National Center for Immunization & Respiratory Diseases

Preliminary end-of-season estimates of 2016–17 seasonal influenza vaccine effectiveness against medically attended influenza from the US Flu VE Network

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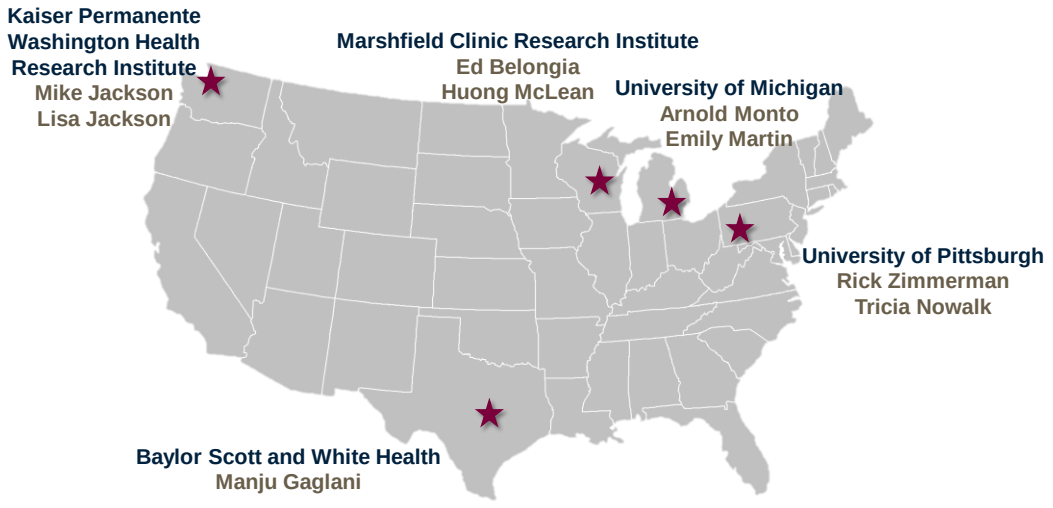
US Flu VE Network sites and principal investigators



US Flu VE Network Methods

Enrollees: Outpatients aged ≥6 months with acute respiratory illness with cough ≤7 days duration

Dates of enrollment: November 28, 2016–April 14, 2017

Design: Test-negative design

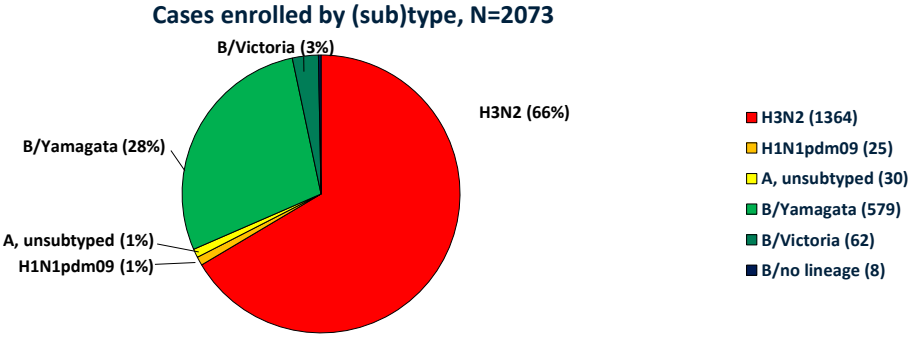
- Comparing vaccination odds among influenza RT-PCR positive cases and RT-PCR negative controls
- Vaccination status: receipt of at least one dose of any 2016–17 seasonal flu vaccine according to medical records, immunization registries, and/or self-report

