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# Surveillance, Response, and The Role of Health Informatics

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LOCALLY ROOTED, GLOBALLY RESPECTED



# Outline

- Epidemiology and Public health surveillance
- Framework of public health surveillance
- Disease and health systems surveillance
- Data as the core of public health surveillance
- Biomedical informatics
- Health informatics approach for public health surveillance

# John Snow, 1858 Cholera Map in London



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- Mapping of cholera patient in London
- Overlay with water source
- Make conclusion: water contamination
- Response immediate and planned
- Public health research known as epidemiology

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# Epidemiology and Public Health Surveillance



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- *Epidemiology is the **study** of the **distribution** and **determinants** of **health-related states or events** in **specified populations**, and the **application** of this study to the control of health problems*
- *“Public health surveillance is the systematic, ongoing **collection**, **management**, **analysis**, and **interpretation** of data followed by the **dissemination** of these data to public health programs to **stimulate public health action**” (International Epidemiology Association)*
- *“.....the ongoing, systematic collection, analysis, and interpretation of health data, **essential to the planning, implementation, and evaluation of public health practice**, closely integrated with the dissemination of these data to those who need to know and linked to prevention and control” (CDC)*

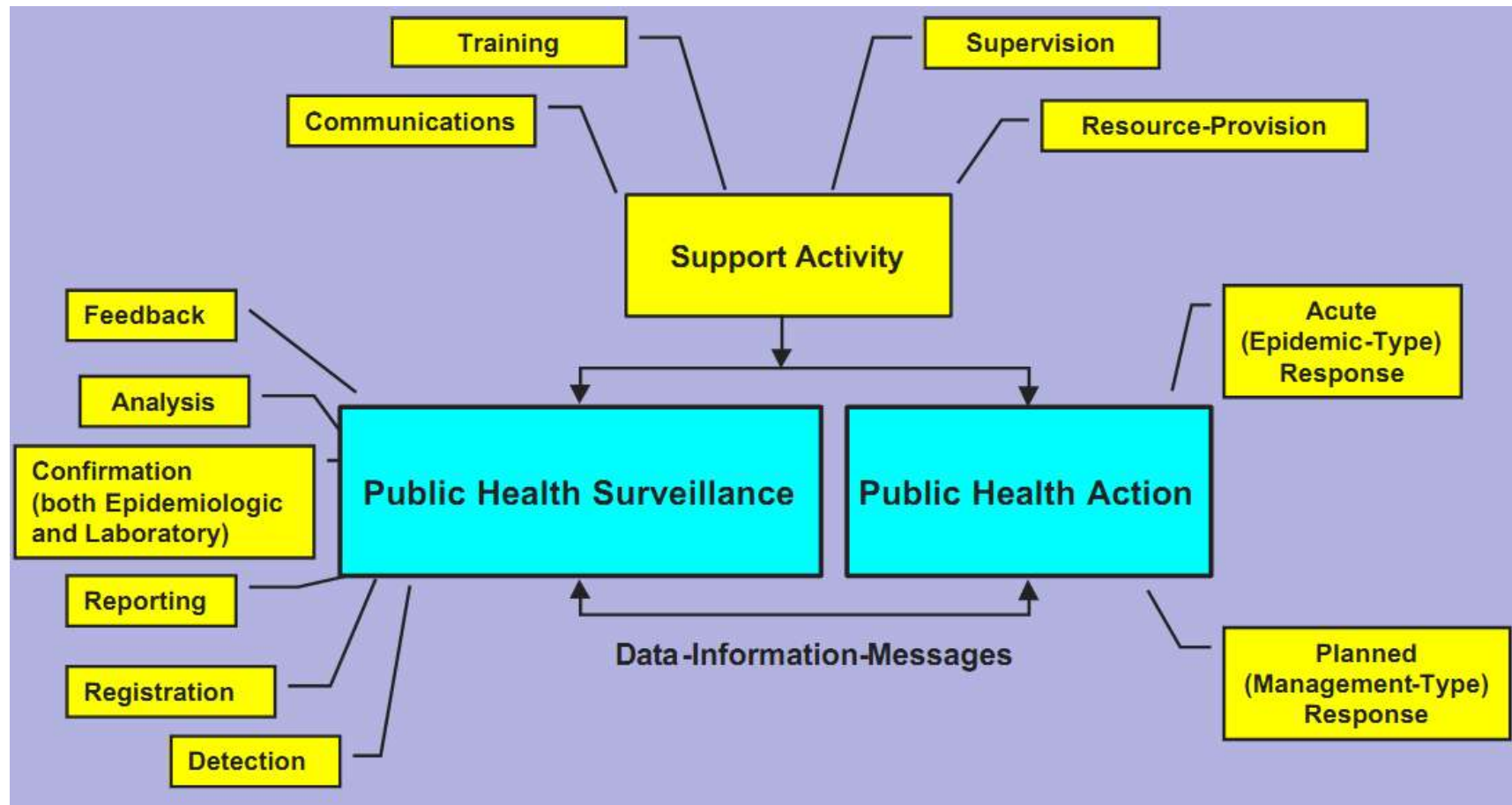
# Purpose of Public Health Surveillance



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- As a tool to estimate the health status and behavior of the populations
- To measure the need for interventions
- Directly measuring the effects of interventions.
- To provide information to guide interventions.

