

Influenza
Diagnostic Options:
Issues and Concerns
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Overview

- Options for influenza diagnosis
- Impact of flu prevalence on diagnosis
- Use of clinical symptoms in hospitalized children and adults

Diagnostic options

- Rapid tests and clinical symptoms
 - Moderate sensitivity and specificity
 - Differ by season, age, timing, and illness severity
 - Interpretation depends on influenza prevalence
- Culture
 - Old “gold standard”
 - Slow
- RT-PCR
 - High sensitivity and specificity
 - 1.6x culture for influenza (children)*
 - New “gold standard”
 - Potential for rapid turn-around

Effect of Influenza Prevalence on Predictive Value of Diagnostic Tests

Results from the CDC-Funded
New Vaccine Surveillance
Network (NVSN)

The New Vaccine Surveillance Network (NVSN)

Population-based ARI Surveillance

140,000 children <5 years



DEPARTMENT OF HEALTH AND HUMAN SERVICES
CENTERS FOR DISEASE CONTROL AND PREVENTION



Surveillance Activities

Children <5 years of age

Residents of Surveillance Counties

Acute Respiratory Infection or Fever

Nasal/throat swab

Parental interview/chart review

Inpatient

- Hospitals with >95% of county hospitalizations for children
- Viral culture and RT-PCR
- Incidence of influenza

