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Chlorine Gas Release Associated with Employee Language Barrier — Arkansas, 2011

On June 27, 2011, a worker at a poultry processing plant in Arkansas began to pour sodium hypochlorite into a 55-gallon drum that contained residual acidic antimicrobial solution. When the sodium hypochlorite reacted with the solution, greenish-yellow chlorine gas was released into the small room where the drum was located and then spread into the plant, where approximately 600 workers were present. These workers promptly were evacuated. Chlorine is a respiratory irritant and can produce symptoms ranging from mild eye, nose, and throat irritation to severe inflammation of the lung, which can lead to death (*1*). Of the approximately 600 workers who were evacuated; 545 were later interviewed, 195 reported seeking medical treatment, 152 reported being hospitalized, and the plant nurse reported that five were admitted to intensive-care units. The next day, the Occupational Safety and Health Administration (OSHA) asked for technical assistance from CDC's National Institute for Occupational Safety and Health (NIOSH) to evaluate health effects of the release and make recommendations to prevent future occurrences. This report describes the results of that evaluation, including findings from two follow-up site visits conducted approximately 4 and 6 months after the release. Of the 545 workers who participated in the evaluation, three developed reactive airways dysfunction syndrome (RADS), an irritant-induced form of asthma that can persist for life. The worker who inadvertently mixed the two solutions indicated that the drum was labeled in English but he could only read Spanish. This incident underscores the danger posed by chlorine gas and the importance of employers providing adequate training and communication of health and safety precautions to employees.

On their first visit to the plant, conducted June 30–July 2, 2011, NIOSH investigators interviewed 523 workers who were at work during the chlorine release. They later interviewed 22 workers who had been off work after the chlorine release when the first visit was made. The ages of the participants ranged from 18 to 72 years, with an average of 42 years; 326 (60%) of the participants were women (Table 1). The participants were interviewed in their primary languages. A total of 371 (68%) participants, including the worker who was filling the drum with sodium hypochlorite, spoke Spanish as their primary language; 91 (17%) primarily spoke English; 68 (12%) primarily spoke Marshallese; and 15 (3%) primarily spoke other languages. Investigators learned that the acidic antimicrobial solution was normally stored in much larger, square containers, but one sample drum inadvertently had been left in the plant in the area where the sodium hypochlorite normally was located, and was labeled only in English. The worker who mixed the sodium hypochlorite with the leftover acidic solution told investigators he knew such a mixture was dangerous but did not recognize the drum and could not read the label to ascertain its contents. When interviewed, the worker was unable to respond in English and required a Spanish translator.

During the first plant visit, participants were asked about their asthma history, smoking status, the strength of the chlorine odor they experienced (used as a surrogate for intensity of exposure), and any symptoms in the first 24 hours after the release and at the time of interview (i.e., 3–5 days after the release). During the second visit in November, a survey that included four questions adapted from the European Community Respiratory Health Survey (ECRHS) (*2*)* was administered to workers who had reported lower respiratory

* Additional information available at http://ac.els-cdn.com/S0895435602006133/1-s2.0-S0895435602006133-main.pdf?_tid=d3e8123a-3d5d-11e2-a775-00000aacb35d&acdnat=1354548577_565682c901907f1a04879273f9d4edaf.

Continuing Education examination available at http://www.cdc.gov/mmwr/cme/conted_info.html#weekly.

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tract symptoms (i.e., cough, wheezing, chest tightness, or shortness of breath) during the first visit and to the 22 workers who were absent at the first site visit.[†]

A positive response to any of the four questions on the survey has a sensitivity of 75% and a specificity of 80% for asthma symptoms on the basis of a clinical examination with immunoglobulin E testing against common allergens, spirometry, and methacholine challenge testing (MCT).[§] These questions had been modified by substituting "since the chlorine release," for "in the last 12 months." Participants were classified as having presumptive RADS[¶] if they answered "yes" to any of the ECRHS questions and did not have asthma before the chlorine release. During the third plant visit, conducted in January 2012, investigators performed spirometry on 101 participants who had been classified as having presumptive RADS at the second visit; they also conducted MCT on 78 of those, based on spirometry results (forced expiratory volume in 1 second of ≥70%) and the presence or absence of medical contraindications to MCT. Participants were defined as having RADS if they had no history of asthma before the release, presumptive RADS at the second visit, and a positive MCT result. Participants were defined as having borderline RADS if they had no history of asthma, one or more RADS symptoms at the second visit, and a borderline-positive MCT result.

Of 543 participants providing information on smoking status, 411 (76%) had never smoked, 73 (13%) were former smokers, and 59 (11%) were current smokers. Thirty-four participants (6%) reported a history of asthma (Table 1).

A total of 520 participants provided information regarding the strength of the chlorine odor during the release; 213 (41%) reported a strong odor, 36 (7%) reported a moderate odor, 117 (23%) reported a light odor, and 154 (30%) said they did not smell chlorine. Among those reporting a strong odor, the most common symptoms in the first 24 hours after release were burning throat (175 [82%]), headache (173 [81%]), burning eyes (157 [74%]), and cough (154 [72%]) (Table 2). Among those reporting a strong odor, the most common symptoms 3–5 days after release were headache (148 [69%]), burning

[†] The questions were 1) Have you been woken up with a feeling of tightness in your chest at any time in the last 12 months? 2) Have you had an attack of asthma in the last 12 months? 3) Are you currently taking any medicine (including inhalers or pumps, aerosols, or tablets) for breathing problems or asthma? and 4) Have you had wheezing or whistling in your chest at any time in the last 12 months?

[§] MCT is performed to assist in the diagnosis of RADS. After baseline spirometry is obtained, methacholine (a bronchoconstricting agent) is inspired through a nebulizer at a series of up to 5 increasing doses. The dose that results in a 20% fall in the forced expiratory volume at 1 second is called the PC20. If the PC20 is <4 mg/mL, bronchial hyperreactivity is occurring (positive test result); if PC20 is 4–16 mg/mL, borderline bronchial hyperreactivity is occurring; and if the PC20 is >16 mg/mL, the test result is considered normal.

[¶] The diagnostic criteria for RADS are 1) a documented absence of preceding respiratory complaints; 2) the onset of symptoms occurred after a single specific exposure incident; 3) the exposure was to a gas, smoke, fume or vapor that was present in very high concentrations and had irritant qualities to its nature; 4) the onset of symptoms occurred within 24 hours after the exposure and persisted for at least 3 months; 5) symptoms simulated asthma with cough, wheeze, and dyspnea predominating; 6) pulmonary function tests might show airflow obstruction; and 7) MCT testing result was positive; 8) other types of pulmonary diseases were ruled out. Source: Brooks SM, Weiss MA, Bernstein IL. Reactive airways dysfunction syndrome (RADS). Persistent asthma syndrome after high level irritant exposures. Chest 1985; 88:376–84.

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TABLE 1. Number and percentage of poultry plant workers present during a chlorine gas release who were interviewed,* by selected characteristics — Arkansas, 2011

Characteristic	No.	(%)
Sex		
Women	326	(60)
Men	219	(40)
Primary language		
Spanish	371	(68)
English	91	(17)
Marshallese	68	(12)
Other	15	(3)
Smoking status		
Never	411	(76)
Former	73	(13)
Current	59	(11)
History of asthma		
Yes	34	(6)
No	509	(94)

* N = 543–545. Denominators vary because of missing data.

