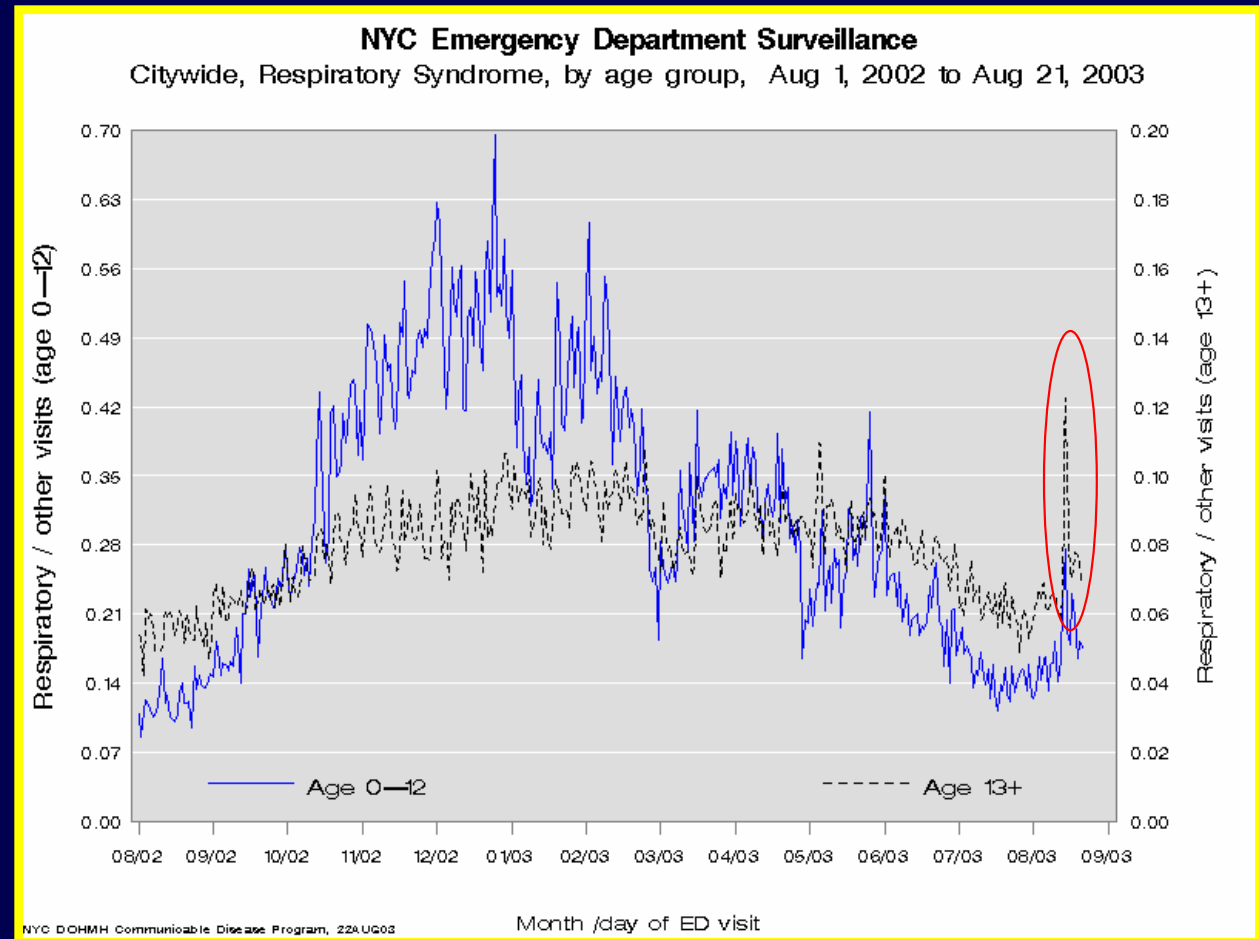


An Overview of Syndromic Surveillance



Community Health Care Association of New York State
Don Weiss, MD, MPH
Bureau of Communicable Disease
New York City Department of Health & Mental Hygiene
March 9, 2007

Disease surveillance:

The ongoing collection, analysis and dissemination of information on health, disease and its determinants, with the ultimate goal of preventing disease and promoting health

Methods:

- Passive vs. active
- Paper vs. electronic

Goals:

- Monitor disease rates & trends
- Risk factors & exposures

eURF <http://www.nyc.gov/html/doh/html/hcp/hcp-urf1.shtml>

NYC Department of Health & Mental Hygiene
Universal Reporting Form

To obtain more copies of this form call the Provider Access Line: 1-866-NYC-DOH1

Mail completed form to: NYC Dept. of Health & Mental Hygiene, 125 West Street, Room 315, CN-6, New York, NY 10013 • Or complete online: www.nyc.gov/html/nycdoh

Form 09-14 (REV 09)

DATE OF REPORT: ___/___/20__

PATIENT INFORMATION

Patient Last Name: _____ First Name: _____ M.I.: _____
 Patient AKA: Last Name: _____ AKA: First Name: _____ M.I.: _____
 Date of Birth: _____ Age: _____ Country of Birth: _____ Soc Sec No: _____
 If patient is a child, Guardian Last Name: _____ Guardian First Name: _____ M.I.: _____

Patient Home Address: _____ Apt. No: _____ Zip Code: _____ Borough: Manhattan Brooklyn Queens Richmond Staten Island NYC, borough unknown

Home Telephone Number: _____ Medical Record Number: _____
 Other Telephone Number: _____ Medical Number: _____
 Sex: Male Female Race (Check all that apply): Asian White American Indian/Alaska Native Unknown Black Other race Native Hawaiian/Pacific Islander Ethnicity: Hispanic (Check one): Non-Hispanic Unknown Please report non-NYC residents to the appropriate health jurisdiction: Not NYC (Specify City/State) Unknown

Admitted to hospital? Yes No Admission Date: ___/___/___ Discharge Date: ___/___/___ Is patient alive? Yes No If no, date of death: ___/___/___ Is patient pregnant? Yes No Unknown If yes, due date: ___/___/___

Risk Groups for Disease Exposure: Occupation: Children worker Construction worker Food service worker Health care worker Other DATE OF DIAGNOSIS: ___/___/___
 Institutional exposure: Nursing home resident Group or Day care Homeless shelter Correctional facility DATE OF ILLNESS ONSET: ___/___/___
 Unknown School Other Unknown

REPORTER INFORMATION

Name of Person Reporting Disease: _____ Phone Number: (____) _____-_____
 Street Address: _____ City: _____ State: _____ Zip Code: _____
 Name of Hospital/Healthcare Facility: _____ PRT Code: _____ Phone: (____) _____-_____
 Street Address: _____ City: _____ State: _____ Zip Code: _____
 Name of Testing Laboratory: _____ PRT Code: _____ Phone: (____) _____-_____
 Street Address: _____ City: _____ State: _____ Zip Code: _____
 Name of Physician: _____ Phone: (____) _____-_____
 Street Address: _____ City: _____ State: _____ Zip Code: _____

CAUTION If there is an outbreak or suspected outbreak of any disease or condition, of known or unknown etiology, which may be a danger to public health, occurring in three or more persons or any unusual manifestation of a disease in an individual, Call Provider Access Line 1-866-NYC-DOH1; after hours, Public Contact Center at 1-800-552-3222.

DISEASE (CODE) WITH SPECIAL INSTRUCTIONS

Annual files. Report immediately on "Report of Animal Bite" and "Report of Injury" or on-line at www.nyc.gov/html/doh/html/hcp/hcp-urf1.shtml. For assistance call 1-866-NYC-DOH1.

Anemia (AMN) (Enterovirus hemolytic only or cases in which E. histolytic cannot be distinguished from Entamoeba dispar) ***
 Arthritis (ART) ***
 Adrenal Infection (ARI) ** Specify organism: _____

Botulism (BOT) Brucellosis (BRU) ***
 Campylobacteriosis (CAM) ***
 Chlamydia: see STD section, page 2
 Chlamydia (CHL) ***
 Cryptosporidiosis (CSP) ***
 Cyclospora (CYC)

Diphtheria (DIP) ***
 E. coli O157:H7 (ECC) ***
 Ehrlichiosis (EHR) Specify: HSE HGE HUS HUS HUS
 Enterobacteriaceae (ENP) ***
 If due to animal bite, report under rabies

Enteritis (ENT) ***
 Enteric (ENR) ***

Gastroenteritis (GEO) ***
 Giardiasis (GIA) ***
 Gonorrhea (GON) ***
 Hemorrhagic fever (HF) ***
 Hemolytic uremic syndrome (HUS) ***
 Hepatitis A (HEP) ***
 Hepatitis B (HEB) ***
 Hepatitis C (HEC) ***
 IgE to HRP Yes No Neg Ind Unknown
 IgE to HRP Yes No Neg Ind Unknown
 IgE to HRP Yes No Neg Ind Unknown
 IgE to HRP Yes No Neg Ind Unknown

HIV-1 (HIV) Pos Neg Ind Unknown
 HIV-2 (HIV) Pos Neg Ind Unknown
 HIV-1/2 (HIV) Pos Neg Ind Unknown
 HIV-1/2 (HIV) Pos Neg Ind Unknown

Herpes (HER) Yes No Unknown
 Herpes (HER) Yes No Unknown
 Herpes (HER) Yes No Unknown
 Herpes (HER) Yes No Unknown

ACT (SPT) value: _____
 HbAg: Pos Neg Ind
 Give a separate report for each of the following: HbAg HbS HbF HbA1c