# Public Health Surveillance Framework

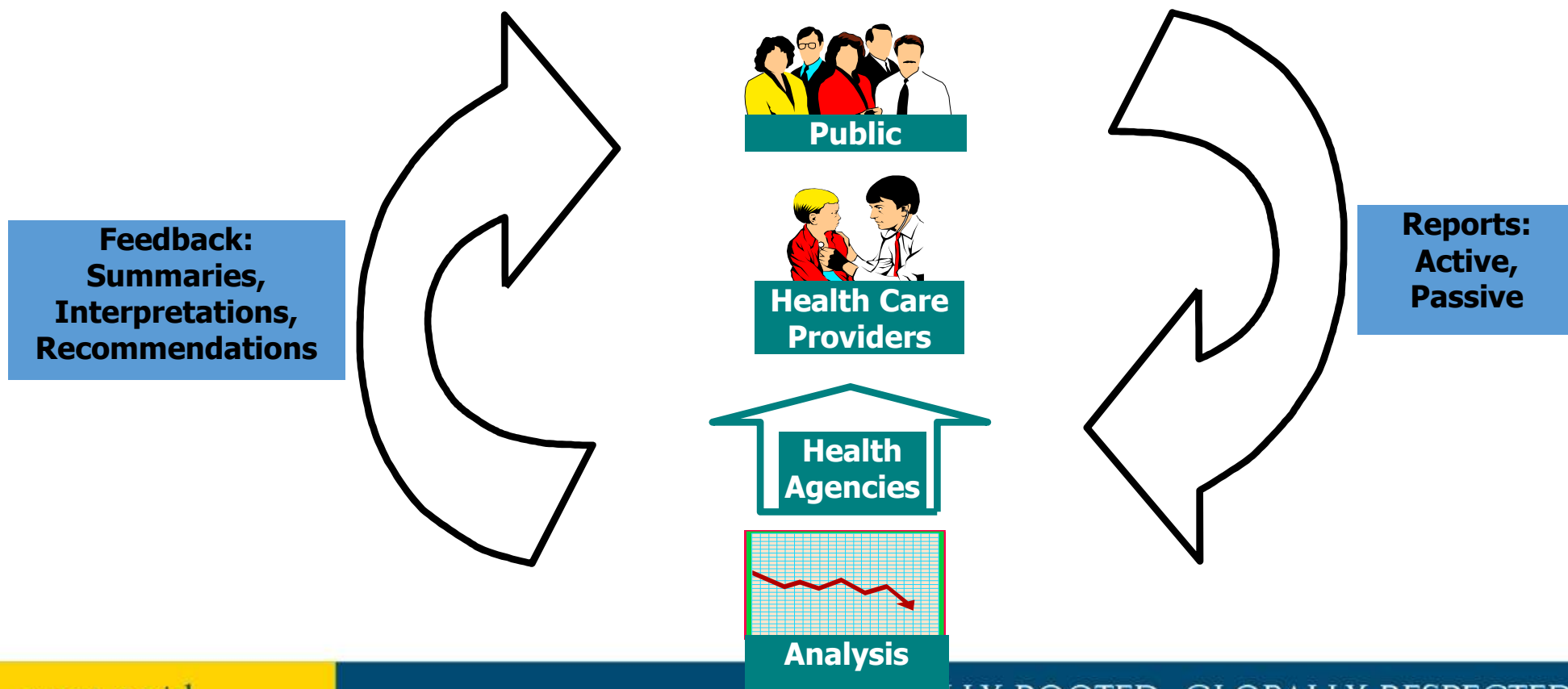


Conceptual framework of public health surveillance and action and its application in health sector reform  
Scott JN McNabb<sup>1\*</sup>, Stella Chungong<sup>2</sup>, Mike Ryan<sup>2</sup>, Tadesse Wuhib<sup>3</sup>, Peter Nsubuga<sup>4</sup>, Wondi Alemu<sup>5</sup>, Vilma Carande-Kulis<sup>6</sup> and Guenael Rodier<sup>2</sup>

# Information cycle in public health surveillance



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# Public Health Action (Surveillance Response)



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- Acute (epidemic-type) responses occur directly, reactively, and generally include immediate public health actions
  - epidemic investigation,
  - contact follow-up, or
  - targeted interventions designed to stop the ongoing transmission of disease.
- Planned (management-type) responses occur with periodicity over time and require a vision of future needs.
  - Examples of such responses include community public health education,
  - purchasing next year's immunization supplies,
  - ordering tuberculosis medication in anticipation of future needs, or
  - reallocating public health personnel and resources in response to changing trends of disease.

