Syndromic Surveillance at the Local Level for the Early Detection of Infectious Disease Outbreaks
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Objectives

- Defining ESSENCE
- Features most useful to local epidemiologists
  - Viewing alerts
  - Querying
  - Mapping
- Selected events of interest observed by electronic surveillance
- Effectiveness of electronic surveillance at the local level
- Concluding remarks

ESSENCE

(Electronic Surveillance System for the Early Notification of Community-Based Epidemics)

- Prototype disease surveillance system that automates process of capturing data electronically
- 1st system to integrate military and civilian data to increase sample size
- Provides data to health departments through secure websites
- Developed in collaboration with Walter Reed Army Institute of Research and the Johns Hopkins University Applied Physics Laboratory under the sponsorship of the Defense Advance Research Projects Agency (DARPA)

  - variants for the military and civilian systems

Features That Interest Local Epidemiologists

- Monitoring general health of population
- Web-based access of near real-time health information
- Flagging statistical anomalies: To assist with detecting outbreaks early
  - from traditional sources
  - evaluate for corroboration by non-traditional sources
- Easy access to patient information for follow up investigations
- Tracking historic disease trends

Features most useful to local epidemiologists

System Features

ESSENCE IV - Demo

History of ESSENCE | Syndrome Definitions | Detector Algorithms | Data Dictionary | Tutorial

HOME | Alert List | Query | Map Portal | Message Board

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ESSENCE Prototype Disclaimer

As prototype software, ESSENCE is provided free of charge on an "as is" basis without warranty of any kind, either expressed or implied, including but not limited to implied warranties of merchantability and fitness for a particular purpose. The authors do not warrant that the functions contained in this program will meet the user's requirements or that the operation of this program will be uninterrupted or error-free. Acceptance and use of this program

Done | Internet

System Features

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HOME | Alert List | Query | Map Portal | Message Board

ESSENCE IV - Demo Syndrome Definitions

ESSENCESyndromes

Death
Gastrointestinal
Neurological
Other
Rash
Respiratory
Sepsis
UnspecifiedInfection

Questions or Problems?

Internet

System Features

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HOME | Alert List | Query | Map Portal | Message Board

ESSENCE IV - Demo Syndrome Definitions

ESSENCESyndromes -- Gastrointestinal

ACUTE infection of the upper and/or lower gastrointestinal tract.
SPECIFIC diagnosis of acute GI distress such as Salmonella gastroenteritis.
ACUTE non-specific symptoms of GI distress such as nausea, vomiting or diarrhea.
EXCLUDES any chronic conditions such as IBS.

001	CHOLERA
001.0	CHOLERA D/T VIBRIO CHOLERAE
001.1	CHOLERA D/T VIBRIO CHOLERAE EL TOR
001.9	CHOLERA NOS
002	TYPHOID AND PARATYPHOID FEVERS
002.0	FEVER, TYPHOID
002.1	FEVER, PARATYPHOID A
002.2	FEVER, PARATYPHOID B
002.3	FEVER, PARATYPHOID C
002.9	FEVER, PARATYPHOID NOS
003	INFECTIONS, OTHER SALMONELLA
003.0	GASTROENTERITIS, SALMONELLA
003.1	SEPTICEMIA, SALMONELLA

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System Features – Detector Outputs

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HOME | Alert List | Query | Map Portal | Message Board

ESSENCE IV - Demo Alert List

Region/Syndrome Based Temporal Alerts

[Region/Syndrome | Region/ICD9Group | Hospital/Syndrome | Region/OTC Category | Schools | Spatial | Reportable Diseases]