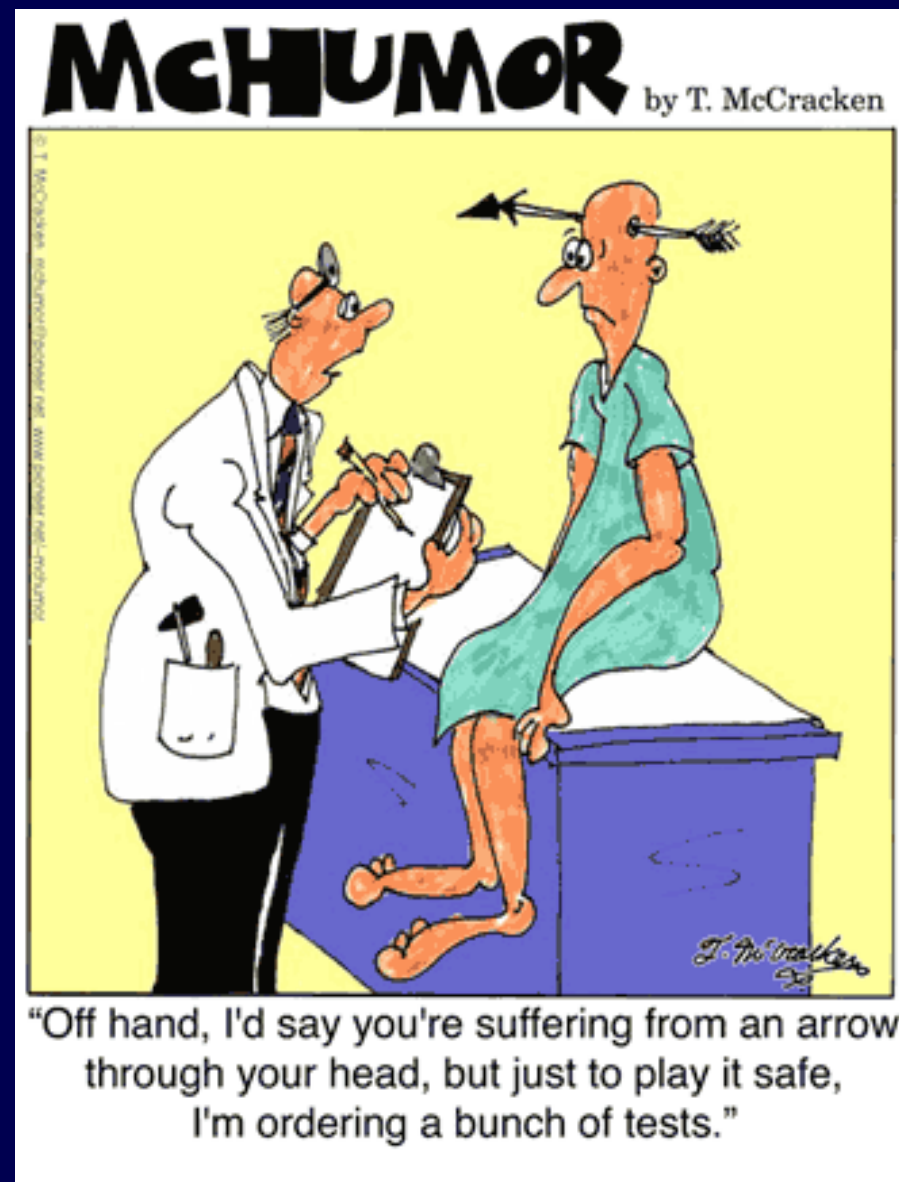
Hepatitis C (HEC) Report only confirmed cases: RNA pos RNA neg Other test not done
 Hepatitis C (HEC) Report only confirmed cases: RNA pos RNA neg Other test not done
 Hepatitis C (HEC) Report only confirmed cases: RNA pos RNA neg Other test not done
 Hepatitis C (HEC) Report only confirmed cases: RNA pos RNA neg Other test not done

ACT (SPT) value: _____
 ACT (SPT) value: _____
 ACT (SPT) value: _____
 ACT (SPT) value: _____

Created on 09/14/09

What is syndromic surveillance?

- Outbreak detection
- Timeliness
- Electronic & automated
- Pre-diagnostic data sources
- Categorization into “syndromes”
- Rapid & continuous analyses



Traditional vs. Syndromic Surveillance

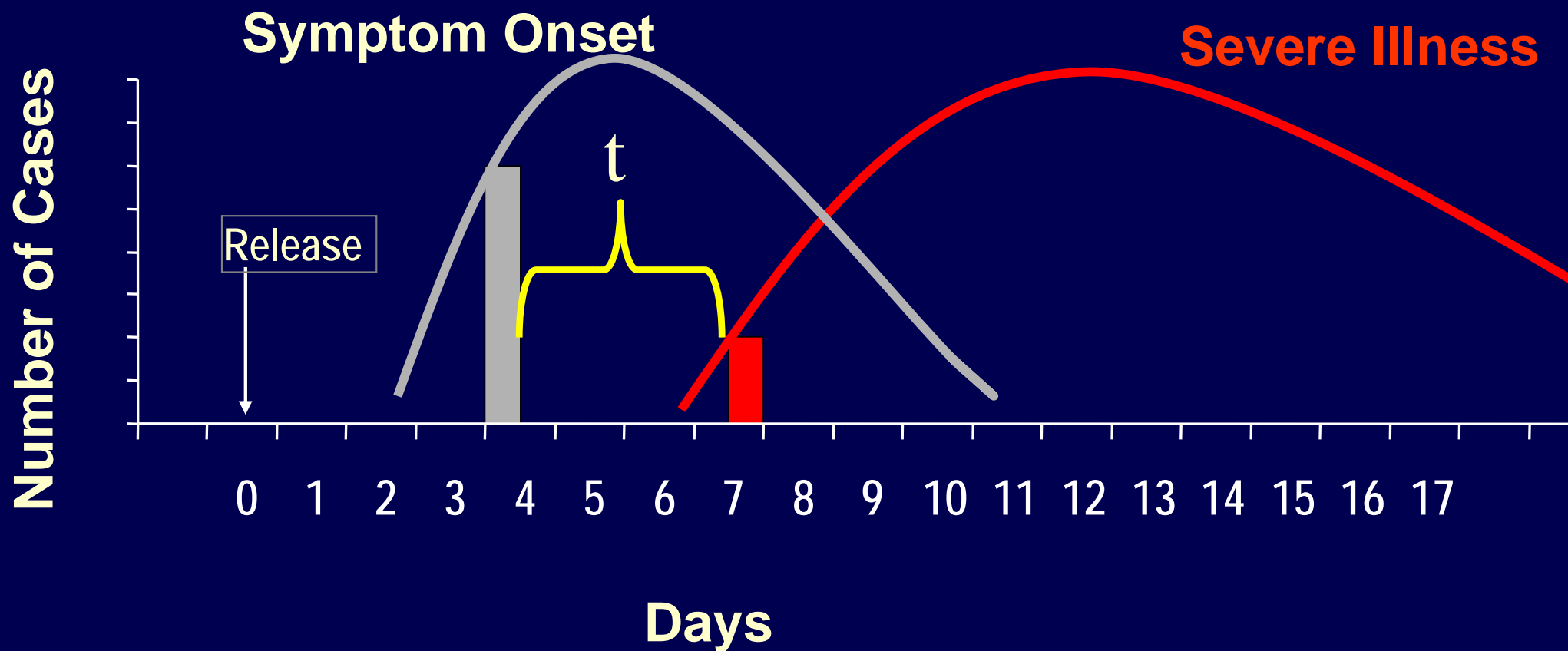
Traditional

- Lab/clinician diagnosis
- Passive, established, slow
- Main ID system
- Same in all states & territories
- Government
- Analyses are simple
- No special funding

Syndromic

- Constellation of symptoms
- Active, new, fast
- Adjunct system
- Sporadic, dissimilar
- Government, academia & for profit
- Analyses more complex
- Federal dollars

