Influenza Vaccine Effectiveness, 2016-17

US Flu VE Network
&
US Hospitalized Adult Influenza Vaccine Effectiveness Network (HAIVEN)

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Meeting of the Advisory Committee on Immunization Practices (ACIP)

June 21, 2017

Objectives

- Review end-of-season estimates of 2016-17 influenza vaccine effectiveness (VE) from US Flu VE Network (outpatient flu, all ages)

- Introduce US Hospitalized Adult Influenza Vaccine Effectiveness Network (HAIVEN) (inpatient flu, adults) and present preliminary 2016-17 VE estimates

UUSUS Flu VE Network VE Estiates, 2016-17

OUTPATIENT
ALL AGES

US Flu VE Networks 2016-2017 Outpatients All Ages

US Flu VE Network and principal investigators

Kaiser Permanente Washington Health Research Institute
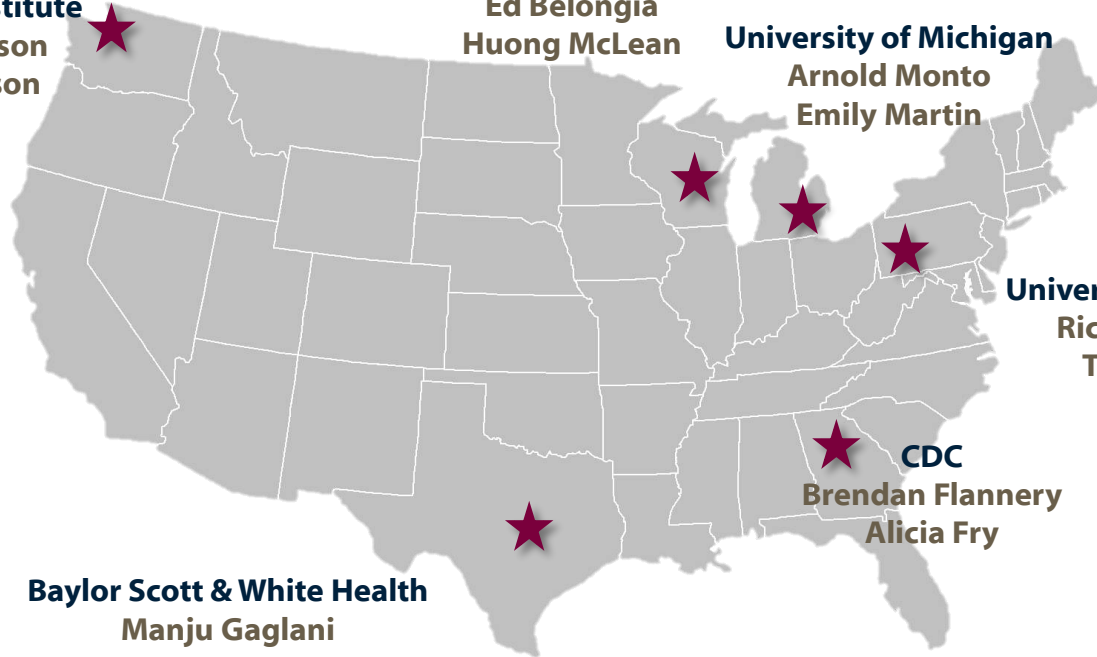Mike Jackson
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University of Michigan
Arnold Monto
Emily Martin

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Rick Zimmerman
Tricia Nowalk

