Interim Influenza Vaccine Effectiveness Against Laboratory-Confirmed Influenza in California, October 2023 — January 2024

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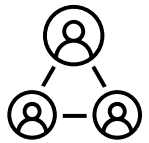
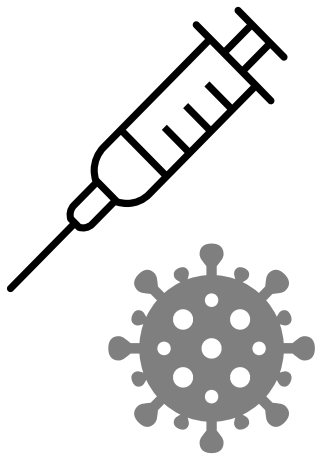
Multiple considerations for vaccine effectiveness (VE) calculation

Data: Interviews, electronic health records

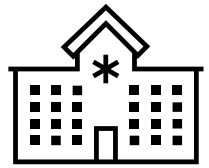


Populations: Pediatric, hospitalized

Influenza VE



Care settings



New: California public health data

New requirements for data reporting in California

- 1/1/23: **Influenza vaccination records** became reportable to the California Immunization Registry (CAIR)

- 6/15/23: All **negative influenza results** (in addition to previously reportable positive influenza results) became reportable to the California Reportable Disease Information Exchange (CalREDIE)

California VE Calculation

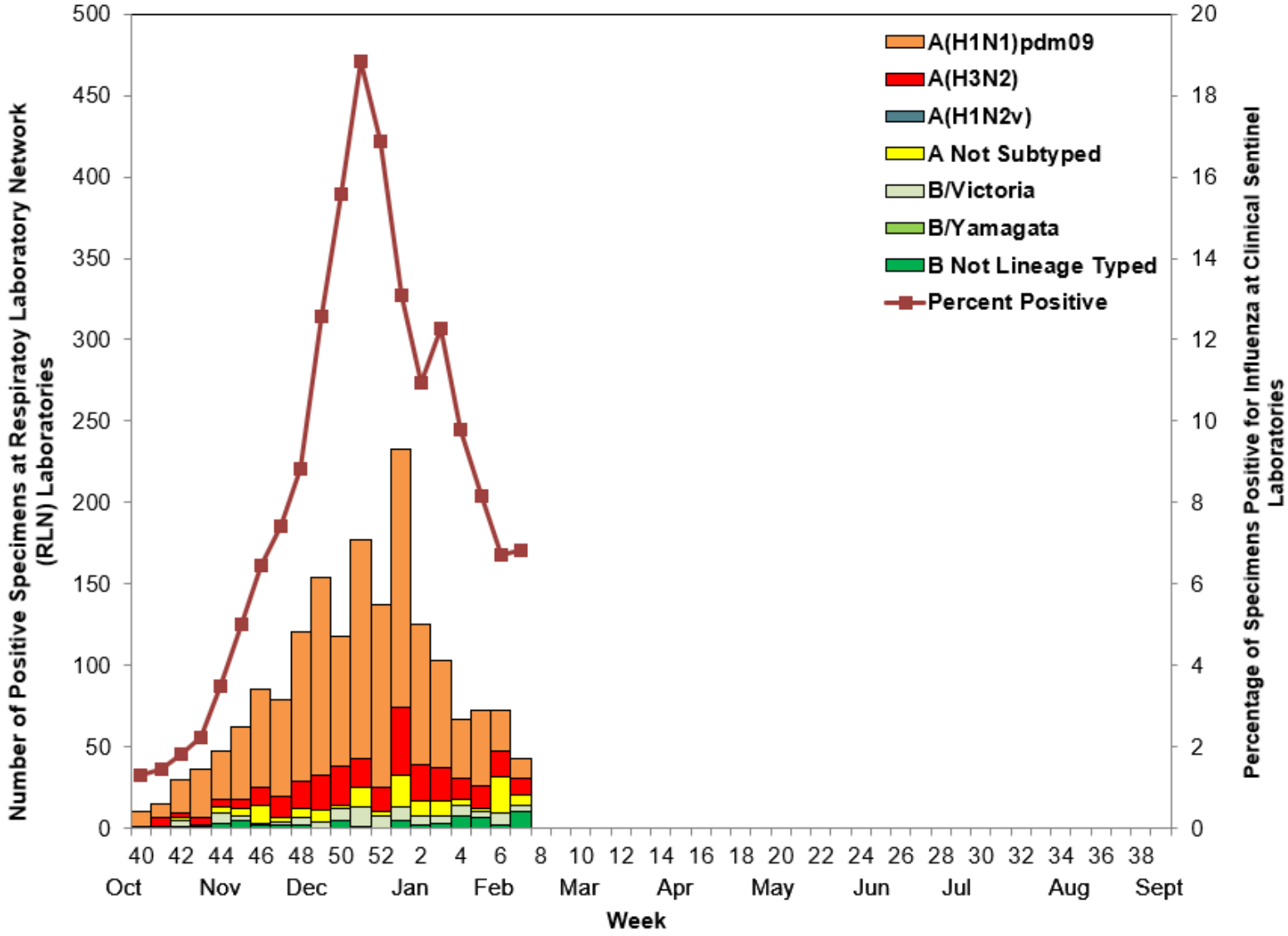
Attribute	California
Data source	Mandatory influenza results and influenza immunization records
Date available	VE estimates and data available each December or earlier
Outcome(s)	Laboratory-confirmed influenza using nucleic acid amplification tests (NAAT)
Population(s)	Californians tested for influenza using NAAT from diverse care settings

