

La *Digital Disease Detection* e sua
applicazione in salute pubblica, con
particolare riferimento alla sorveglianza
basata su eventi (EBS)

Caterina Rizzo, Flavia Riccardo
Istituto Superiore di Sanità



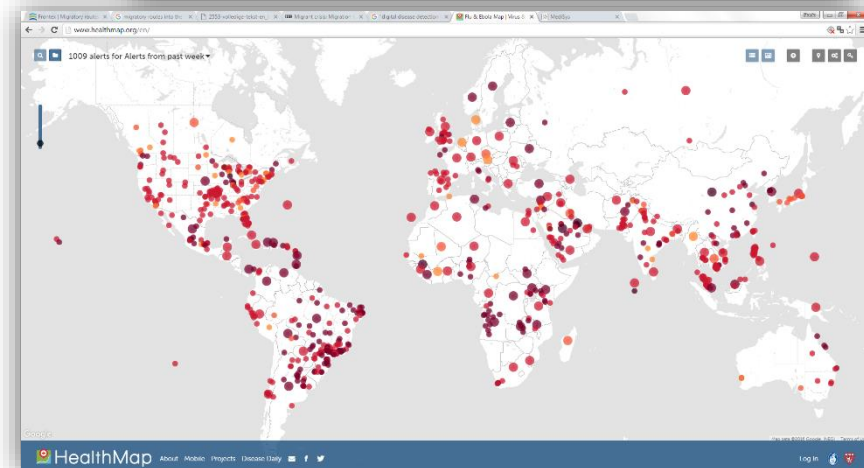
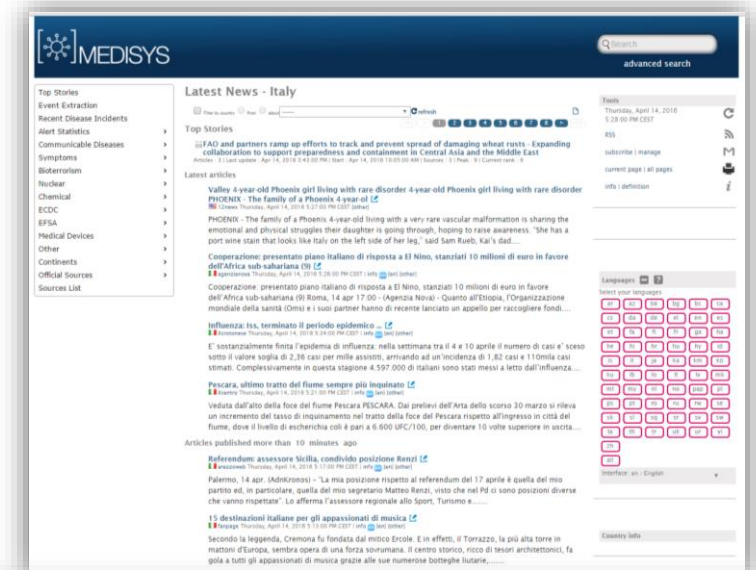


Tracce digitali del comportamento umano

Digital disease detection

«**Digital Disease Detection** is the use of media sources – like Facebook, Twitter, web searches, news reports, chat rooms, and blog posts – and other digital technologies to detect early indications of a disease outbreak, and track the spread of diseases. »

<http://www.healthmap.org/site/diseasedaily/article/digital-disease-detection-introduction-21114#sthash.8pi3bDQf.dpuf>



Esempi di tecniche “passive” : monitorare le query inserite in motori di ricerca; contenuti generati dagli utenti

google.org Flu Trends

Language: English (United States)

[Google.org home](#)

[Dengue Trends](#)

Flu Trends

Home

Select country/region

[How does this work?](#)