CDC
Brendan Flannery
Alicia Fry

Baylor Scott & White Health
Manju Gaglani

US Flu VE Network Methods

Enrollees: Outpatients aged ≥6 months with acute respiratory illness with cough ≤7 days duration
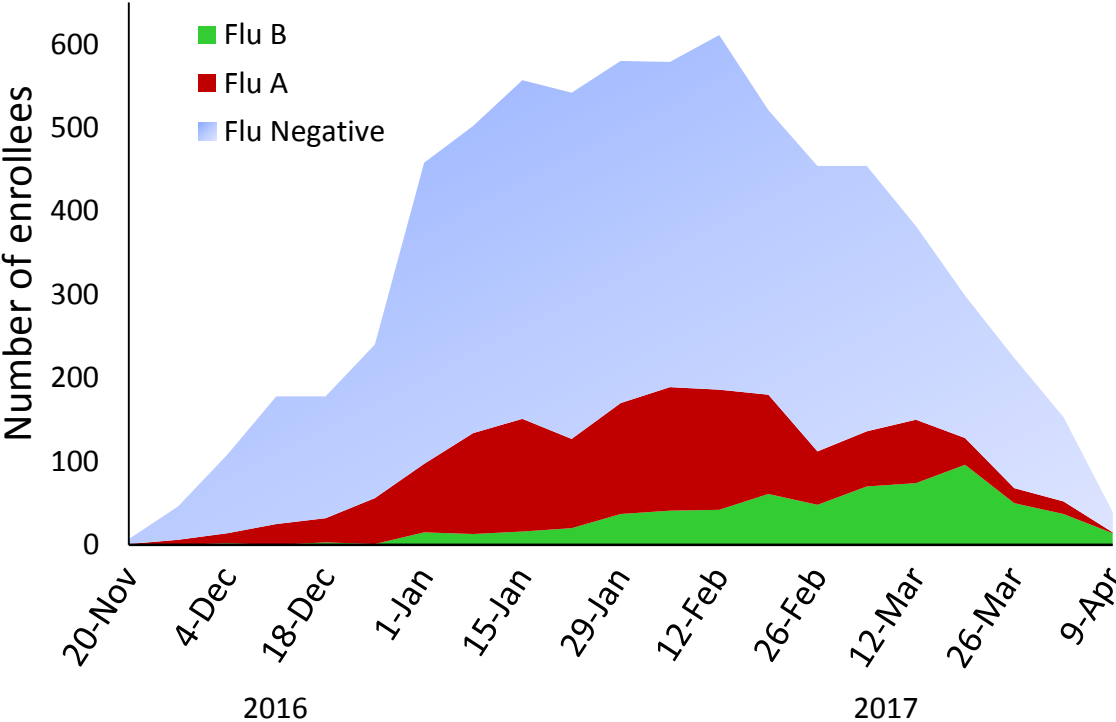
Design: Test-negative case-control design

- Odds of PCR-confirmed influenza among vaccinated compared to unvaccinated enrollees

- Vaccinated: at least one dose of 2016–17 flu vaccine according to medical records, immunization registries, and/or self-report with date and location
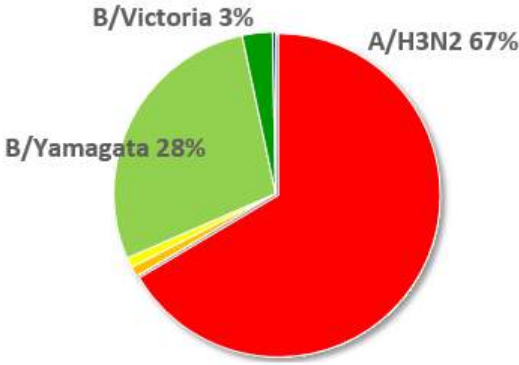
Analysis: VE = (1 – adjusted OR) x 100%

- Adjusted for site, age, sex, race/ethnicity, self-rated general health status, days from onset to enrollment, and calendar time of onset

US Flu VE Enrollment, 2016–17 (N=7205)

Cases by subtype (N=2052)*

B/Victoria 3%
A/H3N2 67%
B/Yamagata 28%

* Cases in analytic dataset (after exclusions)