Methods

Methods: unmatched case-control study

- **Inclusion criteria:** California residents aged ≥6 months with molecular tests for influenza (A/B) captured by the state electronic laboratory reporting system
- **Dates:** October 1, 2023—January 31, 2024
- **Vaccination status:** documented dose of seasonal influenza vaccine in CAIR ≥14 days before testing
- Deduplicate results for persons with multiple records
- Remove results from laboratories weekly with ≥50% positive due to suspected underreporting of negative results (<5% of data)
- **Analysis:** VE = (1 – adjusted OR) x 100%
  - Mixed-effects logistic regression model adjusted for age, race, ethnicity, testing week (random effect), and county (random effect)

Number of influenza detections by type and subtype detected in RLN laboratories and percentage of specimens testing positive at clinical sentinel laboratories – 2023-2024 season to date



Participant characteristics

	Overall No. (%)	Influenza positive No. (%)	Influenza negative No. (%)
Total	678,422 (100)	77,501 (11.4)	600,921 (88.6)
Age (yrs, median)	42 (17–66)	31 (10–52)	44 (19–68)
Race			
American Indian or Alaska Native	2,919 (0.4)	326 (0.4)	2,593(0.5)
Asian	53,419 (7.9)	6,252 (8.1)	47,167 (7.8)
Black or African American	40,069 (5.9)	4,033 (5.2)	36,036 (6.0)
Native Hawaiian or Pacific Islander	2,878 (0.4)	300 (0.4)	2,578 (0.4)
White	301, 779 (44.5)	29,908 (38.5)	271,871 (45.2)
Multiple Races	1,381 (0.2)	130 (0.2)	1,251 (0.2)
Other	131,284 (19.4)	16,098 (20.8)	115,186 (19.2)
Unknown	144,693 (21.3)	20,454 (26.4)	124,239 (20.7)
Ethnicity			
Hispanic or Latino	159,676 (23.6)	21,309 (27.4)	138,367 (23.1)
Not Hispanic or Latino	386,200 (56.9)	38,653 (49.9)	347,547 (57.8)
Unknown	132,546 (19.5)	17,539 (22.7)	115,007 (19.1)
Vaccinated			
Overall	190,313 (28.1)	13,905 (17.9)	176,408 (29.3)
Vaccinated during Oct. 1–31	11,073 (13.1)	93 (6.5)	10,980 (13.2)
Vaccinated during Nov. 1–30	39,497 (25.3)	1,357 (12.5)	38,140 (26.3)
Vaccinated during Dec. 1–31	69,884 (30.1)	7,104 (17.6)	62,780 (32.7)
Vaccinated during Jan. 1–31	69,859 (33.9)	5,351 (21.4)	64,508 (35.6)