Reset 3-Level Sorting

Region/Syndrome Based Temporal Alerts

Date	Data Source	Region	Age	Sex	Syndrome	Detector	Level	Count	Exp
20Apr04	Emergency Room Data by Patient Location	MONTGOMERY	5-17	All	GastroIntestinal	JHUAPL-Regression/EWMA	2.276	17	7.57
20Apr04	Emergency Room Data by Patient Location	PRINCE GEORGES	18-64	All	Neurological	JHUAPL-Regression/EWMA	4.857	11	2.60
20Apr04	Emergency Room Data by Patient Location	PRINCE GEORGES	All	All	Neurological	JHUAPL-Regression/EWMA	2.016	13	5.53
20Apr04	Emergency Room Data by Patient Location	ARLINGTON	65+	All	Sepsis	JHUAPL-Regression/EWMA	2.033	1	0.35
19Apr04	Emergency Room Data by Patient Location	All	65+	All	Sepsis	JHUAPL-Regression/EWMA	2.231	10	2.10
19Apr04	Emergency Room Data by Patient Location	PRINCE GEORGES	All	All	Respiratory	JHUAPL-Regression/EWMA	2.412	130	80.7
19Apr04	Emergency Room Data by Patient Location	ARLINGTON	65+	All	Sepsis	JHUAPL-Regression/EWMA	2.532	3	0.53
19Apr04	Emergency Room Data by Patient Location	FAIRFAX	65+	All	Sepsis	JHUAPL-Regression/EWMA	3.285	4	0.53
19Apr04	Emergency Room Data by Patient Location	ARLINGTON	All	All	Sepsis	JHUAPL-Regression/EWMA	2.248	3	0.5
19Apr04	Emergency Room Data by Patient Location	FAIRFAX	All	All	Sepsis	JHUAPL-Regression/EWMA	2.303	5	1.35
19Apr04	Emergency Room Data by Patient Location	PRINCE GEORGES	0-4	All	Unspecified/Infection	JHUAPL-Regression/EWMA	2.785	25	16.6

Internet

System Features – Time Series

ESSENCE IV - Demo Time Series - Microsoft Internet Explorer

File Edit View Favorites Tools Help

History of ESSENCE | Syndrome Definitions | Detector Algorithms | Data Dictionary | Tutorial

HOME | Alert List | Query | Map Portal | Message Board

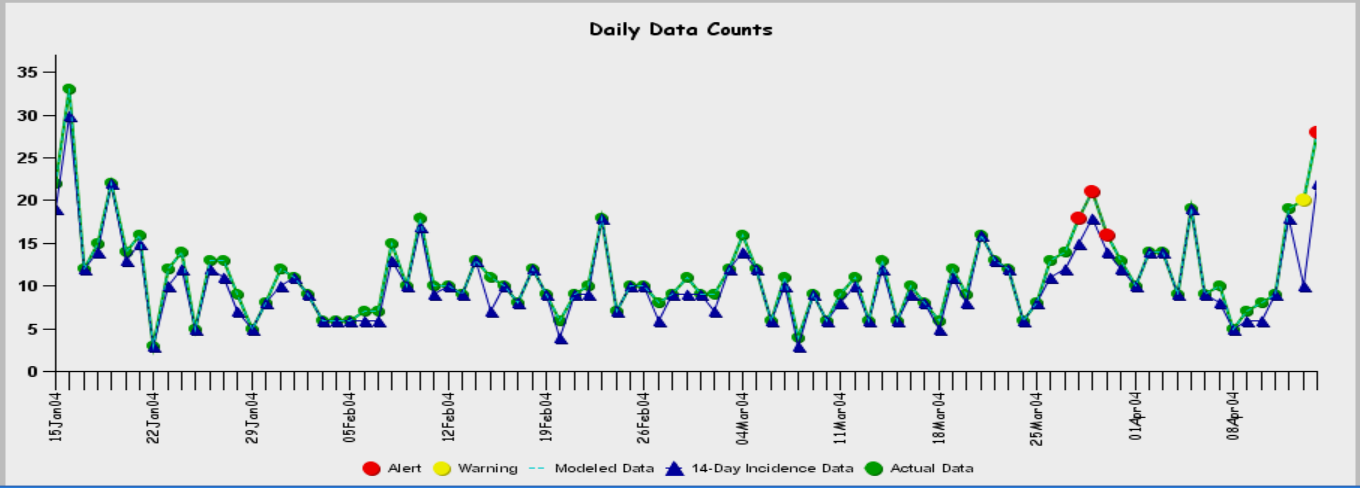
ESSENCE IV - Demo Time Series

⊟ Description

Data Source	Emergency Room Data by Patient Location
Geography System	Region
Region	
Medical Grouping System	ESSENCE Syndrome
ESSENCE Syndrome	Respiratory
Age Group	
Sex	All
Detector	JHUAPL-Regression/EWMA
Start Date	15Jan04
End Date	14Apr04

