.

Indicators to be included in the summary charts

1. Surveillance of SSIs
– Existence (yes/no) of SSI surveillance.
– SSI rate, expressed in 3 or 4 categories, to be defined.
– Surveillance of SSIs by one of two techniques: either periodic and exhaustive (as for Raisin) or simplified and targeted at specific procedures or representative of a surgical specialty, continuously or not. Targeting deep or serious infections (mediastinitis, need for follow-up surgery) appears desirable.

2. MRSA rate
– Of clinical samples, reported per 1000 days of hospitalization
– Expressed in 3 or 4 classes associated with a trend indicator (for example, stable, decrease, increase)
– The classification could be compared with a rate calculated for the region in which the facility is located and should take into account the type of facility.

3. Composite indicator
– the composite indicator score will be based on the assessments of each facility's nosocomial disease committee and supplemented by items not currently included in the standardized assessment (organization of internal reporting, for example). The facility must thus commit itself to making its report accessible.
– the choice of items to be introduced into this composite indicator must be finalized and their weighting assessed by preliminary work. InVS-Raisin, working with DGS/DHOS, will develop tools for the automatic production of this indicator.

4. Consumption of alcohol-based disinfection products
– Gels or liquids, in liters per year per 1000 days of hospitalization.
– The definition of specifications to calculate this indicator will be necessary to take into account the technical problems (purchase of these products by different participants, according to their status as a drug requiring a marketing authorization or not).

Methods of manufacturing, delivery, assessment, and centralization

Facilities will be responsible for producing these indicators. It would therefore be useful to define the methods and standardized tools necessary to do so. Its rhythm, given the constraints of feasibility and the type of indicators, can only be annual. Rather than posting these summary charts in each facility, it would be preferable that they be available to each patient on request.

Quality control must be defined so that the evaluation (ANAES) and control (DDASS, ARH) agencies can assess this implementation of summary indicator charts according to defined rules. These indicators must also be available within regional and national databases and accessible to DDASS, ARH, CClin, and InVS.

Further work required before implementation

1. Definition of standardized methods and production of technical specifications for each indicator
2. Definition of the classes of semiquantitative indicators (SSI and MRSA rates)
3. Evaluation of the resources necessary for surveillance of SSIs according to available methods (including cost-benefit ratio of each method, use of existing medical information)
4. Evaluation of the implementation of the indicators, using hospitals participating in the Compaqh project (coordinated by Inserm and ANAES) and the Raisin surveillance networks
5. Drafting by DHOS and DGS (Ministry of Health) of regulations to implement their use as summary indicators.

Monitoring and evaluation

This system will be simultaneously innovative, ambitious, and constraining. It will mobilize resources in each facility and require monitoring and assessment. Among the topics to be covered by this assessment are the method of implementation, coverage, effectiveness, and positive and negative effects. While monitoring should be assigned to DHOS-DGS and InVS (steering committee), it would be better for an outside agency, such as ANAES, to conduct the evaluation.

– Conclusion

These recommendations were issued by the steering committee based on the proposals of experts, patient representatives, and healthcare facility representatives. They are only the first phase in a much wider process that requires definition, validation, feasibility assessment, and complementary implementation. It is a part of the policy initiated by the Ministry to improve control of nosocomial infections, education about their risks, and quality of care.

Surveillance of the implementation of these summary indicators, which represent an important innovation in both surveillance and transparency, must reflect the real efforts made by the facility and not harm prevention and other activities of nosocomial infection surveillance that overall have had a positive impact so far.

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• Surveillance of foodborne illness outbreaks since 1987: impact of control and prevention measures

Mandatory reporting has been required for foodborne illness outbreaks (FBI) in France since 1987. Such outbreaks are defined as the appearance of at least two similar cases of a group of symptoms, generally gastrointestinal, that can be related to the same foodborne origin.
Only by investigating FBIs can we identify their causes and establish prevention and control measures. Analysis of trends over time also helps to develop measures to control FBIs in the food-processing industry and to assess their impact.

– Description of FBI reports

Every FBI must be reported to district public health authorities (DDASS or DSV, that is, the district health or veterinary bureaus). These offices are charged with investigating FBIs and may call upon regional epidemiology units and InVS for help if needed. This reporting has made it possible for InVS—which compiles the annual report and provides feedback to the different FBI reporting partners—to identify associations that may exist between several FBIs affecting different districts or regions.

All FBIs are not reported. However, the proportion of all outbreaks that are reported appears to be growing. For FBO involving salmonella, it was assessed at 21% in 1995 and 26% in 2000.

FBI from a confirmed agent: a pathogenic agent was isolated in a human sample (blood/stool) and/or in the remaining food.
FBI from a suspected agent: an agent is suspected, on the basis of an "etiological" algorithm that takes clinical signs and median duration of incubation into account.

– Results

The number of FBI outbreaks reported in France grew five-fold from 1987 (n=129) through 1998 (n=662). This increase is probably related to the improved performance of the reporting system. The number of outbreaks has remained stable since 1998.

Between 1987 and 2002, 7100 FBIs were reported, involving 131 471 patients; 11 423 (8.6%) were hospitalized and 91 died. An agent was confirmed in 59% of the outbreaks (4162) and was suspected in 20% (1437).

From 1987 through 2002, 41% of the FBIs reported were due to salmonella (confirmed or suspected), mainly *S. enteritidis* (40% of FBIs from a confirmed agent). The others were principally associated with *Staphylococcus aureus* (10%) and *Clostridium perfringens* (5%). The proportion of FBI from salmonella has fallen from 71% to 58% from 1998 through 2002: this reduction mainly concerned *S. enteritidis*; *S. typhimurium* remained stable. The proportion of FBIs from *Clostridium perfringens* also dropped notably, from 26% to 8% between 1987 and 2002.

The principal foods involved in FBIs are: eggs or egg-based products (24%), cooked dishes (14%), fish (7%), meat (8%), poultry (5%), cold cuts (5%), cheese and dairy products (5%), shellfish (4%), water and various drinks (2%). The number of FBIs involving eggs or egg-based products was reduced by half between 1996 (33%) and 2002 (14%).

