

Using and Improving EARS for Local Public Health Biosurveillance

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Outline of Presentation

- Define biosurveillance
- Discuss evolving need for syndromic surveillance at Health Department
- Describe the EARS program and its use within Monterey County
- Quantitative and qualitative analysis of modifications to EARS' logic



What is Biosurveillance?

- Homeland Security Presidential Directive HSPD-21 (October 18, 2007):
 - “The term ‘biosurveillance’ means the process of active data-gathering ... of biosphere data ... in order to achieve early warning of health threats, early detection of health events, and overall situational awareness of disease activity.” ^[1]
- Syndromic surveillance:
 - “...surveillance using health-related data that precede diagnosis and signal a sufficient probability of a case or an outbreak to warrant further public health response.” ^[2]

[1] www.whitehouse.gov/news/releases/2007/10/20071018-10.html

[2] CDC (www.cdc.gov/eпо/dphsi/syndromic.htm, accessed 5/29/07)



Need for Syndromic Surveillance

- County Health Officer wanted greater use of real-time surveillance data
- Preparedness grants required enhanced surveillance
- Lag-time in receipt of reports from local hospitals; reports from only two hospitals



Early Aberration Reporting System (EARS)

- Developed by the CDC
- Originally designed to monitor for bioterrorism during large-scale events that often have little or no baseline data
- Now used by various state and local public health departments for routine health surveillance purposes



Benefits of the EARS Program

- Data stays at the local level
- Flexibility to modify syndromes as needed
- Analysis occurs on-site
- Decreased lag-time in reporting
- Program available at no cost



Data Collection and Reporting

Data Collection

Data Management

Analysis

Reporting





Daily Observational and Situational Evaluation (DOSE) Report

ED Census and Clinic Services Census*:

Green	No alert flags on the previous day
Yellow	One alert flag on the previous day
Orange	Two alert flags on the previous day
Red	Three alert flags on the previous day or three consecutive days of single or double alert flags

Total Hospital Census 319

Clinic Services Visits 719

****Note that the hospital ED aggregate and syndromic surveillance only includes data from facilities providing information for the reported days.**

Syndromic Surveillance*: (EARS output for Monterey County aggregate w/o clinics) [Shown as # of patients]

Green	No alert flags on the previous day
Yellow	One alert flag on the previous day
Orange	Two alert flags on the previous day
Red	Three alert flags on the previous day or three consecutive days of single or double alert flags