⊞ Configuration Options

⊟ Graph



System Features – Data Details

ESSENCE IV - Demo Data Details - Microsoft Internet Explorer

File Edit View Favorites Tools Help

History of ESSENCE | Syndrome Definitions | Detector Algorithms | Data Dictionary | Tutorial

HOME | Alert List | Query | Map Portal | Message Board

ESSENCE IV - Demo Data Details

Description

Data Source	Emergency Room Data by Patient Location
Geography System	Region
Region	
Medical Grouping System	ESSENCE Syndrome
ESSENCE Syndrome	Respiratory
Age Group	
Sex	All
Detector	JHUAPL-Regression/EWMA
Start Date	14Apr04
End Date	14Apr04

Configuration Options

Available Links

[Time Series | Data Details | Map View]

[Plain Text | Microsoft Excel]

Reset 3-Level Sorting

Date	Time	Hospital	HospitalName	HospitalZipCode	HospitalRegion	MedRecNo	Zipcode	Orig_Zipcode	Region	Age	Sex

System Features – Querying

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ESSENCE IV - NCR Data Query

Current Data Query Selections			
Data Source	Military Outpatient Visits	**Geography System**	MTF
MTF	Andrews AFB	**Medical Grouping System**	ESSENCE Syndrome

Next Selections:			
Select ESSENCE Syndrome:	All ESSENCE Syndromes Death GastroIntestinal	**Detector:**	JHUAPL-Regression/EWMA
Select Age Range:	All Ages Unknown 0-4	**Select Sex:**	All Sexes Unknown Male
Select Start Date:	22 Jan 04	**Select End Date:**	21 Apr 04
Submit			

Done Internet

System Features – Mapping

Map Configuration Page - Microsoft Internet Explorer provided by ITSD

History of ESSENCE | Syndrome Definitions | Detector Algorithms | Data Dictionary | Tutorial

HOME | Alert List | Query | Map Portal | Message Board

Map Configuration Page

Map Type	Full Data Map	ESSENCESyndromes	All ESSENCESyndromes
Start date	12 Apr 04	End date	19 Apr 04
Submit			

Map Configuration Help	
Full Data Map Type Description	The Full Data Map shows a map with all available datasources for the chosen time period. This will map the raw data associated with the datasource. Each data layer is accompanied by a corresponding detector layer which will show any alerts for that datasource.
Detector Alerts Map Description	The Detector Alerts Map shows a map with Temporal and Spatial Detector Alerts for the choosen time period.
ESSENCESyndromes	Choose a Syndrome to filter the data that will be displayed on the map.
Start Date	Choose a Start Date to filter the data that will be displayed on the map.
End Date	Choose a End Date to filter the data that will be displayed on the map.
Submit Button	Submits the configuration and opens the map.

Internet

System Features – Mapping

ESSENCE IV - Demo - Microsoft Internet Explorer provided by ITSD

ESSENCE IV - Demo : Data Sources Map

Toggles: Navigation: Date Range: Other: Help: Current Tool: Zoom In

LAYERS
- All Layers
- Base Layers
- School Absences
- OTC Sales
  - |Visible|Label|Active|Name|
- ER By Hospital
  - |Visible|Label|Active|Name|
- ER By Zipcode
  - |Visible|Label|Active|Name|
- Civilian Office Visits
- Elderly Office Visits
- Military Outpatient Visits
  - |Visible|Label|Active|Name|

