BACKGROUND

• Transmission and amplification of influenza A and B (Flu-A, Flu-B) within schools has been purported as a driving mechanism for subsequent outbreaks in surrounding communities.
• We explored the timing and relationship between Flu-A and Flu-B detections at four levels within a common community: schools, primary care clinics, an emergency department, and a hospital.
• We also examined the timing of school absenteeism due to an influenza-like illness (aILI) at all levels.

METHODS

Data Collection
• ILL absenteeism: The average daily counts of children absent due to IILI were obtained from the Oregon School District electronic database.
• Flu-related School Absences: Prospective detection of Flu-A and Flu-B in children aged 4-19 years within the Oregon School District (Oregon, Wisconsin) in students absent from school for IILI. Home visits conducted to collect nasopharyngeal or oropharyngeal specimens for reverse transcription polymerase chain reaction (RT-PCR).
• Primary Care Clinic: Medically-attended Flu-A and Flu-B confirmed by RT-PCR at five primary care clinics (surrounding the school district) enrolled in the Wisconsin Influenza Incidence Surveillance Project (W-HISP).
• Emergency Department and Hospitalized Patients: Flu-A and Flu-B RT-PCR data from the UW Hospital Emergency Department and inpatient services provided by the Public Health Information Exchange (PHINEX) at the University of Wisconsin School of Medicine and Public Health.

Data Analysis
• We compared weekly counts of Flu-A and Flu-B from 1/04/2015 - 6/07/2016 across the four datasets (from venues within 12 miles of one another) using Spearman rank correlation and tested the a priori hypothesis that school detections precede those in clinics, EDs, and hospitals.

RESULTS

Influenza was detected in 799 individuals: Flu-A = 548; Flu-B = 251 (see figure 1a and 1b)
• 60 absent children (28 Flu-A [47%] and 32 Flu-B [53%])
• 273 outpatients (177 Flu-A [65%] and 96 Flu-B [35%])
• 281 emergency department patients (213 Flu-A [76%] and 68 Flu-B [24%])
• 185 hospitalized patients (130 Flu-A [70%] and 55 Flu-B [30%])
Flu-A tended to be detected later in emergency department and hospitalized patients (NS) (Table and figure 2a)
Flu-B was detected 4 weeks later in hospitalized patient (p = 0.067; Table and figure 2b)

Influenza in emergency room patients and hospitals tended to occur 1 to 3 weeks following increases in children absent with influenza-like illness (Table)

<table>
<thead>
<tr>
<th>Time Lag for Maximal Rank Correlations (P-value)</th>
<th>Clinic</th>
<th>Emergency Department</th>
<th>Hospital</th>
<th>School</th>
<th>Clinic</th>
<th>Emergency Department</th>
<th>Hospital</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flu-A</td>
<td>0 weeks (0.001)</td>
<td>1 week (0.001)</td>
<td>1 week (0.001)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Flu-B</td>
<td>0 weeks (0.007)</td>
<td>0 weeks (0.001)</td>
<td>4 weeks (0.002)</td>
<td>*</td>
<td>*</td>
<td>*</td>
<td>*</td>
</tr>
<tr>
<td>Flu-A + B</td>
<td>0 weeks (0.001)</td>
<td>0 weeks (0.001)</td>
<td>2 weeks (0.004)</td>
<td>0 weeks (&lt;0.001)</td>
<td>0 weeks (&lt;0.001)</td>
<td>1 week (&lt;0.001)</td>
<td>3 weeks (&lt;0.001)</td>
</tr>
</tbody>
</table>

DISCUSSION

• This is the first study evaluating RT-PCR-confirmed influenza across multiple levels within a common community.
• Absentee children had a lower incidence of Flu-A and higher Flu-B than did patients.
• ILL-absenteeism was an excellent marker for influenza-absenteeism, a clear predictor of ED and hospital influenza, and may emerge as a clinic predictor with a larger sample size.
• Flu-A tended to occur later in ED and hospitalized patients than in absentee children.
• Flu-B tended to occur later in hospitalized patients than in absentee children.
• This is consistent with prediction that schools are centers of transmission and amplification of influenza.
• Limitations: small sample size; short time frame of 1½ academic years.

CONCLUSION

We express our gratitude to:
• ORCHARDS - the Oregon Child Absenteeism due to Respiratory Disease Study
• Funding through CDC/CSTE
• Oregon School District, Oregon, Wisconsin for ongoing support of ORCHARDS
• Wisconsin Influenza Incidence Surveillance Project
• Funding through CDC/CSTE
• Wisconsin Division of Public Health
• Wisconsin State Laboratory of Hygiene
• University of Wisconsin School of Medicine and Public Health Department of Family Medicine and Community Health

ACKNOWLEDGEMENTS

1. UW School of Medicine and Public Health
2. Centers for Disease Control and Prevention