

Internet-based monitoring system for influenza-like illness: H1N1 surveillance in Italy

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Abstract. Influenza surveillance in Italy, as in most European countries, is based upon Influenza-like illness (ILI) consultations reported by GPs. An innovative internet-based monitoring system for ILIs' in the general population has been carried on in Italy during the H1N1 pandemic. The system has provided information on the incidence of H1N1 in the community in real-time.

Key words: Web 2.0, social networks, user-generated content, information, patients, outbreak detection, data collection, analysis, surveillance, epidemiology

1 The project

Surveillance of Influenza-like Illness is essential for assessing how many cases may occur during the yearly winter season. Moreover, during the wave of A(H1N1) pandemic influenza in 2009, it has become clear for policy makers and public health institutions how crucial is to estimate, rapidly and reliably, the number of ILI cases to be expected in each country. A broad range of techniques can be used to estimate the progress of infection based on reports collected via a number of sources, for instance the number of consultations with sentinel General Practitioners (GPs) or the number of prescriptions for antivirals. However, all these surveillance schemes require individuals to access health services and relies on the propensity of individuals to consult. We present a system that intends to overcome the limitation of the state-of-the-art surveillance systems in Italy by proposing an innovative ICT approach based on Web2.0 tools.

An internet-based monitoring system (IMS) was started in The Netherlands and Belgium (<http://www.degrotegriepmeting.nl>) in 2003/2004, and in Portugal (<http://www.gripenet.pt>) in 2005. Data collected by these platforms during non-pandemic years have been evaluated [1] and the estimated seasonal influenza incidence curves have been found to be in good agreement with those from the former European Influenza Surveillance Scheme (EISS), now European Influenza

Surveillance Network (EISN). Following these encouraging experiences, the web-based real-time surveillance system has been adapted to Italy in 2008 under the name of “Influweb”. Since 2009, the internet-based monitoring systems in the various European countries are the key instrument to provide real-time disease incidence data collection for the epidemic forecast infrastructure developed by the EU-funded research project EPIWORK. In July 2009 the IMS has been deployed in the United Kingdom, during the summer wave of the A(H1N1) pandemic. In the next years, the IMSs are going to operate in Sweden, Germany, France and Spain, in addition to the Netherlands, Belgium, Portugal, Italy and UK.

1.1 The platform

Influweb (www.influweb.it) is an internet based cohort which provides information on influenza-like illness in Italy in real time, every winter since 2008. At the beginning of the season, a number of press releases are distributed to encourage a visit to the website and participation in the internet-surveillance. Moreover, during the season, communications are continuously distributed to focus public attention on the internet-based system. Any resident of Italy may participate. On registering, participants are requested to complete a short on-line background questionnaire containing demographical, medical and lifestyle questions. Thereafter, registered participants receive by e-mail a weekly newsletter with a link to a short symptoms questionnaire about their recent symptoms (if any). Individuals are asked whether they have had any of the following symptoms: runny nose, cough, sore throat, headache, muscle and/or joint pain, chest pain, stomach ache, diarrhoea, nausea, chills, weakness, eye irritation, fever since their previous visit to the website. Those who report any of these symptoms are asked a series of follow-up questions, including the date of onset of the symptoms, the highest body temperature (if measured), if the fever was observed with or without sudden onset, whether and when they sought medical assistance, whether they took any medication, and whether they changed their daily routine. To enhance the collection of information, since mid-December 2009 participants have also been asked to complete a vaccination questionnaire, asking whether they have been offered, had, or intend to have pandemic and/or seasonal influenza vaccine this season; those who received a vaccine were asked what date they received it. Some improvements will be added to the platform for future seasons, including a mobile phone application to collect surveillance data in parallel to the Web site.

1.2 The participants

In total, 3029 persons participated during at least one of two influenza seasons (2008-2009 and 2009-2010) with a mean number of reports per week of about 500. The number of participants reporting their health status has almost doubled during the peak of the H1N1 pandemic (see Fig. 1).

