

Supplementary Online Content

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eReferences

This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Influenza season dates

Influenza season	Influenza Circulation Period
2012-13	November 11, 2012 to June 1, 2013
2013-14	November 24, 2013 to April 19, 2014
2014-15	October 5, 2014 to May 2, 2015
2015-16	December 13, 2015 to April 30, 2016

eTable2. Administrative data sets used¹

Dataset	Description
Discharge Abstract Database	This database includes records for acute inpatient care in the province, and includes demographic information as well as coded diagnoses.
Ambulatory Care Database	This database includes data on publicly funded clinic, day surgery, and emergency department visits. It includes demographic information as well as coded diagnoses.
Pharmaceutical Information Network (PIN)	This database includes community-based pharmacy dispensations, including prescriptions for vaccines. It includes over 97% of all pharmacies in the province, but does not provide information on vaccine administration.
Alberta Blue Cross (ABC)	This database includes claims for reimbursement for publicly funded drug programs, including the influenza program. All pharmacists administering vaccine submit a claim for reimbursement indicating the patient, date of service and risk group. This information is reported daily to Alberta Health.
Immunization and Adverse Reaction to Immunization (Imm/ARI)	This provincial immunization repository contains data on publicly funded vaccines. For influenza, it includes all vaccination events delivered by Alberta Health Services, and receives data from ABC on pharmacist-administered vaccines. Imm/ARI does not include data on vaccines administered to most First Nations children on reserves, and children in the border town of Lloydminster, who receive public health services from the province of Saskatchewan.

eTable 3. List of *International Classification of Diseases, 10th Revision, With Canadian Enhancement (ICD-10-CA)* codes to define acute respiratory infections (hospitalizations and emergency department visits)

Description	ICD-10-CA Code
Viral infection, unspecified site	B34
Viral agents as the cause of diseases classified to other chapters	B97
Acute nasopharyngitis (common cold)	J00
Acute sinusitis	J01
Acute pharyngitis	J02
Acute tonsillitis	J03
Acute laryngitis and tracheitis	J04
Acute obstructive laryngitis (croup) and epiglottitis	J05
Acute upper respiratory infections of multiple or unspecified sites	J06
Influenza due to identified novel influenza A virus	J09
Influenza	J10, J11
Viral pneumonia	J12
Bacterial pneumonia	J13, J14, J15
Pneumonia due to other specified organism	J16
Pneumonia in infectious diseases classified elsewhere	J17
Bronchopneumonia, organism unspecified	J18
Acute bronchitis and bronchiolitis	J20, J21
Unspecified acute lower respiratory infection	J22
Other diseases of upper respiratory tract	J39-8, J39-9
Bronchitis, not specified as acute or chronic	J40
Asthma	J45
Adult respiratory distress syndrome	J80
Pulmonary edema	J81
Respiratory failure	J96
Other respiratory disorders	J98
Cough	R05
Shortness of breath (dyspnea)	R06-0
Stridor	R06-1
Wheezing	R06-2
Tachypnea	R06-4
Sneezing	R06-7
Respiratory abnormality, other	R06-8
Pain in throat	R07-0
Chest pain on breathing	R07-1
Respiratory arrest	R09-2
Abnormal sputum	R09-3
Fever	R50
Malaise and fatigue	R53

eTable 4. Included specimens by influenza season, testing status, and subtype

Influenza season	Total specimens	Influenza-negative	Influenza-positive				
			Any influenza	A(H3N2)	A(H1N1)pdm09	A/Unknown	B
2012-13	2480	1820	660	303	48	17	292
2013-14	2445	1902	543	11	443	35	56
2014-15	3079	2291	788	625	1	15	149
2015-16	2775	1605	1170	14	573	13	583
Total	10779	7618	3161	953	1065	80	1080