Theory



Theory

[1] Outbreak behavior

Sharp & sustained upslope of epidemic curve

[2] Health behavior

Early access to care

[3] Clinical patterns

Similarity of symptoms

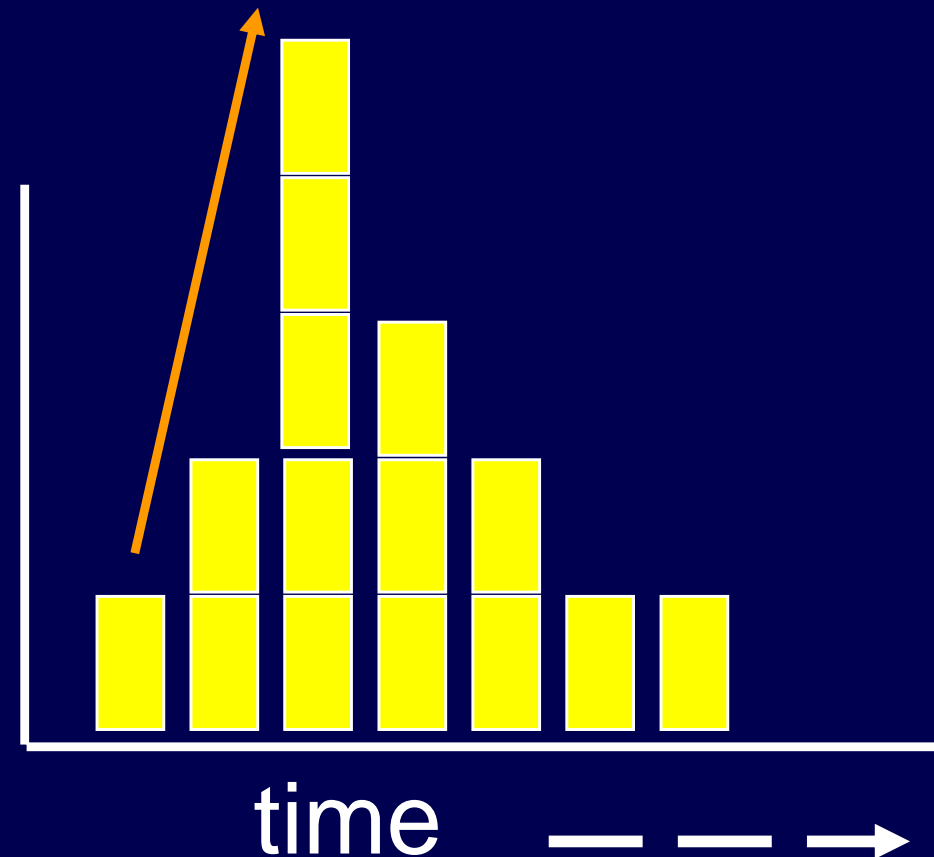
[4] Geographic patterns

Common exposure

[5] Data collection

Electronic format

Busy clinical staff



Data sources

Provider encounters

- ED
- Outpatient
- School Nurse

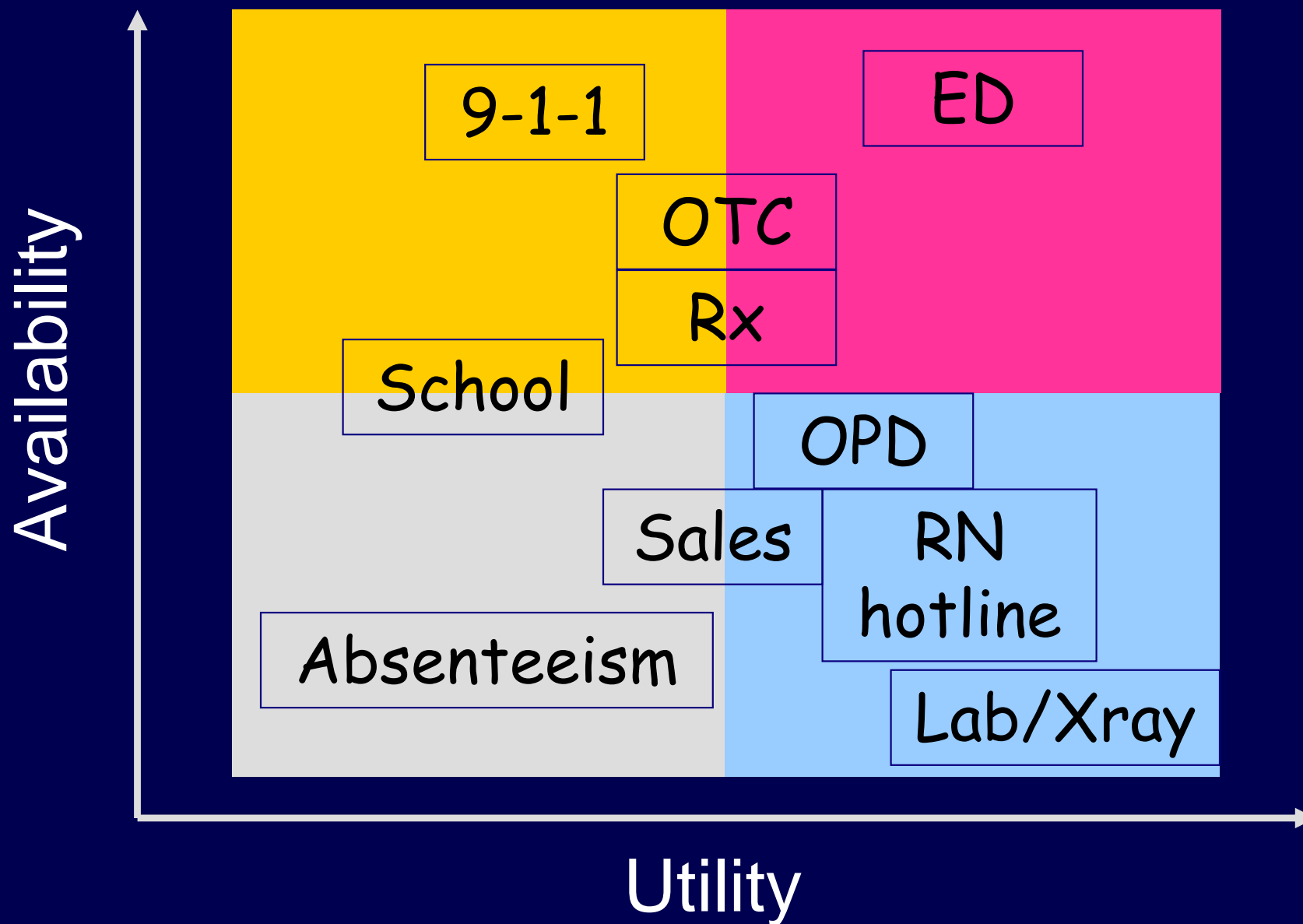
Commercial sales

- OTC medications
- Prescriptions
- Thermometers, diapers

Other health data

- 9-1-1 ambulance dispatch
- Laboratory/radiology
- HMO hotlines
- Worker absenteeism

Which data sources are best?



Privacy/Legal

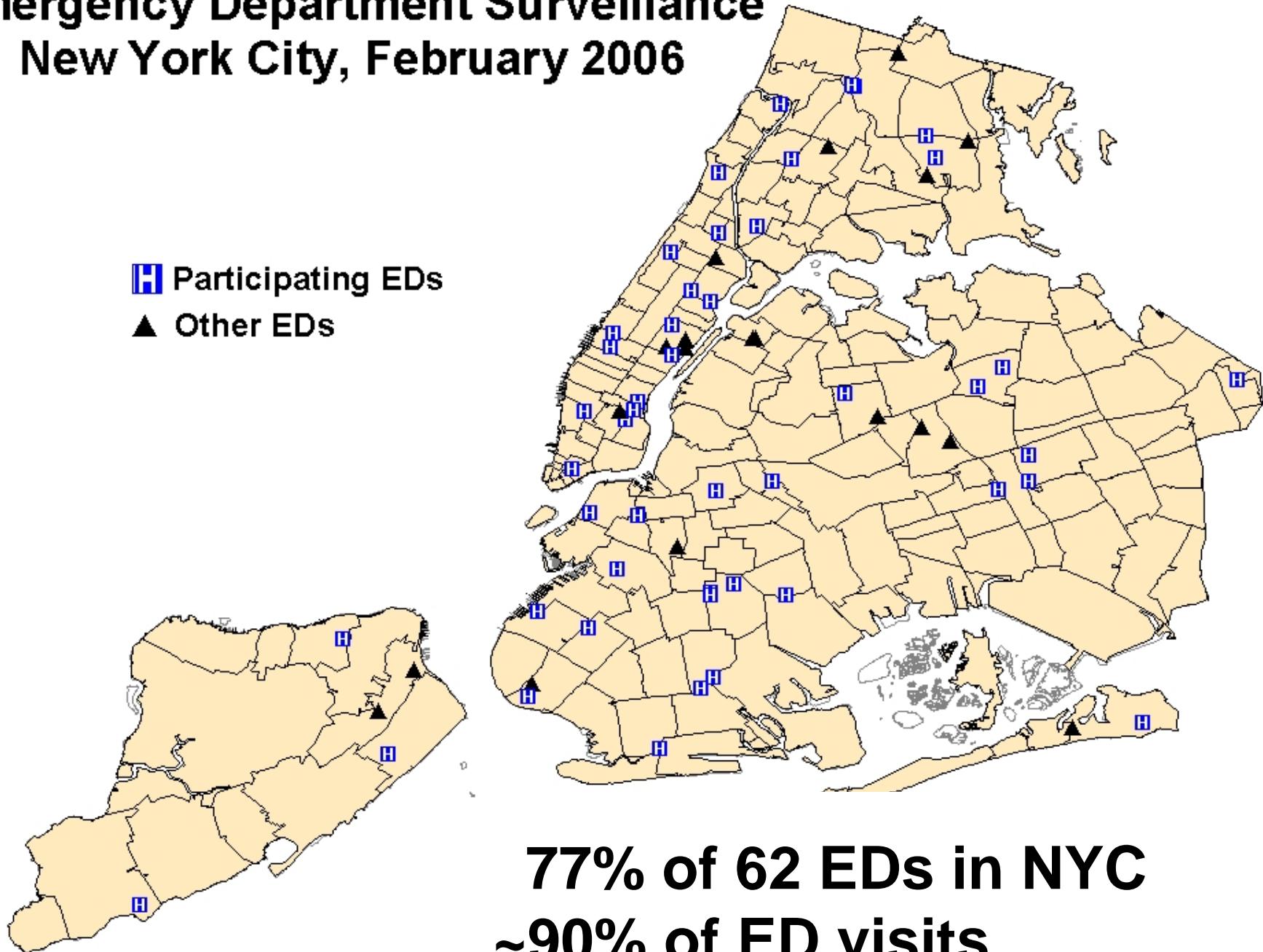
- NYC Health code: detect and investigate outbreaks
- Data files omit name, address, phone
- Need link to patient
- HIPAA allows reporting to public health
- Define “minimum data necessary” to protect the public’s health
- Evolving issue

NYC Systems

- ED
- OTC Pharmacy
- Rx pharmacy
- RODS Pharmacy
- 9-1-1 Ambulance dispatch
- HHC Outpatient
- School Nurse

Emergency Department Surveillance New York City, February 2006

 Participating EDs
 Other EDs



ED Data

<u>Age</u>	<u>Sex</u>	<u>Home Zip</u>	<u>Time</u>	<u>Chief Complaint</u>	<u>Discharge Diagnosis ICD9</u>
15	M	11691	01:04	ASSAULTED YEST	
1	M	11455	01:17	FEVER 104	
42	F	11220	03:20		
9	F	10013	22:51	ASTHMA ATTACK	493.9
48	M	10027	13:04	SOB AT HOME.	
66	M	10031	17:01	PT. CYANOTIC	

Syndrome coding

Based on chief complaint

Respiratory illness

key words: cough, shortness of breath, URI, pneumonia

excludes: cold symptoms

Febrile illness

key words: fever, chills, body aches, flu

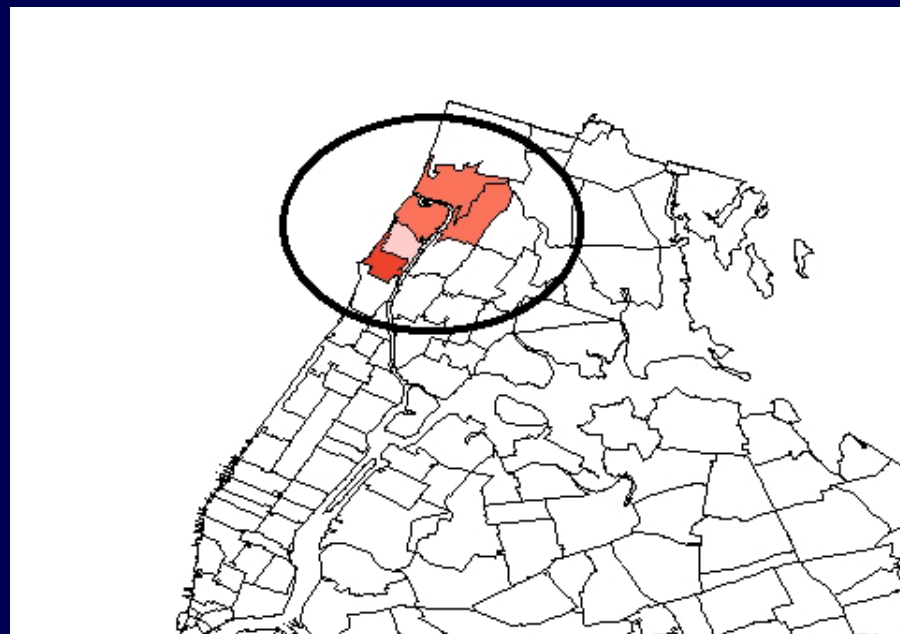
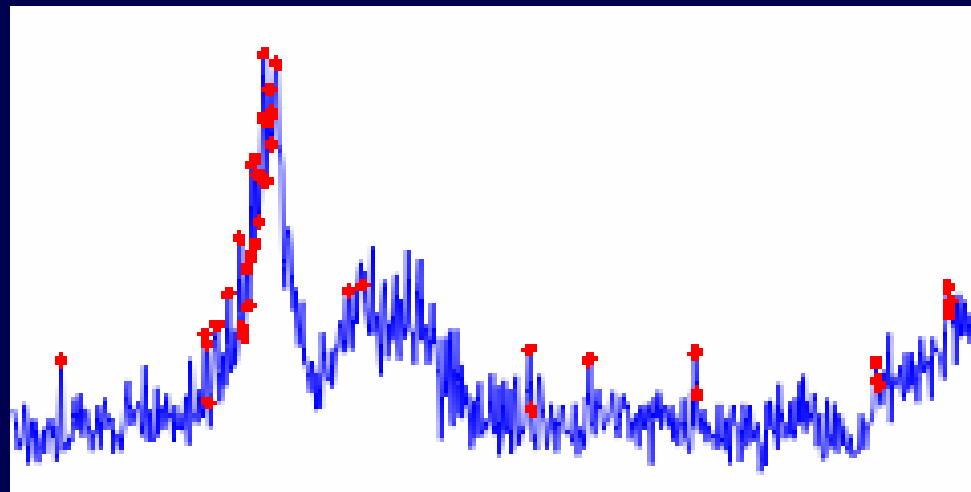
Gastrointestinal illness

key words: diarrhea, vomiting

excludes: abdominal pain, nausea

Daily statistical analyses

- Citywide temporal aberrations
- Spatial clusters



Results

Citywide

Citywide Signals by Syndrome and Year

Count

	year					Total
	2002	2003	2004	2005	2006	
Diar	30	24	43	59	30	186
Fevflu	31	38	51	42	16	178
Resp	36	56	69	69	70	300
Vomit	26	15	38	45	41	165
Total	123	133	201	215	157	829

