

## **Virtual surveillance of communicable diseases : a 20 year experience in France**

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**Background** - Inserm has developed since 1984 an information system based on a computer network of physicians in France. It allows for constituting large databases on diseases with individual description of cases and to explore some aspects of the mathematical theory of communicable diseases.

**Methods** - We developed user-friendly interfaces for remote data entry and GIS tools providing real-time atlas of the epidemiologic situation in any location. The continuous and ongoing surveillance network is constituted of about 1,200 sentinel voluntary and unpaid investigators. We studied their motivation, reasons for either withdrawal or compliance, by using survival analyses. We implemented early warning systems for outbreak detection, and for time-space forecasting. We conducted epidemiological surveys for investigating outbreaks. Large available time and space series allowed for calibrating and exploring synchronism of influenza epidemics, for testing the assumption of panmixing in Susceptibles-Infectious-Removed (SIR) type models, and for studying the role of closing school in Influenza morbidity and mortality in elderly.

**Results** - More than 250,000 cases of influenza, 150,000 cases of acute diarrheas, 35,000 patients of whose HIV tests have been prescribed by GPs, and 25,000 cases of chickenpox have been collected. Detection of regional influenza or acute diarrhea outbreaks and forecasting of epidemic trends three weeks ahead are currently broadcasted to the French media and published on *Sentiweb*<sup>®</sup> on a weekly basis. Age-cohort-period models assessed field effectiveness of mass immunization strategies against measles and influenza in the country. Case-control studies with more than 1,200 set of cases of acute diarrheas and their matched controls showed the role of calicivirus and rotavirus as probable major causes of gastroenteritis during recurrent widespread outbreaks in winter in France. An age-specific model for chickenpox showed the probable role of children in disease transmission to their susceptible parents or grand-parents. High level of synchronism between influenza epidemics has been demonstrated, either at a regional level (in France) or between France and the USA.

**Conclusion** - The designation of our lab as a WHO collaborating center for electronic disease surveillance stimulates the development of global monitoring of diseases. We developed operational systems which are now available for the global monitoring of influenza (FluNet<sup>®</sup>),

and human and animal rabies (RABNET<sup>®</sup>). Extension of electronic syndromic surveillance is needed in the world for improving surveillance capacities and real time response against emerging diseases.