eTable 5. Vaccine effectiveness estimates by age and subtype

	Cases/Total	LAIV VE (95% CI)	IIV VE (95% CI)
<i>A(H1N1)pdm09</i>			
2-4 years	494/4157	69 (50, 81)	81 (66, 90)
5-8 years	296/2123	73 (48, 86)	90 (71, 96)
9-17 years	275/2403	67 (20, 86)	62 (30, 80)
<i>A(H3N2)</i>			
2-4 years	340/4003	39 (2, 63)	44 (7, 66)
5-8 years	269/2096	51 (18, 71)	58 (17, 79)
9-17 years	344/2472	3 (-77, 46)	27 (-23, 57)
<i>Influenza B</i>			
2-4 years	270/3933	84 (62, 93)	49 (18, 68)
5-8 years	377/2204	73 (54, 84)	64 (38, 79)
9-17 years	433/2561	65 (35, 82)	52 (25, 69)

eTable 6. Unadjusted vaccine effectiveness estimates

	LAIV	IIV	Relative odds of influenza, LAIV vs. IIV ^a
Overall	57 (48, 64)	65 (58, 71)	1.23 (0.96, 1.57)
<i>By influenza season</i>			
2012-13	45 (19, 62)	64 (47, 76)	1.54 (0.91, 2.62)
2013-14	65 (42, 79)	73 (58, 82)	1.29 (0.68, 2.45)
2014-15	37 (15, 54)	53 (35, 66)	1.33 (0.87, 2.04)
2015-16	74 (63, 82)	67 (55, 76)	0.78 (0.49, 1.24)
<i>By influenza type/subtype^b</i>			
A/H1N1	68 (55, 77)	81 (73, 87)	1.72 (1.05, 2.82)
2013-14	79 (59, 90)	87 (76, 93)	1.62 (0.64, 4.06)
2015-16	64 (45, 76)	76 (62, 85)	1.54 (0.82, 2.86)
A/H3N2	32 (12, 48)	58 (45, 69)	1.63 (1.12, 2.36)
2012-13	62 (28, 80)	63 (36, 78)	1.03 (0.46, 2.30)
2014-15	22 (-6, 43)	52 (32, 67)	1.63 (1.03, 2.56)
Influenza B	70 (58, 79)	58 (45, 67)	0.71 (0.46, 1.08)
2012-13	29 (-17, 57)	57 (28, 75)	1.67 (0.83, 3.35)
2015-16	86 (73, 92)	57 (38, 71)	0.34 (0.17, 0.69)
<i>By age group</i>			
2-4 years	61 (47, 71)	66 (55, 75)	1.17 (0.78, 1.74)
5-8 years	59 (44, 70)	72 (59, 80)	0.69 (0.43, 1.09)
9-17 years	42 (17, 60)	55 (41, 66)	0.77 (0.49, 1.22)
<i>By healthcare setting</i>			
Hospital	36 (9, 55)	53 (35, 66)	1.35 (0.86, 2.12)
Emergency Department	64 (52, 73)	71 (62, 79)	1.27 (0.85, 1.88)
Physician Office	58 (38, 71)	46 (22, 63)	0.79 (0.47, 1.32)
Unknown	57 (20, 78)	62 (28, 80)	1.11 (0.47, 2.64)
<i>By comorbidity status</i>			
Yes	53 (35, 65)	57 (46, 66)	1.11 (0.77, 1.59)
No	59 (49, 67)	67 (56, 75)	1.24 (0.87, 1.78)

^aAnalysis limited to vaccinated children, comparing odds of laboratory-confirmed influenza in LAIV recipients to IIV recipients

^bSeason-specific estimates are provided for a given subtype when it was a dominant circulating strain

eTable 7. Adjusted^a vaccine effectiveness including healthcare setting in model

	Cases/Total	LAIV	IIV	Relative odds of influenza, LAIV vs. IIV ^b
Overall	3161/10779	59 (50, 66)	59 (51, 66)	1.07 (0.82, 1.40)
<i>By influenza season</i>				
2012-13	660/2480	46 (20, 64)	60 (41, 74)	1.69 (0.94, 3.02)
2013-14	543/2445	59 (32, 75)	67 (48, 78)	1.17 (0.59, 2.33)
2014-15	788/3079	53 (34, 67)	52 (32, 67)	0.86 (0.50, 1.49)
2015-16	1170/2775	75 (64, 83)	61 (45, 72)	0.72 (0.43, 1.21)
<i>By influenza subtype^c</i>				
A(H1N1)pdm09	1065/8683	69 (55, 78)	79 (68, 86)	1.47 (0.84, 2.54)
2013-14	443/2345	75 (50, 88)	84 (68, 91)	1.36 (0.49, 3.73)
2015-16	573/2178	66 (47, 78)	71 (52, 82)	1.36 (0.68, 2.72)
A(H3N2)	953/8571	37 (15, 53)	44 (22, 59)	1.21 (0.76, 1.94)
2012-13	303/2123	59 (20, 79)	54 (19, 74)	1.54 (0.59, 3.98)
2014-15	625/2916	39 (12, 58)	44 (15, 63)	0.95 (0.53, 1.73)
Influenza B	1080/8698	74 (63, 82)	55 (40, 66)	0.63 (0.40, 1.01)
2012-13	292/2112	40 (-1, 65)	57 (24, 75)	1.55 (0.72, 3.34)
2015-16	583/2188	86 (74, 93)	50 (25, 66)	0.33 (0.15, 0.72)
<i>By age group</i>				
2-4 years	1129/4792	62 (49, 72)	61 (48, 71)	1.01 (0.66, 1.56)
5-8 years	962/2789	61 (47, 72)	68 (54, 78)	1.35 (0.81, 2.26)
9-17 years	1070/3198	47 (22, 64)	47 (28, 61)	0.92 (0.55, 1.53)
<i>By comorbidity status</i>				
Yes	1079/4456	54 (37, 67)	57 (45, 66)	1.04 (0.71, 1.52)
No	2082/6323	61 (51, 70)	62 (49, 72)	1.06 (0.72, 1.58)

^aAdjusted for age (in groups for overall estimates, and months or years for age group estimates), calendar month within season, presence of any comorbidity, influenza season (where applicable), and setting

^bAnalysis limited to vaccinated children, comparing odds of laboratory-confirmed influenza in LAIV recipients to IIV recipients

^cSeason-specific estimates are provided for a given subtype when it was a dominant circulating strain

eTable 8. Adjusted^a vaccine effectiveness using children who tested positive for other respiratory viruses as controls

	Cases/Total	LAIV	IIV	Relative odds of influenza, LAIV vs. IIV ^b
Overall	3161/5726	58 (47, 67)	63 (54, 71)	1.16 (0.84, 1.60)
<i>By influenza season</i>				
2012-13	660/1277	50 (19, 69)	66 (44, 79)	1.9 (0.89, 4.06)
2013-14	543/1246	55 (19, 74)	70 (51, 81)	1.56 (0.70, 3.49)
2014-15	788/1538	59 (37, 73)	55 (31, 71)	0.79 (0.41, 1.53)
2015-16	1170/1665	71 (53, 82)	67 (49, 79)	0.95 (0.49, 1.83)
<i>By influenza subtype^c</i>				
A(H1N1)pdm09	1065/3630	64 (46, 76)	82 (73, 88)	1.88 (1.00, 3.55)
2013-14	443/1146	73 (43, 87)	87 (73, 93)	2.31 (0.71, 7.48)
2015-16	573/1068	58 (29, 75)	77 (58, 87)	1.70 (0.75, 3.88)
A(H3N2)	953/3518	47 (23, 63)	47 (22, 64)	1.06 (0.61, 1.84)
2012-13	303/920	63 (23, 82)	55 (12, 77)	1.41 (0.46, 4.32)
2014-15	625/1375	46 (13, 66)	43 (4, 66)	0.90 (0.44, 1.84)
Influenza B	1080/3645	72 (56, 82)	61 (45, 73)	0.81 (0.48, 1.37)
2012-13	292/909	31 (-34, 65)	63 (27, 82)	1.89 (0.70, 5.12)
2015-16	583/1078	86 (70, 94)	62 (34, 78)	0.48 (0.20, 1.18)
<i>By age group</i>				
2-4 years	1129/2884	63 (49, 74)	56 (40, 68)	0.82 (0.52, 1.30)
5-8 years	962/1487	60 (39, 73)	75 (60, 84)	1.64 (0.85, 3.14)
9-17 years	1070/1355	39 (-20, 69)	60 (37, 74)	1.14 (0.47, 2.74)
<i>By healthcare setting</i>				
Hospital	591/1599	45 (17, 64)	54 (33, 69)	1.18 (0.68, 2.05)
Emergency department	1546/2670	65 (51, 76)	73 (61, 81)	1.26 (0.75, 2.10)
Physician office	743/1021	62 (31, 79)	37 (-16, 66)	0.50 (0.18, 1.37)
Unknown	281/436	47 (-30, 78)	62 (3, 85)	1.76 (0.31, 10.09)
<i>By comorbidity status</i>				
Yes	1079/2158	60 (43, 72)	59 (46, 69)	0.92 (0.59, 1.43)
No	2082/3568	57 (42, 68)	69 (55, 78)	1.58 (0.96, 2.60)

