UiT

THE ARCTIC
UNIVERSITY
OF NORWAY

The Snow communicable disease outbreak detection approach

Stein Olav Skrøvseth
Kassaye Y. Yigzaw
Torje Starbo Henriksen
Lars Ilebrekke
Per Atle Bakkevoll
Gunnar Skov Simonsen
Tore Gutteberg
Johan Gustav Bellika

HelseIT 2013, Trondheim

UNIVERSITY OF TROMSØ

Overview

- Introduction
- Data sources
- Outbreak detection
- c-SiZer algorithm
- Discussion

Introduction

- Early outbreak detection
- Microbiology lab results
- Diagnosis data

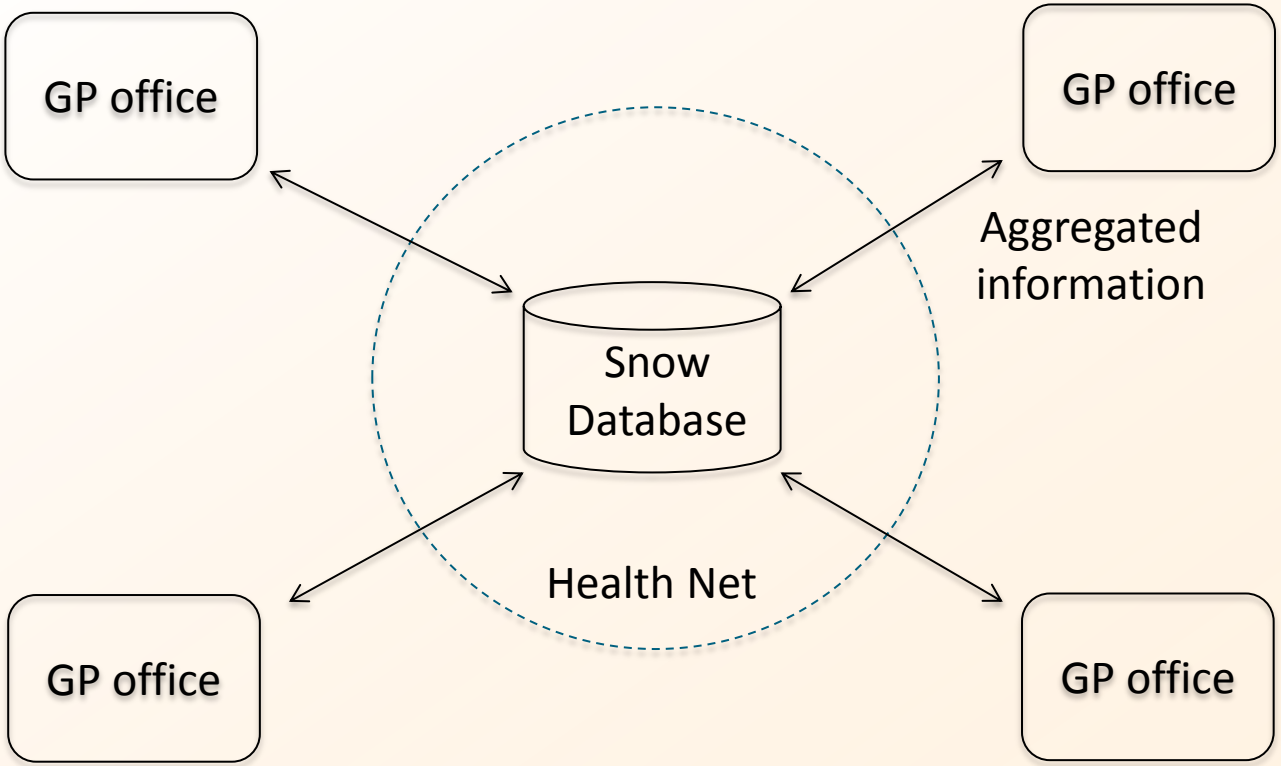
Diagnosis data

- Consultation data from GP offices
- Each GP office provides electronic access to their data
- Extract Respiratory (i.e. ILI) and gastrointestinal diagnosis dataset every night
- The extracted dataset contains: date, type, pseudonymised identifier, and diagnosis codes

Diagnosis data (2)

- At each GP office we compute (i.e. sum) on the extracted dataset
- Only computation result (aggregated information) leave the data owner
- Combine the intermediate result from all GP
- The combined result of all GP offices data is available at http://snow.cs.uit.no and http://snow.nhn.no in the health net

Architecture



Outbreak detection

- Similarly, we compute the percentage of consultations of given symptom group in one day
- For example, the percentage of influenza like illness (ILI) consultations
- When the value exceeds 1.4%, it may signal an epidemic situation
- In the same manner as our national sentinel surveillance system for Influenza like illness

Outbreak detection (2)

- Detection based on diagnosis data precede the lab data a minimum of 1-2 days, depending on the geographical location
- However, the diagnosis data is not confirmed

Laboratory data

- Microbiology laboratory, University Hospital of North Norway (UNN)
- 44 municipalities in Troms and Finnmark counties
- Weekly aggregated test results
- Different disease agents

c-SiZer Algorithm[1]