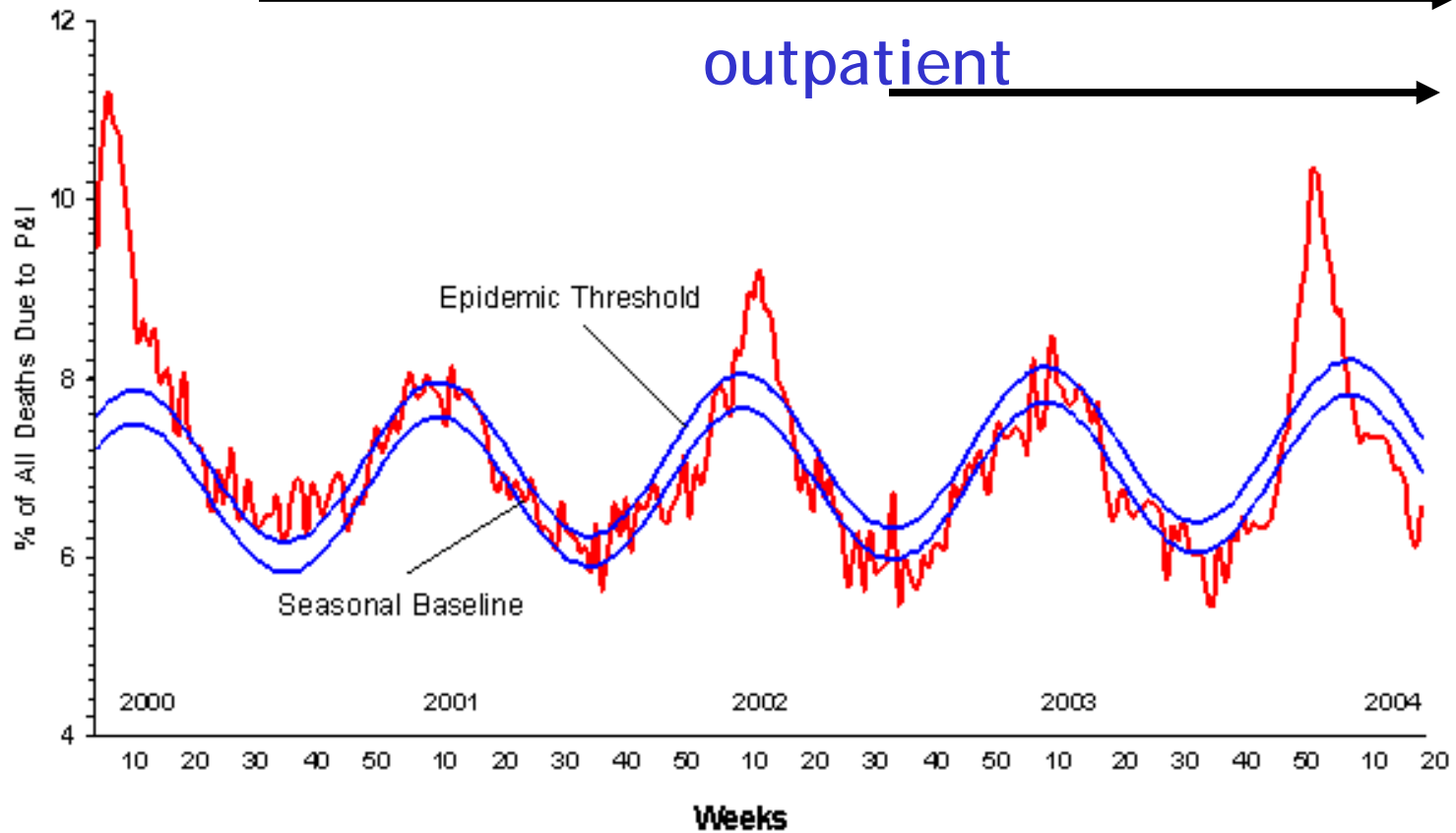
Outpatient

- Selected ED and outpatient clinics
- PCR only
- Proportion with influenza

Pneumonia and Influenza Mortality for 122 U.S. Cities Week Ending 05/22/2004

inpatient

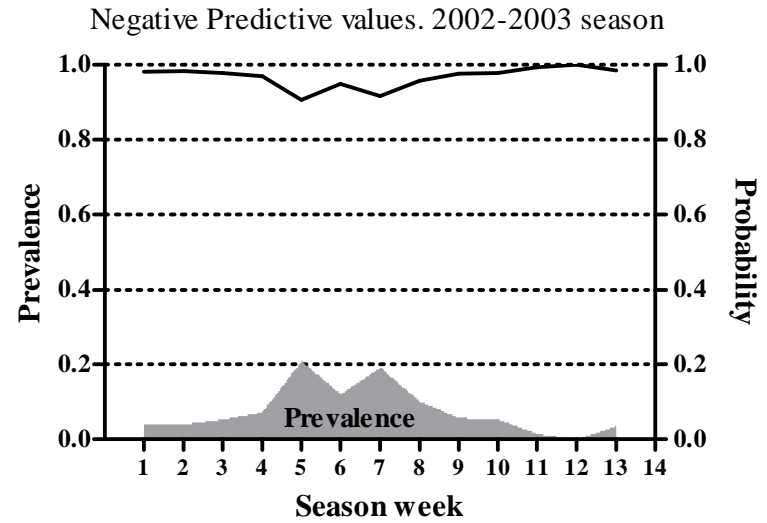
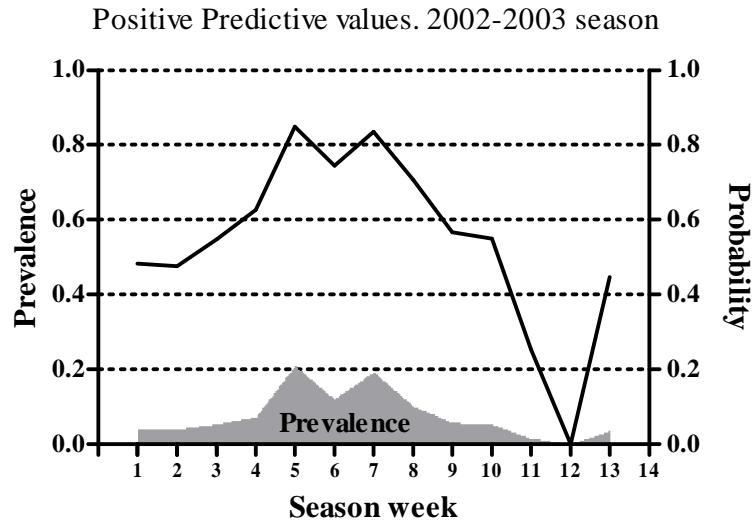
outpatient



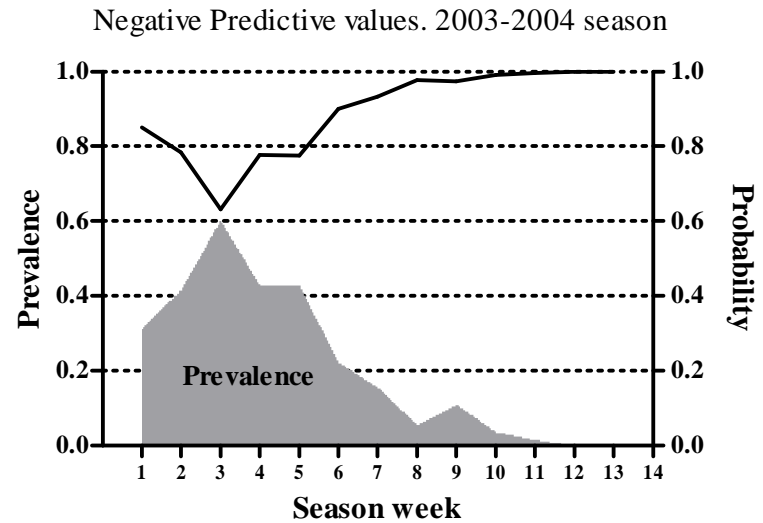
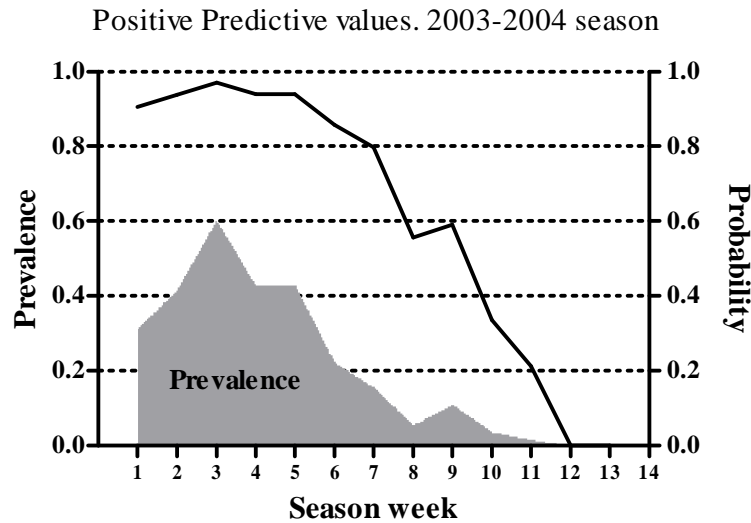
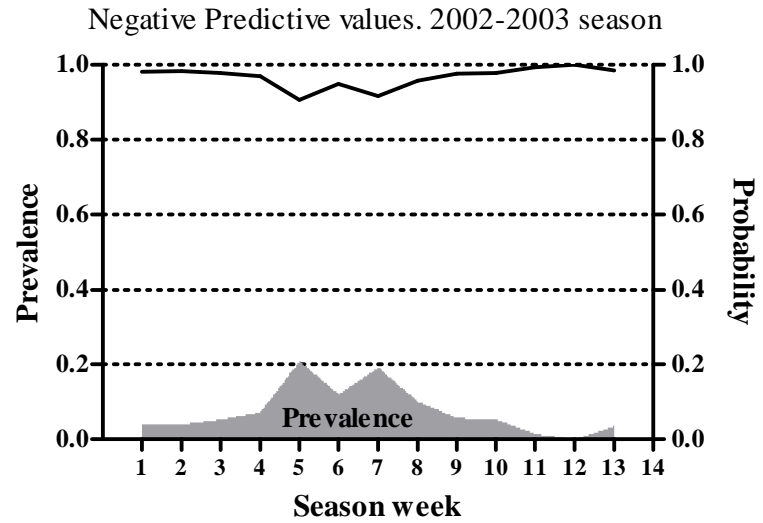
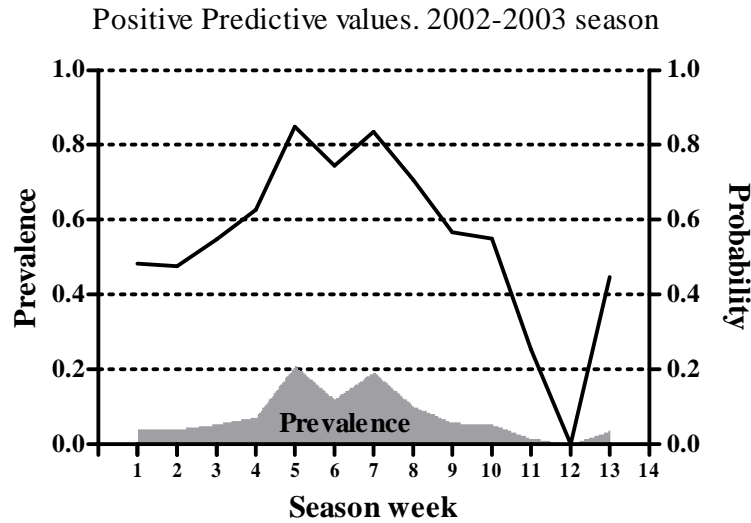
Rapid tests in clinical practice