^aAdjusted for age (in groups for overall estimates, and months or years for age group estimates), calendar month within season, presence of any comorbidity, and influenza season (where applicable)

^bAnalysis limited to vaccinated children, comparing odds of laboratory-confirmed influenza in LAIV recipients to IIV recipients

^cSeason-specific estimates are provided for a given subtype when it was a dominant circulating strain

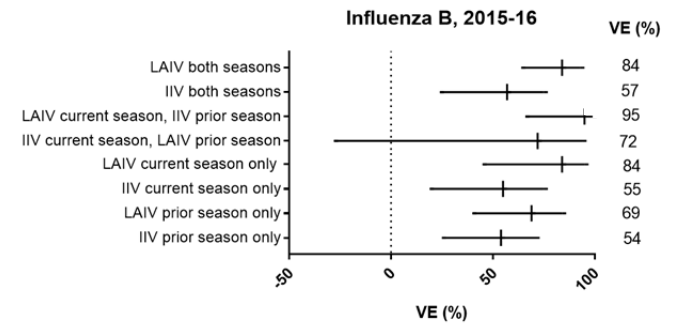
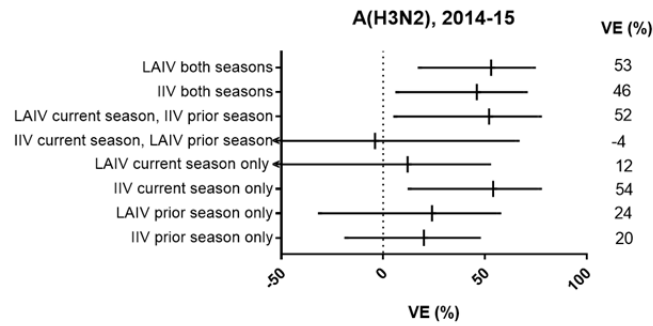
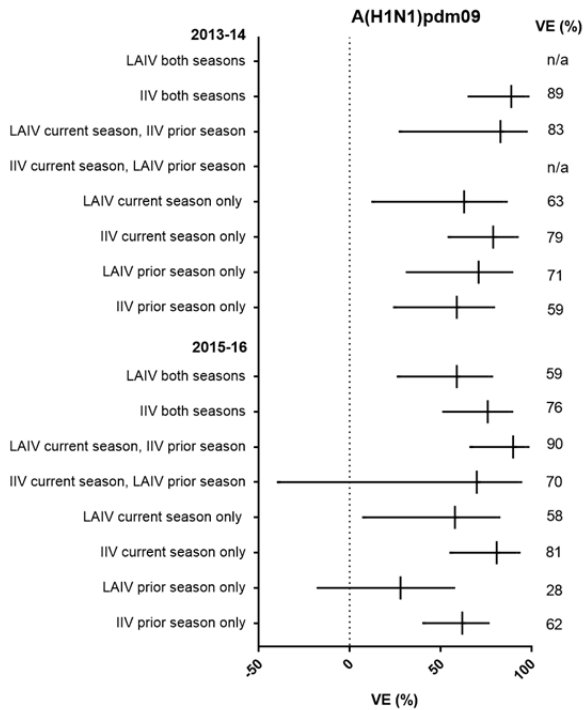
eTable 9. Adjusted^a vaccine effectiveness restricting to those eligible to receive LAIV