6

US Flu VE Network:
Vaccine effectiveness against influenza A/B, 2016–17

| Any influenza A or B virus | Influenza positive | | Influenza negative | | Vaccine Effectiveness | | | |
| | | | | | Unadjusted | | Adjusted* | |
	N vaccinated/Total	(%)	N vaccinated/Total	(%)	VE %	95% CI	VE %	95% CI
All ages	883/2052	(43)	2761/5153	(54)	35	(27 to 41)	**42**	**(35 to 48)**
Age group (yr)								
6 mo–8 yr	106/353	(30)	709/1318	(54)	63	(53 to 71)	**61**	**(49 to 70)**
9–17	123/402	(31)	245/606	(40)	35	(15 to 50)	**35**	**(13 to 61)**
18–49	203/529	(38)	716/1629	(44)	21	(3 to 35)	**19**	**(-1 to 34)**
50–64	203/442	(46)	537/909	(59)	41	(26 to 53)	**42**	**(26 to 55)**
≥65	248/326	(76)	554/691	(80)	21	(-8 to 43)	**25**	**(-5 to 46)**

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

US Flu VE Network:
Vaccine effectiveness by subtype, 2016–17

| | Influenza positive | | Influenza negative | | Vaccine Effectiveness | | | |
					Unadjusted		Adjusted*	
	N vaccinated/Total	(%)	N vaccinated/Total	(%)	VE %	95% CI	VE %	95% CI
Influenza A/H3N2								
All ages	619/1349	(46)	2761/5153	(54)	27	(17 to 35)	**34 (24 to 42)**	
Age group (yr)								
6 mo–8 yr	71/203	(35)	709/1318	(54)	54	(37 to 66)	**51 (33 to 65)**	
9–17	78/258	(30)	245/606	(40)	36	(13 to 53)	**31 (3 to 50)**	
18–49	143/352	(41)	716/1629	(44)	13	(-10 to 31)	**12 (-13 to 32)**	
50–64	145/299	(49)	537/909	(59)	35	(15 to 50)	**34 (12 to 50)**	
≥65	182/237	(77)	554/691	(80)	18	(-17 to 43)	**25 (-10 to 48)**	
Influenza A/H1N1pdm09								
All ages	8/26	(31)	2761/5153	(54)	61	(11 to 83)	**54 (-11 to 81)**	

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

US Flu VE Network:
Vaccine effectiveness by B lineage, 2016–17

| | Influenza positive | | Influenza negative | | Vaccine Effectiveness | | | |
					Unadjusted		Adjusted*	
	N vaccinated/Total	(%)	N vaccinated/Total	(%)	VE %	95% CI	VE %	95% CI
Influenza B								
All ages	238/650	(37)	2761/5153	(54)	50	(41 to 58)	**56**	**(47 to 64)**
Influenza B/Yamagata								
All ages	215/579	(37)	2761/5153	(54)	49	(39 to 57)	**55**	**(45 to 63)**
Influenza B/Victoria								
All ages	21/63	(33)	2761/5153	(54)	57	(27 to 74)	**60**	**(31 to 77)**

* Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, days from illness onset to enrollment, and calendar time of illness onset
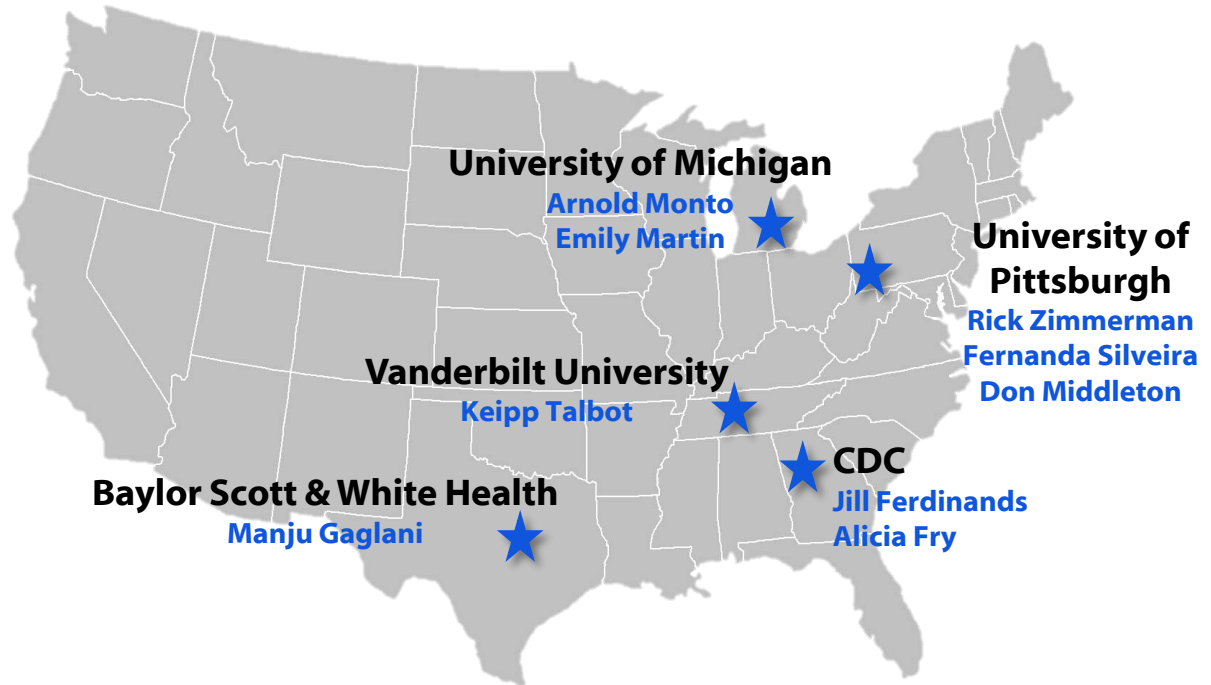
HAIVEN VE Estimates, 2016-17

INPATIENT

ADULTS

10

US Hospitalized Adult Influenza Vaccine Effectiveness Network (HAIVEN)

- CDC-funded study to estimate effectiveness of influenza vaccine for prevention of influenza hospitalizations among adults
- 2015-16 was pilot year with 7 hospitals
- 2016-17 through 2019-20 enrollment at 10 hospitals with 5000+ acute care beds

University of Michigan
Arnold Monto
Emily Martin

University of Pittsburgh
Rick Zimmerman
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HAIVEN Methods

Similar to US Flu VE Network

Enrollees: <u>Adults</u> aged ≥18 years old <u>hospitalized</u> for <72 hr with acute respiratory illness with cough <u>≤10 days</u> duration

Design: Test-negative case-control design

- Odds of PCR-confirmed influenza among vaccinated compared to unvaccinated enrollees

- Vaccinated: At least one dose of 2016–17 flu vaccine ≥14 days prior to illness onset by <u>patient self-report</u>

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

- Adjusted for site, age, sex, race/ethnicity, days from onset to enrollment, calendar time of onset, <u>number of hospitalizations in past year, frailty, and home oxygen use</u>

