Epi-Log & VacScene

The Communicable Disease Prevention Quarterly

Epi-Log: West African Ebola Outbreak

On August 8th, The World Health Organization declared the Ebola outbreak in West Africa a public health emergency of international concern, characterizing it as the "largest, most severe, and most complex in the nearly four-decade history of the disease."

In response to the potential for Ebola infected persons to travel to the United States, the Centers for Disease Control and Prevention (CDC) has issued a plethora of guidance and resources for U.S. healthcare providers in order to facilitate prompt recognition and appropriate evaluation and management of persons with potential and suspected Ebola virus disease (EVD) in the United States. Although the risk of an EVD patient presenting in King County is low, healthcare providers and facilities must be vigilant for such an event and prepared to respond expertly.

Public Health has communicated key guidance to King County healthcare facilities and providers through our INFO-X health alert and advisory system. If you are a King County provider and do not currently receive these alerts, contact maybelle.tamura@kingcounty.gov to subscribe. ***Additional resources on page 2.***

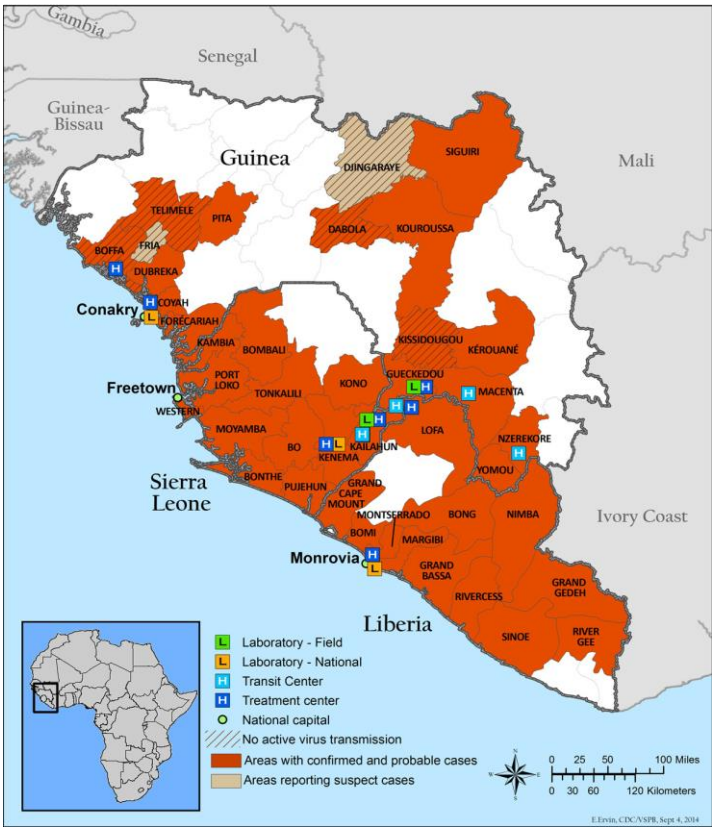


Figure. West African areas reporting confirmed, probable, or suspect EVD cases, as of Sept 4, 2014.

Public Health
Seattle & King County

Q3/14

Welcome to the second issue of the combined Epi-Log & VacScene quarterly newsletter.

IMPORTANT: If you are receiving the print version, unless you confirm your subscription at kingcounty.gov/communicable, you will no longer receive the Quarterly in the mail.

In This Issue:

West African Ebola Outbreak Resources:

The **CDC website** provides guidance and up-to-date information on the outbreak, including:

- Guidelines for Evaluation of U.S. Patients Suspected of Having EVD
- Guidance for Specimen Collection, Transport, Testing, and Submission for Patients Suspected of Having EVD
- Guidance for Monitoring and Movement of Persons with EVD Exposure
- EVD Information for Clinicians in U.S. Healthcare Settings
- Infection Prevention and Control Recommendations for Hospitalized Patients with Known or Suspected EVD in U.S. Hospitals
- Frequently Asked Questions: Safe Management of Patients with EVD in U.S. Hospitals
- Tools for Protecting Healthcare Personnel

The **World Health Organization** (WHO) also provides Ebola outbreak information.

The New England Journal of Medicine provides more on the emergence of Zaire Ebola virus disease in Guinea.

Epi-Log: Chikungunya Outbreak in the Americas

by Nicola Marsden-Haug, MPH
Washington State Department of Health

Chikungunya is an arboviral (arthropod-borne viral) disease transmitted by mosquitoes. The name chikungunya originates from Tanzania, where it was first recognized in the 1950s. It means "that which bends," reflecting the very painful arthralgias it causes. For decades, most chikungunya outbreaks were small and limited to countries in Africa and Asia. Infected travelers returning to Europe led to outbreaks in Italy and France, but it wasn't until late 2013 that chikungunya began circulating in the western hemisphere. The first cases of locally acquired chikungunya were acquired in Saint Martin in October 2013. In the following months, the outbreak intensified throughout many of the Caribbean islands. Hundreds of travel-associated cases have been reported from the United States, and the first locally acquired U.S. cases were reported in July 2014 from Florida. Many states in the United States, including Washington, are seeing travel-associated cases, and national surveillance is ongoing to detect potential local transmission.

