

2014–2015 Influenza Hospitalization Report



Oregon Emerging Infections Program
Acute and Communicable Disease Prevention
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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 1,645,459 in 2010—which is 43% of the population of Oregon.

This report summarizes incidence and severity of influenza in Oregon’s EIP surveillance area during the 2014–2015 influenza season (October 1, 2014 to April 30, 2015).

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 nurses, who collected standardized data regarding demographic characteristics, clinical manifestations, underlying conditions, and illness outcomes.

Surveillance Results

Between October 1, 2014 and April 30, 2015, 810 influenza-related hospitalizations were reported in the EIP area—764 adults and 46 pediatric cases. This represents a crude rate of 49.2 cases per 100,000 residents of the EIP area, a rate higher than even the 2009–2010 pandemic season rate (30.3 per 100,000).

Table 1 shows the sex, age, ethnicity, and race of Oregon EIP cases in 2014–2015. The median age of hospitalized cases was 73.0 years—older than the median age during the 2013–2014 influenza season (median=56.0 years). Persons aged more than 70 years were the leading age category in influenza hospitalizations (55.1%). Fifty-four percent of cases were female. Nearly 63% percent of cases were reported as white, while blacks—4.6% of hospitalized cases—were the next most frequently reported race (where race was known). Most cases, 68.8%, were reported as non-Hispanic.

Table 1. Characteristics of all Oregon EIP influenza-associated hospitalized cases, 2014–2015.

Sex	No.	Percent
Male	372	45.9
Female	438	54.1
Age		
<6 months	6	0.7
6–23 months	8	1.0
24–59 months	10	1.2
5–10 years	15	1.9
11–17 years	7	0.9
18–30 years	31	3.8
31–50 years	73	9.0
51–70 years	214	26.4
>70 years	446	55.1
Ethnicity		
Hispanic and Latino	37	4.6
Non-Hispanic	557	68.8
Not specified	216	26.7
Race		
White	509	62.8
Black	37	4.6
Asian/Hawaiian or Pacific Islander	33	4.1
American Indian/Alaska Native	6	0.7
Multiple Races	3	0.4
Unknown	222	27.4

Figure 1 shows the distribution of cases during the influenza season. The peak of influenza-associated hospitalizations occurred during MMWR week 1 of 2015 (the week ending 1/10/2015). During the peak week, 149 influenza hospitalizations were reported. The first cases were reported week 40 (the week ending 10/4/2014), and the last cases reported week 17 (the week ending 5/2/2015).

Figure 1. Number of Oregon EIP influenza-associated hospitalized cases by week, 2014-2015.