<u>Underline</u> indicates difference in methodology from US Flu VE Network

HAIVEN Enrollment, 2016–17* (N=2275)
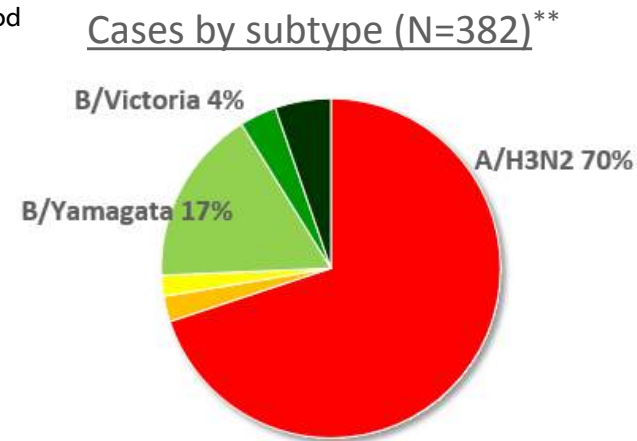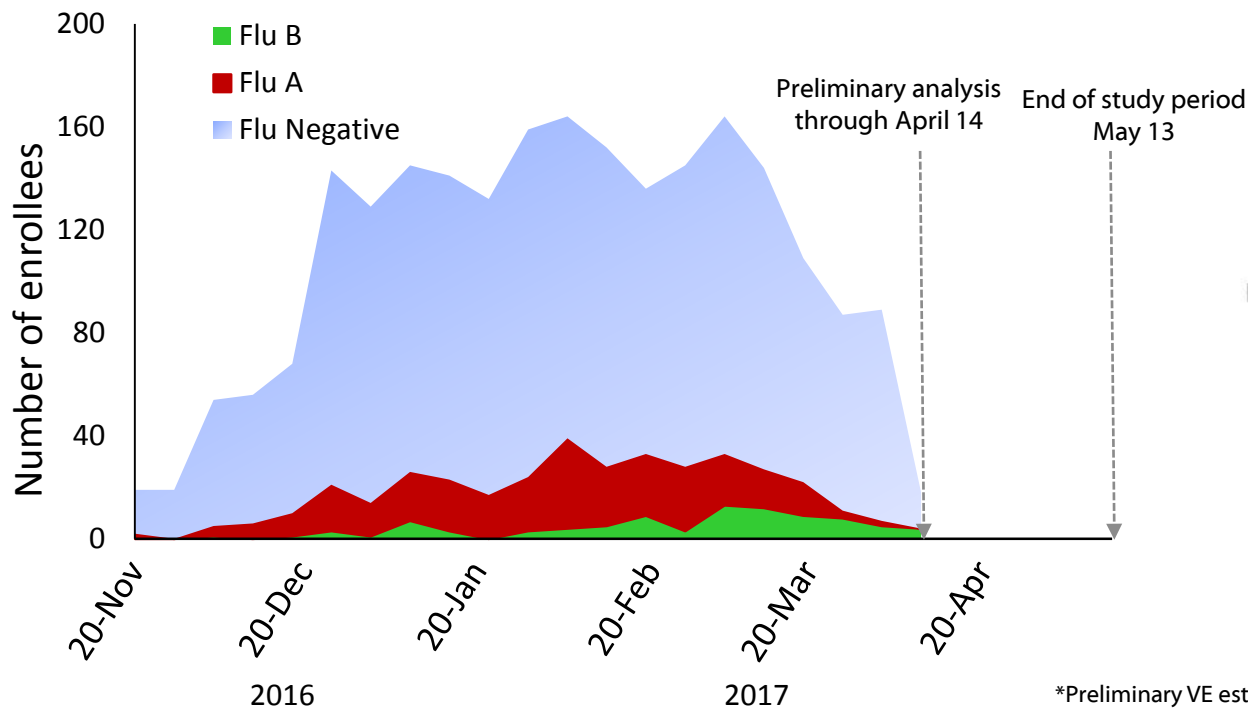
*Preliminary VE estimates include HAIVEN enrollees through April 14, 2017
** Cases in analytic dataset (after exclusions)

13

HAIVEN: Vaccine effectiveness against influenza A/B, 2016–17 (preliminary)

| Any influenza A or B virus | N | Influenza positive | | | Influenza negative | | | Vaccine Effectiveness | | | |
| | | | | | | | | Unadjusted | | Adjusted* | |
		N vaccinated/Total	(%)		N vaccinated/Total	(%)		VE %	95% CI	VE %	95% CI
Age ≥18 yr	2275	235/382	(62)		1302/1893	(69)		27	(9, 42)	**30**	**(11 to 46)**
Age group (yr)											
18-49	510	37/78	(47)		240/432	(56)		28	(-17, 56)	**23**	**(-29 to 54)**
50-64	787	59/107	(55)		441/680	(65)		33	(-1, 56)	**31**	**(-6 to 55)**
≥65	978	139/197	(71)		621/781	(80)		38	(12, 57)	**37**	**(8 to 57)**

