World Health Organization

Questions and Answers

Vaccine effectiveness estimates for seasonal influenza vaccines

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1. **What is the vaccine effectiveness of seasonal influenza vaccines?**
2. **How is vaccine effectiveness measured?**
3. **What factors influence the vaccine effectiveness estimate?**
4. **Earlier this year, the Centers for Disease Control and Prevention (CDC) in the United States of America had an interim estimate of vaccine effectiveness for the northern hemisphere 2014-15 seasonal influenza vaccine as 23%. What does this mean?**
5. **What does vaccine "match" and "mismatch" mean?**
6. **Why was the vaccine virus for the 2014-2015 season not closely related to circulating influenza viruses?**
7. **Does WHO recommend the seasonal influenza vaccine even if it is not closely-related to the predominant circulating influenza viruses? If so, why?**
8. **Can I get vaccinated and still get the influenza?**

1. What is the vaccine effectiveness of seasonal influenza vaccines?

The vaccine effectiveness of seasonal influenza vaccines is a measure of how well the seasonal influenza vaccine prevents influenza virus infection in the general population during a given influenza season. If the vaccine effectiveness is high, it indicates that individuals who have received the seasonal influenza vaccine are less likely to have an influenza illness. If the vaccine effectiveness is low, it indicates that the seasonal influenza vaccine may not be as likely to prevent influenza illness in the vaccinated population. It is important to remember that even with low vaccine effectiveness, substantial numbers of influenza-related illnesses can still be prevented.

Each season, studies are conducted in some countries to measure the effectiveness of influenza vaccine. During seasons when most circulating influenza viruses are similar to the viruses in the influenza vaccine, the vaccine can reduce the risk of illness caused by influenza virus infection by about 50-60% among the overall population.

2. How is vaccine effectiveness measured?

There are many different study designs to measure influenza vaccine effectiveness, although all compare rates of influenza disease among unvaccinated persons and vaccinated persons and make efforts to adjust for differences between the two groups. A popular study design to measure vaccine effectiveness is to compare the rates of vaccination in a group of patients that seek medical care for acute respiratory illness and that are tested for influenza virus infection. Data are collected from a network of outpatient clinics on patients that have sought medical care for acute respiratory illness. Data on vaccine status and the laboratory findings

are used to calculate an estimate of how well the seasonal vaccine prevented patients from suffering from influenza.

3. What factors influence the vaccine effectiveness estimate?

Estimates of vaccine effectiveness depend on when and where the study is done because changes in circulating influenza viruses can occur during the season. Early estimates may differ from those done at the end of the season. The estimates also depend on many factors inherent to the patient (such as age and health status) and how respiratory illness due to influenza is precisely defined in the particular effectiveness study.

Vaccine effectiveness studies also depend on how closely related the viruses in the vaccine are to the influenza viruses circulating in the general population during the season. More detailed analysis of the influenza viruses infecting vaccinated individuals can yield information on which viruses in the vaccine might not be closely related to the circulating viruses.

Variations in vaccine effectiveness studies can make comparisons of estimates taken from multiple studies difficult. For example, vaccine effectiveness estimates may not apply to other groups of individuals where host factors (again including age and health status) might be different. The definitions of infection can also differ between various vaccine effectiveness studies. The timing and location of vaccine effectiveness studies can influence the results.

Vaccine effectiveness studies are subject to various forms of bias, especially confounding, selection, and information biases. Therefore, the methods used to conduct observational studies of vaccine effectiveness needs careful review to see if possible forms of bias have been described and addressed.

4. Earlier this year, the Centers for Disease Control and Prevention (CDC) in the United States of America had an interim estimate of vaccine effectiveness for the northern hemisphere 2014-15 seasonal influenza vaccine as 23%. What does this mean?

This estimate of vaccine effectiveness implies that vaccination with the seasonal influenza vaccine reduced a person's risk of being diagnosed by a doctor to have laboratory-confirmed influenza virus infection by 23% among people of all ages. During seasons when most circulating influenza viruses are closely related to the viruses in the influenza vaccine, the vaccine effectiveness estimate has ranged from 50-60% among the overall population. This means that the interim vaccine effectiveness for the 2014-15 season was less than half that seen in years where the vaccine and circulating viruses were closely related.

