

2015–2016 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 1,790,958 in 2016—which is 44% of the population of Oregon.

This report summarizes incidence and severity of influenza in Oregon’s EIP surveillance area during the 2015–2016 influenza season (October 1, 2015 to April 30, 2016).

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.

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Surveillance Results

Between October 1, 2015 and April 30, 2016, 466 influenza-related hospitalizations were reported in the EIP area—434 adults and 32 pediatric cases. This represents a crude rate of 26.4 cases per 100,000 residents of the EIP area, a rate nearly half that of last season (49.2 per 100,000).

Table 1 shows the sex, age, ethnicity, and race of Oregon EIP cases in 2015–2016. The median age of hospitalized cases was 61 years—younger than the median age last influenza season (median=73 years). Persons aged greater than 64 years were the leading age category in influenza hospitalizations (44.6%) this season. Fifty-one percent of cases were female. Over 78% percent of cases were reported as white, while Asian/Pacific Islander—6.0% of hospitalized cases—were the next most frequently reported race (where race was known). Most cases, 88.0%, were reported as non-Hispanic.

Table 1. Characteristics of all Oregon EIP influenza-associated hospitalized cases, 2015–2016.

Sex	No.	Percent
Male	228	48.9
Female	238	51.1
Age		
<6 months	3	0.6
6–23 months	6	1.3
24–59 months	5	1.1
5–10 years	10	2.2
11–17 years	8	1.7
18–49 years	92	19.7
50–64 years	134	28.8
>64 years	208	44.6
Ethnicity		
Hispanic and Latino	34	7.3
Non-Hispanic	410	88.0
Not specified	22	4.7
Race		
White	364	78.1
Black	27	5.8
Asian/Hawaiian or Pacific Islander	28	6.0
American Indian/Alaska Native	2	0.4
Multiple Races	2	0.4
Unknown	43	9.2

Figure 1 shows the distribution of cases during the influenza season. The peak of influenza-associated hospitalizations occurred during MMWR week 13 of 2016 (the week ending 4/2/2016). During the peak week, 52 influenza hospitalizations were reported. During the surveillance period the first case was reported week 40 (the week ending 10/10/2015), and the last cases were reported week 17 (the week ending 4/30/2016, when our reporting season ends).

Figure 1. Number of Oregon EIP influenza-associated hospitalized cases by MMWR week, 2015–2016.