Gastrointestinal 58

Influenza-Like Illness 6

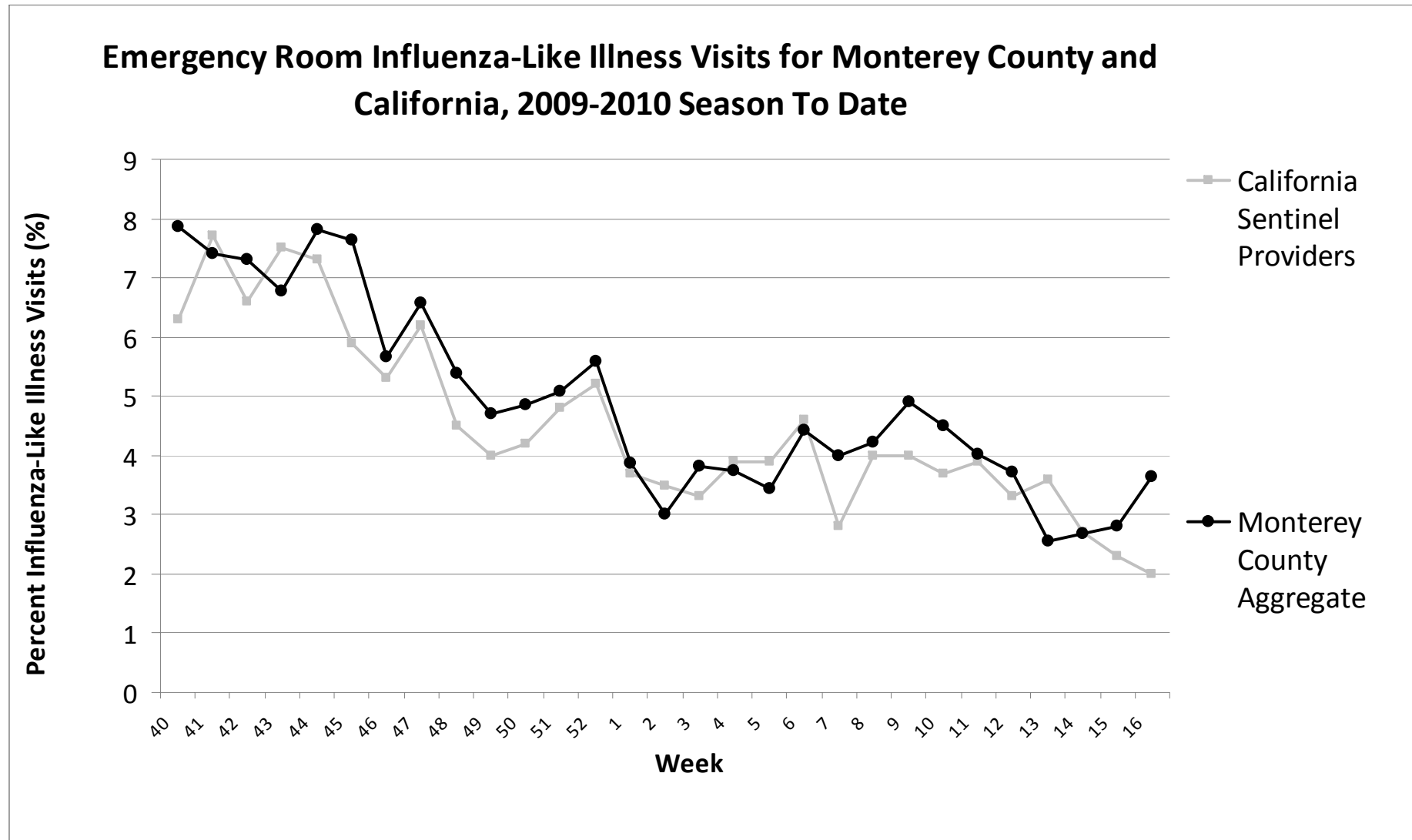
Lower Respiratory 9

Upper Respiratory 29

Neurological 30



ER ILI Visits for Monterey County and California, 2009-2010 Season To Date



Note: Restricted ILI syndrome definition

Early Aberration Reporting System (EARS)

- Designed to be a drop-in surveillance system
- Increasingly being used as standard health surveillance system

		Test Outcome	
		Positive	Negative
Actual Status	Sick	TP	FN (Type II error)
	Healthy	FP (Type I error)	TN

$$\text{Sensitivity} = \frac{\# \text{TP}}{\# \text{TP} + \# \text{FN}}$$

$$\text{Specificity} = \frac{\# \text{TN}}{\# \text{TN} + \# \text{FP}}$$



Modifications to Logic

- What happens when we modify the following?
 - Syndrome definitions
 - Symptom aliases
 - Text matching algorithms





