

SANOFI PASTEUR INFLUENZA VACCINES

Dan DiVito
Senior Director, Influenza Vaccines US



Our Credo

**Sanofi Pasteur believes
in a world in which
no one
suffers or dies from a
vaccine-preventable disease.**



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It Has Been a Rough Season 'In the News'...

HEALTH

This Flu Season Is the Worst in Nearly a Decade

By DONALD G. McNEIL Jr. JAN. 26, 2018

The New York Times

Flu vaccines just 25% effective against worst strain this year, CDC says

Kim Painter, Special for USA TODAY Published 1:00 p.m. ET Feb. 15, 2018 | Updated 5:22 p.m. ET Feb. 15, 2018

USA TODAY

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...but We Know the Current Vaccines Have a Major Impact

BRIEF REPORT

Modeling the Effect of Different Vaccine Effectiveness Estimates on the Number of Vaccine-Prevented Hospitalizations in Older Adults

Wenqi Wu, PhD; Felipe A. Cruz; Ryan Reed; Mark Thompson

effectiveness in old and moderate severity strains in this real-world group, we used a previously published model to estimate the number of prevented or averted hospitalizations from influenza vaccination and applied a range of hypothetical vaccine effectiveness estimates (2). We used rates of influenza-associated hospitalizations from 2 seasons (2012–2013) representing a moderate to severe season, and 2013–2014, a mild season.

CID; Modeling Effect of VE on Preventing Hospitalizations in 65+

40% VE would prevent 60,000 hospitalizations

hospitalizations associated with influenza during 2012–2013 and 2013–2014 seasons. Our analyses demonstrate the substantial effect of older non-elderly vaccinees in averting influenza hospitalizations, and particularly deaths. Our results also demonstrate that the benefit from vaccination from influenza is more sensitive to changes in vaccination coverage than to changes in vaccine effectiveness. We further estimated the relative contribution of the 2013–2014 season to the total number of averted hospitalizations and deaths. Our results indicate that the number of averted hospitalizations and deaths is most sensitive to changes in vaccination coverage than to changes in vaccine effectiveness. Our results indicate that the number of averted hospitalizations and deaths is most sensitive to changes in vaccination coverage than to changes in vaccine effectiveness.

Number 1 vaccine effectiveness (VE) against 14 real 2014 moderate-to-severe influenza strains was 25%. Hospitalizations from 10 to 20% effectiveness were 100,000 and 100,000, respectively. (1) Wu et al. 2018. <https://doi.org/10.1093/cid/cix288>

DOI: 10.1093/cid/cix288

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Optimizing the impact of low-efficacy influenza vaccines

Pritha Saha¹, Jan Medlock², Megan C. Fitzgerald³, Burton H. Singer⁴, and Alison F. Galvani¹

¹Center for Simulation-Based Modeling and Analysis, Yale School of Public Health, New Haven, CT 06510; ²Department of Biomedical Sciences, Oregon State University, Corvallis, OR 97331; ³Center for Vaccine Development, University of Maryland School of Medicine, Baltimore, MD 21205; and ⁴Georg-August-Universität, University of Göttingen, Göttingen, 37073

Contributed by Burton H. Singer, March 30, 2018 (sent for review February 9, 2018; received by Anthony S. Fauci and David Fisman)

The efficacy of influenza vaccine varies from year to year, with low-efficacy influenza vaccines. We applied an optimization algorithm to our model. We consider both impact and optimal uptake in terms of preventing incidence, hospitalizations, deaths, and disability-adjusted life years (DALYs). Influenza vaccine efficacy (VE) is a multifactorial function of influenza transmission and vaccination in

50% mean. To identify socially optimal vaccine uptake for low-efficacy influenza vaccines, we applied an optimization algorithm to our model. We consider both impact and optimal uptake in terms of preventing incidence, hospitalizations, deaths, and disability-adjusted life years (DALYs). Influenza vaccine efficacy (VE) is a multifactorial function of influenza transmission and vaccination in

PNAS; Optimizing the Impact of Low-Efficacy Influenza Vaccines

20% VE projected to avert 130,000 hospitalizations and 62,000 deaths

reported to avert attack rates, as observed in Australia (1, 5). Considering the epidemiologic effects of low efficacy, variable vaccination uptake. Early uptake from the 2017–2018 season also may decrease hospitalizations from influenza in years sensitive to changes in vaccination coverage than to changes in vaccine effectiveness. We further estimated the relative contribution of the 2013–2014 season to the total number of averted hospitalizations and deaths. Our results indicate that the number of averted hospitalizations and deaths is most sensitive to changes in vaccination coverage than to changes in vaccine effectiveness. Our results indicate that the number of averted hospitalizations and deaths is most sensitive to changes in vaccination coverage than to changes in vaccine effectiveness.

