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Title: **Developing a real-time syndromic surveillance system based on the monitoring of drug purchases in pharmacies: the OpenHealth.fr experience**

Body: **Purpose**

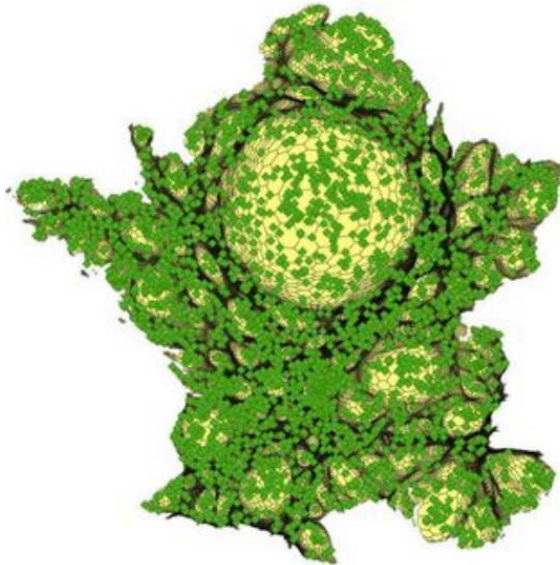
Background: Data on the purchase of medicines in pharmacies by patients are a source of information allowing the development of real-time “big data” syndromic surveillance systems. The proof of concept has been validated by numerous studies, but there are few examples of operational implementation.

Objectives: Develop a syndromic surveillance system in operational real time, from field data collection to the publication of monitoring indicators, develop the pilot indicators, develop innovative approaches to spatio-temporal analysis and operate the system for at least six months.

Methods & Materials

The field network consists of 4,600 pharmacies located throughout France (21 % of French pharmacies). They continuously transmit anonymous information on the sales of medicines to a secure data treatment centre. The information includes co-deliveries (multiple purchases by the same patient), the type of purchase (on prescription or over the counter) and the age of the patient (in case of purchase on prescription). Statistical processing algorithms are run each night and the results are published before 8am the following morning on www.OpenHealth.fr. The entire process is automated. Open-source software (R and QGIS) is used.

The development of a new indicator includes the following steps: defining the need, selecting the drug candidates based on expert opinion, developing the algorithm (choice of numerators and denominators, weighting different types of drugs and type of purchase, choice of spatial and temporal smoothing parameters...), validation by comparison with existing data and development of publication interfaces.



Field network of 4,600 pharmacies (isodemographic map)

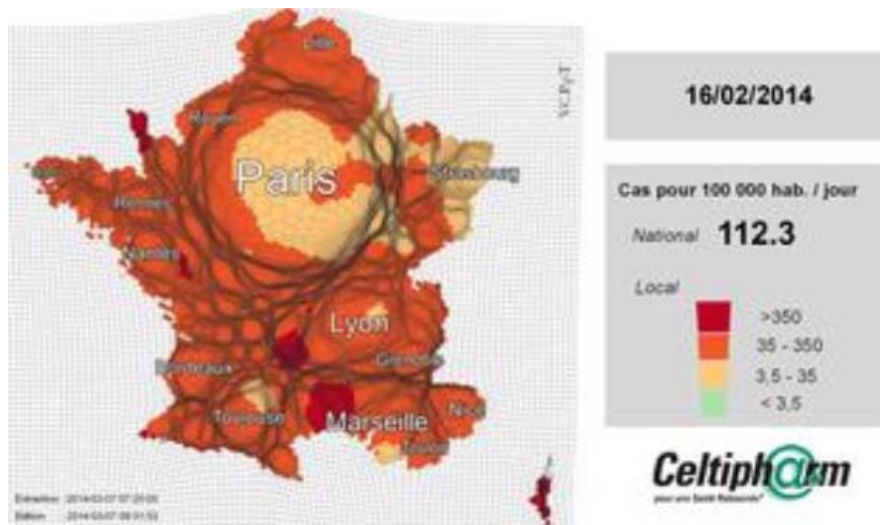


From the field to the web : the daily data processing scheme

Results

Six indicators, including two for the syndromic surveillance of infectious diseases (influenza-like illness, gastroenteritis) were developed. They were validated by comparison with the French Sentinelles Network. The update of the indicators was done in real time (1 day release lag, daily time resolution) on a daily basis since November 2013. The data can be freely downloaded (Open database licence).

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Influenza-Like-Incidence at seasonal peak (isodemographic map)

Conclusion

The developed methodology can be used to develop a surveillance system for any syndrome. The only prerequisite is to identify tracer drugs. The structure put in place will allow the development of indicators in a few days to allow a response to health crises. The structure can also be duplicated in other countries.

Keywords: Syndromic surveillance
Real time
Drug purchases