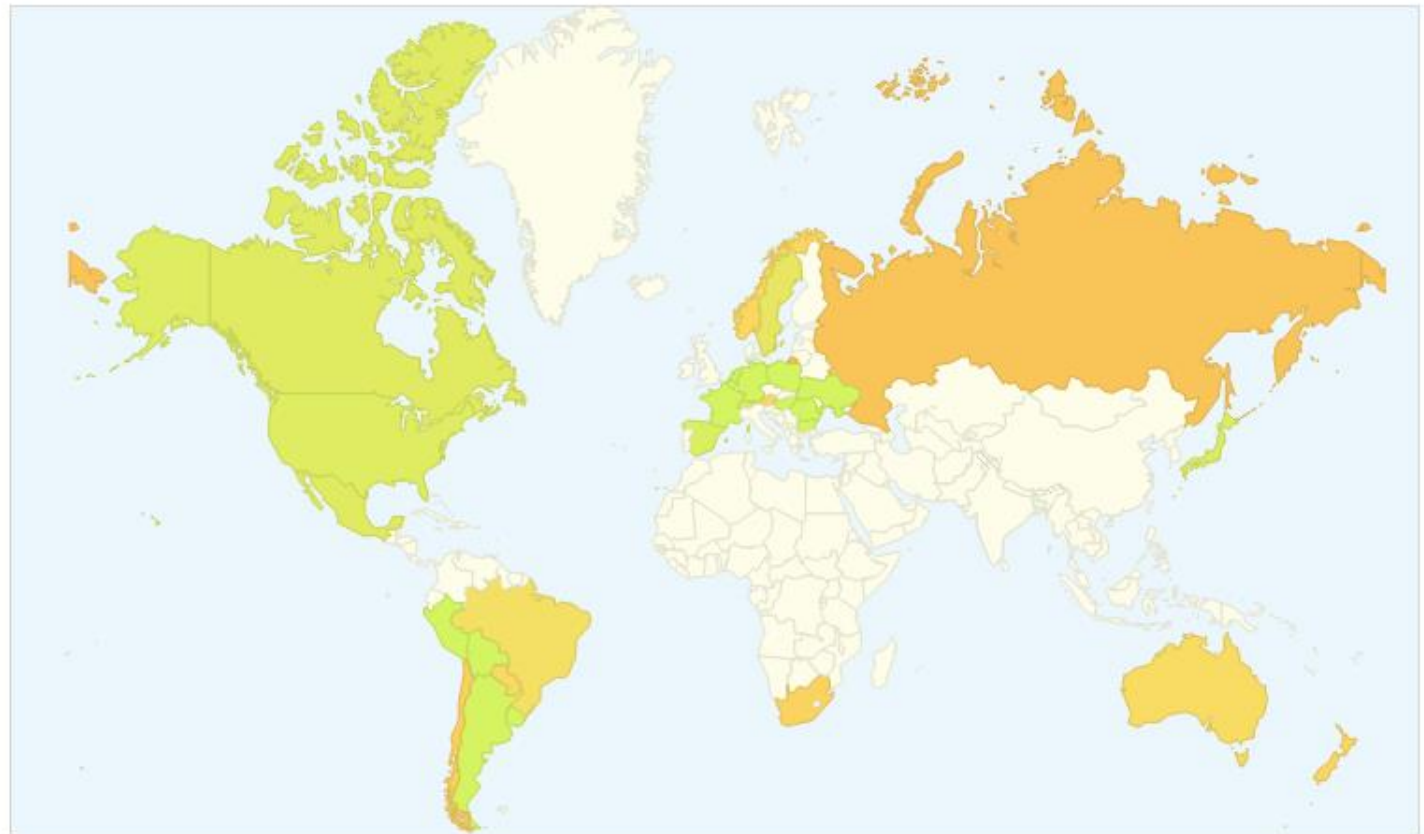
[FAQ](#)

Flu activity



Explore flu trends around the world

We've found that certain search terms are good indicators of flu activity. Google Flu Trends uses aggregated Google search data to estimate flu activity. [Learn more »](#)



[Download world flu activity data](#) - [Animated flu trends for Google Earth](#) - [Compare flu trends across regions in Public Data Explorer](#)

Using Twitter to track the flu

Researchers find a better way to screen the tweets

Phil Sneiderman / 🕒 **January 24, 2013**

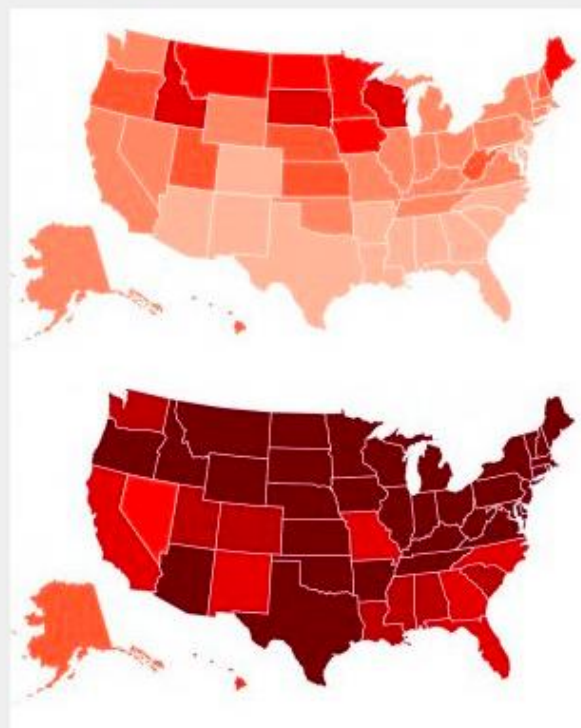
Posted in *Health, Science+Technology*

Tagged *computer science, flu, influenza, tweets, twitter, mark dredze*

Sifting through social media messages has become a popular way to track when and where flu cases occur, but a key hurdle hampers the process: how to identify flu-infection tweets. Some tweets are posted by people who have been sick with the virus, while others come from folks who are merely talking about the illness. If you are tracking actual flu cases, such conversations about the flu in general can skew the results.