TABLE 2. Prevalence of symptoms within 24 hours of chlorine gas release among poultry plant workers who reported strength of chlorine odor* — Arkansas, 2011

	Strength of chlorine odor							
	Strong		Moderate		Light		None	
Symptoms	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Total	**213**	**(41)**	**36**	**(7)**	**117**	**(23)**	**154**	**(30)**
Mucus membrane								
Burning eyes	157	(74)	18	(50)	36	(31)	15	(10)
Burning nose	124	(58)	12	(33)	25	(21)	7	(5)
Burning throat	175	(82)	20	(56)	39	(33)	17	(11)
Constitutional								
Dizziness/ Lightheadedness	135	(63)	16	(44)	27	(23)	9	(6)
Headache	173	(81)	22	(61)	50	(43)	23	(15)
Chest								
Chest congestion or phlegm	105	(49)	11	(31)	10	(9)	9	(6)
Chest pain	140	(66)	12	(33)	23	(20)	7	(5)
Chest tightness	119	(56)	13	(36)	10	(9)	10	(6)
Cough	154	(72)	21	(58)	38	(32)	12	(8)
Coughing up blood	21	(10)	0	(0)	1	(1)	0	(0)
Shortness of breath	142	(67)	14	(39)	14	(12)	6	(4)
Wheezing in chest	86	(40)	4	(11)	7	(6)	3	(2)
Gastrointestinal								
Nausea	111	(52)	13	(36)	15	(13)	7	(5)
Vomiting	53	(25)	5	(14)	7	(6)	3	(2)
Skin								
Irritation/Pain/Burning	56	(26)	3	(8)	6	(5)	4	(3)

* N = 520.

throat (140 [66%]), cough (136 [64%]), and shortness of breath (118 [55%]) (Table 3).

Of the 545 participants, 267 (49%) either reported lower respiratory tract symptoms 3–5 days after the release or had not returned to work at the time of the first site visit. At the second site visit, 240 (90%) of these 267 participants were surveyed, and 105 (44%) had presumptive RADS. At the third site visit, 101 (96%) of the 105 participants with presumptive RADS were available for further testing; of these, 23 had medical conditions incompatible with MCT, had uninterpretable spirometry results, or did not meet spirometry criteria for MCT. MCT was conducted on 78 (77%) of the 101. Of the 78 tested, three had borderline RADS, and three had RADS.

TABLE 3. Prevalence of symptoms 3–5 days after chlorine gas release among poultry plant workers who reported strength of chlorine odor* — Arkansas, 2011

	Strength of chlorine odor							
	Strong		Moderate		Light		None	
Symptoms	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Total	**213**	**(41)**	**36**	**(7)**	**117**	**(23)**	**154**	**(30)**
Mucus membrane								
Burning eyes	103	(48)	11	(31)	25	(21)	8	(5)
Burning nose	70	(33)	7	(19)	20	(17)	6	(4)
Burning throat	140	(66)	14	(39)	34	(29)	14	(9)
Constitutional								
Dizziness/ Lightheadedness	100	(47)	8	(22)	16	(14)	7	(5)
Headache	148	(69)	15	(42)	38	(32)	23	(15)
Chest								
Chest congestion or phlegm	92	(43)	9	(25)	16	(14)	12	(8)
Chest pain	113	(53)	7	(19)	22	(19)	8	(5)
Chest tightness	98	(46)	11	(31)	12	(10)	8	(5)
Cough	136	(64)	16	(44)	27	(23)	12	(8)
Coughing up blood	18	(8)	0	(0)	0	(0)	1	(1)
Shortness of breath	118	(55)	9	(25)	19	(16)	8	(5)
Wheezing in chest	59	(28)	4	(11)	5	(4)	5	(3)
Gastrointestinal								
Nausea	72	(34)	6	(17)	10	(9)	5	(3)
Skin								
Irritation/Pain/Burning	42	(20)	2	(6)	8	(7)	6	(4)

* N = 520.

Reported by

Ashley Whitlow, MS, Shirley Louie, Arkansas Dept of Health. Charles Mueller, MS, Bradley King, MPH, Elena Page, MD, Bruce Bernard, MD, Div of Surveillance, Hazard Evaluations, and Field Studies, National Institute for Occupational Safety and Health; Francisco Meza, MD, EIS Officer, CDC. ***Corresponding contributor:*** *Elena Page, epage@cdc.gov, 513-458-7144.*

Editorial Note

This chlorine release and its resultant health effects were preventable. OSHA issued the owner of the poultry plant a citation for not ensuring that chemical hazard communication training was understood by all employees. The OSHA Hazard Communication Standard states, "Employers shall provide employees with effective information and training on hazardous chemicals in their work area at the time of their initial

assignment, and whenever a new physical or health hazard the employees have not previously been trained about is introduced into their work area."** Under the standard, employers also are expected to communicate work instructions and information on workplace hazards to employees tailored to the employees' language and education level (*3*). The growing presence of Spanish-speaking workers in the United States, and the high rates of morbidity and fatalities among Hispanic workers, point to the need for improved workplace instruction and training to ensure employee comprehension (*4*).

The worker who began to pour sodium hypochlorite into the drum that had contained an acidic antimicrobial solution did not recognize the drum, had limited English skills, and was unable to read the label on the drum that had been inadvertently left in the wrong place. As a result of its investigation, NIOSH recommended 1) providing material safety data sheets and labeling in the languages spoken at the facility, 2) ensuring that employee training programs regarding hazardous chemicals used on-site and needed protective measures comply with upcoming changes in the OSHA Hazard Communication Standard, 3) installing special fittings to prevent inadvertent connections between the filling station and containers, 4) keeping incompatible chemicals in different sized or different colored barrels to prevent them from being mixed together, and 5) establishing evacuation plans and drills appropriate for potential hazards at the facility.

At the poultry plant, Spanish was the primary language for 68% of the workers, and Marshallese was the primary language for 12%. These percentages are higher than those for the racial/ethnic composition of workers in the U.S. animal slaughtering and processing industry cited by the Bureau of Labor Statistics, which indicated that 38.1% of workers were Hispanic or Latino and 8.6% were Asian in 2011 (*5*). The potential for injury as a result of inadequate attention to foreign language health and safety training extends beyond this industry, with approximately 40.4 million foreign-born residents in the United States, 46.6% of whom are Hispanic and 51.0% who report an inability to speak English very well (*6*).

In addition, an estimated 30 million adults with below basic literacy skills often are working in dangerous jobs (*4,7*). Nonetheless, most material safety data sheets used in industry are written at a college reading level, making communication with most workers difficult; the problem is compounded when workers do not speak English well or at all (*8*).

** Additional information available at http://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=standards&p_id=10099.

What is already known on this topic?

Chlorine is a respiratory irritant and can produce symptoms ranging from mild eye, nose, and throat irritation to severe inflammation of the lung. Despite current standards regarding hazard communication, including those related to inadvertent release of chlorine gas, workplaces might not have adequate hazard communication programs.

What is added by this report?

A large release of chlorine gas in a poultry processing plant exposed approximately 600 workers and resulted in 152 workers being hospitalized, five in an intensive-care unit; three went on to develop reactive airways dysfunction syndrome. Investigators found that the chlorine was released because a Spanish-speaking worker could not read the English-language label on a container containing acid that was left in the wrong place.

