

# Using Indian Health Service Electronic Medical Records for Public Health Surveillance:

## IHS Influenza Awareness System (IIAS), 2009

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# Introduction

- **Background**
  - Surveillance in IHS
  - Electronic surveillance
- **Influenza-like illness (ILI) surveillance**
  - Development
  - Evaluation

# Surveillance in IHS

- **Routine state-based surveillance**
- **No parallel IHS system**
  - **Support state system since 1970s**
  - **Enhance/improve data**
  - **Collaborative effort**

# Fully-Electronic Surveillance

- **Bioterrorism--syndromic surveillance**
  - Poor specificity
  - Not a replacement for traditional system
- **Electronic surveillance pilots**
  - Lack of data--laboratory or clinical
  - Difficult to translate case definitions
  - Disparate computer systems or none

# eSurveillance in IHS

- **Opportunity**
  - Common computer system
  - Rich clinical information
  - Reasonably timely with electronic health record
  - Local awareness alert system
- **Challenges**
  - Lack of uniform laboratory data
  - Electronic case definitions

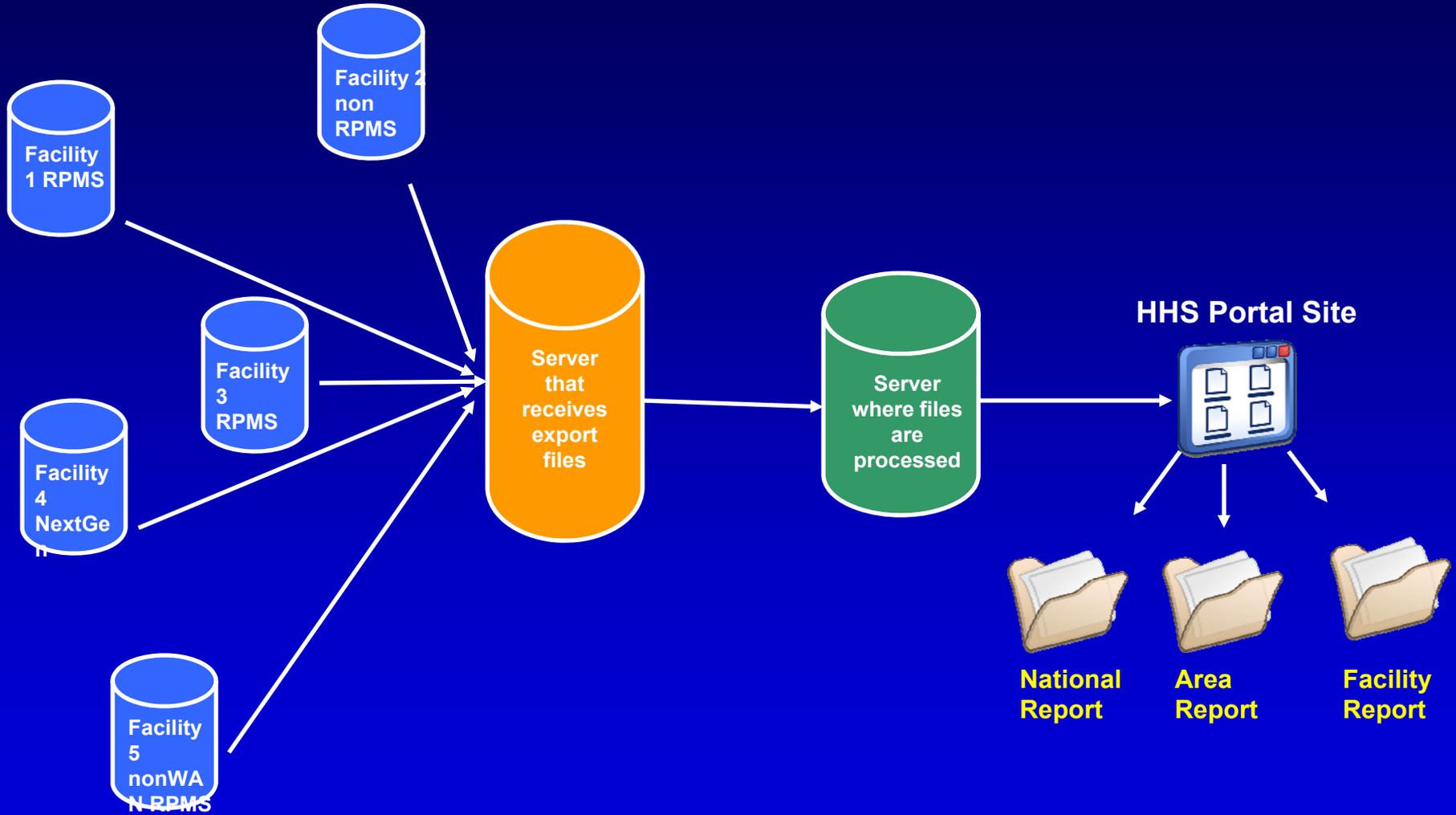
# H1N1 Influenza Surveillance

- **Public health emergency**
  - Need for data in timely fashion
  - Political will
- **Features of ILI surveillance**
  - Syndrome--not dependent on lab data
  - Tested sets of ICD-9 codes

