

2018–2019 Influenza Hospitalization Report



Oregon Emerging Infections Program
Acute and Communicable Disease Prevention
Oregon Public Health Division

Background

The Oregon Emerging Infections Program (EIP) has conducted surveillance for pediatric influenza hospitalizations in collaboration with the Centers for Disease Control and Prevention (CDC) since 2003. Surveillance for adult influenza hospitalizations was added in 2005.

The objectives of EIP influenza surveillance are to:

- Estimate age-specific hospitalization rates.
- Describe the temporal trends of laboratory-confirmed influenza hospitalization, including by influenza subtype.
- Describe characteristics of persons hospitalized with severe influenza illness.
- Describe the clinical features and course of influenza disease (e.g., severe illness and influenza-associated complications) among persons hospitalized with influenza.

In Oregon, the EIP surveillance area for influenza hospitalizations comprises the tri-county (Clackamas, Multnomah, and Washington) Portland metropolitan area with a population of 1,832,634 in 2019, approximately 43% of the population of Oregon.

This report summarizes incidence and severity of influenza in Oregon's EIP surveillance area during the 2018–2019 influenza season (October 1, 2018 to April 30, 2019).

Methods

Cases are defined as laboratory-confirmed influenza hospitalizations among residents of the EIP area (Clackamas, Multnomah, and Washington counties) that test for influenza within 14 days before or 3 days after admission. Cases are reported by hospitals in the tri-county area. Health record reviews using the EIP case report form are performed by trained personnel, who collected standardized data regarding demographic characteristics, clinical manifestations, underlying conditions, and illness outcomes. Due to the high number of cases during the 2018-2019 season, 50% of cases \geq 65 years in age were randomly sampled for health record reviews. These reviews were completed for all cases under the age of 65.

Surveillance Results

Between October 1, 2018 and April 30, 2019, 1,305 influenza-related hospitalizations were reported in the EIP area—1,214 adults and 91 pediatric cases. This represents a crude rate of 71.2 cases per 100,000 residents of the EIP area for the season, a decrease from the 2017-2018 influenza season.

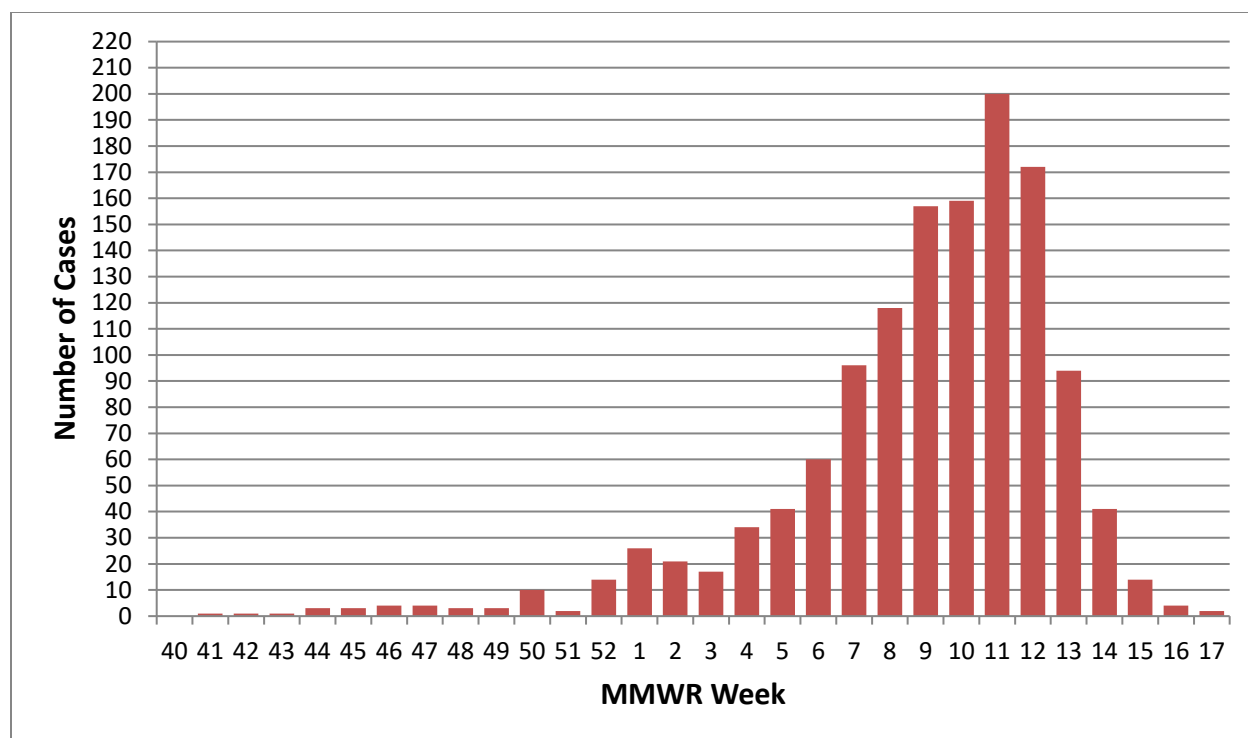
Table 1 shows the sex, age, ethnicity, and race of Oregon EIP cases in 2018–2019. The median age of hospitalized cases was 68 years (range 10 days – 100 years)—older than the median age last influenza season (median age for the 2017-2018 season was 67 years). Persons 65 years and older accounted for the majority of influenza hospitalizations (58.4%) this season. Approximately 54% of cases were female. Nearly 78% of cases were reported as White; the next most commonly reported races were Black (7.5%) and Asian, Hawaiian, or Pacific Islander (5.1%). The majority of cases (90.6%) were reported as non-Hispanic.

