

# Assessing the Accuracy of Physician Billing Claims For Use in Automated Syndromic Surveillance

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**McGill**



COLLÈGE DES MÉDECINS  
DU QUÉBEC

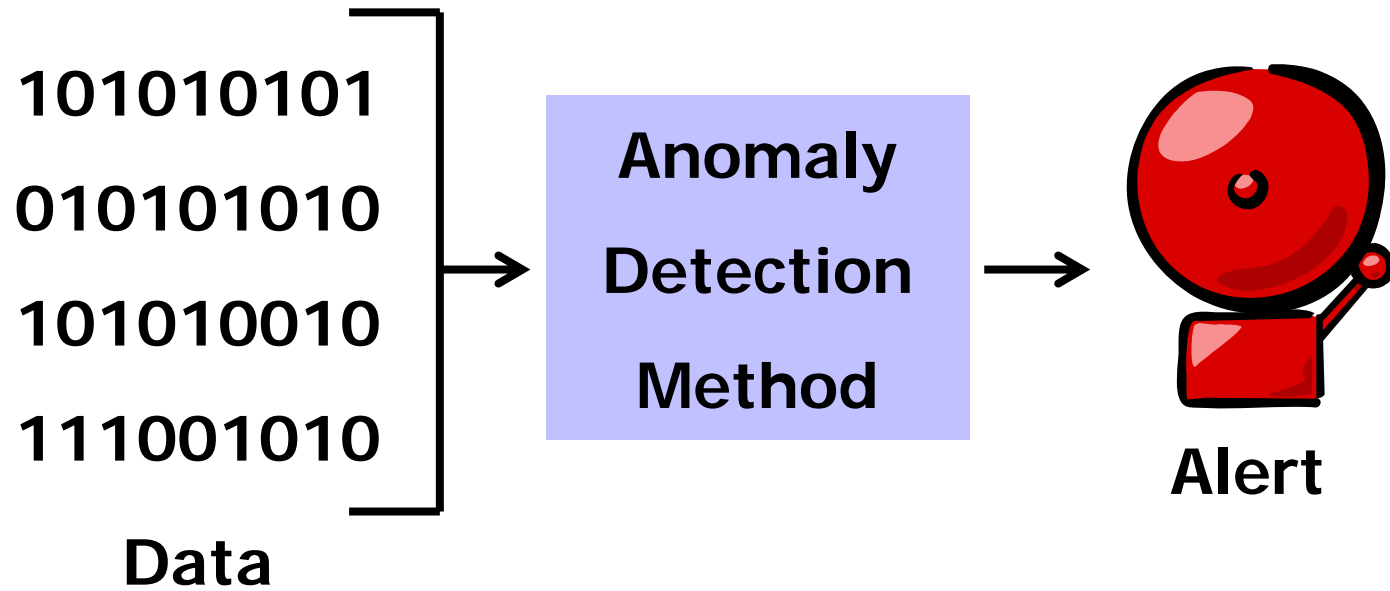
Agence de la santé  
et des services sociaux  
de Montréal

**Québec**



Santé publique

# Surveillance



# Syndrome definitions

Example: GI syndrome (CDC 2003, DoD)

## Conceptual definition

**ACUTE GI infection**  
*or*  
**SPECIFIC diagnosis of ACUTE GI distress**  
*or*  
**ACUTE non-specific GI symptoms**  
  
*Excluding*  
**CHRONIC conditions**

## Corresponding ICD-9 codes

005.9	Food poisoning NOS
008.4	Intestinal infection other
008.5	Bacterial enteritis NOS
008.6	Enteritis viral other
008.8	Enteritis viral NOS
009.0	Enteritis/colitis/gastro
009.1	Colitis/enteritis/gastro
009.2	Diarrhea infectious NOS
009.3	Diarrhea infectious origin
Etc.	...

