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

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US Flu VE Network: Five Study Sites and Principal Investigators

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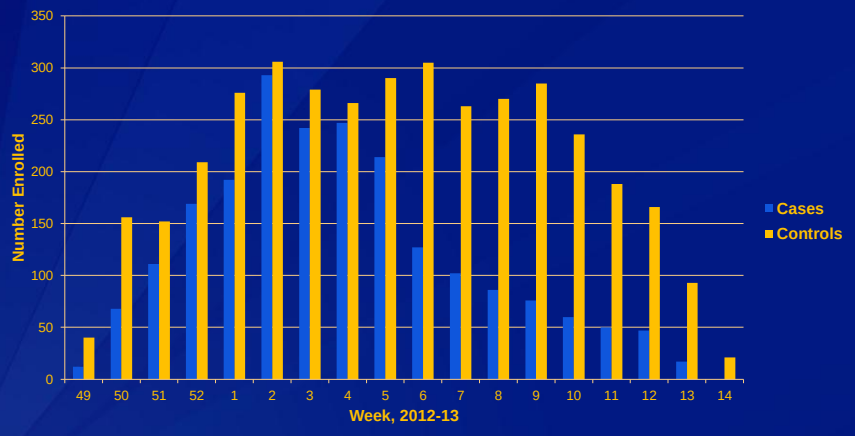
US Flu VE Network: Methods

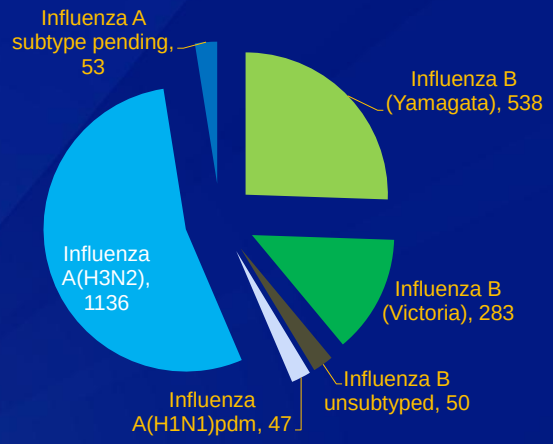
- **Purpose:** Estimate VE for prevention of outpatient healthcare visits due to influenza
- **Design:** Prospective case-control study
  - **Cases**: Medically attended ARI and RT-PCR influenza
  - **Controls**: Medically attended ARI but negative for influenza
- **Interim vaccination status:** Confirmed 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)
- **Analysis:** VE = (1 – adjusted OR) x 100%
  - Standard covariates: age, site, and days from illness onset to enrollment
  - Adjusted for potential confounding by race/ethnicity and self-rated health

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



2,113 influenza cases and 3,801 influenza-negative controls

2012-13 Cases Enrolled by (Sub)Type



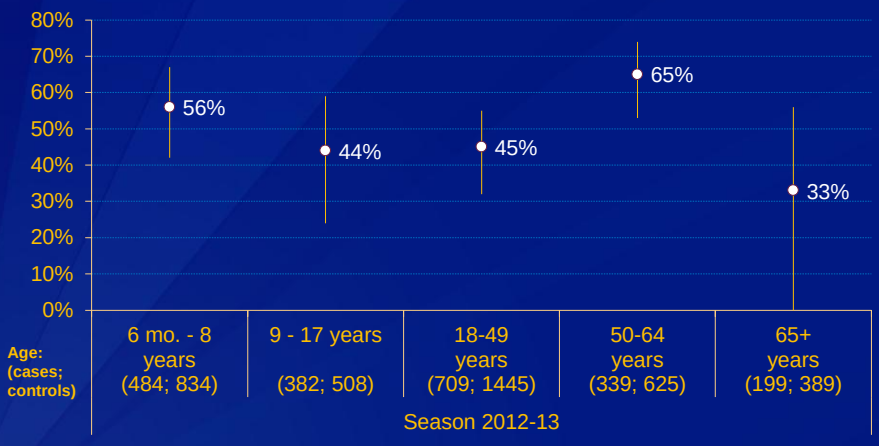
Adjusted VE against A and B

	Influenza and Vaccination Status				Vaccine Effectiveness	
	Influenza-Positive Cases		Influenza-Negative Controls		Adjusted †	
	No. Vaccinated /Total	(%)	No. Vaccinated /Total	(%)	(%)	(95% CI)
Influenza A and B						
All ages	683/2113	(32)	1881/3801	(49)	**(53)**	(47-58)
6 mo. – 8 years *	130/484	(27)	431/834	(52)	**(56)**	(42-67)
9 – 17 years	98/382	(26)	192/508	(38)	**(44)**	(24-59)
18 – 49 years	201/709	(28)	590/1445	(41)	**(45)**	(32-55)
50-64 years	126/339	(37)	382/625	(61)	**(65)**	(53-74)
65+ years	128/199	(64)	286/389	(74)	**(33)**	(-2,56)

† 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, race/ethnicity, study site, days from illness onset to enrollment, and self-rated health status. 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 (95% CI) against A and B

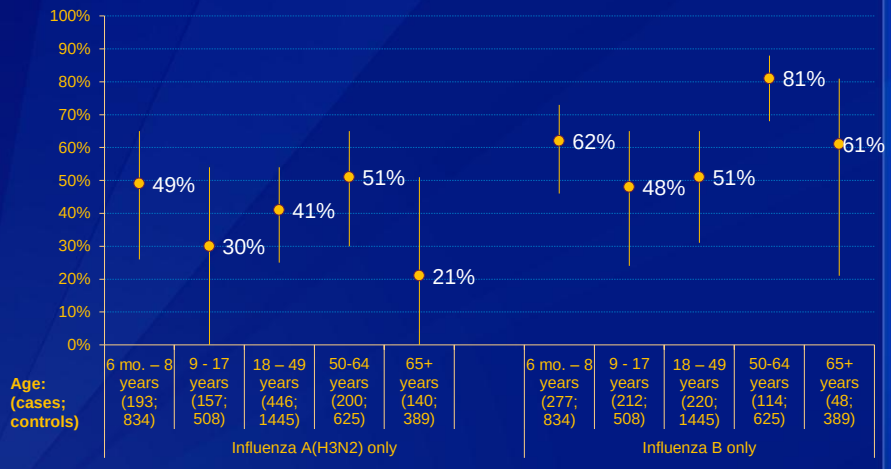


VE against A(H3N2) only and B only by Age

Virus and age groups	Influenza and Vaccination Status: Influenza-Positive Cases No. Vaccinated /Total	(%)	Influenza-Negative Controls No. Vaccinated /Total	(%)	Vaccine Effectiveness Adjusted † (%)	(95% CI)
Influenza A(H3N2) only						
All ages	424/1136	(37)	1881/3801	(49)	**(45)**	(36-52)
6 mo. – 8 years *	57/193	(30)	431/834	(52)	**(49)**	(26-65)
9 – 17 years	44/157	(28)	192/508	(38)	**(30)**	(-5, 54)
18 – 49 years	132/446	(30)	590/1445	(41)	**(41)**	(25-54)
50-64 years	94/200	(47)	382/625	(61)	**(51)**	(30-65)
65+ years	97/140	(69)	286/389	(74)	**(21)**	(-29, 51)
Influenza B only						
All ages	227/871	(26)	1881/3801	(49)	**(63)**	(55-69)
6 mo. – 8 years *	69/277	(25)	431/834	(52)	**(62)**	(46-73)
9 – 17 years	53/212	(25)	192/508	(38)	**(48)**	(24-65)
18 – 49 years	58/220	(26)	590/1445	(41)	**(51)**	(31-65)
50-64 years	25/114	(22)	382/625	(61)	**(81)**	(68-88)
65+ years	22/48	(46)	286/389	(74)	**(61)**	(21-81)

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

Adjusted VE (95% CI) against A(H3N2) only and B only by Age

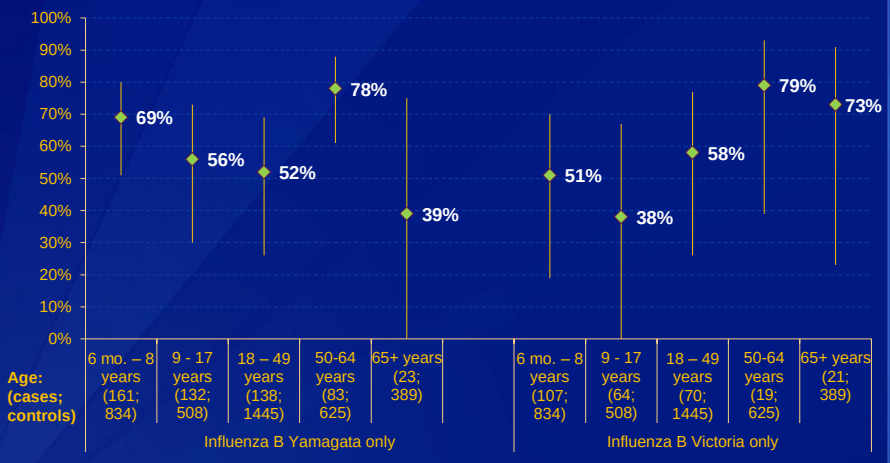


VE against B Yamagata and B Victoria by Age

Virus and age groups	Influenza and Vaccination Status: Influenza-Positive Cases No. Vaccinated /Total	(%)	Influenza-Negative Controls No. Vaccinated /Total	(%)	Vaccine Effectiveness Adjusted † (%)	(95% CI)
Influenza B(Yamagata) only						
All ages	124/538	(23)	1881/3801	(49)	**(64)**	(56-71)
6 mo. – 8 years *	30/161	(19)	431/834	(52)	**(69)**	(51-80)
9 – 17 years	30/132	(23)	192/508	(38)	**(56)**	(30-73)
18 – 49 years	35/138	(25)	590/1445	(41)	**(52)**	(26-69)
50-64 years	18/83	(22)	382/625	(61)	**(78)**	(61-88)
65+ years	11/23	(48)	286/389	(74)	**(39)**	(-53, 75)
Influenza B (Victoria) only						
All ages	87/283	(31)	1881/3801	(49)	**(60)**	(47-70)
6 mo. – 8 years *	38/107	(36)	431/834	(52)	**(51)**	(19-70)
9 – 17 years	18/64	(28)	192/508	(38)	**(38)**	(-17, 67)
18 – 49 years	17/70	(24)	590/1445	(41)	**(58)**	(26-77)
50-64 years	5/19	(26)	382/625	(61)	**(79)**	(39-93)
65+ years	9/21	(43)	286/389	(74)	**(73)**	(23-91)

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

Adjusted VE (95% CI) against B (Yamagata) and B (Victoria) by Age



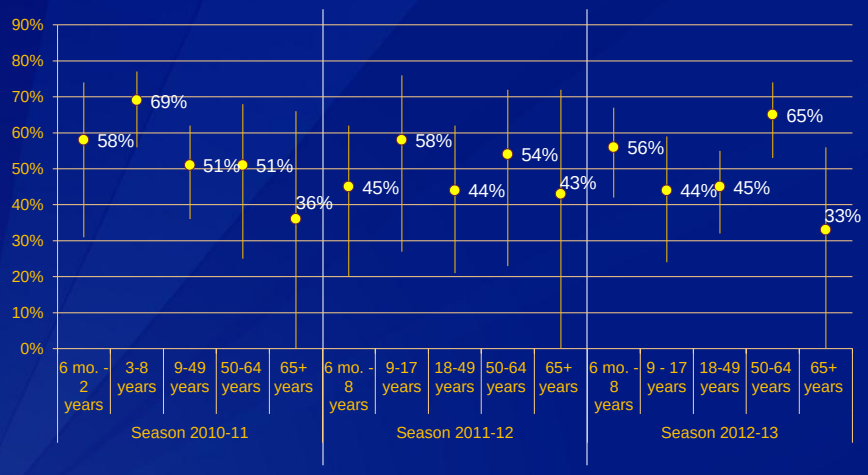
Conclusions

- **Adjusted VE against influenza A and B was 53% (47-58%)**
  - 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 (45%); exceptions for aged 9-17 and 65+ years
  - Due to influenza B by two-thirds (63%); consistent for all ages
- **Similar VE against vaccine lineage B (Yamagata) and excluded B (Victoria)**
  - Need further research to confirm and understand age differences
  - Need better understanding of cross-protection