Aedes aegypti and *Aedes albopictus*, the vector mosquitoes for both chikungunya and dengue, are aggressive daytime biting mosquitoes. Unlike with West Nile virus, people are not "dead end hosts" in which the infection cycle stops at humans. Chikungunya is transmitted in a human-to-mosquito-to-human cycle. Because infected persons have high levels of virus in their blood, mosquitoes that bite such persons can become infected and transmit the virus to others. Generally, patients with dengue and chikungunya infections in areas where the vectors are present should be sequestered from mosquitoes while viremic to avoid local transmission. However, because we do not have the vector mosquito species in Washington, local transmission of the disease is not likely, and sequestration of chikungunya cases is not currently recommended here.

Clinical presentation & laboratory findings

Chikungunya is typically a febrile illness with marked polyarthralgia or polyarthritis. The incubation period is usually 3–7 days (range 1–12). The illness often involves more than one joint and is usually bilateral and symmetric. Hands and feet are commonly affected. Other symptoms may include maculopapular rash, headache, myalgia, back pain, conjunctivitis, swollen joints, and nausea or vomiting. Atypical manifestations include: uveitis, retinitis, hepatitis, nephritis, myocarditis, hemorrhage, myelitis, cranial nerve palsies, Guillain-Barré syndrome, meningoencephalitis, or bullous skin lesions. Clinical laboratory findings often show lymphopenia, thrombocytopenia, elevated creatinine, and elevated hepatic transaminases.

Acute symptoms usually resolve within 7–10 days, though some patients may have persistent joint pains for months to years. Some patients may have relapse of rheumatologic symptoms (e.g., polyarthralgia, polyarthritis, tenosynovitis, Raynaud's syndrome) in the months following acute illness. Persons at risk for severe or atypical disease include neonates exposed intrapartum, adults >65 years, and persons with underlying medical conditions (e.g., hypertension, diabetes, or cardiovascular disease).

Diagnostic considerations

When evaluating a patient for possible chikungunya infection, it is important to consider and test for both

dengue and chikungunya. The diseases have similar clinical features, are transmitted by the same mosquitoes, circulate in the many of the same areas, and can cause co-infections. Table 1 compares the clinical features of the two diseases. It is important to rule out dengue because proper clinical management can improve outcomes for chikungunya. Management for chikungunya is supportive. Fevers should be treated with acetaminophen until dengue can be ruled out because aspirin and other NSAIDs can increase the risk of hemorrhage in patients with dengue. Dengue clinical management guidelines are available from the World Health Organization.

Routine laboratory testing for chikungunya is either by RT-PCR to detect viral RNA or ELISA/IFA for IgM or IgG antibodies. Specimens for PCR should ideally be collected within five days of symptom onset. IgM is generally first detectable from about four to eight days after symptom onset and can persist for months; IgG is generally detectable by eight days. However, serum collected within eight days of onset may not have detectable antibody levels, and testing should be repeated on a convalescent specimen obtained 10–14 days after an initial negative acute specimen.

Report all cases of chikungunya (and other arboviral diseases) to Public Health by calling (206) 296.4774. If you suspect that a patient with chikungunya has been exposed in the United States please notify Public Health immediately so that suspected local transmission can be investigated promptly. Additional confirmatory testing through the public health system may be requested for such cases.

Table 1. Clinical features of chikungunya versus dengue infections (Source: CDC)

Clinical Feature	Chikungunya	Dengue
Fever (>39°C)	+++	++
Arthralgia	+++	+/-
Arthritis	+	-
Headache	++	++
Rash	++	+
Myalgia	+	++
Hemorrhage	+/-	++
Shock	-	+
Lymphopenia	+++	++
Neutropenia	+	+++
Thrombocytopenia	+	+++
Hemoconcentration	-	++

Epi-Log: Coccidioidomycosis in Washington

Coccidioidomycosis (San Joaquin Valley fever or valley fever) is the endemic mycosis caused by the fungal pathogens *Coccidioides immitis* and *C. posadasii*. The number of reported coccidioidal infections has increased dramatically in endemic areas of the United States over the past decade. Although 17,802 cases were reported in the United States in 2012, the actual number of cases may be ten times that number.

These fungi occur in the soil in areas characterized by low rainfall, high summer temperatures and moderate winters including desert regions in the southern Arizona, the central valley and southern California, the southern tip of Nevada, southern Utah, southern New Mexico, western Texas, and northern and Pacific Coastal Mexico. Until recently, *Coccidioides* have not been known to be present in the Pacific Northwest.

Coccidioides proliferate as mycelia in soil during rainy seasons. In dry conditions, arthroconidia (spores) form that can readily become airborne. When airborne spores are inhaled by humans or other species of

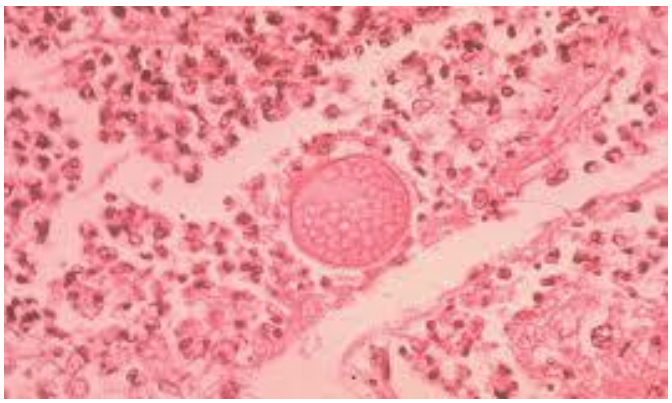


Figure. Histopathology of coccidioidomycosis of lung. Mature spherule with endospores of *Coccidioides immitis*, intense infiltrate of neutrophils. CDC/Dr. Lucille K. Georg

mammals, infection develops in the lungs. The consequences of infection range from an asymptomatic or inconsequential illness with resulting lifelong resistance to reinfection to severe and potentially life-threatening pneumonia or tissue destruction throughout the body.