To address this problem, Johns Hopkins computer scientists and researchers in the School of Medicine have developed a new tweet-screening method that not only delivers real-time data on flu cases, but also filters out online chatter that is not linked to actual flu infections. Comparing their method, which is based on analysis of 5,000 publicly available tweets per minute, to other Twitter-based tracking tools, the Johns Hopkins researchers say their real-time results track more closely with government disease data that takes much longer to compile.

"When you look at Twitter posts, you can see people talking about being afraid of catching the flu or asking friends if they should get a flu shot or mentioning a public figure who seems to be ill," said Mark Dredze, an assistant research professor in the [Department of Computer Science](#) who uses tweets to monitor public health



These U.S. maps indicate the Twitter systems rate of influenza in each state in the first week of January (higher flu rates are marked with darker red). They show that the country is awash in a high flu rate in 2013 (the bottom map), yet was relatively unscathed during the same week in 2012 (the top map).

Wikipedia Usage Estimates Prevalence of Influenza-Like Illness in the United States in Near Real-Time

David J. McIver*, John S. Brownstein

Boston Children's Hospital, Harvard Medical School, Boston, Massachusetts, United States of America

Abstract

Circulating levels of both seasonal and pandemic influenza require constant surveillance to ensure the health and safety of the population. While up-to-date information is critical, traditional surveillance systems can have data availability lags of up to two weeks. We introduce a novel method of estimating, in near-real time, the level of influenza-like illness (ILI) in the United States (US) by monitoring the rate of particular Wikipedia article views on a daily basis. We calculated the number of times certain influenza- or health-related Wikipedia articles were accessed each day between December 2007 and August 2013 and compared these data to official ILI activity levels provided by the Centers for Disease Control and Prevention (CDC). We developed a Poisson model that accurately estimates the level of ILI activity in the American population, up to two weeks ahead of the CDC, with an absolute average difference between the two estimates of just 0.27% over 294 weeks of data. Wikipedia-derived ILI models performed well through both abnormally high media coverage events (such as during the 2009 H1N1 pandemic) as well as unusually severe influenza seasons (such as the 2012–2013 influenza season). Wikipedia usage accurately estimated the week of peak ILI activity 17% more often than Google Flu Trends data and was often more accurate in its measure of ILI intensity. With further study, this method could potentially be implemented for continuous monitoring of ILI activity in the US and to provide support for traditional influenza surveillance tools.

Citation: McIver DJ, Brownstein JS (2014) Wikipedia Usage Estimates Prevalence of Influenza-Like Illness in the United States in Near Real-Time. PLoS Comput Biol 10(4): e1003581. doi:10.1371/journal.pcbi.1003581

Editor: Marcel Salathé, Pennsylvania State University, United States of America

Received: December 20, 2013; **Accepted:** March 11, 2014; **Published:** April 17, 2014

Copyright: © 2014 McIver, Brownstein. This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

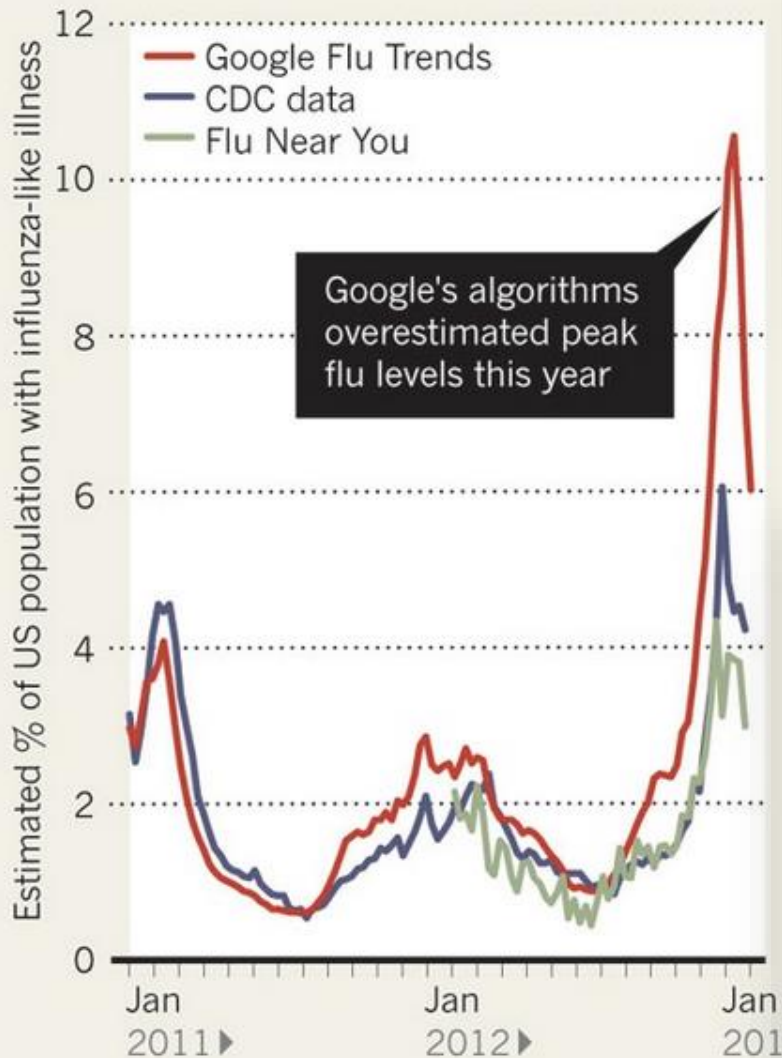
Funding: This work was funded by the National Institutes of Health and National Library of Medicine 1R01LM010812-03. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

Competing Interests: The authors have declared that no competing interests exist.