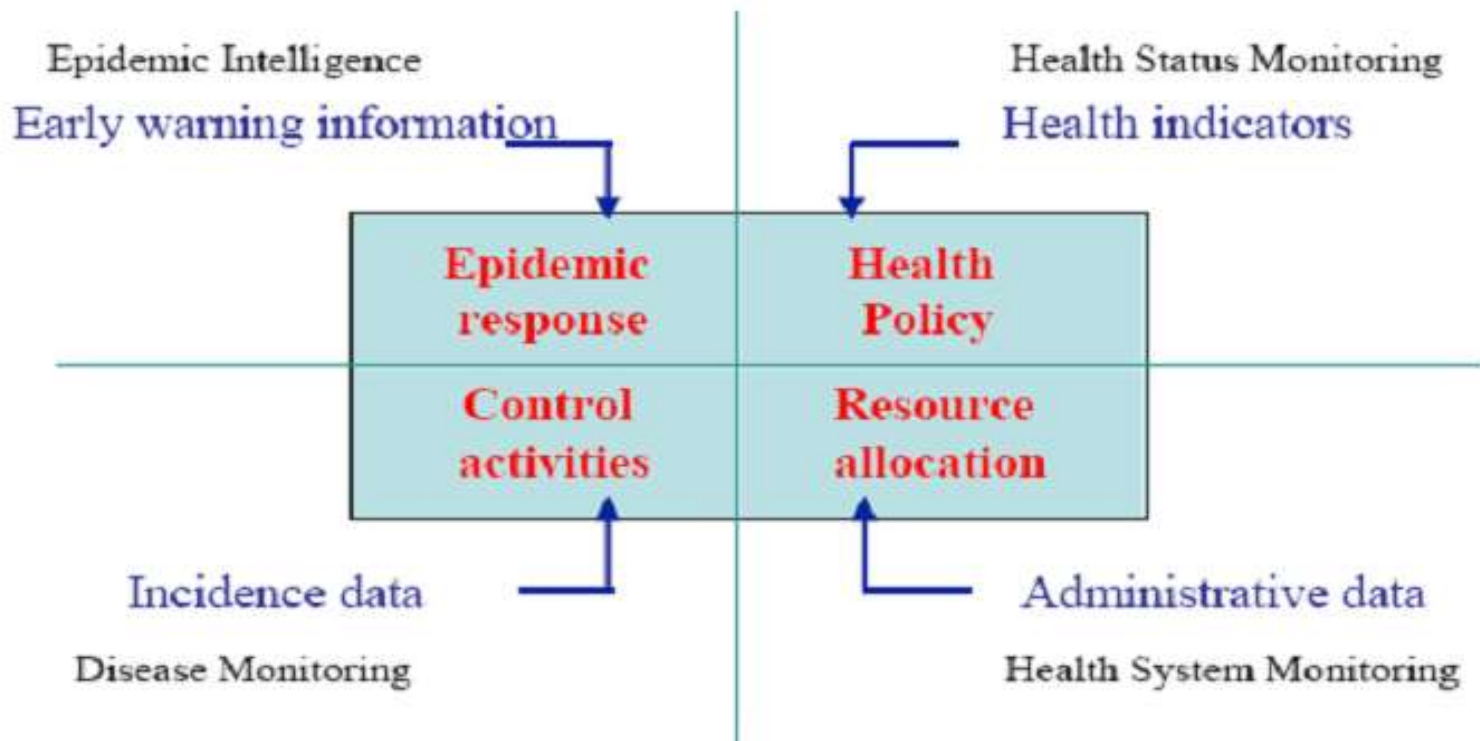




# Support Activity

- Communication
  - Data collection and transmission
  - Feedback
  - Dissemination of information
- Supervision and training
- Resource-provision
  - Reporting form
  - Trained personnel
  - Communication channel
  - .....

**Public Health Surveillance**  
Different Objectives, Different Data, Different Methods



From a presentation by Dr G Rodier, Director, Division of Communicable Disease Surveillance and Response, WHO at the WHO Global Consultancy on Surveillance meeting held in Geneva in October 2003. 4