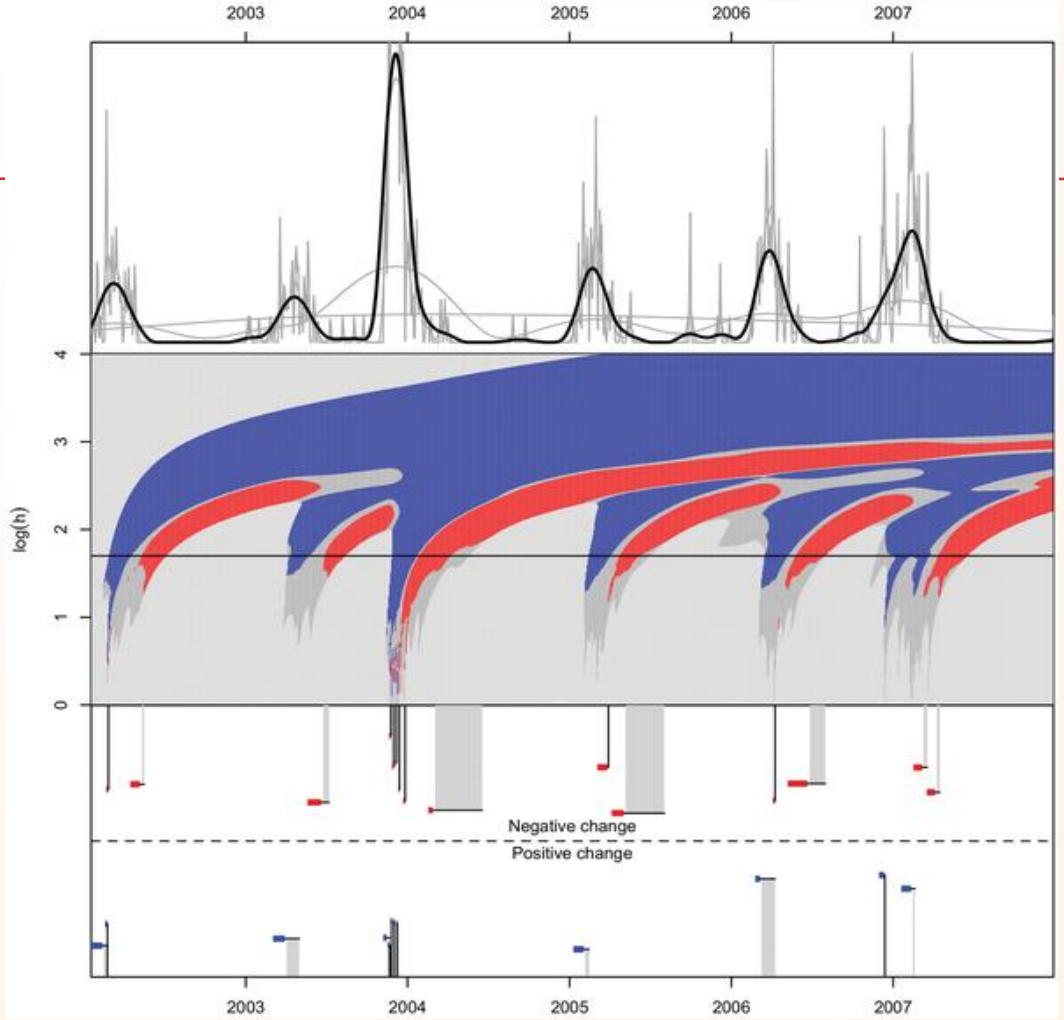
- The lab data is used as an input
- Identify significant changes in the data that possibly lead to outbreak
- Before the beginning of outbreak there are few disease cases
- No priori knowledge of the scale of an outbreak
- How fast the situation changes from normal to abnormal
- The scale varies between different infectious agents and even between seasons for seasonal diseases

Skrøvseth SO, Bellika JG, Godtliebsen F. Causality in scale space as an approach to change detection. PloS One 2012

c-SiZer Algorithm (2)

- Thus, cSiZer uses a multiscale approach where all the relevant scales are checked simultaneously
- Analyze whether there is a significant deviation for any time t and scale h
- Gives a quick overview of the time and scale where significant changes occur

Figure 7. c-SiZer KDE analysis of the number of confirmed laboratory cases of influenza A in North Norway in the period 2002–2007.



Skrøvseth SO, Bellika JG, Godtliebsen F (2012) Causality in Scale Space as an Approach to Change Detection. PLoS ONE 7(12): e52253. doi:10.1371/journal.pone.0052253

Discussion

- Diagnosis and microbiology lab data is used for detection
- Patients privacy is preserved
- Early outbreak detection
- Improve public health preparedness and quality of care
- c-SiZer is general purpose model (regardless of infectious agent, outbreak season)
- If the scale is known in advance, the detection time could improve
- It provides very good detection time

Acknowledgement

- Microbiology laboratory, UNN
- IBM Norway and IBM France
- Godtliebsen Fred
- Tromsø Telemedicine Laboratory (TTL)
- Norwegian Center for Integrated Care and Telemedicine (NST)

Thank you!

Contact Information
Kassaye Y. Yigzaw
PhD student
University of Tromsø
kassaye.y.yigzaw@uit.no
+4796747253