* E-mail: david.mciver@childrens.harvard.edu

FEVER PEAKS

A comparison of three different methods of measuring the proportion of the US population with an influenza-like illness.



When Google got flu wrong

US Science 14 March 2014:
Vol. 343 no. 6176 pp. 1203-1205
DOI: 10.1126/science.1248506

< Prev | T

Read

POLICY FORUM

BIG DATA

The Parable of Google Flu: Traps in Big Data Analysis

David Lazer^{1,2,*}, Ryan Kennedy^{1,3,4}, Gary King³, Alessandro Vespignani^{5,6,3}

FT Magazine

March 28, 2014 11:38 am

Big data: are we making a big mistake?

By Tim Harford

Big data is a vague term for a massive phenomenon that has rapidly become an obsession with entrepreneurs, scientists, governments and the media

Esempi di tecniche “attive” : sorveglianze “crowdsourcing” e sorveglianza basata su eventi





Disease surveillance, #crowdsourced. **Powered by you.**

Move the map to your area of interest, and find out which diseases are trending.

What is Crowdbreaks?

Crowdbreaks is a crowdsourced disease surveillance system. It collects public data from online sources generated by millions of people (using Twitter). It sifts and filters through the data to provide you with geographically specific disease relevant information. Crowdbreaks is designed to get better over time by using feedback from users that helps the system make sense of the data.

How does Crowdbreaks work?

Crowdbreaks collects Tweets with keywords that might be related to disease. The temporal dynamics of the number of Tweets are shown on the website for a user-defined geographic area. Based on user feedback on particular tweets, our machine learning algorithms will get better and better at detecting which tweets are truly relevant for disease surveillance.

Some of the keywords seem irrelevant to diseases.

This might be true. The initial set of keywords was defined by the Department of Human Health and Services, and is not set in stone. Our machine learning algorithms are designed to detect which of the keywords are most relevant. We will also update the list of keywords as we go forward.

Why crowdsourcing?

Early detection of disease outbreaks is perhaps our best bet to keep diseases in check. While public health systems are already in place to help us with early detection, the resources available for these systems are limited. There is also a time delay from the moment someone starts to fall ill to the moment public health authorities are alerted. At the same time, millions of people use social media to share how they feel, both good and bad. In a very real sense, it's like having millions of sensors to help us understand the health situation on the ground. Crowdbreaks, however, goes one step further: by asking people to help make sense of the reported data, we invoke the wisdom of the crowd to help us separate signal from noise. We also hope to engage the public in public health.

<http://www.crowdbreaks.com>

Digital Disease Detection/Epidemic Intelligence

l'Epidemic intelligence (EI) comprende tutte le attività volte alla **identificazione precoce** di rischi in sanità pubblica, la loro validazione, valutazione ed indagine finalizzate alla raccomandazione di misure di controllo.

EMERGING INFECTIOUS DISEASES™

Emerg Infect Dis. 2015 Aug; 21(8): 1285–1292.
doi: [10.3201/eid2108.141156](https://doi.org/10.3201/eid2108.141156)

Drivers of Emerging Infectious Disease Events as a Framework for Digital Detection

Sarah H. Olson,¹ Corey M. Benedum,¹ Sumiko R. Mekaru, Nicholas D. Preston, Jonna A.K. Mazet, Damien O. Joly,² and John S. Brownstein^{3,2}

[Author information](#) ▶ [Copyright and License information](#) ▶

This article has been [cited by](#) other articles in PMC.

Abstract Go to:

The growing field of digital disease detection, or epidemic intelligence, attempts to improve timely detection and awareness of infectious disease (ID) events. Early detection remains an important priority; thus, the next frontier for ID surveillance is to improve the recognition and monitoring of drivers (antecedent conditions) of ID emergence for signals that precede disease events. These data could help alert public health officials to indicators of elevated ID risk, thereby triggering targeted active surveillance and interventions. We believe that ID emergence risks can be anticipated through surveillance of their drivers, just as successful warning systems of climate-based, meteorologically sensitive diseases are supported by improved temperature and precipitation data. We present approaches to driver surveillance, gaps in the current literature, and a scientific framework for the creation of a digital warning system. Fulfilling the promise of driver surveillance will require concerted action to expand the collection of appropriate digital driver data.