Spatial signals by Syndrome and Year

Count

	year					Total
	2002	2003	2004	2005	2006	
Diar	16	16	11	14	23	80
Fevflu	13	21	7	16	10	67
Resp	11	8	7	4	6	36
Vomit	16	10	4	18	10	58
Total	56	55	29	52	49	241

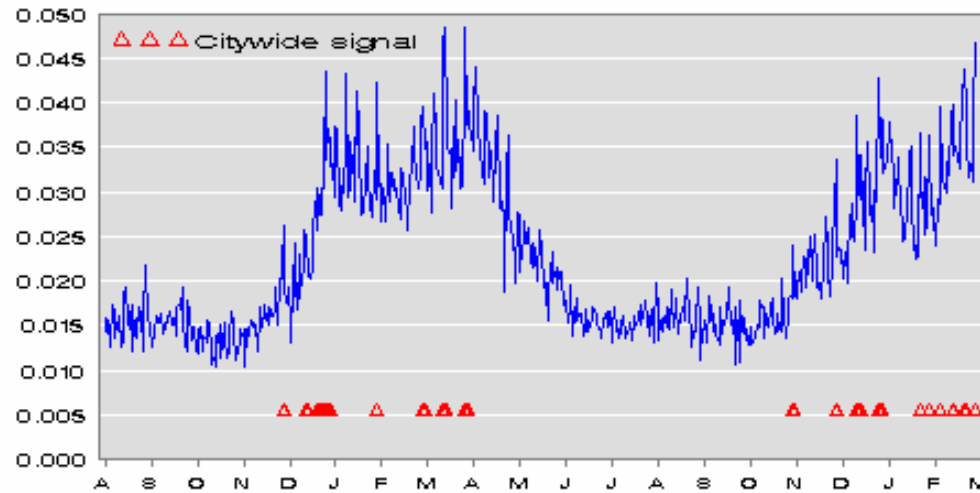
Spatial

GI Syndromes-Citywide trend, 2006-07

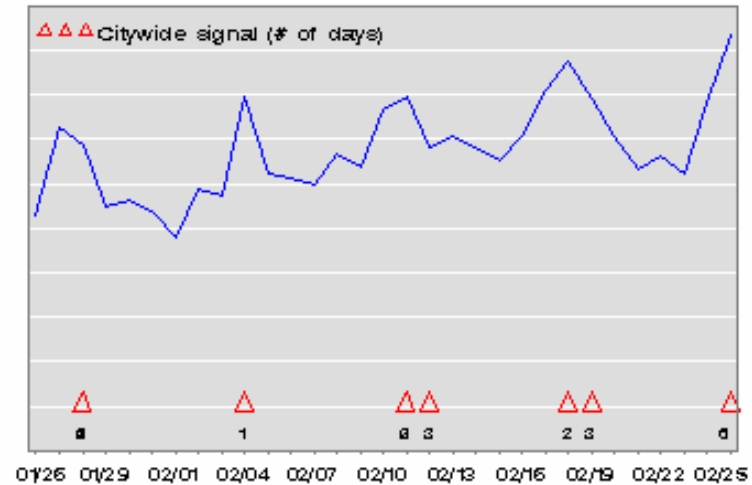
NYC Emergency Department Surveillance

Citywide trends in the ratio of syndrome visits to other visits through Feb 25, 2007

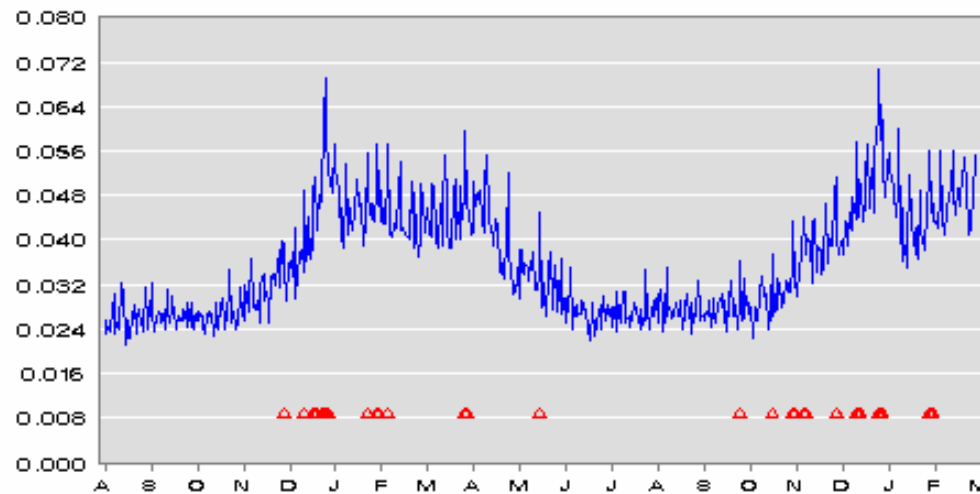
Diarhea Syndrome, All ages, last 18 months



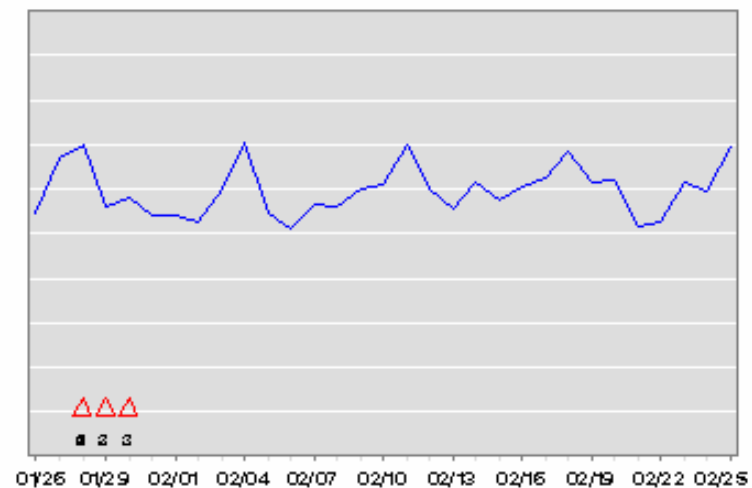
Last 30 days



Vomiting Syndrome, All ages, last 18 months



Last 30 days



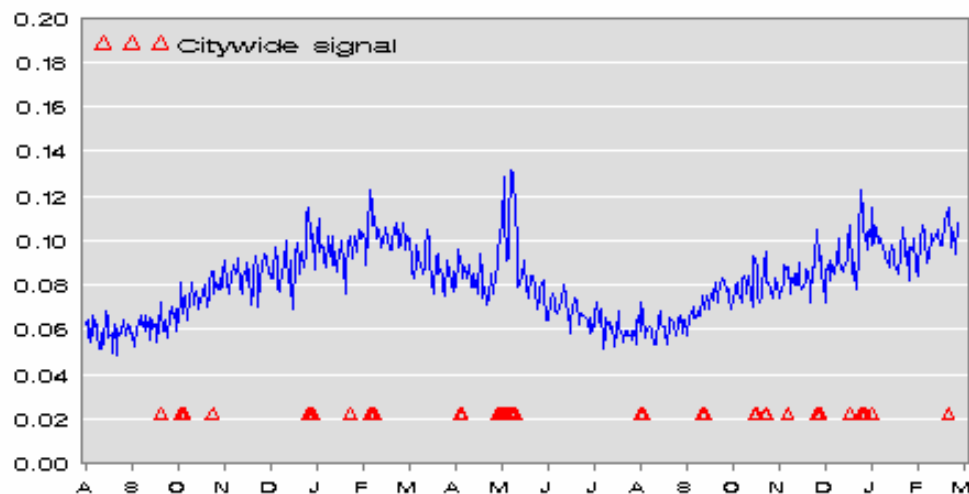
Date of ED visit

Resp & Fever Syndromes-Citywide trend, 2006-07

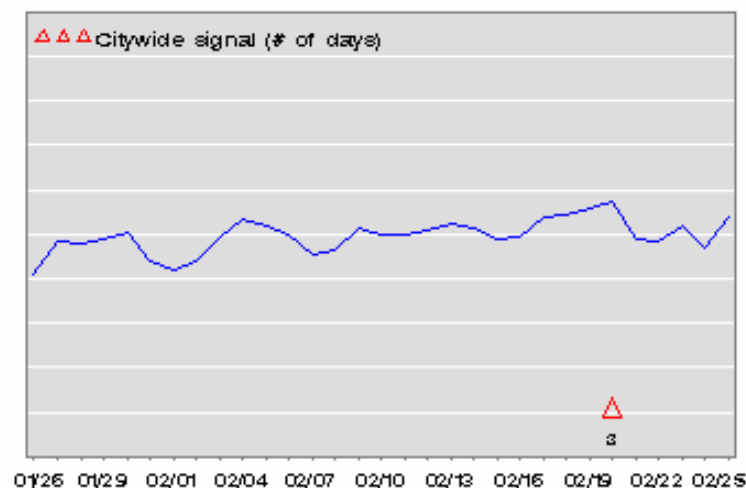
NYC Emergency Department Surveillance

Citywide trends in the ratio of syndrome visits to other visits through Feb 25, 2007