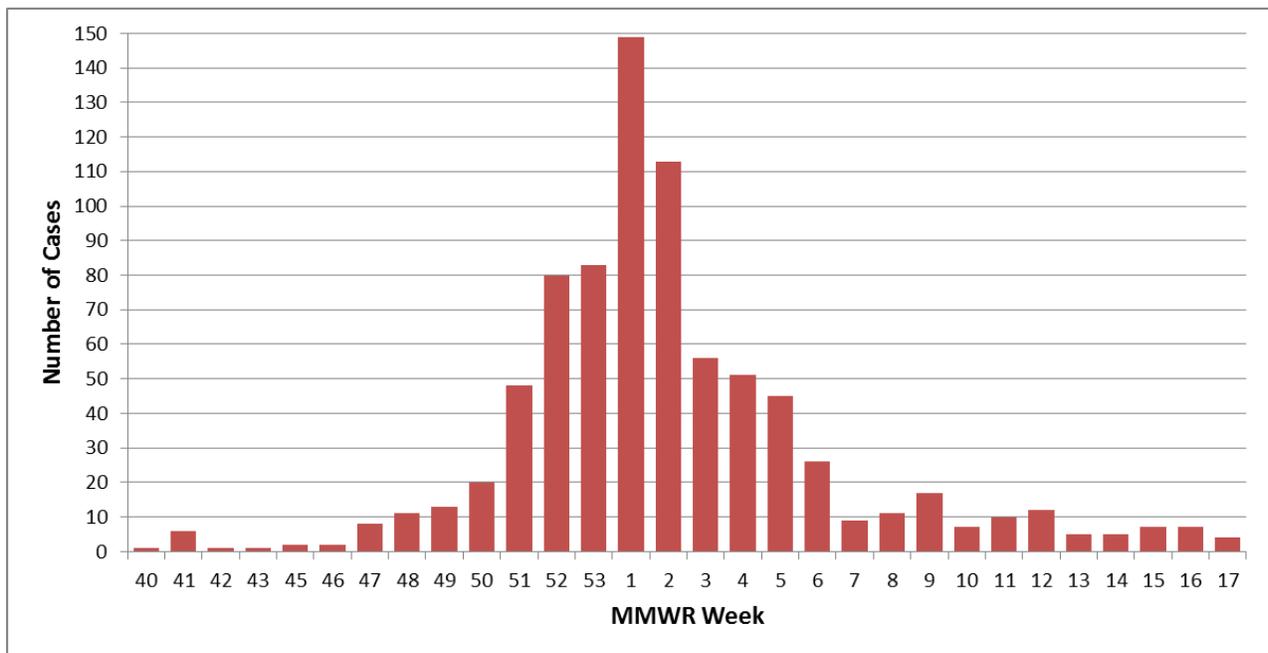


Table 2 shows procedures, conditions, antiviral use, and vaccination status. Nearly all hospitalized cases (94.9%) underwent a chest x-ray within 24 hours of admission. Approximately 5% required mechanical ventilation and 12.4% were admitted to an ICU. Most cases had at least one underlying medical condition (90.0%), with cardiovascular disease (44.7%), chronic metabolic disease (44.0%), and obesity (32.8%) being the most frequently reported. Nearly 55% 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, 2014–2015.

Procedures, conditions, and findings*	No.	Percent
Chest x-ray within 3 days of admission	769	94.9
Mechanical ventilation	41	5.1
ICU	100	12.4
Treated with Antivirals^{&}	693	85.6
Any Underlying Medical Condition**	729	90.0
Condition		
Cardiovascular disease	362	44.7
Chronic metabolic disease	356	44.0
Obese***	266	32.8
Chronic lung disease	216	26.7
Renal disease	212	26.2
Neurologic disorder	188	23.2
Asthma	149	18.4
Immunosuppressive condition	135	16.7
Cancer	49	6.1
Seizure disorder	33	4.1
Cognitive dysfunction	26	3.2
Pregnant [†]	11	2.6 [‡]
Hemoglobinopathy	19	2.4
History of Guillain-Barre Syndrome	2	<1.0
Vaccinated[‡] prior to hospitalization		
Yes	444	54.8
No	307	37.9
Unknown	59	7.3

*Unknown values not shown

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

***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 of females ≥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. Fifty-six percent of hospitalized adults were reported as vaccinated prior to hospitalization. Women were somewhat more likely to be vaccinated than men (59.3% vs. 52.6%). The likelihood of vaccination generally increased with age—61.2% of persons 70 years of age and older were vaccinated prior to hospitalization, compared to the lowest—22.6% among adults 18–30 years.

Table 3. Characteristics by vaccination status (vaccinated prior to admission) for adult influenza-associated hospitalized cases, Oregon EIP, 2014–2015.

Sex	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Male	134 (39.0)	181 (52.6)	29 (8.4)	344 (45.0)
Female	144 (34.3)	249 (59.3)	27 (6.4)	420 (55.0)
Age				
18–30 years	20 (64.5)	7 (22.6)	4 (12.9)	31 (4.1)
31–50 years	37 (50.7)	30 (41.1)	6 (8.2)	73 (9.6)
51–70 years	84 (39.3)	120 (56.1)	10 (4.7)	214 (28.1)
>70 years	137 (30.7)	273 (61.2)	36 (8.1)	446 (58.4)
Ethnicity				
Hispanic and Latino	14 (43.8)	17 (53.1)	1 (3.1)	32 (4.2)
Non-Hispanic	196 (36.9)	293 (55.2)	42 (7.9)	531 (69.5)
Not specified	68 (33.8)	120 (59.7)	13 (6.5)	201 (26.3)
Race				
White	175 (36.0)	272 (56.0)	39 (8.0)	486 (63.6)
Black	10 (29.4)	23 (67.7)	1 (2.9)	34 (4.5)
Asian or Pacific Islander	11 (34.4)	19 (59.4)	2 (6.3)	32 (4.2)
American Indian/Alaska Native	4 (66.7)	2 (33.3)	0 (0.0)	6 (0.8)
Multiple races	1 (50.0)	0 (0.0)	1 (50.0)	2 (0.3)
Unknown	77 (37.8)	114 (55.9)	13 (6.4)	204 (26.7)

Among adults, blacks were more likely to be vaccinated (67.7%) than Asian or Pacific Islanders (59.4%), whites (56.0%), and American Indians and Alaska Natives (33.3%).