What are the implications for public health practice?

This case demonstrates the urgency of implementing hazard communication programs and training in workplaces in the United States. All communication, training, and signage in the workplace should be easy-to-read and provided in languages understood by workers.

To help overcome language and literacy obstacles, employers should actively engage workers in hands-on training (*9*). To lessen communication gaps, training should be interactive, and employees and employers should work together to analyze and improve workplace health and safety policies and programs. OSHA has made changes to its Hazard Communication Standard that will be phased in over the next 4 years, in accordance with recommendations from the United Nations (*10*). These changes establish a standardized international labeling system (Globally Harmonized System of Classification and Labeling of Chemicals) to be used by manufacturers of chemicals. Using symbols and simplified text, its intent is to improve understanding of chemical hazards for all employers and employees, regardless of primary language or literacy level.

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Mumps Outbreak on a University Campus — California, 2011

Mumps is a vaccine-preventable viral disease characterized by swelling of the salivary glands; serious complications (e.g., meningitis, encephalitis, orchitis, or oophoritis) can occur. On September 29, 2011, the California Department of Public Health (CDPH) confirmed by polymerase chain reaction (PCR) three cases of mumps among students recently evaluated at their university's student health services with symptoms suggestive of mumps. An investigation by CDPH, student health services, and the local health department identified 29 mumps cases. The presumed source patient was an unvaccinated student with a history of recent travel to Western Europe, where mumps is circulating. The student had mumps symptoms >28 days before the onset of symptoms among the patients confirmed on September 29. Recognizing that at least two generations of transmission had occurred before public health authorities were alerted, measles, mumps, and rubella (MMR) vaccine was provided as a control measure. This outbreak demonstrates the potential value of requiring MMR vaccination (including documentation of immunization or other evidence of immunity) before college enrollment, heightened clinical awareness, and timely reporting of suspected mumps patients to public health authorities.

On August 25, 2011, the presumed source patient, an unvaccinated male, aged 21 years, arrived at the university's student health services with fever and unilateral facial and jaw swelling. The initial diagnosis was cellulitis and antibiotics were prescribed. By day 6 after symptom onset, the patient complained of testicular pain, and mumps was suspected. He had not been vaccinated against mumps and had traveled to Western Europe during the exposure period. He was referred for mumps serological testing, but did not follow through. His illness was not reported to the local health department when mumps was suspected. Approximately 3 weeks later, a second student, the source patient's roommate, was treated at student health services for fatigue and unilateral pain and swelling of the jaw and neck. This patient, a male aged 21 years, with a history of receiving 2 doses of MMR vaccine, received a diagnosis of parotitis. Mumps serologies were drawn, and he was advised to isolate himself in his room for 5 days. Mumps immunoglobulin M (IgM) testing was negative, and immunoglobulin G testing was positive, a pattern that does not rule out acute mumps because the ability to detect IgM is poor in vaccine recipients. The local health department was not notified. When three subsequent cases of mumps were confirmed by PCR on September 29 at CDPH, an investigation was initiated.

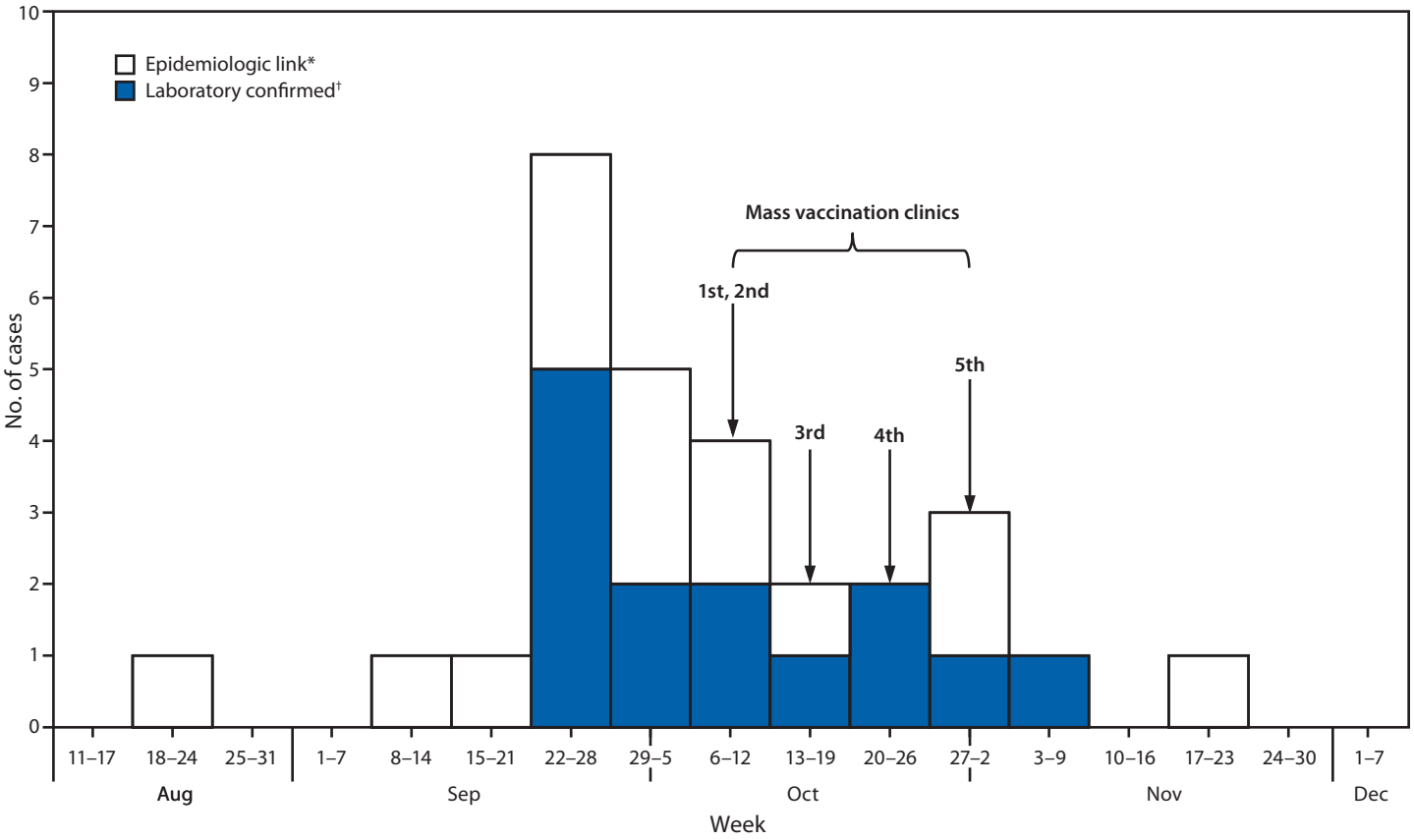
During the outbreak period (August 25, 2011–January 7, 2012), investigators identified 29 cases that met the Council of State and Territorial Epidemiologists 2010 case definition of mumps.* The outbreak period extended from the symptom onset date of the source patient through two incubation periods after the symptom onset of the last laboratory-confirmed case. The average incubation period for mumps is 16–18 days (range: 12–25 days); thus, the timing of the first five patients indicated that at least two generations of transmission had occurred by the time public health was notified. Case-finding activities included notifying health-care providers serving the affected community, requesting PCR testing for persons with clinically compatible symptoms, and alerting adjacent local health departments to notify CDPH of suspected mumps cases.