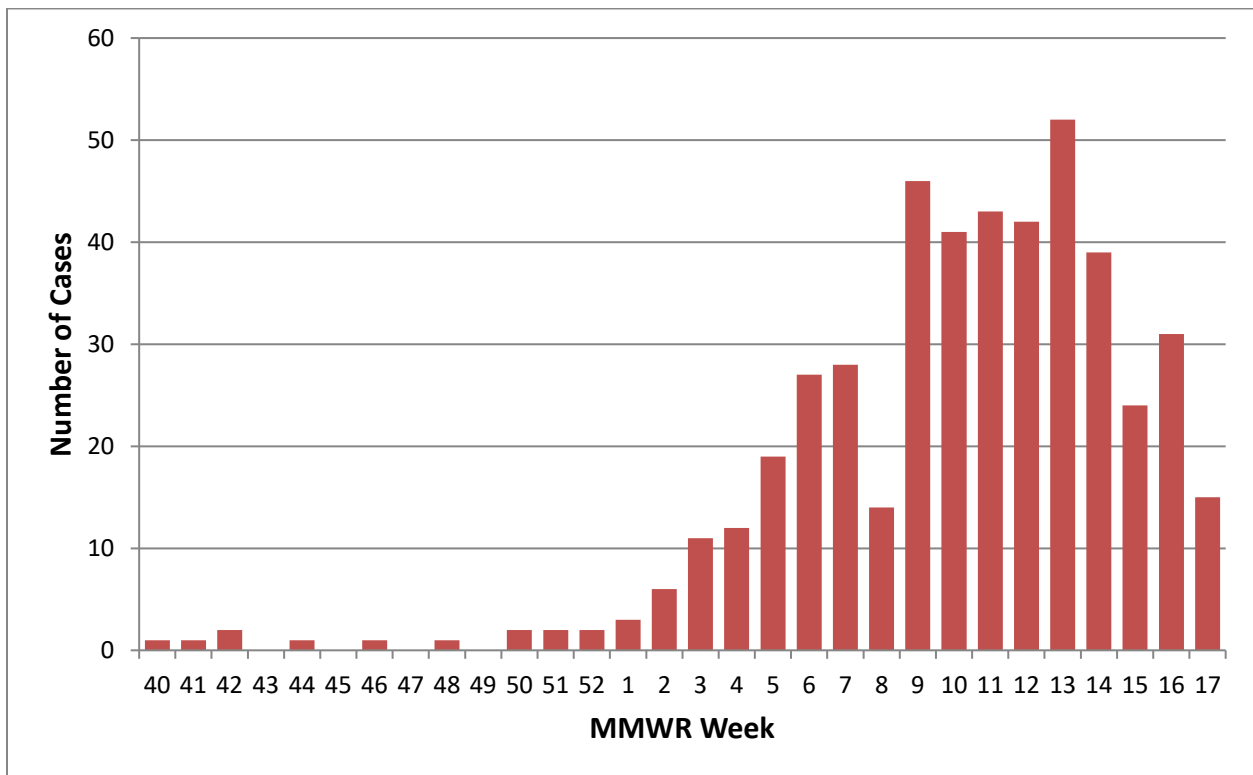


Table 2 shows procedures, conditions, antiviral use, and vaccination status. Nearly all hospitalized cases (94.2%) received a chest x-ray within 72 hours of admission. Approximately 10% required mechanical ventilation and 20% were admitted to an ICU. The percent of hospitalized patients in the ICU is greater than the 2014-15 season (12.4%). Most cases had at least one underlying medical condition (88.0%), with obesity among adults (43.3%), cardiovascular disease (40.1%), and chronic metabolic disease (38.6%) being the most frequently reported. Nearly 46% of hospitalized cases were reported as vaccinated for influenza prior to hospitalization.

Table 2. Procedures, conditions, antiviral use, and vaccination status for all Oregon EIP influenza-associated hospitalized cases, 2015–2016.

Procedures, conditions, and findings*	No.	Percent
Chest x-ray within 3 days of admission	439	94.2
Mechanical ventilation	47	10.1
ICU	93	20.0
Treated with Antivirals^{&}	386	82.8
Any Underlying Medical Condition**	410	88.0
Condition		
Obese***	183	42.2
Cardiovascular disease	187	40.1
Chronic metabolic disease	180	38.6
Chronic lung disease	141	30.3
Asthma	90	19.3
Renal disease	87	18.7
Neurologic disorder	79	17.0
Immunosuppressive condition	71	15.2
Hemoglobinopathy	33	7.1
Seizure disorder	29	6.2
Cancer	26	5.6
Cognitive dysfunction	14	3.0
Pregnant [†]	6	2.6 [‡]
History of Guillain-Barre Syndrome	0	0.0
Vaccinated[‡] prior to hospitalization		
Yes	214	45.9
No	202	43.4
Unknown	50	10.7

*Unknown values not shown

**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 \geq 30.

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

[†] Percent of females \geq 14 years.

[‡] Vaccination status as reported to the state. CDC determines vaccination status based on an algorithm.

Tables 3 and 4 show demographic characteristics, procedures, and antiviral use for adult cases (persons 18 years and older) by vaccination status. Forty-seven percent of hospitalized adults were reported as vaccinated prior to hospitalization. Women were somewhat more likely to be vaccinated than men (50.2% vs. 44.5%). The likelihood of vaccination among adults generally increased with age—57.7% of persons 65 years of age and older were vaccinated prior to hospitalization, compared to 38.1% among adults 18–64 years.