12Apr04 - 19Apr04

0 15mi

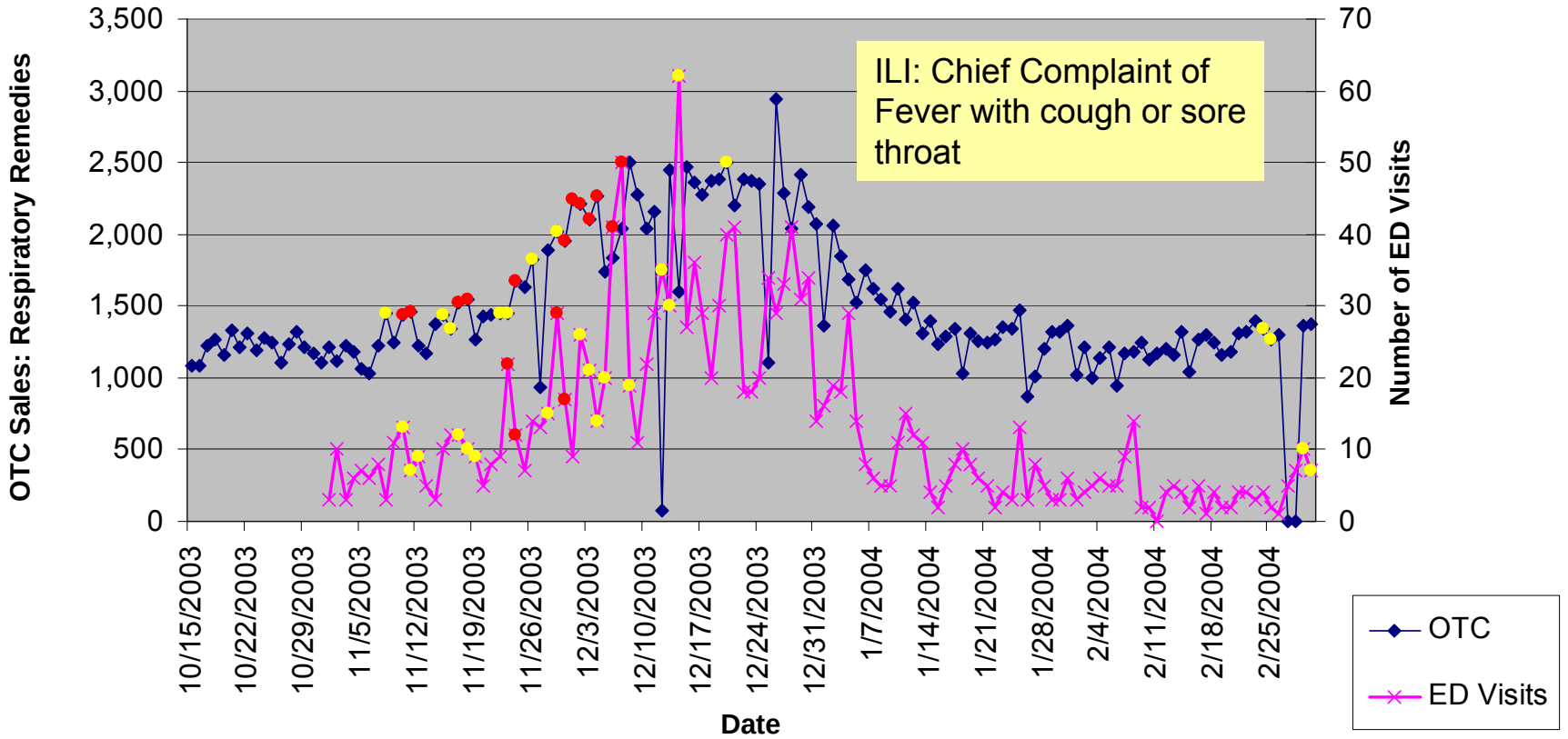
Legend
- Counties
- mil01
- N/A
- 0-15
- 16-39
- 40-63
- 64+
- Zips
- States

Layer Name		Data Column Name	
Data Source		Geography System	
Medical Grouping System		ESSENCE Syndrome	
Detector	JHUAPL-Regression/EWMA	Start Date	12Apr04