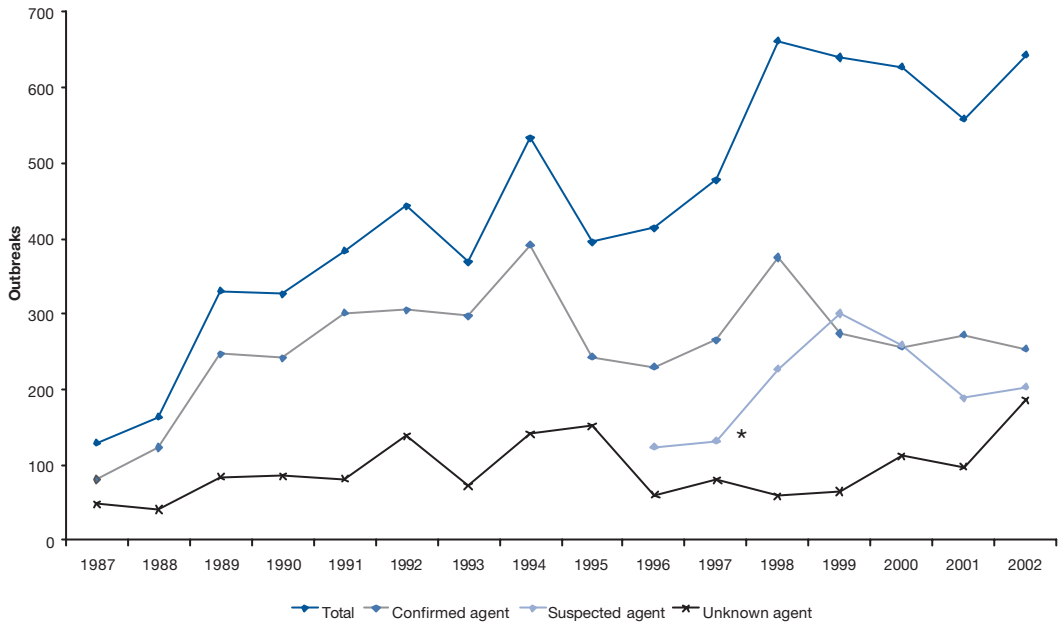
The national reference center for noroviruses has developed a diagnostic test that has improved detection and investigation of outbreaks linked to these agents in recent years. A large epidemic of norovirus infections, linked to oysters, was detected in 2002, and appropriate control measures were thus rapidly implemented.

Between 1987 and 2002, 68% of the FBIs reported broke out in group and institutional settings and 32% in families. Most family FBIs were due to salmonella (80% of those from a confirmed agent). In group settings, salmonella accounts for 53% of the illnesses from a confirmed agent, but the proportion of cases due to staphylococcus (15%) and *Clostridium perfringens* (9%)—most often associated with mistakes during preparation—is also important.

– Prevention and control measures

Since the 1970s, hotels, restaurants, and institutions have set up prevention and control measures in the transformation, preparation, and

Figure 23. Number of FBIs reported in France, 1987-2002



* the algorithm for suspected agents was established in 1996

Table 17: FBI reported to DDASS or DSV in France between 1987 and 2002, by causal agent

Causal agent	Outbreaks reported to DDASS or DSV			
	Outbreaks		Cases	
Confirmed agents	N	%	N	%
Salmonella	2834	68.1	41 670	53.0
enteritidis	1682	59.4	26 405	63.4
typhimurium	471	16.6	6533	15.7
Other serotypes	431	15.2	6910	16.6
Serotypes not determined	250	8.8	1822	4.4
Clostridium perfringens	318	7.6	16 409	20.9
Staphylococcus aureus	571	13.7	12 081	15.4
Bacillus cereus	49	1.2	944	1.2
Histamine	1124	3.0	1374	1.7
Virus	32	0.8	59	0.1
Other pathogens	232	5.6	4199	5.3
Total confirmed	**4160**	**58.6**	**78 661**	**100.0**
Suspected agents	**1044**	**34.0**	**N/A**	**N/A**
Salmonella	38	9.7	306	5.9
Clostridium perfringens	63	16.0	1464	28.2
Staphylococcus aureus	120	30.5	1196	23.0
Bacillus cereus	46	11.7	774	14.9
Histamine	19	4.8	95	1.8
Virus	77	19.6	1055	20.3
Other pathogens	30	7.6	300	5.8
Suspected agents 1996-2000	**393**	**27.3**	**5190**	**22.9**
Total suspected agents	**1437**	**20.2**	**24 378**	**18.5**
Unknown agent	**1503**	**21.2**	**28 432**	**21.6**
Total outbreaks	**7100**	**100.0**	**131 471**	**100.0**

distribution of food (for example, cold chain, hygiene). The reduction in FBIs from *Clostridium perfringens* may be linked to the efficacy of these measures.

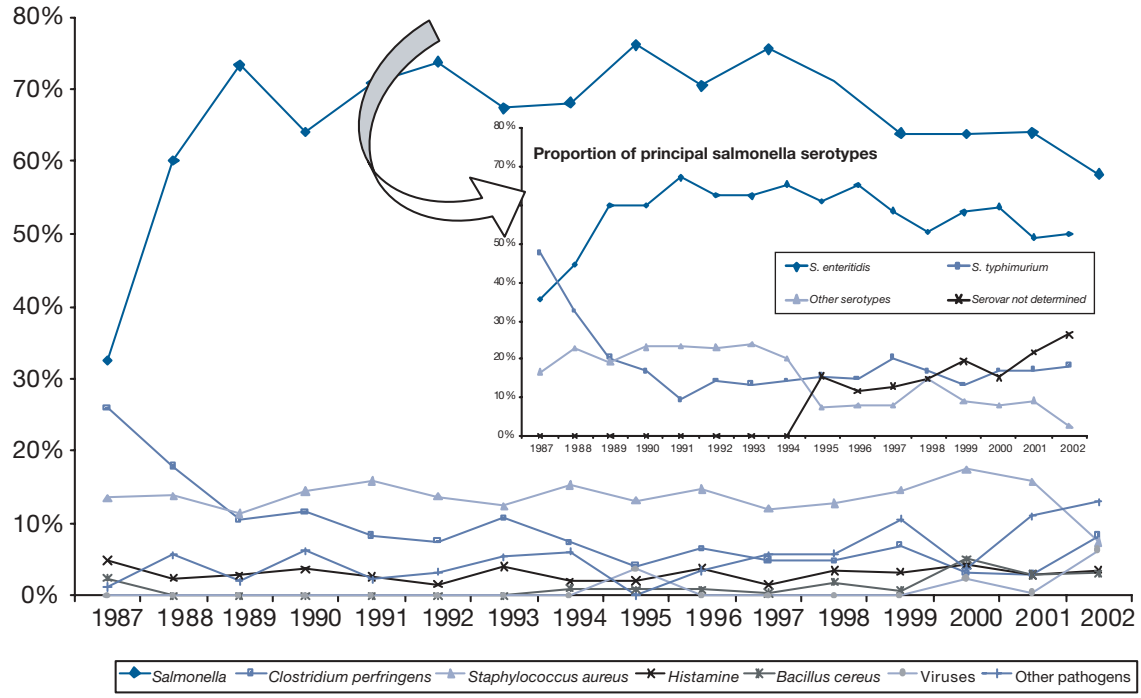
In 1998, strict control measures (culling of flocks infected by *S. enteritidis* and systematic withdrawal of batches of contaminated eggs) were instituted in the poultry industry. These measures are probably responsible for the reduction observed in FBIs from *S. enteritidis*.