Influenza vaccines protect against laboratory-confirmed influenza

	Influenza positive		Influenza negative		Adjusted VE*
	Total	Vaccinated no. (%)	Total	Vaccinated no. (%)	% (95% CI)
Influenza A and B**					
Overall	75,876	13,629 (18)	600,921	176,408 (29)	45 (44–46)
<18 years	28,914	3,744 (13)	147,047	32,791 (22)	56 (54–57)
18–49 years	26,435	3,334 (13)	189,129	36,171 (19)	48 (46–50)
50–64 years	10,861	2,575 (24)	96,148	28,579 (30)	36 (33–39)
≥65 years	9,666	3,976 (41)	168,597	78,867 (47)	30 (27–33)

Study period: October 1, 2023 – January 31, 2024.

*VE was estimated using an unmatched case-control study as 100% x (1-aOR) where aOR is the ratio of odds of vaccination among influenza positive cases versus influenza negative controls. ORs were estimated using mixed-effects logistic regression with adjustment for age, race, ethnicity as fixed effects and enrollment week and county of residence as random effects.

**VE for unknown influenza types was not calculated because of small sample size, and unknown influenza type results were excluded from overall influenza A and B VE estimation.

VE against influenza A was lower but still protective in all age groups

	Influenza positive		Influenza negative		Adjusted VE*
	Total	Vaccinated no. (%)	Total	Vaccinated no. (%)	% (95% CI)
Influenza A					
Overall	68,716	13,118 (19)	600,921	176,408 (29)	42 (41–43)
<18 years	25,393	3,517 (14)	147,047	32,791 (22)	52 (51–53)
18–49 years	23,257	3,136 (14)	189,129	36,171 (19)	44 (42–46)
50–64 years	10,546	2,532 (24)	96,148	28,579 (30)	35 (32–38)
≥65 years	9,520	3,933 (41)	168,597	78,867 (47)	29 (26–32)

Study period: October 1, 2023 – January 31, 2024.

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VE against influenza B was highly protective across most age groups

	Influenza positive		Influenza negative		Adjusted VE*
	Total	Vaccinated no. (%)	Total	Vaccinated no. (%)	% (95% CI)
Influenza B					
Overall	7,160	511 (7)	600,921	176,408 (29)	76 (73–78)
<18 years	3,521	227 (6)	147,047	32,791 (22)	79 (76–82)
18–49 years	3,178	198 (6)	189,129	36,171 (19)	75 (71–78)
50–64 years	315	43 (14)	96,148	28,579 (30)	67 (55–76)
≥65 years	146	43 (29)	168,597	78,867 (47)	54 (33–67)

Study period: October 1, 2023 – January 31, 2024.

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Cumulative VE — Oct. 1, 2023–Jan. 31, 2024

	Influenza positive		Influenza negative		Adjusted VE*
	Total	Vaccinated no. (%)	Total	Vaccinated no. (%)	% (95% CI)
Influenza A and B**					
October 31st	1,455	93 (6)	83,403	11,021 (13)	46 (34, 57)
November 30th	11,703	1,376 (12)	223,921	47,682 (21)	51 (48, 54)
December 31st	53,181	8,695 (16)	416,136	110,816 (27)	47 (46, 48)
Overall (January 31st)	75,876	13,905 (18)	600,921	176,408 (29)	45 (44, 46)

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Limitations

1. Likely incomplete documentation and reporting of mandatory vaccination and testing
2. Cannot assess partial/full vaccination status for children aged <9 years
3. Lack of symptom information, test setting, and outcome status (illness, hospitalization, or death)
4. Potential lack of generalizability across the US
5. Subtype information not available for positive influenza results
6. Lack of control for other confounders (health seeking behavior, pre-existing conditions)

Summary

- Current seasonal influenza vaccines provide protection against laboratory-confirmed influenza for persons aged ≥6 months
  - Higher VE for influenza B & younger age groups (<18 years, 18-49 years)

- Mandatory public health data can be leveraged to calculate timely in-season influenza effectiveness as an additional estimate supporting existing public health influenza efforts including vaccination messaging
  - Useful to promote additional prevention measures prior to peak
  - Prepare for increased hospital capacity

Acknowledgments

California's local health departments

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