Table 1. Characteristics of all Oregon EIP influenza-associated hospitalized cases, 2018–2019.

Case Characteristics	No. N = 1,305	Percent
Sex		
Male	600	46.0
Female	705	54.0
Age		
<6 months	11	0.8
6–23 months	18	1.4
24–59 months	13	1.0
5–10 years	28	2.2
11–17 years	21	1.6
18–49 years	175	13.4
50–64 years	277	21.2
>64 years	762	58.4
Ethnicity		
Hispanic and Latino	1,182	90.6
Non-Hispanic	82	6.3
Not specified	41	3.1
Race		
White	1,015	77.8
Black	98	7.5
Asian/Hawaiian or Pacific Islander	67	5.1
American Indian/Alaska Native	11	0.8
Multiple Races	7	0.5
Unknown	107	8.2

Figure 1 shows the distribution of cases during the influenza season. The peak of influenza-associated hospitalizations occurred during MMWR week 11 of 2019 (the week ending 3/16/2019). During the peak week, 200 influenza hospitalizations were reported. During the surveillance period, the first case was reported during week 41 of 2018 (the week ending 10/13/2018), and the last cases were reported week 17 of 2019 (the week ending 4/27/2019).

Figure 1. Number of Oregon EIP influenza-associated hospitalized cases by MMWR week, 2018–2019.



A total of 928 cases were sampled and their medical records reviewed, including all 543 cases ages 64 years and under, and 385 cases ages 65 years and above (50% of the total cases in this age group). The percentages reported below are weighted to account for this sampling.

Table 2 shows procedures, conditions, antiviral use, and vaccination status among sampled cases. Nearly all hospitalized cases (92.6%) received a chest x-ray within 72 hours of admission. Approximately 6.6% required mechanical ventilation and 17.2% were admitted to an ICU. Most cases had at least one underlying medical condition (91.0%), with cardiovascular disease (49.5%), chronic metabolic disease (42.6%), and obesity among adults (39.3%) being the most frequently reported. More than half (59.3%) of hospitalized cases were reported as vaccinated for influenza prior to hospitalization.

Table 2. Procedures, conditions, antiviral use, and vaccination status for sampled Oregon EIP influenza-associated hospitalized cases, 2018–2019.

Procedures, conditions, and findings*	No. (n=928)	Weighted Percent°
Chest x-ray within 3 days of admission	843	92.6
Mechanical ventilation	73	6.6
ICU	179	17.2
Treated with Antivirals&	884	95.7
Any Underlying Medical Condition**	821	91.0
Condition		
Obese***	350	39.3
Cardiovascular disease	390	49.5
Chronic metabolic disease	365	42.6
Chronic lung disease	258	30.1
Asthma	178	17.4
Renal disease	172	21.6
Neurologic disorder	189	23.1
Immunosuppressive condition	129	14.5
Hemoglobinopathy	18	1.8
Seizure disorder	56	5.8
Cancer	39	4.6
Cognitive dysfunction	20	2.6
Pregnant†	29	27.1
History of Guillain-Barre Syndrome	1	0.1
Vaccinated‡ prior to hospitalization		
Yes	511	59.3
No	306	29.4
Unknown	111	11.4

*Unknown values not shown

° Data are reported as raw counts among sampled cases and weighted percents calculated based on sampling scheme.

& Treated with antivirals defined as antiviral treatment during the course of illness.