Eurosurveillance, Volume 11, Issue 12, 01 December 2006

Surveillance report

EPIDEMIC INTELLIGENCE: A NEW FRAMEWORK FOR STRENGTHENING DISEASE SURVEILLANCE IN EUROPE

Citation style for this article: Paquet C, Coulombier D, Kaiser R, Ciotti M. Epidemic intelligence: a new framework for strengthening disease surveillance in Europe. Euro Surveill. 2006;11(12):pii=665. Available online: <http://www.eurosurveillance.org/ViewArticle.aspx?ArticleId=665>

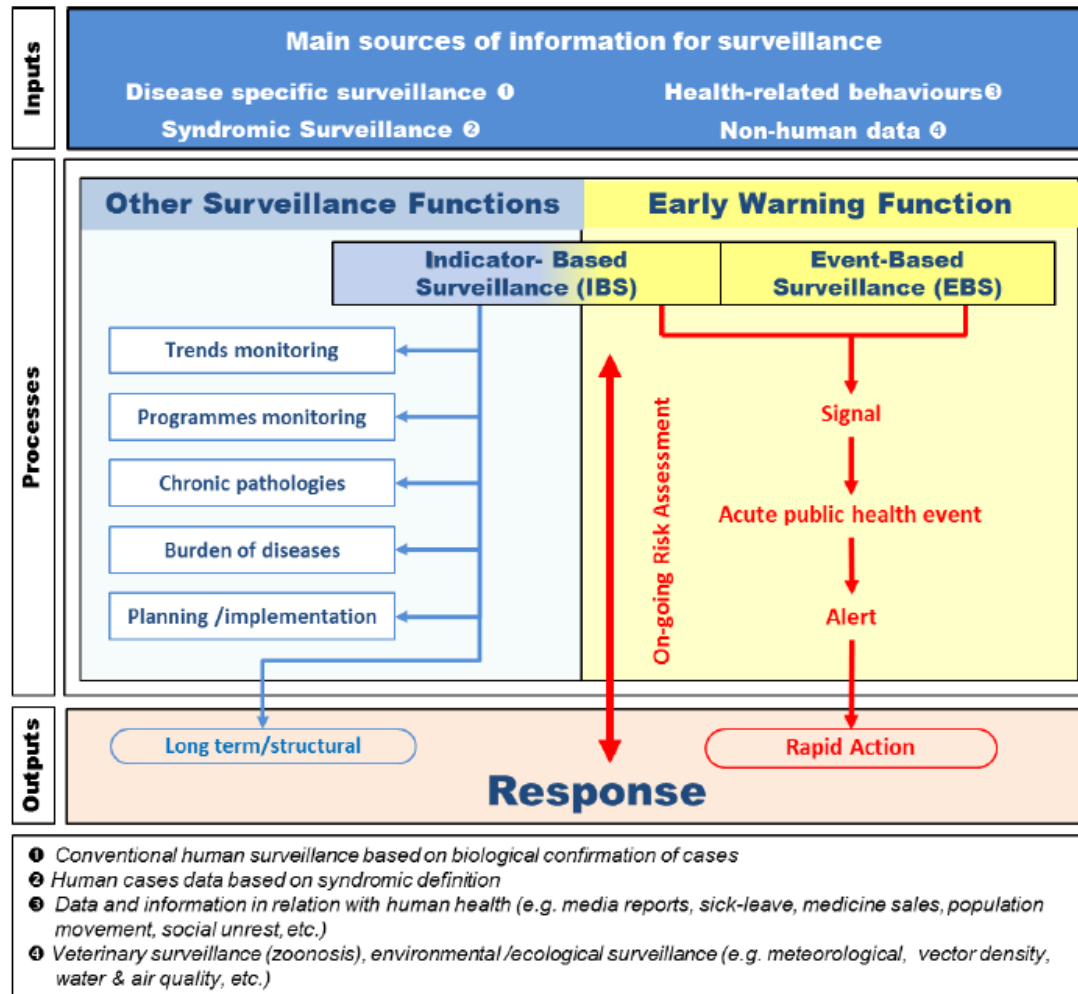
C. Paquet¹, D. Coulombier², R. Kaiser², M. Ciotti²

1. Institut de Veille Sanitaire, Saint-Maurice, France

2. European Centre for Disease Prevention and Control, Stockholm, Sweden

“The growing field of digital disease detection, or epidemic intelligence, attempts to improve timely detection and awareness of infectious disease (ID) events.”

Sorveglianza basata su indicatori e su eventi

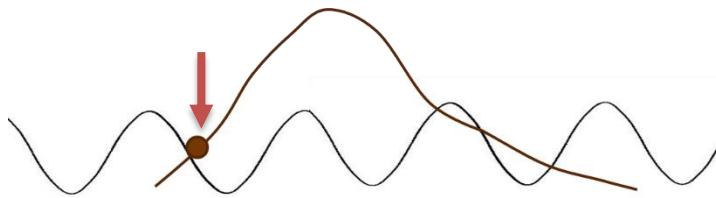


Sorveglianza basata su indicatori, sorveglianza basata su eventi, early warning ed epidemic intelligence.