	Cases/Total	LAIV	IIV	Relative odds of influenza, LAIV vs. IIV ^b
Overall	2455/7989	59 (49, 67)	66 (57, 74)	1.31 (0.94, 1.84)
<i>By influenza season</i>				
2012-13	499/1812	49 (19, 68)	68 (44, 82)	1.99 (0.90, 4.43)
2013-14	419/1830	55 (22, 74)	66 (43, 80)	1.32 (0.61, 2.85)
2014-15	606/2260	49 (26, 65)	49 (20, 68)	0.97 (0.51, 1.82)
2015-16	931/2087	77 (65, 85)	77 (63, 85)	1.09 (0.56, 2.11)
<i>By influenza subtype^c</i>				
A(H1N1)pdm09	849/6383	71 (57, 81)	83 (71, 90)	1.76 (0.89, 3.50)
2013-14	343/1754	73 (43, 87)	80 (58, 90)	1.21 (0.41, 3.56)
2015-16	468/1624	71 (52, 82)	84 (65, 92)	1.85 (0.72, 4.75)
A(H3N2)	737/6271	33 (7, 52)	49 (21, 67)	1.49 (0.84, 2.64)
2012-13	230/1543	60 (14, 82)	66 (18, 86)	1.94 (0.53, 7.08)
2014-15	487/2141	35 (4, 56)	44 (4, 67)	1.23 (0.61, 2.45)
Influenza B	817/6351	76 (63, 84)	63 (45, 74)	0.71 (0.40, 1.25)
2012-13	219/1532	48 (1, 73)	61 (17, 82)	1.44 (0.51, 4.11)
2015-16	451/1607	85 (70, 92)	69 (46, 82)	0.56 (0.22, 1.39)
<i>By age group</i>				
2-4 years	927/3791	63 (49, 74)	71 (56, 80)	1.26 (0.74, 2.15)
5-8 years	751/2039	64 (48, 74)	78 (62, 88)	1.84 (0.91, 3.73)
9-17 years	777/2159	48 (17, 67)	42 (13, 61)	0.84 (0.44, 1.60)
<i>By healthcare setting</i>				
Hospital	387/2182	39 (6, 60)	62 (39, 77)	1.81 (0.94, 3.48)
Emergency department	1230/3572	65 (51, 74)	77 (65, 85)	1.60 (0.92, 2.79)
Physician office	616/1636	61 (39, 75)	48 (15, 68)	0.73 (0.35, 1.51)
Unknown	222/599	66 (28, 84)	60 (9, 82)	0.98 (0.24, 4.01)
<i>By comorbidity status</i>				
Yes	373/1666	47 (15, 66)	73 (58, 82)	2.09 (1.12, 3.91)
No	2082/6323	61 (51, 70)	62 (49, 72)	1.06 (0.72, 1.58)

^aAdjusted for age (in groups for overall estimates, and months or years for age group estimates), calendar month within season, presence of any comorbidity, and influenza season (where applicable)

^bAnalysis limited to vaccinated children, comparing odds of laboratory-confirmed influenza in LAIV recipients to IIV recipients

^cSeason-specific estimates are provided for a given subtype when it was a dominant circulating strain



eFigure. Vaccine effectiveness estimates by vaccines received during the current and prior influenza seasons, by influenza season and influenza subtype

eReferences

1. Government of Alberta. Overview of Administrative Health Datasets. 2017 [updated 2017-04-28]. Available from: <https://open.alberta.ca/dataset/657ed26d-eb2c-4432-b9cb-0ca2158f165d/resource/38f47433-b33d-4d1e-b959-df312e9d9855/download/Research-Health-Datasets.pdf>. Accessed 2017-10-17.