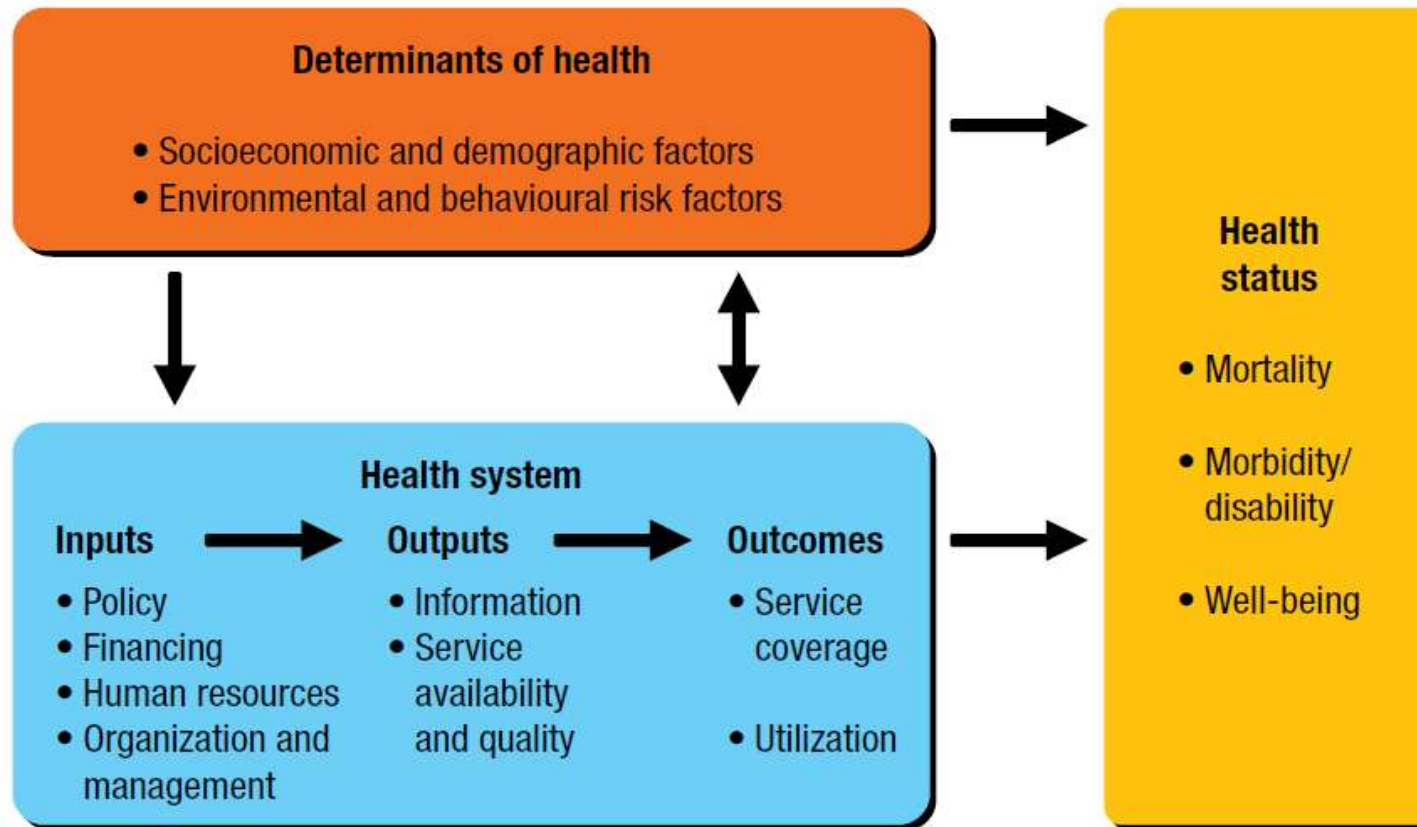
# Disease surveillance



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- To know a burden of the disease in a population at risk
- To understand natural course of disease
- To detect outbreak and epidemic
- To document the distribution of health events
- To test hypothesis for etiology of the disease
- To evaluate intervention strategy
- To monitor the changed of infection pattern and health care

# Health Systems Surveillance



# Data as the core of Public Health Surveillance



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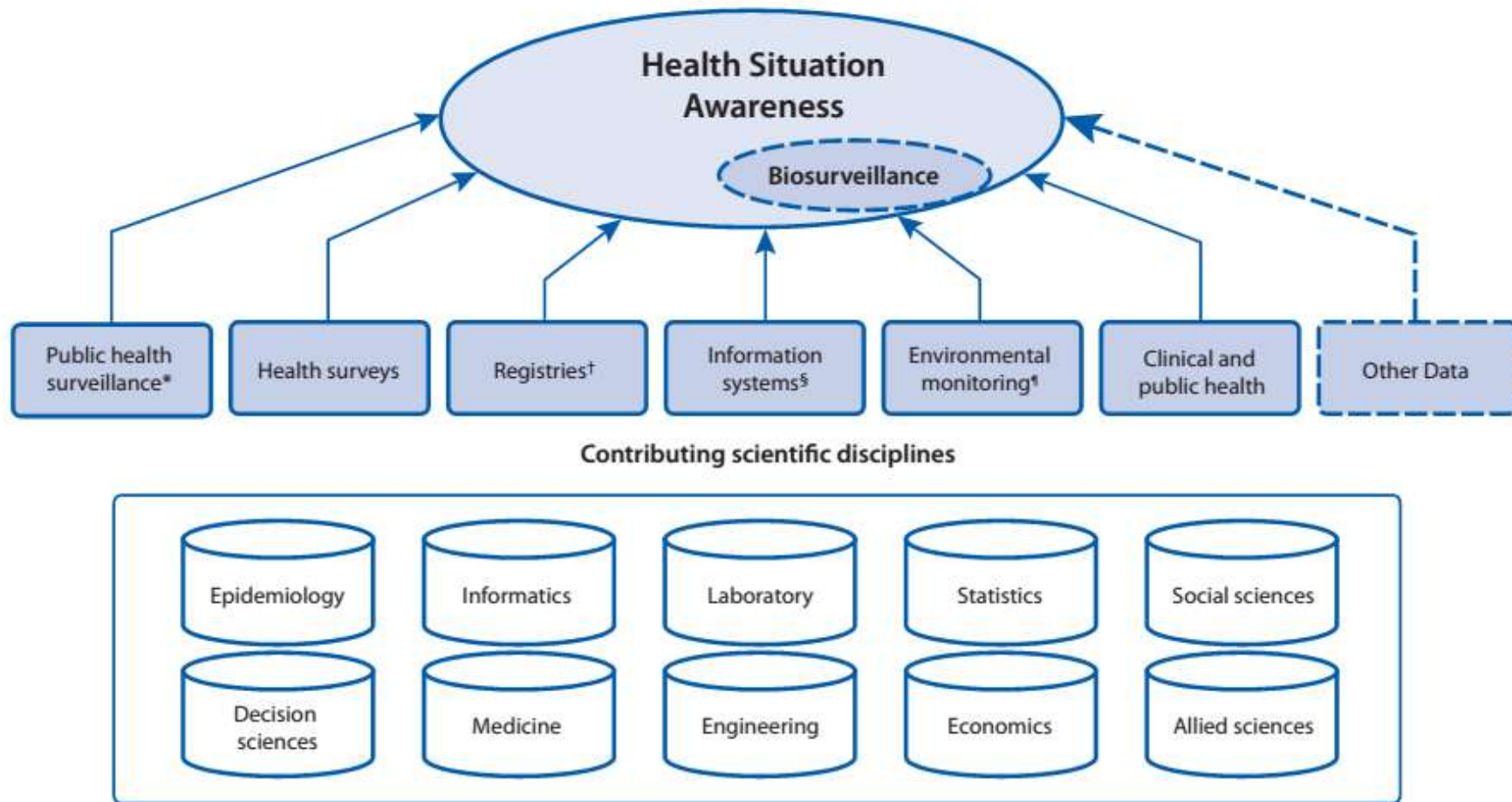
- Health data for detection of epidemics and other health problems in a community,
- Data to estimate the scope and magnitude of a problem, including the geographic and demographic distribution of health events
- Data to detect changes in health practices,
- monitor changes in infectious and environmental agents,
- evaluate control measures, and
- describe the natural history of a health event in a community that will generate hypotheses and stimulate applied research