**Cases may have more than one underlying condition; categories are not mutually exclusive.

***Obesity among adults aged 18 years and older. Calculated using height and weight or where indicated in medical record if height or weight was unknown. Obesity defined as BMI≥30.

† Percent of females 14-49 years (n=107).

‡ Vaccination status determined according to CDC algorithm using available information from medical records, vaccine registry, and patient and provider contact.

Tables 3 and 4 show demographic characteristics, procedures, and antiviral use for adult cases (persons 18 years and older) by vaccination status. Sixty percent of hospitalized adults were reported as vaccinated prior to hospitalization. Women were somewhat more likely to be vaccinated than men (62.2% vs. 58.3%). The likelihood of vaccination among adults generally increased with age—69.7% of persons 65 years of age and older were vaccinated prior to hospitalization, compared to the lowest—42.3% among adults 18–49 years.

Table 3. Characteristics by vaccination status (vaccinated prior to admission) for sampled adult influenza-associated hospitalized cases, Oregon EIP, 2018–2019.

Sex	Vaccine Status			Total No. (%) ^o n=837
	Unvaccinated No. (%) ^o n=255	Vaccinated No. (%) ^o n=471	Unknown No. (%) ^o n=111	
Male	113 (27.9)	203 (58.3)	57 (13.8)	373 (45.2)
Female	142 (27.0)	268 (62.2)	54 (10.9)	464 (54.8)
Age				
18–49 years	73 (41.7)	74 (42.3)	28 (16.0)	175 (14.4)
50–64 years	103 (37.2)	129 (46.6)	45 (16.2)	277 (22.8)
>64 years	79 (20.5)	268 (69.7)	38 (9.9)	385 (62.7)
Ethnicity				
Hispanic and Latino	16 (35.5)	23 (48.4)	9 (16.2)	48 (5.1)
Non-Hispanic	232 (27.0)	438 (61.4)	97 (11.6)	767 (92.0)
Not specified	7 (25.1)	10 (49.9)	5 (25.0)	22 (2.9)
Race				
White	194 (26.4)	386 (62.5)	78 (11.1)	658 (80.3)
Black	23 (31.5)	32 (49.4)	16 (19.2)	71 (7.3)
Asian or Pacific Islander	12 (24.2)	21 (62.9)	5 (13.0)	38 (4.4)
American Indian/ Alaska Native	3 (27.3)	6 (54.5)	2 (18.2)	11 (0.9)
Multiple races	2 (100.0)	0 (0.0)	0 (0.0)	2 (0.3)
Unknown	21 (33.8)	26 (49.3)	10 (16.9)	57 (6.8)

^o Data are reported as raw counts among sampled cases and weighted percents calculated based on sampling scheme.

Among adults, Asians and Pacific Islanders had the highest influenza vaccination coverage (62.9%), followed by White adults (62.5%). Adults who were Black or multiracial were less likely to have received the influenza vaccine (49.4% and 0.0%, respectively).

Table 4. Procedures, findings and treatment by vaccination status for adult influenza-associated hospitalized cases, Oregon EIP, 2018–2019.

	Vaccine Status			Total No. (%)° n=837
	Unvaccinated No. (%)° n=255	Vaccinated No. (%)° n=471	Unknown No. (%)° n=111	
Chest X-ray				
Chest X-ray within 3 days	241 (27.3)	439 (60.4)	104 (12.3)	784 (94.7)
No Chest X-ray within 3 days	14 (28.1)	32 (60.9)	7 (11.0)	53 (5.3)
Mechanical ventilation				
Yes	33 (45.2)	22 (36.5)	13 (18.3)	68 (6.7)
No	222 (26.2)	448 (62.2)	97 (11.6)	767 (93.0)
Unknown	0 (0.0)	1 (33.6)	1 (66.4)	2 (0.3)
ICU				
Yes	55 (29.9)	74 (49.7)	35 (20.4)	164 (17.3)
No	200 (26.9)	396 (62.7)	75 (10.3)	671 (82.5)
Unknown	0 (0.0)	1 (33.6)	1 (66.4)	2 (0.3)
Treated with Antivirals^{&}				
Treated	244 (27.1)	455 (60.6)	107 (12.2)	806 (96.4)
Not treated	10 (32.5)	15 (55.0)	4 (12.5)	29 (3.3)
Unknown	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.3)
Any medical condition				
None or unknown	35 (58.6)	14 (27.1)	10 (14.3)	59 (5.8)
At least one	220 (25.5)	457 (62.5)	101 (12.1)	778 (94.3)
Type of medical condition				
Asthma	47 (26.5)	97 (63.6)	18 (9.9)	162 (17.4)
Cancer	6 (15.0)	27 (75.0)	5 (10.0)	38 (4.9)
Cardiovascular disease	90 (21.1)	252 (67.2)	46 (11.7)	388 (53.0)
Chronic lung disease	65 (24.3)	159 (64.7)	30 (11.0)	254 (32.0)
Chronic metabolic disease	82 (19.8)	243 (70.5)	37 (9.7)	362 (45.6)
Cognitive dysfunction	1 (6.1)	16 (84.8)	2 (9.1)	19 (2.7)
Hemoglobinopathy	4 (28.5)	10 (62.0)	1 (9.5)	15 (1.73)
History of Guillain-Barre Syndrome	1 (100.0)	0 (0.0)	0 (0.0)	1 (0.1)
Immunosuppressive condition	23 (17.9)	86 (71.9)	14 (10.3)	123 (15.2)
Neurologic condition	28 (14.8)	120 (69.6)	27 (15.5)	175 (23.9)
Obese**	114 (28.4)	199 (61.8)	37 (9.8)	350 (39.3)
Pregnant [‡]	8 (18.6)	18 (36.7)	3 (10.3)	29 (27.6)
Renal disease	30 (16.5)	121 (74.3)	17 (9.3)	168 (22.9)
Seizure disorder	12 (25.4)	28 (59.7)	7 (14.9)	47 (5.5)

