

Influenza and Pneumonia

A Continuing Health Threat



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Influenza and pneumonia are substantial public health threats, yet both are vaccine preventable diseases. The entire population is vulnerable to these illnesses although some groups are at greater risk for complications. Healthy People 2010 (HP 2010) set goals of increasing the proportion of adults vaccinated annually for influenza and ever vaccinated against pneumococcal disease.¹ The goal for each disease is to have 90% of both institutionalized adults and adults 65 years of age or older vaccinated. The goal for each disease is for 60% of non-institutionalized adults with high-risk medical conditions to be vaccinated. This article will discuss each illness briefly, vaccination recommendations, the impact of influenza and pneumonia, and strategies to improve vaccination rates. Among Spokane County residents in 2006, there were approximately 1,500 hospitalizations and nearly 100 deaths from influenza/pneumonia. Vaccination against these illnesses increased with age, but Spokane County falls well below the HP 2010 goals. Additional health statistics for Spokane County, Washington are presented to ascertain the impact of influenza and pneumonia locally.

ILLNESS BACKGROUND

Influenza is caused by a viruses that are regularly altered by either minor (drift) or major (shift) genetic mutations. A mutated virus becomes the predominant virus when the previously circulating virus no longer causes widespread illness due to specific antibody development in the population. Transmission of influenza primarily occurs by direct or indirect contact with droplet secretions from the respiratory tract of an infected person. The incubation period is usually about two days, but may range from one to four days. Influenza activity typically peaks from December to March. The severity of the illness is dependent on the individual's immunological experience with related virus variants and the general health status of the individual. Symptoms, usually lasting two to three days, include an abrupt onset of fever, myalgia, sore throat, headache, and a non-productive cough.²

Pneumococcal pneumonia is caused by the bacteria *Streptococcus pneumoniae*, which commonly is found in the respiratory tract of asymptomatic individuals. Transmission of *S. pneumoniae* occurs through direct person-to-person contact with respiratory droplets and by autoinoculation of individuals carrying the bacteria in their respiratory tract. Infections are most common in the winter and early spring. The incubation period is from one to three days. Typical symptoms include an abrupt onset of fever, chills or rigors, pleuritic chest pain, productive cough, shortness of breath, rapid breathing, hypoxia, tachycardia, malaise, and weakness.²

IMPACT

There is no easy way to estimate the number of individuals who contract influenza or pneumonia. Neither illness is a reportable disease and sick individuals may not seek professional medical treatment. However,

the impact of these diseases can be measured by examining hospitalization and mortality rates of individuals with a primary diagnosis of either influenza or pneumonia. This method allows for comparison between geographic areas and over time, but only provides information on the more severe cases in the community.

The risks for complications and hospitalizations from influenza are higher among young children, adults 65 years of age or older, and individuals with certain underlying medical conditions. The most frequent complication of influenza is pneumonia.²

Nationally, every year there are more than 200,000 hospitalizations related to influenza and 175,000 hospitalizations for pneumonia. Hospitalization rates for influenza among children 0-4 years of age range from 100 per 100,000 healthy children to 500 per 100,000 children with high-risk medical conditions. Hospitalization rates for children younger than 2 years of age are similar to adults age 65 years or older.²

The case-fatality rate for influenza (nationally) is 0.5-1.0 per 1,000 cases with most deaths occurring among individuals 65 years of age or older.³ The case-fatality rate of pneumonia is 5-7% and may be higher among the elderly. More than 90% of deaths attributed to pneumonia or influenza are among individuals 65 years of age or older. In the decade of 1990-1999, there were approximately 36,000 influenza-associated pulmonary and circulatory deaths per influenza season. This nearly doubles the approximately 19,000 deaths per season occurring between 1976 and 1990. The increase in influenza-associated deaths may reflect either the aging population or that influenza A, which has a higher mortality rate, was the predominant influenza strain from 1990-1999.²

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VACCINATIONS

Vaccinations are available for both influenza and pneumonia. Due to ever changing influenza viruses, vaccination against influenza is needed every year. Two types of vaccine are available for influenza in the United States, trivalent inactivated vaccine (TIV, the standard flu shot) and live attenuated influenza vaccine (LAIV). The flu shot has been available since the 1940's and is administered intramuscularly. LAIV became available in 2003 and is administered intranasally. There is some evidence that the efficacy of LAIV may be greater than that of the flu shot, but more studies are still needed to confirm this.⁴