# Concerns about ICD-9 code accuracy

- **ICD-9 codes are not audited**
- **Coding differences between physicians are expected**
- **Need to evaluate how accurately ICD-9 codes capture the reason for the clinical encounter**

# Previous work by others

Assessing accuracy using the chart as the gold standard

## RODS

(Chapman, 2005)

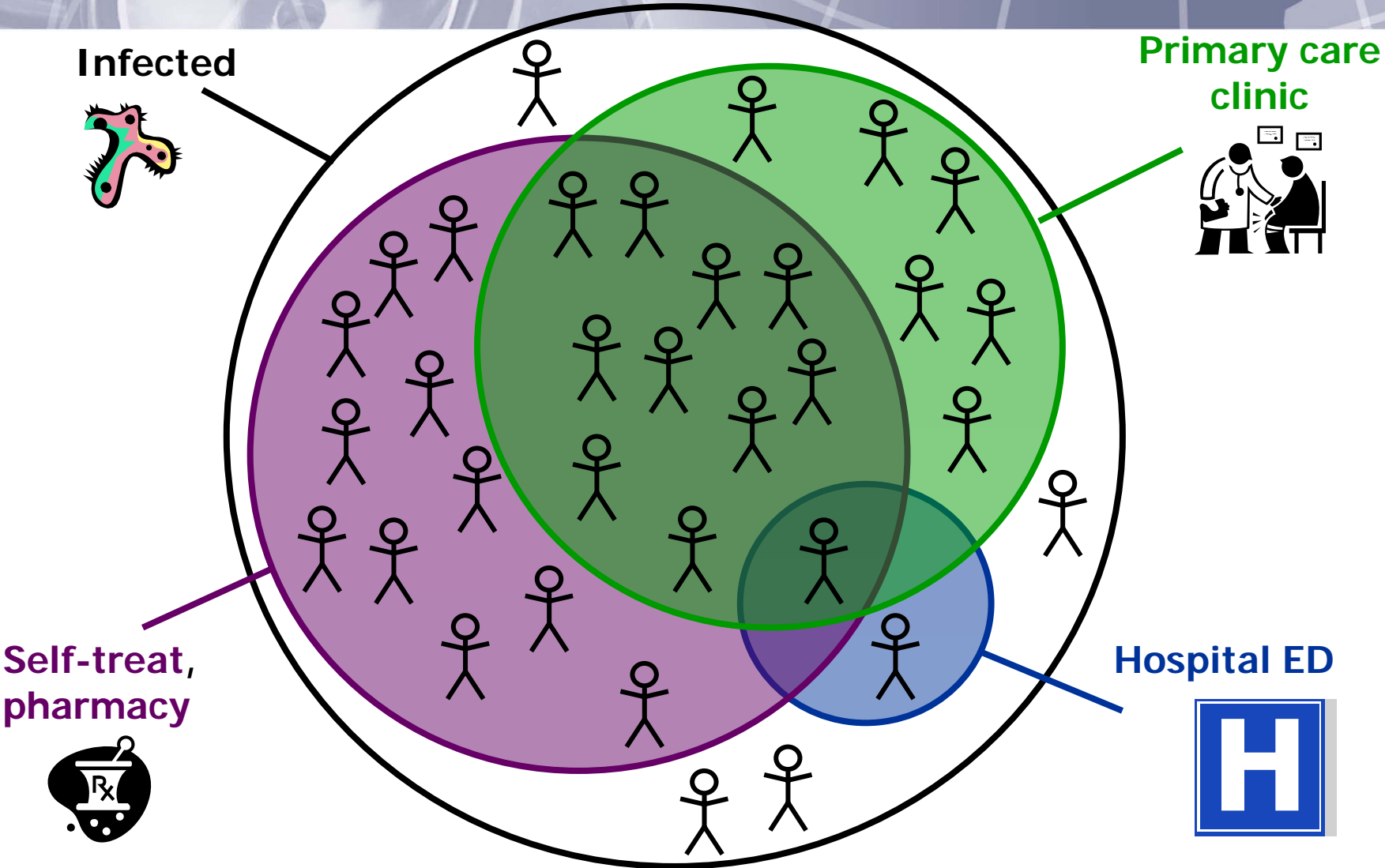
- 7 syndromes
- 1,557 visits
- 1 emergency dept (ED)
- ICD-9 coded discharge diagnoses Vs. dictated transcribed ED reports (MARS database)
- Sensitivity 0.24-0.66
- Sensitivity underestimated due to sampling/analysis