# Data as the core of Public Health Surveillance



Health Metrics Network, WHO. 2008. Framework and standards for country health information systems. 2<sup>nd</sup> Ed.

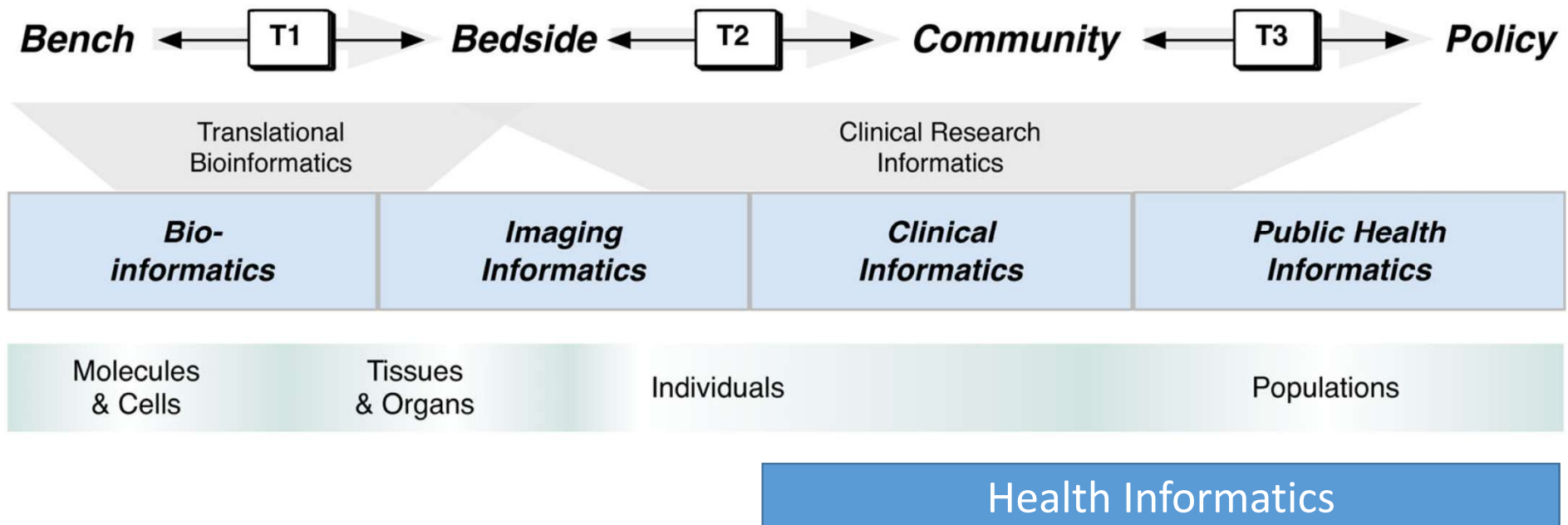
# Data as the core of Public Health Surveillance



# Biomedical Informatics in Perspective



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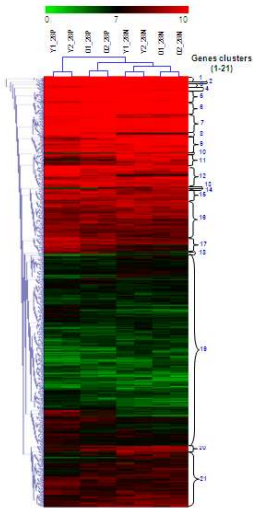


.... is the interdisciplinary study of the design, development, adoption, and application of IT-based innovations in healthcare services delivery, management, and planning (NLM)