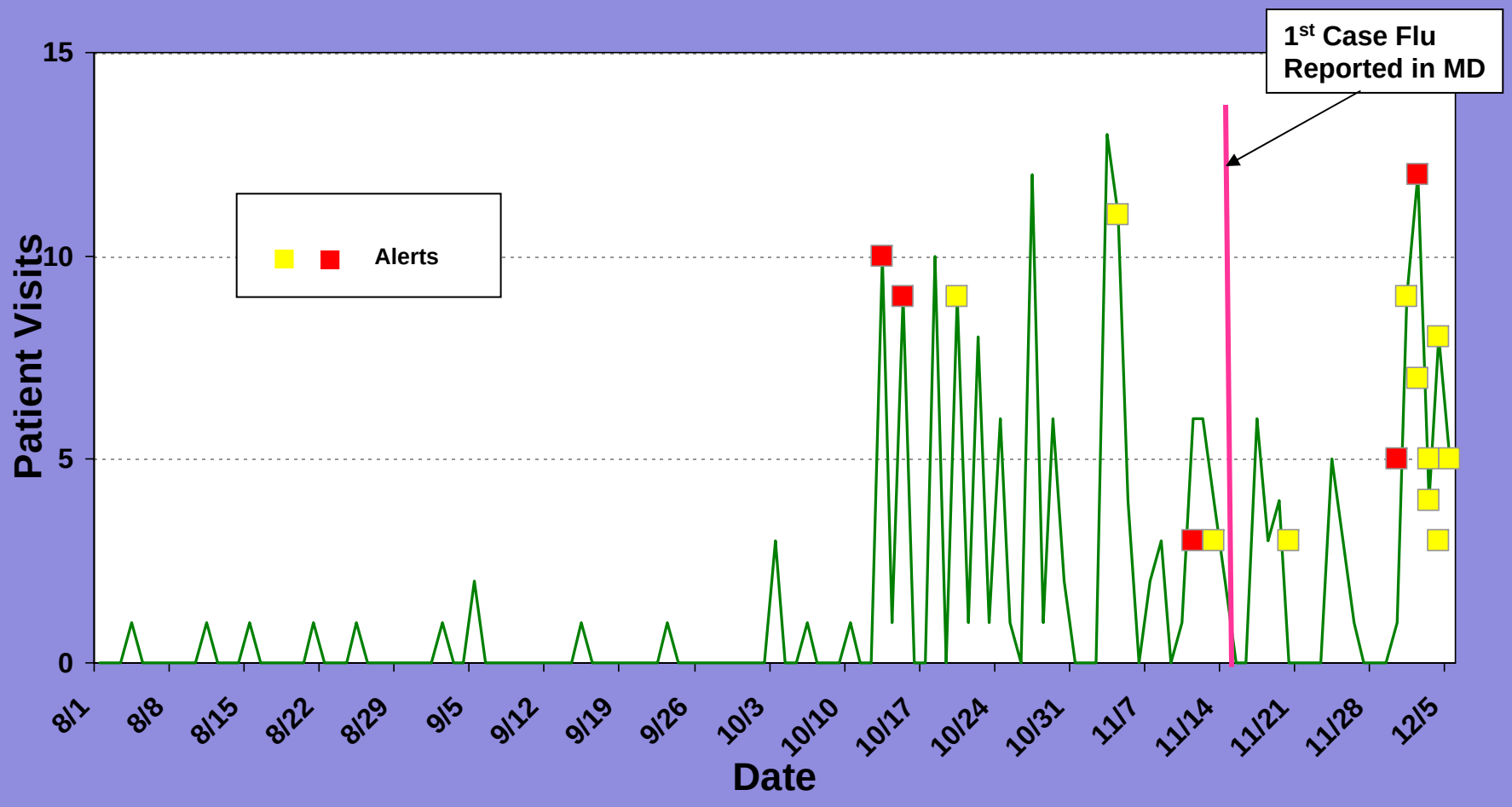
Map: -76.75 , 39.38 -- Image: 713 , 13 -- ScaleFactor: 0.0017642929092518328 Internet