– Perspectives

Improvement is needed in FBI reporting, in terms of the number reported, the delays until reporting, and identification of the pathogens and of the cause. New software, installed in 2004 in the DDASS and DSV, should improve transmission of this information and its accompanying algorithm should facilitate etiological identification.

Early reporting of FBI episodes will make their investigation more systematic and thereby improve documentation of these episodes, especially family outbreaks; this in turn will enable effective control measures.

Figure 24. Proportion of principal confirmed etiologic agents, FBIs reported in France, 1987-2002



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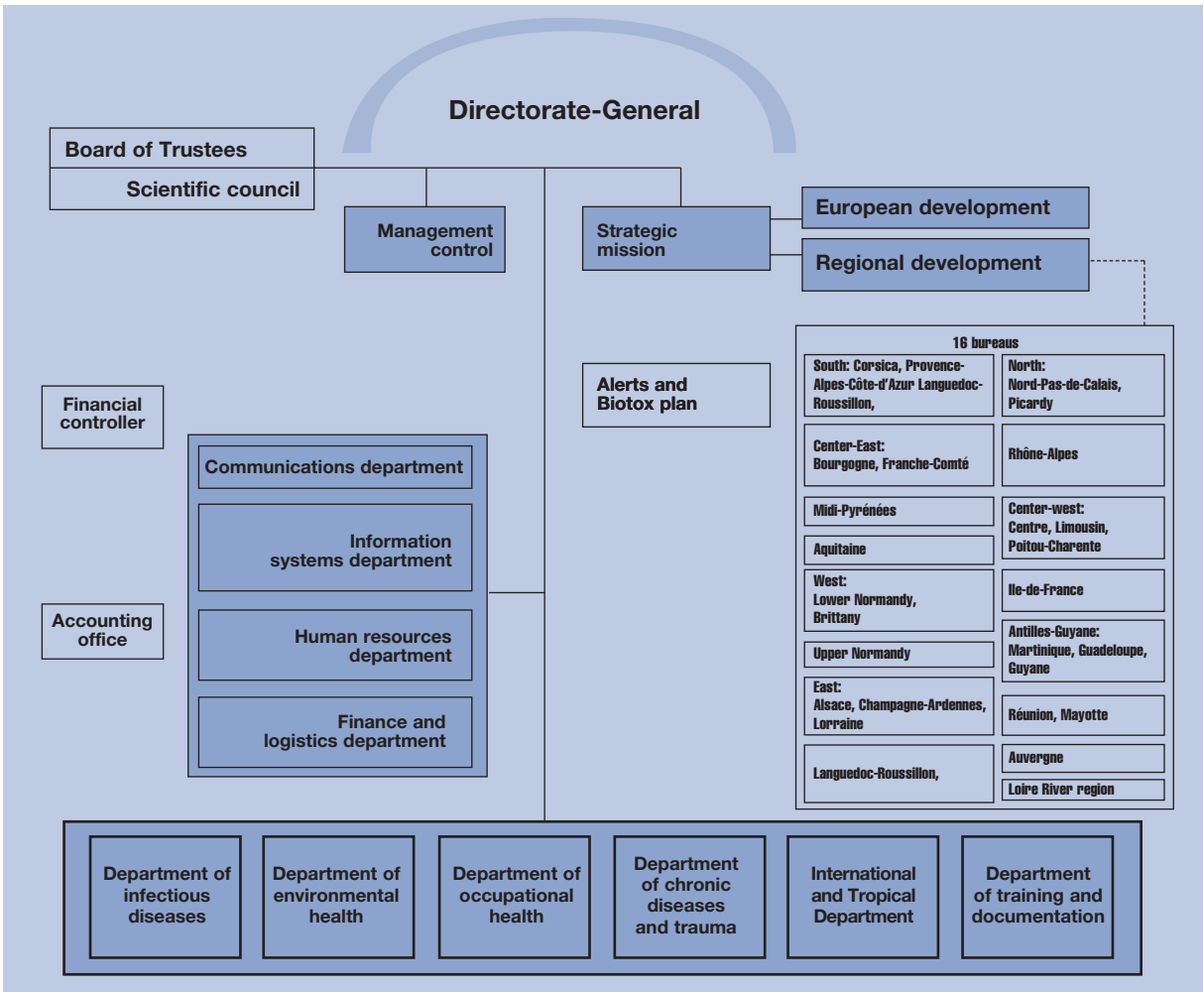
Appendixes

- **InVS: Organization and organizational chart**
- **Publications 2003**
- **Acronyms and Abbreviations**
- **Glossary**

• Organization and organizational chart InVS:

The National Institute for Public Health Surveillance is headed by Pr Gilles BRÜCKER, executive director, aided by Martial METTENDORFF, assistant director. It is organized in six scientific departments and four agency-wide service departments; it also has a strategic team. Its Board of Trustees is chaired by Dr Gilles DUHAMEL and includes 22 members; the scientific council is chaired by Pr François DABIS and has 17 members.

InVS's regional activity is carried out through the 16 regional epidemiology groups, under the scientific supervision of InVS and located within the regional health and welfare departments (DRASS) in Dijon, Fort de-France, Paris, Lyon, Marseille, Lille, Nancy, Rennes, Toulouse, Bordeaux, Saint-Denis de la Réunion, Rouen, Orléans, Nantes, Montpellier, and Clermont-Ferrand. InVS is developing a network to collaborate with the many partners who play a role in the surveillance of the health status of the French population (including government departments, regional health observatories, disease registries, welfare agencies, hospitals, and health professionals).



Scientific departments

The department of infectious diseases (DMI) includes 59 permanent personnel and is divided into five specific units:
– HIV, HCV, and sexually transmitted infections
– enteric and foodborne infections and zoonoses
– vaccination-avoidable infections
– nosocomial infections and antibiotic resistance
– airborne infections (legionellosis, tuberculosis), imported diseases.
It also hosts three European programs: the European HIV-AIDS surveillance program, EuroHIV, the European tuberculosis surveillance program, EuroTB, and the experimental European listeriosis surveillance program, Listernet.

The department of environmental health (DSE) has 37 permanent staff members and is organized in three units:
– the alert response unit
– the surveillance unit, which includes all national and international epidemiologic surveillance programs (including air and health; toxic products and substances and health; allergic and asthma diseases)
– the health risk assessment unit.
All three units receive cross-sectional statistics and toxicology support.

The department of occupational health (DST) includes nine staff members and is responsible for epidemiologic surveillance of occupational risks, including occupational cancers (especially asbestos-associated mesothelioma) and musculoskeletal diseases. It is establishing basic tools that will make it possible to assess mortality by occupation as well as exposures associated with occupational factors.