Table 3. Characteristics by vaccination status (vaccinated prior to admission) for adult influenza-associated hospitalized cases, Oregon EIP, 2015–2016.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Sex				
Male	88 (42.1)	93 (44.5)	28 (13.4)	209 (48.2)
Female	90 (40.0)	113 (50.2)	22 (9.8)	225 (51.8)
Age				
18–49 years	43 (46.7)	35 (38.0)	14 (15.2)	92 (21.2)
50–64 years	64 (47.8)	51 (38.1)	19 (14.2)	134 (30.9)
>64 years	71 (34.1)	120 (57.7)	17 (8.2)	208 (47.9)
Ethnicity				
Hispanic and Latino	13 (48.2)	11 (40.7)	3 (11.1)	27 (6.2)
Non-Hispanic	155 (40.2)	187 (48.5)	44 (11.4)	386 (88.9)
Not specified	10 (47.6)	8 (38.1)	3 (14.3)	21 (4.8)
Race				
White	141 (40.9)	166 (48.1)	38 (11.0)	345 (79.5)
Black	12 (46.2)	10 (38.5)	4 (15.4)	26 (6.0)
Asian or Pacific Islander	6 (27.3)	11 (50.0)	5 (22.7)	22 (5.1)
American Indian/Alaska Native	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.5)
Multiple races	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.5)
Unknown	17 (46.0)	17 (46.0)	3 (8.1)	37 (8.5)

Among adults, Asian or Pacific Islanders and whites reported similar influenza vaccination coverage (approximately 50%) but blacks were less likely to have received the influenza vaccine (38.5%). Small numbers for the remaining racial groups make it difficult to make any inferences about their likelihood of vaccination.

Table 4 shows the frequency and percent of procedures and antiviral use by vaccination status for adult cases. Most adults (90.3%) had at least one underlying condition. More than half (51.0%) 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 4. Procedures, findings and treatment by vaccination status for adult influenza-associated hospitalized cases, Oregon EIP, 2015–2016.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	170 (40.7)	200 (47.8)	48 (11.5)	418 (96.3)
No Chest X-ray within 3 days	7 (46.7)	6 (40.0)	2 (13.3)	15 (3.5)
Unknown	1 (100.0)	0 (0.0)	0 (0.0)	1 (0.2)
Mechanical ventilation				
Yes	16 (38.1)	18 (42.9)	8 (19.1)	42 (9.7)
No	162 (41.7)	185 (47.6)	42 (10.8)	389 (89.6)
Unknown	0 (0.0)	3 (100.0)	0 (0.0)	3 (0.7)
ICU				
Yes	33 (38.8)	38 (44.7)	14 (16.5)	85 (19.6)
No	145 (41.7)	167 (48.0)	36 (10.3)	348 (80.2)
Unknown	0 (0.0)	1 (100.0)	0 (0.0)	1 (0.2)
Treated with Antivirals^{&}				
Treated	149 (41.4)	174 (48.3)	37 (10.3)	360 (83.0)
Not treated	29 (39.2)	32 (43.2)	13 (17.6)	74 (17.1)
Any medical condition				
None or unknown	29 (70.7)	6 (14.3)	7 (16.7)	42 (9.7)
At least one	149 (38.0)	200 (51.0)	43 (10.9)	392 (90.3)
Type of medical condition				
Asthma	29 (34.1)	47 (55.3)	9 (10.6)	85 (19.6)
Cancer	5 (20.0)	14 (56.0)	6 (24.0)	25 (5.8)
Cardiovascular disease	66 (35.7)	97 (52.4)	22 (11.9)	185 (42.6)
Chronic lung disease	43 (30.7)	85 (60.7)	12 (8.6)	140 (32.3)
Chronic metabolic disease	70 (39.6)	93 (52.5)	14 (7.9)	177 (40.8)
Cognitive dysfunction	4 (28.6)	9 (64.3)	1 (7.1)	14 (3.2)
Hemoglobinopathy	13 (39.4)	17 (51.5)	3 (9.1)	33 (7.6)
History of Guillain-Barre Syndrome	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Immunosuppressive condition	18 (26.5)	41 (60.3)	9 (13.2)	68 (15.7)
Neurologic condition	26 (36.1)	38 (52.8)	8 (11.1)	72 (16.6)
Obese**	78 (42.6)	84 (45.9)	21 (11.5)	183 (42.2)
Pregnant [‡]	4 (66.7)	1 (16.7)	1 (16.7)	6 (2.7)
Renal disease	26 (30.2)	51 (59.3)	9 (10.5)	86 (19.8)
Seizure disorder	10 (40.0)	12 (48.0)	3 (12.0)	25 (5.8)