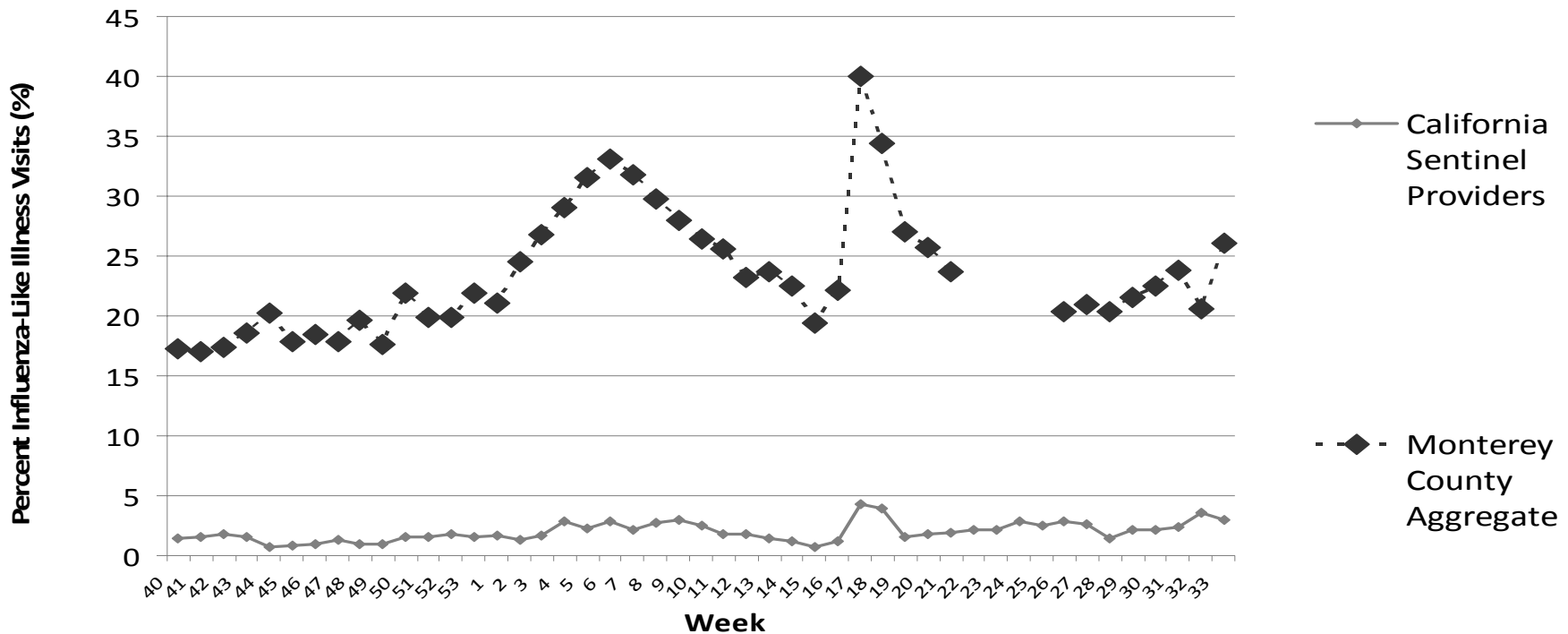
ILI Syndrome Definitions

- EARS (CDC)
 - Sore throat **or**
 - Cold **or**
 - Cough
- Restricted (MCHD)
 - Fever & cough
 - Fever & sore throat
 - Fever & cough & sore throat
 - Flu **and**
 - Not shot
- Expanded (MCHD)
 - Cold **or**
 - Cough **or**
 - Fever **or**
 - Chills **or**
 - Muscle pain **or**
 - Headache **or**
 - Flu **and**
 - Not shot



Monterey County ER ILI

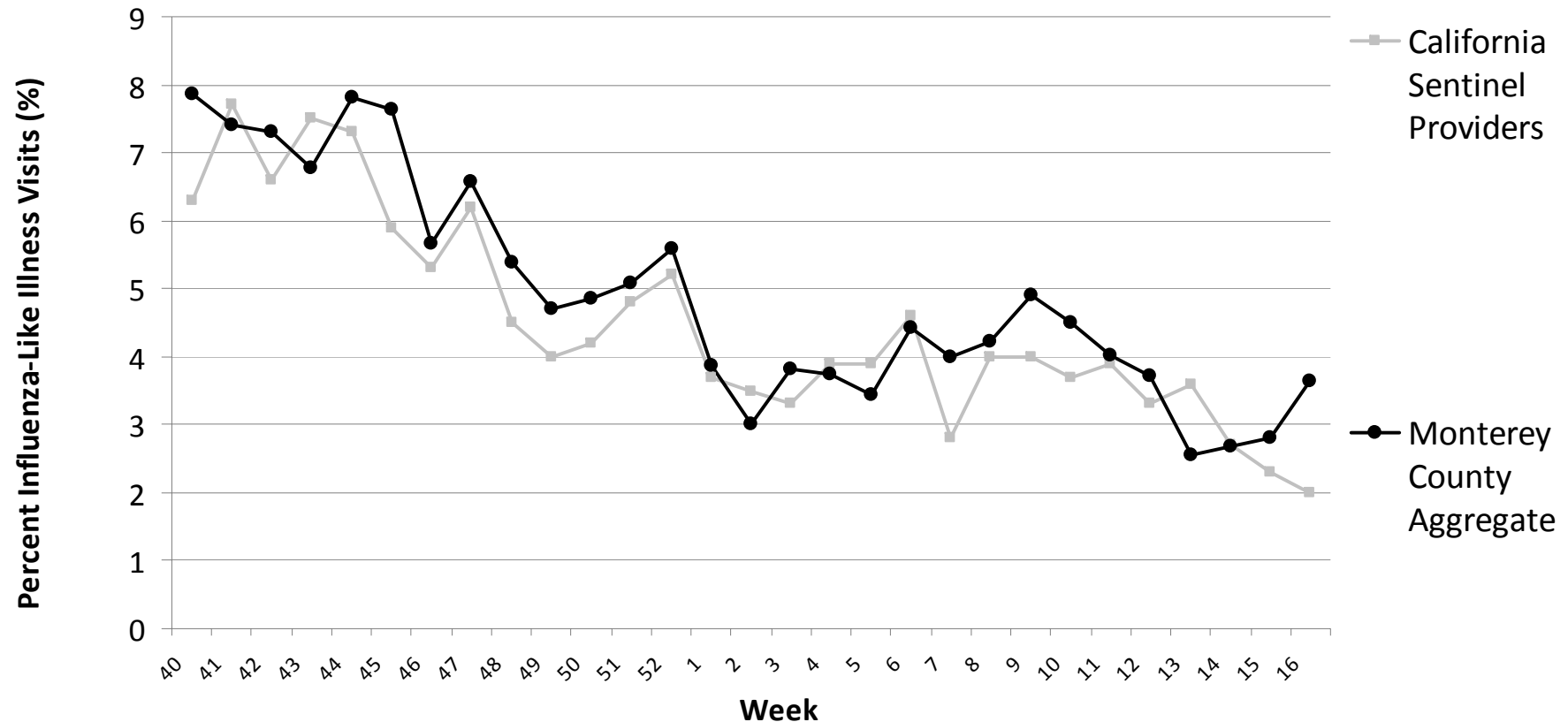
Emergency Room Influenza-Like Illness Visits for Monterey County and California, 2008-2009 Season