Conclusions

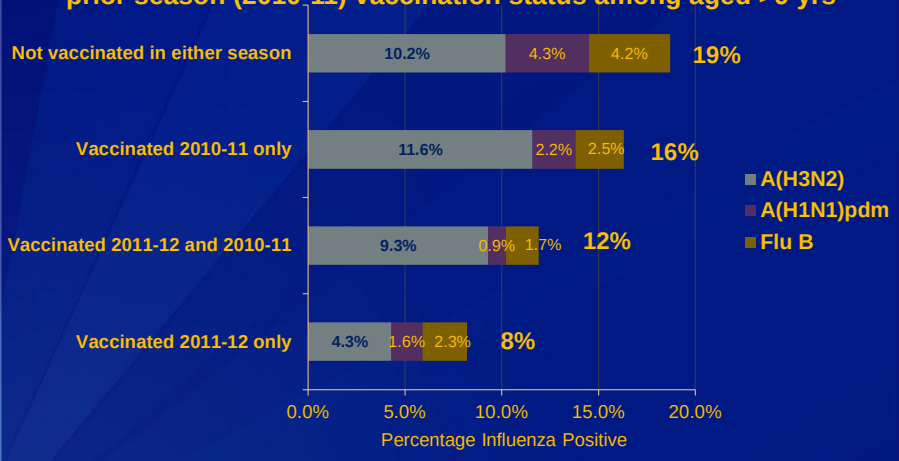
- **Limits and next steps**
  - Missing chronic medical conditions, vaccine type, and prior vaccination status until final data set
  - Additional potential confounders will be considered
- **Implications**
  - Opportunity to expand beneficial vaccination, especially among young children
  - Important to recognize illness and treat with antiviral medications, especially among older adults
  - Need more effective vaccines and vaccination strategies
  - Need better understanding of factors that modify VE
  - VE this season has to be considered in the context of other seasons, strains, and outcomes

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



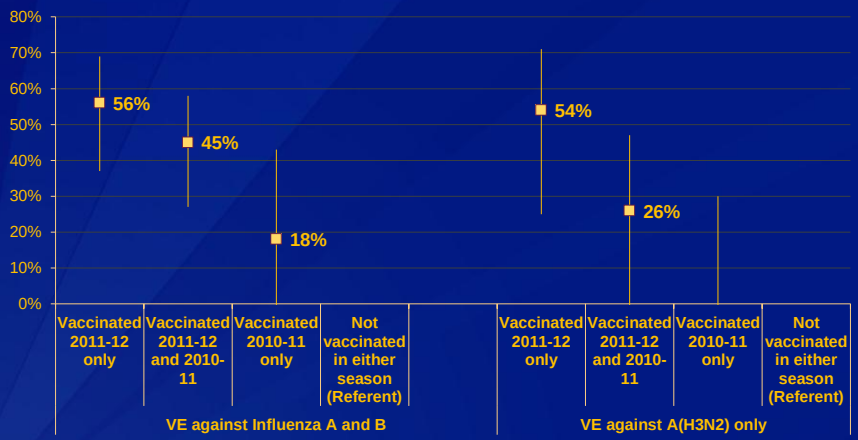
Did prior vaccination modify VE in 2011-12?

Percentage influenza positive by current season (2011-12) and prior season (2010-11) vaccination status among aged >9 yrs



Vaccination 2011-12 is 1 or more dose confirmed by medical record or vaccine registry >14 days prior to illness onset; vaccination 2010-11 was any dose of vaccine confirmed by medical record or registry.

Adjusted VE against influenza A and B and against A(H3N2) only by combination of vaccine exposure during 2011-12 season among aged >9 yrs.



Models were adjusted for network center, subject age in months, sex, race/ethnicity categories, presence of high risk health conditions, self-rated health status, time (days) between illness onset and specimen collection, and calendar time. P-values for interaction term of current and prior season vaccination were < .05 for both models.

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