## ESSENCE

(Betancourt, 2007)

- 3 syndromes
- 2,474 visits
- 3 military hospital EDs
- Electronic ICD-9 code submitted to ESSENCE Vs. ED medical records
- Sensitivity 0.66-0.89
- Sensitivity overestimated due to verification bias

# Opportunities for early detection



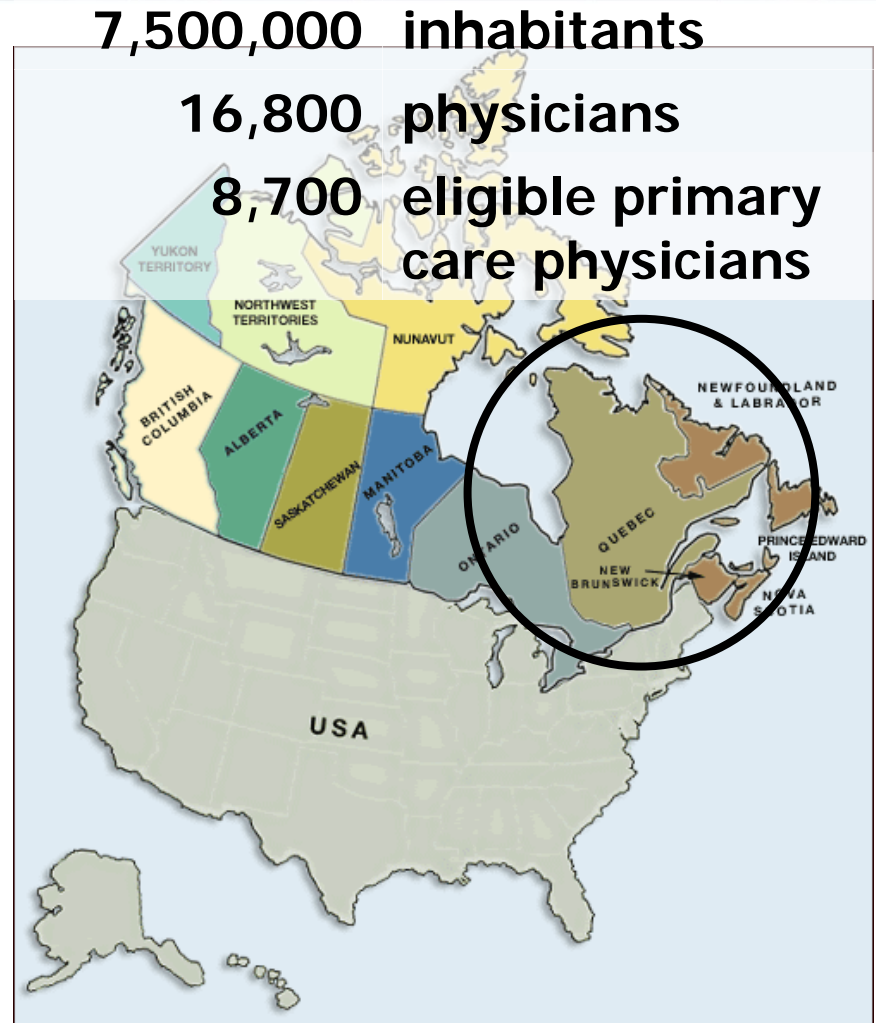


# **Study objective**

**To assess the accuracy of  
ICD-9 codes from primary care  
physician billing claims  
for identifying syndromes  
by comparison to medical records**

# Setting

- All community-based, primary care practices in the province of Quebec
- All patient visits to these practices from 10/2005 to 10/2007