ER ILI Visits for Monterey County and California, 2009-2010 Season To Date

Emergency Room Influenza-Like Illness Visits for Monterey County and California, 2009-2010 Season To Date



Note: Restricted ILI syndrome definition



ILI Symptom Aliases

Symptom Alias	Symptom	Symptom Alias	Symptom	Symptom Alias	Symptom
SROETHROAT	SORETHROAT	COL	COLD	COUGH	COUGH
SSORE THROAT	SORETHROAT	NOSE	COLD	C9UGH	COUGH
ST	SORETHROAT	URI	COLD	CCOUGH	COUGH
TBROAT	SORETHROAT	EAR PAIN	COLD	CIUGH	COUGH
THROAT	SORETHROAT	DISCH	COLD	CKUGH	COUGH
TH4OAT	SORETHROAT	OM	COLD	OUGH	COUGH

Chief Complaint Examples:

1)NP FOR HIV TEST PER VERONICA/CHART MADE/LM



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Chief Complaint Examples:

- 1)NP FOR HIV TEST PER VERONICA/CHART MADE/LM
- 2)RTN RE-COLPO/LM



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Chief Complaint Examples:

- 1)NP FOR HIV TEST PER VERONICA/CHART MADE/LM
- 2)RTN RE-COLPO/LM
- 3)R/S PREV APPT CALL NOT GOING THROUGH



Text Matching Logic

Example: ILI

- **EARS (CDC) Logic**

If an ILI symptom alias is found anywhere within the chief complaint text, then it will be flagged as an ILI indicator

- **Enhanced (NPS) Logic**

- For short words (≤ 3 characters)
 - No variations on alias words allowed
 - Example: ■ ST ■
 - NP FOR HIV TEST ST PER VERONICA/CHART MADE/LM
 - Example: ■ COL ■
 - RTN RE-COLPO/LM
- For longer words (≥ 4 characters)
 - Variations on one side of the alias word is allowed
 - Example: ■ COUGH ■
 - PT COUGHING FOR 4 DAYS
 - Example: ■ OUGH ■
 - R/S PREV APPT CALL NOT GOING THROUGH



Qualitative Comparisons Aug 1, 2008 – July 31, 2009

Base Case

EARS Text Matching Logic
EARS Symptoms Aliases
EARS Syndrome Definitions

9,093 total “flu”
(out of 153,696 total records)



Qualitative Comparisons

Aug 1, 2008 – July 31, 2009

Base Case

EARS Text Matching Logic
EARS Symptoms Aliases
EARS Syndrome Definitions

9,093 total “flu”
(out of 153,696 total records)