Between June 2010 and May 2011, physicians diagnosed three unrelated cases of acute coccidioidomycosis in residents of Walla Walla, Benton, and Franklin counties in eastern Washington. Investigation indicated these infections were likely

acquired locally.[1] Testing at the Centers for Disease Control and Prevention (CDC) detected *C. immitis* in soil from Benton County, and DNA from the soil isolates matches DNA from a clinical isolate from one of the cases. **This is the first time that *Coccidioides* have been detected in soil in Washington.** The distribution and extent of this organism in the environment remains to be determined. Human illness surveillance is therefore important to both identify other locally-acquired infections and target environmental sampling.

Clinical considerations

Most infected persons have mild symptoms and do not seek medical attention. The most common clinical presentation of coccidioidomycosis is a self-limited acute or subacute community-acquired pneumonia that becomes evident 1-4 weeks after infection. In most cases these illnesses are indistinguishable from other causes of community-acquired pneumonia without specific laboratory tests, such as coccidioidal serological testing. Even in endemic areas, the infection is not often recognized early because of failure to order appropriate diagnostic tests and is underdiagnosed. Recovery can take weeks to months in otherwise healthy people.

Patients may present with fever, cough, shortness of breath, chest pain, headache and fatigue (fatigue often prominent). Other symptoms may include night sweats, weight loss, hemoptysis, myalgias, or arthralgias. Occasionally, a transient nonpruritic maculopapular rash, erythema nodosum or erythema multiforme may be present. Chest x-ray (CXR) findings can vary and may initially show infiltrates, hilar adenopathy, or pleural effusions; later CXRs may show one or more cavity or nodule. *Coccidioides* infection does not spread from person to person, and patients do not require isolation from others.

Disseminated disease occurs uncommonly (<1%), and can present as meningitis, osteomyelitis, extra-thoracic lymphadenopathy, or skin lesions. African Americans, Filipinos, Hispanics, persons 60 years and older, pregnant women, and persons with diabetes, HIV, or other immunocompromising conditions are at increased risk of developing severe or disseminated infection.

Routine lab studies are non-specific. Peripheral blood white blood cell counts are normal or mildly elevated, eosinophilia may be present. Erythrocyte sedimentation rate and C-reactive protein may be elevated. **Serologic testing for anti-coccidioidal antibodies is the most common diagnostic test, but requires care in interpretation. Several serologic test methods with differing sensitivity and specificity are available.**

Detection of antibodies may lag behind the onset of illness by several weeks or even months, particularly in immunocompromised hosts. For this reason, a negative serologic test does not rule out *Coccidioides* infection, particularly early in the illness. Fungal cultures of sputum or other specimens are typically obtained in more severe cases and require precautions to protect laboratory personnel.

Fluconazole or other triazoles are often used for treatment; mild cases often resolve without specific therapy.

Bottom line

- Health-care providers should be aware that *C. immitis* is present in south central Washington (as well as in other areas in the southwestern United States, California and Mexico), and should consider the diagnosis in patients with clinically compatible illness who reside or have traveled in this area.
- Increase clinical suspicion for patients with: fever, pulmonary symptoms, fatigue for two weeks or longer, skin rash, and arthralgias or unexplained eosinophilia.
- Serologic testing options include enzyme-linked immunoassay (EIA), complement fixation (CF), and immunodiffusion (ID). Sputum or other appropriate clinical specimens can be submitted for culture – always notify the lab that you suspect coccidiodomycosis to prevent potential exposures to laboratory workers.
- Report all coccidioidomycosis cases to Public Health at (206) 296.4774 (reportable as a rare disease of public health significance). For patients

Further Coccidioidomycosis Information:

- Coccidioidomycosis (Galgiani et al. Clinical Infectious Diseases, 2005)
- Coccidioidomycosis treatment guidelines from the Infectious Disease Society of America (IDSA)
- Coccidioidomycosis Info, and Further Info (CDC)
- Coccidioidomycosis Health Advisory (PHSKC)

[1] *Clin Infect Dis. 2013 Mar;56(6):847-50*

suspected to have acquired the infection in Washington, Public Health will facilitate confirmatory testing at the CDC.

- Veterinarians should also be aware of the possibility of *Coccidioides* outside its recognized range.

Epi-Log: Vector-Borne Diseases

Mosquitoes, ticks, fleas, midges, and other vectors transmit a number of bacterial and viral diseases that pose a risk to the health of humans and animals worldwide. In the United States, the most common vector-borne diseases are West Nile virus, Lyme disease and Rocky Mountain spotted fever. Dengue, chikungunya, and malaria cases in U.S. residents have typically occurred among travelers to endemic areas outside of the United States. However, with changing climate and land use as well as expanding global travel, the risk increases for new and emerging vector-borne diseases to cross our borders. For example, during 2006–2013, an average of 28 cases of chikungunya were reported in the United States annually. So far in 2014, over 600 cases have been reported nationwide, and the first cases of local transmission (within the United States) of chikungunya were documented this year.