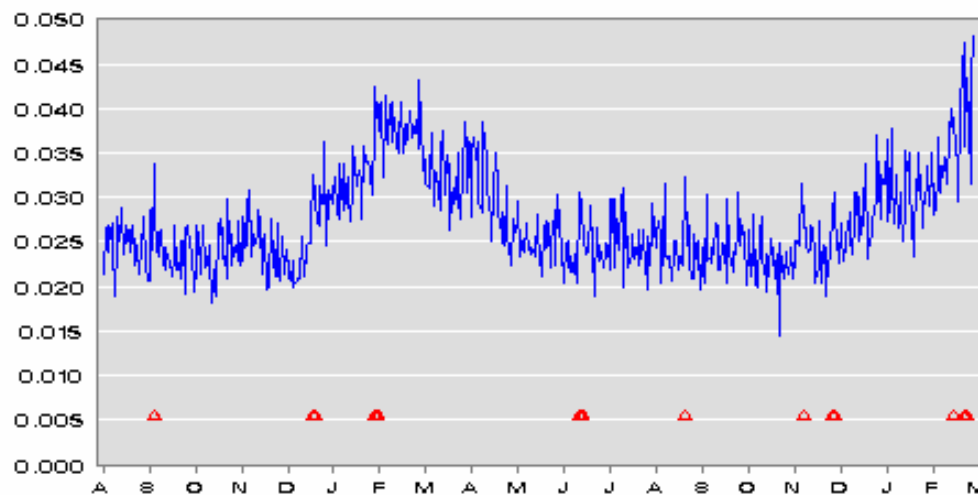
Respiratory / other, Age 13+, last 18 months