# **IHS H1N1 Surveillance System**

- **Syndromic surveillance system conceived first weekend of outbreak**
- **Support/permission obtained from IHS CMO and Area CMOs**
- **Programming began quickly; multiple software patches since**

# Data Flow



# Fields Collected (Initial)

- **Gender, DOB, Community of Residence**
- **Service unit, date of visit/hospitalization**
- **Up to 3 ILI diagnoses (initially 36 codes)**
- **Temperature**
- **Denominator (per day at each facility)**

# Fields Collected (New)

- **Risk factor diagnoses**
  - **Asthma**
  - **Diabetes**
  - **Obesity**
  - **Pregnancy status**
- **BMI**
- **Severity codes**

# Fields Collected (New)

- **Pneumococcal vaccine status**
- **H1N1 vaccine status**
- **Seasonal influenza vaccine status**
- **Adverse events**
  - **Collaboration with FDA**

# Clinics Covered

**General**

**Diabetic**

**Gyn**

**Immunization**

**Internal  
Medicine**

**Pediatrics**

**Well Child  
Care**

**Family  
Practice**

**Emergency  
Room**

**Epsdt**

**Women's  
Health**

**Urgent Care**

# Development of Definition

- **Consideration of other definitions**
  - **ESSENCE**
  - **BIOSENSE**
- **Initial manual chart review at Southwestern site (~ 120 patients)**

# Development of Definition

- **Comparison of IIAS codes with chart ILI**
- **Full 36-code set clearly overly sensitive (“ILI” % up to 30%)**
- **Code-by-code frequency analysis**
  - **Multiple models considered**
- **Simplicity considerations**

# Influenza-Like Illness Definition

ICD-9 diagnosis code of 488.1 or 487.x

*OR*

A body temperature of 100° F or greater

*AND*

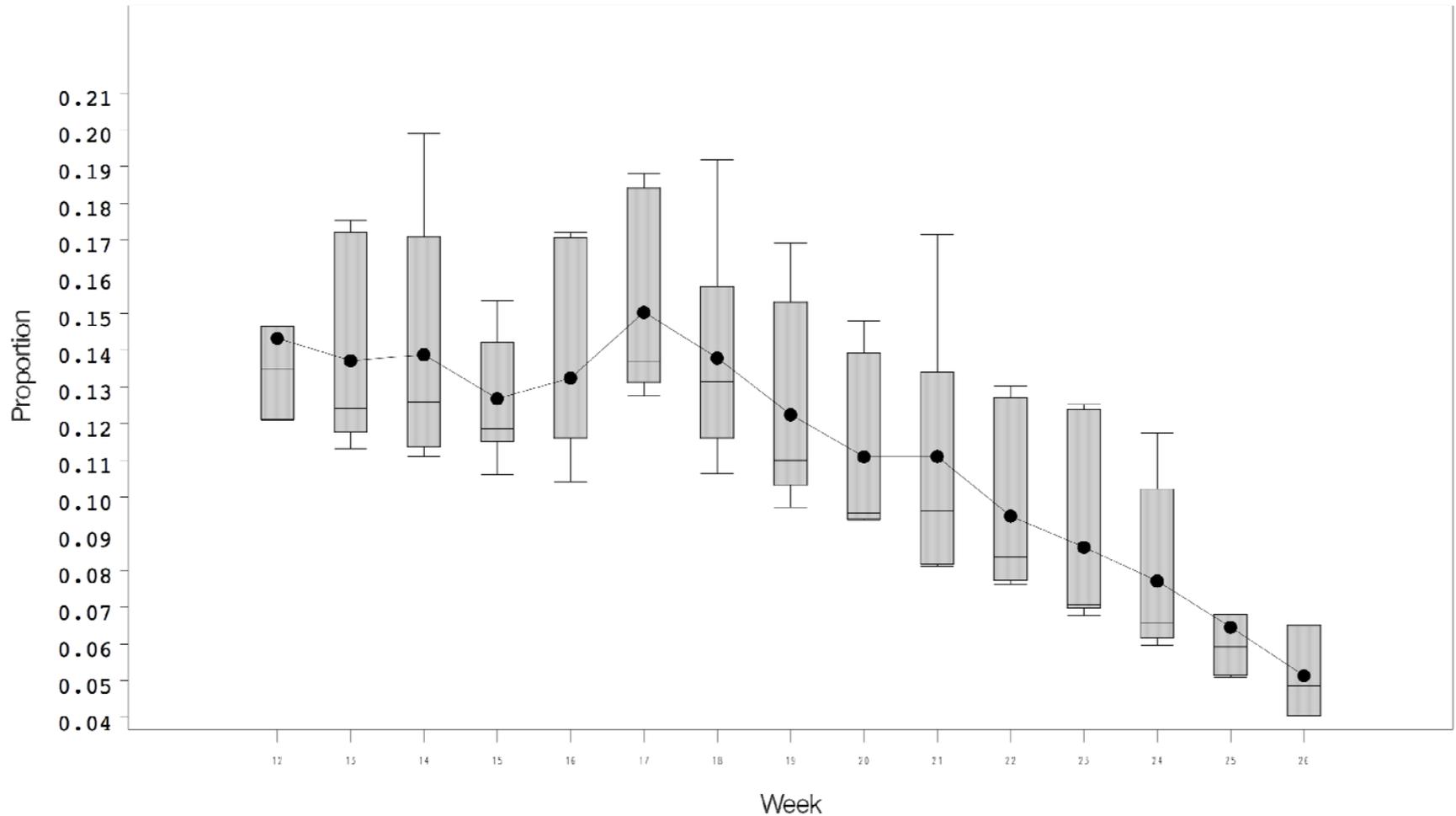
one or more ILI ICD-9 diagnosis codes:

079.99	464.00	478.9
382.00	464.10	480.9
382.9	464.20	485
460	465.0	486
461.8	465.8	490
461.9	465.9	780.6
462	466.0	780.60
463	466.19	786.2

# Examples of ICD-9 Codes (total of 24 collected)

<b>079.99 Unspecified viral infection</b>	<b>382.00 Acute suppurative otitis media</b>	<b>382.9 Unspecified otitis media</b>	<b>460 Acute nasopharyngitis [common cold]</b>
<b>461.8 Other acute sinusitis</b>	<b>461.9 Acute sinusitis, unspecified</b>	<b>462 Acute pharyngitis</b>	<b>463 Acute tonsillitis</b>
<b>780.60 Fever, unspecified</b>	<b>786.2 Cough</b>	<b>486 Pneumonia, organism unspecified</b>	<b>480.9 Viral pneumonia, unspecified</b>

# Example of Data Shared with Local Site



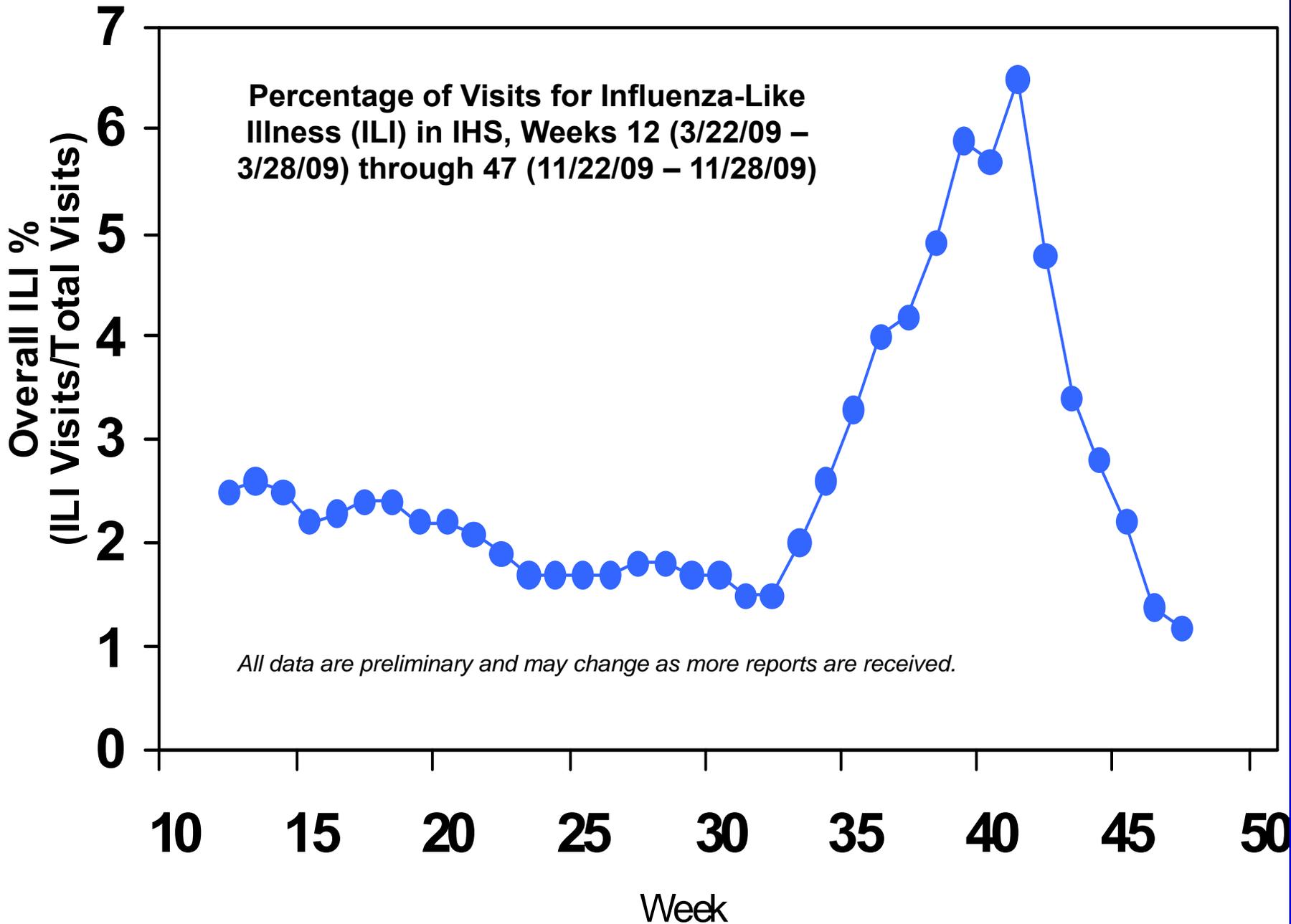
*Proportions are computed as the number of ILI visits divided by the total number of visits per day*