Influenza vaccination is recommended for the following groups:⁵

- Adults age 50 years or older
- Children age 6 months – 18 years of age
- Residents of long-term care facilities
- Anyone with chronic disease of the kidneys, heart or lungs, including children with asthma
- Pregnant women
- Individuals age 2 – 49 years of age with an underlying medical condition such as diabetes, severe forms of anemia or immunosuppression
- All health care personnel
- Caregivers and household contacts of children younger than 5 years and adults 50 years of age or older, with emphasis on caregivers and contacts for children younger than 6 months
- Caregivers and household contacts of anyone who has a chronic medical condition that puts them at higher risk for severe complications
- Individuals who want to reduce their risk of becoming ill with seasonal influenza or transmitting influenza to other people

Two types of vaccines are available for pneumonia, one for young children and children not completely vaccinated and one for children and adults.⁶

Pneumococcal conjugate vaccine (PCV7 or Prevnar) is recommended for:

- All children under 2 years of age, in a series of 4 doses
- Children not previously vaccinated with PCV7 who are 24-59 months of age and at high risk for serious pneumococcal disease. In this circumstance, PPV23 is also recommended (see below). These vaccines may be given at the same time in different sites.

Pneumococcal polysaccharide vaccine (PPV23) is recommended for:

- Individuals 2 years of age or older with underlying medical conditions or immunosuppression*
- Individuals 65 years of age or older
- Adults 19-64 years of age with asthma⁷
- Adults 19-64 years of age who smoke cigarettes⁷

Vaccination for PPV23 is not recommended for individuals 64 years of age or younger unless the individual is immunocompromised or has underlying medical conditions that put them at risk for pneumonia. For individuals who received the PPV23 prior to 65 years of age, a second dose after the age of 65 is recommended. If a second dose is administered, the individual must wait at least five years between vaccinations.

WHAT IS HAPPENING LOCALLY?

Since the influenza vaccine is needed yearly and influenza may lead to pneumonia, an estimated count is provided of the population who meets the recommendation for receiving the influenza vaccine. Nationally, 86% of the population is recommended to receive an influenza vaccination. Similarly, most people in Spokane County, Washington are included in the recommended groups to receive influenza vaccine. More than one-third of residents meet either the older or younger age recommendations. More than one in ten individuals has a medical condition that places them in a high-risk category. Approximately another one-third of residents either work in the health care industry or are caregivers or household contacts of individuals in a high-risk category.⁸

Table 1

Estimated Count of Spokane County Residents Recommended for Influenza Vaccination, 2008

	Estimated count	Percent of population
Children 6-59 months	26,544	5.7
Adults 50+ years	145,050	31.6
Children 5-17 years with medical risks	9,042	2.0
Adults 18-49 years with chronic health problems	48,646	10.6
Pregnant women*	3,492	0.8
SUBTOTAL	232,774	50.7
Health care workers	25,166	5.5
Adults 18-49 living with someone at risk	115,332	21.0
SUBTOTAL	140,498	30.6
TOTAL	373,272	81.3

* 7/12 of all births in 2006. **May overestimate. These individuals could not be identified exclusively of other risk factors. For more information on the estimation, please see endnote number 8.

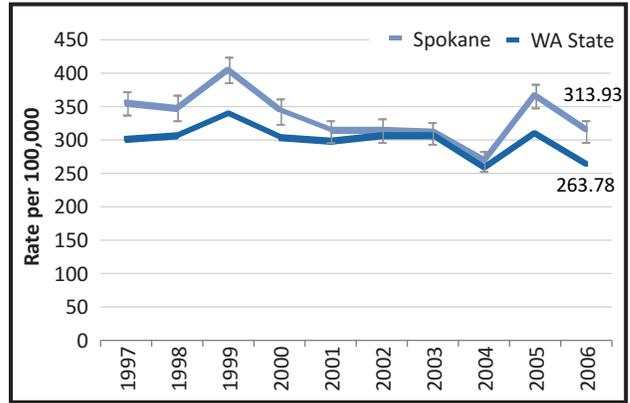
*High-risk conditions include sickle cell disease, asplenia, HIV infection or other immunocompromising conditions, or chronic illness.

In 2006, influenza/pneumonia was the 11th leading cause of hospitalization in Spokane County and 12th statewide. Historically, Spokane County had a higher hospitalization rate for influenza/pneumonia compared to Washington State. The gap between Spokane County's and Washington State's age-adjusted hospitalization rate narrowed between 2001 and 2004, but has since increased. The 2006 rate was significantly higher in Spokane County compared to Washington State (Fig. 1).