The department of chronic diseases and trauma (DMCT) includes 21 permanent staff, organized into five units:
– the cancer unit, whose primary task is cancer surveillance and the evaluation of screening programs
– the 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 cardiovascular disease surveillance program
– the diabetes surveillance program.
This department provides, jointly with Inserm, the technical secretariat for the national registries committee (epidemiologic organizations that collect on a continuous and exhaustive basis data related to a specific disease, including cancers, malformations, and cardiovascular disease).

The international and Tropical department (DIT)
Created in July 2002, this department employs 6 people. Its principal tasks are to:
- manage international surveillance for early detection of health events occurring abroad that might, like SARS in 2003, affect France
- monitor tropical diseases such as malaria, both in the overseas districts (local cases) and in metropolitan France (imported and airport malaria)
- participate in activities and missions of the global epidemic alert and response network coordinated by the World Health Organization
- develop collaborations with sister institutions in partner countries and conduct technical assistance activities at the request of the Ministry of Foreign Affairs.

The department of training and documentation (DFD) has a staff of 12 persons in two units:
– the documentation unit, which provides all InVS personnel and its network of correspondents with access to the documents necessary for their work
– the training unit, which runs a tutorial program in field epidemiology and the IDEA course, in association with the National School of Public Health. It also organizes InVS participation in numerous training programs, university-based and otherwise.
The DFD also coordinates two European programs: EPIET (European training program in intervention epidemiology) and Eurosurveillance (bilingual newsletter of infectious disease surveillance in Europe).

Agency service departments

The communications department has ten staff members. In collaboration with the Directorate-General, scientific departments, and agency service departments, it develops the external and internal communications policies for the Institute. Its work is divided among three units:
– the editing-publishing unit, which sees to the production of the assorted media in which InVS disseminates content
– the unit in charge of the weekly epidemiologic bulletin (BEH)
– the external communication unit (including press relations, Prevalence, editorial responsibility for the institute's website) and internal (Intranet).

The finance and logistics department employs 28 persons. It is divided in two units, both reporting to the assistant director:
– the budget, accounting, public purchasing, and logistics unit, which draws up the budget, monitors compliance with it, and develops a purchasing policy to ensure the quality of the competitive procedures. Logistics services are a part of this department: they are intended to contribute to improving working conditions for all InVS personnel by managing its real estate, moving, automotive vehicle fleet, etc.
– 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 information systems department includes 15 persons. It has two units:
– the information technology unit manages the computer and telephone systems, maintains them, and plans their future development.
– the 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.

The human resources department has eight employees. It helps to ensure that the institute has a skilled and competent staff, by its policies in hiring, training, and continuing education. It is prepared to aid each employee in the management of his or her career and sets up, with the communications department, the inhouse communications policy that ensures the agency's cohesiveness. It assists management in reaching decisions about human resources policies (including social policy, mobility, and evaluations).

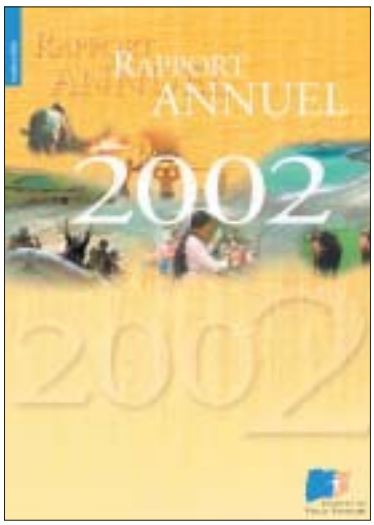
Strategic mission

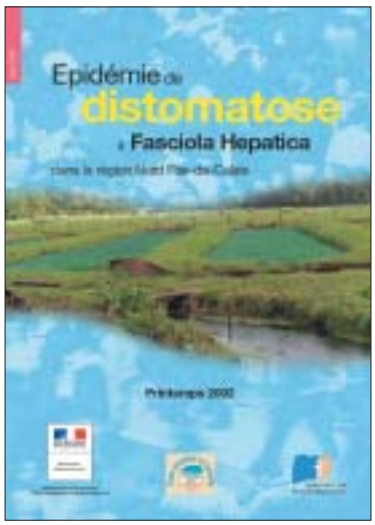
This unit reports directly to the director, and its staff represent him in a wide variety of settings. It implements regional development and coordinates European activities and the construction of the national public health network. It also conducts the follow-up and evaluation of the initial departmental contracts, in association with the departments, and prepares subsequent contracts. It is also charged, together with the information systems department, to develop the master plan for the information systems.

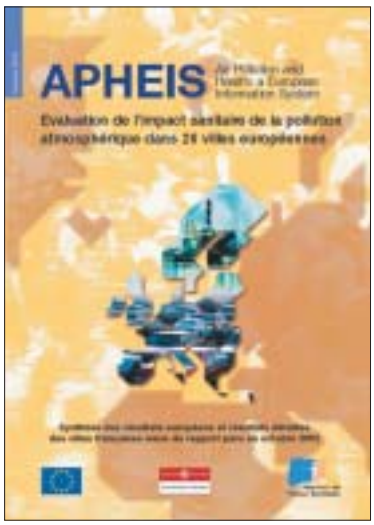
Alert coordinating committee (CCA)

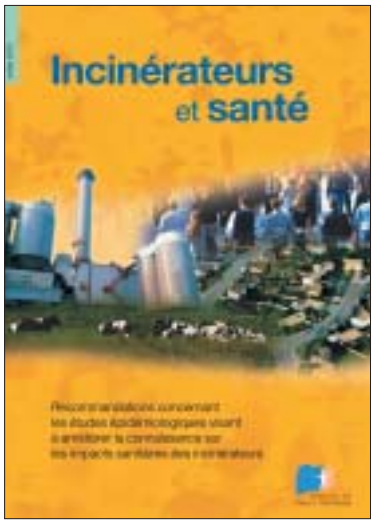
Created from the job of the "Alert and Biotox plan " representative, the Alert coordinating committee is responsible for the cross-sectional management of the Biotox plan and of vague alerts of undetermined origin. It works in liaison with all of InVS's departments; it manages the surveillance system for non-specific events based on emergency room and mortality data; and it produces the daily alert bulletin, which is transmitted to the Minister of Health and the Director-General of Health.