# 5 syndromes to be validated

- Botulism-like
- **Constitutional (fever)**
- **Gastrointestinal**
- Hemorrhagic
- Localized cutaneous lesion (e.g. anthrax)
- Lymphadenitis (e.g. plague)
- **Neurological**
- **Rash**
- **Respiratory**
- Severe illness or death potentially related to infectious disease (e.g. shock)
- Specific infection (e.g. scarlet fever)

# Overview of data collection

Régie de  
l'assurance maladie

Québec



Step 1: RAMQ sends  
anonymized file of all  
visits to be validated



McGill  
Research team

Step 2: RAMQ sends  
list of sampled  
physicians and visits to  
College of Physicians



COLLÈGE DES MÉDECINS  
DU QUÉBEC

(State Board)

Step 3: College of physicians  
sends recruitment packages  
and lists of sampled visits to  
physicians

Step 4: Physicians  
consent

Step 5:  
Data  
collection



# Sampling physicians & visits

- **Random sample of 3,600 primary care physicians**
  - GPs, internists, pediatricians, geriatricians, and general surgeons
- **Random sample of 36,000 claims, stratified by:**
  - 3,600 physicians
  - 5 syndromes
  - Syndrome present/absent (1:1 case-control ratio)
  - Syndrome ICD-9 code

# Syndrome prevalence

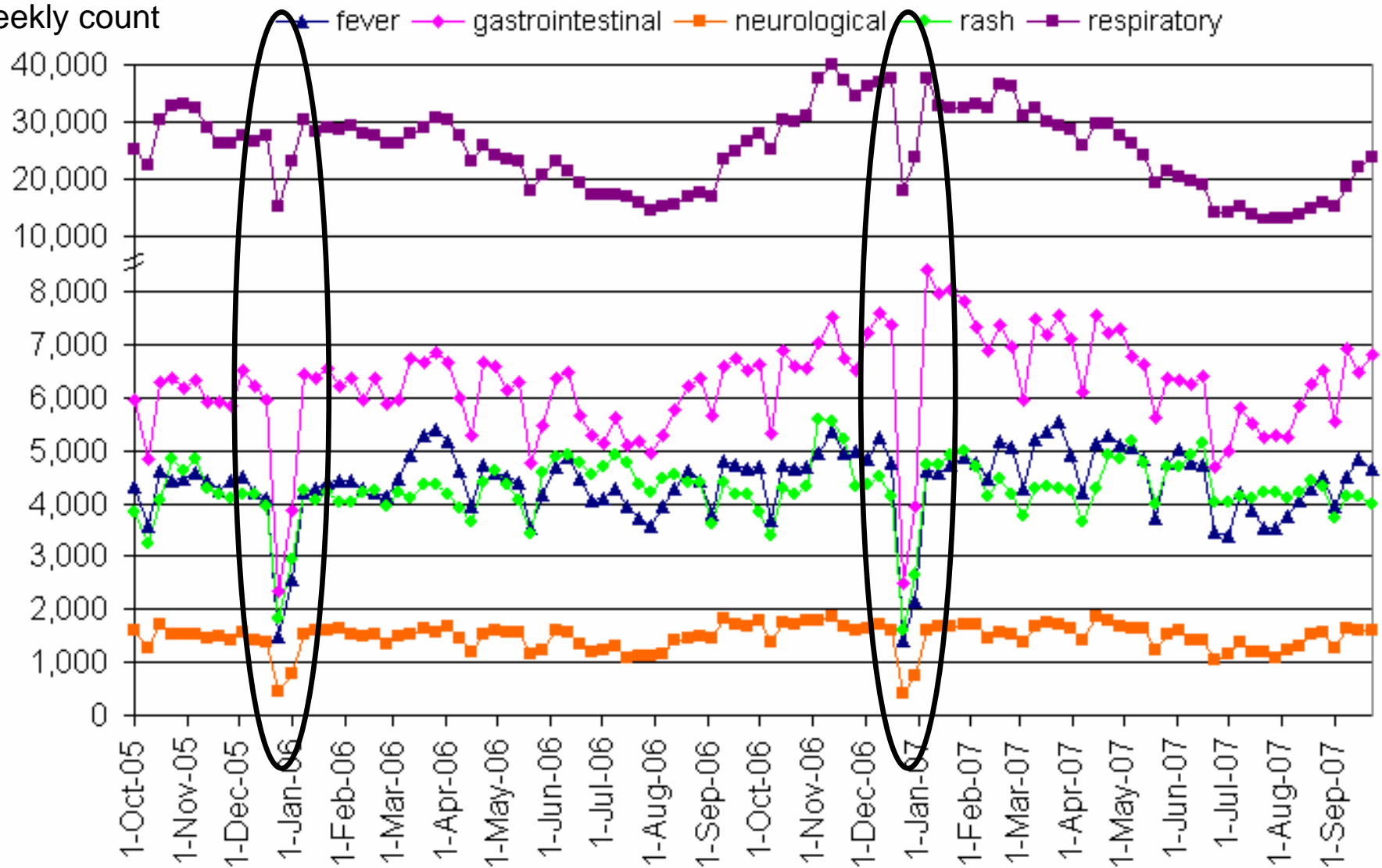
(N=30,370,924 claims)