*A visit is counted if it belongs to one of the following: General (01), Diabetic (06), Gyn (10), Immunization (12), Internal Medicine (13), Pediatrics (20), Well Child Care (21), Family Practice (28), Emergency Room (30), EPSDT (57), Women Health (70), Urgent Care (80), Evening (89)*

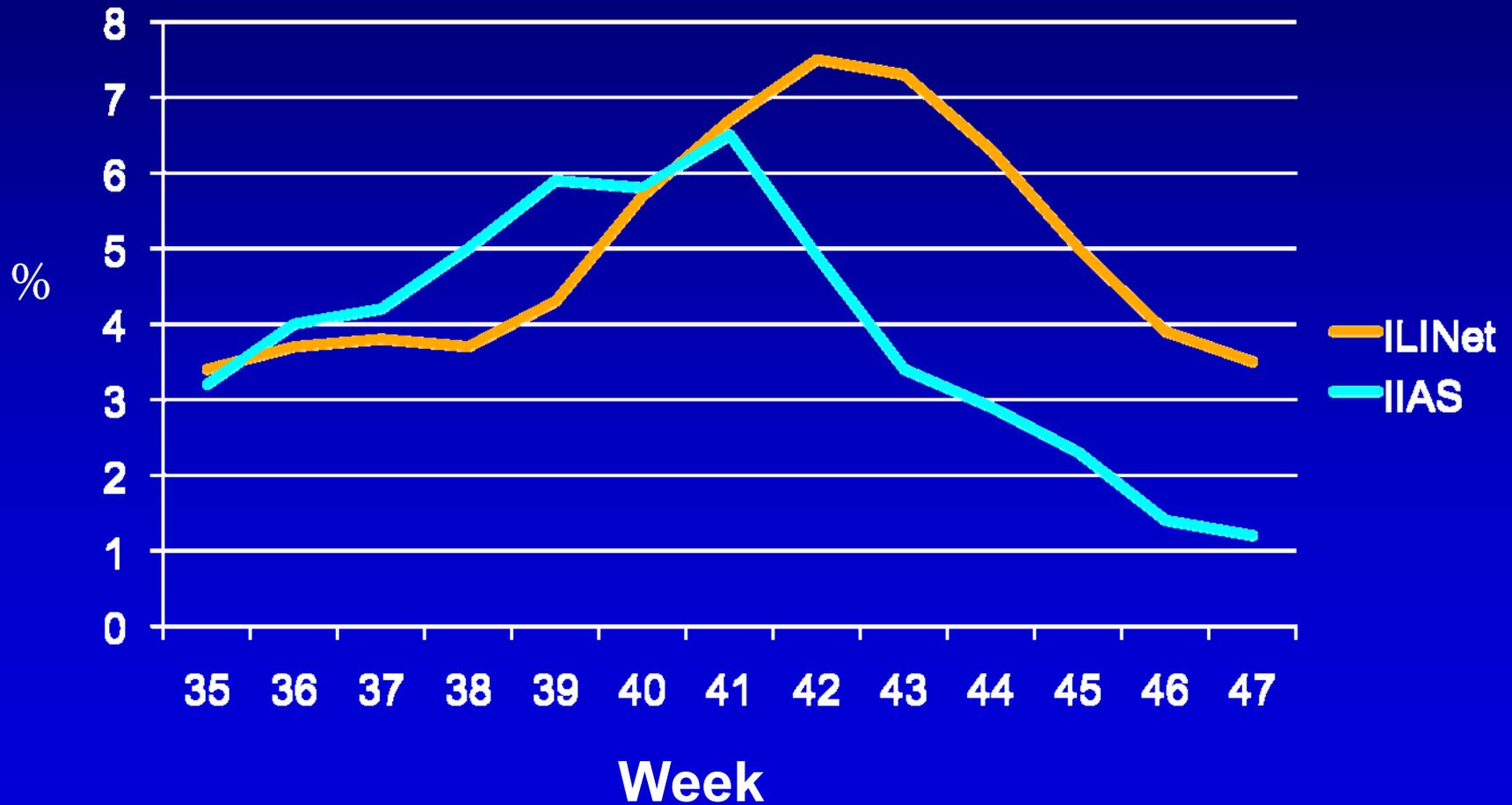
Facility Name: 1  
 Influenzalike Illness (ILI) Counts by Day, Age Group, and Sex for all days  
 ILI definition based upon 36 ICD-9 codes

