**CDC Influenza Division Key Points**
**Seasonal Influenza Vaccine Effectiveness: Early Estimates**
**January 15, 2015**

## In this document:



## Summary Key Messages

- Since 2004-2005, CDC has been conducting vaccine effectiveness (VE) studies each season to measure how well the vaccine is protecting vaccinated people from having to go to the doctor because of flu.
- Study results from the U.S. Influenza Vaccine Effectiveness (Flu VE) Network have varied from 10% to 60% between 2004-2005 and 2013-2014.
- Early estimates for the current season were published in the January 16, 2015 edition of the Morbidity and Mortality Weekly Report. The MMWR report is available on the CDC web site at http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6401a4.htm?s_cid=mm6401a4_w
- Data so far this season indicate that influenza vaccination reduced a vaccinated person's risk of having to go to the doctor for flu illness by about 23% across all ages.
- These early VE estimates are lower compared to some other seasons, likely reflecting the fact that more than two-thirds of circulating H3N2 viruses this season have been antigenically or genetically different from the H3N2 vaccine virus.
- A meta-analysis of influenza vaccine effectiveness studies, published in 2012, found that VE against medically attended illness is around 60% during seasons when circulating viruses and vaccine viruses are well-matched.[1]
- While offering reduced protection, this season's vaccine can still prevent some infections with currently circulating H3N2 viruses and also lessen related complications.
- The reduced protection offered by flu vaccine this season underscores the need for additional prevention and treatment efforts, including the appropriate use of influenza antiviral medications for treatment.

## Seasonal Influenza Vaccine Effectiveness: Early Estimates

- The VE estimates published today (January 15) are derived from data collected from 2,321 children and adults enrolled as outpatients at five study sites across the United States through the U.S. Flu VE Network.

**CDC Influenza Division Key Points**
**Seasonal Influenza Vaccine Effectiveness: Early Estimates**
**January 15, 2015**

- Effectiveness of the seasonal flu vaccine was estimated using medically attended acute respiratory illness (ARI) as a specific outcome.
- Of the 2,321 children and adults with ARI enrolled at the study sites, 950 (41%) tested positive for influenza by rRT-PCR (real time reverse transcription polymerase chain reaction). Of these, 916 (96%) were influenza A viruses and 35 (4%) were influenza B viruses.
    - Among the 916 infections with influenza A viruses, 842 (92%) were subtyped; 842 (100%) of those were caused by influenza A (H3N2) viruses.
    - Overall, a total of 24 influenza A (H3N2) viruses from patients enrolled in Flu VE were characterized; eight (33%) were antigenically similar to A/Texas/50/2012, and 16 (67%) were antigenically drifted.
    - The large majority of H3N2 viruses tested by CDC this season, including viruses from the U.S. VE Flu Network study sites, have been antigenically different from A/Texas/50/2012, the H3N2 vaccine component of the 2014-2015 influenza vaccines. Sequencing analyses of H3N2 virus specimens have also shown differences compared with the H3N2 vaccine virus.
- Across study sites, the proportion of enrollees vaccinated with 2014-2015 influenza seasonal vaccine ranged from 46% to 66% across sites, and differed by age, race/ethnicity and self-rated health status.
- Early vaccine effectiveness estimates for the 2014-2015 season indicate that vaccination with the 2014-2015 influenza season vaccine reduced the risk of outpatient medical visits due to influenza by approximately 23% for children and adults. (The VE point estimate is 23% with a 95% confidence interval [CI] of 8%-36%. Information on point estimates and confidence intervals is available at http://www.cdc.gov/flu/about/qa/vaccineeffect.htm )
- An adjusted VE estimate of 22% (CI=5% to 35%) against A (H3N2) influenza viruses was also reported.
- These estimates were adjusted for study site, age, sex, race/ethnicity, self-reported health and days from illness onset to enrollment.
- While offering reduced protection, this season's vaccine can still prevent some infections with currently circulating H3N2 viruses and also lessen related complications.
- These interim estimates indicate that many vaccinated persons may become infected with influenza A (H3N2) viruses, despite having been vaccinated.
- However, other flu viruses the vaccine protects against may circulate at higher levels later in the season. It's not possible to say with certainty what the rest of this flu season will be like.