More detailed analysis of the influenza viruses isolated from patients in this study revealed that most patients with laboratory-confirmed influenza virus were infected with the A(H3N2) subtype. Characterization of A(H3N2) influenza viruses from patients showed differences between viruses infecting people and the A(H3N2) subtype that was included in the seasonal influenza vaccine. These differences are likely the reason why the vaccine was less effective in preventing influenza virus infection than anticipated.

Public health officials used the 23% vaccine effectiveness estimate to emphasize the importance of prevention measures against influenza infection (other than vaccination) and prompt treatment of infections with antiviral medications, especially in patients at high risk for severe influenza-related illness.

5. What does vaccine "match" and "mismatch" mean?

Vaccines against seasonal influenza must be frequently updated and the process for selecting the viruses and manufacturing the influenza vaccines starts several months before the influenza season begins. Detailed, timely data on viruses that are circulating and infecting humans globally are gathered, shared among countries and scientists, and are eventually used to formulate the upcoming seasonal influenza vaccines.

Influenza viruses are constantly changing, including during the time between vaccine virus selection and the influenza season. If these changes lead to antigenic differences between the circulating seasonal influenza viruses and those viruses that are included in the seasonal influenza vaccine, then the vaccine and circulating viruses may not be closely related. The degree of similarity or difference between the circulating viruses and the viruses in the vaccines is often referred to as "vaccine match" or "vaccine mismatch".

6. Why was the vaccine virus for the 2014-2015 season not closely related to circulating influenza viruses?

Influenza A/Texas/50/2012-like viruses were the most common circulating influenza A(H3N2) viruses during the 2013-14 season. This virus was therefore recommended as the vaccine virus in February 2014. New groups of A(H3N2) viruses that became predominant during the 2014-15 season were first detected through surveillance in late March 2014, after WHO recommendations for the vaccine composition for the northern hemisphere 2014-2015 season had been made in mid-February, and after vaccine manufacturing had begun. In March 2014, a very small number of these viruses had been found among the numerous specimens that had been collected and tested. An updated vaccine virus (A/Switzerland/9715293/2013), a representative of one of the new groups, was recommended in September 2014 for inclusion in vaccines for the 2015 southern hemisphere influenza season.

7. Does WHO recommend the seasonal influenza vaccine even if it is not closely-related to the predominant circulating influenza viruses? If so, why?

Yes, for several reasons. First, even if a vaccine is not closely related to the predominant circulating virus, it can offer protection against infection with different but related viruses and prevent influenza-related illness. Also, seasonal influenza vaccines include several different influenza viruses, so even if one of the viruses is not closely related, the other viruses in the vaccine are likely to be closely related and therefore offer good protection. Influenza vaccines are safe and are especially important for reducing severe disease in certain high-risk populations (such as the elderly, pregnant women, and young children). It is important to remember that even low estimates of vaccine effectiveness indicate substantial numbers of influenza-related illnesses can be prevented.

8. Can I get vaccinated and still get the influenza?

Yes. It is possible to get influenza-like illness even if you have been vaccinated. This is possible for the following reasons:

- Antibodies that protect against infection take approximately two weeks to develop after vaccination. You may be exposed to an influenza virus shortly before or after getting vaccinated. This exposure may result in your becoming ill before the vaccine begins to protect you.
- The influenza vaccine is made to protect against viruses that were identified in the previous influenza season as likely to become widespread. You may be exposed to a virus not included in the vaccine and develop illness.
- The effectiveness of influenza vaccines can vary widely. Moreover, a person's susceptibility to infection and response to vaccination are influenced by numerous factors. In general, the influenza vaccine works best among healthy younger adults and older children. Influenza vaccination is not a perfect tool, but it is the best available way to protect against influenza infection.
- Respiratory pathogens that are not related to influenza viruses can cause "flu-like" symptoms. The influenza vaccine does not protect you against these pathogens. You won't know for sure that you are infected with influenza virus unless you are tested.