* Multivariate logistic regression models adjusted for site, age group, sex, race/ethnicity, days from illness onset to specimen collection, calendar time of illness onset, home oxygen use, frailty score, and number of self-reported hospitalizations in the past year
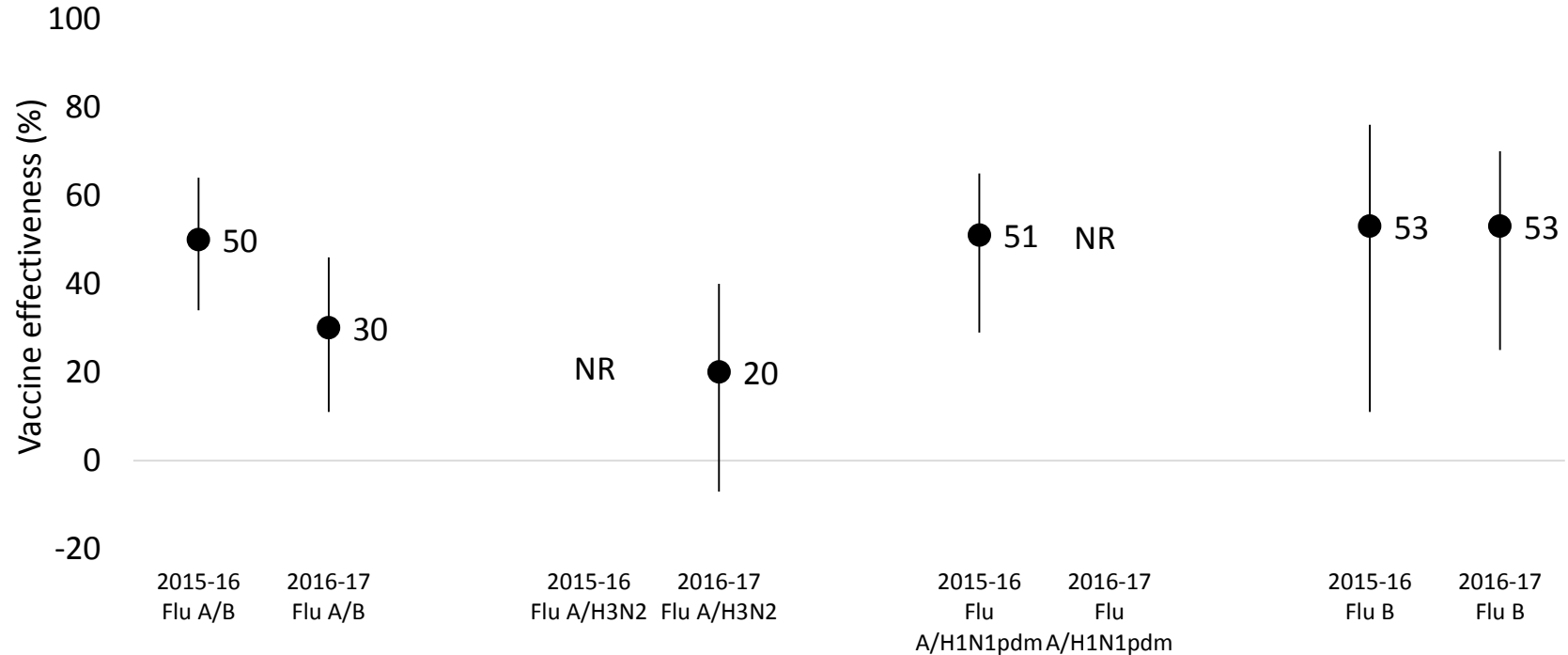
HAIVEN:
Vaccine effectiveness by virus type, 2016–17 (preliminary)

| | | Influenza positive | | Influenza negative | | Vaccine Effectiveness | | | |
| | | | | | | Unadjusted | | Adjusted* | |
	N	N vaccinated/Total	(%)	N vaccinated/Total	(%)	VE %	95% CI	VE %	95% CI
Influenza A/B									
Age ≥18 yr	2275	235/382	(62)	1302/1893	(69)	27	(9, 42)	**30 (11 to 46)**	
Influenza A/H3N2									
Age ≥18 yr	2167	177/274	(65)	1302/1893	(69)	17	(-8, 37)	**20 (-7 to 40)**	
Influenza B									
Age ≥18 yr	1984	49/91	(54)	1302/1893	(69)	47	(19, 65)	**53 (25 to 70)**	