- Therefore, clinicians and the public are reminded of CDC's antiviral treatment recommendations. Antiviral medications should be used as recommended for treatment in patients, regardless of vaccination status.
- See Influenza Antiviral Medications: Summary for Clinicians (for health care providers) and What You Should Know about Flu Antiviral Drugs (for the public) on the CDC web site for more information.
- CDC will continue to monitor VE throughout the season and will share updated VE estimates as the information becomes available.
- The final, adjusted vaccine effectiveness estimates for the 2014-2015 influenza vaccine are likely to be somewhat different from the current interim estimates for a number of reasons, including adjustments for additional potential confounders, such as chronic medical conditions in patients, which are not available for interim estimates.
- VE estimates could also change as more patient data become available, or if changes occur in the circulating influenza viruses during the remainder of this season.

### Methodology

- From November 10 to January 2, 2015, patients aged 6 months and older who sought outpatient medical care for an ARI with cough, within 7 days of illness onset, were enrolled at five study sites within the U.S. Flu VE Network.
- Study enrollment began once laboratory-confirmed cases of influenza were identified through local surveillance.
- Patients were eligible for enrollment if they:
    1) were aged ≥6 months on September 1, 2014, and thus were eligible for vaccination;
    2) reported an ARI with onset ≤7 days prior to their visit; and
    3) had not yet been treated with influenza antiviral medication (e.g. oseltamivir) during this illness.
- Respiratory specimens were collected from each patient using nasal and/or oropharyngeal swabs (only nasal swabs were collected from children 2 years old and younger).
- Specimens were tested at U.S. flu VE Network laboratories using CDC's real-time reverse transcription polymerase chain reaction (rRT-PCR) protocol for detection and identification of influenza viruses.
- Participants were considered vaccinated if they received at least one dose of any seasonal influenza vaccine ≥14 days prior to illness onset, according to medical records and registries (at two sites) or self-report and medical records (at three sites).

- VE was estimated by comparing the odds of vaccination among influenza-positive (cases) versus influenza-negative (controls) participants.
- Estimates were adjusted for study site, age, sex, race/ethnicity, self-rated health and days from illness onset to enrollment using logistic regression.

## Background

- CDC conducts studies to measure the benefits of seasonal flu vaccination each flu season to help determine how well flu vaccines are working. These studies are called "vaccine effectiveness" studies or "VE" studies, for short.
- How well the flu vaccine works can vary by season, virus type/subtype, the vaccine, and age and other host factors of the people being vaccinated.
- Although antigenic match influences vaccine effectiveness, randomized studies of influenza vaccines have reported variable vaccine efficacy during seasons when antigenically drifted viruses predominated.
- VE is difficult to measure and study results can vary widely based on the study design, the outcome being measured and the population being studied.
- CDC has worked with researchers at universities and health systems since 2003-2004 to estimate VE in non-randomized, observational studies.
- The U.S. Flu VE Network consists of five study sites across the United States that measure the flu vaccine's effectiveness at preventing outpatient medical visits due to laboratory-confirmed influenza.
- CDC's observational studies at U.S. Flu VE Network sites measure outpatient visits for laboratory-confirmed influenza infection using a highly accurate lab test called rRT-PCR to verify the outcome.
- This is an observational study that compares the odds of vaccination among outpatients with acute respiratory illness and laboratory-confirmed influenza infection to the odds of vaccination among outpatients with ARI who test negative for influenza infection.
- The study uses a test-negative control design, which minimizes potential bias introduced by access to medical care and health care-seeking behavior.

[1] Osterholm MT, Kelley NS, Sommer A, Belongia EA. Efficacy and effectiveness of influenza vaccines: a systematic review and meta-analysis. Lancet Infect Dis. 2012 Jan;12(1)36-44.