Since 1999, when West Nile virus was first documented in the United States, surveillance for mosquito-borne diseases has increased. In 2001, routine surveillance for mosquito-borne diseases was initiated in Washington, and sentinel species including chickens and horses were employed to improve vector-borne disease detection efforts. The first human cases of West Nile virus acquired in Washington were identified in 2006; no cases of West Nile virus acquired in King County have been reported to date.

In addition to West Nile virus, cases and sporadic outbreaks of western equine encephalitis (WEE) and St. Louis encephalitis (SLE) acquired in Washington have been reported over the years. The most recent case of WEE acquired in Washington was reported in 1988. According to Washington Department of Health's Zoonotic Disease Program, in 2005, SLE was detected in sentinel chickens in Benton County.

For more information on vector-borne diseases, visit the CDC website.

Visit WA Department of Health for more information on mosquito distribution in Washington and mosquito-borne diseases.

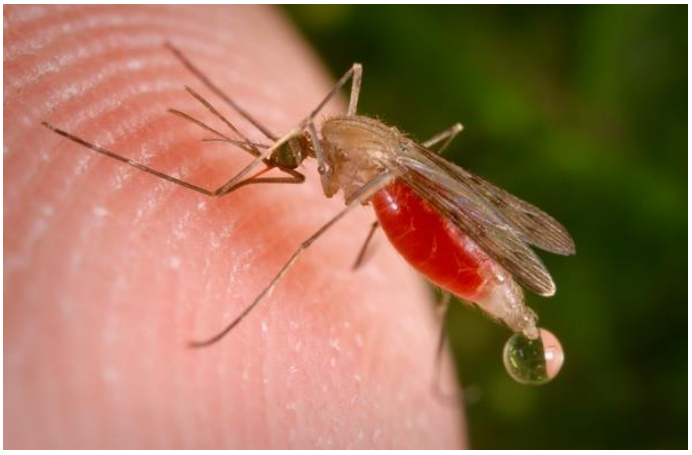
Are You A Mosquito Geek?

Test Your Knowledge of Mosquito-Borne Diseases!

I. Match the disease number with the primary vector(s) that transmit it. Hint: *some diseases might have more than one mosquito vector.*

II. Circle the mosquito vectors found in King County.

West Nile Virus	*Culex tritaeniorhynchus*
Malaria	*Aedes aegypti*
Chikungunya	*Haemogogus leucocelanus*
Japanese encephalitis	*Anopheles freeborni*
Yellow Fever	*Culex tarsalis*
Dengue	*Culex pipians*
St. Louis encephalitis	*Aedes albopictus*



Anopheles freeborni. Image James Gathany/CDC.

Answer Key:

West Nile Virus (Culex pipians, Culex tarsalis); Malaria (Anopheles freeborni); Chikungunya (Aedes aegypti, Aedes albopictus); Japanese Encephalitis (Culex tritaeniorhynchus); Yellow Fever (Aedes aegypti, Haemogogus leucocelaenus); Dengue Fever (Aedes aegypti, Aedes albopictus), St. Louis encephalitis (Culex pipians, Culex tarsalis).

**Mosquito vectors present in King County are underlined.*

Epi-Log: An Outbreak of *E. coli* O26 in a King County Child Care Facility

A case of Shiga toxin-producing *E. coli* (STEC) enteritis in a young child with no obvious high-risk exposures and mild diarrheal illness was reported by a King County laboratory. The public health nurse investigating the case discovered that the child had attended a child care facility while potentially infectious. Subsequently, the child's mother revealed that an older sister who also attended the child care was ill with similar symptoms. The mother thought her children had possibly contracted it from another child at the facility who had reportedly been ill previously.

Child care centers are of particular concern for transmission of enteric illnesses for a number of reasons, including ease of spread among diapered children, the difficulty of enforcing good hand hygiene, young children's predilection for putting things in their mouths, the presence of equipment such as sandboxes, water tables and plush toys which can harbor and incubate pathogenic organisms [1,2], and the low infectious dose for STEC. STEC outbreaks have been documented in numerous child care facilities across the United States. Among those closest to home was the March 2010 outbreak of *E. coli* O157 in Clark County, WA, which resulted in four hospitalizations and one death.