Month/Day	Age Group																					Total M F	Total Daily Visits			
	0-9			10-19			20-29			30-39			40-49			50-59			60-69					70+		
	Sex		T	Sex		T	Sex		T	Sex		T	Sex		T	Sex		T	Sex		T			Sex		T
	F	M		F	M		F	M		F	M		F	M		F	M		F	M				F	M	
6/11	12	12	24	3	1	4	5	2	7	3	2	5	7	1	8	3	.	3	1	.	1	.	1	1	53	414
6/12	9	15	24	4	1	5	1	4	5	1	2	3	3	2	5	1	.	1	.	.	.	.	.	.	43	452
6/13	5	1	6	2	2	4	1	.	1	1	.	1	3	.	3	3	.	3	.	.	.	.	.	.	18	127
6/14	3	1	4	1	1	2	5	2	7	1	2	3	1	.	1	2	2	4	.	.	.	.	.	.	21	139
6/15	10	9	19	1	2	3	6	5	11	2	5	7	4	.	4	5	.	5	.	.	.	.	.	.	49	428
6/16	19	10	29	6	1	7	8	3	11	5	2	7	2	2	4	1	.	1	1	.	1	.	.	.	60	417
6/17	4	7	11	4	3	7	4	3	7	4	1	5	4	.	4	.	1	1	1	.	1	.	.	.	36	354
6/18	8	8	16	1	3	4	5	1	6	2	2	4	3	4	7	1	.	1	.	.	.	.	.	.	38	434
6/19	9	10	19	.	1	1	3	1	4	3	1	4	2	1	3	1	.	1	1	.	1	.	.	.	33	480
6/20	6	.	6	1	.	1	5	3	8	2	.	2	2	.	2	.	.	.	1	.	1	.	.	.	20	131
6/21	2	.	2	2	3	5	3	2	5	2	2	4	.	.	.	2	.	2	.	.	.	.	.	.	18	124
6/22	14	9	23	4	2	6	6	5	11	2	1	3	1	1	2	1	1	2	.	.	.	1	.	1	48	469
6/23	8	8	16	1	2	3	6	2	8	2	3	5	7	1	8	3	1	4	.	.	.	.	.	.	44	490
6/24	8	11	19	2	1	3	2	3	5	1	3	4	3	.	3	.	.	.	3	.	3	.	.	.	37	449
6/25	7	12	19	1	.	1	.	6	6	2	.	2	2	2	4	3	2	5	2	.	2	.	.	.	39	463
6/26	6	13	19	1	2	3	3	1	4	.	1	1	2	2	4	3	.	3	1	.	1	.	.	.	35	471
6/27	6	5	11	.	2	2	.	.	.	.	2	2	1	1	2	.	.	.	.	1	1	.	1	1	19	169
6/28	2	3	5	.	2	2	2	1	3	2	.	2	1	.	1	.	.	.	.	.	.	.	.	.	13	145
6/29	9	15	24	3	2	5	2	5	7	.	.	.	3	1	4	3	.	3	.	.	.	.	.	.	43	563
6/30	6	7	13	2	2	4	3	.	3	3	.	3	4	2	6	4	.	4	.	1	1	.	.	.	34	483