Variant 1a

EARS Text Matching Logic
Expanded Symptoms Aliases
Expanded Syndrome Definitions

5,154 added
291 deleted
13,956 total “flu”

Variant 2a

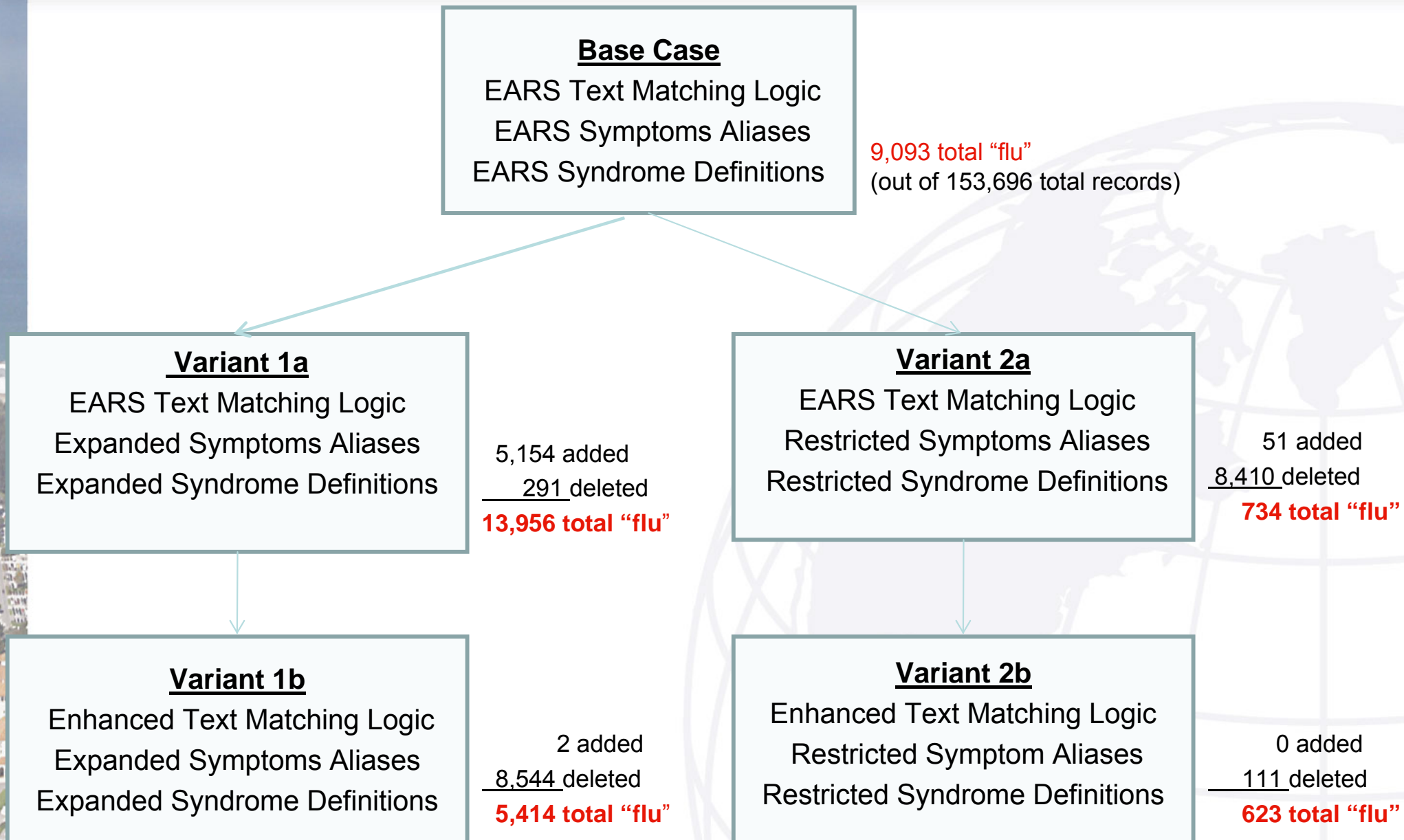
EARS Text Matching Logic
Restricted Symptoms Aliases
Restricted Syndrome Definitions

51 added
8,410 deleted
734 total “flu”



Qualitative Comparisons

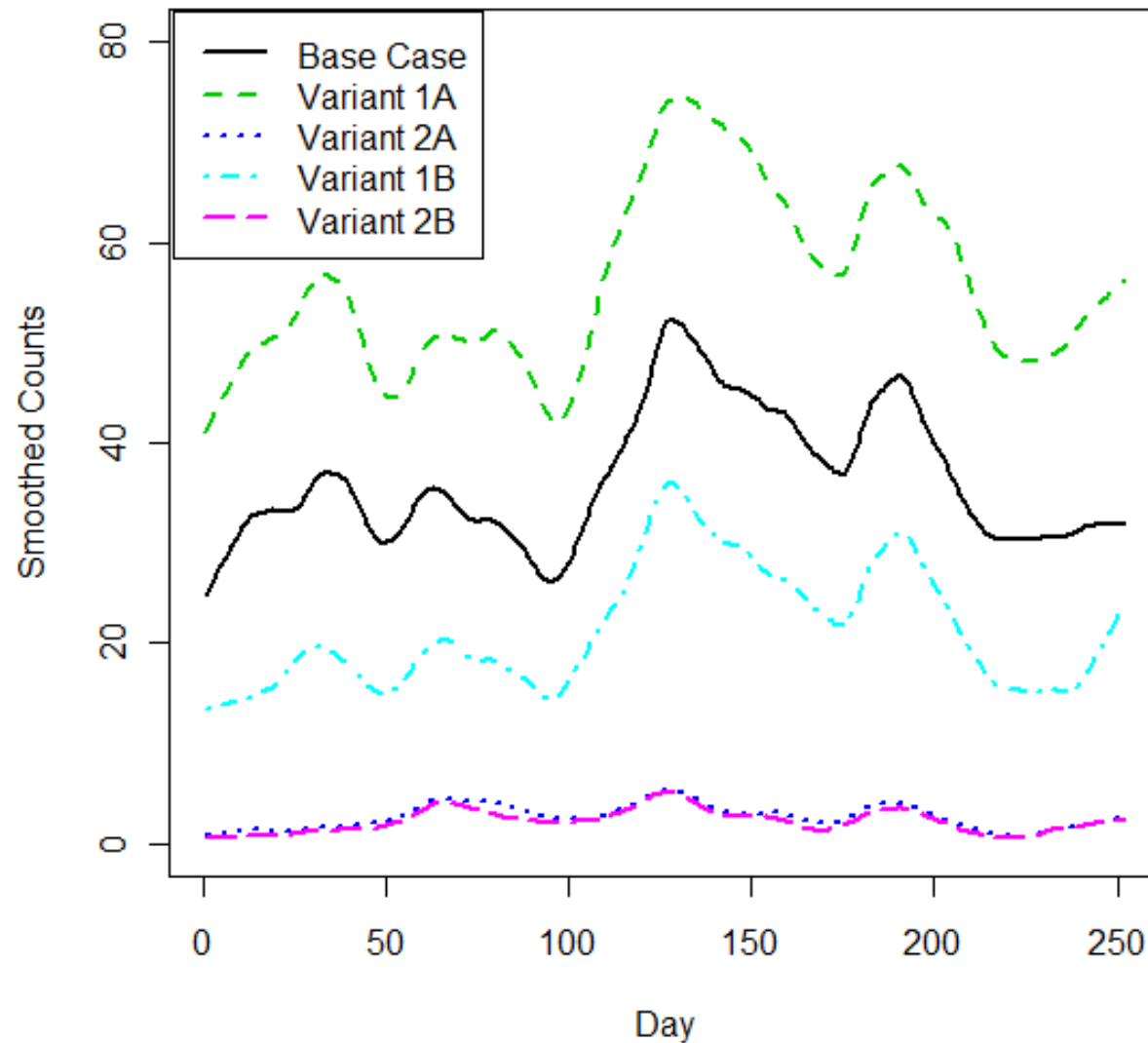
Aug 1, 2008 – July 31, 2009





Qualitative Comparisons Aug 1, 2008 – July 31, 2009

ILI Syndrome





In Conclusion

- Recommend on-going research that conducts comparisons between methods under various conditions
- Way ahead: results vs. actual diagnosis codes
- Small changes in syndrome definitions, symptom aliases, and text-matching logic can have large effects on the resulting syndrome counts and overall “trend”
- Exercise caution!!





Questions?



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