## Updated Adjusted Estimates of 2012-13 Seasonal Influenza Vaccine Effectiveness in the United States

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#### **Overview**

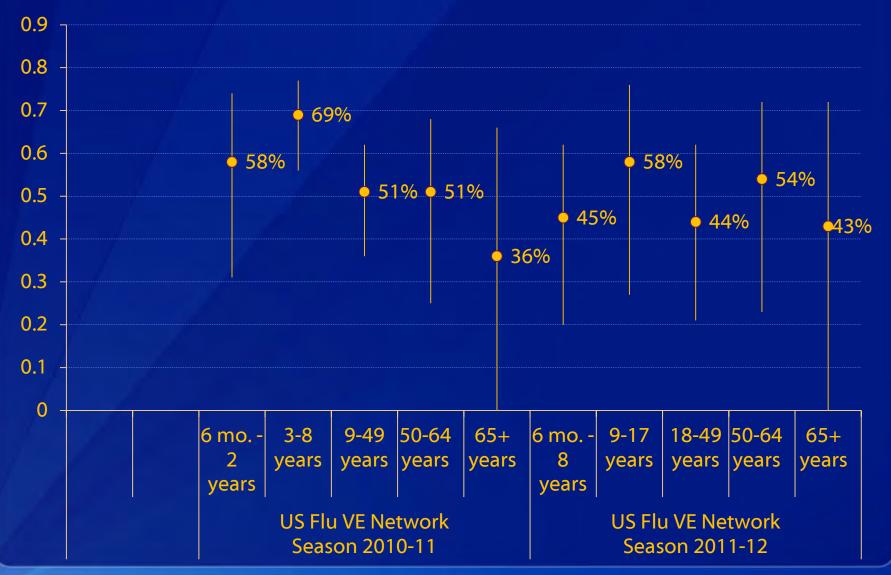
- Influenza VE background
- Updated adjusted VE estimates for 2012-13 season
- Comparison of interim vs. full season estimates
- Updates on VE against inpatient outcomes

Update for ACIP INFLUENZA VACCINE EFFECTIVENESS (VE) BACKGROUND

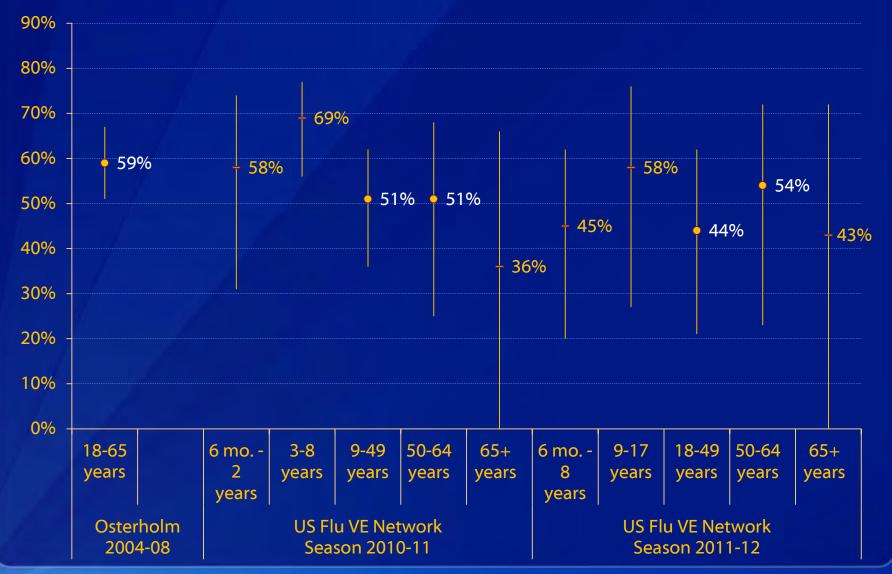
#### Influenza VE Background

- VE may differ by age and other host factors, vaccines, viruses, and seasons
- Observational studies compare the odds of vaccination among cases vs. controls
- US Flu VE Network uses test-negative control design, which minimizes potential biases

#### Adjusted VE (95% CI) against medically attended influenza in 2010-11 and 2011-12



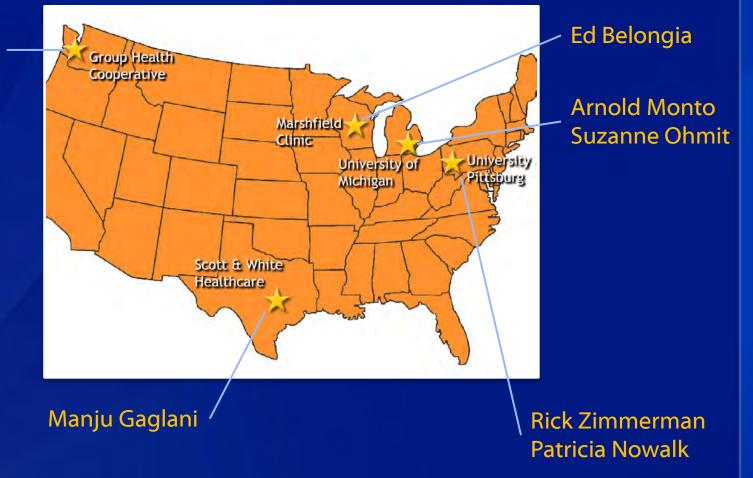
## Comparison with pooled VE estimates for adults during 2004-08



# US Flu VE Network update for ACIP FULL 2012-13 SEASON INTERIM VE ESTIMATES

## US Flu VE Network: Five Study Sites and Principal Investigators

Lisa Jackson Mike Jackson



#### **US Flu VE Network: Interim Estimate Methods**

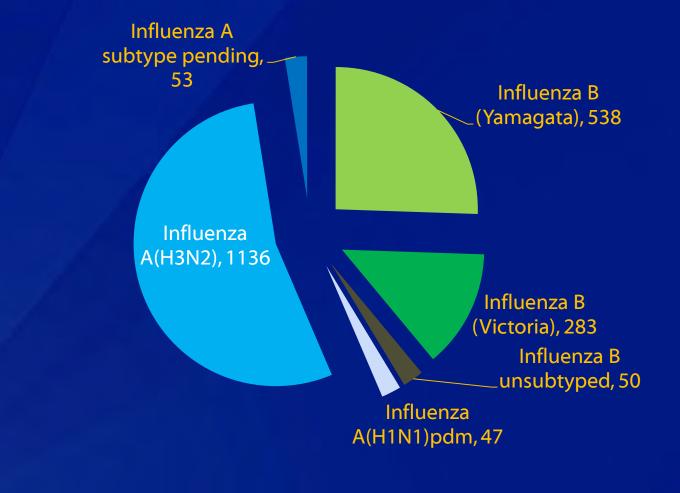
- Purpose: Estimate VE for prevention of outpatient visits
- Design: Prospective case-control study
  - Cases: Medically attended ARI and RT-PCR influenza
  - Controls: Medically attended ARI but negative for influenza
- Interim vaccination status: Confirmed by medical record or registry (4 sites) and by self-report (1 site)
- Immunization: 1 dose ≥14 from illness onset (or 2 doses since 07/2010 for aged <9)</p>
- □ Interim analysis: VE = (1 adjusted OR) x 100%
  - Standard covariates: age, sex, site, days from illness onset to enrollment, and calendar time (2 weeks intervals)
  - Adjusted for potential confounding by race/ethnicity and selfrated health
  - Still awaiting complete final season data sets

#### Numbers of influenza-positive medically attended ARI cases (blue bars) and influenza-negative controls (orange bars) by week of illness onset



2,137 influenza cases and 3,843 influenza-negative controls

#### 2012-13 Cases Enrolled by (Sub)Type

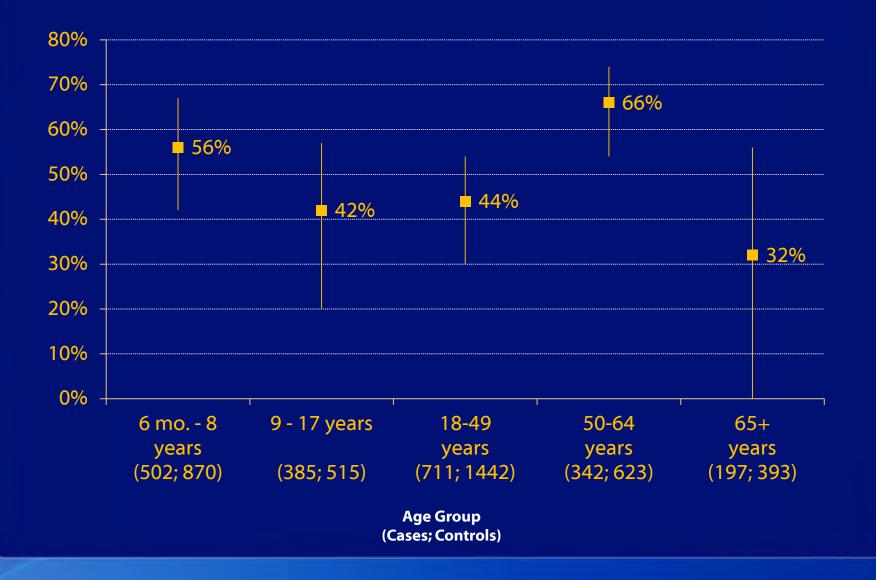


#### **Adjusted VE against A and B**

Influenza and Vaccination Status				Vaccine Effectiveness	
Influenza-Positive Cases		Influenza-Negative Controls		Adjusted †	
No. Vaccinated		No. Vaccinated			
/Total	(%)	/Total	(%)	(%)	(95% CI)
706/2137	(33)	1929/3843	(50)	(52)	(46-58)
151/502	(30)	468/870	(54)	(56)	(42-67)
100/385	(26)	193/515	(37)	(42)	(20-57)
202/711	(28)	592/1442	(41)	(44)	(30-54)
125/342	(37)	383/623	(61)	(66)	(54-74)
128/197	(65)	293/393	(75)	(32)	(-5-56)
	Influenza-Pox         Cases         No. Vaccinated         /Total         706/2137         151/502         100/385         202/711         125/342	Influenza-Positive Cases         Cases         No. Vaccinated       (%)         /Total       (%)         706/2137       (33)         151/502       (30)         100/385       (26)         202/711       (28)         125/342       (37)	Influenza-Positive       Influenza-Neg         Cases       Controls         No. Vaccinated       No. Vaccinated         /Total       (%)       /Total         706/2137       (33)       1929/3843         151/502       (30)       468/870         100/385       (26)       193/515         202/711       (28)       592/1442         125/342       (37)       383/623	Influenza-Positive CasesInfluenza-Negative ControlsNo. VaccinatedNo. Vaccinated/Total(%)706/2137(33)151/502(30)468/870(54)100/385(26)193/515(37)202/711(28)592/1442(41)125/342(37)	$\begin{array}{c c c c c c c c c c c c c c c c c c c $

- + Vaccine effectiveness was estimated as 100% X (1 odds ratio [ratio of odds of being vaccinated among the cases to the odds of being vaccinated among the controls]) using logistic regression. Multivariate models adjusted for age group, sex, race/Hispanic ethnicity, health status, days between illness onset and specimen testing, and calendar time (2 week intervals based on MMWR week of illness onset) For the all ages models, age was represented as categories; age in years was used in age-stratified models.
- \* Under age 9 Fully vaccinated received 2 doses at least 4 weeks apart in the 2012/13 season or 1 dose in the 2012/13 season and a total of 2 or more doses of seasonal influenza vaccine since July 1, 2010

#### **Adjusted VE against Influenza A and B**

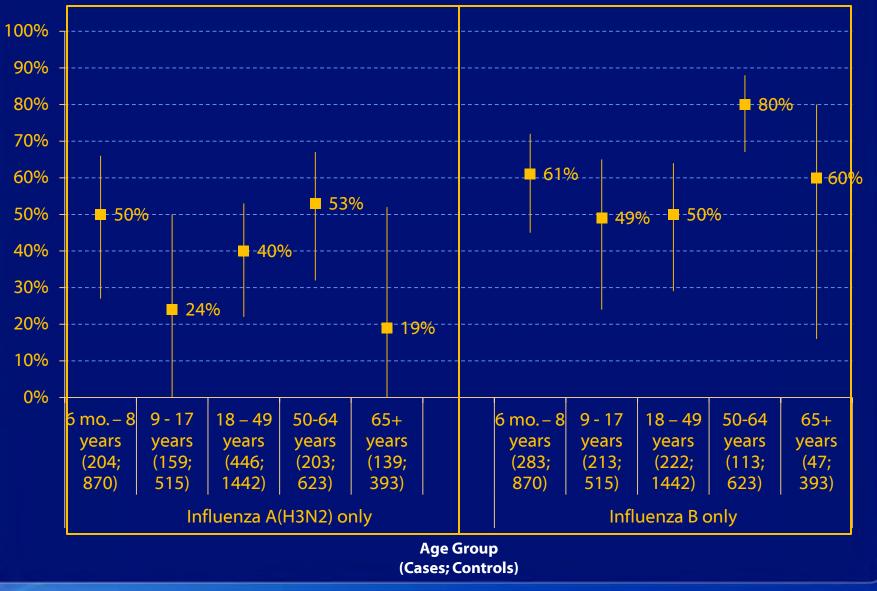


## VE against A(H3N2) only and B only by Age

	Influenza and Vaccination Status				Vaccine Effectiveness	
	Influenza-Po	sitive Influenza-Negative		Adjusted †		
	Cases		Controls			
Virus and age groups	No. Vaccinated		No. Vaccinated			
	/Total	(%)	/Total	(%)	(%)	(95% CI)
Influenza A(H3N2) only						
All ages	435/1151	(38)	1929/3843	(50)	(44)	(35-52)
6 mo. – 8 years *	66/204	(32)	468/870	(54)	(50)	(27-66)
9 – 17 years	46/159	(29)	193/515	(37)	(24)	(-17 -50)
18 – 49 years	133/446	(30)	592/1442	(41)	(40)	(22-53)
50 – 64 years	93/203	(46)	383/623	(61)	(53)	(32-67)
65+ years	97/139	(70)	293/393	(75)	(19)	(-36- 52)
<u>Influenza B only</u>						
All ages	237/878	(27)	1929/3843	(50)	(62)	(55-68)
6 mo. – 8 years *	80/283	(28)	468/870	(54)	(61)	(45-72)
9 – 17 years	53/213	(25)	193/515	(37)	(49)	(24-65)
18 – 49 years	58/222	(26)	592/1442	(41)	(50)	(29-64)
50 – 64 years	24/113	(21)	383/623	(61)	(80)	(67-88)
65+ years	22/47	(47)	293/393	(75)	(60)	(16-80)

† Adjusted for age, site, race/ethnicity, self-rated health, and days from onset

## Adjusted VE against Influenza A(H3N2) and B

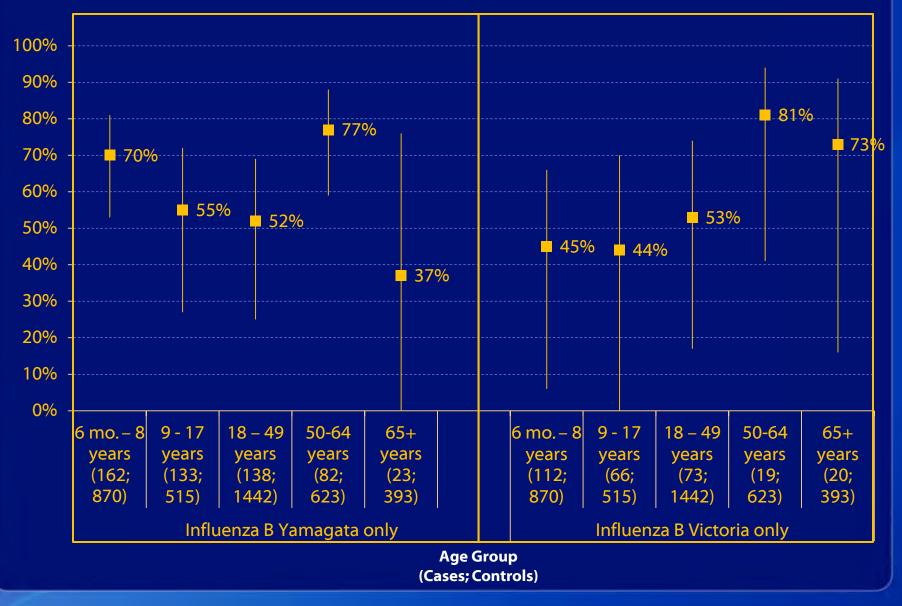


## VE against B Yamagata and B Victoria by Age

	Influen	enza and Vaccination Status			<u>Vaccine Effectiveness</u> Adjusted †	
	Influenza-Positive Cases		Influenza-Negative Controls			
Virus and age groups	No. Vaccinated		No. Vaccinated			
	/Total	(%)	/Total	(%)	(%)	(95% CI)
<u>Influenza B(Yamagata) only</u>						
All ages	126/538	(23)	1929/3843	(50)	(64)	(56-71)
6 mo. – 8 years *	34/162	(21)	468/870	(54)	(70)	(53-81)
9 – 17 years	30/133	(23)	193/515	(37)	(55)	(27-72)
18 – 49 years	34/138	(25)	592/1442	(41)	(52)	(25-69)
50 – 64 years	17/82	(21)	383/623	(61)	(77)	(59-88)
65+ years	11/23	(48)	293/393	(75)	(37)	(-67 -76)
<u>Influenza B (Victoria) only</u>						
All ages	95/290	(33)	1929/3843	(50)	(56)	(42-67)
6 mo. – 8 years *	45/112	(40)	468/870	(54)	(45)	(6-66)
9 – 17 years	18/66	(27)	193/515	(37)	(44)	(-8- 70)
18 – 49 years	18/73	(25)	592/1442	(41)	(53)	(17-74)
50 – 64 years	5/19	(26)	383/623	(61)	(81)	(41-94)
65+ years	9/20	(45)	293/393	(75)	(73)	(16-91)

† Adjusted for age, site, race/ethnicity, self-rated health, and days from onset

## **Adjusted VE against Influenza B by Lineage**



#### Conclusions

#### Adjusted VE against influenza A and B was 52% (46-58%)

- Similar to early unadjusted VE of 62% (51-71%) and mid-season adjusted VE of was 56% (47-63%) against A and B
- Similar to international interim VE estimates
- Vaccination reduced the risk of outpatient medical visits:
  - Due to influenza A(H3N2) by half (44%), except among children aged 9-17 years and aged 65+
  - Due to influenza B by two-thirds (62%); consistent for all ages
- Similar VE against both B lineages in circulation
  - Need further research to confirm and understand age differences
- Limits and next steps
  - Missing chronic medical conditions and vaccine type until final data
  - Additional potential confounders and effect modifiers will be considered

#### Adjusted VE (95% CI) against circulating strains by season in US Flu VE Network



US Flu VE Network update for ACIP

# **COMPARISON OF INTERIM VE: MID-VS. FULL-SEASON ESTIMATES**

#### Early Unadjusted and Interim Adjusted Influenza VE Estimates

#### MMWR: Jan. 11, 2013

#### Multially and Mertally Bendy Report

#### Early Estimates of Seasonal Influenza Vaccine Effectiveness – United States, January 2013 and IL 2013 the new serveral as a MMWR Enh Rear or the MMWR where the interview and

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#### MMWR: Feb. 22, 2013

#### Interim Adjusted Estimates of Seasonal Influenza Vaccine Effectiveness --United States, February 2013

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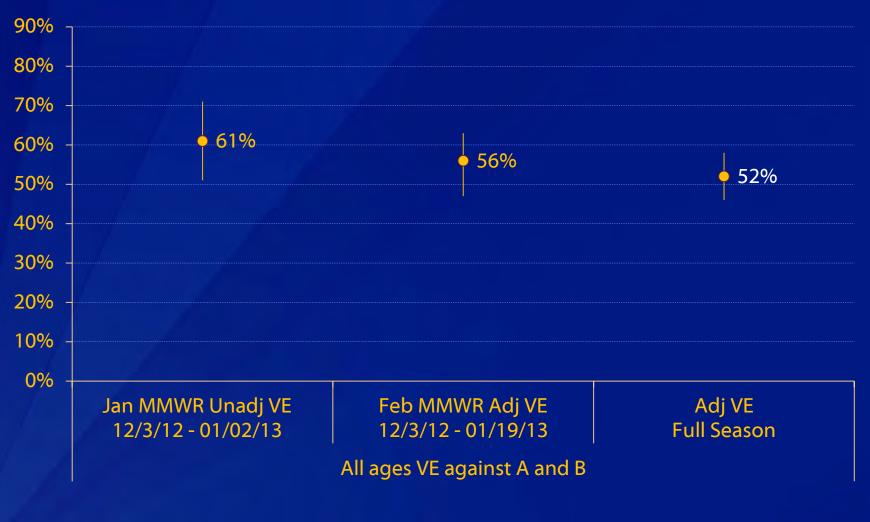
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 Addressed early misperceptions about vaccine's performance

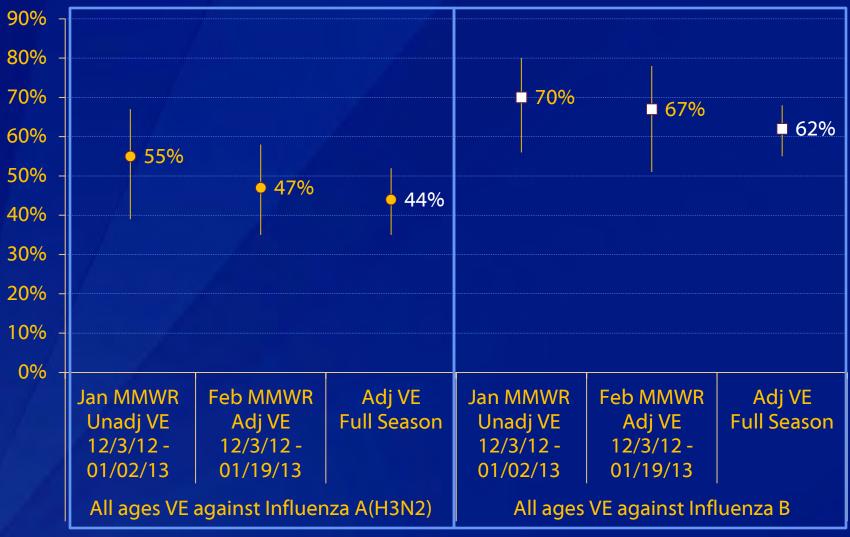
Encouraged better clinical management and control

 Early and later estimates were largely consistent, with strata and precision limited by number of cases

#### All ages VE against circulating strains at three estimates

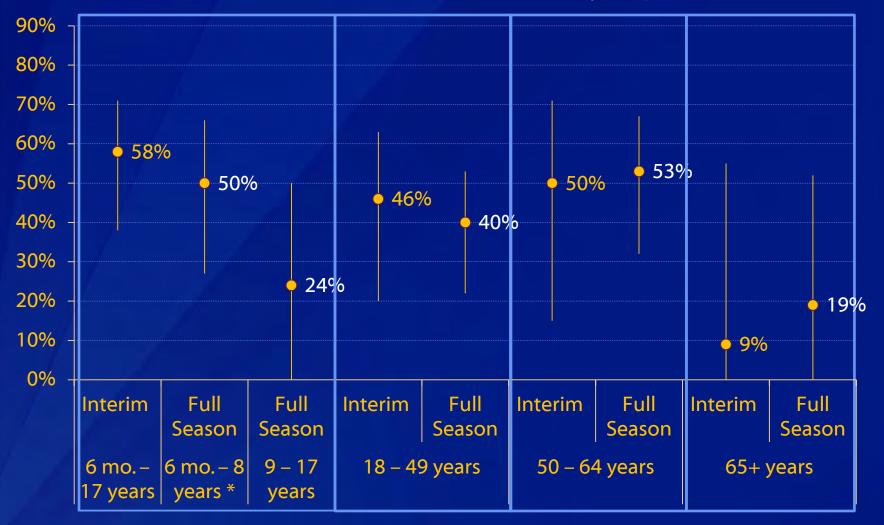


#### All ages VE against A(H3N3) and B at three estimates

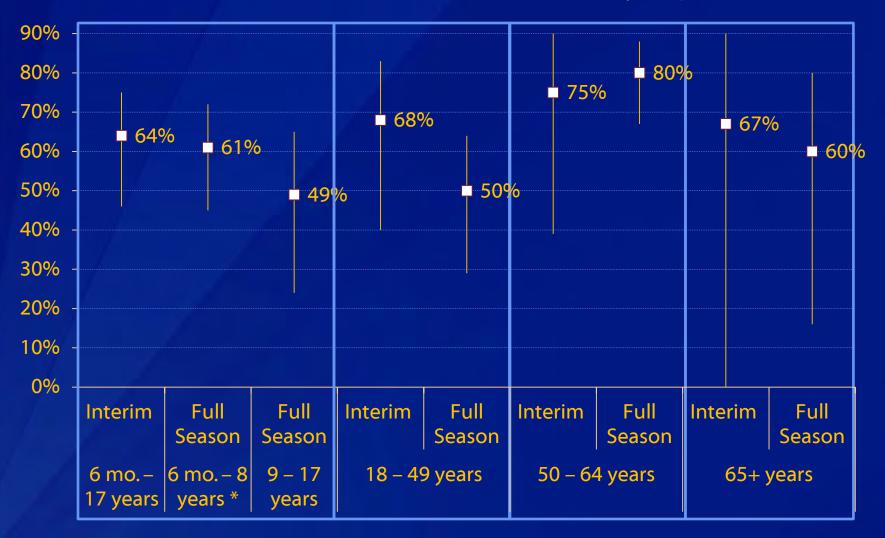


NOTE: January MMWR included all influenza A viruses; the vast majority of which were A(H3N2)

### Adjusted VE against A(H3N2) at mid- and full-season estimates by age

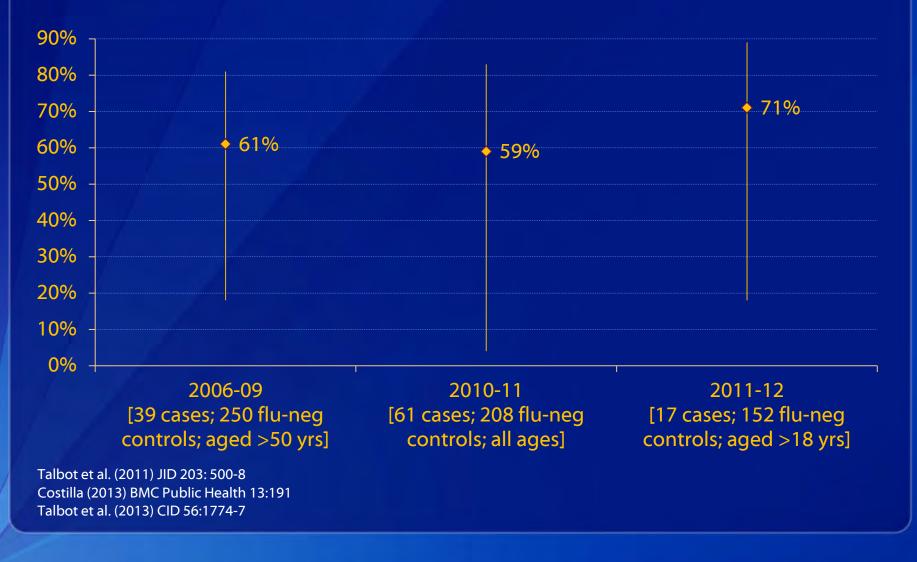


#### Adjusted VE against influenza B viruses at midand full-season estimates by age

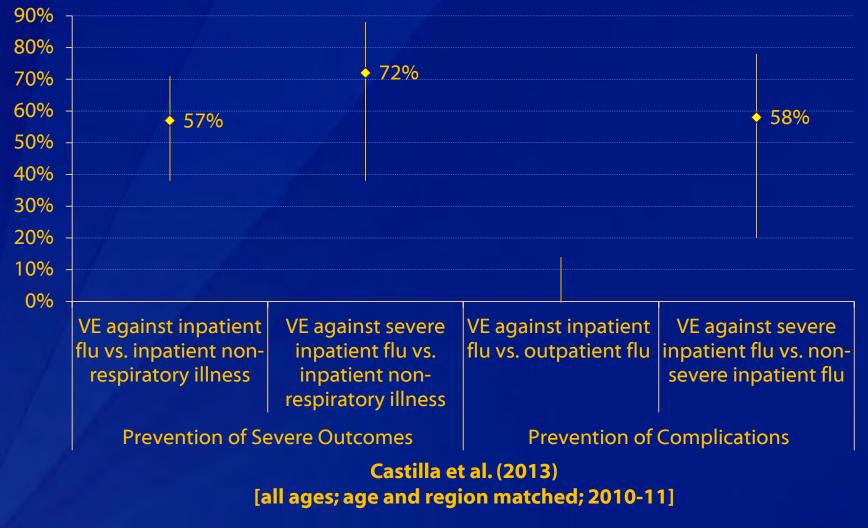


Update for ACIP
VE AGAINST INPATIENT OUTCOMES

#### Adjusted VE (95% CI) against hospitalization using influenza-negative control design



#### Adjusted VE (95% CI) against hospitalization using age-matched controls



Castilla et al. (2013). CID: doi: 10.1093/cid/cit194

#### Influenza VE against inpatient outcomes

- VE against influenza-associated inpatient care has been similar (or higher) than estimates of outpatient VE during the same season
- Influenza vaccines may potentially reduce the risk of hospitalizations due to influenza by over half
- US currently lacks a consistent platform for assessing VE against inpatient outcomes
- Important questions remain about VE against mild vs. severe disease

#### Acknowledgments

- CDC: Alicia Fry, Swathi Thaker, Sarah Spencer, Jessie Clippard, Jill Ferdinands, Ivo Foppa, David Shay, Xiyan Xu, Wendy Sessions, Angie Foust, Steve Lindstrom, LaShondra Berman, Joseph Bresee, Nancy Cox
- Group Health: Mike Jackson, Lisa Jackson
- Marshfield: Ed Belongia, Huong McLean
- Scott & White: Manju Gaglani, Juhee Song
- U Michigan: Arnold Monto, Suzanne Ohmit
- UPittsburgh: Rick Zimmerman, Tricia Nowalk