Table 4 shows the frequency and percent of procedures and antiviral use by vaccination status for adult cases. Most adults (92.4%) had at least one underlying condition. More than half (57.8%) 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, 2014–2015.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	264 (36.0)	413 (56.3)	56 (7.6)	733 (96.0)
No Chest X-ray within 3 days	13 (43.3)	17 (56.7)	0 (0.0)	30 (3.9)
Unknown	1 (100.0)	0 (0.0)	0 (0.0)	1 (0.1)
Mechanical ventilation				
Yes	14 (40.0)	19 (54.3)	2 (5.7)	35 (4.6)
No	258 (36.0)	405 (56.5)	54 (7.5)	717 (93.9)
Unknown	6 (50.0)	6 (50.0)	0 (0.0)	12 (1.6)
ICU				
Yes	35 (40.2)	46 (52.9)	6 (6.9)	87 (11.4)
No	240 (35.8)	380 (56.7)	50 (7.5)	670 (87.7)
Unknown	3 (42.9)	4 (57.1)	0 (0.0)	7 (0.9)
Treated with Antivirals^{&}				
Treated	223 (34.0)	387 (59.0)	46 (7.0)	656 (85.9)
Not treated	50 (49.0)	42 (41.2)	10 (9.8)	102 (13.4)
Any medical condition				
None or unknown	30 (51.7)	22 (37.9)	6 (10.3)	58 (7.6)
At least one	248 (35.1)	408 (57.8)	50 (7.1)	706 (92.4)
Type of medical condition				
Asthma	51 (36.7)	79 (56.8)	9 (6.5)	139 (18.2)
Cancer	14 (29.2)	31 (64.6)	3 (6.3)	48 (6.3)
Cardiovascular disease	111 (30.7)	219 (60.5)	32 (8.8)	362 (47.4)
Chronic lung disease	66 (31.0)	135 (63.4)	12 (5.6)	213 (27.9)
Chronic metabolic disease	116 (32.6)	219 (61.5)	21 (5.9)	356 (46.6)
Cognitive dysfunction	9 (34.6)	14 (53.9)	3 (11.5)	26 (3.4)
Hemoglobinopathy	7 (39.9)	8 (44.4)	3 (16.7)	18 (2.4)
History of Guillain-Barre Syndrome	1 (50.0)	1 (50.0)	0 (0.0)	2 (0.3)
Immunosuppressive condition	39 (30.0)	85 (65.4)	6 (4.6)	130 (17.0)
Neurologic condition	67 (37.0)	98 (54.1)	16 (8.8)	181 (23.7)
Obese ^{**}	104 (39.1)	153 (57.5)	9 (3.4)	266 (34.8)
Pregnant [‡]	4 (36.4)	7 (63.6)	0 (0.0)	11 (2.6)
Renal disease	71 (33.7)	124 (58.8)	16 (7.6)	211 (27.6)
Seizure disorder	12 (44.4)	13 (48.2)	2 (7.4)	27 (3.5)

*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 \geq 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—71.4% of males and 50.0% of females—were not vaccinated prior to being hospitalized for influenza. Half of hospitalized children (23 of 46) had underlying medical conditions; only 9 (39.1%) of those children were vaccinated.

Table 5. Case characteristics by vaccination status (vaccinated prior to admission) for pediatric influenza-associated hospitalized cases, Oregon EIP, 2014–2015.

Sex	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Male	20 (71.4)	6 (21.4)	2 (7.1)	28 (60.9)
Female	9 (50.0)	8 (44.4)	1 (5.6)	18 (39.1)
Age				
<6 months	4 (66.7)	0 (0.0)	2 (33.3)	6 (13.0)
6–23 months	4 (50.0)	4 (50.0)	0 (0.0)	8 (17.4)
24–59 months	7 (70.0)	2 (20.0)	1 (10.0)	10 (21.7)
5–10 years	11 (73.3)	4 (26.7)	0 (0.0)	15 (32.6)
11–17 years	3 (42.9)	4 (57.1)	0 (0.0)	7 (15.2)
Ethnicity				
Hispanic and Latino	3 (60.0)	2 (40.0)	0 (0.0)	5 (10.9)
Non-Hispanic	15 (57.7)	9 (34.6)	2 (7.7)	26 (56.5)
Not specified	11 (73.3)	3 (20.0)	1 (6.7)	15 (32.6)
Race				
White	14 (60.9)	7 (30.4)	2 (8.7)	23 (50.0)
Black	1 (33.3)	2 (66.7)	0 (0.0)	3 (6.5)
Asian or Pacific Islander	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.2)
American Indian/Alaska Native	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Multiple Races	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.2)
Unknown	13 (72.2)	4 (22.2)	1 (5.6)	18 (39.1)

Table 6. Procedures, underlying conditions, and antiviral use by vaccination status for pediatric influenza-associated hospitalized cases, Oregon EIP, 2014–2015.

