Interim Estimates of 2018–19 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 23, 2018–February 2, 2019

**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 2018–19 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, self-rated general health status, race/Hispanic ethnicity, interval from onset to enrollment, and calendar time
Interim Results (Published Feb 15, 2019 MMWR)

- 3,254 enrolled from Nov 23, 2018–Feb 2, 2019 at 5 sites
- 465 (14%) influenza RT-PCR positive
- 2,789 (86%) influenza RT-PCR negative

Cases enrolled by (sub)type, N=465

- H3N2 (101)
- H1N1pdm09 (293)
- A, unsubtyped (62)
- B/Yamagata (4)
- B/Victoria (4)
- B, no lineage (1)

Doyle et al, MMWR 2019
Note: Week 7 only includes patients with completed laboratory tests and thus does not reflect all enrolled patients during that week across study sites.
Interim adjusted vaccine effectiveness against medically attended influenza A/B by age group, 2018–19

<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</td>
<td>(%)</td>
<td>N vaccinated</td>
</tr>
<tr>
<td>Overall</td>
<td>198/465 (43)</td>
<td>1591/2789 (57)</td>
<td>44 (32 to 54)</td>
</tr>
<tr>
<td>Age group (yrs)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mos–17</td>
<td>58/173 (34)</td>
<td>515/926 (56)</td>
<td>60 (43 to 71)</td>
</tr>
<tr>
<td>18–49</td>
<td>58/166 (35)</td>
<td>403/932 (43)</td>
<td>30 (1 to 50)</td>
</tr>
<tr>
<td>≥50</td>
<td>82/126 (65)</td>
<td>673/931 (72)</td>
<td>29 (-6 to 52)</td>
</tr>
</tbody>
</table>

* Multivariable logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.
Interim adjusted vaccine effectiveness against medically attended influenza A subtypes by age group, 2018–19

<table>
<thead>
<tr>
<th>Influenza subtype</th>
<th>Vaccine Effectiveness</th>
<th>Unadjusted</th>
<th>Adjusted*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Influenza positive</td>
<td>Influenza negative</td>
<td>VE %</td>
</tr>
<tr>
<td></td>
<td>N vaccinated /Total (%)</td>
<td>(%)</td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>125/293 (43)</td>
<td>1591/2789 (57)</td>
<td>44</td>
</tr>
<tr>
<td><strong>Age group (yrs)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 mos–17</td>
<td>37/106 (35)</td>
<td>515/926 (56)</td>
<td>57</td>
</tr>
<tr>
<td>18–49</td>
<td>38/113 (34)</td>
<td>403/932 (43)</td>
<td>33</td>
</tr>
<tr>
<td>≥50</td>
<td>50/74 (68)</td>
<td>673/931 (72)</td>
<td>20</td>
</tr>
<tr>
<td>* Influenza A/H3N2</td>
<td>Overall</td>
<td>42/101 (42)</td>
<td>1591/2789 (57)</td>
</tr>
</tbody>
</table>

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

- Interim results for 2018–19 season (through February 2, 2019) indicate protection against influenza
  - 47% (CI: 35, 57) vaccine effectiveness against any influenza virus
  - 46% (CI: 30, 58) against H1N1pdm09, 44% (CI: 13, 64) against H3N2
- Effectiveness estimates among children aged 6 months – 17 years
  - 61% (CI: 44, 73) against any flu, 62% (CI: 40, 75) against H1N1pdm09
- Effectiveness estimates 37% – 45% among adults aged 18-49 years
- Effectiveness estimates not statistically significant among those ≥50 years
  - US Flu VE study will continue enrolling through end of season
Recently published estimates of 2018-19 VE

- Canada, Skowronski et al, Eurosurveillance 2019
  - VE 68% (CI: 55, 77) against any flu, 72% against H1N1pdm09
- Europe, Kissling et al, Eurosurveillance 2019
  - VE 32% – 43% against flu A, 45% – 71% against H1N1pdm09
  - UK, LAIV: VE 87% (CI: 4, 100) against H1N1pdm09
- Hong Kong, Chiu et al, Eurosurveillance 2019
  - Inpatient VE 92% (CI: 82, 96) against H1N1pdm09, 6m-17 years
- Australia (2018), Australian Government website
  - VE 78% (CI: 51, 91) against H1N1pdm09, all ages
Influenza disease burden during recent H1N1pdm09-predominant seasons

Annual burden of flu in the U.S. since 2010 (estimated range)

Recent A(H1N1)pdm09 predominant seasons

<table>
<thead>
<tr>
<th>Season</th>
<th>Cases</th>
<th>Hospitalizations</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-14</td>
<td>30,000,000</td>
<td>350,000</td>
<td>38,000</td>
</tr>
<tr>
<td>2015-16</td>
<td>25,000,000</td>
<td>310,000</td>
<td>25,000</td>
</tr>
</tbody>
</table>

www.cdc.gov/flu/about/burden/index.html
Deaths, hospitalizations and cases averted in the US due to influenza vaccination, 2017-18 flu season

- Deaths averted: 8,000
- Hospitalizations averted: 109,000
- Cases averted: 7.1 million

<table>
<thead>
<tr>
<th>Season</th>
<th>Vaccine coverage % (range)</th>
<th>Vaccine effectiveness % (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2017-18</td>
<td>37–58</td>
<td>38 (31–43)</td>
</tr>
</tbody>
</table>

Estimates of 2018-19 averted burden expected in fall 2019

Rolfes et al, Clinical Infectious Diseases 2019
US Flu VE Network

- Baylor Scott and White Health, Texas A&M University Health Science Center College of Medicine: Manjusha Gaglani, Chandni Raiyani, Madhava Beeram, Kelsey Bounds, Wencong Chen, Lydia Clipper, Renee Day, Amanda Drake, Mary Kylberg, Michael Smith, Kempapura Murthy, Teresa Ponder, Michael Reis, Natalie Settele, Jennifer Thomas, Jamie Walkowiak, Alejandro Arroliga


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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.