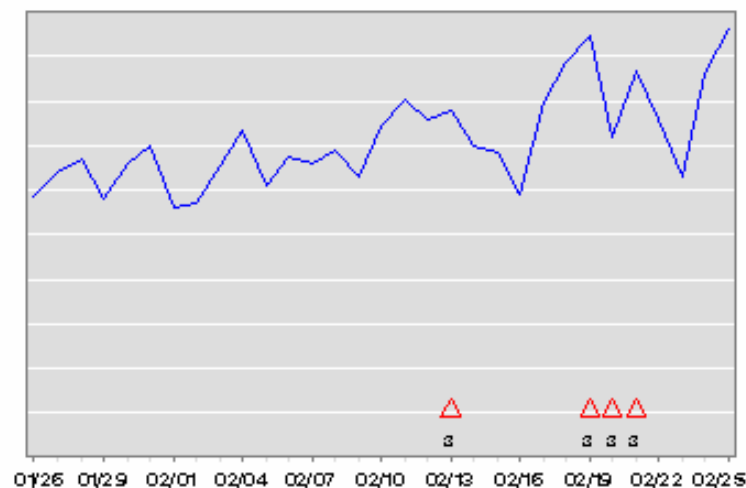
Last 30 days



Fever / other, Age 13+, last 18 months



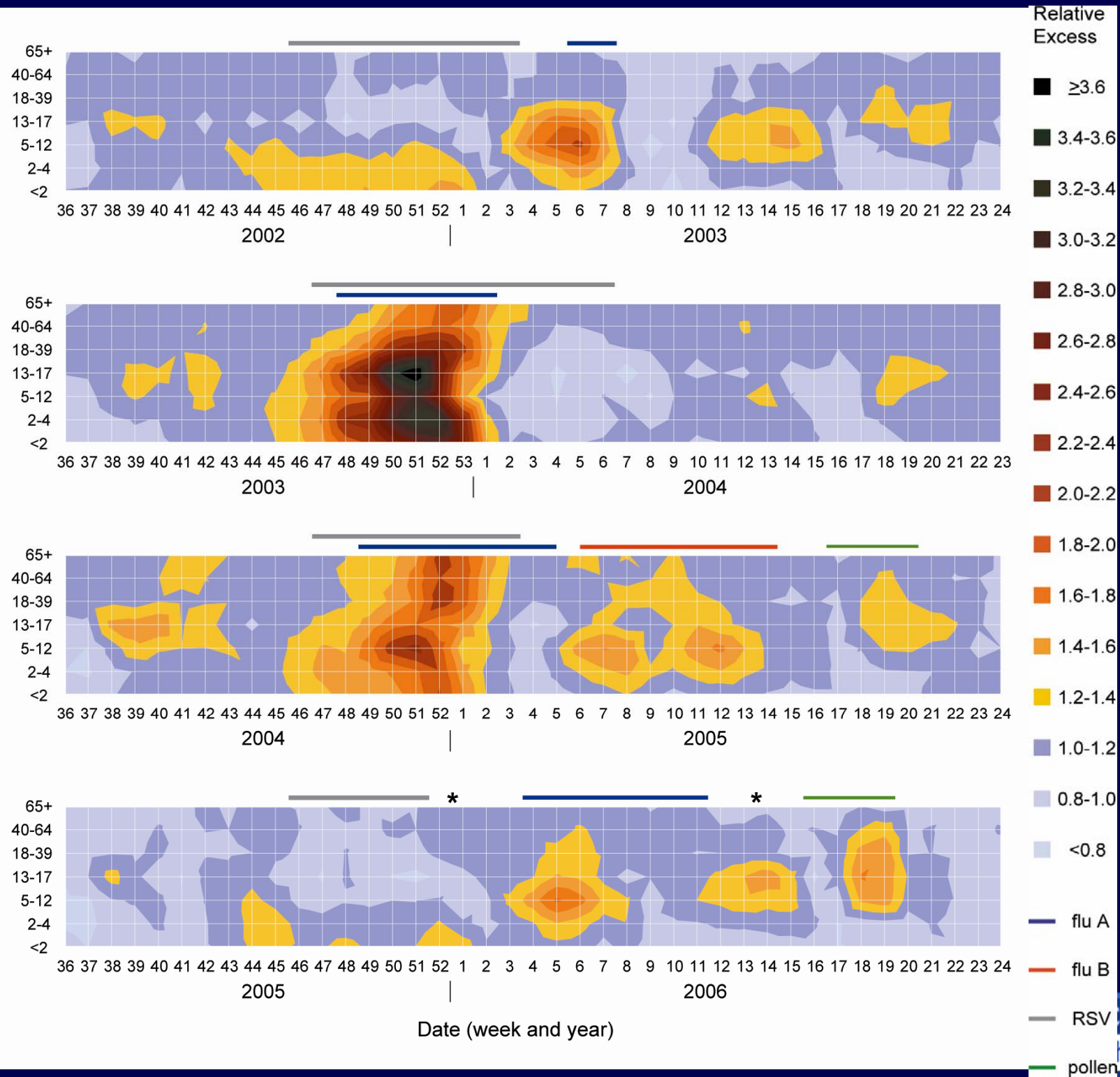
Last 30 days



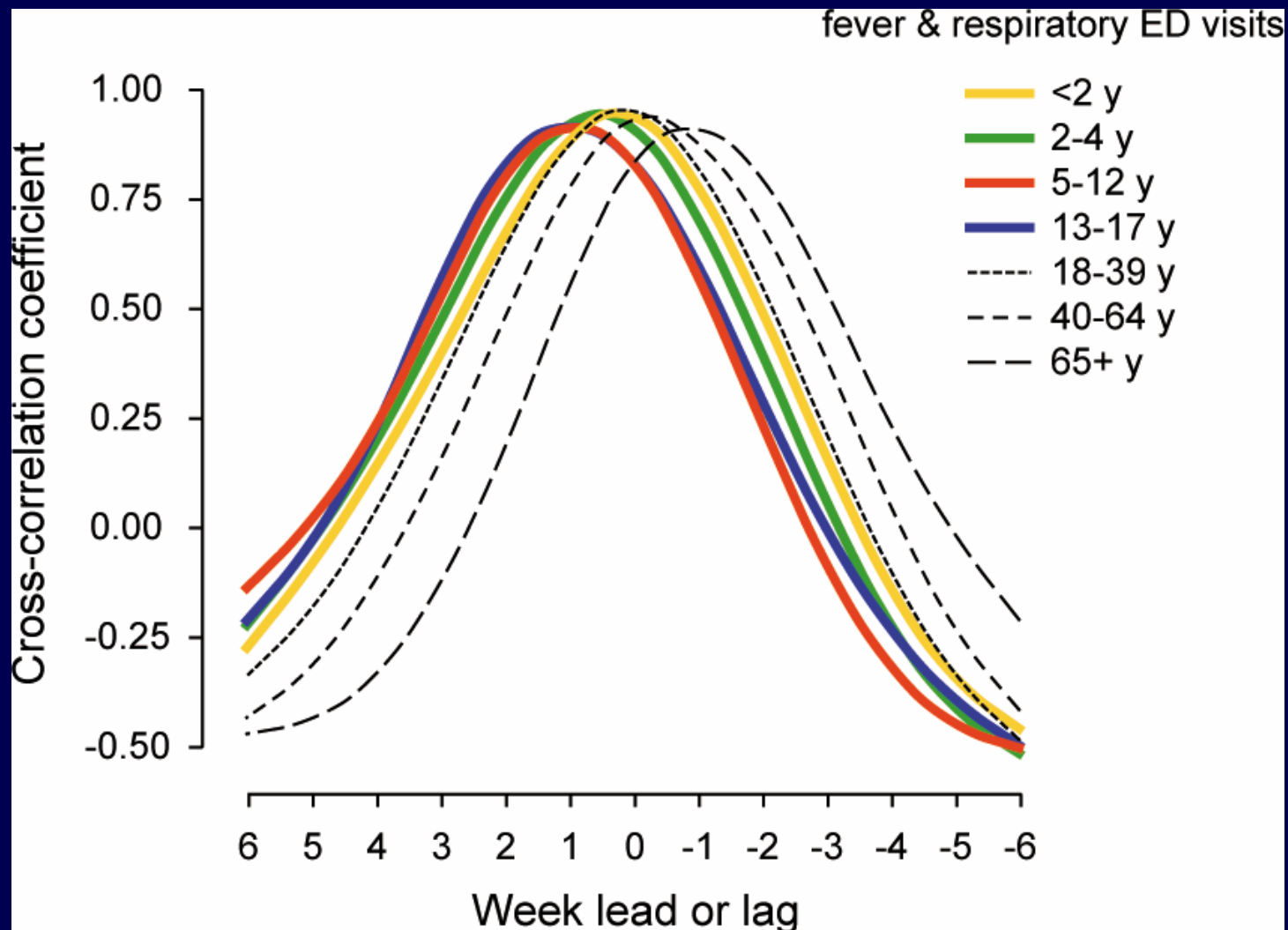
Date of ED visit

ED Flu by age & season

Distinct age patterns by circulating strain

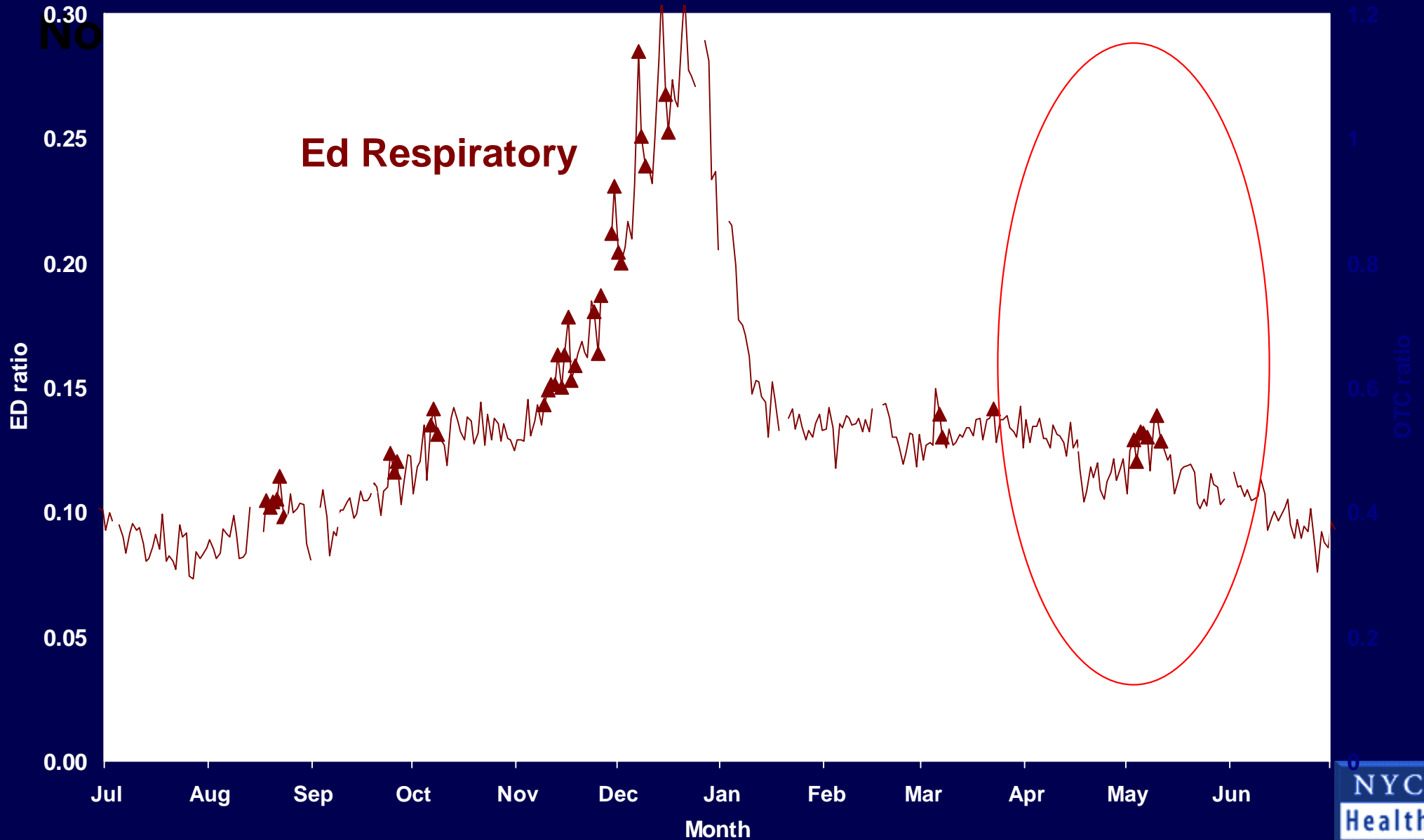


ED Flu by age (2003-04 season)



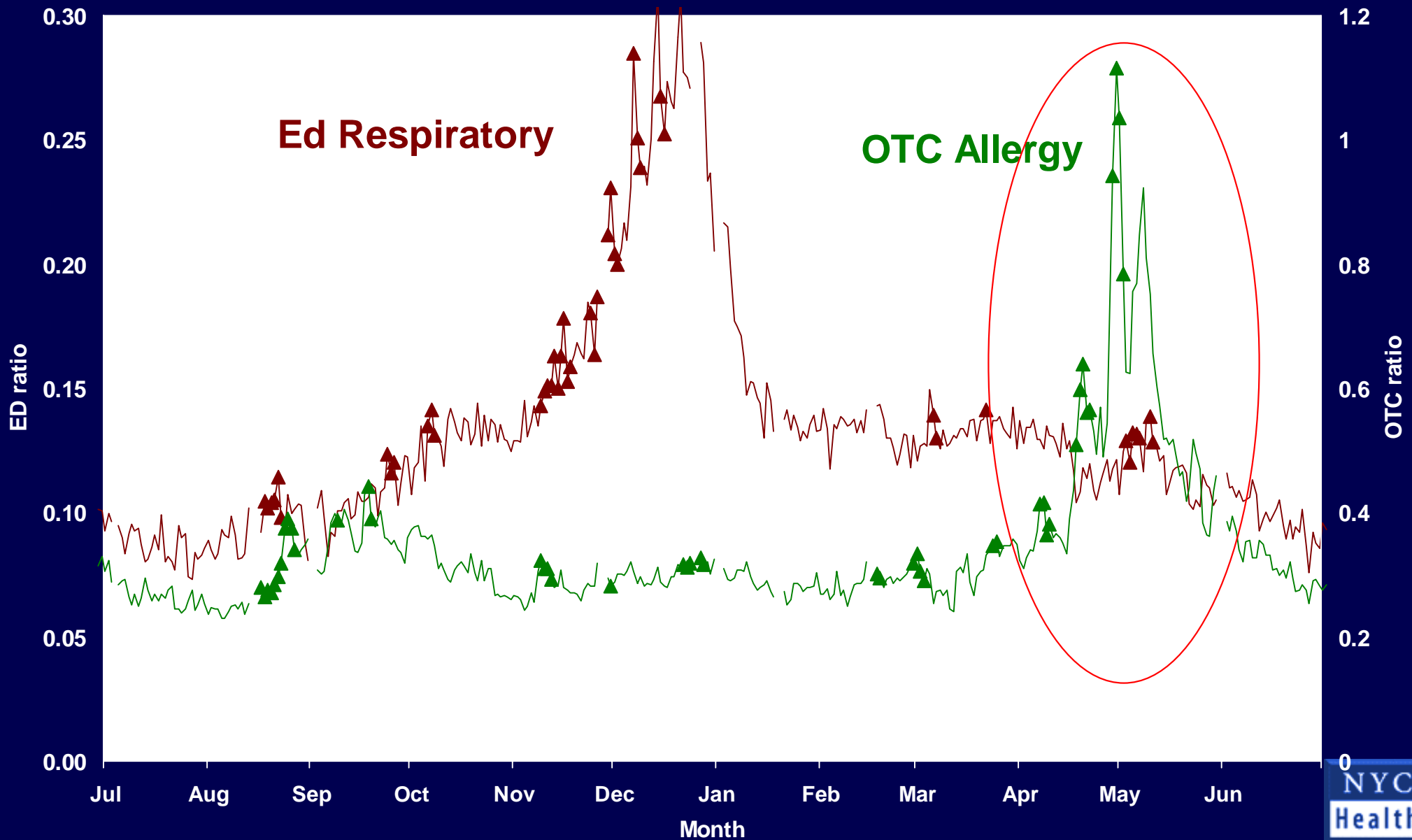
ED Respiratory

July 2003 - June 2004



ED Respiratory & OTC Allergy

July 2003 - June 2004

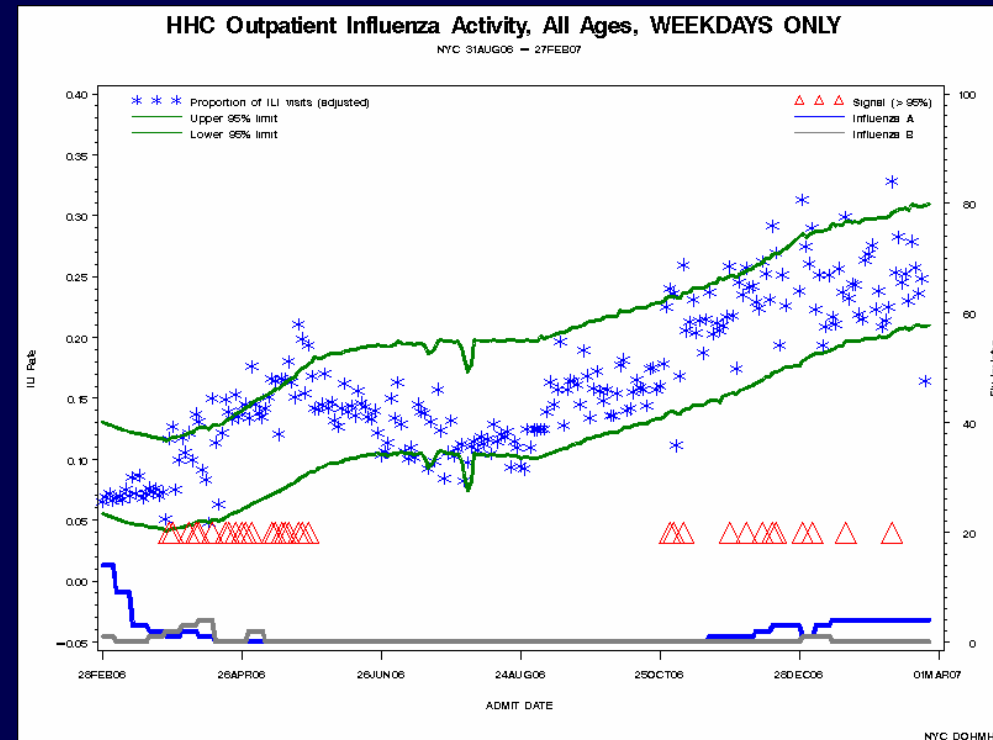


Investigation of signals

- Review line list
- Check complementary systems
- Calls to ED(s)
- Chart reviews
- Patient follow-up
- Augment lab testing

HHC Outpatient

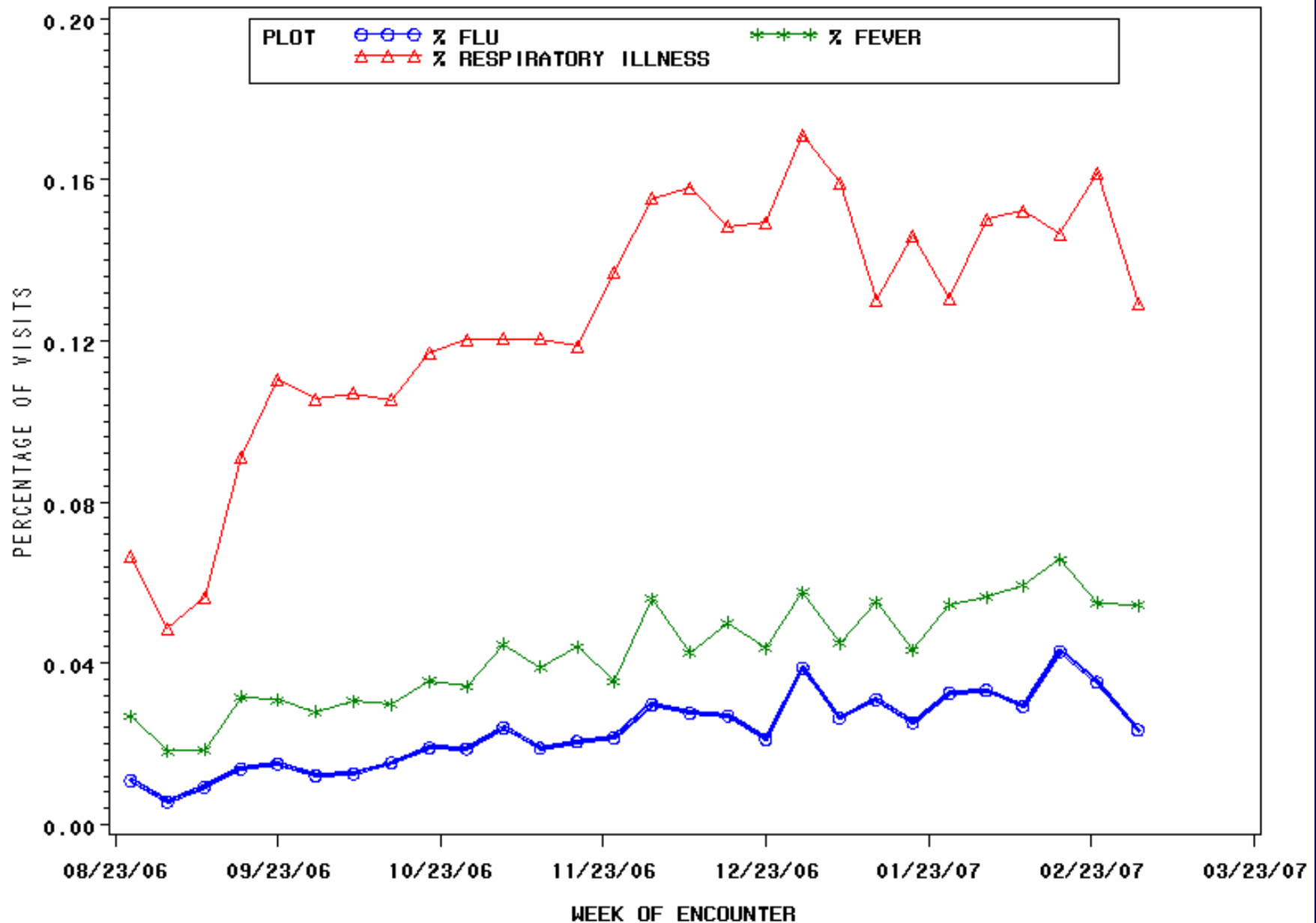
- 8 facilities (n=17)
- > 4000 records/day (deduped)
- weekends
- ICD-9 codes
- ILI, GI & asthma syndromes
- Data Lag
- Data elements:



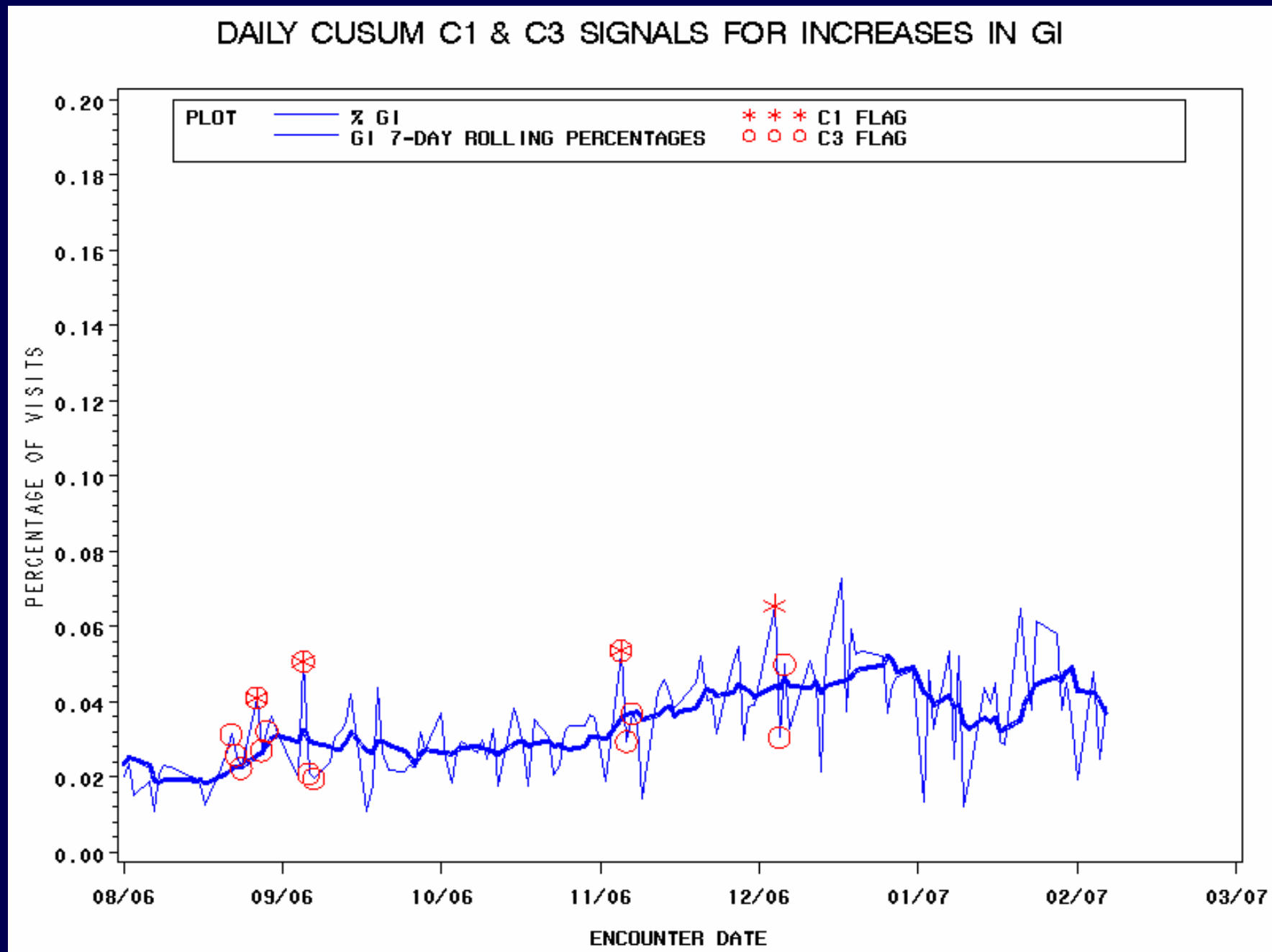
- Medical record number
- Date of visit
- HHC site
- Gender
- Race
- Age at visit
- ZIP
- ICD-9 diagnosis codes
- CPT procedure codes
- Type of clinic

Institute for Urban Family Health

IUFH FLU COMPONENTS – WEEKLY PERCENTAGES OF RESPIRATORY SX & FEVER INDICATORS



Institute for Urban Family Health

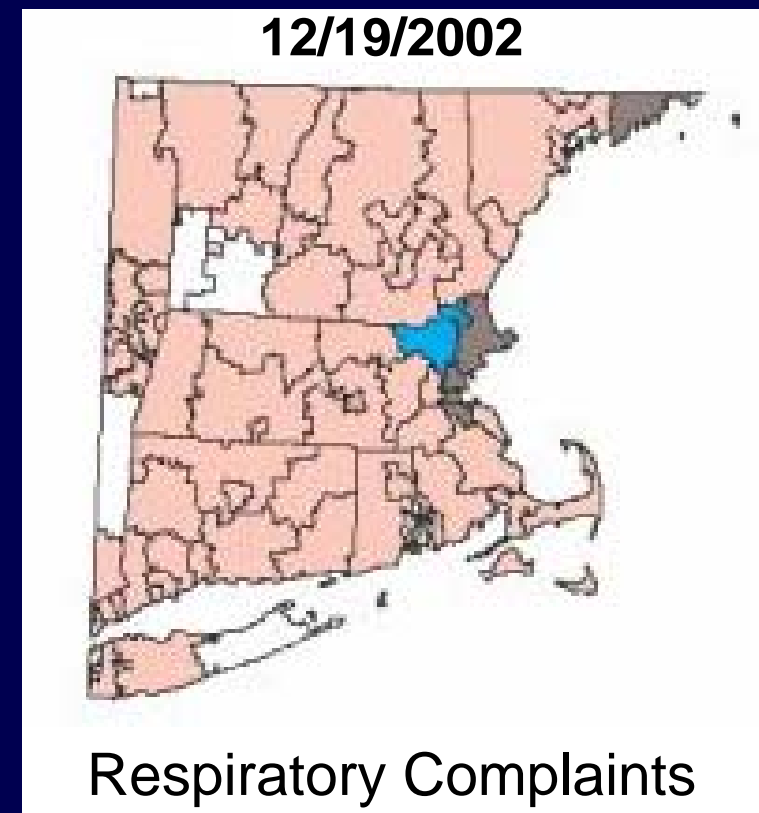


The National Bioterrorism Syndromic Surveillance Demonstration Program

- **CDC funded**
- **EHR data, covers ~ 1.5 million population**
- **Auto extracts encounters, codes & forwards to data center**

HMO data providers:

Denver, CO
Boston area, MA
Minneapolis-St. Paul, MN
Austin, TX
San Francisco Bay area, CA



The National Bioterrorism Syndromic Surveillance Demonstration Program

- **Retrospective, 2001-2003**
- **Detected 59 syndromic signals:**
 - 3 unusual signals **Concordant yet unrelated**
 - 55 “chance” signals
 - Median 4-9 cases; 1 zip code
 - Chance signals not fully investigated
- **110 GI outbreaks (MN): None detected**
- **Health seeking behavior**

Yih et al., Ambulatory-Care diagnoses as potential indicators of outbreaks of gastrointestinal illness-Minnesota. MMWR: 45, supp 157-162.