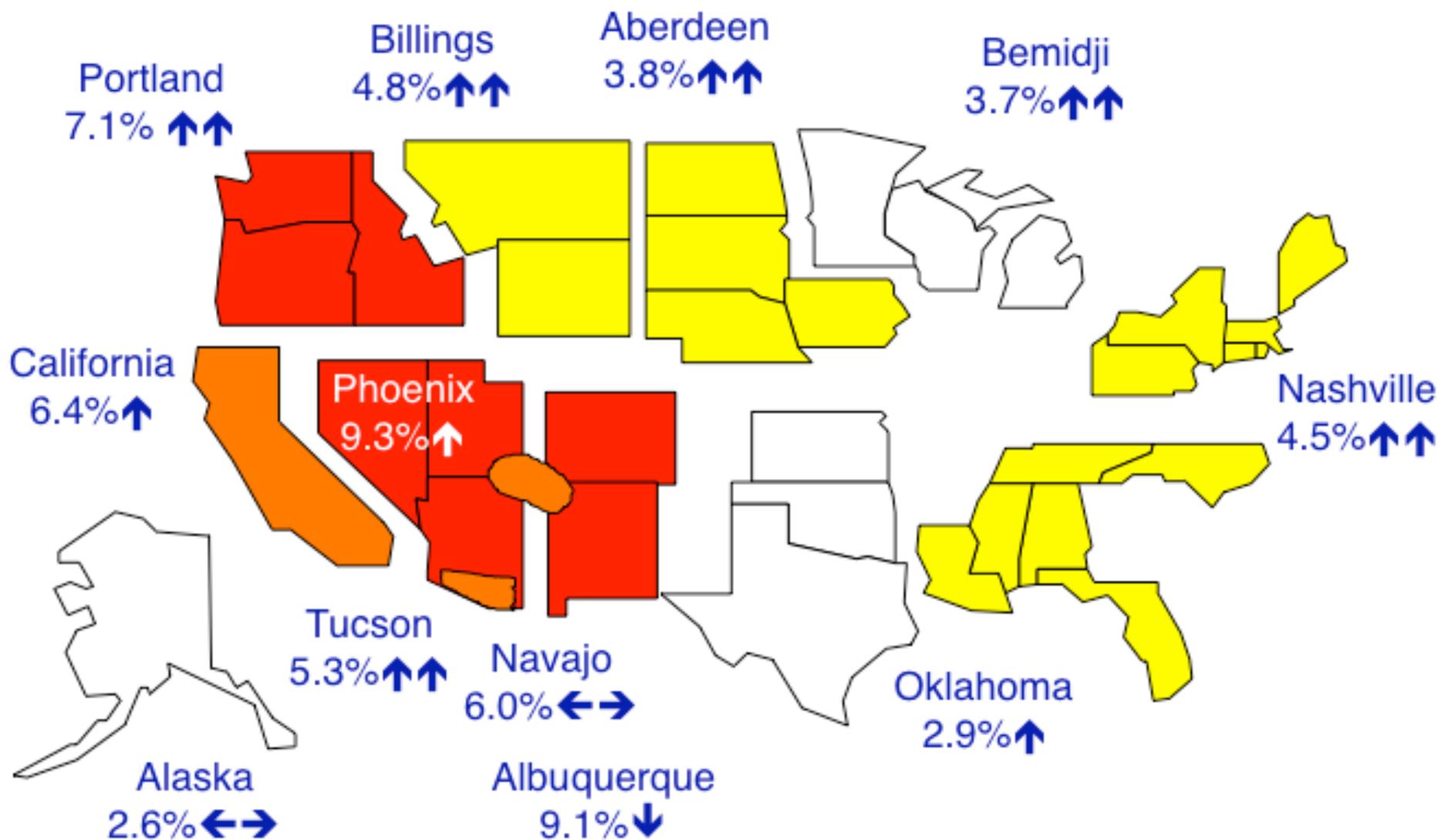
Visits for Total Daily Visits counted if a visit to: General (01), Diabetic (06), Gyn (10), Immunization (12), Internal Medicine (13), Pediatrics (20), Well Child Care (24), Family Practice (28), Emergency Room (30), EPSDT (57), Women Health (70), Urgent Care (80), Evening (89)