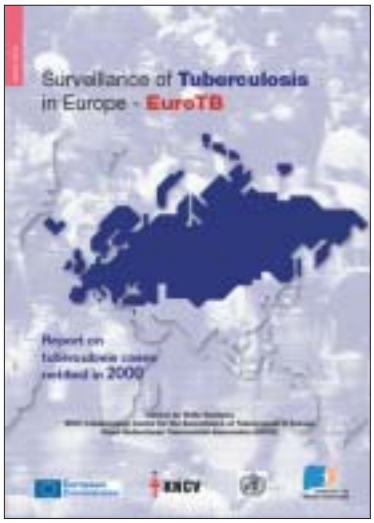
• Publications 2003





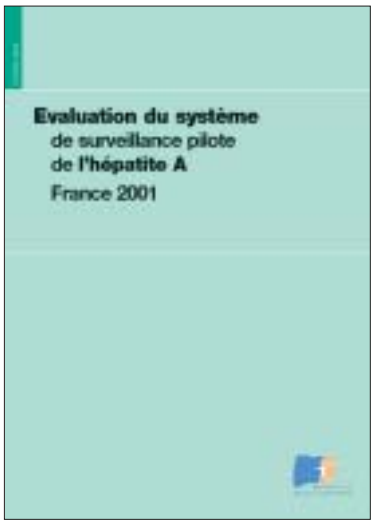





Surveillance of Tuberculosis in Europe - EuroTB
Report on tuberculosis cases notified in 2000

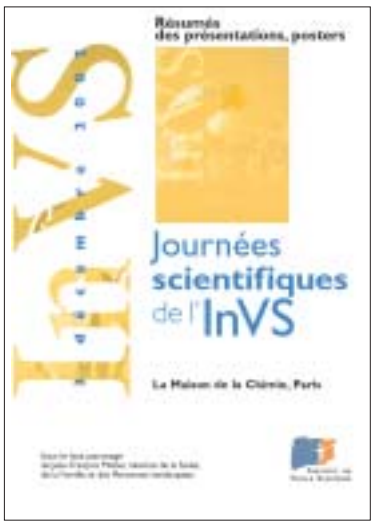

Réseau National de Surveillance du Gonocoque RENAGO
Rapport d'activité année 2001


Évaluation de l'impact sanitaire de la pollution atmosphérique urbaine


Evaluation du système de surveillance pilote de l'hépatite A
France 2001

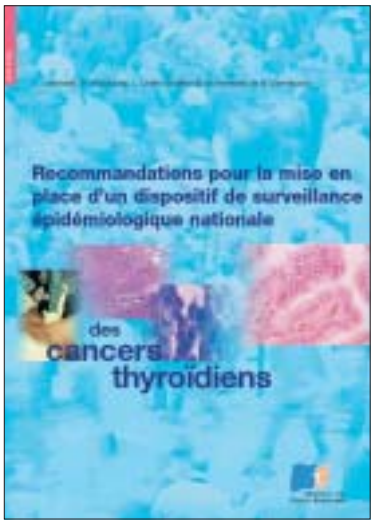

HIV / AIDS
Surveillance in Europe
Surveillance du
VIH / SIDA en Europe
EuroHIV


Symposium
« Amiante et risques professionnels : études épidémiologiques récentes »
Lundi 17 novembre 2003
Résumés des interventions

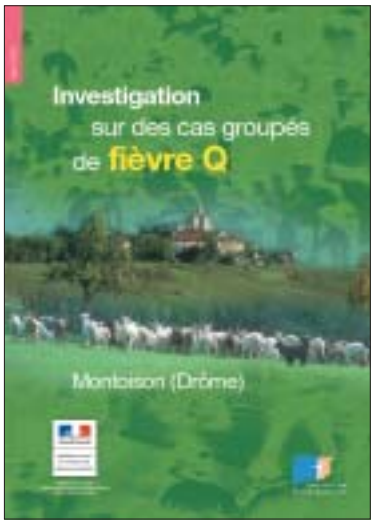

Résumés des présentations, posters
InVS
Journées scientifiques de l'InVS
La Maison de la Chimie, Paris


Incinérateurs et santé

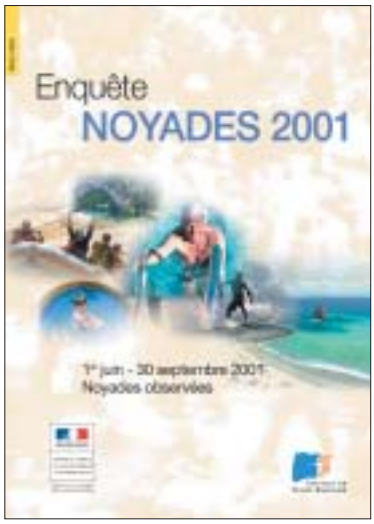

Conséquences sanitaires de l'explosion survenue à l'usine "AZF" de Toulouse le 21 Septembre 2001


Recommandations pour la mise en place d'un dispositif de surveillance épidémiologique nationale
des
cancers
thyroïdiens


Evaluation quantitative
du risque de mésothéliome
et de cancer du poumon
chez les mécaniciens
de véhicules automobiles


Investigation
sur des cas groupés
de fièvre Q
Montboison (Drôme)

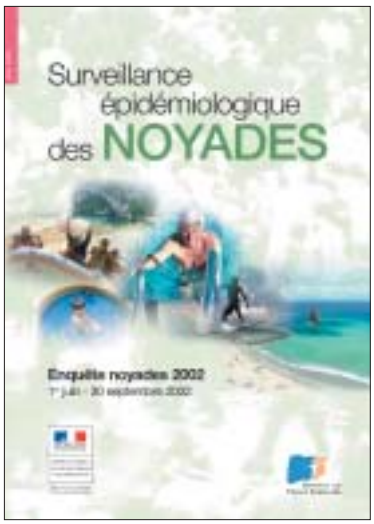

Évolution de l'incidence
et de la mortalité par
cancer
en France de 1978 à 2000


Enquête
NOYADES 2001
1er juin - 30 septembre 2001
Noyades observées

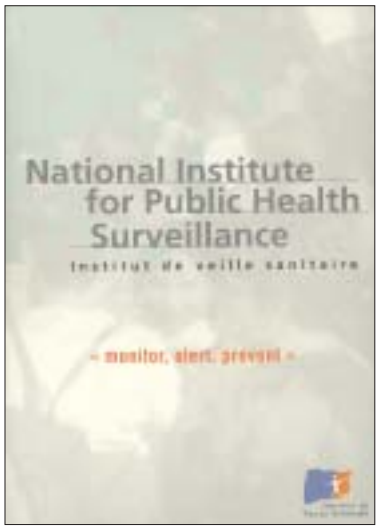

Surveillance
des infections
du site opératoire en France
en 1999 et 2000
Résultats