° Data are reported as raw counts among sampled cases and weighted percents calculated based on sampling scheme.

& Treated with antivirals defined as antiviral treatment during the course of illness.

**Obesity among adults aged 18 years and older. Calculated using height and weight or where indicated in medical record if height or weight was unknown. Obesity defined as BMI≥30.

‡Percent of females 14-49 years (n=107).

Table 4 shows the frequency and percent of procedures and antiviral use by vaccination status for adult cases. Most adults (94.3%) had at least one underlying condition. More than half (62.5%) of cases with at least one underlying medical condition were vaccinated prior to admission. Persons with underlying medical conditions are at high risk for adverse medical outcomes related to influenza infection.

Table 5. Case characteristics by vaccination status (vaccinated prior to admission) for pediatric influenza-associated hospitalized cases, Oregon EIP, 2018–2019.

	Vaccine Status						Total No. (%) n=91
	Unvaccinated No. (%) n=51		Vaccinated No. (%) n=40		Unknown No. (%) n=0		
Sex							
Male	32	(60.4)	21	(39.6)	0	(0.0)	53 (58.2)
Female	19	(50.0)	19	(50.0)	0	(0.0)	38 (41.8)
Age							
<6 months	11	(100.0)	0	(0.0)	0	(0.0)	11 (12.1)
6-23 months	6	(33.3)	12	(66.7)	0	(0.0)	18 (19.8)
24-59 months	7	(53.9)	6	(46.1)	0	(0.0)	13 (14.3)
5-10 years	15	(53.6)	13	(46.4)	0	(0.0)	28 (30.8)
11-17 years	12	(57.1)	9	(42.9)	0	(0.0)	21 (23.1)
Ethnicity							
Hispanic and Latino	13	(56.5)	10	(43.5)	0	(0.0)	23 (25.3)
Non-Hispanic	37	(55.2)	30	(44.8)	0	(0.0)	67 (73.6)
Not specified	1	(100.0)	0	(0.0)	0	(0.0)	1 (1.1)
Race							
White	22	(51.2)	21	(48.8)	0	(0.0)	43 (47.3)
Black	6	(54.6)	5	(45.5)	0	(0.0)	11 (12.1)
Asian or Pacific Islander	3	(50.0)	3	(50.0)	0	(0.0)	6 (6.6)
American Indian/ Alaska Native	0	(0.0)	0	(0.0)	0	(0.0)	0 (0.0)
Multiple races	3	(60.0)	2	(40.0)	0	(0.0)	5 (5.5)
Unknown	17	(65.4)	9	(34.6)	0	(0.0)	26 (28.6)

Tables 5 and 6 show demographic characteristics, procedures, and antiviral use for pediatric cases by vaccination status. Over a third of hospitalized children—39.6% of males and 50.0% of females—were vaccinated prior to being hospitalized for influenza. About half of hospitalized children (43 of 91) had underlying medical conditions; only 22 (51.2%) of the children with underlying medical conditions were vaccinated.

Table 6. Procedures, underlying conditions, and antiviral use by vaccination status for pediatric influenza-associated hospitalized cases, Oregon EIP, 2018–2019.