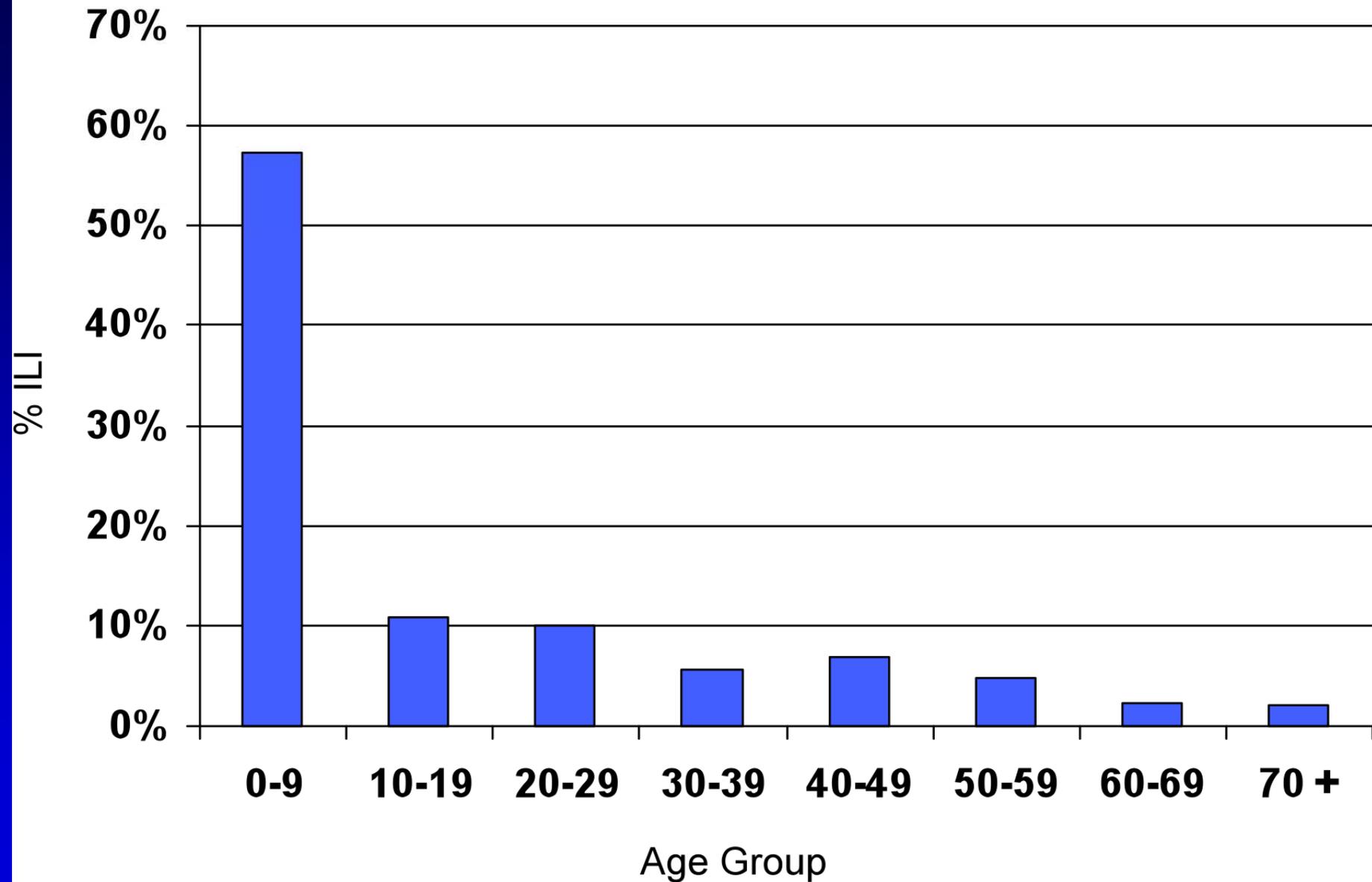
# ILI %, Weeks 35 - 47



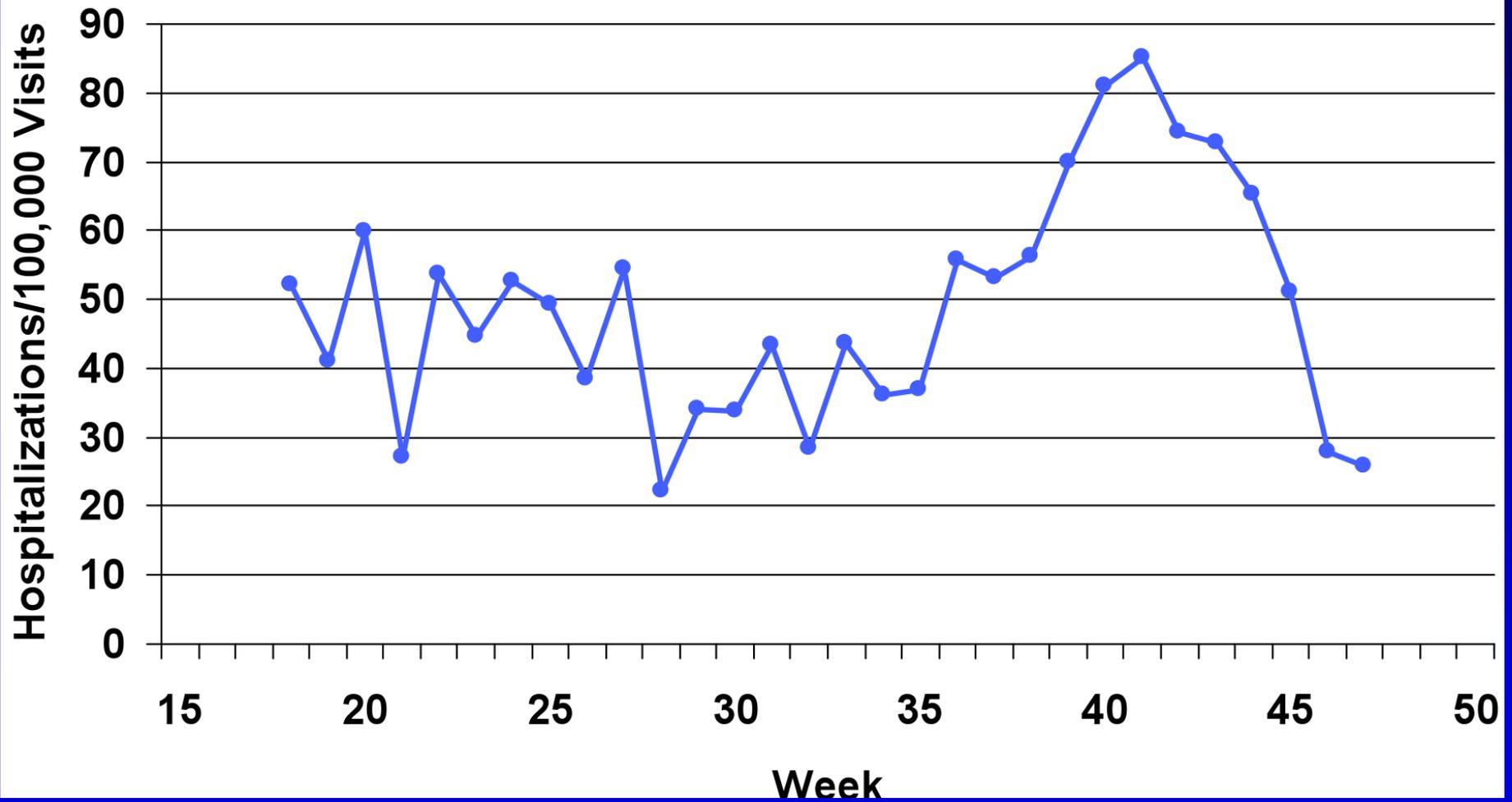
# % Visits for ILI by Area, Week 41, With Trend Comparison to Week 40



# IHS ILI Visits by Age, as % of Total, Week 47



# IHS ILI Hospitalization Rate per 100,000 Total Visits



# Vaccine Delivery

**Table 2: Number of H1N1 Vaccine Doses by Age Group**

<b>Age Group</b>	<b># H1N1 doses</b>
< 5 years	15,715
5-24 years	31,617
25-64 years high risk	12,354
25 – 64 no high risk condition	20,865
65+ years	3939
<b>Total Number of doses</b>	<b>84,490</b>

# Uptake: At least 1 dose of H1N1 by Risk Group



# Evaluation: Methodology

- Chart review
  - Outpatient and emergency visits
  - September 14<sup>th</sup> and 21<sup>st</sup>, 2009
  - Screen visits using **ILINet ILI case definition**

**Temperature  $\geq 100^{\circ}\text{F}$  + sore throat or cough**

- Comparison of IIAS surveillance data with chart review (gold standard)

# Results

- Reviewed 82.8% (1,968) of ambulatory visits on study days
- Chart review found 63 visits that met ILI criteria
- IIAS surveillance captured 95 visits from the same patient group

# IIAS Surveillance Attributes

Influenza-like illness by:

		Chart review	
		+	-
IIAS surveillance	+	60	35
	-	3	1870

- **ILI = 3.2% (by chart review)**
- **IIAS sensitivity = 95.2%**
- **IIAS specificity = 98.2%**
- **IIAS positive predictive value = 63.2%**