Abstract. Influenza vaccine efficacy (VE) is a multifactorial function of influenza transmission and vaccination in 50% mean. To identify socially optimal vaccine uptake for low-efficacy influenza vaccines, we applied an optimization algorithm to our model. We consider both impact and optimal uptake in terms of preventing incidence, hospitalizations, deaths, and disability-adjusted life years (DALYs). Influenza vaccine efficacy (VE) is a multifactorial function of influenza transmission and vaccination in

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DOI: 10.1093/cid/cix288

And We Know there is Much More to Influenza than Influenza

The risk of having a heart attack is 6-10X greater after an influenza infection

Kwong, et al. *NEJM*
Warren-Gash, et al. *European Respiratory Journal*

Influenza vaccination is similarly effective in preventing heart attacks as statins, antihypertensive therapy, and smoking cessation

Meta-analysis - MacIntyre, et al. *Heart*

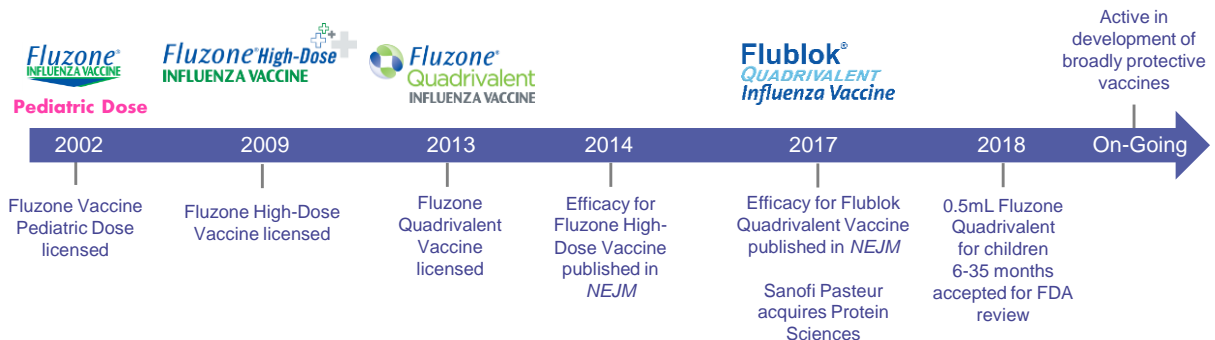
Adults with type 2 diabetes are less likely to be hospitalized for multiple conditions (30% reduction in stroke, 22% reduction in heart failure) or die (24% reduction in all-cause death) if they are vaccinated against influenza

Vamos et al. *CMAJ*

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Sanofi Pasteur Committed to *Do More and Do Better* in the Fight Against Influenza



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Flublok Quadrivalent Vaccine is Demonstrated to Prevent More Influenza in Adults 50+

According to a study published in the *New England Journal of Medicine* in June 2017, **FLUBLOK QUADRIVALENT VACCINE PROVIDED:**

30%
BETTER PROTECTION
from influenza disease

PRIMARY ENDPOINT:
rtPCR²-confirmed, protocol-
defined, influenza-like illness
due to any influenza virus
type or subtype

43%
BETTER PROTECTION
from influenza disease

SECONDARY ENDPOINT:
Culture-confirmed, protocol-
defined, influenza-like illness
due to any influenza virus
type or subtype

- First and only vaccine with demonstrated better protection for 50-64 population vs. standard-dose inactivated quadrivalent comparator
- Only recombinant hemagglutinin vaccine – replicates the wild-type HA exactly
- 3X the HA antigen of a standard-dose inactivated quadrivalent vaccine
- Comparable safety profile to standard-dose inactivated quadrivalent comparator

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Fluzone High-Dose Vaccine is Demonstrated to Prevent More Influenza and Reduce Serious Outcomes in Adults 65+

According to a head-to-head study published in the *New England Journal of Medicine* in August 2014 that spanned 2 flu seasons? **FLUZONE HIGH-DOSE VACCINE PROVIDED:**

PRIMARY ENDPOINT
24.2%
BETTER PROTECTION
from influenza disease
compared with Fluzone vaccine,
when caused by viral strains
regardless of their antigenic
similarity to vaccine components

Primary endpoint of the study was the occurrence of laboratory-confirmed, protocol-defined, influenza-like illness caused by viral strains regardless of their antigenic similarity to vaccine components.