Public Health Utility

NYC 3-yr ED evaluation study¹

- 138 spatial GI signals, no outbreaks¹
- 47 known GI outbreaks, none detected¹
- Outbreaks detected {
 - Blackout (2003)²
 - Mosque pot luck (2005)*
 - Irish students (2007)*
- Citywide trends {
 - Influenza/RSV
 - Norovirus
 - Rotavirus
- Reassurance Absence of visits

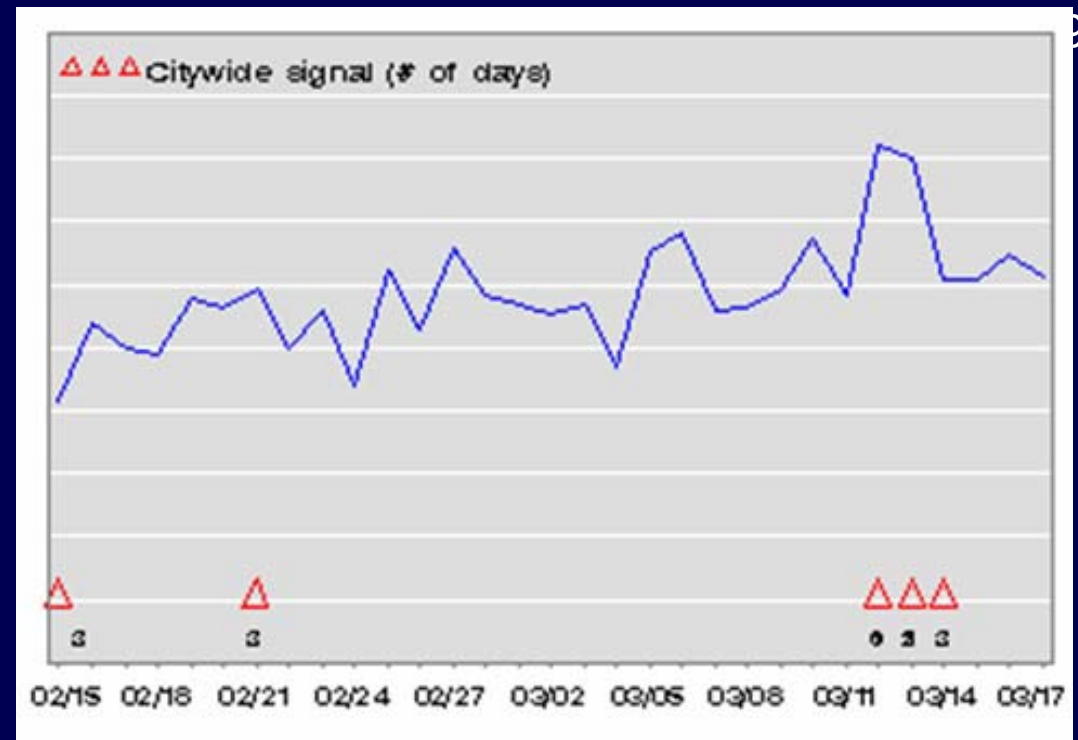
¹Balter MMWR 2005; ²Marx AJPH 2005

*Previously reported

Spatial outbreaks

*Outbreak at a pot
luck dinner*

Citywide Diarrhea
Obs-270 exp-198.3 RR-1.4



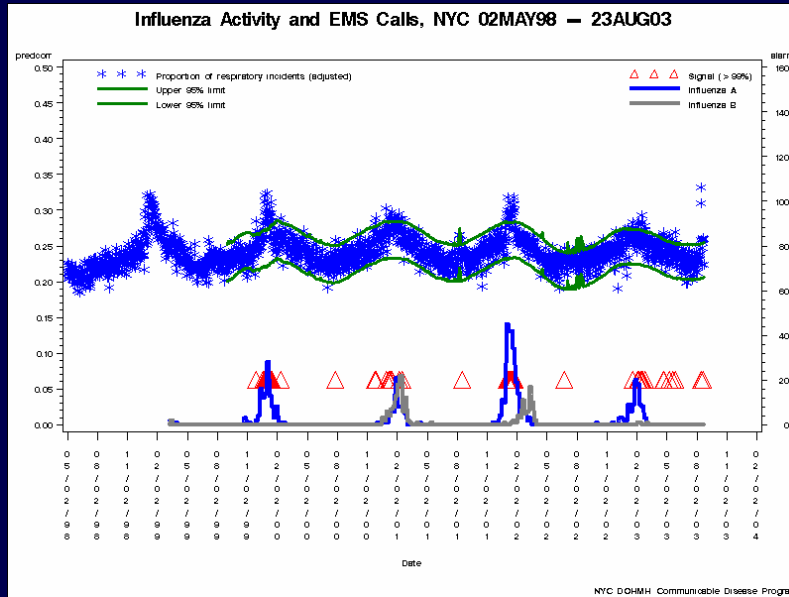
Zipcode (11XXX)
Obs- 8/Exp- 0.9
p=0.0031

Diarrhea Signal 3-12-05

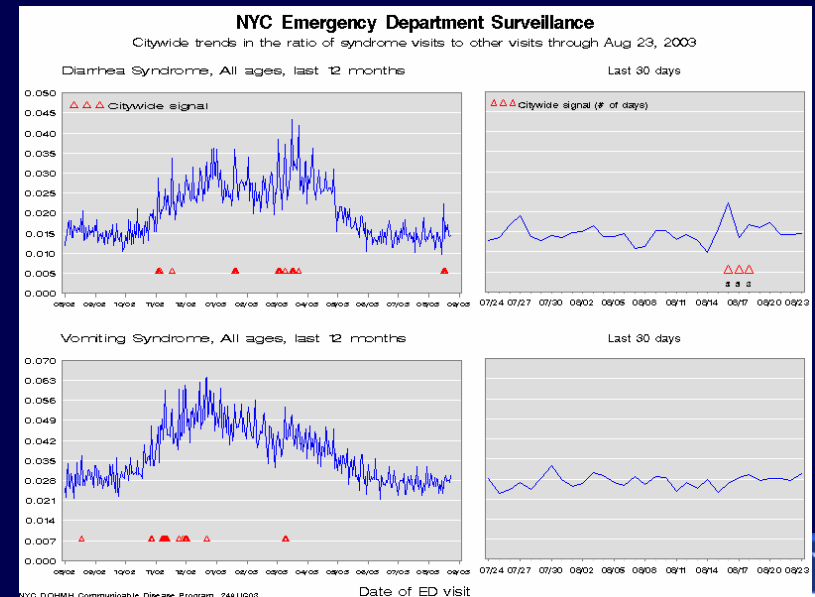
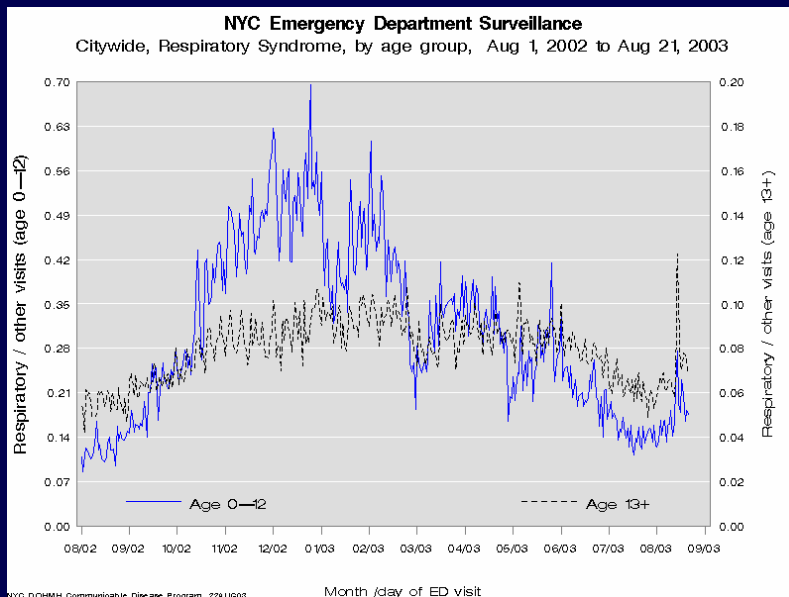
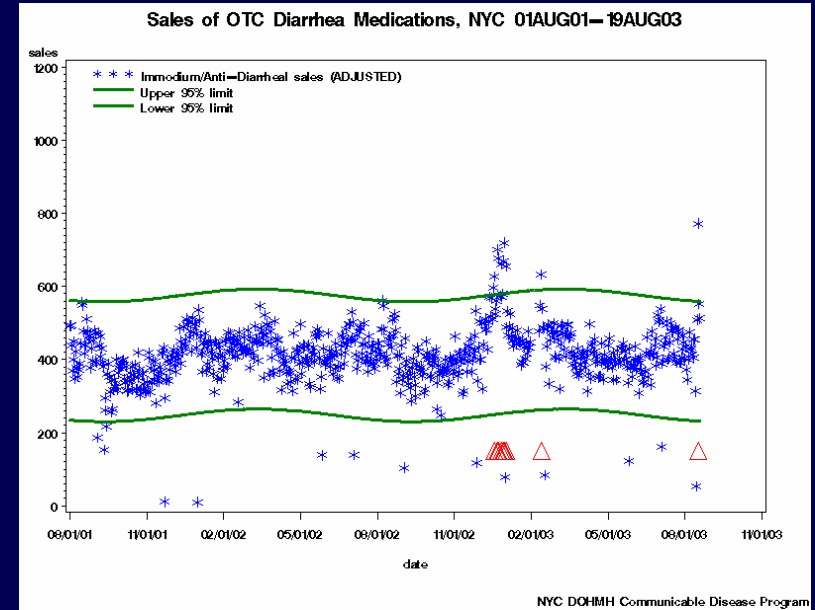
hospcode	time	sex	agenum	cc
B	19:17	M	3	VOMITTINGAND DIARRHEA
A	21:15	M	27	TRIAGE STS VOMIT DIARRHEA
A	22:23	M	6	C/O OF VOMITING AND DIARRHEA
A	22:32	M	11	C/O OF VOMITING AND DIARRHEA
A	22:41	F	13	C/O OF VOMITING AND DIARRHEA
A	23:05	F	5	C/O OF VOMITING AND DIARRHEA
A	23:13	F	33	C/O OF VOMITING AND DIARRHEA
A	22:53	F	31	C/O OF VOMITING AND DIARRHEA
8	8	8	8	8

NYC blackout

Respiratory



Gastrointestinal



Multi-use systems

- Heat/Cold-related illness
- Asthma trends
- Cigarette sales
- Cipro sales after anthrax
- Fireworks
- Dog bites/rat bites
- West Nile virus spraying
- Suicide attempts
- Overdoses

Case finding:

- Bloody diarrhea
- Jaundice

Cost

- NYC DOHMH
 - ~ \$500k per year 1/2 operations 1/2 R&D
- UK national nurse call system
 - ~ \$300k per year
- CDC BioSense system
 - ~ \$50 million per year

Summary/Future

Adjunct systems

Two-way provider communication

Specificity vs. timeliness

Signal to noise

Critical evaluation

Large outbreaks

EHR & lab data

Acknowledgements

NYC DOHMH Syndromic Surveillance Team:

Bureau of Communicable Disease

Bureau of Epidemiology Services

Primary Care Information Project

For more information contact ...

DWeiss @health.nyc.gov

And special thanks to ...

NYC Office of Emergency Management

NYC Hospitals: Emergency Departments, MIS and
Infection Control staff

Martin Kulldorff (Harvard University)

Centers for Disease Control and Prevention (CDC)