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

**Obesity calculated using height and weight or where indicated in medical record if height or weight was unknown. Obesity defined as BMI≥30.

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

‡Percent pregnant includes only adult females in denominator.

Tables 5 and 6 show demographic characteristics, procedures, and antiviral use for pediatric cases by vaccination status. Most hospitalized children—73.7% of males and 76.9% of females—were not vaccinated prior to being hospitalized for influenza. Over half of hospitalized children (18 of 32) had underlying medical conditions; only 6 (33.3%) of the children with underlying medical conditions were vaccinated. Again, small numbers of cases in the pediatric age group do not allow statistical comparisons to be made.

Table 5. Case characteristics by vaccination status (vaccinated prior to admission) for pediatric influenza-associated hospitalized cases, Oregon EIP, 2015–2016.

Sex	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Male	14 (73.7)	5 (26.3)	0 (0.0)	19 (59.4)
Female	10 (76.9)	3 (23.1)	0 (0.0)	13 (40.6)
Age				
<6 months	3 (100.0)	0 (0.0)	0 (0.0)	3 (9.4)
6–23 months	2 (33.3)	4 (66.7)	0 (0.0)	6 (18.8)
24–59 months	4 (80.0)	1 (20.0)	0 (0.0)	5 (15.6)
5–10 years	9 (90.0)	1 (10.0)	0 (0.0)	10 (31.3)
11–17 years	6 (75.0)	2 (25.0)	0 (0.0)	8 (25.0)
Ethnicity				
Hispanic and Latino	6 (85.7)	1 (14.3)	0 (0.0)	7 (21.9)
Non-Hispanic	17 (70.8)	7 (29.2)	0 (0.0)	24 (75.0)
Not specified	1 (100.0)	0 (0.0)	0 (0.0)	1 (3.1)
Race				
White	15 (79.0)	4 (21.1)	0 (0.0)	19 (59.4)
Black	0 (0.0)	1 (100.0)	0 (0.0)	1 (3.1)
Asian or Pacific Islander	5 (83.3)	1 (16.7)	0 (0.0)	6 (18.8)
American Indian/Alaska Native	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Multiple Races	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Unknown	4 (66.7)	2 (33.3)	0 (0.0)	6 (18.8)