Syndrome	Number of claims	Prevalence (per 1,000)
Fever	457,224	15.1
GI	646,376	21.3
Neurological	152,849	5.0
Rash	443,031	14.6
Respiratory	2,610,965	86.0
<b>Total</b>	<b>4,310,445</b>	<b>142.0</b>

# Syndrome seasonality

(n= 4,310,445 syndrome-positive claims)

Weekly count



# Sample of claims to be validated

(N=36,000)

Syndrome	Cases	Controls*	Total
Fever	3,225	3,895	7,120
GI	3,325	3,786	7,111
Neurological	3,199	3,880	7,079
Rash	3,268	3,821	7,089
Respiratory	3,850	3,751	7,601
<b>Total</b>	<b>16,867</b>	<b>19,133</b>	<b>36,000</b>

\*Month-matched to cases to avoid seasonal bias.

# Physician-facilitated chart review

## Double-blinded data extraction protocol

- **Interview**
  - Billing practices
- **Chart review**
  - Visit date
  - Complaint(s)
    - Suspected cause(s)
    - Symptoms
    - Signs
    - Key findings



# Initial results: participation

1,300 physicians invited since 10/3

- 193 (14.9%) agreed to participate
  - 135 completed the chart review
  - 58 chart review not yet completed
- 22 (1.7%) refused
- 30 (2.3%) wrong address
- 1,055 (81.1%) no reply

# **Initial results: date agreement (N=1,350 claims validated)**

- **1,304 (96.6%) match exact date**
- **18 (1.3%) match date  $\pm 3$  days**
- **28 (2.1%) no match**
  - **13 visits not found**
  - **6 charts not found**
  - **9 charts not accessible  
(stored elsewhere, destroyed)**

# Initial results: syndrome agreement

(N=1,322 claim-chart date-matched pairs)

Syndrome	Number of visits	
	Claims <sup>1</sup>	Charts <sup>2</sup>
Fever	123	90
GI	111	120
Neurological	117	85
Rash	117	115
Respiratory	133	232
None (controls)	734	748

<sup>1</sup> Some syndrome definitions overlap, i.e. some ICD-9 codes are included in more than one syndrome definition.

<sup>2</sup> Several possible complaints (syndromes) per visit.

# Initial results: syndrome agreement

(N=1,322 claim-chart date-matched pairs)

Syndrome	Number of visits	
	Claims <sup>1</sup>	Charts <sup>2</sup>
Fever	123	90
GI	111	120
Neurological	117	85
Rash	117	115
Respiratory	133	232
<i>ILI large+small group*</i>	68	141
<i>ILI small group*</i>	6	7
None (controls)	734	748

\* From Marsden-Haug *et al.* EID 2007.

# **Future work**

## **Determinants of ICD-9 code accuracy**

- **Physician characteristics**
  - Billing practices
- **Patient characteristics**
  - Age
  - Income and education
  - Comorbidity
- **Visit characteristics**
  - Setting
  - Day of the week

# Acknowledgements

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