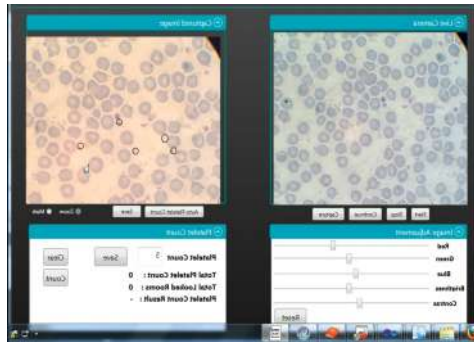
## Bioinformatics Molecular Cellular

- Sequence analysis
- Microarray data analysis



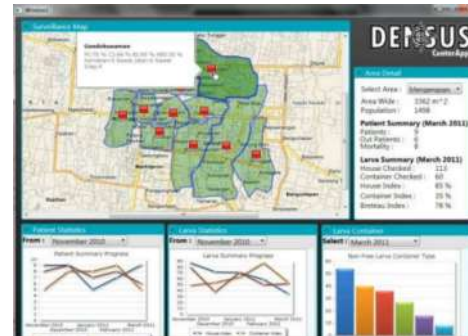
## Imaging Informatics Tissues, Organs

- Pattern recognition for Dengue platelet calculation



## Clinical Informatics Individual Patients

- Electronic health record
- Telemedicine
- Clinical Decision Support System



## Public Health Informatics Populations

- Dengue Surveillance System
- Mobile Larvae Tracker for Dengue Surveillance



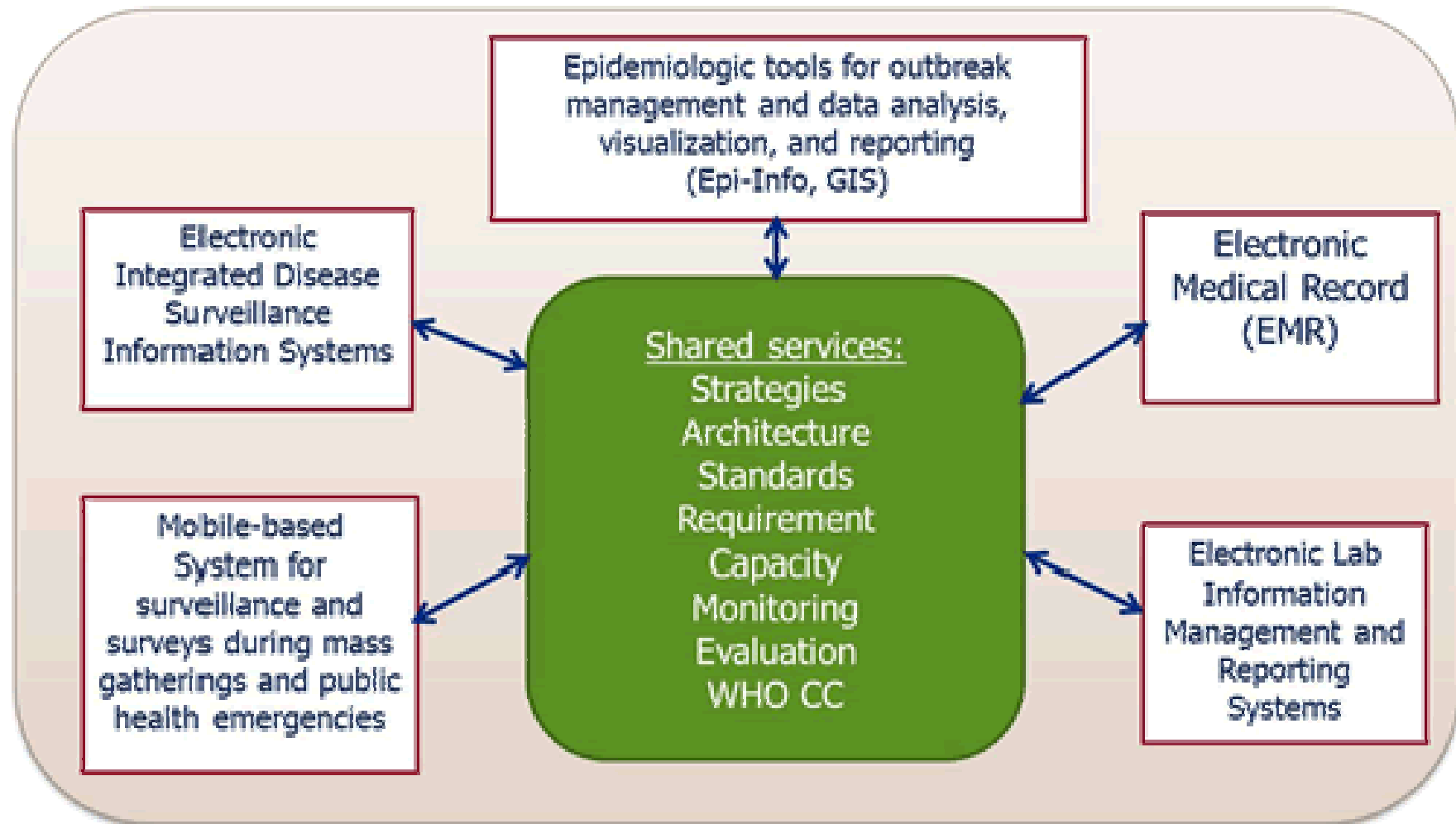
# Public Health Informatics



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- Public health informatics has been defined as the systematic application of information and computer science and technology to public health practice, research, and learning (O'Carrol, 2002)
  - Facilitating the availability of timely, relevant, and high-quality information
  - Improve quality of data
  - Better analyze and visualize public health information