Analysis: VE = (1 – adjusted OR) x 100%

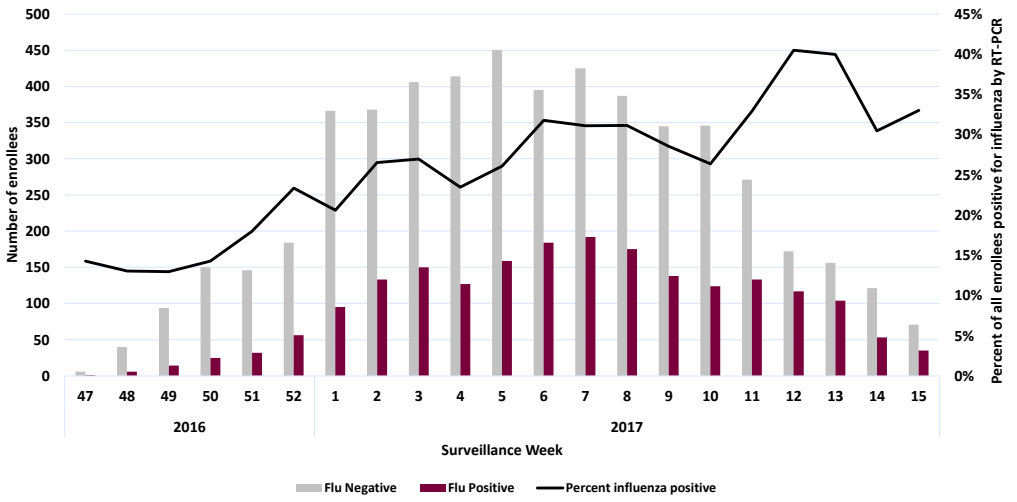
- Adjustment for study site, age, sex, self-rated general health status, race/Hispanic ethnicity, interval (days) from onset to enrollment, and calendar time

Preliminary 2016-17 Results

- 7410 enrolled from Nov 28, 2016–Apr 14, 2017 at 5 sites
- 2073 (28%) influenza RT-PCR positive
- 5323 (72%) influenza RT-PCR negative



Number of enrolled participants by influenza RT-PCR result and percent positivity by week of onset



Interim (February) vaccine effectiveness against medically attended influenza, 2016–17

	Influenza positive		Influenza negative		Vaccine Effectiveness: Unadjusted		Vaccine Effectiveness: Adjusted*	
Any influenza A or B virus	N vaccinated /Total	(%)	N vaccinated /Total	(%)	VE %	95% CI	VE %	95% CI
Overall	333/744	(45)	1317/2400	(55)	33	(21 to 44)	**48**	**(37 to 57)**
Age group (yrs)								
6 mos–8	32/97	(33)	330/614	(54)	58	(33 to 73)	**53**	**(22 to 72)**
9–17	36/122	(30)	92/247	(37)	29	(-12 to 56)	**32**	**(-20 to 61)**
18–49	89/208	(43)	363/783	(46)	13	(-18 to 36)	**19**	**(-17 to 43)**
50–64	76/189	(40)	261/425	(61)	58	(40 to 70)	**58**	**(38 to 72)**
≥65	100/128	(78)	271/331	(82)	21%	(-31 to 52)	**46**	**(4 to 70)**

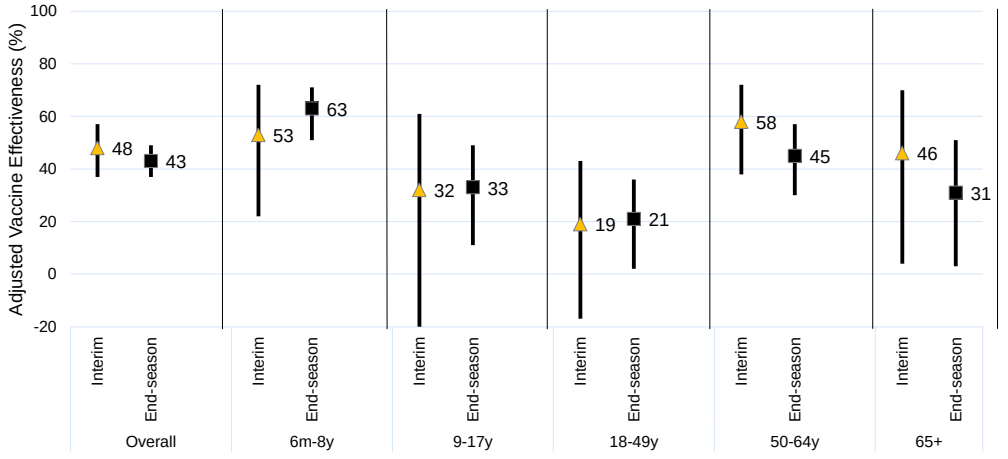
* Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.