SECONDARY ENDPOINT
51.1%
BETTER PROTECTION
from influenza disease
compared with Fluzone
vaccine, when caused
by viral strains similar
to vaccine components

A secondary endpoint of the study was the occurrence of culture-confirmed influenza caused by viral types/subtypes antigenically similar to those contained in the respective annual vaccine formulations in association with a modified Centers for Disease Control and Prevention-defined influenza-like illness.

Study population: 31,803 adults ranging from 65 to 100 years of age (with a median age of 70 years)
*Per-protocol analysis set for efficacy assessments.

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According to a recently published meta-analysis of 7 studies in *Expert Review of Vaccines*, Fluzone High-Dose demonstrated higher relative efficacy/effectiveness than standard-dose comparator vaccines:

Clinical Outcome	Pooled Relative Vaccine Efficacy/Effectiveness (95% CI)	P-value
All Studies (7 Observational + Randomized Studies)		
Influenza-like Illness	18.3% (7.0%, 28.3%)	0.002
Influenza Hospitalization	17.8% (8.1%, 26.5%)	<0.001
Pneumonia Hospitalization	25.1% (10.5%, 37.3%)	0.001
Cardiorespiratory Hospitalization	18.2% (6.8%, 28.1%)	0.002
All-cause Hospitalization	9.9% (1.3%, 17.7%)	0.025
Post-Influenza Mortality	22.2% (-18.2%, 48.8%)	0.240
All-cause Mortality	2.5% (-5.2%, 9.5%)	0.514
Randomized Studies Only (5)		
Influenza-like Illness	24.1% (10.0%, 36.1%)	0.002
Pneumonia Hospitalization	27.3% (15.3%, 37.6%)	<0.001
All-cause Hospitalization	11.9% (2.0%, 20.7%)	0.019
All-cause Mortality	4.9% (-6.5%, 15.1%)	0.381

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Sanofi Pasteur's Commitment for the 2018-19 Season

**Do
More**

Producing nearly 70 million doses of Fluzone vaccines + Flublok Quadrivalent vaccine

Expanding / enhancing healthcare provider and patient education

- *Senior Flu Shot* campaign
- Disease and vaccine education initiatives focused on children and adults 50+

**Do
Better**

Expanding availability and use of vaccines that help prevent more flu for adults 50+

- Flublok Quadrivalent vaccine: 12-15X increase in availability
- Fluzone High-Dose vaccine: 2/3 of immunized seniors in 2017 and continuing to grow

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IMPORTANT SAFETY INFORMATION FOR FLUBLOK QUADRIVALENT, FLUZONE QUADRIVALENT, AND FLUZONE HIGH-DOSE VACCINES

Flublok Quadrivalent, Fluzone Quadrivalent, and Fluzone High-Dose vaccines should not be administered to anyone who has had a severe allergic reaction (eg, anaphylaxis) to any component (including egg protein for Fluzone Quadrivalent and Fluzone High-Dose vaccines) or previous dose of the respective vaccine. In addition, Fluzone Quadrivalent and Fluzone High-Dose vaccines should not be administered to anyone who has had a severe allergic reaction to a previous dose of any influenza vaccine.

If Guillain-Barré syndrome has occurred within 6 weeks following previous influenza vaccination, the decision to give Flublok Quadrivalent, Fluzone Quadrivalent, or Fluzone High-Dose vaccine should be based on careful consideration of the potential benefits and risks.

In adults, the most common local and systemic adverse reactions to Flublok Quadrivalent, Fluzone Quadrivalent, and Fluzone High-Dose vaccines include pain at the injection site; headache and myalgia. In children, the most common reactions to Fluzone Quadrivalent vaccine include pain, erythema, and swelling at the injection site; myalgia, malaise, and headache (irritability, abnormal crying, drowsiness, appetite loss, vomiting, and fever in young children). Other adverse reactions to these vaccines may occur. Vaccination with Flublok Quadrivalent, Fluzone Quadrivalent, or Fluzone High-Dose vaccine may not protect all individuals.

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INDICATION FOR FLUBLOK QUADRIVALENT, FLUZONE QUADRIVALENT, AND FLUZONE HIGH-DOSE VACCINES

Flublok Quadrivalent, Fluzone Quadrivalent, and Fluzone High-Dose vaccines are indicated for active immunization for the prevention of influenza disease caused by influenza A subtype viruses and type B virus(es) contained in each vaccine. Flublok Quadrivalent vaccine is approved for use in persons 18 years of age and older. Fluzone Quadrivalent vaccine is approved for use in persons 6 months of age and older. Fluzone High-Dose vaccine is approved for use in persons 65 years of age and older.

Before administering Flublok Quadrivalent, Fluzone Quadrivalent, or Fluzone High-Dose vaccine, please see accompanying full Prescribing Information.