All patients had epidemiologic links to the university: 27 (93%) were students, one was a close contact of a student, and one was a public health staff member who assisted during a mumps vaccination clinic. Among the 29 cases, 13 (45%) were laboratory confirmed by PCR, one was confirmed by the presence of mumps IgM, and the remainder were confirmed on the basis of symptoms clinically compatible with mumps together with epidemiologic links to the university (Figure). Of the epidemiologically linked cases, 11 were negative and four were not tested by PCR. All viral specimens were genotype G, the predominant mumps genotype circulating in Western Europe. Eight patients (28%), including the source patient, were students who participated in organized sports. Four of the first five patients resided in congregate housing, and 17 (59%) illnesses occurred among students living in congregate housing. Among the 29 cases, 22 (76%) mumps illnesses occurred among persons previously vaccinated with the recommended 2 doses of MMR vaccine (Table).

CDC recommendations for mumps outbreak control include defining the at-risk population and transmission setting, and rapidly identifying and vaccinating persons without presumptive evidence of immunity (*1*). Other recommended control measures include cough etiquette, respiratory and hand hygiene, and isolation of infectious patients for 5 days. Early in the outbreak, the university arranged alternate housing to isolate infectious patients who resided in congregate housing; however, as the number of patients increased, this became less feasible. Students were encouraged to monitor themselves for mumps symptoms and symptomatic students were encouraged to go to student health services for testing.

* Additional information available at http://www.cdc.gov/vaccines/vpd-vac/mumps/outbreak/case-def.htm.

FIGURE. Number of mumps cases (n = 29) at a university, by week of illness onset, and mass vaccination clinics — California, 2011



* Defined as a patient associated with the university and with signs and symptoms consistent with mumps.
† Defined as detection of virus by polymerase chain reaction or by the presence of serum mumps immunoglobulin M.

Initially, the disclosure of patient student medical records to public health authorities was limited by requirements of the federal Family Educational Rights and Privacy Act (FERPA).† Because student medical records are considered educational records under FERPA, the university requested that CDPH declare the mumps outbreak an emergency, thereby permitting public health review of student medical records.

Of approximately 36,000 students enrolled at the university; an estimated 9,300 reside in housing owned by, operated by, or affiliated with the university. Recognizing that at least two generations of transmission had occurred before public health authorities were alerted to this outbreak, and wanting to avert a larger outbreak, the local health department and the university, in consultation with CDPH and CDC, decided to provide MMR vaccine as a control measure. The university recommends that matriculating students receive 2 doses of MMR vaccine, but does not require proof of MMR vaccination before matriculation, making student vaccination status difficult to assess. Therefore, messages sent to the university community advised that an additional dose of MMR vaccine, irrespective of previous MMR vaccination status, was recommended for all university community members, with an emphasis on those residing in congregate housing. Beginning 1 week after the local health department was alerted, five vaccination clinics were held during a 4-week period; a total of 3,631 persons received a dose of MMR vaccine.

† Additional information available at http://www2.ed.gov/policy/gen/guid/fpco/index.html.

Reported by

Jennifer Zipprich, PhD, Erin L. Murray, PhD, Kathleen Winter, MPH, Darryl Kong, MPH, Kathleen Harriman, PhD, Chris Preas, Debra Wadford, PhD, Sharon Messenger, PhD, John Talarico, DO, James P. Watt, MD, California Dept of Public Health. Janet Berreman, MD, Barbara Gregory, City of Berkeley, Public Health Div. Pat Cameron, MSN, Brad Buchman, MD, University Health Svcs, Univ of California, Berkeley. Jonathan J. Nunez, CDC. ***Corresponding contributor:*** *Jonathan J. Nunez, vig2@cdc.gov, 510-620-3047.*

TABLE. Number and percentage of mumps patients from a university, by demographic characteristics, symptoms, and vaccination status — California, 2011

Characteristic	Laboratory confirmed*		Epidemiologic link†	
	No.	(%)	No.	(%)
Total	**14**	**(100)**	**15**	**(100)**
Median age (yrs)	19	—	20	—
Sex				
Male	9	(64)	10	(67)
Female	5		5	(33)
Symptoms				
Parotitis	14	(100)	12	(80)
Orchitis§	0	(0)	4	(40)
Vaccination status¶				
Unvaccinated	0	(0)	1	(7)
1 MMR dose	1	(7)	1	(7)
2 MMR doses	11	(79)	11	(73)
3 MMR doses	2	(14)	0	(0)
Unknown	0		2	(13)

Abbreviation: MMR = measles, mumps, rubella vaccine.
* Defined as detection of virus by polymerase chain reaction or by the presence of serum mumps immunoglobulin M.
† Defined as a patient associated with the university and with signs and symptoms consistent with mumps.
§ Testicular inflammation, a postpubertal complication in males; therefore, the denominator used was male patients.
¶ Vaccination status was determined by documented history of vaccination records or self-reporting.

Editorial Note

This outbreak demonstrates that even persons who have received 2 doses of mumps vaccine might not be protected against mumps, and highlights the importance of heightened clinical awareness and timely reporting of suspected mumps cases to public health authorities (*2*). The effectiveness of MMR vaccine to prevent mumps has been estimated at medians of 78% (range: 49%–91%) for 1 dose and 88% (range: 66%–95%) for 2 doses (*3*). Despite a substantial decline in U.S. mumps cases since mumps vaccine licensure in 1967, large mumps outbreaks have occurred in recent years among vaccinated populations (*4,5*). The World Health Organization indicates that only 62% of countries use mumps vaccine in national programs (*6*). Although MMR vaccine is included in national programs in Europe, MMR vaccination rates declined in many European countries over the last decade because of vaccine safety concerns, and outbreaks of measles and mumps have occurred. Public colleges and universities in 22 states and the District of Columbia require that enrolling students provide documentation that they have received 2 doses of MMR vaccine.

Although mumps outbreaks have occurred in populations in which many persons have received 2 doses of MMR vaccine, prematriculation MMR vaccination might prevent the introduction of mumps and limit its spread if it is introduced into a university setting (*5,7*). In this outbreak, the suspected source patient was unvaccinated and the outbreak might have been prevented if a prematriculation requirement had been in place. Documentation of MMR vaccination also can allow public health officials to rapidly assess the mumps vaccination status of exposed students and prioritize vaccination efforts.

Outbreak management was complicated by a delay in receiving the medical records of suspect patients. FERPA limits disclosure of student medical records by stipulating that even reportable diseases cannot be disclosed to public health authorities without prior permission from the student, except in an emergency, which is not clearly defined. An interpretation of FERPA provided by the U.S. Department of Education to the University of New Mexico in 2004 clearly states these limitations.§

Recognition and prompt reporting of clinically suspected mumps, even in the absence of laboratory confirmation, facilitates early implementation of control measures and can mitigate outbreaks. Reliable identification of mumps infections can be difficult; PCR testing is preferred when testing previously vaccinated persons. Control measures for mumps are limited. Neither MMR vaccine nor immune globulin is effective as postexposure prophylaxis; however, in an outbreak setting, MMR

What is already known on this topic?

Mumps outbreaks can occur in populations in which a large percentage of persons have received the recommended 2 doses of measles, mumps, and rubella (MMR) vaccine. Detection of outbreaks can be delayed because falsely negative serological test results might occur in vaccinated persons.

What is added by this report?

A mumps outbreak occurred at a university that did not require proof of MMR vaccination of students before enrollment. The presumed source patient was an unvaccinated student who had recently returned from Western Europe, where mumps is circulating. Among the 29 cases, 22 (76%) mumps illnesses occurred among persons previously vaccinated with the recommended 2 doses of MMR vaccine.

What are the implications for public health practice?

Because the source patient was unvaccinated, this outbreak might have been prevented if the university had a prematriculation MMR vaccination requirement in place. Accessing the medical records of students suspected and confirmed to have mumps was complicated by federal privacy protections of education records. In addition, immunization efforts initially could have been targeted to unvaccinated or undervaccinated students if prematriculation immunization records had been available. Colleges and universities should consider ensuring that matriculating students have documentation of receipt of 2 doses of MMR. Heightened clinical awareness of mumps, appropriate testing, and rapid reporting of suspected cases to public health authorities is essential for limiting outbreaks.

§ Additional information available at http://www2.ed.gov/policy/gen/guid/fpco/ferpa/library/baiseunmslc.html.

vaccine might reduce transmission to susceptible persons not yet exposed to the mumps virus.

Even though a population might be highly vaccinated, some persons who have received 2 doses of MMR vaccine still will be susceptible. Data collected during previous mumps outbreaks on college campuses indicate that extended person-to-person contact, in combination with waning vaccine-induced immunity, might make colleges and universities high-risk settings for outbreaks, even when 2-dose MMR vaccination coverage is high (*8*). In addition, patients are infectious before onset of parotitis, and asymptomatic persons can transmit disease. Isolation of patients for 5 days after parotitis onset and monitoring of contacts for symptoms are primary control measures. However, even strict isolation of reported patients is unlikely to completely interrupt disease transmission. CDC has evaluated use of a third dose of MMR vaccine for mumps outbreak control during two previous mumps outbreaks in which transmission was sustained, despite high 2-dose coverage (*9,10*). During both outbreaks, targeted vaccination was followed by a decrease in mumps incidence among the target group. Available data are insufficient to recommend for or against the use of a third dose of MMR vaccine for mumps outbreak control. Because control measures for mumps are limited, the ability to offer a third dose of MMR vaccine might be a tool that could be used in an attempt to limit the extent of mumps outbreaks, particularly in high-risk settings.

Colleges and universities should consider implementing prematriculation immunization requirements similar to those recommended by the American College Health Association, including ensuring that students have documented receipt of 2 doses of MMR vaccine (*2*). Public health officials should be aware of disclosure limitations under FERPA and how these might impact communicable disease reporting requirements and timely investigation of outbreaks. Clinicians should be diligent about reporting suspected cases of mumps to local health departments, and PCR testing should be performed for vaccinated persons with suspected mumps. More data are needed regarding the effectiveness of the use of a third dose of MMR vaccine to control outbreaks.

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Update: Influenza Activity — United States, September 30–November 24, 2012

CDC collects, compiles, and analyzes data on influenza activity year-round in the United States. The influenza season generally begins in the fall and continues through the winter and spring months; however, the timing and severity of circulating influenza viruses can vary by geographic location and season. Influenza viruses were detected in the United States throughout the summer months (*1*), and activity increased steadily during October and November. Most influenza viruses characterized thus far this season are well matched to the 2012–13 vaccine viruses. This report summarizes U.S. influenza activity* during September 30–November 24, 2012.†

Viral Surveillance

During September 30–November 24, 2012, approximately 140 World Health Organization (WHO) and National Respiratory and Enteric Virus Surveillance System collaborating laboratories in the United States tested 40,716 respiratory specimens for influenza viruses; 3,573 (8.8%) were positive (Figure 1). Of these, 2,287 (64%) were influenza A viruses, and 1,285 (36%) were influenza B viruses. Of the 2,287 influenza A viruses, 1,374 (60%) were subtyped; 1,342 (98%) of these were influenza A (H3) viruses and 32 (2%) were influenza A (H1N1)pdm09 (pH1N1) viruses. Influenza virus–positive tests have been reported from 48 states, the District of Columbia (DC), and Puerto Rico and all 10 U.S. Department of Health and Human Services (HHS) regions§ since September 30, 2012. Although influenza A viruses have predominated in the United States overall, influenza B viruses were identified more frequently than influenza A viruses in regions 6 and 8.

Novel Influenza A Viruses

One infection with an influenza A (H3N2) variant virus (H3N2v) was reported to CDC during the week ending November 24 from Iowa. Although no contact with swine or other livestock in the week preceding illness was reported, investigation into potential additional sources of infection is ongoing. No further cases have been identified in contacts of the patient. This is the first H3N2v infection reported for the 2012–13 influenza season.

Antigenic Characterization

WHO collaborating laboratories in the United States are requested to submit a subset of their influenza-positive respiratory specimens to CDC for further antigenic characterization. CDC has antigenically characterized 140 influenza viruses collected by U.S. laboratories during the 2012–13 season, including two pH1N1, 90 influenza A(H3N2), and 48 influenza B viruses. All pH1N1 and A(H3N2) viruses were antigenically related to the 2012–13 influenza A vaccine components (A/California/7/2009-like [H1N1] and A/Victoria/361/2011-like [H3N2]). Of the 48 influenza B viruses tested, 34 (71%) belong to the B/Yamagata lineage and were characterized as B/Wisconsin/1/2010-like, the influenza B component of the 2012–13 Northern Hemisphere influenza vaccine; 14 (29%) of the influenza B viruses tested belong to the B/Victoria lineage of viruses.

Antiviral Resistance of Influenza Virus Isolates

Since September 30, 2012, a total of 205 influenza viruses have been tested for antiviral resistance. Of the two pH1N1, 122 influenza A(H3N2), and 81 influenza B viruses tested, all were sensitive to both oseltamivir and zanamivir.

Outpatient Illness Surveillance

Since September 30, 2012, the weekly percentage of outpatient visits for influenza-like illness (ILI)¶ reported by approximately 1,800 U.S. Outpatient ILI Surveillance Network (ILINet) providers in 50 states, New York City, Chicago, the U.S. Virgin Islands, and the District of Columbia that comprise ILINet, has

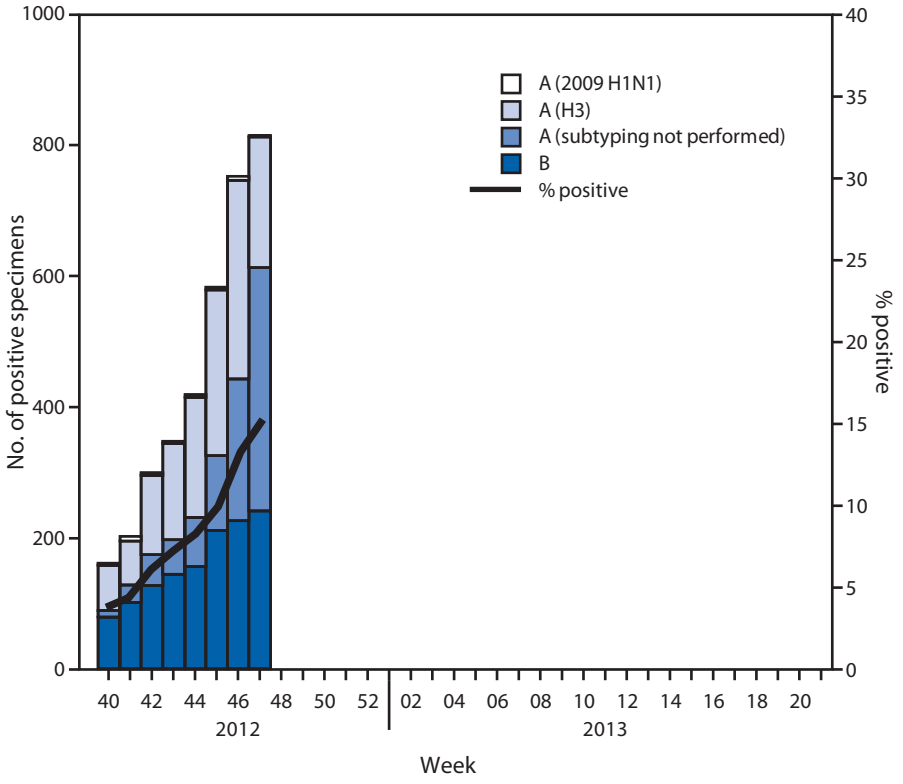
* The CDC influenza surveillance system collects five categories of information from eight data sources: 1) viral surveillance (World Health Organization collaborating laboratories, the National Respiratory and Enteric Virus Surveillance System, and novel influenza A virus case reporting); 2) outpatient illness surveillance (U.S. Outpatient Influenza-like Illness Surveillance Network); 3) mortality (122 Cities Mortality Reporting System and influenza-associated pediatric mortality reports); 4) hospitalizations (FluSurv-NET, which includes the Emerging Infections Program and surveillance in five additional states); and 5) summary of the geographic spread of influenza (state and territorial epidemiologist reports).

† Data as of November 29, 2012.

§ The 10 regions include the following states and territories: Region 1: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont; Region 2: New Jersey, New York, Puerto Rico, and the U.S. Virgin Islands; Region 3: Delaware, District of Columbia, Maryland, Pennsylvania, Virginia, and West Virginia; Region 4: Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, and Tennessee; Region 5: Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin; Region 6: Arkansas, Louisiana, New Mexico, Oklahoma, and Texas; Region 7: Iowa, Kansas, Missouri, and Nebraska; Region 8: Colorado, Montana, North Dakota, South Dakota, Utah, and Wyoming; Region 9: Arizona, California, Hawaii, Nevada, American Samoa, Commonwealth of the Northern Mariana Islands, Federated States of Micronesia, Guam, Marshall Islands, and Republic of Palau; Region 10: Alaska, Idaho, Oregon, and Washington.

¶ Defined as a temperature ≥100°F (≥37.8°C), oral or equivalent, and cough or sore throat, without a known cause other than influenza.

FIGURE 1. Number and percentage of respiratory specimens testing positive for influenza, by type, surveillance week, and year — U.S. World Health Organization and National Respiratory and Enteric Virus Surveillance System collaborating laboratories, United States, 2012–13



ranged from 1.2% to 2.2%. The percentage equaled the national baseline** of 2.2% during the week ending November 24, 2012 (Figure 2). Peak weekly percentages of outpatient visits for ILI ranged from 2.4% to 7.6% from the 1997–98 through 2011–12 seasons, excluding the 2009–10 pandemic. For the week ending November 24, 2012, five regions reported ILI activity above region-specific baseline levels. This is the first week this season region-specific baselines were exceeded. Data collected in ILINet are used to produce a measure of ILI activity†† by state. During the week ending November 24, 2012, five states experienced high ILI activity (Alabama, Louisiana, Mississippi, Tennessee, and Texas), two states experienced moderate ILI activity (Georgia and Missouri), and four states experienced low ILI activity (Hawaii, Ohio, Utah, and Virginia). New York City and 39 states experienced minimal ILI activity, and data were insufficient to calculate an ILI activity level from the DC.

State-Specific Spread of Influenza Activity

For the week ending November 24, 2012, the geographic spread of influenza§§ was reported as widespread in four states (Alaska, Mississippi, New York, and South Carolina), regional in seven states (Alabama, Idaho, Iowa, Maine, Massachusetts, North Carolina, and Ohio), and local in 19 states (Arkansas, Colorado, Connecticut, Georgia, Illinois, Kansas, Kentucky, Louisiana, Minnesota, Missouri, Oregon, Rhode Island, South Dakota, Tennessee, Texas, Utah, Virginia, Wisconsin and Wyoming). Sporadic influenza activity was reported by DC and 18 states; no influenza activity was reported by Guam and one state (Vermont); and Puerto Rico, the U.S. Virgin Islands, and one state (Delaware) did not report.

Pneumonia and Influenza-Related Mortality

For the week ending November 24, 2012, pneumonia and influenza (P&I) was reported as an underlying or contributing cause of death for 6.3% of all deaths reported to the 122 Cities Mortality Reporting System. This percentage is below the epidemic threshold of 6.7% for that week.¶¶ Since September 30, 2012, the weekly percentage of deaths attributed to P&I ranged from 5.8% to 6.7%, and has not exceeded the epidemic threshold for more than 1 week this season. Peak

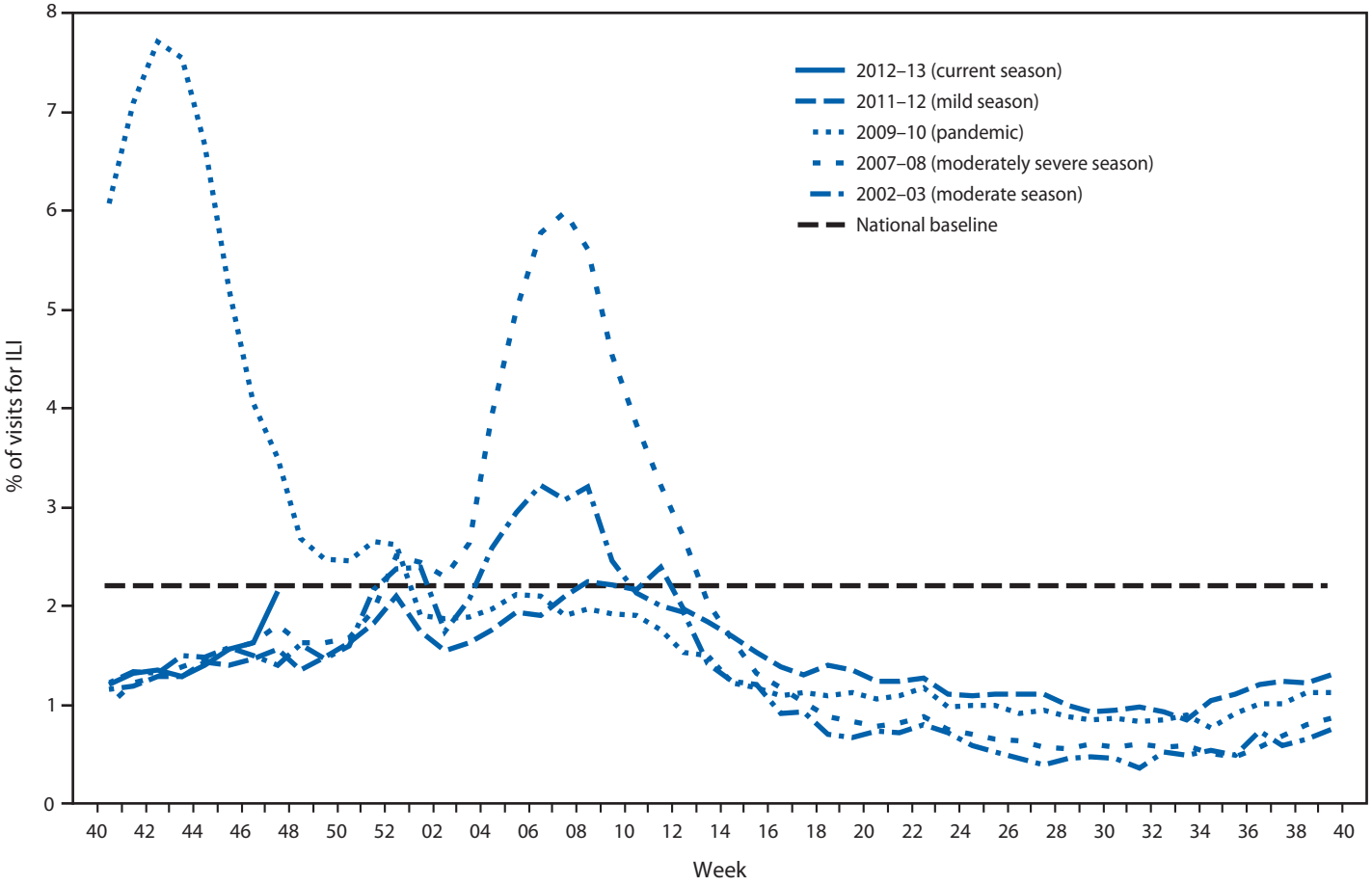
** The national and regional baselines are the mean percentage of visits for ILI during noninfluenza weeks for the previous three seasons plus two standard deviations. A noninfluenza week is defined as periods of 2 or more consecutive weeks in which each week accounted for less than 2% of the season's total number of specimens that tested positive for influenza. National and regional percentages of patient visits for ILI are weighted on the basis of state population. Use of the national baseline for regional data is not appropriate.

†† Activity levels are based on the percent of outpatient visits in a state attributed to ILI and are compared with the average percent of ILI visits that occur during spring and fall weeks with little or no influenza virus circulation. Activity levels range from minimal, which would correspond to ILI activity from outpatient clinics being at or below the average, to high, which would correspond to ILI activity from outpatient clinics being much higher than the average. Because the clinical definition of ILI is very general, not all ILI is caused by influenza; however, when combined with laboratory data, the information on ILI activity provides a clearer picture of influenza activity in the United States.

§§ Levels of activity are 1) no activity; 2) sporadic: isolated laboratory-confirmed influenza cases or a laboratory-confirmed outbreak in one institution, with no increase in activity; 3) local: increased ILI, or at least two institutional outbreaks (ILI or laboratory-confirmed influenza) in one region of the state, with recent laboratory evidence of influenza in that region; virus activity no greater than sporadic in other regions; 4) regional: increased ILI activity or institutional outbreaks (ILI or laboratory-confirmed influenza) in at least two but less than half of the regions in the state with recent laboratory evidence of influenza in those regions; and 5) widespread: increased ILI activity or institutional outbreaks (ILI or laboratory-confirmed influenza) in at least half the regions in the state, with recent laboratory evidence of influenza in the state.

¶¶ The seasonal baseline proportion of P&I deaths is projected using a robust regression procedure in which a periodic regression model is applied to the observed percentage of deaths from P&I that were reported by the 122 Cities Mortality Reporting System during the preceding 5 years. The epidemic threshold is set at 1.645 standard deviations above the seasonal baseline.

FIGURE 2. Percentage of visits for influenza-like illness (ILI) reported by the U.S. Outpatient Influenza-like Illness Surveillance Network (ILINet), by week — United States, 2012–13 and selected previous seasons



weekly percentages of deaths attributed to P&I in the previous five seasons ranged from 7.9% for the 2008–09 and 2011–12 seasons to 9.1% during the 2007–08 and 2010–11 seasons.

Influenza-Related Pediatric Mortality

As of November 24, 2012, two influenza-related pediatric deaths occurring during the 2012–13 season have been reported to CDC; one death was associated with an influenza A virus infection that was not subtyped and one was associated with an influenza A(H3N2) infection. During the 2011–12 season, a total of 34 influenza-related pediatric deaths were reported to CDC; 122 influenza-related pediatric deaths were reported for the 2010–11 season. During the 2009 pandemic, 348 pediatric deaths were reported from April 15, 2009, through October 2, 2010 (other influenza seasons include data from October through September of the following year). Before the 2009 pandemic, 67 influenza-related pediatric deaths were reported for the 2008–09 season (through April 14, 2009), and 88 pediatric deaths were reported for the 2007–08 season (*3*).

Reported by

World Health Organization Collaborating Center for Surveillance, Epidemiology, and Control of Influenza. Lynnette Brammer, MPH, Scott Epperson, MPH, Lenee Blanton, MPH, Krista Kniss, MPH, Desiree Mustaquim, MPH, Craig Steffens, MPH, Rosaline Dhara, MPH, Teresa Wallis, MS, Julie Villanueva, PhD, Xiyan Xu, MD, Lyn Finelli, DrPH, Larisa Gubareva, PhD, Joseph Bresee, MD, Alexander Klimov, PhD, Nancy Cox, PhD, Influenza Div, National Center for Immunization and Respiratory Diseases. ***Corresponding contributor:*** *Lynnette Brammer, lsb1@cdc.gov, 404-639-3747.*

Editorial Note

As measured across all CDC influenza surveillance systems in the United States, overall influenza activity so far this season is low but increasing, and expected to continue to increase in the coming weeks. During September 30–November 24, 2012, influenza A (H3N2) and influenza B viruses were identified most frequently in the United States, but pH1N1 viruses also were reported. Antigenic characterization of influenza-positive

What is already known on this topic?

CDC collects, compiles, and analyzes data on influenza activity year-round in the United States. The influenza season generally begins in the fall and continues through the winter and spring months; however, the timing and severity of circulating influenza viruses can vary by geographic location and season.

What is added by this report?

During September 30–November 24, 2012, influenza activity was low overall in the United States, but it began increasing in mid-November. Most of the influenza viruses characterized thus far this season are well matched to the 2012–13 vaccine viruses and sensitive to the antiviral drugs oseltamivir and zanamivir.

What are the implications for public health practice?

Influenza activity is increasing in the United States. Vaccination remains the most effective method to prevent influenza and its complications. December 2–8, 2012, is National Influenza Vaccination Week. This observance serves as a reminder that health-care providers should continue to offer vaccine to all unvaccinated persons aged ≥6 months throughout the influenza season.

respiratory specimens submitted to CDC indicates that the majority of these isolates are antigenically similar to the 2012–13 influenza vaccine viruses. Although the timing of influenza activity is not predictable, peak activity in the United States most commonly occurs in February; however, substantial activity can occur as late as May (*2*). Vaccination remains the most effective method to prevent influenza and its complications. December 2–8, 2012, is National Influenza Vaccination Week. This observance serves as a reminder that health-care providers should continue to offer vaccine to all unvaccinated persons aged ≥6 months throughout the influenza season.