Interim (February) vaccine effectiveness against medically attended influenza by virus type, 2016–17

	Influenza positive		Influenza negative		Vaccine Effectiveness: Unadjusted		Vaccine Effectiveness: Adjusted*	
	N vaccinated /Total	(%)	N vaccinated /Total	(%)	VE %	95% CI	VE %	95% CI
Influenza A/H3N2								
Overall	282/595	(47)	1317/2400	(55)	26	(11 to 38)	**43**	**(29 to 54)**
Age group (yrs)								
6 mos–8	24/68	(35)	330/614	(54)	53	(21 to 72)	**53**	**(16 to 74)**
9–17	28/94	(30)	92/247	(37)	29	(-19 to 57)	**23**	**(-43 to 59)**
18–49	73/168	(43)	363/783	(46)	11	(-24 to 36)	**13**	**(-30 to 41)**
50–64	70/154	(45)	261/425	(61)	48	(24 to 64)	**50**	**(23 to 67)**
≥65	87/111	(78)	271/331	(82)	20	(-37 to 53)	**44**	**(-3 to 69)**
Influenza B								
Overall	23/90	(26)	1317/2400	(55)	72	(54 to 83)	**73**	**(54 to 84)**

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

Interim vs prelim. end-of-season vaccine effectiveness against medically attended influenza, 2016–17



Note: Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, interval from onset to enrollment, and calendar time.

Summary of 2016-17 flu vaccine effectiveness

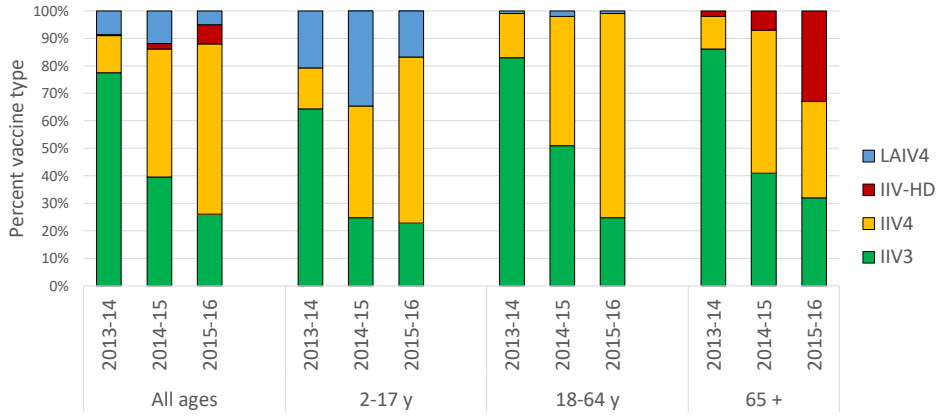
- Preliminary end-of-season results for 2016–17 season indicate vaccine effectiveness of 43% against medically attended influenza
  - Interim and prelim. end-of-season estimates similar to previous seasons when vaccine was well matched to circulating influenza viruses
- Significant protection against circulating influenza A(H3N2) and B viruses (predominantly B/Yamagata)