	Vaccine Status			Total No. (%) n=91
	Unvaccinated No. (%) n=51	Vaccinated No. (%) n=40	Unknown No. (%) n=0	
Chest X-ray				
Chest X-ray within 3 days	34 (57.6)	25 (42.4)	0 (0.0)	59 (64.8)
No Chest X-ray within 3 days	17 (53.1)	15 (46.9)	0 (0.0)	32 (35.2)
Mechanical ventilation				
Yes	3 (60.0)	2 (40.0)	0 (0.0)	5 (5.5)
No	48 (55.8)	38 (44.2)	0 (0.0)	86 (94.5)
ICU				
Yes	8 (53.3)	7 (46.7)	0 (0.0)	15 (16.5)
No	43 (56.6)	33 (43.4)	0 (0.0)	76 (83.5)
Treated with Antivirals*				
Treated	42 (53.8)	36 (46.2)	0 (0.0)	78 (85.7)
Not treated	9 (69.2)	4 (30.8)	0 (0.0)	13 (14.3)
Any medical condition				
None or unknown	30 (62.5)	18 (37.5)	0 (0.0)	48 (52.8)
At least one	21 (48.8)	22 (51.2)	0 (0.0)	43 (47.3)
Type of medical condition*				
Asthma	9 (56.3)	7 (43.8)	0 (0.0)	16 (17.6)
Cancer	0 (0.0)	1 (100.0)	0 (0.0)	1 (1.1)
Cardiovascular disease	1 (50.0)	1 (50.0)	0 (0.0)	2 (2.2)
Chronic lung disease	2 (50.0)	2 (50.0)	0 (0.0)	4 (4.4)
Chronic metabolic disease	1 (33.3)	2 (66.7)	0 (0.0)	3 (3.3)
Cognitive dysfunction	0 (0.0)	1 (100.0)	0 (0.0)	1 (1.1)
Hemoglobinopathy	0 (0.0)	3 (100.0)	0 (0.0)	3 (3.3)
History of Guillain-Barre Syndrome	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Immunosuppressive condition	2 (33.3)	4 (66.7)	0 (0.0)	6 (6.6)
Neurologic condition	8 (57.1)	6 (42.9)	0 (0.0)	14 (15.4)
Pregnant†	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Renal disease	1 (25.0)	3 (75.0)	0 (0.0)	4 (4.4)
Seizure disorder	7 (77.8)	2 (22.2)	0 (0.0)	9 (9.9)

† Treated with antivirals defined as antiviral treatment during the course of illness.

* Cases may have more than one underlying condition; categories are not mutually exclusive. Not all categories or subcategories shown.

During the 2018–2019 influenza season, influenza A predominated in Oregon, with both flu A (H3) and flu A (H1N1) co-circulating. Table 7 shows the frequency of virus types and subtypes detected among influenza-associated hospitalized cases in the Oregon EIP area. Influenza A was detected in 99.9% of all hospitalizations. Among influenza A specimens that were subtyped, 18.4% were flu A (H3) and 12.9% were flu A (2009 H1N1). Influenza B was detected in 0.1% of hospitalizations.

Table 7. Influenza virus types and subtypes among Oregon EIP influenza-associated hospitalized cases, 2018–2019.

Virus	No. N=1,305	Percent
Influenza A	1,296	99.9
H3	239	18.4
2009 H1N1	167	12.9
Unknown subtype*	890	68.7
Influenza B	9	0.1
Yamagata Lineage	0	0.0
Victoria Lineage	0	0.0
Unknown Lineage*	9	100.0
Both A and B	0	0

*Specimen not subtyped or lineage not performed.

The age distribution of influenza cases hospitalized during the 2018–2019 season (Figure 2) shows that the highest rate of hospitalization occurred among persons 65 years and older, at 227 cases per 100,000 population over the 2018-2019 season. During 2008–2009 and 2009–2010 (pandemic year), the highest rates of hospitalization occurred among children 0–4 years of age (40 and 68 cases per 100,000 population, respectively). Other than these two years, the rate of influenza hospitalization has consistently been greatest among the elderly.

Deaths: Among all individuals hospitalized for flu during the 2018-2019 flu season, 53 (4.1%) died during their hospitalization. Adults accounted for 53 of these deaths (4.4% of all flu-associated adult hospitalizations) and children aged 17 and under accounted for 0 deaths (0.0% of all flu-associated pediatric hospitalizations). This overall percentage of deaths among hospitalized patients is slightly higher than the 2017–2018 season (3.6%). Data on deaths includes only those who died while hospitalized.

Figure 2. Oregon EIP influenza-associated hospitalized cases by age group, comparison by influenza season, 2010–2011 to 2018–2019.