Selected events of interest observed using electronic syndromic surveillance

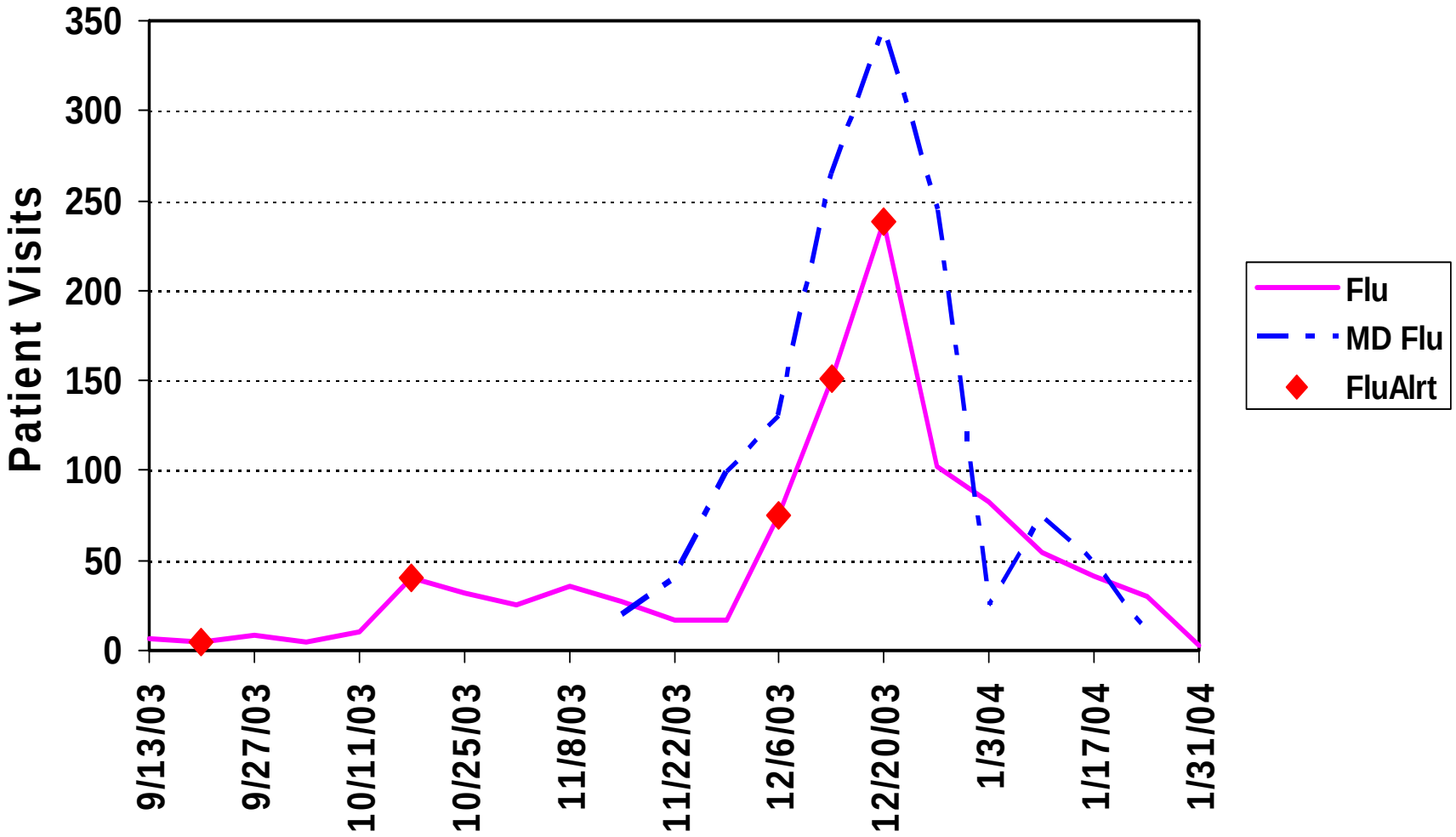
ILI Presentations:
Emergency Departments & OTC Purchases
2003 - 04



