Introduction

Influenza vaccination can reduce the transmission of influenza viruses in the community by establishing herd immunity. The objectives of this study were: 1) to determine the influenza vaccination coverage required to establish herd immunity, and 2) to assess whether the percentages of vaccination coverage proposed and those registered in the United States and Europe are sufficient to establish herd immunity.

Materials and Methods

The herd immunity needed to interrupt transmission of influenza viruses in a population is established when the prevalence of protected persons (I) is higher than the "herd immunity threshold" (I>Ic). The critical vaccination coverage required to establish herd immunity (Vc) was determined taking into account the basic reproductive number (Ro) of the influenza virus and the vaccine effectiveness (E):

\[ V_c = \frac{1}{(1/Ro)/E} \]

The percentages of coverage required to establish herd immunity against future influenza viruses were determined taking in to account values of Ro ranging from 1 to 9 and vaccine effectiveness ranging from 40% to 90%.

Influenza vaccination coverage recommendations in the United States (80% in healthy persons and 90% in high-risk persons) and Europe (only 75% in elderly and high-risk persons) were evaluated by means of determining whether they could block transmission of future influenza viruses.\(^1\)

Results

The Figure shows the vaccination coverage (Vc) required to establish herd immunity against future influenza viruses according to values of Ro and vaccine effectiveness. The objectives of vaccination coverage proposed in the United States are sufficient to establish herd immunity against most viruses, while those proposed in Europe are not sufficient. The vaccination coverage registered in the United States is, however, lower than proposed objectives.

Conclusions

The universal influenza vaccination strategy proposed in the United States is adequate to establish herd immunity and block influenza transmission against most influenza viruses.

The high-risk influenza vaccination strategy proposed in Europe can reduce the risk of influenza in high-risk groups, but it is not adequate to block influenza transmission.

Influenza vaccination coverage should be increased in the United States and Europe by means of developing new health education messages based on herd immunity. These messages should show that individual vaccinations can reduce the risk of influenza in vaccinated persons, and also the risk of influenza in unprotected high-risk individuals if the influenza vaccination coverage is >Vc.

References