From 2002 to 2006, an average of 1,400 Spokane County residents were hospitalized annually with influenza/pneumonia. For every age group, Spokane County had significantly higher hospitalization rates than Washington State. In Spokane County, the peak of the influenza season typically is in March, when the hospitalization rate is the highest (Fig. 2).

Figure 1

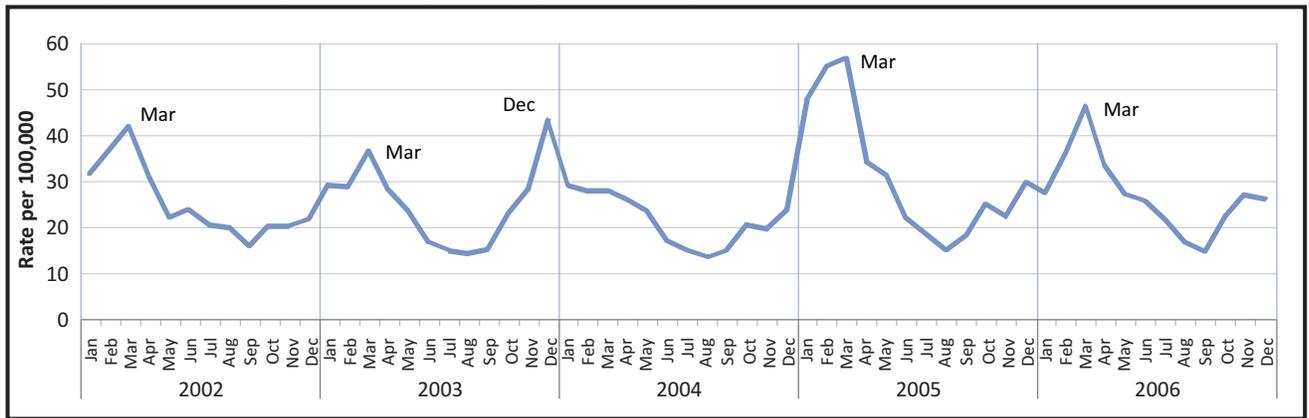
Influenza/Pneumonia Hospitalizations Over Time



Source: Washington State Department of Health, Comprehensive Hospital Abstract Reporting System (CHARS).

Figure 2

Influenza/Pneumonia Hospitalizations by Month, Spokane County Over Time



Source: Washington State Department of Health, Comprehensive Hospital Abstract Reporting System (CHARS).

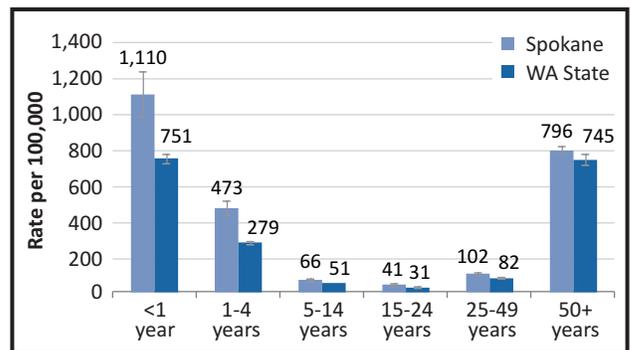
Individuals at greatest risk for being hospitalized with influenza/pneumonia were infants younger than 12 months and adults 50 years of age or older. Although infants had the greatest risk for hospitalization, they accounted for 4.3% of all cases. Comparatively, adults 50 years of age or older accounted for 72.4% of all cases. An average of 60 infants and more than 1,000 adults 50 years of age or older were hospitalized with influenza/pneumonia each year in Spokane County.

Among Spokane County residents in 2006, the average number of days an individual was hospitalized for influenza/pneumonia was 5.2 days, ranging from 1-51 days. The average cost for a influenza/pneumonia hospitalization was \$16,000, ranging from \$1,100-\$309,000. Hospitalization charges totaled \$23,700,000.

