Preliminary end-of-season estimates of 2016–17 seasonal influenza vaccine effectiveness against medically attended influenza from the US Flu VE Network

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US Flu VE Network Methods

**Enrollees:** Outpatients aged ≥6 months with acute respiratory illness with cough ≤7 days duration

**Dates of enrollment:** November 28, 2016–April 14, 2017

**Design:** Test-negative design

- Comparing vaccination odds among influenza RT-PCR positive cases and RT-PCR negative controls
- Vaccination status: receipt of at least one dose of any 2016–17 seasonal flu vaccine according to medical records, immunization registries, and/or self-report

**Analysis:** VE = (1 – adjusted OR) x 100%

- Adjustment for study site, age, sex, self-rated general health status, race/Hispanic ethnicity, interval (days) from onset to enrollment, and calendar time

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**Preliminary 2016-17 Results**

- 7410 enrolled from Nov 28, 2016–Apr 14, 2017 at 5 sites
- 2073 (28%) influenza RT-PCR positive
- 5323 (72%) influenza RT-PCR negative

![Cases enrolled by (sub)type, N=2073](chart.png)

- H3N2 (66%)
- B/Yamagata (28%)
- B/Victoria (3%)
- A, unsubtyped (1%)
- H1N1pdm09 (1%)

- H3N2 (1364)
- H1N1pdm09 (25)
- A, unsubtyped (30)
- B/Yamagata (579)
- B/Victoria (62)
- B/no lineage (8)
Number of enrolled participants by influenza RT-PCR result and percent positivity by week of onset

Interim (February) vaccine effectiveness against medically attended influenza, 2016–17

<table>
<thead>
<tr>
<th>Any influenza A or B virus</th>
<th>Influenza positive</th>
<th>Influenza negative</th>
<th>Vaccine Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N vaccinated /Total</td>
<td>(%)</td>
<td>N vaccinated /Total</td>
</tr>
<tr>
<td>Overall</td>
<td>333/744 (45)</td>
<td>1317/2400 (55)</td>
<td>33 (21 to 44)</td>
</tr>
<tr>
<td>Age group (yrs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mos–8</td>
<td>32/97 (33)</td>
<td>330/614 (54)</td>
<td>58 (33 to 73)</td>
</tr>
<tr>
<td>9–17</td>
<td>36/122 (30)</td>
<td>92/247 (37)</td>
<td>29 (-12 to 56)</td>
</tr>
<tr>
<td>18–49</td>
<td>89/208 (43)</td>
<td>363/783 (46)</td>
<td>13 (-18 to 36)</td>
</tr>
<tr>
<td>50–64</td>
<td>76/189 (40)</td>
<td>261/425 (61)</td>
<td>58 (40 to 70)</td>
</tr>
<tr>
<td>≥65</td>
<td>100/128 (78)</td>
<td>271/331 (82)</td>
<td>21% (-31 to 52)</td>
</tr>
</tbody>
</table>

* Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.
### Interim (February) vaccine effectiveness against medically attended influenza by virus type, 2016–17

<table>
<thead>
<tr>
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<th>Influenza negative</th>
<th>Vaccine Effectiveness</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>N vaccinated/Total</td>
<td>(%)</td>
<td>N vaccinated/Total (%)</td>
</tr>
<tr>
<td><strong>Influenza A/H3N2</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Overall</td>
<td>282/595 (47)</td>
<td>1317/2400 (55)</td>
<td>26 (11 to 38)</td>
</tr>
<tr>
<td>Age group (yrs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mos–8</td>
<td>24/68 (35)</td>
<td>330/614 (54)</td>
<td>53 (21 to 72)</td>
</tr>
<tr>
<td>9–17</td>
<td>28/94 (30)</td>
<td>92/247 (37)</td>
<td>29 (-19 to 57)</td>
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<td>18–49</td>
<td>73/168 (43)</td>
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<td>11 (-24 to 36)</td>
</tr>
<tr>
<td>50–64</td>
<td>70/154 (45)</td>
<td>261/425 (61)</td>
<td>48 (24 to 64)</td>
</tr>
<tr>
<td>≥65</td>
<td>87/111 (78)</td>
<td>271/331 (82)</td>
<td>20 (-37 to 53)</td>
</tr>
<tr>
<td><strong>Influenza B</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>23/90 (26)</td>
<td>1317/2400 (55)</td>
<td>72 (54 to 83)</td>
</tr>
</tbody>
</table>

* Multivariate logistic regression models adjusted for site, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.

### Interim vs prelim. end-of-season vaccine effectiveness against medically attended influenza, 2016–17

**Note:** Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.
Summary of 2016-17 flu vaccine effectiveness

- Preliminary end-of-season results for 2016–17 season indicate vaccine effectiveness of 43% against medically attended influenza
  - Interim and prelim. end-of-season estimates similar to previous seasons when vaccine was well matched to circulating influenza viruses
- Significant protection against circulating influenza A(H3N2) and B viruses (predominantly B/Yamagata)

VE against influenza A (H3N2) viruses

- Interim VE of 43% against A (H3N2) similar to antigenically matched H3N2 viruses
  - 2011-12 (39%) and 2012-13 (39%)
  - Meta-analysis\(^1\) of test-negative VE studies: 33% (26% - 39%)
- VE against A (H1N1)pdm09 (61%) and B viruses (54%) tend to be higher\(^1\)
- A (H3N2) viruses have required more frequent vaccine updates
- Candidate A (H3N2) vaccine viruses more often have antigenic changes after adaptation to growth in eggs
- Efforts ongoing to improve VE against A (H3N2) viruses

\(^1\) Belongia et al. Lancet Infect Dis, 2016
Distribution of vaccine type among US Flu VE enrollees, 2013-14 – 2015-16

- Vaccine effectiveness by vaccine type (live-attenuated vs inactivated vaccine in children, trivalent vs quadrivalent vs high dose among adults)
- No differences in VE by vaccine type (predominant B lineage included in trivalent vaccine)
Adjusted A/H3N2 vaccine effectiveness by vaccine type and age group, US Flu VE, 2014-15

Source: Zimmerman, CID 2016

Adjusted vaccine effectiveness against flu B by vaccine type and age group, US Flu VE, 2014-15

Source: Zimmerman, CID 2016
Influenza Vaccine Effectiveness Against Pediatric Deaths: 2010–2014

- 358 influenza-associated deaths aged 6m-17y over 4 flu seasons
- 75 (26%) vaccinated out of 291 with known vaccination status
- VE was 51% (CI, 31%-67%) among children with high-risk conditions
- VE was 65% (47%-78%) among children without high-risk conditions

US Flu VE Network


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- **CDC**: Alicia M. Fry, Swathi N. Thaker, Sarah Spencer, LaShondra Berman, Angie Foust, Wendy Sessions, Joseph Bresee, Erin Burns, Jerome Tokars, Jackie Katz, Daniel Jernigan
Thank you

For more information, contact CDC
1-800-CDC-INFO (232-4636)

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention.