

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

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June 20, 2013

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**

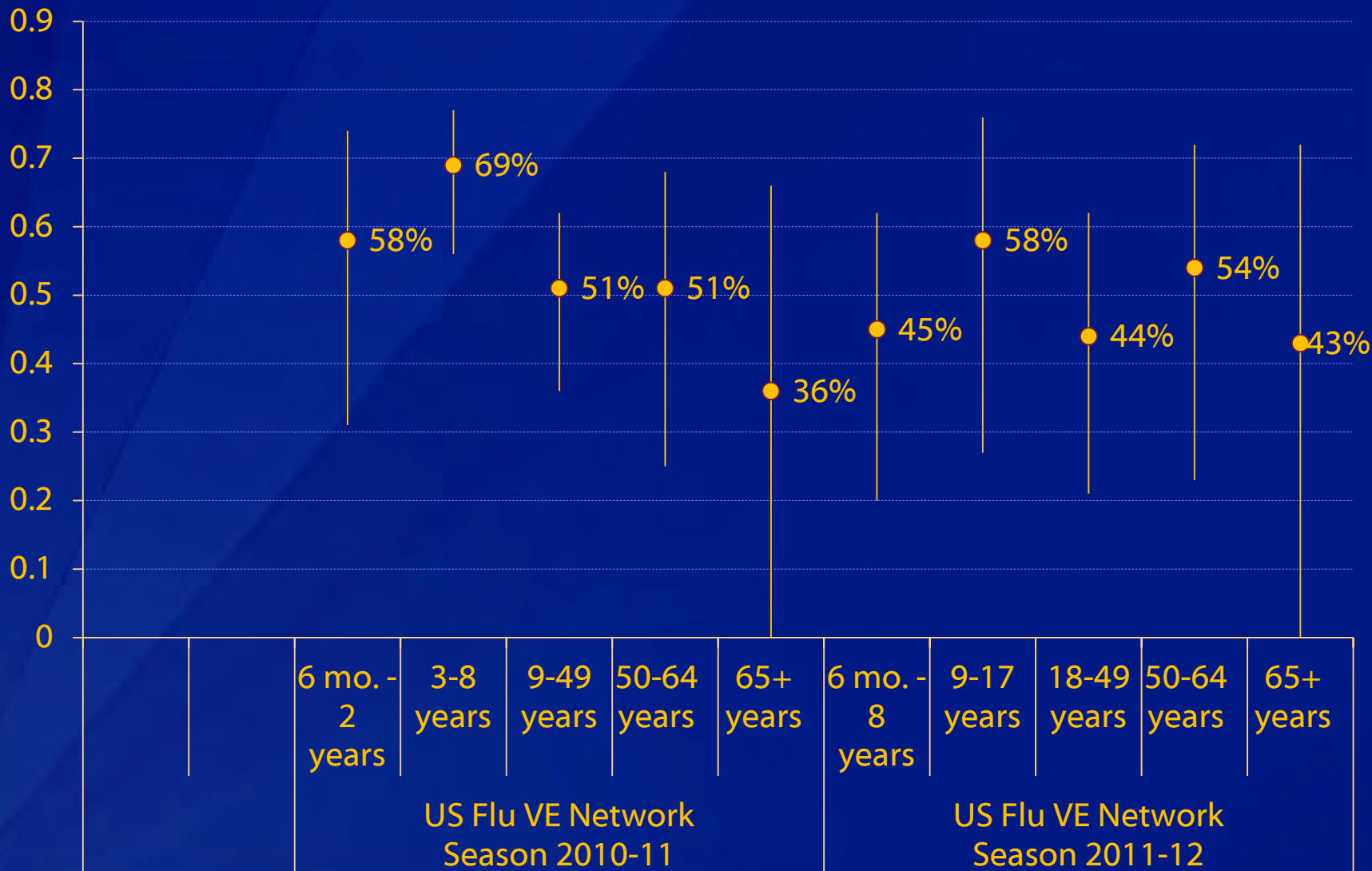
Update for ACIP

INFLUENZA VACCINE EFFECTIVENESS (VE) BACKGROUND

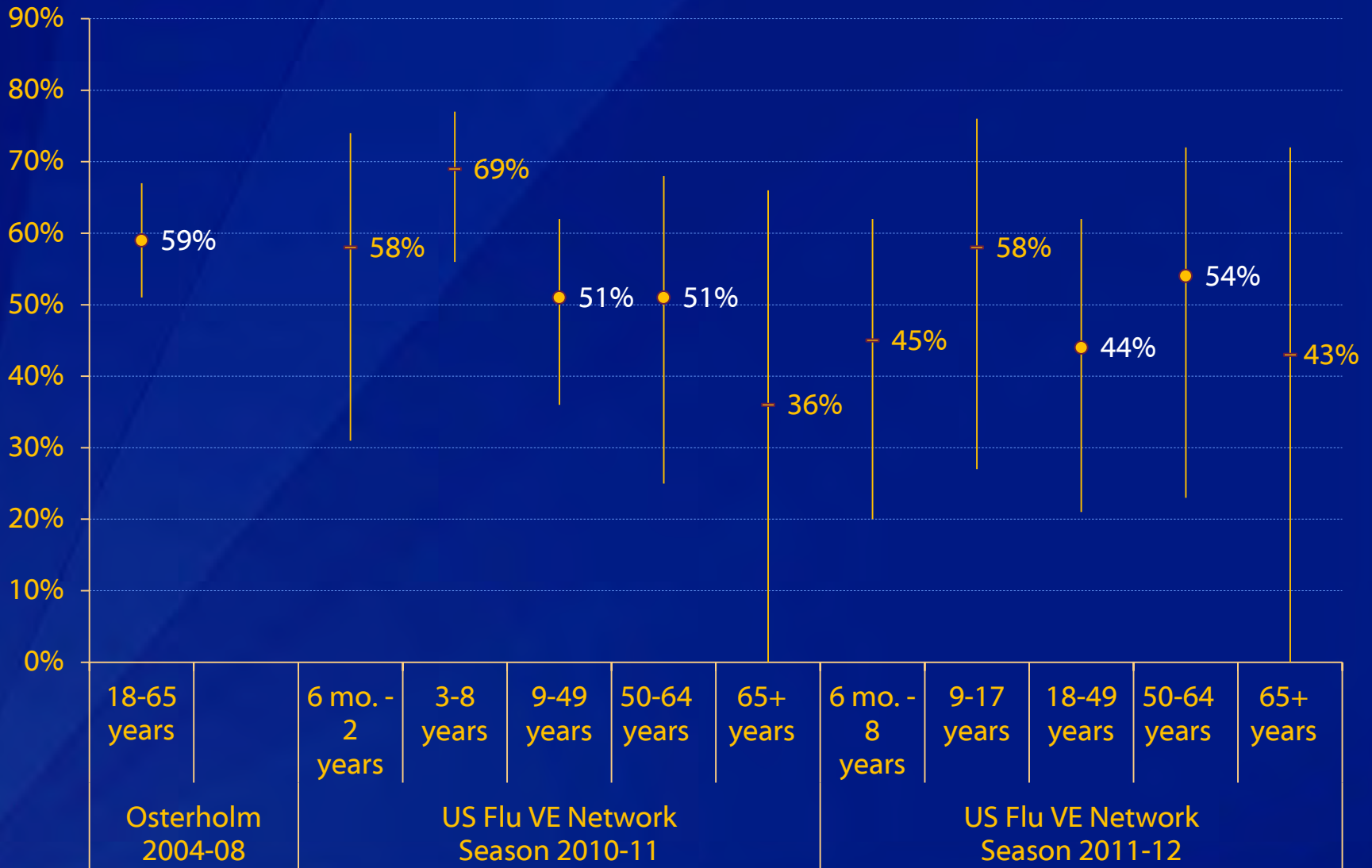
Influenza VE Background

- ❑ 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



Ed Belongia

Arnold Monto
Suzanne Ohmit

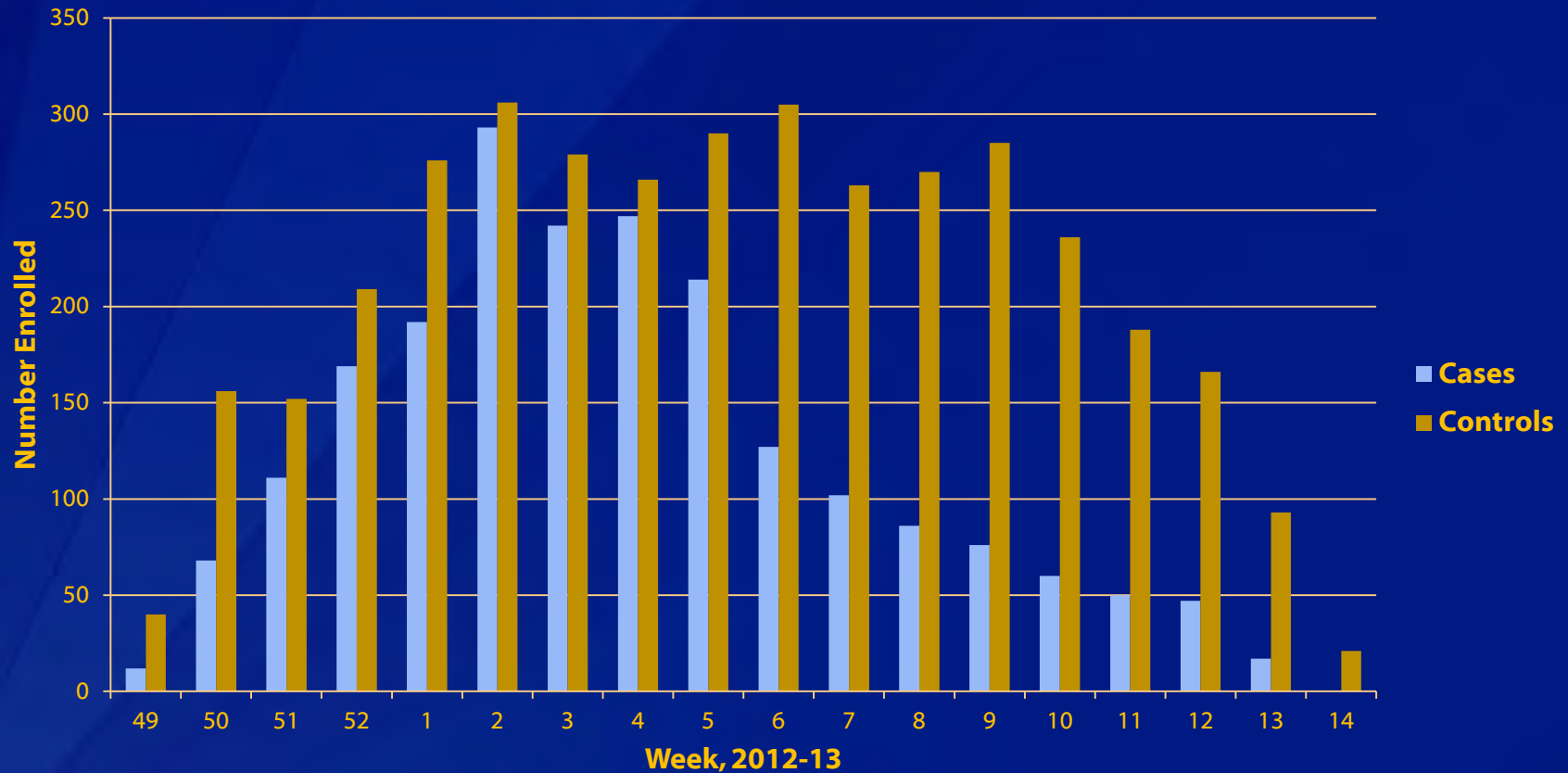
Manju Gaglani

Rick Zimmerman
Patricia Nowalk

US Flu VE Network: Interim Estimate Methods

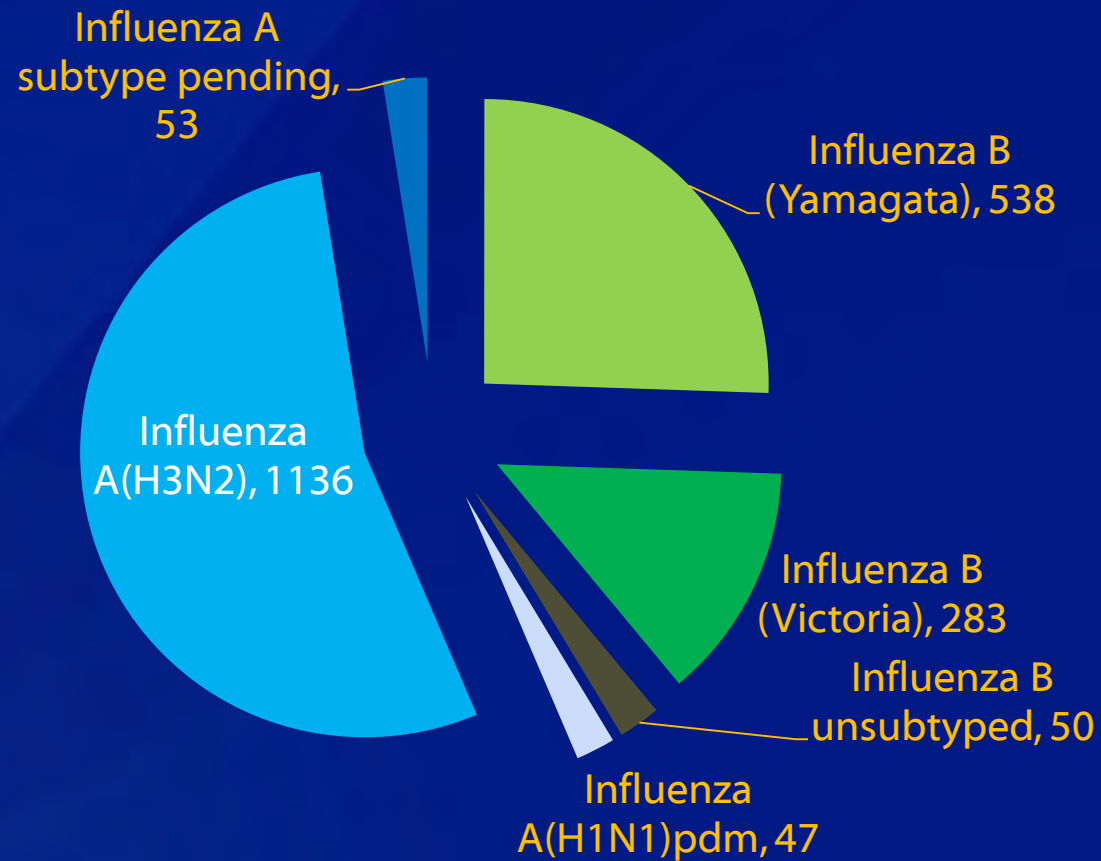
- ❑ **Purpose:** Estimate VE for prevention of outpatient visits
- ❑ **Design:** Prospective case-control study
 - **Cases:** Medically attended ARI and RT-PCR influenza
 - **Controls:** Medically attended ARI but negative for influenza
- ❑ **Interim vaccination status:** Confirmed by medical record 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)
- ❑ **Interim analysis:** $VE = (1 - \text{adjusted OR}) \times 100\%$
 - 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 self-rated 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



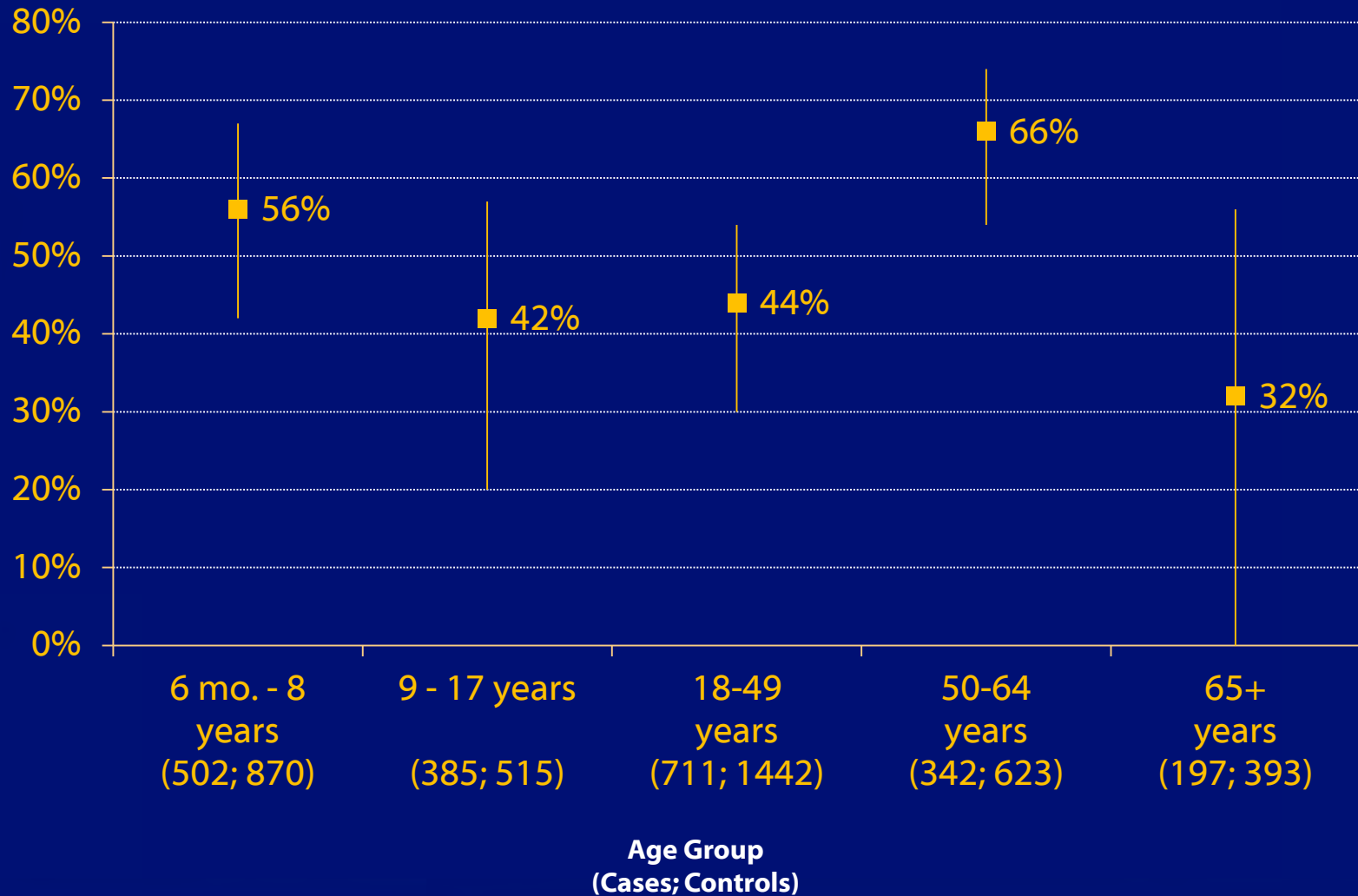
Adjusted VE against A and B

	<u>Influenza and Vaccination Status</u>				<u>Vaccine Effectiveness</u>	
	<u>Influenza-Positive Cases</u>		<u>Influenza-Negative Controls</u>		<u>Adjusted †</u>	
	<u>No. Vaccinated</u>	<u>(%)</u>	<u>No. Vaccinated</u>	<u>(%)</u>	<u>(%)</u>	<u>(95% CI)</u>
<u>Influenza A and B</u>						
All ages	706/2137	(33)	1929/3843	(50)	(52)	(46-58)
6 mo. – 8 years *	151/502	(30)	468/870	(54)	(56)	(42-67)
9 – 17 years	100/385	(26)	193/515	(37)	(42)	(20-57)
18 – 49 years	202/711	(28)	592/1442	(41)	(44)	(30-54)
50 – 64 years	125/342	(37)	383/623	(61)	(66)	(54-74)
65+ years	128/197	(65)	293/393	(75)	(32)	(-5-56)