Public Health immediately followed up with the child care facility to identify any other symptomatic attendees or staff and to provide guidance on necessary infection control measures to prevent further transmission. In Washington, STEC cases are restricted from attending child care until two consecutive stool specimens collected at least 24 hours apart are negative for Shiga toxin (WAC 246-110 and Washington State Department of Health recommendations).***

Public Health staff visited the child care facility, a mid-sized child care with roughly 100 children and 25 staff to obtain information about other attendees and staff reporting gastrointestinal illnesses in the prior two weeks, identify any potential factors related to STEC transmission, and provide recommendations for controlling the spread of STEC. Five children and one staff member identified at the time of the site visit as having been ill in the previous week were immediately excluded from attending child care until testing negative for STEC. Public Health also worked with the child care to set up daily vomiting and diarrhea screening of children and staff upon arrival to the center. In addition to active surveillance for new cases, several other recommendations were made to the child care to limit

Measures To Prevent Transmission of Infectious Diarrhea Including Shiga Toxin-Producing *E. coli* in Child Care Settings

- Actively monitor children and staff during an outbreak for onsets of diarrheal illness.
- Children with diarrhea should not attend child care programs.
- Exclude any child or staff member until symptoms have resolved and s/he has been cleared by Public Health to return to child care.
- Do not admit any new child who has been excluded from another child care for illness.
- Enforce strict hand washing, particularly after toileting and diapering, and before eating.
- Enhance regular cleaning.
- Ensure immediate and appropriate clean-up of vomit or diarrhea.
- Suspend activities that are potentially high risk for fecal-oral transmission, such as family-style dining, food preparation, and sand and water sensory table activities.
- Food handlers, child care workers and health care workers with direct patient care should not perform these activities until they are no longer ill and have been instructed that it is safe to return to these activities by their local Public Health department.
- **NOTE:** Washington State law requires health departments to restrict the activities of persons with STEC in certain settings.

[1] Pickering LK, Bartlett AV, Woodward WE. Acute infectious diarrhea among children in day care: epidemiology and control. Rev Infect Dis. 1986 Jul-Aug; 8(4):539-47.

[2] Ekanem EE, DuPont HL, Pickering LK et al. Transmission dynamics of enteric bacteria in day-care centers. Am J Epidemiol. 1983 Nov; 118(4): 562-72.

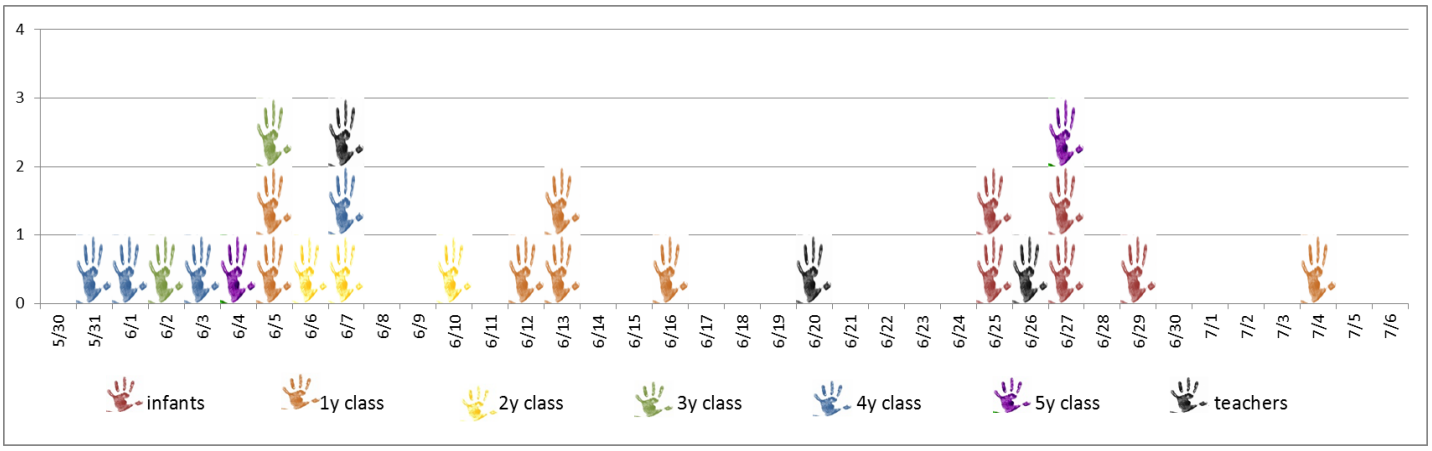


Figure. Epidemic curve of *E. coli* cases by onset date and classroom.

the risk to other children and staff, including suspension of family-style meals, better monitoring of hand washing after diapering, toileting, and before eating, and enhanced cleaning of facilities and toys. An informational letter was prepared in collaboration with the child care and was distributed to parents and staff.

Public Health and the child care staff monitored the outbreak until two incubation periods (16 days) passed without new reports of illness. During that time, 27 potentially infected persons (24 children and 3 teachers) from 24 households were identified and investigated. Cases occurred in six of the seven classrooms at the facility (Figure). Of the 26 symptomatic persons reported, only one (4%) had had bloody diarrhea, and none were hospitalized. Twelve (46%) of 26 cases tested positive for Shiga toxin, including one sibling of an ill child who had never been symptomatic; upon further laboratory testing, all twelve were identified as *E. coli* O26, a non-O157 *E. coli* serotype, and were indistinguishable by pulsed-field gel electrophoresis (PFGE).

Non-O157 STEC account for an increasing proportion of STEC infections in the United States. Most non-O157 STEC outbreaks are caused by STEC O111 or O26. Although non-O157 STEC can cause severe disease with hemolytic uremic syndrome and colitis comparable to that of O157 disease, the clinical spectrum of non-O157 STEC is variable, and many infections are mild and uncomplicated. Severity has been associated with a number of STEC virulence factors including presence of Shiga toxin 2 (versus Shiga toxin 1 only) containing strains and presence of other virulence determinants, but there are no accepted criteria for predicting virulence prospectively. In this outbreak, the absence of severe disease and the lack of Shiga toxin 2 were reassuring and allowed us to minimize use of stringent and potentially counterproductive disease control measures in the latter stages of the outbreak.