Résultats
de l'Enquête Permanente
sur les Accidents
de la Vie Courante


Incinérateurs
et santé

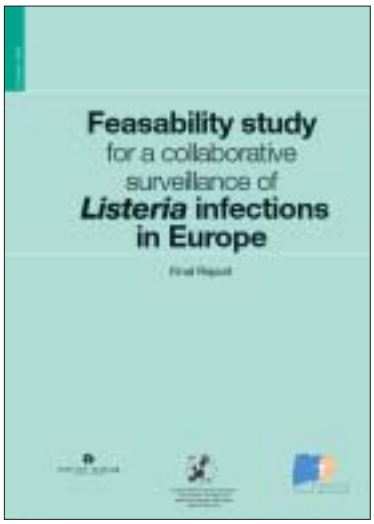

Surveillance
épidémiologique
des NOYADES
Enquête noyades 2002


Légionellose et pratiques diagnostiques des laboratoires de biologie médicale de la région Poitou-Charentes en 2002


National Institute for Public Health Surveillance
Institut de veille sanitaire
« monitor, alert, prevent »


Institut de veille sanitaire
« surveiller, alerter, prévenir »


Les facteurs de risques de leptospirose en France métropolitaine
Une étude cas-témoin, juillet 1999 - février 2000


Feasability study for a collaborative surveillance of Listeria infections in Europe
Final Report

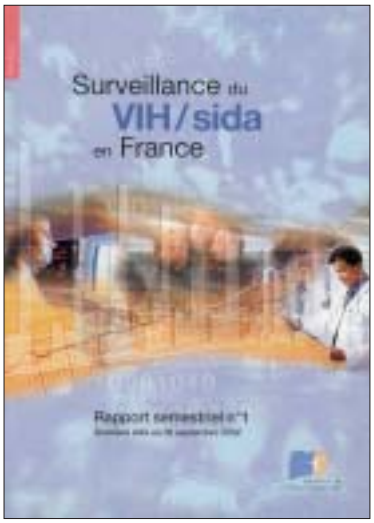

Bulletin d'information
Réseau de surveillance de la maladie de Lyme en Alsace


Maladies à déclaration obligatoire
Fiches de notification obligatoire
Fiches d'information des personnes sur la notification obligatoire

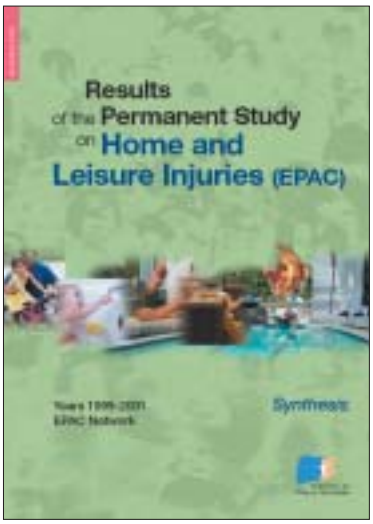

Le nouveau dispositif de surveillance des maladies à déclaration obligatoire


déclarer | agir | prévenir
Le nouveau dispositif de surveillance des maladies à déclaration obligatoire


Etude multicentrique multisites
sur les fréquences et les déterminants
des pratiques à risque de transmission
des VIH et VHC chez les usagers
de drogues (étude Coquelicot)
- Phase de faisabilité -


Surveillance du
VIH/sida
en France
Rapport semestriel n°1


Etude d'évaluation des risques sanitaires
encourus par la population résidant
à proximité de la papeterie
Assidoman-Kappa à Mennecy


Results
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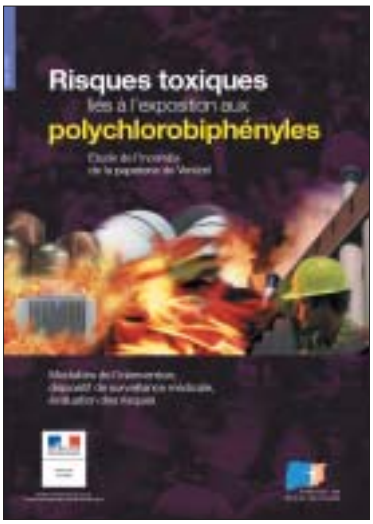
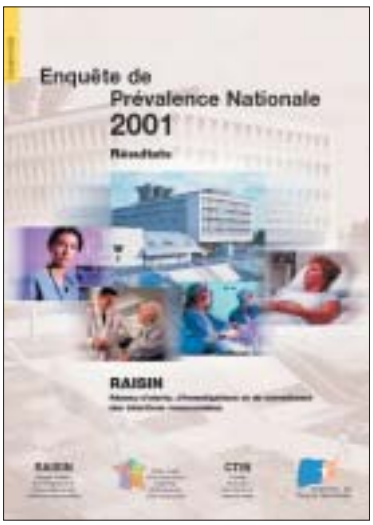
on Home and
Leisure Injuries (EPAC)
Synthesis

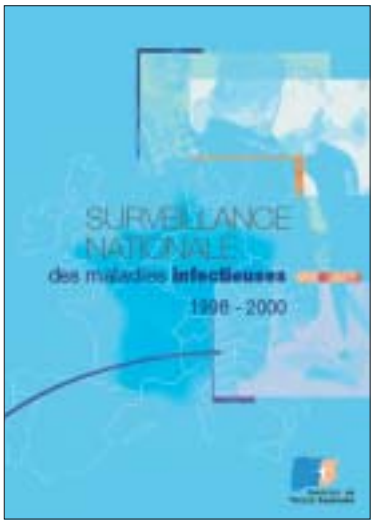

Analyse descriptive d'une
pollution industrielle
chronique
à partir des données disponibles


Risques toxiques
liés à l'exposition aux
polychlorobiphényles


Programme de travail 2003-2005
développé en partenariat
entre l'InVS/DMCT et les registres
du cancer du réseau FRANCIM


Propositions pour la mise
en place et le renforcement
d'activités de surveillance
des expositions et des risques
associés à l'inhalation
du RADON


Enquête de
Prévalence Nationale
2001
RAISIN


SURVEILLANCE
NATIONALE
des maladies infectieuses
1998 - 2000


Surveillance épidémiologique
des cancers :
état des lieux, enjeux et perspectives
Résumés des interventions


Surveillance
de la Syphilis
en France 2000 - 2002


Facteurs de risque de survenue des
syndromes hémolytiques et urémiques
liés à une infection à
Escherichia coli producteur de shiga-toxines


Toxi-infection
alimentaire collective
à Escherichia coli O148:H8
producteur de shigatoxines
Gironde, juin 2002 :
Rapport d'investigation


Impact sanitaire de la vague
de chaleur en France
survenue en août 2003
Rapport d'étape, 29 août 2003

Prevalence
newsletter of the National Institute for Public Health Surveillance

Eurosurveillance
(monthly journal)

Weekly Epidemiologic Bulletin (BEH)