* Multivariate logistic regression models adjusted for site, age group, sex, race/ethnicity, days from illness onset to specimen collection, calendar time of illness onset, home oxygen use, frailty score, and number of self-reported hospitalizations in the past year
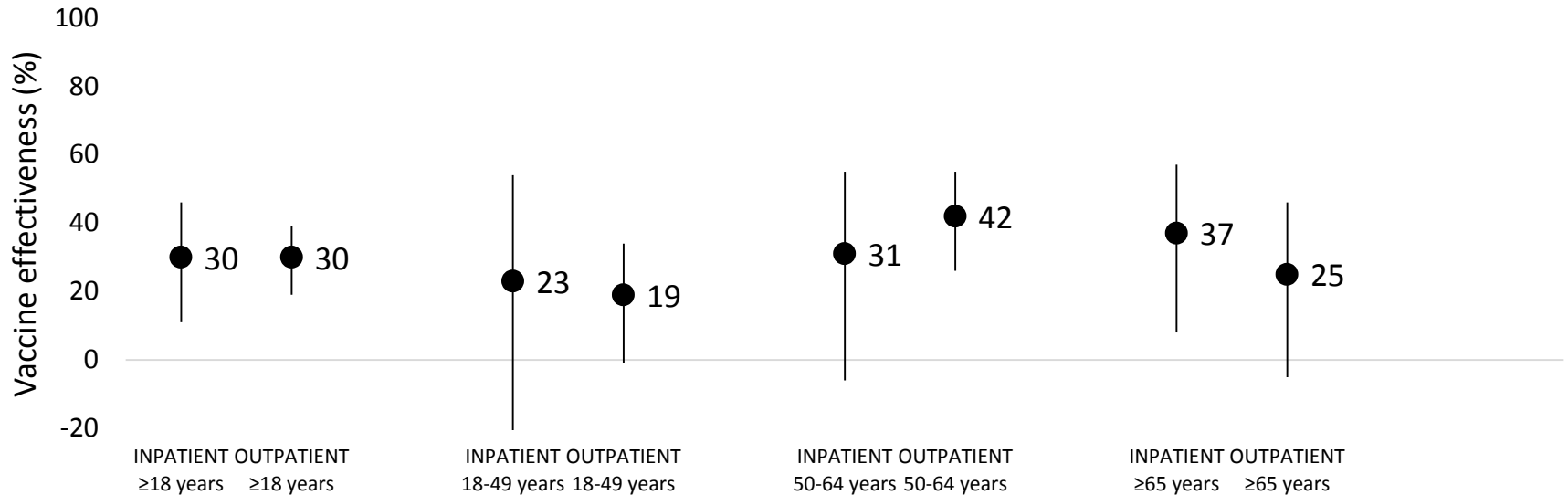
HAIVEN:
Vaccine effectiveness by virus type, 2015-16 and 2016-17

NR = not reported

Vaccine effectiveness against PCR-confirmed influenza A/B in HAIVEN[1] (inpatient) and US Flu VE Network[2] (outpatient) by adult age group, 2016-17

[1] Multivariate logistic regression models adjusted for site, age group, sex, race/ethnicity, days from illness onset to specimen collection, calendar time of illness onset, home oxygen use, frailty, and number of hospitalizations in past year
[2] Multivariate logistic regression models adjusted for site, age, sex, race/ethnicity, self-rated general health status, days from onset to specimen collection, and calendar time of illness onset

Summary

- Vaccine reduced outpatient influenza visits by 42% for influenza A and B viruses and by 34% for influenza A/H3N2 viruses
- Vaccine effectiveness was similar to previous A/H3N2 predominant seasons when vaccine was antigenically like circulating influenza viruses
- Vaccine offered significant protection against influenza hospitalizations
  - Vaccine reduced influenza hospitalizations by 30% among all adults and by 37% among adults ≥65 years of age (influenza A and B viruses)
  - Results are preliminary and may change when final dataset is available

For more information, contact CDC
1-800-CDC-INFO (232-4636)
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