	Vaccine Status			Total
	Unvaccinated No. (%)	Vaccinated No. (%)	Unknown No. (%)	
Chest X-ray				
Chest X-ray within 3 days	23 (63.9)	11 (30.6)	2 (5.6)	36 (78.3)
No Chest X-ray within 3 days	6 (60.0)	3 (30.0)	1 (10.0)	10 (21.7)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mechanical ventilation				
Yes	5 (83.3.0)	1 (16.7)	0 (0.0)	6 (13.0)
No	24 (60.0)	13 (32.5)	3 (7.5)	40 (87.0)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ICU				
Yes	10 (76.9)	3 (23.1)	0 (0.0)	13 (28.3)
No	19 (57.6)	11 (33.3)	3 (9.1)	33 (71.7)
Unknown	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Treated with Antivirals^{&}				
Treated	22 (59.5)	12 (32.4)	3 (8.1)	37 (80.4)
Not treated	7 (77.8)	2 (22.2)	0 (0.0)	9 (19.6)
Any medical condition				
None or unknown	15 (65.2)	5 (21.7)	3 (13.0)	23 (50.0)
At least one	14 (60.9)	9 (39.1)	0 (0.0)	23 (50.0)
Type of medical condition[*]				
Asthma	5 (50.0)	5 (50.0)	0 (0.0)	10 (21.7)
Chronic lung disease	2 (66.7)	1 (33.3)	0 (0.0)	3 (6.5)
Cardiovascular disease	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Chronic metabolic disease	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Renal disease	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.2)
Cancer	0 (0.0)	1 (100.0)	0 (0.0)	1 (2.2)
Immunosuppressive condition	1 (20.0)	4 (80.0)	0 (0.0)	5 (10.9)
Neurologic condition	4 (57.1)	3 (42.9)	0 (0.0)	7 (15.2)
Seizure disorder	3 (50.0)	3 (50.0)	0 (0.0)	6 (13.0)
Hemoglobinopathy	1 (100.0)	0 (0.0)	0 (0.0)	1 (2.2)

[&] 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 2014–2015 influenza season, the predominant viruses that circulated in Oregon were A/Switzerland/9715293/2013-like (H3N2) and influenza B. The Oregon State Public Health Laboratory does not test for influenza B strain, but 98.1% of influenza B/Yamagata viruses tested at CDC were B/Massachusetts/2/2012-like, which was a component of the 2014–2015 influenza vaccine. Unfortunately, the predominant influenza A virus in circulation was not a component of the 2014–2015 influenza vaccine

for the Northern Hemisphere. CDC estimated that getting a flu vaccine during the 2014–2015 season reduced the risk of having to go to the doctor because of the flu by 19% 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 91.0% of all hospitalizations, and Influenza A (H3) was detected in all of the specimens that were subtyped. Influenza A (H1N1) was not detected in any hospitalized cases. Just 8.9% of hospitalizations were associated with influenza B.

Table 7. Influenza virus types and subtypes among Oregon EIP influenza-associated hospitalized cases, 2014–2015.

Virus	No.	Percent
Influenza A	737	91.0
H3	367	49.8
2009 H1N1	0	0.0
Unknown subtype*	370	50.2
Influenza B	72	8.9
Both A and B	1	0.1
Type unknown ⁺	0	0.0
Total	810	100

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

*Specimen not subtyped.

The age distribution of hospitalized cases in 2014–2015 (Figure 2) shows that adults aged 65 years and older saw a substantially increased rate of hospitalization compared with any age group in any previous season—294.4 cases per 100,000. Similar to the previous four seasons (2013–2014, 2012–2013, 2011–2012, 2010–2011), in 2014–2015 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. Adults aged 18–64 years had a decreased rate of hospitalization in 2014–2015 compared with the 2013–2014 season.

Deaths: There were 23 deaths among adults hospitalized in 2014–2015, which was 2.8% of all hospitalizations, and no deaths among hospitalized pediatric patients reported in the Oregon EIP catchment area. This percent of deaths among hospitalized patients is the same as the 2013–2014 season. Data on deaths includes only those who died while hospitalized.

¹ Appiah GD, Blanton L, D’Mello T, Kniss K, Smith S, Mustaquim D, et al. Influenza activity – United States, 2014–15 season and composition of the 2015–16 influenza vaccine. *MMWR Morb Mortal Wkly Rep* (2015) 64(21): 583–90.

Figure 2. Oregon EIP influenza-associated hospitalized cases by age group, comparison by influenza season, 2008–2009 to 2014–2015.