- 2797 hospitalized children enrolled and tested for influenza by culture & RT-PCR
 - 160 (6%) influenza positive
- 270 children (9.7%) also had a rapid test for influenza performed by hospital lab
- 41/270 (15%) flu+ by culture/RT-PCR
 - Sensitivity 63% (95% CI: 47%-78%)
 - Specificity 97% (95% CI: 94%-99%)

Predictive values for Influenza clinical rapid tests NVSN Outpatient Surveillance 2002 - 2004



Predictive values for Influenza clinical rapid tests NVSN Outpatient Surveillance 2002 - 2004



Clinical Symptoms in Patients Hospitalized with Influenza

Clinical Symptoms

Hospitalized patients

- Aged <5 years
 - New Vaccine Surveillance Network (CDC)
 - Population based hospital surveillance children in 3 US counties
- Aged 50+
 - NIH (Nashville, TN)
 - MedImmune (Knoxville, TN)
 - 2 hospitals in each county 2006—2007
 - Coverage 30-35% county population

% Discharge Diagnoses in Children <5 years with Confirmed Influenza 2000–2004

Discharge Diagnosis	<6 mos (n=79)	6-23 mos (n=49)	2-4 years (n=32)
Influenza	28	24	34
Bronchiolitis	25	20	3
Pneumonia	5	18	16
Asthma	1	12	6
Seizure	0	8	9
Viral Illness	22	6	28
Fever/Sepsis	19	10	3

Poehling et al N Engl J Med. 2006 Jul 6;355(1):31-40.

Rapid antigen testing Adults Hospitalized during Influenza Season

	Knox (N=367)	Davidson (N=190)
Rapid Flu test performed	78 (21%)	46 (24%)

Conclusion 1

- Operating characteristics of clinical diagnosis and rapid tests
 - Vary by age, time of presentation, and possibly severity
 - May need “recalibration” each season
 - Very dependent on disease prevalence
 - Difficult to determine in real time

Conclusion 2

- Use of tests with moderate sensitivity and specificity in epidemic or pandemic requires
 - Rapid determination of “test(s)” of choice and operating characteristics by age group
 - Real-time estimates of disease prevalence
 - Thresholds for treatment/isolation/other measures

Conclusion 3

- Widespread availability of rapid tests with high sensitivity and specificity would greatly enhance clinical and public health decision-making