• Acronyms and Abbreviations

-A-

AASQA	Approved air quality surveillance groups (Associations agréées de surveillance de la qualité de l'air)
ADEME	Environmental and energy agency (Agence de l'environnement et de la maîtrise de l'énergie)
AFSSA	French food safety agency (Agence française de sécurité sanitaire des aliments)
AFSSAPS	French drug agency (Agence française de sécurité sanitaire des produits de santé)
AFSSE	French agency for environmental safety and health (Agence française de sécurité sanitaire de l'environnement)
AIDS	Acquired Immunodeficiency Syndrome
ANAES	National agency for health accreditation and evaluation (Agence nationale d'accréditation et d'évaluation en santé)
ALD-30	List of long-term diseases for which treatment is free
AP-HP	Paris public hospital system (Assistance publique - hôpitaux de Paris)
ARH	Regional hospitalization agency (Agence régionale de l'hospitalisation)

-B-

BEH	Weekly Epidemiologic Bulletin (Bulletin épidémiologique hebdomadaire)

-C-

CCA	Alert coordinating committee (Cellule de coordination des alertes)
CClin	Nosocomial infection coordinating center (Centre de coordination de la lutte contre les infections nosocomiales)
CCPPRB	French ethics committee (Comités Consultatifs de Protection des Personnes dans la Recherche Biomédicale)
CDC	Centers for Disease Control
CES	Health examination centers (Centre d'examen de santé, de la CnamTS)
CÉPIDC	Center for death statistics and epidemiology (Centre d'épidémiologie des causes médicales de décès)
CeTAF	Technical support and training center (Centre technique d'appui et de formations)
CFU/L	Colony-forming units per liter
CIRE	InVS's regional epidemiology bureaus (Cellules interrégionales d'épidémiologie)
CNAMTS	National health insurance fund for salaried workers (Caisse nationale d'assurance maladie des travailleurs salaries)
Clin	Nosocomial infection control committee, for each healthcare facility (Comité de lutte contre les infections nosocomiales)
CNIL	National Commission for Information Technology and Privacy (Commission nationale de l'informatique et des libertés)
CNR	National Reference Center (Centres nationaux de référence)
Crisap	National federation of pathology statistics and data centers (Centre de regroupement informatique et statique en anatomie et cytologie pathologique)
CSHPF	High Council of Public Hygiene in France (Conseil supérieur d'hygiène publique de France)
CTIN	Technical assistance committee for nosocomial infections (Comité technique des infections nosocomiales)
CTS	Carpal tunnel syndrome (Syndrome du canal carpien)

-D-

DDASS	District health and welfare bureaus (Direction départementale des affaires sanitaires et sociales)
DDSV	District veterinary bureaus (Direction départementale des services vétérinaires)
DFD	Department of training and documentation, InVS (Département formation-documentation de l'InVS)
DGAS	Directorate-General of social action (Direction générale de l'action sociale)
DGS	Directorate-General of Health (Direction générale de la santé)
DHOS	Hospitalization and healthcare organization, Ministry of Health (Direction de l'hospitalisation et de l'organisation des soins)
DIM	Medical informatics department in healthcare facilities (Département d'information médicale)
DIT	International and Tropical Department, InVS (Département Tropical International)
DMCT	Department of chronic diseases and trauma, InVS (Département des maladies chroniques et traumatismes de l'InVS)
DMI	Department of infectious diseases, InVS (Département des maladies infectieuses de l'InVS)
DRASS	Regional health and welfare bureaus (Direction régionale des affaires sanitaires et sociales)
DREES	Department of research studies, evaluation and statistics, Ministry of Health (Direction de la recherche, des études, de l'évaluation et des statistiques)
DRIRE	Regional offices of industry, research and the environment (Direction régionale de l'industrie, de la recherche et de l'environnement)
DRT	Office of Labor Relations (Direction des relations du travail)
DSE	Department of environmental health, InVS (Département Santé Environnement de l'InVS)
DST	Department of occupational health InVS (Département santé-travail de l'InVS)

-E-

EID Mediterranean interdistrict antimosquito group (Entente interdépartementale pour la démoustication du littoral méditerranéen)

ESBL Extended-spectrum beta lactamase

EU European Union

EWGLI European working group for legionella infections

-F-

FBI Foodborne illness

FRANCIM French network of 21 cancer registries

-G-

GIP Corporate form for a mixed private-public organization (Groupement d'intérêt public)

GIR Scale of dependence to assess needs of persons requiring assistance to accomplish the activities of daily living or requiring regular surveillance.

GOARN Global outbreak alert and response network, coordinated by WHO

GPHIN Global public health information network

GROG Regional influenza observation groups (Groupes régionaux d'observation de la grippe)

GRSP Regional public health consortium (Groupement régional de santé publique)

-H-

HIA Health impact assessments

HIA-AP Health impact assessments of urban air pollution

HCV Hepatitis C virus

HIV Human immunodeficiency virus

-I-

IARC International Agency for Research on Cancer (Centre international de recherche sur le cancer)

IGS Health engineer (Ingénieur de génie sanitaire)

INERIS National institute of the environment and industrial risks (Institut national de l'environnement et des risques industriels)

INRS National institute for security research (Institut national de recherche et de sécurité)

INSEE National statistics institute (Institut national de la statistique et des études économiques)

INSERM National institute for health and medical research (Institut national de la santé et de la recherche médicale)

InVS National institute for Public Health Surveillance (Institut de Veille Sanitaire)

ISTNA Institute for nutritional sciences and techniques

-M-

MAE Ministry of Foreign Affairs (ministère des Affaires étrangères)

MISP Public health offices in the DRASS (Médecin inspecteur de santé publique)

MRSA Methicillin-resistant *Staphylococcus aureus*

-N-

NGO Nongovernmental organization

NHL Non-Hodgkins lymphoma

NGO Nongovernmental organization

-O-

OR Odds ratio

ORS Regional health observatory

-P-

PACA Provence-Alpes-Maritime (region)

PaF Population attributable risk fraction

PAHO Pan-American Health Organization

PCR Polymerase chain reaction

PHEWE Assessment and Prevention of Acute Health Effects of Weather Conditions in Europe

PFG Funeral home franchise (Pompes funèbres générales)

PMSI Medical information systems program

PNSM National mesothelioma surveillance program (Programme national de surveillance du mésothéliome)

PPA Air protection plan

PROMED Network reporting program for emerging diseases

PRSP Regional public health program (Programme régional de santé)

PSAS-9 Air and health surveillance program in 9 French cities

-R-

RAISIN Alert network for the investigation and surveillance of nosocomial infections (Réseau d'alerte d'investigation et de surveillance des infections nosocomiales)

-S-

SAMU/SMUR Prehospital emergency care: ambulance services staffed by mobile medical teams: call center and ambulances (Service d'aide médicale d'urgence/ Service médical d'urgence et de réanimation)

SARS Severe acute respiratory syndrome (Syndrome respiratoire aigu severe)

SARS-CoV Coronavirus responsible for SARS

SIR Standardized incidence ratio

SSI Surgical site infection

STD Sexually transmissible disease

-U-

UADT Upper aero-digestive tract

UHC University hospital center

USEN Nutritional epidemiology surveillance unit

-W-

WHO World Health Organization

• **Glossary** (of underlined terms)

Attack rate
proportion of those becoming ill among the population exposed to an epidemic.