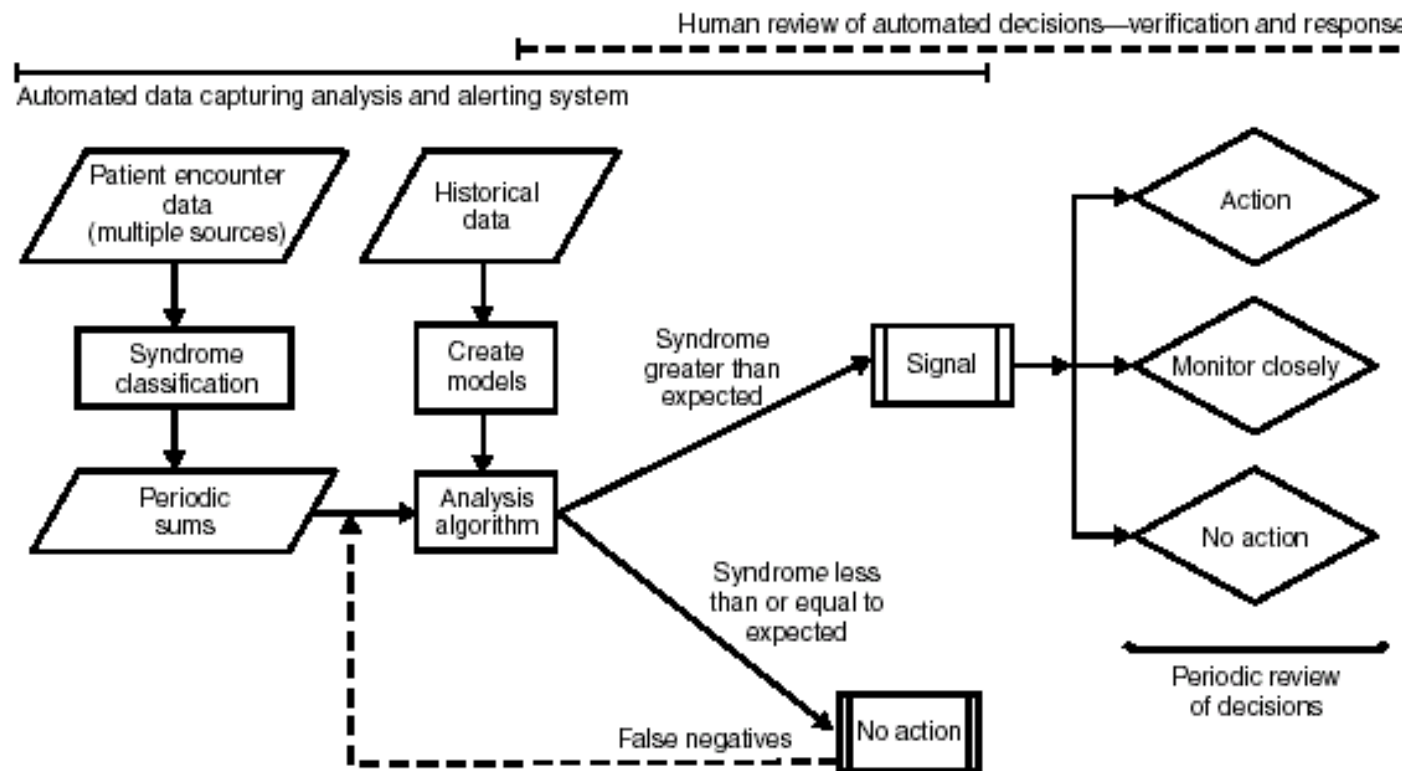
# Information Systems for Support of Public Health Practice



# Syndromic Surveillance Systems



FIGURE 2. Prototypical surveillance data flow chart for emergency department encounters



# Google Flu Trend



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google.org Flu Trends

Language: English (United States)

[Google.org home](#)

[Dengue Trends](#)

**Flu Trends**

Home

Select country/region

[How does this work?](#)

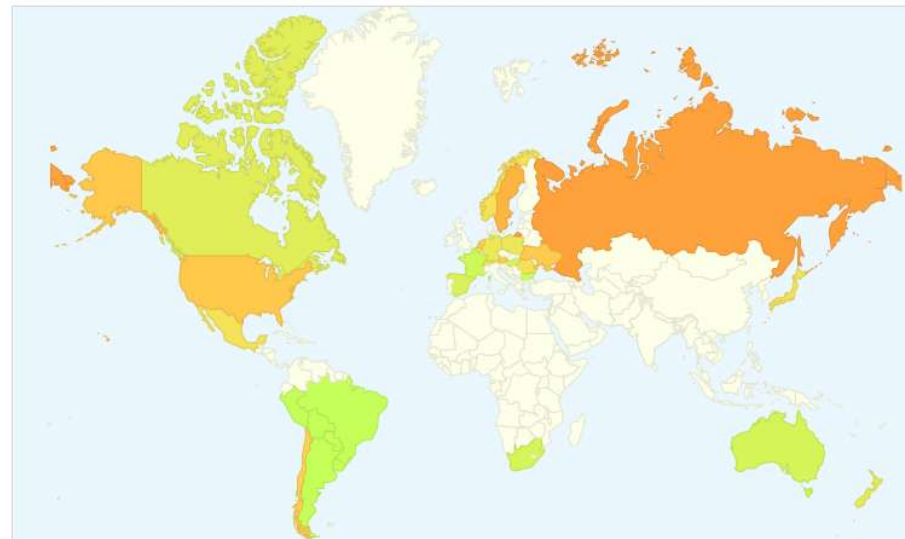
[FAQ](#)

**Flu activity**

Intense  
High  
Moderate  
Low  
Minimal

## 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](#)



Short Paper

## Using Social Media to Perform Local Influenza Surveillance in an Inner-City Hospital: A Retrospective Observational Study