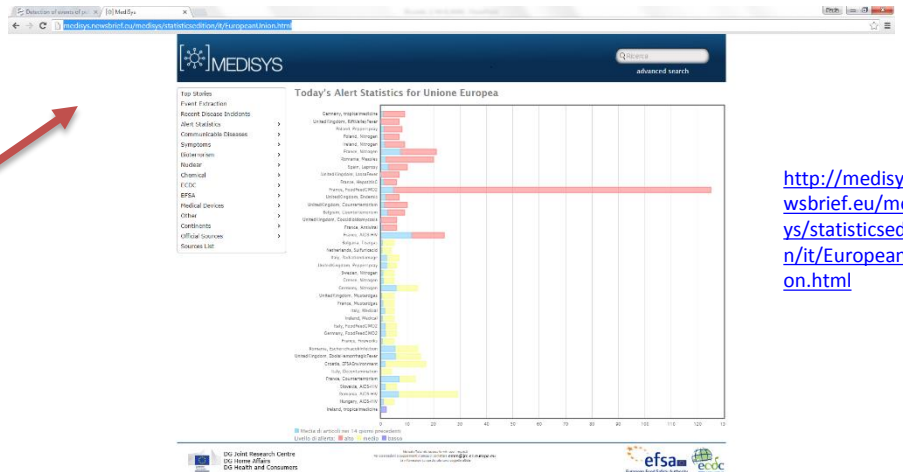
Estratto da WHO [Implementation of Early Warning and Response with a focus on Event-Based Surveillance](#), 2014

Identificazione con metodi statistici, più o meno «automatizzati»

Segnale digitale di un evento biologico



Rumore di fondo



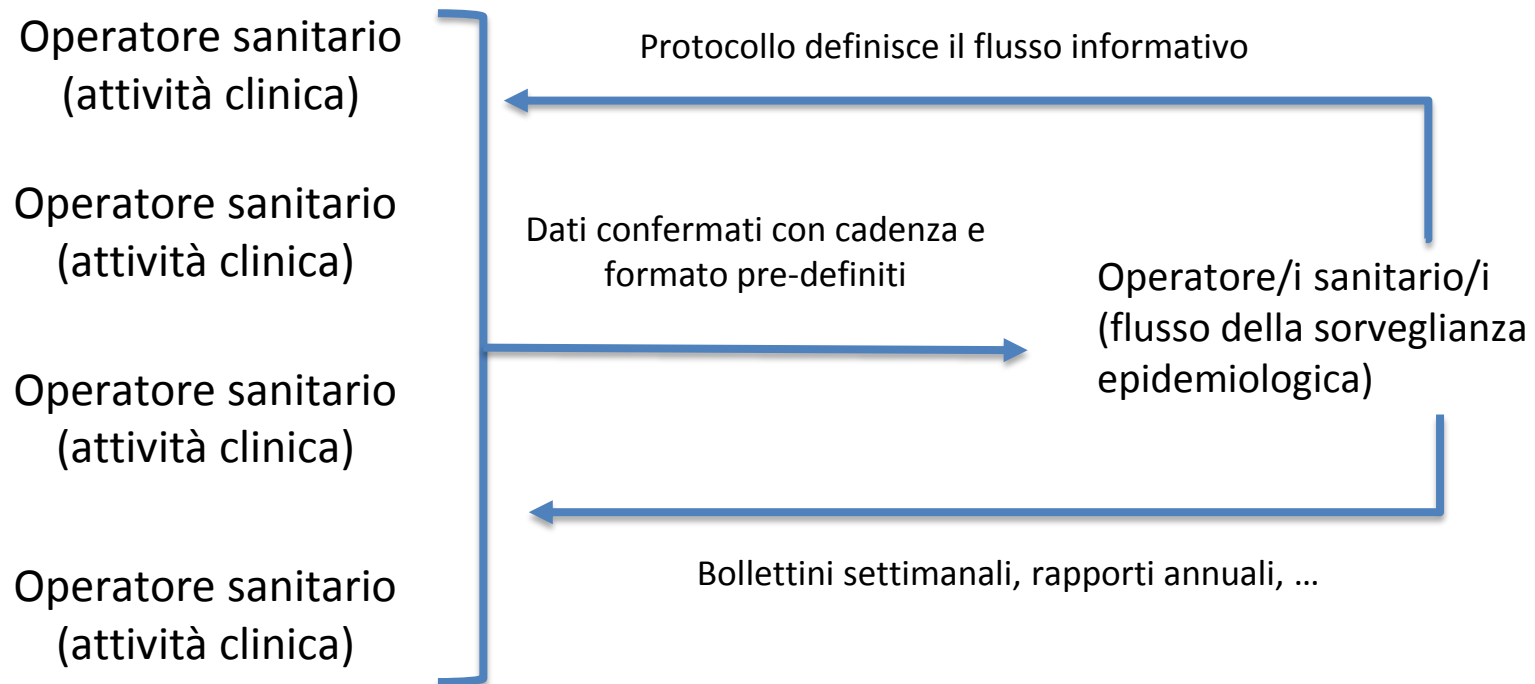
<http://medisys.netwsbrief.eu/medisys/statisticsedition/it/EuropeanUnion.html>