† 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

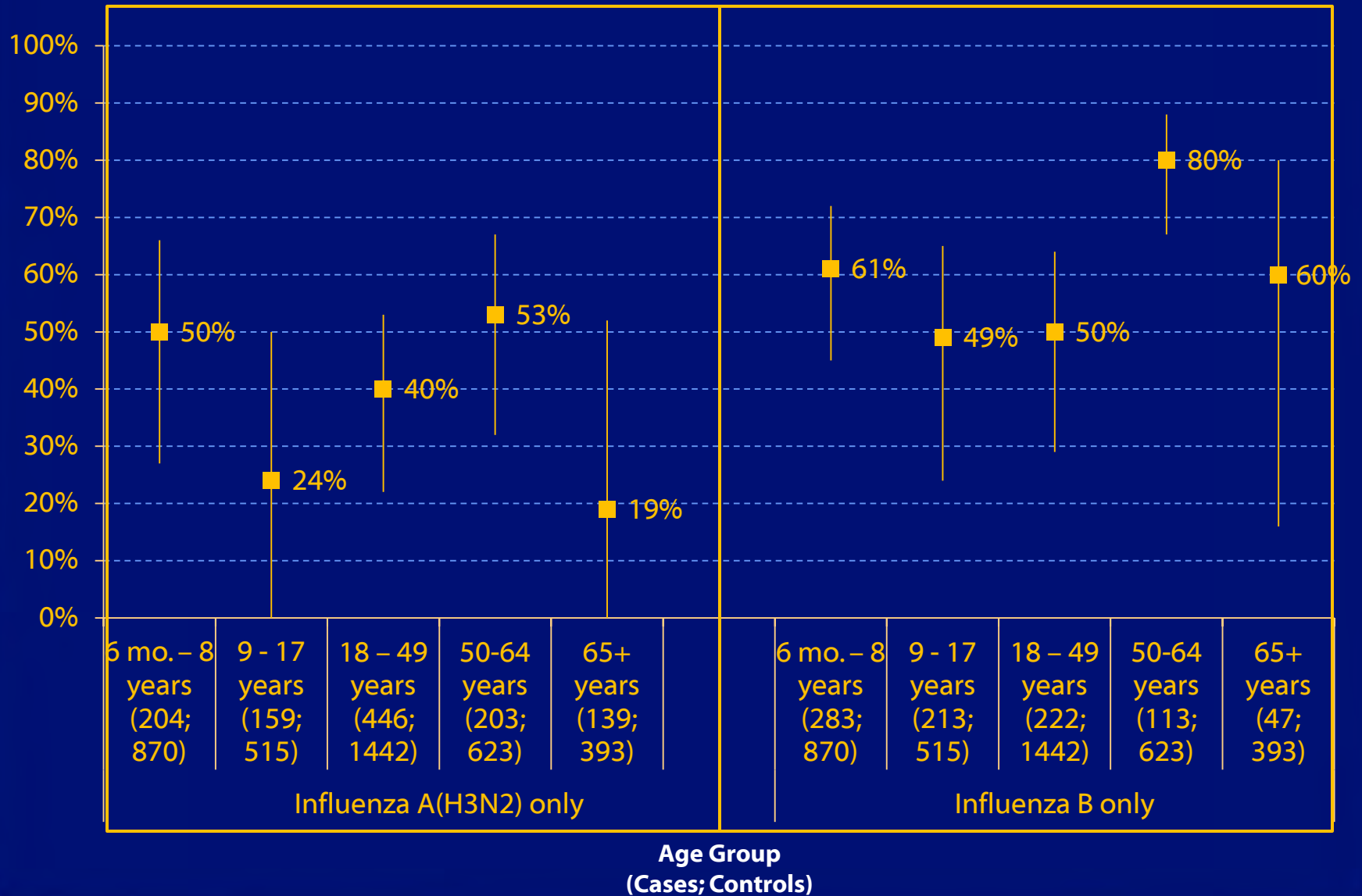


VE against A(H3N2) only and B only by Age

<u>Virus and age groups</u>	<u>Influenza and Vaccination Status</u>				<u>Vaccine Effectiveness</u>	
	<u>Influenza-Positive Cases</u>		<u>Influenza-Negative Controls</u>		<u>Adjusted †</u>	
	<u>No. Vaccinated</u> <u>/Total</u>	<u>(%)</u>	<u>No. Vaccinated</u> <u>/Total</u>	<u>(%)</u>	<u>(%)</u>	<u>(95% CI)</u>
<u>Influenza A(H3N2) only</u>						
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