Table 6. Procedures, underlying conditions, and antiviral use by vaccination status for pediatric influenza-associated hospitalized cases, Oregon EIP, 2015–2016.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	15 (71.4)	6 (28.6)	0 (0.0)	21 (65.6)
No Chest X-ray within 3 days	9 (81.8)	2 (18.2)	0 (0.0)	11 (34.4)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mechanical ventilation				
Yes	4 (80.0)	1 (20.0)	0 (0.0)	5 (15.6)
No	20 (74.1)	7 (25.9)	0 (0.0)	27 (84.4)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ICU				
Yes	6 (75.0)	2 (25.0)	0 (0.0)	8 (25.0)
No	18 (75.0)	6 (25.0)	0 (0.0)	24 (75.0)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Treated with Antivirals^{&}				
Treated	20 (76.9)	6 (23.1)	0 (0.0)	26 (81.3)
Not treated	4 (66.7)	2 (33.3)	0 (0.0)	6 (18.8)
Any medical condition				
None or unknown	12 (85.7)	2 (14.3)	0 (0.0)	14 (43.8)
At least one	12 (66.7)	6 (33.3)	0 (0.0)	18 (56.3)
Type of medical condition[*]				
Asthma	3 (60.0)	2 (40.0)	0 (0.0)	5 (15.6)
Chronic lung disease	1 (100.0)	0 (0.0)	0 (0.0)	1 (3.1)
Cardiovascular disease	0 (0.0)	2 (100.0)	0 (0.0)	2 (6.3)
Chronic metabolic disease	2 (66.7)	1 (33.3)	0 (0.0)	3 (9.4)
Renal disease	0 (0.0)	1 (100.0)	0 (0.0)	1 (3.1)
Cancer	0 (0.0)	1 (100.0)	0 (0.0)	1 (3.1)
Immunosuppressive condition	0 (0.0)	3 (100.0)	0 (0.0)	3 (9.4)
Neurologic condition	4 (57.1)	3 (42.9)	0 (0.0)	7 (21.9)
Seizure disorder	2 (50.0)	2 (50.0)	0 (0.0)	4 (12.5)
Hemoglobinopathy	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)

[&] 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 2015–2016 influenza season, the predominant viruses that circulated in Oregon were A/California/7/2009-like (H1N1)pdm09 and influenza B. The Oregon State Public Health Laboratory does not test for influenza B strain, but 100.0% of influenza B/Yamagata viruses tested at CDC were B/Phuket/3073/2013-like which was a component of the 2015–2016 influenza vaccine. 98.4% of influenza B/Victoria viruses tested at CDC were B/Brisbane/60/2008-like which was a component of the 2015-2016

quadrivalent vaccine. Fortunately, virtually all influenza viruses in circulation in Oregon were components of the 2015–2016 influenza vaccine for the Northern Hemisphere. CDC estimated that getting a flu vaccine during the 2015–2016 season reduced the risk of having to go to the doctor because of the flu by 47% for both children and adults.¹

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 51.9% of all hospitalizations. Influenza A (H1N1) predominated, and was detected in 86.2% of Flu A specimens subtyped compared to influenza A (H3), which was detected in 13.8% of the specimens that were subtyped. 47.9% of hospitalizations were associated with influenza B.

Table 7. Influenza virus types and subtypes among Oregon EIP influenza-associated hospitalized cases, 2015–2016.

Virus	No.	Percent
Influenza A	242	51.9
H3	24	5.2
2009 H1N1	150	32.2
Unknown subtype*	292	62.7
Influenza B	223	47.9
Both A and B	1	0.2
Type unknown [†]	0	0.0
Total	466	100

*type unknown: influenza type not reported in medical records.

[†]Specimen not subtyped.

The age distribution of hospitalized cases in 2015–2016 (Figure 2) shows that in 2015–2016 the highest rate of hospitalization occurred among persons 65 years and older. During 2009–2010 (pandemic year) and 2008–2009 the highest rates of hospitalization occurred among children 0–4 years of age. Other than these two years, influenza has had the greatest rate of hospitalization in the elderly. However, Adults aged 18–64 years had a decreased rate of hospitalization in 2015–2016 compared with the 2014–2015 season.

Deaths: There were 20 deaths among adults hospitalized in 2015–2016, which was 4.3% of all hospitalizations. This percentage of deaths among hospitalized patients is greater than that seen in the 2014–2015 season (2.8%). One of the deaths was a

¹ CDC. Flannery B, Chung J. Influenza vaccine effectiveness, including LAIV vs IIV in children and adolescents, U.S. Flu VE Network 2015–16, June 22, 2016. Available at: <https://www.cdc.gov/vaccines/acip/meetings/downloads/min-archive/min-2016-06.pdf>. Accessed 06/25/2018

pediatric patient hospitalized in the Oregon EIP catchment area. 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, 2009–2010 to 2015–2016.