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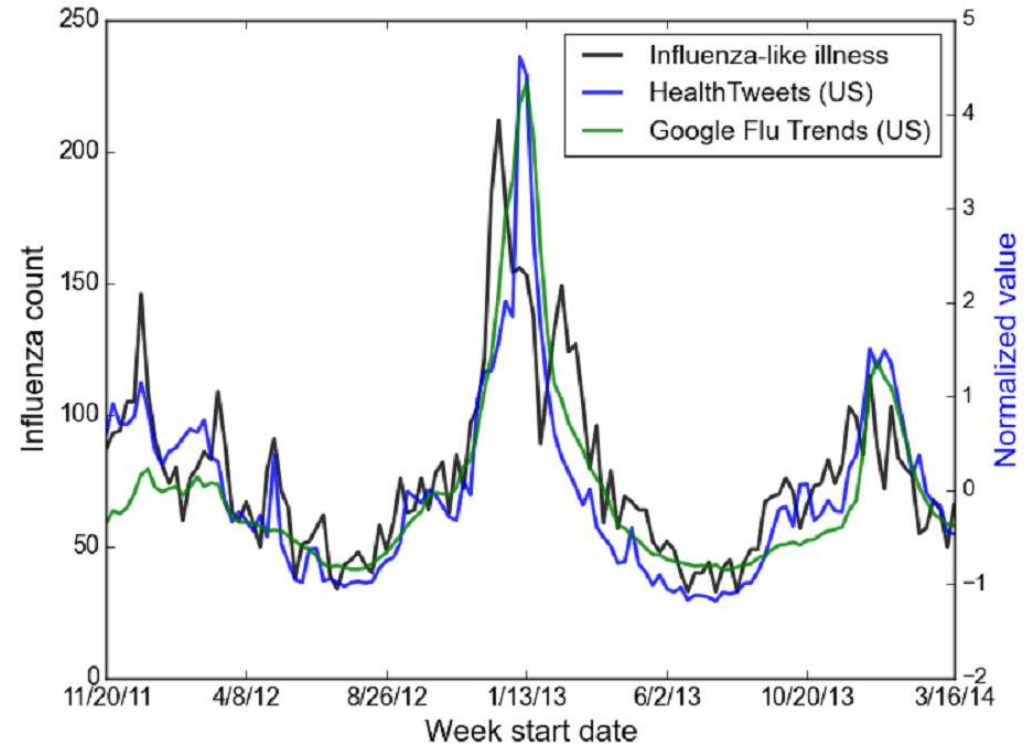
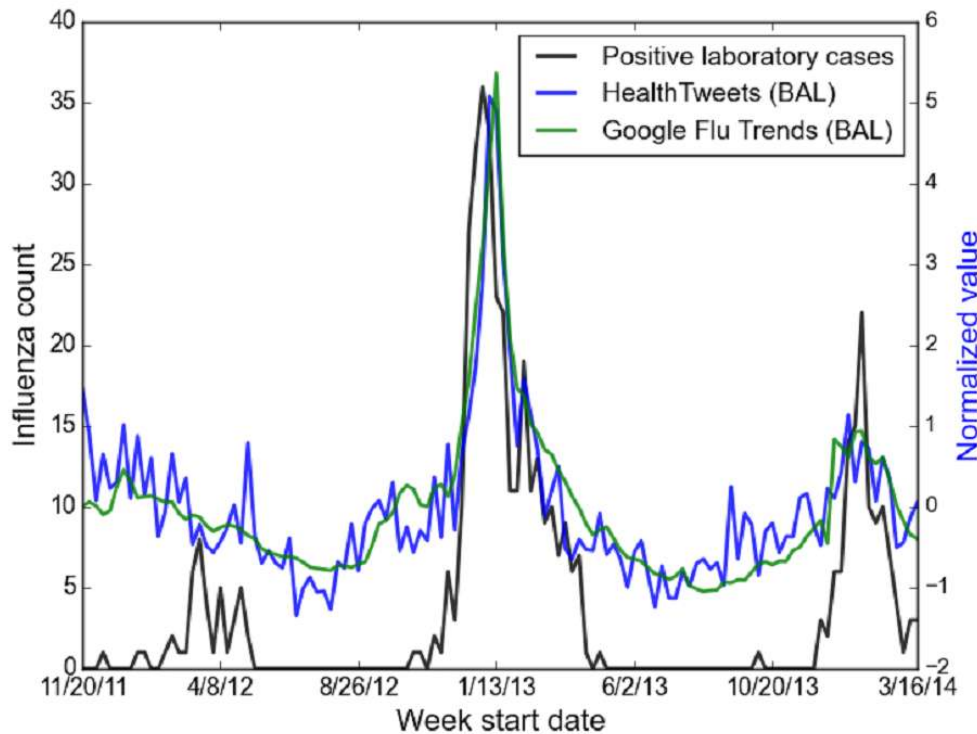
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# Using Social Media to Perform Local Influenza Surveillance



# Health informatics role in Dengue Surveillance



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- Using electronic event-/search query-based surveillance for early detection of increased dengue activity
- Using the appearance of a new dengue serotype/genotype as an alert signal for dengue outbreaks
- Using syndromic surveillance to create alert signals for dengue outbreaks
- Use of other sentinel site-based approaches to increase capacity for outbreak detection



# Reference



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