Identificazione con metodi «moderazione umana»



Immagine da http://www.123rf.com/photo_10591253_worried-man-has-done-something-terribly-wrong-with-his-computer.html

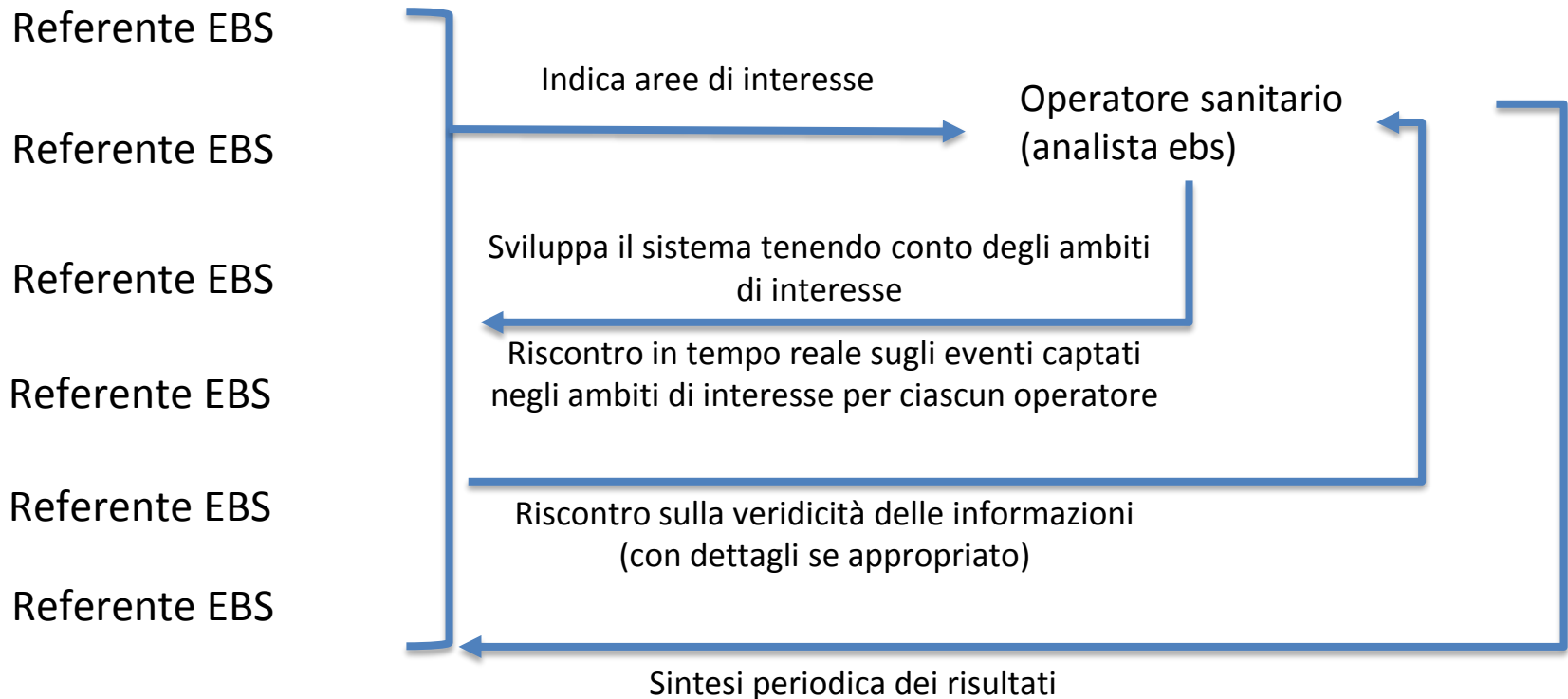
Modello semplificato: sorveglianza basata su indicatori



Componente basata su eventi (EBS) di un sistema di epidemic intelligence

- Insieme di procedure volte ad identificare, **da fonti informative non-strutturate**, segnali di una possibile emergenza sanitaria.
- OSINT = Open Source Intelligence (informazione pubblica).
- Fonti : generalmente i media ed internet, piattaforme di bio-sorveglianza (aggregatori e filtri).