***Routine bacterial culture for *E. coli* does not detect non-O157 STECs. CDC recommends that all patients with acute community-acquired diarrhea (regardless of patient age, season of the year, or presence or absence of blood in the stool) be simultaneously cultured for O157 STEC and tested with an assay (such as enzyme immunoassay [EIA]) for presence of Shiga toxins to detect non-O157 STEC. Shiga toxin assays are tests for pathogenic *E. coli* and do not indicate infection with *Shigella*.**

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Readers of our print edition:

Direct URL links to all citations & references are available at: **kingcounty.gov/communicable.**

VacScene: 2014-15 Seasonal Flu Vaccination Guidance and Resources

In the August 15, 2014 MMWR, the Advisory Committee on Immunization Practices (ACIP) published its 2014-15 seasonal influenza vaccination recommendations. As in previous years, routine annual flu vaccination is recommended for all persons ≥ 6 months of age without contraindications.

Timing of vaccination

Flu vaccination should ideally be offered just prior to the start of flu season and as long as flu activity persists, usually from October through May. Antibody levels induced by vaccine decline post-vaccination. Although a 2008 literature review found no clear evidence of more rapid decline among the elderly, a 2010 study noted a statistically significant decline in titers 6 months post-vaccination among persons aged ≥ 65 years (although titers still met levels considered adequate for protection). A case-control study conducted in Navarre, Spain, during the 2011–12 season revealed a decline in vaccine effectiveness primarily affecting persons aged ≥65 years.

Although delaying vaccination might permit greater immunity later in the season, deferral might result in missed opportunities to vaccinate and difficulties in vaccinating a population within a limited time. **Vaccination programs should balance maximizing likelihood of persistence of vaccine-induced protection through the season with avoiding missed opportunities to vaccinate or vaccinating after influenza virus circulation begins.**

Although flu virus strains for 2014-15 vaccine formulations remain unchanged from 2013-14, ACIP recommends annual vaccination due to waning antibody levels. 2014-15 trivalent formulations include an A/California/7/2009 (H1N1)-like virus, an A/Texas/50/2012 (H3N2)-like virus, and a B/Massachusetts/2/2012-like (Yamagata lineage) virus. Quadrivalent formulations include the trivalent strains plus a B/Brisbane/60/2008-like (Victoria lineage) virus.

ACIP does not express a preference for quadrivalent flu vaccine over trivalent vaccine. The Washington State Vaccine Advisory Committee (VAC) published Clinical Guidance on Use of Flu Vaccines when Multiple Flu Products are Available. The VAC advises that if both quadrivalent and trivalent vaccines are available, a provider should consider using quadrivalent vaccine for anyone for whom the vaccine is indicated, but that vaccination should not be delayed if only trivalent formulation is available. VAC's guidance is not intended to supersede ACIP recommendations.

For More Information:

- Seasonal Influenza Vaccination Resources for Health Professionals (CDC)
- Influenza Information for Public Health and Healthcare (WA DOH)
- Seasonal Influenza Information & Resources (PHSKC)
- Inactivated Influenza Vaccine Information Statement (CDC)
- Live, Intranasal Influenza Vaccine Information Statement (CDC)

As during previous seasons, **some children aged 6 months through 8 years are recommended to receive two doses of seasonal flu vaccine**. The algorithm for determining the number of doses children in that age group need is in Figure 1 of the recommendations. Because the vaccine virus strains in 2013-14 and 2014-15 formulations are unchanged, this season's recommendation is that **all children with documentation of at least one dose of flu vaccine in 2013-14 should receive only one dose in 2014-15**.

Both live, attenuated influenza vaccine (LAIV) and inactivated influenza vaccine (IIV) are effective in preventing influenza in children. Several well-designed studies have demonstrated superior efficacy of LAIV over IIV against laboratory-confirmed, medically attended influenza in young children. Risks for harms assessed (including fever, wheezing, and serious adverse events) appear to be similar for LAIV and IIV. **Beginning in 2014-15, ACIP recommends use of LAIV over IIV for flu vaccination of eligible healthy children aged 2 through 8 years without contraindications or precautions when LAIV is immediately available**. If LAIV is not immediately available, vaccination should not be delayed and IIV should be given. The relative effectiveness of LAIV and IIV will continue to be monitored by CDC.

LAIV should not be given to children aged 2 through 4 years with asthma or a wheezing episode documented during the past 12 months, or if a parent reports that a health care provider indicated the child had asthma or wheezing during the past 12 months. In children 5 years and older, asthma is now considered a

precaution for use of LAIV. While one study showed no significant difference in wheezing among children aged 6 through 17 years with asthma when given LAIV vs. IIV, there are insufficient data to establish the level of asthma severity when LAIV administration becomes inadvisable.

There are limited safety and efficacy data for LAIV vs. IIV in children and adults with other chronic medical conditions placing them at higher risk of flu complications, including chronic pulmonary, cardiovascular (except isolated hypertension), renal, hepatic, neurologic, hematologic or metabolic disorders (including diabetes mellitus). Use of LAIV is considered a precaution in persons with those conditions.

Persons reporting allergy to eggs may be able to receive flu vaccine. Providers should consult ACIP's algorithm regarding flu vaccination of persons who report allergy to eggs in Figure 2 of the recommendations.

Fluzone High-Dose vaccine**,** approved for use in persons ≥ 65 years, contains more antigen than standard dose flu vaccine. The high dose vaccine produces higher antibody levels in older adults, and an August 14, 2014 report in The New England Journal of Medicine demonstrated that high dose vaccine had 24% greater efficacy than standard dose vaccine against any laboratory-confirmed influenza infection among non-institutionalized adults. The safety profile of the two formulations is similar; some adverse events, such as pain, redness and swelling at the injection site, headache, muscle aches, fever and malaise, were reported more frequently among recipients of the high dose vaccine. **ACIP expresses no preference for use of high dose or standard dose flu vaccine in adults ≥ 65 years. The Washington State VAC states use of high dose flu vaccine is reasonable in adults ≥ 65 years for whom it is not contraindicated**.

VacScene: HPV Vaccine Coverage Among King County Adolescents

The human papillomavirus (HPV) vaccine is recommended for adolescent females and males to provide protection against certain cancers and genital warts. The vaccine is administered in a three-dose series and was first recommended for females in 2006 and males in 2011. The recommended age to initiate the HPV series is 11 or 12 years, and catch-up doses are recommended for any adolescent age 13 and older that has not completed the series. However, uptake of the HPV vaccine and series completion among adolescents remains low. We assessed HPV vaccination coverage among King County (KC) adolescents born from 1994 through 2001 using data from the Washington State Immunization Information System (WAIIS). Unless otherwise noted, vaccination coverage was assessed at the end of 2013.

HPV Vaccination Coverage: U.S., Washington, and King County

The 2013 National Immunization Survey of Teens in the United States (NIS-Teen) found that HPV vaccination coverage among 13–17 year old females nationally was 57% for ≥1 dose and 38% for ≥3 doses, and 70% of females with one dose completed the series (Table 1). Coverage among 13–17 year old males remains low nationally. Among Washington adolescents, coverage among females was higher than the national averages, and for males coverage was slightly lower for all measures except series completion (the proportion of teens who complete the series among all who received at least the first dose). Data from the WAIIS indicates that coverage rates among King county adolescents for one or more doses were higher for both males and females than state and national estimates; however, compared to Washington, King County adolescents had lower rates for 3-dose coverage and series completion. Rates of series completion were also lower among King County adolescents compared to the national averages.

HPV Vaccination Coverage: King County

Overall, approximately 64% of females and 38% of males born during 1994–2001 received at least one dose of HPV vaccine by the end of 2013. Among those with at least one dose, 61% of females and 33% of males completed the HPV vaccine series by the end of 2013.

The percentage of males with at least one dose increased over the birth year cohort (likely related to the more recent recommendation for routine vaccination of males), with the oldest males having the lowest coverage; however, among females, the highest coverage was observed among the older adolescents. Completion rates among females and males were highest among older adolescents and decreased by birth year cohort, likely because younger adolescents have had fewer opportunities to complete the series.

The HPV vaccination series is recommended at age 11 or 12, and we assessed vaccination status of adolescents in the birth cohort on their 13th birthday.

Table 1. HPV Vaccination coverage among adolescents aged 13-17

	Females			Males		
	≥1 Dose	3 Doses	Completed**	≥1 Dose	3 Doses	Completed**
National*	57.3 (±1.9)	37.6 (±1.9)	70.4 (±2.5)	34.6 (±1.9)	13.9 (±1.4)	48.3 (±4.0)
Washington*	60.7 (±9.7)	45.3 (±9.8)	79.5 (±10.4)	29.8 (±8.0)	12.5 (±5.2)	49.6 (±16.8)
King County†	65.8	39.9	60.7	40.7	13.9	34.1

*Data from NIS-Teen 2013
† Data from WAIIS on vaccination status of adolescents aged 13-17 years as of 12/31/2013
**Percent of males and females who received 3 doses among those who had at least one HPV vaccine dose

Receipt of at least one dose of HPV vaccine by age 13 increased among females with each birth year cohort, from 32% among those born in 1995 to 54% among those born in 2000. Among males born in 2000, 32% received at least one dose of HPV vaccine by age 13. Completion of the series by age 13 remains low for all adolescents; 22% of females and 9% of males born in 2000 had received three doses by the recommended age.

HPV Vaccination Coverage: Provider Type

We assessed differences in HPV vaccination coverage among patients of King County healthcare providers that participate in the Vaccines For Children program according to provider specialty, including family practice and pediatric specialties, community clinics that are federally qualified health centers (FQHCs), and school-based health centers in middle and high schools (Table 2).

There were significant differences between the provider groups in the average coverage rates for both males and females. School-based health centers had the highest coverage for all measures; however, less than 2% of the adolescent population utilizes these providers for HPV vaccination. Future analyses will assess for additional differences in provider characteristics and HPV vaccination coverage.