VE against influenza A (H3N2) viruses

- Interim VE of 43% against A (H3N2) similar to antigenically matched H3N2 viruses
  - 2011-12 (39%) and 2012-13 (39%)
  - Meta-analysis[1] of test-negative VE studies: 33% (26% - 39%)
- VE against A (H1N1)pdm09 (61%) and B viruses (54%) tend to be higher[1]
- A (H3N2) viruses have required more frequent vaccine updates
- Candidate A (H3N2) vaccine viruses more often have antigenic changes after adaptation to growth in eggs
- Efforts ongoing to improve VE against A (H3N2) viruses

[1] Belongia et al. Lancet Infect Dis, 2016

Distribution of vaccine type among US Flu VE enrollees, 2013-14 – 2015-16



Clinical Infectious Diseases

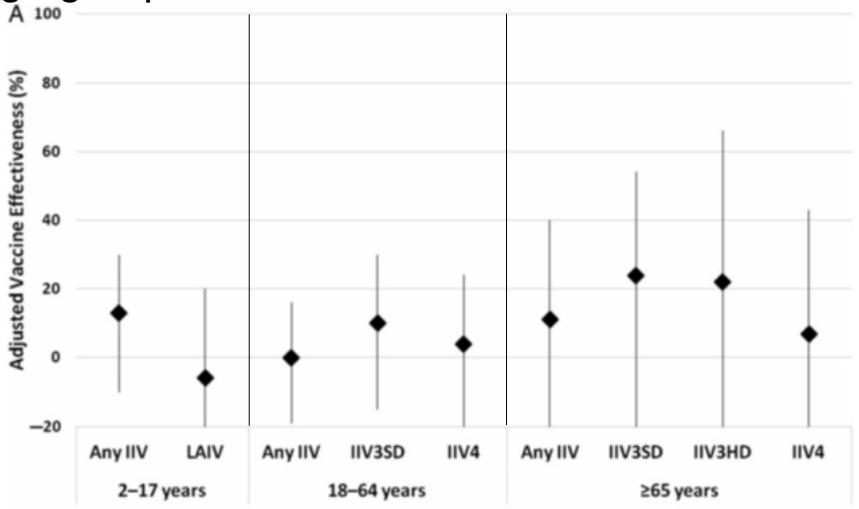
IDSA Infectious Diseases Society of America

2014–2015 Influenza Vaccine Effectiveness in the United States by Vaccine Type

Richard K. Zimmerman,[1] Mary Patricia Nowalk,[1] Jessie Chung,[2] Michael L. Jackson,[3] Lisa A. Jackson,[3] Joshua G. Petrie,[4] Arnold S. Monto,[4] Huong Q. McLean,[5] Edward A. Belongia,[5] Manjusha Gaglani,[6] Kempapura Murthy,[6] Alicia M. Fry,[2] and Brendan Flannery[2]; for the US Flu VE Investigators[a]

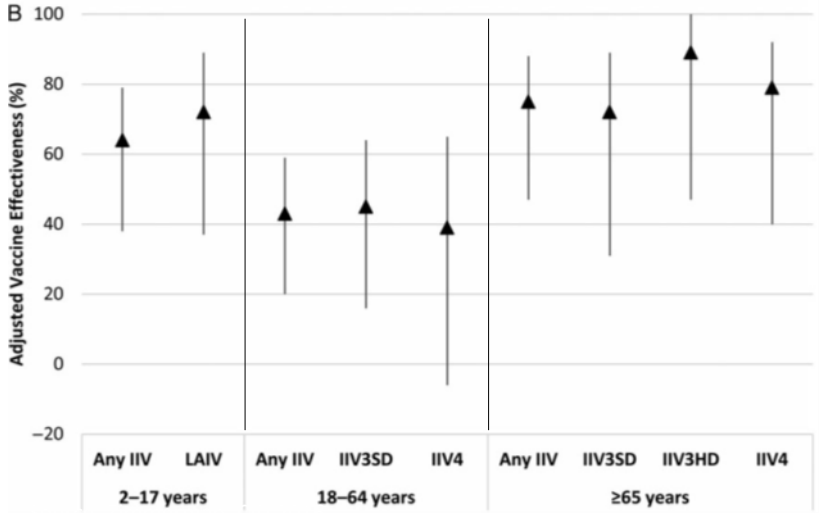
- Vaccine effectiveness by vaccine type (live-attenuated vs inactivated vaccine in children, trivalent vs quadrivalent vs high dose among adults)
- No differences in VE by vaccine type (predominant B lineage included in trivalent vaccine)