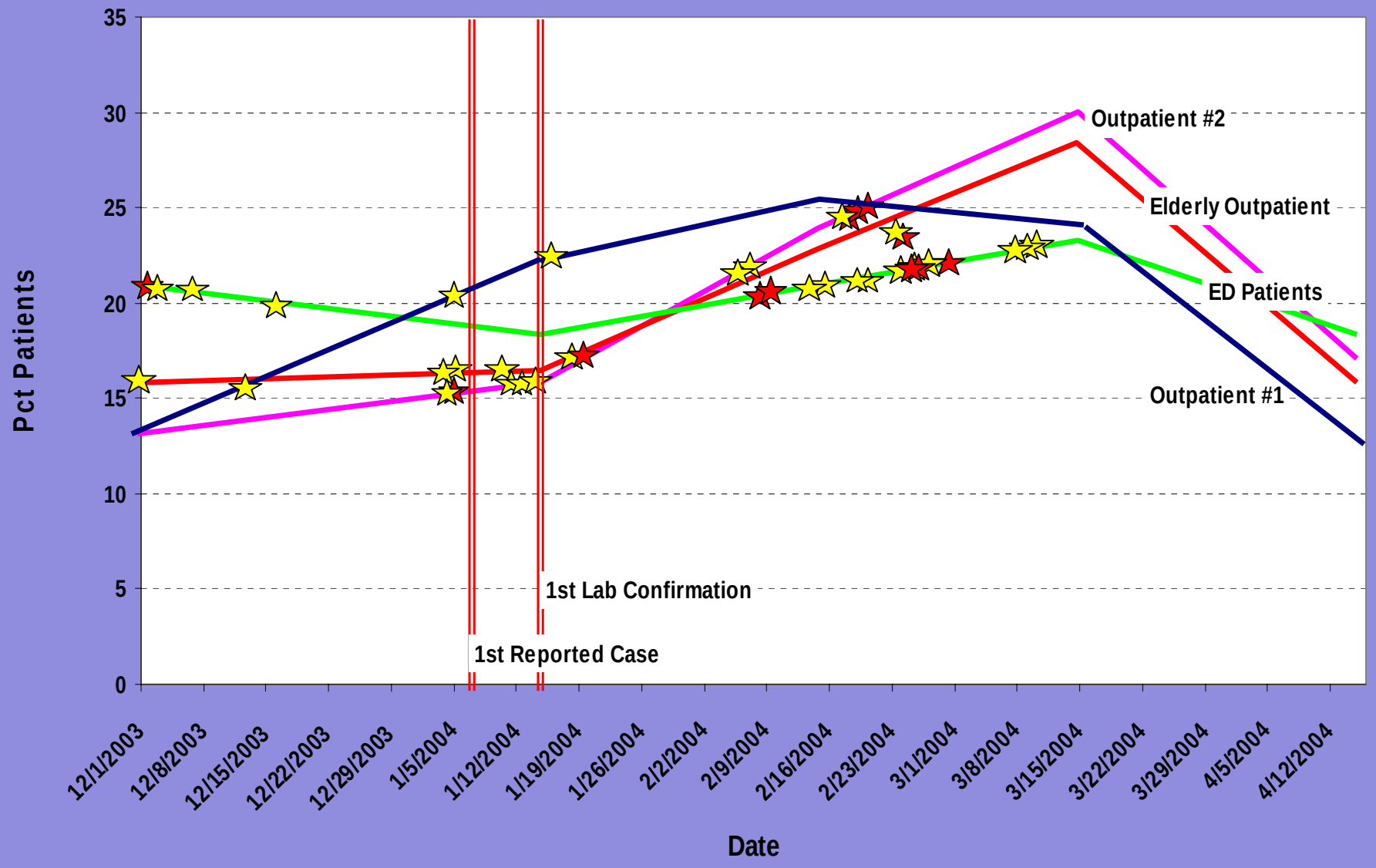
Influenza Related Patient Visits:
1 Aug 2003 - 5 Dec 2003



Influenza Related Patient Visits:
13 Sept 2003 – 31 Jan 2004



Percent of GI Patients by Time & Data Source
Showing Red & Yellow System-Generated Alerts



Usefulness at the Local Level: Other Applications

ESSENCE data used to provide outbreak estimates needed for exercise response planning

Montgomery County Department of Health and Human Services

Developed county-wide simulation exercise with county hospitals

Increased vigilance following reports of rabies, *E. coli* infection in child care patron, SARS, avian influenza

Daily community health status reports to county emergency managers during periods of elevated National security level.

Effectiveness of electronic surveillance at the local level

- Flexible – system is continually updated to best serve user needs
- Fast – quick web-based access to near real-time information
- Has Helpful Features – for data manipulation and analysis
- Reliable – has been successfully operational over time
- Applicable - is used for surveillance at multiple levels

Concluding Remarks

- The ESSENCE system has been used successfully in local jurisdictions.
- System standards should be developed to support adaptability to the needs of local public health entities and to allow data comparisons across systems. Biosurveillance at the local level may be more effective at lowering morbidity and mortality from infectious diseases.