Bacteremia
Presence of bacteria in blood, detected by blood test, corresponding to an ephemeral phenomenon, with no serious manifestations, contrary to septicemia.

Carcinogen
Capable of causing or promoting development of cancer.

Carpal tunnel syndrome
Events due to the compression of the canal in the palm of the hand (between bones and joint) and through which pass tendons and nerves. This narrowness of the carpal tunnel may be due to musculoskeletal disease. It can induce pain in the fingers, generally nocturnal, diminished sensitivity or even muscle strength).

Case/control study
Study comparing the frequency of a past exposure among a group of subjects affected by the disease under study ("cases") and a group of subjects who do not have the disease ("controls"), with the aim of assessing a possible association between the disease studied and exposure.

Community-acquired (infection)
describes infections acquired in the community (that is, to which exposure occurred in the community) as opposed to nosocomial infections, acquired in a hospital.

Cytopathology branch of medicine that examines organs or tissues microscopically to study the lesions caused by diseases. Today it uses many techniques (electronic microscopy, tissue culture, histochemistry, histoenzymology, immunology, radioisotope labeling).

Epidemiologic surveillance
"Systematic epidemiologic follow-up and analysis of a health problem and its determinants on a population scale in order to control them through interventions at an individual or collective level and to identify unknown phenomena in terms of their effects or determinants." This definition was chosen to differentiate epidemiologic surveillance from individual medical surveillance in the workplace and other forms of epidemiologic studies. In these conditions, surveillance must concentrate primarily on problems that have already been identified (through epidemiologic research) and on their expression in the population being monitored, in order to orient preventive or corrective activities.

Epidemiology
Scientific discipline that studies the different factors involved in the onset of diseases or health phenomena as well as their frequency, their mode of distribution, their time course, and the implementation of the resources necessary for their prevention. Sources: Good practices in epidemiology.)

GIR
according to the law of 24 January, 1997, dependence is defined as the "condition of persons who, notwithstanding the care they are likely to receive, need assistance to accomplish the activities of daily living or require regular surveillance". This degree of dependence is assessed with the Aggir national checklist, which classifies dependence of the elderly in six categories, from most dependent (GIR 1) for an elderly person with no independence for whom the continuous presence of a third person is essential to the least dependent (GIR 6) for an elderly person able to handle the activities of daily living on an almost independent basis.

Health risk
In the area of health, risks are distinguished from hazards: a hazard is the intrinsic capacity of a given agent to cause an adverse effect on health, such as disease, death, malformation, organic or biological dysfunction, while risk is the probability that this effect will occur in a person or within a population exposed to this agent.

Incidence (rate)
Number of new cases of a disease (or of a health event, such as an accident or a risk) in a population during a given period of time, relative to the number of persons in this population (to be distinguished from prevalence).

Incubation
Term designating the latency period between the infection by a microorganism and the appearance of the first symptoms, which characterize the invasive phase.

Median
A statistical indicator that represents the central value of a data series and separates the study sample into two equal parts.

Mesothelioma
Malignant tumor located principally in the pleura, often accompanied by effusion; its principal known cause is asbestos exposure.

Microbiology
Science that deals with microscopic and ultramicroscopic organisms and includes, in

particular, bacteriology and virology (the study of bacteria and of viruses).

Musculoskeletal diseases
Condition caused by repetitive movements, by repetitive procedures, work involving force, postures and vibrations that make excessive demands on the periarticular muscles and tendons. All joints of the limb and vertebral column can be effected.

Nosocomial (infection)
Said of an infection acquired during hospitalization. Infections acquired at the hospital (or in a clinic) by hospital personnel are also nosocomial infections.

Nosology (nosologic)
Branch of medicine that deals with the classification, definition, and study of the distinct characteristics of diseases.

Occupational disease
Disease listed in the tables annexed to the Social Security Code and which can give rise to specific workers' compensation under the conditions mentioned in the table.

[Occupational-type disease]
Any disease related to workplace exposure that is not listed in the official occupational disease tables. It does not give rise to specific compensation, but remains covered by national health insurance. Reports of occupational-type diseases contribute to the creation or modification of the occupational disease tables.

Osteomalacia
Disease in adults characterized by the generalized softening of bones, which undergo painful deformations associated with a defect in calcification.

PCR (Polymerase Chain Reaction)
Special biological technique that makes it possible to detect the virus's genetic material. This test for SARS developed by the Institute Pasteur detects the presence of the coronavirus in possible or probable cases.

Prevalence (rate)
Number of new cases of a disease (or a health event, such as an accident or a risk) in a population during a given period of time (a year, for example) – without distinction between new and old cases – relative to the number of persons in this population (to distinguish from incidence).

Registries
Epidemiologic organizations that "collect on a continuous and exhaustive basis nominative data related to one or more health events in a geographically defined population for purposes of epidemiologic and public health research by a team with the appropriate skills (definition of the decree of 6 November 1995).

Risk factor
Variable associated statistically with the onset of a disease or a health phenomenon. (Definition by A. Leclerc, L. Papoz, G. Breart, J. Lellouch. Dictionnaire d'épidémiologie. Ed. Frison Roche. Paris. 1990. 143 p.)

Screening
Activity that, in public health, makes it possible to identify a subpopulation with an elevated probability of having a given disease (cancer or lead poisoning, for example). Screening relies on the existence and use of one or more acceptable and easily applied tests that can detect an asymptomatic problem that may not otherwise be noticed (mammography for breast cancer, blood lead level assays for lead poisoning). Persons with a positive or uncertain test result must then undergo more thorough diagnostic examination for verification and, if the diagnosis is confirmed, they must undergo treatment.

Septicemia
Blood-borne dissemination of a pathogenic germ from a site of infection. Septicemia involves generalized and serious events, which is what differentiates it from bacteremia.

Serogroup or serotype or serovar
Category in which bacteria or viruses are classified according to their reaction in the presence of serum containing specific antibodies. This serologic variety is one subdivision of the species.

Serology
Diagnostic technique to search the blood for antibodies directed against the agent for an infectious disease, such as SARS.

Standardized incidence ratio (SIR)
Comparative incidence ratio: relation between the number of cases observed and the number of cases expected. This is the indirect standardization method in which we calculate the number of events expected in the study population by applying to it (for each age group) the specific rates of a reference population.

Syndrome
Combination of several symptoms, signs or anomalies, constituting a recognizable clinical entity, either because of the uniformity of the combination of events, or because it expresses a well-defined disease.

notes

notes