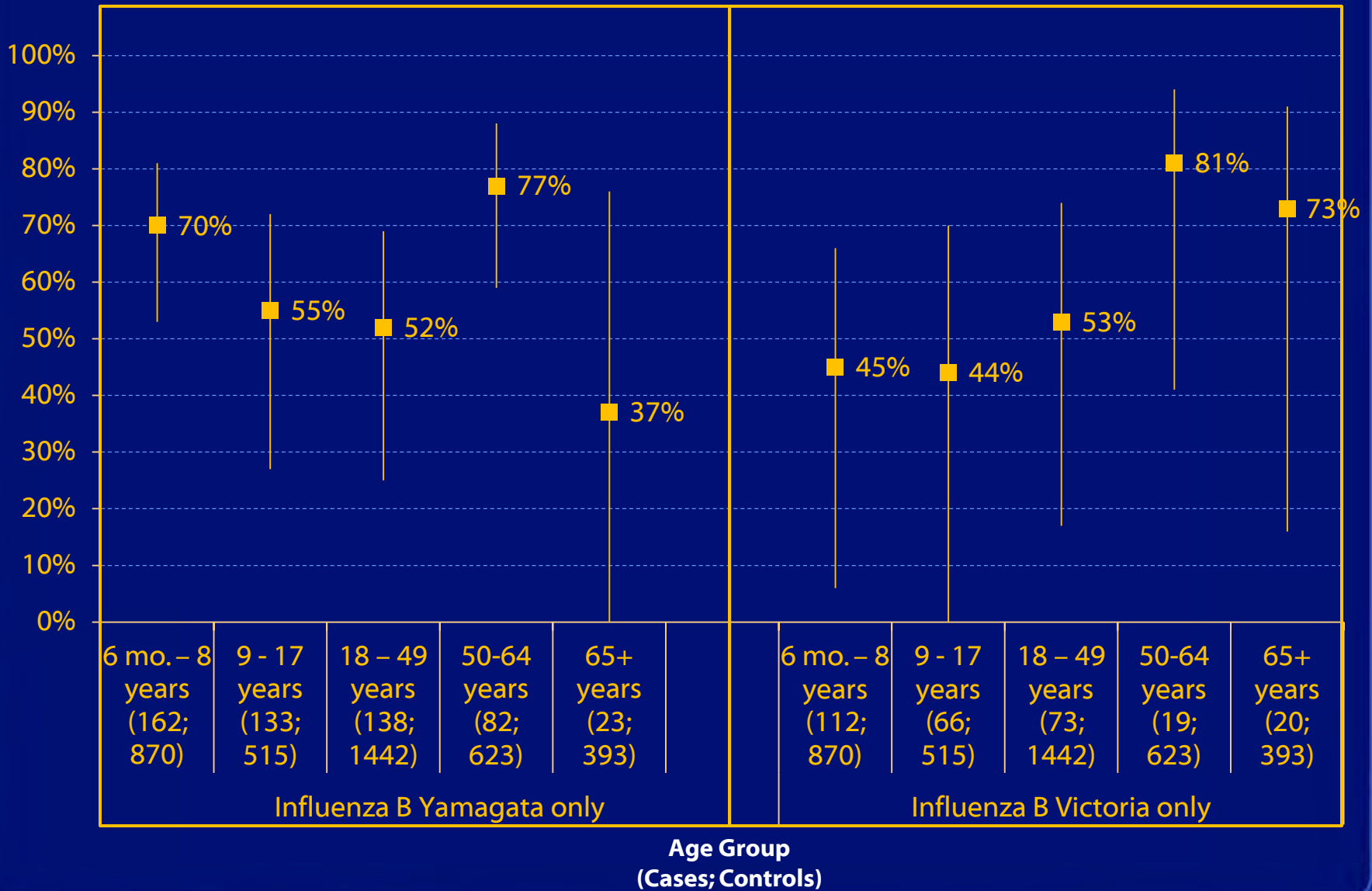


VE against B Yamagata and B Victoria by Age

<u>Virus and age groups</u>	<u>Influenza and Vaccination Status</u>				<u>Vaccine Effectiveness</u>	
	<u>Influenza-Positive Cases</u>		<u>Influenza-Negative Controls</u>		<u>Adjusted †</u>	
	<u>No. Vaccinated</u> <u>/Total</u>	<u>(%)</u>	<u>No. Vaccinated</u> <u>/Total</u>	<u>(%)</u>	<u>(%)</u>	<u>(95% CI)</u>
<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

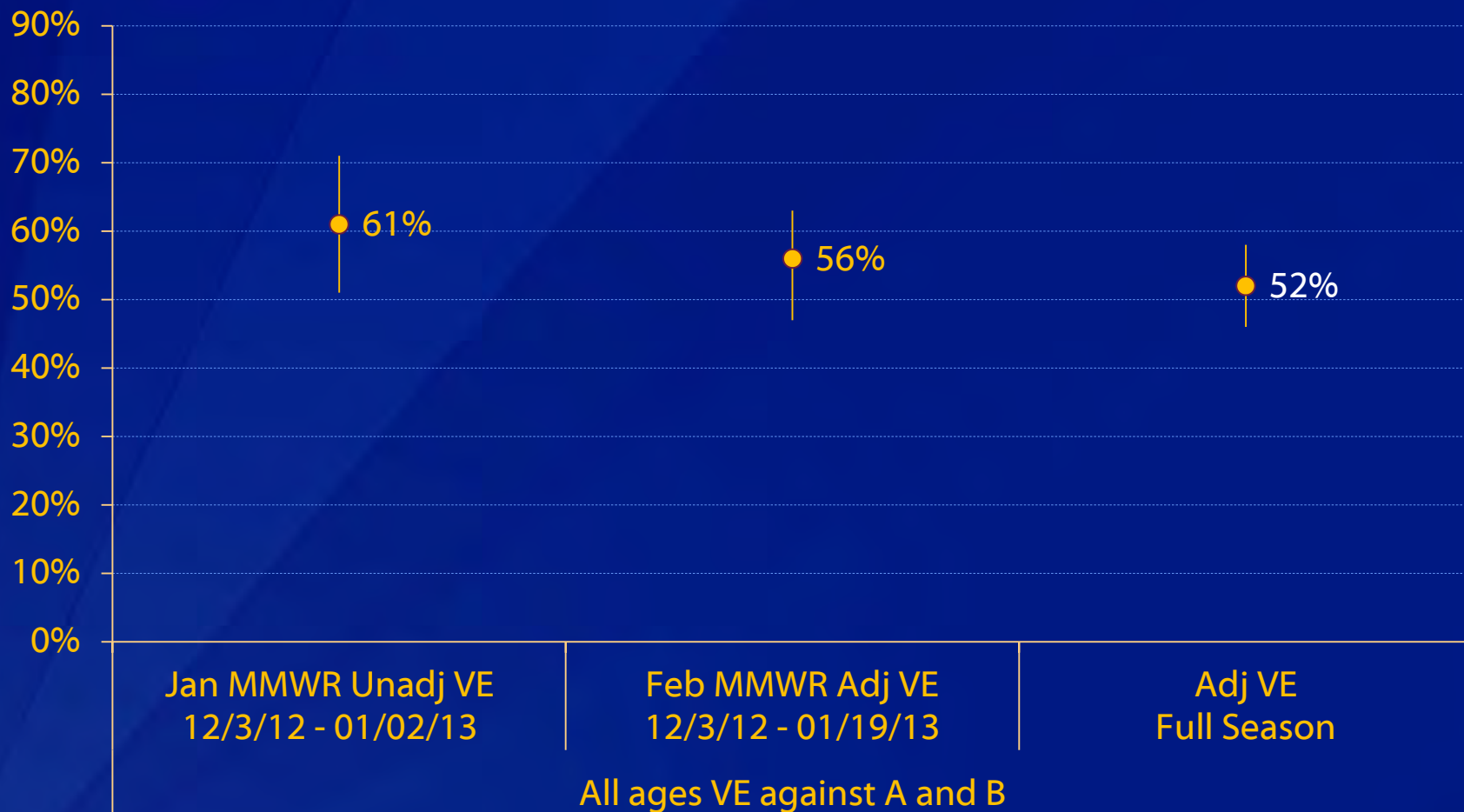
Adjusted VE (95% CI) against circulating strains by season in US Flu VE Network