Antiviral medications continue to be an important adjunct to vaccination for reducing the health impact of influenza. On January 21, 2011, Advisory Committee on Immunization Practices recommendations on use of antiviral agents for treatment and chemoprophylaxis of influenza were released (*4*). This guidance remains in effect for the 2012–13 season. Antiviral treatment as soon as possible is recommended for patients with confirmed or suspected influenza who 1) have severe, complicated, or progressive illness; 2) who require hospitalization; or 3) who are at higher risk for influenza complications*** without waiting for confirmatory testing (*4*). Antiviral treatment also may be considered for outpatients with confirmed or suspected influenza who do not have known risk factors for severe illness, if treatment can be initiated within 48 hours of illness onset. Recommended antiviral medications include oseltamivir and zanamivir. All influenza viruses tested for the 2012–13 season since October 1, 2012, have been susceptible to these medications. Amantadine and rimantadine should not be used because of high levels of resistance to these drugs among circulating influenza A viruses (*4*). Influenza B viruses are not susceptible to amantadine or rimantadine.

Influenza surveillance reports for the United States are posted online weekly and are available at http://www.cdc.gov/flu/weekly. Additional information regarding influenza viruses, influenza surveillance, influenza vaccine, influenza antiviral medications, and novel influenza A infections in humans is available at http://www.cdc.gov/flu.

*** Persons at higher risk include children aged <5 years (especially those aged <2 years); adults aged ≥65 years; persons with chronic pulmonary (including asthma), cardiovascular (except hypertension alone), renal, hepatic, hematologic (including sickle cell disease), metabolic disorders (including diabetes mellitus), or neurologic and neurodevelopment conditions (including disorders of the brain, spinal cord, peripheral nerve, and muscle, such as cerebral palsy, epilepsy [seizure disorders], stroke, intellectual disability [mental retardation], moderate to severe developmental delay, muscular dystrophy, or spinal cord injury); persons with immunosuppression, including that caused by medications or by human immunodeficiency virus infection; women who are pregnant or postpartum (within 2 weeks after delivery); persons aged ≤18 years who are receiving long-term aspirin therapy; American Indians/Alaska Natives; persons who are morbidly obese (i.e., body mass index ≥40); and residents of nursing homes and other chronic-care facilities.

Acknowledgments

State, local, and territorial health departments and public health laboratories; US WHO collaborating laboratories; the National Respiratory and Enteric Virus Surveillance System laboratories; US Outpatient Influenza-like Illness Surveillance Network; Influenza-Associated Pediatric Mortality Surveillance System; 122 Cities Mortality Reporting System.

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Errata

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For the report, "Vaccination Coverage Among Children in Kindergarten — United States, 2011–12 School Year," two state immunization programs submitted updated data, correcting data previously reported to CDC. On page 649, the fourth sentence of the second full paragraph should read, "The largest increase in exemption levels was reported by **Idaho**, with an increase of **1.6** percentage points; the largest decrease was reported by Nebraska, with a decrease of 2.3 percentage points."

In addition, in Table 2 on page 650, in the column labeled "Total exemptions," total exemptions for the 2011–12 school year in Arkansas should be **0.9%**, a difference from the 2009–10 school year of **0.3** percentage points. The total exemptions for the 2011–12 school year in Kansas should be **1.3%**, a difference from the 2009–10 school year of **0.3** percentage points.

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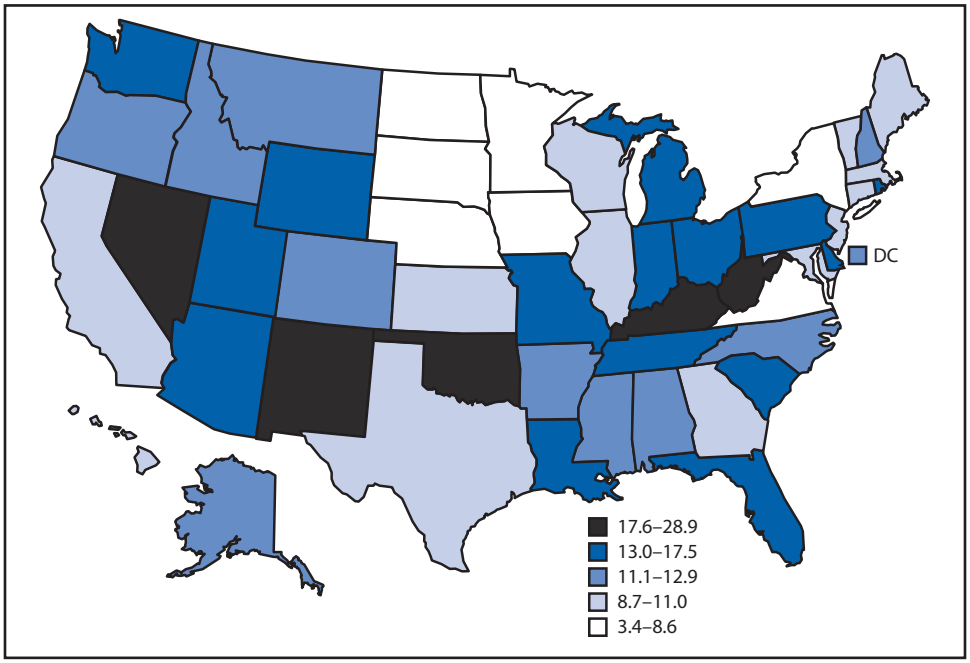
On page 978, in the QuickStats, "Birth Rates Among Women Aged 15–44 Years, by Maternal Age Group — National Vital Statistics System, United States, 1961, 2007, and 2011," several errors occurred. The caption should read, "During 1961–2011, birth rates decreased for all women aged 15–44 years. During 2007–2011, birth rates decreased for all women aged **<40** years, with rates for women aged 20–24 years (85.3 per 1,000 population) and those aged 15–19 years (31.3) reaching historic lows. The birth rate for women aged 25–29 years decreased 9% (to 107.2), and the rate for women aged 30–34 years decreased **4%** (to 96.5). The birth rate for women aged 35–39 years **decreased** 1% (47.2), and the rate for women aged 40–44 years increased **7%** (to 10.3)."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Drug-Poisoning* Death Rates† — National Vital Statistics System, United States, 2010



* Deaths include those coded as X40–X44, X60–X64, X85, or Y10–Y14 in the *International Classification of Diseases, 10th Revision*.
† Age adjusted, per 100,000 standard population.

In 2010, age-adjusted drug poisoning death rates varied by state, ranging from 3.4 to 28.9 per 100,000 standard population. The rate for the United States was 12.3. The five states with the highest rates were Oklahoma (19.4), Nevada (20.7), Kentucky (23.6), New Mexico (23.8), and West Virginia (28.9).

Source: CDC. Death rates for drug poisoning, by state of residence, United States, 2010. Available at http://www.cdc.gov/nchs/pressroom/states/drug_deaths_2010.pdf.

Reported by: Arialdi M. Miniño, MPH, aminino@cdc.gov, 301-458-4376; Margaret Warner, PhD.

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