# False Positives

- **IIAS identified 35 false positive ILI visits**
  - **22 afebrile patients with an influenza ICD9 code**
  - **13 febrile patients with an ILI-related ICD9 code without documented cough or sore throat**

# Usefulness

- **Provides ILI information on a vulnerable population**
- **Fills geographic gaps in ILINet surveillance**
- **ILI prevalence used to allocate influenza vaccine to federal healthcare workers at IHS facilities**

# Simplicity and Flexibility

## Simplicity

- Automated data collection, analysis, and dissemination
- Comprehensive surveillance without personnel burden

## Flexibility

- IIAS collects additional influenza information
  - Hospitalizations
  - Vaccination coverage
  - Adverse events following immunization
- Ability to modify computer patch and look retrospectively

# Timeliness and Stability

## Timeliness

- **Dependent on data entry into RPMS**
- **Variable by location**

## Stability

- **Stable since inception**

# Where do we go now?

- **ILI surveillance**
  - Robust, timely system
  - Demonstrated utility
- **Expand to other diseases/conditions**
  - Develop electronic case definitions
  - Standardize laboratory data (LOINC)

# Vision for the future

- **Capture all notifiable diseases**
- **Timely reporting**
  - **Public health authorities**
  - **Augment state-based systems**
- **Provide a model system**

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