Modello semplificato: sorveglianza basata su eventi



Procedure EBS



la Nuova di Venezia e Mestre

COMUNI: VENEZIA - MESTRE SAN DONÀ JESOLO CHIOGGIA MIRANO DOLO PORTOGRUARO TUTTI I COMUNI

HOME CRONACA SPORT TEMPO LIBERO VENETO NORDEST ECONOMIA ITALIA MONDO FOTO

SI PARLA DI TRAM BILANCIO COMUNALE MOSE ARTE GRANDI NAVI

FRESCHI SOTTOCOSTO Maxi

Sai in: VENEZIA > CRONACA > ALLARME MORBILLO A VENEZIADIECI...

Allarme morbillo a Venezia dieci ricoveri in pochi giorni

Colpiti gli adulti e i bambini non vaccinati

MALATTIE INFETTIVE SANITÀ VACCINAZIONI

28 dicembre 2010

Condividi 0 Tweet 0 G+ 0



Il morbillo rialza prepotentemente la testa in centro

BioPrepWatch

The Leading News Source on Biological Threats and Countermeasures

Home News Directory About Us Contact Us

Home » 2010 » July

Mysterious plague outbreak among Syrian army

Tuesday, Jul 6, 2010 @ 7:44pm by BioPrepWatch Reports



An outbreak of plague, which is considered a potential bioweapon, among the Syrian military may be raising more questions than answers.

Syrian President Bashar al-Assad recently ordered the shutdown of all Syrian military exercises due to a plague that currently affects a large number of military personnel, according to Examiner.com.

The Syrian president has told Syrian news sources that food and drinking water in military bases, coupled with one of the country's worst droughts in over 40 years, are responsible for the outbreak of plague.

Hundreds of thousands of Syrians are experiencing food shortages, nearly 60,000 small livestock owners have lost all their animals and 50,000 others have lost 50 to 60 percent of their cattle.

The infectious bacterium *Yersinia pestis* causes the infectious disease plague, which is commonly found worldwide in rats and other rodents. Fleas often serve as common vectors of plague. There are three forms of human plague - bubonic, septicemic and pneumonic.

Humans may also be infected by direct contact with an infected animal, through inhalation and, if it is pneumonic plague, by person to person contact.

Drinking water, food and a heat wave are not common causes of plague, Examiner.com says, unless they have increased the contact between humans and plague carriers.

Because of this, the article says, questions should be raised about the true cause of the Syrian army plague.

<http://nuovavenezia.gelocal.it/venezia/cronaca/2010/12/28/news/allarme-morbillo-a-veneziadieci-ricoveri-in-pochi-giorni-1.1374065>

<http://bioprepwatch.com/stories/510506954-mysterious-plague-outbreak-among-syrian-army>

<http://www.bbc.com/news/world-us-canada-32910020>

Cronaca »

Busta sospetta con polvere bianca indirizzata al direttore dell'Izs

Bon conteneva lettere ma solo la sostanza, adesso sottoposta ad analisi. Indagano i carabinieri

02 novembre 2015

Teramo - Teramo

TERAMO - Una busta contenente solo polvere bianca, la cui natura è ancora da accertare, è stata recapitata per posta all'Istituto zooprofilattico di Teramo, indirizzata al direttore generale. Contenuto e busta sono stati consegnati questa mattina ai carabinieri della compagnia di Teramo dal direttore amministrativo dell'Istituto di Campo Boario, mentre i vigili del fuoco hanno sigillato il tutto per predisporre le analisi. La busta reca un mittente fittizio che sarebbe residente a Bari. Dai primi accertamenti la sostanza sarebbe innocua ma si attende il referto dell'analisi specifica.

<http://www.emmelle.it/Prima-pagina/Cronaca/Busta-sospetta-con-polvere-bianca-indirizzata-al-direttore-dell-izs/11-37532-1.html>

<http://www.laprovinciavarese.it/stories/Cronaca/teme-lebola-e-prende-il-buserrone-va-chiamato-il-118-1125685-11/>

La Provincia di Varese.it

Cronaca Economia Sport Italia Mondo Varese Busto Gallarate Provincia Video Foto Rubriche **Più letti**

HOME / CRONACA / Teme l'ebola e prende il bus -ERRORE, VA CHIAMATO IL 118-



Venerdì 12 giugno 2015 (0)

Facebook Twitter Google plus Email

Teme l'ebola e prende il bus «Errore, va chiamato il 118»

Migliorano le condizioni dell'uomo dopo il primo test negativo. Oggi nuovi esami. Il primario Grossi: «In casi simili state in casa»

Validazione

Processo di conferma o smentita di una notizia catturata dal sistema EBS e ritenuta un evento di rilevanza (per la salute pubblica).

- Chi valida?
- Quando?
- Esperienze e Strategie?



Un percorso di formalizzazione del sistema di sorveglianza basato su eventi



- Esperienze nella sorveglianza basata su eventi in Italia a complemento della sorveglianza delle malattie infettive
- Prima applicazione sistematica di una validazione degli eventi

Scopo



Rafforzare la cultura *dell'Epidemic Intelligence*

Iniziare a sviluppare un *network italiano* di referenti per la ricezione e validazione di eventi

GRAZIE