Deaths from influenza/pneumonia in 2006 were the 8th leading cause of death in Spokane County and 9th statewide. Overall, there was a decreasing trend from 1997 to 2006 in the age-adjusted rates of influenza/pneumonia deaths among Spokane County residents and statewide. There were two years in Spokane County where the death rate increased, 2002 and 2005. The increase in 2002 was not seen statewide

Figure 3

Influenza/Pneumonia Hospitalizations by Age Group 2002-2006

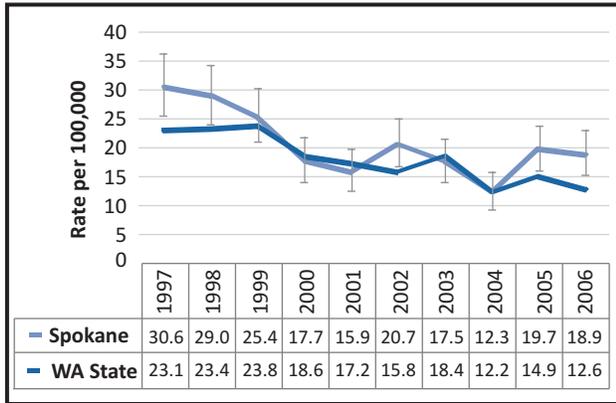


Source: Washington State Department of Health, Comprehensive Hospital Abstract Reporting System (CHARS).

and the increase in 2005 was seen to a lesser extent statewide. In 2006, there were 84 influenza/pneumonia deaths among Spokane County residents; the majority (92%) occurred among individuals 50 years of age or older. The 2006 influenza/pneumonia death rate was significantly higher in Spokane County than in Washington State (OR=1.5, p<0.001) (Fig. 4).

Figure 4

Influenza/Pneumonia Deaths Over Time



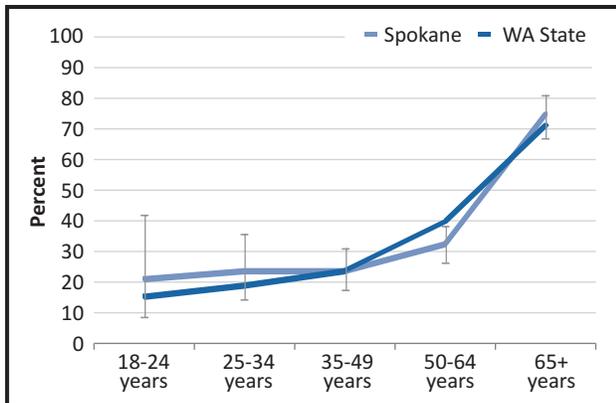
Source: Washington State Department of Health, Death Certificates

Vaccines are available to boost immunity against the organisms causing pneumonia and influenza. Immunization information was unavailable for children younger than 18 years.

In 2006, 33.5% of adults in Spokane County reported having a flu shot in the last year. Individuals 50 years of age or older had the highest proportion receiving a flu shot, 49.6% compared with 22.6% of adults younger than 50 years. Adults 50 years of age or older in Spokane County were nearly 2 times more likely to have received a flu shot in the last year than younger adults (OR=1.8, p<0.001). There were similar results statewide.⁹

Figure 5

Received a Flu Shot in the Last Year by Age Group, 2006



Source: Washington State Department of Health, Death Certificates

Receipt of an influenza vaccination was related to both poverty level and insurance status among Spokane County adults. Adults living at or below 185% of the Federal Poverty Level* (FPL) were almost two times less likely to have a flu shot compared to individuals above 185% FPL. Uninsured adults were nearly four times less likely to receive a flu shot than those with insurance. Only 23.5% of the population at or below 185% FPL and 13.1% of uninsured adults reported receiving a flu shot in the previous 12 months.⁹

Among Spokane County adults in 2006, 26.9% reported ever having an immunization for pneumonia. The proportion increased substantially at 65 years of age or older, the recommended age to receive the immunization. Adults age 65 years and older were 15 times more likely than younger adults ever to have received a pneumonia vaccine (p<0.001).⁹

There was no significant difference in receipt of pneumonia vaccination by either poverty level or insurance status. There were 22.3% of Spokane County adults living at or below 185% FPL who reported ever receiving a pneumonia shot and 18.0% of uninsured had the vaccination.⁹

Table 2

Adult Influenza and Pneumonia Immunization Status, Spokane County, 2006

	Received an influenza vaccination in the previous 12 months	Ever received a pneumonia vaccination
TOTAL	33.5	26.9
AGE GROUP		
18-24	20.6	11.5
25-34	23.2	7.0
35-49	23.4	17.0
50-64	32.0	24.4
65+	74.5	74.8
FEDERAL POVERTY LEVEL		
≤185%	23.5	22.3
>185%	36.3	28.1
INSURANCE		
Uninsured	13.1	18.0
Insured	37.2	28.6

Source: Washington State Department of Health, Behavioral Risk Factor Surveillance System (BRFSS)

*185% FPL in 2006 was \$18,130 for a single person or \$37,000 for a family of four.