The Role of Healthcare Providers in Improving HPV Vaccination Coverage

Our analysis, although not yet complete, suggests there is ample room for improvement in HPV vaccination coverage among King County adolescents. We found that few adolescents are beginning and completing the vaccination series by the recommended age, although whether this is primarily related to lack of a strong provider recommendation or parental hesitancy is not known. However, the NIS-Teen found that lack of knowledge and lack of provider recommendations were the main reasons parents gave for not vaccinating teens against HPV. To improve vaccination coverage, healthcare providers should assess vaccination status at each visit and emphasize starting and completing the HPV vaccination series.

Although our research did not assess missed opportunities, the NIS-Teen found that if the first dose of HPV vaccine was administered at the same visit as other routinely recommended adolescent immunizations, coverage rates would be over 90% for one or more doses among adolescent females born in 2000. Below are some resources from the CDC to provide to patients and parents regarding the HPV vaccination series; you can contact Public Health for additional guidance.

Table 2. HPV vaccination coverage among King County adolescents aged 13-17 years who received ≥1 dose and 3 doses by Dec 31, 2013, by owning provider type***

			Females		Males	
Provider Type	Facilities (N)	Patients (N)	≥1 dose (%)	Completion* (%)	≥1 dose (%)	Completion* (%)
Private Provider - Fam Practice	158	45,557	62.0	61.1	38.0	31.4
Private Provider - Pediatrics	31	39,501	65.5	60.7	42.8	35.9
Community Clinic FQHC	25	12,981	74.0	64.3	48.9	35.0
School-Based Health Centers	17	1,697	84.7	69.8	58.4	39.9
Other Providers	66	17,732	50.0	60.5	31.7	36.8
Overall	297	117,468	63.0	61.5	40.2	34.2

*Percent of males and females who received 3 doses among those who had at least one HPV vaccine dose
FQHC = Federally Qualified Health Centers
***Note – These data represent patients aged 13 to 17 years who were "owned" in WAIIS by a King County provider participating in the VFC program. These numbers will not match any of the statistics presented elsewhere in this document

We plan to continue exploring the data on HPV vaccination coverage locally and develop strategies to increase coverage. In the interim, health care providers should:

- Make a strong, clear, and routine recommendation for HPV vaccine at age 11-12 years. Parents trust your opinion more than anyone else's when it comes to immunizations. Studies consistently show that provider recommendation is the strongest predictor of vaccination.
- Assess for and administer all needed vaccines, including HPV, at every visit.
- Schedule follow-up appointments before the patient leaves the office.
- Use reminder/recall systems to identify and notify patients who are due or overdue for vaccination.
- Implement standing orders policies so that patients can receive vaccines without a physician examination or individual physician order.

HPV Vaccine Resources for Providers

- HPV Vaccine Resources for Healthcare Professionals (CDC)
- Tips and Time-savers for Talking with Parents about HPV Vaccine (CDC)

NIS-Teen 2013 Further Reading

- U.S. Department of Health and Human Services (DHHS). National Center for Health Statistics. The 2013 National Immunization Survey - Teen. Hyattsville, MD: Centers for Disease Control and Prevention, 2014.
- CDC. Human Papillomavirus vaccination coverage among adolescents, 2007-2013, and postlicensure vaccination safety monitoring, 2006-2014 – United States. MMWR. 2014; 63(29):620-4.

Readers of our print edition:

Direct URL links to all citations & references are available at: **kingcounty.gov/communicable**.

VacScene: Study Measures Protection Against Clinical Pertussis Among Infants of Mothers Who Received Pertussis Vaccination in Pregnancy

Effectiveness of Maternal Pertussis Vaccination in England, a report in *The Lancet's* July 26, 2014 issue, describes a large, well-conducted observational study of the vaccine effectiveness of maternal pertussis vaccination on the prevention of infant disease in the United Kingdom (UK).

In September 2012, in response to increasing pertussis rates in infants younger than three months and a related increase in infant deaths, public health authorities in the UK recommended that dTaP-IPV be offered to all women in the third trimester of each pregnancy. Using data from their national Clinical Practice Research Datalink (CPRD), the authors reported the average pertussis-containing vaccine coverage for a cohort of 26,684 women (representing 4% of all live births in England in 2012) who recorded a live birth from October 1, 2012 to September 3, 2013 as 64%, and undertook an analysis of laboratory-confirmed cases and hospital admissions for pertussis in infants between Jan 1, 2008, and Sept 30, 2013, using data submitted to Public Health England.

For the first nine months of 2013 compared with the same period in 2012, the greatest proportional fall in confirmed cases (328 cases in 2012 vs. 72 cases in 2013, –78%, 95% CI –72 to –83) and in hospitalization admissions (440 admissions in 2012 vs 140 admissions in 2013, –68%, –61 to –74) occurred in infants younger than three months, although the incidence remained highest in this age group. Infants younger than three months were also the only age group in which there were fewer cases in 2013 than in 2011 (118 cases in 2011 vs. 72 cases in 2013), before the resurgence.

Vaccine effectiveness based on 82 confirmed cases in infants born from Oct 1, 2012, and younger than three months at onset was 91% (95% CI 84 to 95). Vaccine effectiveness was 90% (95% CI 82 to 95) when the analysis was restricted to cases in infants younger than two months. The authors attribute high vaccine effectiveness primarily to passive maternal antibody transfer to the infant. **Bottom line: This study highlights the effectiveness of maternal pertussis vaccination and the importance of administering the vaccine at the recommended time to maximize infant protection.**

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