A participant is considered active if he/her has filled in at least one symptoms questionnaire after the registration (excluding the very first one) and if he/her has completed on average at least a symptoms questionnaire every three weeks since the registration. Only active participants have been considered in the successive data analysis (see next section). This definition has been chosen to take into account the contribution of participants that wouldn't fill in the questionnaire every week but nevertheless contributed with information about their health status along the whole influenza season.

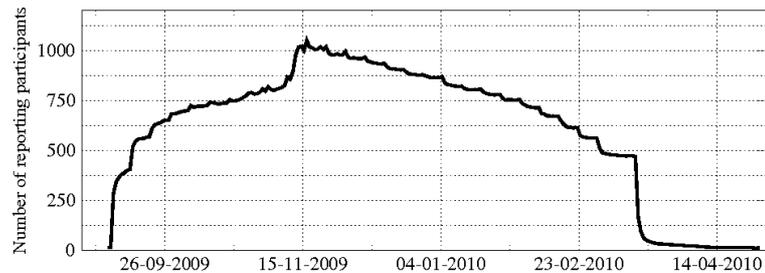


Fig. 1. Active users reporting their health status during the H1N1 pandemic in Italy.

The age distribution within the IMS does not follow the age distribution of the general Italian population (see table 1). Children and elderly are under-represented but nevertheless the presence of people with age above 60 among participants reaches a 10% (compared to the 24.8% of the general population) showing that in this age group the use of new technologies such as the web is becoming more and more common.

Table 1. Characteristics of Inluweb participants compared to the Italian general population

		Inluweb	Gen. Pop.
age distribution	0-19 years	7.4%	19.0%
	20-39 years	41.6%	27.6%
	40-59 years	40.4%	28.6%
	60 or older	10.6%	24.8%
sex	male	59.5%	49.0%
	female	40.5%	51.0%

2 H1N1 pandemic

During the Fall of 2009, Italy has experienced the epidemic wave of the new influenza virus A(H1N1), as the rest of EU. The IMS has collected data about the health status of the cohort volunteers during the whole duration of the pandemic. ILI is defined as a sudden onset of fever ($\geq 38.0^{\circ}\text{C}$) accompanied by muscle pain, and cough and/or sore throat and/or chest pain. The day of onset of symptoms determines the onset of ILI. The weekly incidence is calculated by

dividing the number of active participants with ILI in a particular week by the total number of active participants in the same week. With different definitions of ILI case the incidence has the same trend, with a slight difference in the peak amplitude, but not in the timing. These incidence curves can be compared with the incidence rates as estimated from ILI consultations in the sentinel GP network (<http://www.iss.it/ifu>) showing a very good agreement in the peak time (see Fig. 2). Moreover, the real-time surveillance carried on by the Inluweb platform has been able to detect the upcoming of the pandemic peak about one week in advance. It is worth mentioning that, when asked if during an ILI episode they consulted a GP, 55% of participants answered that they phoned a GP and only 4% that they visited a GP, showing that the IMS platform can be of great advantage in collecting data about ILI cases that otherwise would go undetected in the GP surveillance.

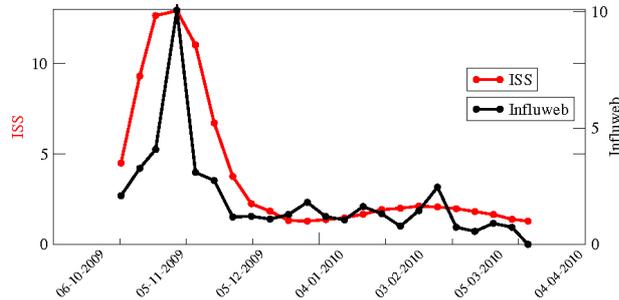


Fig. 2. Incidence curve during the H1N1 pandemic in Italy.

3 Conclusions

The use of an IMS with a weekly symptom questionnaire has proved to be an effective approach in reporting ILI occurrence: it can detect cases that would go undetected by the traditional surveillance system and is capable of providing faster reporting. Though participants are not representative for the Italian population, and efforts should be made to gain more insight in the characteristics of the participants and to improve representativeness, the IMS has proved to be a useful addition to the sentinel GP surveillance when the regular health system is under stress in a pandemic situation.

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