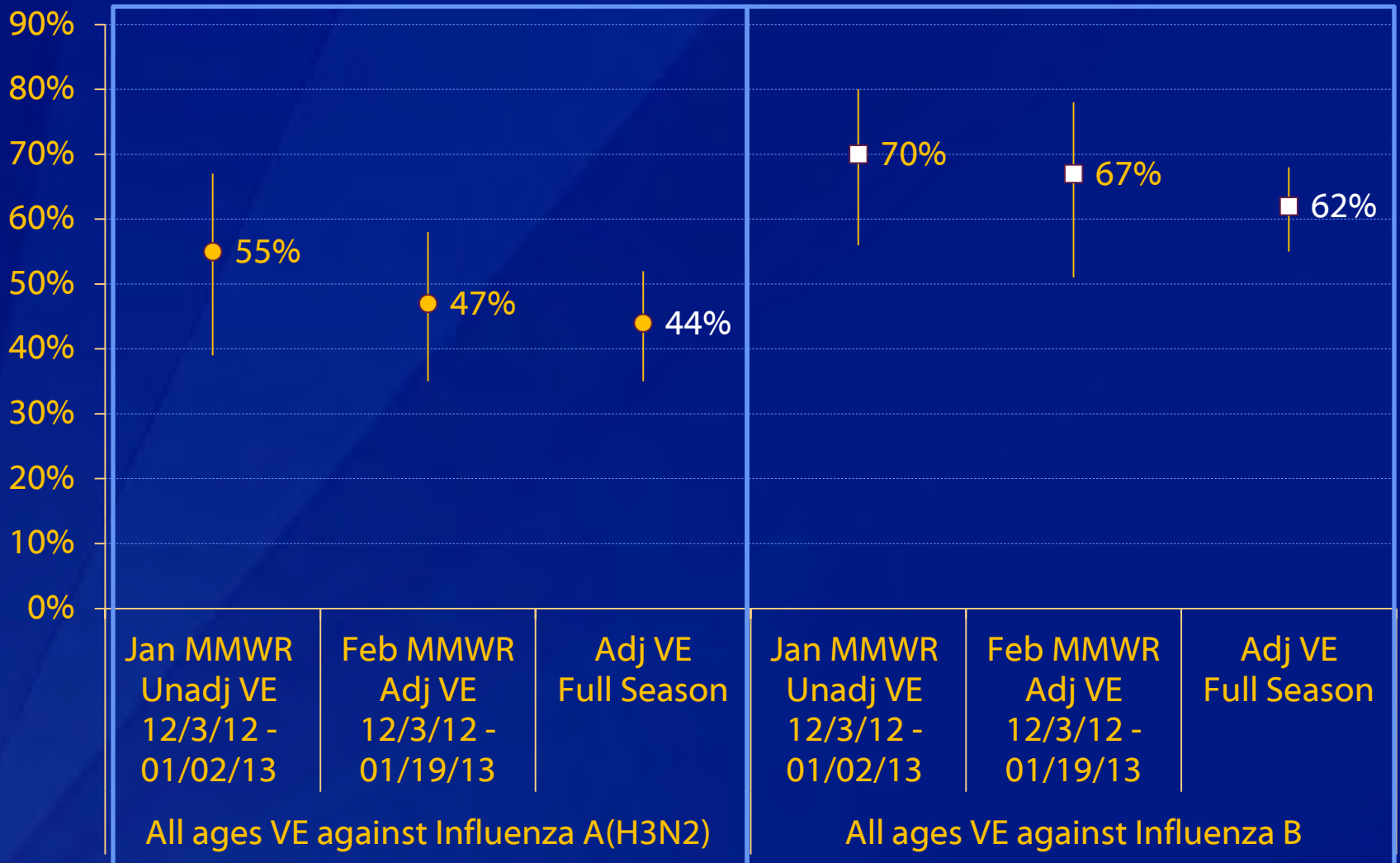
US Flu VE Network update for ACIP

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

All ages VE against circulating strains at three estimates