SUMMARY

Influenza and pneumonia are vaccine preventable diseases that have a significant health impact in Spokane County. The Centers for Disease Control and Prevention provide guidelines for who is considered high-risk for complications from these diseases and therefore should be considered a priority for vaccination. Half of the Spokane County population is estimated to personally be at high-risk.

Pneumonia/influenza is the 11th leading cause of hospitalizations in Spokane County. Infants and adults 65 years of age or older have the highest rates of hospitalization for influenza/pneumonia and account for three-fourths of all the influenza/pneumonia hospitalizations. The average length of stay for an influenza/pneumonia hospitalization was 5 days with an average cost of \$16,000. The total cost of influenza/pneumonia hospitalizations in 2006 for Spokane County residents was \$23,700,000.

The 8th leading cause of death in Spokane County was from influenza/pneumonia. The vast majority of these deaths were among individuals 50 years of age or older (92%).

Although several distinct groups have been identified at increased risk of complications from influenza and pneumonia, older adults represent the greatest proportion of hospitalizations and deaths from these diseases. Among individuals age 65 years and older, receiving the influenza and pneumococcal vaccines together is effective in reducing hospital admissions for those diseases.¹⁰

A third of adults in Spokane County reported having an influenza vaccination in the previous year. Adults 50 years of age or older, a group considered at high-risk, were significantly more likely to have received the vaccination. Still, half of that group did not receive the vaccination, an estimated 67,700 individuals. Additionally, receipt of the vaccination was less likely among adults living at or below 185% FPL and uninsured adults.

Less than a third of Spokane County adults reported ever having a vaccination for pneumonia. The proportion having the vaccination increased with age. Similar to influenza vaccinations, the high-risk group of adults 65 years of age or older were significantly more likely to have received the vaccination. However, a quarter of this group had not received the vaccination. There was no significant difference in vaccination status by poverty level or insurance status.

Immunization status of individuals at risk for complications from influenza or pneumonia due to medical conditions could not be evaluated with available data sources. Adults at greatest risk due to age are the most likely to receive an influenza or pneumonia vaccination. However, the proportion of individuals age 65 years and older reporting current vaccination is well below the 90% recommended by HP2010.

EMERGING ISSUES

Methicillin Resistant Staphylococcus aureus (MRSA)

Although an infrequent cause of community acquired pneumonia, Staphylococcus aureus is a cause of influenza associated community acquired pneumonia. S. aureus and the influenza virus have a synergistic relationship where each increases the disease severity of the other. In the 2006-2007 flu season among cases of community acquired pneumonia caused by S. aureus: the average age was 16 years, 79% were infected with MRSA, 47% reported having an influenza illness, and 51% died an average of 4 days after onset of symptoms. Pediatric influenza related deaths with a S. aureus coinfection increased 5 fold in a 3 year period from the 2004-2005 flu season to the 2006-2007 flu season. Among the pediatric deaths, the average age was 5 years, 64% were infected with MRSA, and 45% died within 72 hours after onset of symptoms.^{11, 12, 13}

Reports indicate that the prevalence of community acquired (CA-MRSA) is increasing,^{14, 15} given the increase in MRSA and its association with influenza, MRSA may become a more common cause of influenza associated community acquired pneumonia. Drug susceptibility testing of cases of influenza related community acquired MRSA pneumonia revealed that all cases were resistant to oxacillin and erythromycin, half were resistant to levofloxacin, and 9% were resistant to clindamycin.¹¹

Influenza vaccination is a prevention strategy to reduce pneumonia associated with influenza. Since influenza vaccination reduces the overall risk of pneumonia, it is assumed the vaccination would also help prevent secondary bacterial pneumonia, including MRSA.

STRATEGIES TO INCREASE VACCINATIONS

Elderly patients are significantly more likely to receive an influenza vaccination if they report planning to receive a flu shot the next year or believe those who do not receive the vaccination will acquire influenza¹⁶. Discussing an influenza shot with a healthcare provider and having a positive attitude toward an influenza shot are also associated with receiving an influenza vaccination¹⁷. Several physician practice methods have been shown to improve patient immunization rates for influenza and pneumonia. Those methods include practices having express influenza immunization services or flu shot clinics, use of patient outreach letters, standing orders, provider reminders for pneumococcal vaccine, and educational outreach visits to health care teams.^{16, 18, 19} Pneumococcal vaccination rates can be significantly increased by providing the vaccine at flu clinics and using a local campaign to promote its availability through this avenue²⁰. A recommendation from a health care provider is the easiest method shown to promote adults receiving influenza and pneumonia immunizations²¹.

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