Adjusted A/H3N2 vaccine effectiveness by vaccine type and age group, US Flu VE, 2014-15



Source: Zimmerman, CID 2016

Adjusted vaccine effectiveness against flu B by vaccine type and age group, US Flu VE, 2014-15



Source: Zimmerman, CID 2016

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Influenza Vaccine Effectiveness Against Pediatric Deaths: 2010–2014

Brendan Flannery, PhD,[a] Sue B. Reynolds, PhD,[a] Lenee Blanton, MPH,[a] Tammy A. Santibanez, PhD,[b] Alissa O'Halloran, MSPH,[b] Peng-Jun Lu, MD, PhD,[b] Jufu Chen, PhD,[a] Ivo M. Foppa, MD, PhD,[a] Paul Gargiullo, PhD,[a] Joseph Bresee, MD,[a] James A. Singleton, PhD,[b] Alicia M. Fry, MD[a]

- 358 influenza-associated deaths aged 6m-17y over 4 flu seasons
- 75 (26%) vaccinated out of 291 with known vaccination status
- VE was 51% (CI, 31%-67%) among children with high-risk conditions
- VE was 65% (47%-78%) among children without high-risk conditions

US Flu VE Network

- **University of Michigan and Henry Ford Health System:** Arnold S. Monto, Emily Martin, Joshua G. Petrie, Lois E. Lamerato, Ryan E. Malosh, E.J. McSpadden, Hannah Segaloff, Caroline K. Cheng, Rachel Truscon, Emileigh Johnson, Anne Kaniclides, Heather R. Lipkovich, Nishat Islam, Michelle Groesbeck, Andrea Lee, Joey Lundgren, Erika Chick, Lindsey Benisatto, Tosca Le, Dexter Hobdy, Kristyn Brundidge, Christina Rincon, Stephanie Haralson, Jennifer Hessen, Ahn Trinh
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- **University of Pittsburgh Schools of the Health Sciences and UPMC:** Richard K. Zimmerman, Mary Patricia Nowalk, Todd M. Bear, Heather Eng, Samantha Ford, Krissy K. Moehling, Jonathan M. Raviotta, Sean Saul, Terrie Sax, Michael Susick, G.K. Balasubramani, Rina Chabra, Edward Garofolo, Philip Iozzi, Barbara Kevish, Donald B. Middleton, Christopher Olbrich, Evelyn C. Reis, Leonard Urbanski, John V. Williams, Monika Johnson
- **Baylor Scott and White Health, Texas A&M University Health Science Center College of Medicine:** Manjusha Gaglani, Kempapura Murthy, Anne Robertson, Ashley Kossie, Michael Smith, Vanessa Hoelscher, Lydia Clipper, Kevin Dunlap, Crystal Hodges, Teresa Ponder, Ineshia Jackson, Deborah Furze, Mary Kylberg, Martha Zayed, Melissa Zdroik, Kimberley Walker, Marcus Volz, Arundhati Rao, Robert Fader, Yolanda Munoz-Maldonado, Lea Mallett, Hania Wehbe-Janek, Madhava Beeram, Michael Reis, Jennifer Thomas, Jaime Walkowiak, Jeremy Ray, Renee Day, Deborah Price, Jennifer Fox
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- **CDC:** Alicia M. Fry, Swathi N. Thaker, Sarah Spencer, LaShondra Berman, Angie Foust, Wendy Sessions, Joseph Bresee, Erin Burns, Jerome Tokars, Jackie Katz, Daniel Jernigan

Thank you

For more information, contact CDC
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