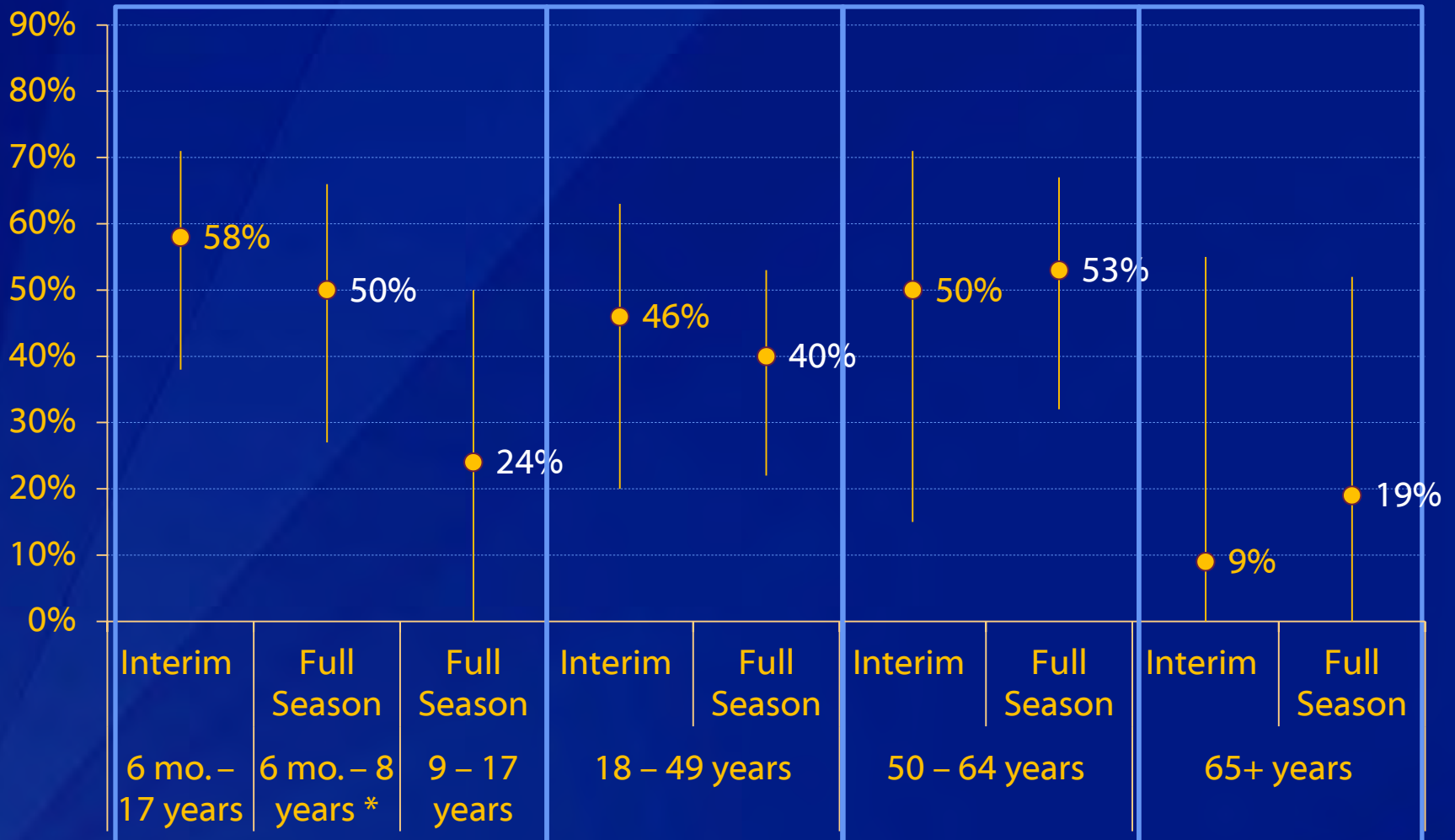


All ages VE against A(H3N3) and B at three estimates

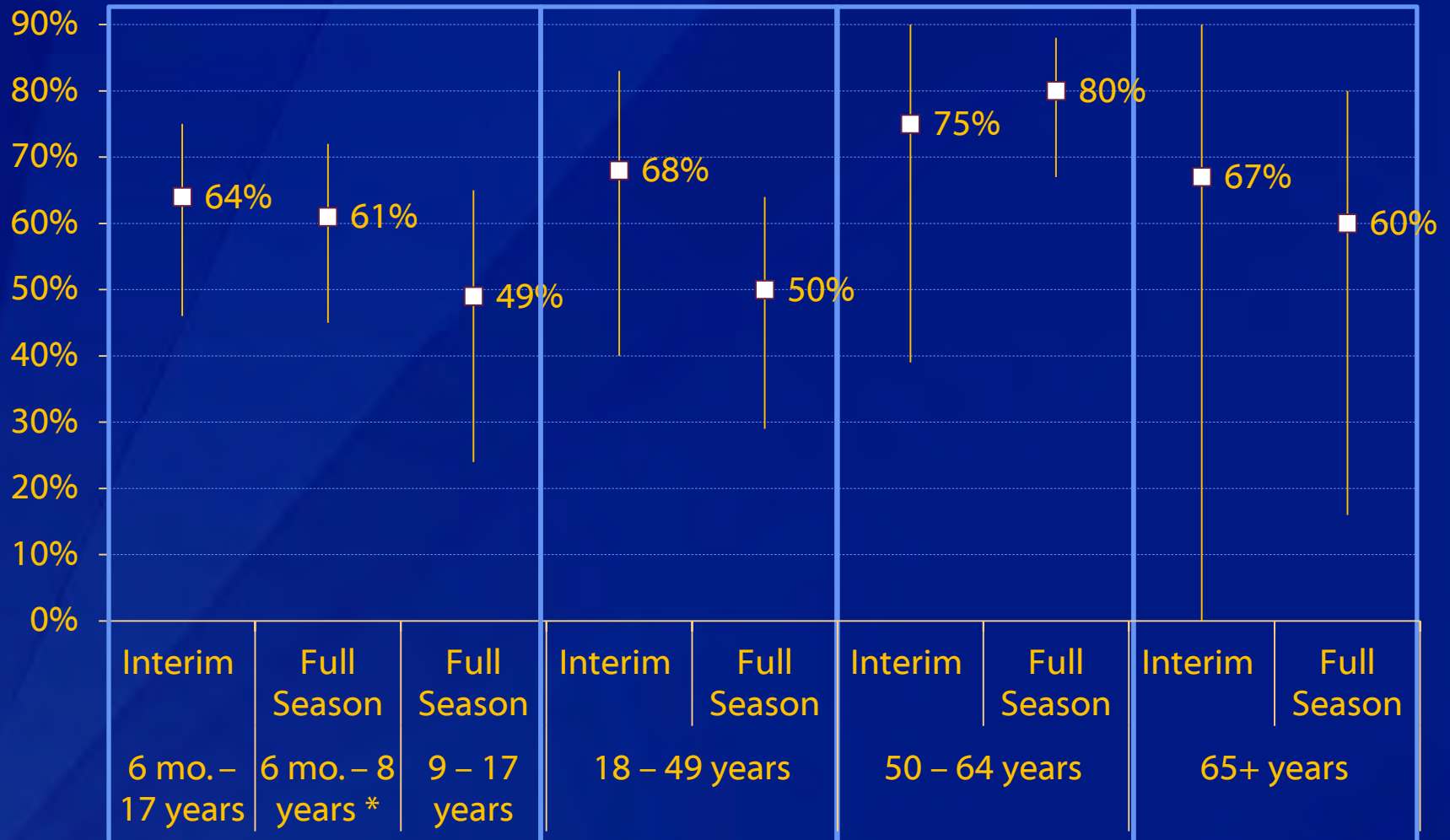


NOTE: January MMWR included all influenza A viruses; the vast majority of which were A(H3N2)

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



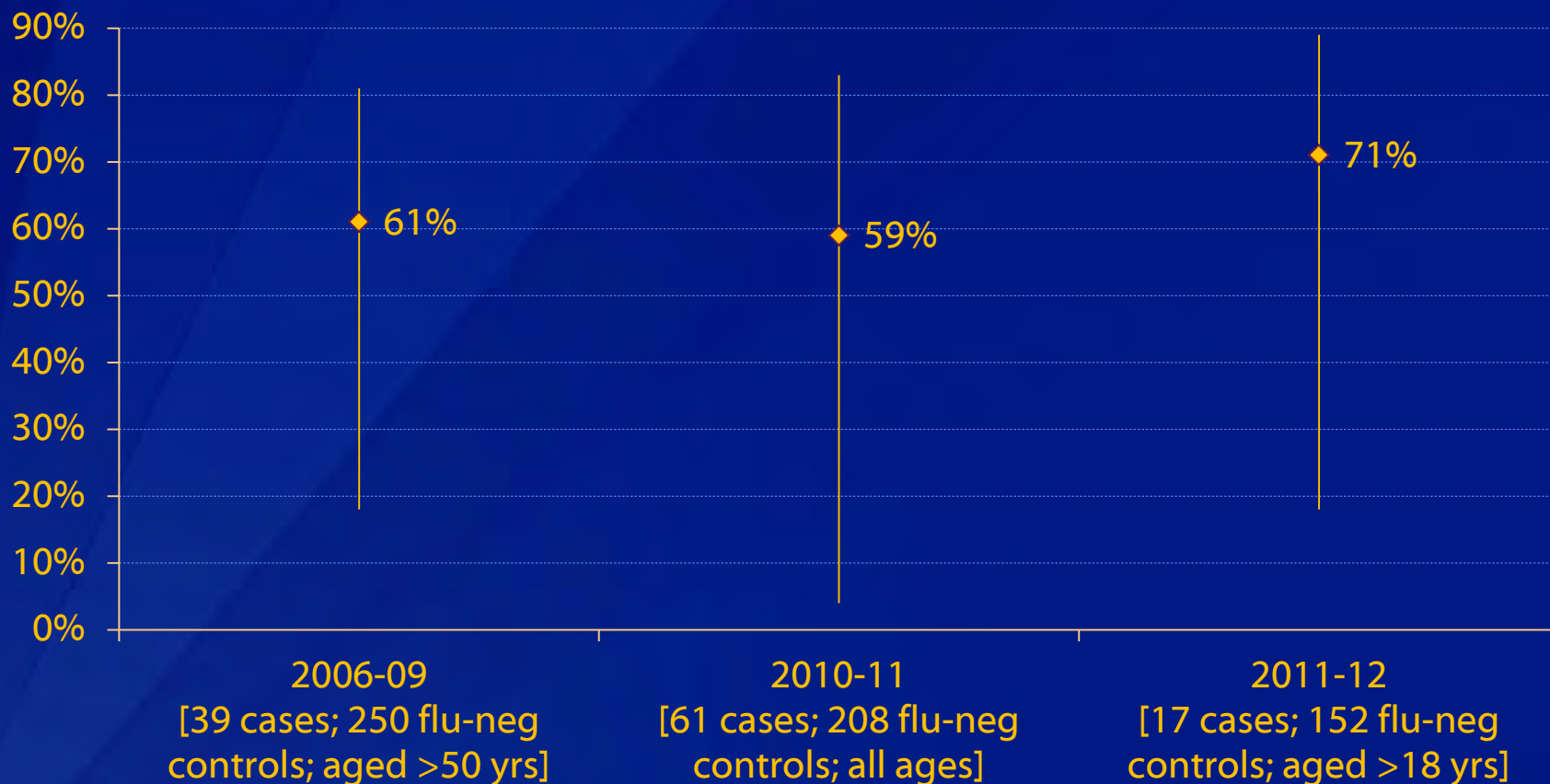
Adjusted VE against influenza B viruses at mid- and full-season estimates by age



Update for ACIP

VE AGAINST INPATIENT OUTCOMES

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

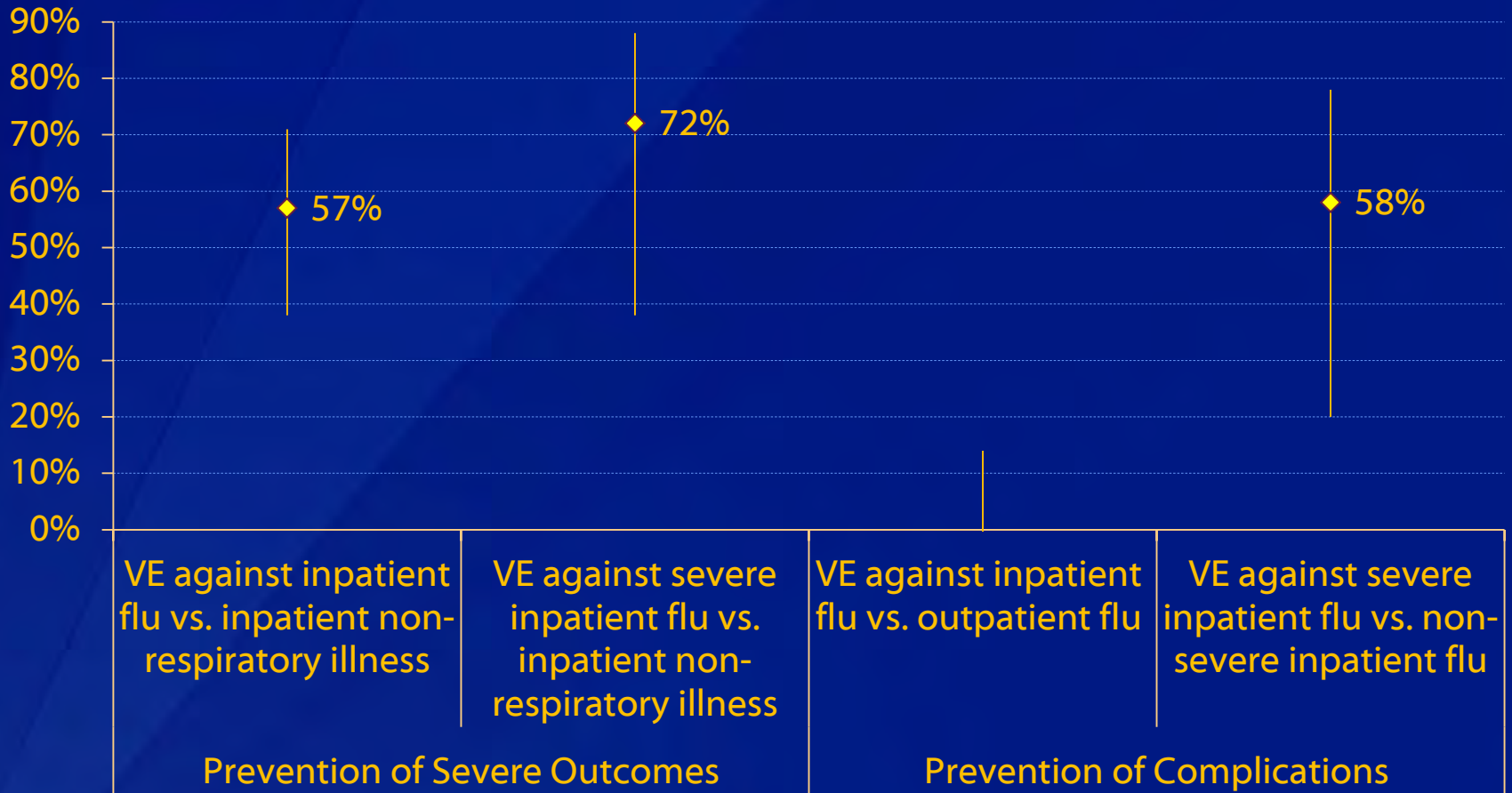


Talbot et al. (2011) JID 203: 500-8

Costilla (2013) BMC Public Health 13:191

Talbot et al. (2013) CID 56:1774-7

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



Castilla et al. (2013)
[all ages; age and region matched; 2010-11]

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
- **U Pittsburgh:** Rick Zimmerman, Tricia Nowalk