Centers for Disease Control and Prevention

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Hepatitis Awareness Month and National Hepatitis Testing Day — May 2012

This month marks the 17th anniversary of Hepatitis Awareness Month and the first National Hepatitis Testing Day in the United States. In 2011, the U.S. Department of Health and Human Services (HHS) developed a comprehensive viral hepatitis action plan that outlines strategies in six areas to improve viral hepatitis prevention, care, and treatment in the United States (*1*). Three of these areas (protecting patients and workers from health-care–associated viral hepatitis, reducing viral hepatitis caused by drug-use behaviors, and strengthening surveillance) are highlighted by reports in this issue of *MMWR*.

The first report illustrates one major city's approach to tracking infection among patients exposed to hepatitis B virus (HBV) or hepatitis C virus (HCV) in health-care settings. The second report examines outbreaks of HBV infection associated with assisted blood glucose monitoring among residents of assisted living facilities in Virginia. Finally, a Notes from the Field describes an investigation of HCV transmission among young persons in Wisconsin, which provides further evidence of a troubling increase in the incidence of HCV infection associated with drug use among adolescents and young adults. The findings in all three reports underscore the importance of viral hepatitis surveillance in detecting outbreaks and changes in transmission patterns.

The HHS action plan also established May 19 as National Hepatitis Testing Day. Testing for viral hepatitis is the first step in linking HBV- and HCV-infected persons to recommended care and treatment. Additional information about National Hepatitis Testing Day activities is available at http://www.cdc.gov/hepatitis.

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Investigation of Viral Hepatitis Infections Possibly Associated with Health-Care Delivery — New York City, 2008–2011

Hepatitis B virus (HBV) and hepatitis C virus (HCV) infections are important causes of morbidity and mortality in the United States. Because HBV and HCV are transmitted efficiently percutaneously, possible transmission in health-care settings is of particular concern. Public health investigations of cases of HBV and HCV infection suspected to be associated with health-care delivery play an essential role in identifying unsafe practices and controlling health-care–associated viral hepatitis transmission. However, these investigations are resource intensive, and frequently overwhelm health department resources. Over many years, the New York City Department of Health and Mental Hygiene (DOHMH)

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developed a systematic approach to guide investigation and public health response to case reports of acute HBV or HCV infection in patients whose infection was potentially associated with health-care delivery. In this approach, the least resource-intensive investigation components are conducted for each case, and decisions to expand the investigation to more resource-intensive components are guided by the likelihood that a single case report represents a cluster of health-care–associated infections (HAIs). This report describes the DOHMH approach in the context of two single case reports. Components of this approach might be useful to other health departments that are developing their own approaches to this type of investigation.

Health care should provide no avenue for transmission of bloodborne pathogens, yet transmission of HBV and HCV in health-care settings is an increasingly recognized public health problem (*1,2*). During 2008–2011, a total of 31 outbreaks of HBV or HCV infection in health-care settings were reported to CDC. These outbreaks, reported from jurisdictions across the United States, resulted in approximately 250 persons acquiring HBV and/or HCV and the notification of approximately 88,000 persons potentially at risk for infection (*2*).

Outbreaks often are identified through the investigation of a single case report of acute HBV or HCV infection in which infection is suspected to be associated with health-care delivery (e.g., HAI). DOHMH investigates an average of 40 reports of persons with acute HCV and nearly 600 with acute HBV annually; for 10–20 of these reports each year, initial investigation determines that infection is potentially associated with health-care delivery. Because investigation of these reports has the potential to overwhelm available resources, beginning in 2001, DOHMH developed a systematic approach to guide investigation and public health response (Boxes 1 and 2). The least resource-intensive investigation components (i.e., interviews with the patients and their health-care providers) are conducted for each case. Decisions to expand the investigation to more resource-intensive components (e.g., site visits, active case finding, and broader notification of other patients) are guided by findings from the initial investigation.

The DOHMH approach is described in the context of the following two single case reports.

Case 1. In May 2007, a male resident of New York City aged 60–69 years contacted DOHMH to report his recent hepatitis C diagnosis. He and his gastroenterologist believed that he acquired HCV during an outpatient colonoscopy in February 2007; this was the index patient's only invasive procedure during the likely exposure period. Symptom onset occurred 32 days after the procedure and included influenza-like symptoms, anorexia, and joint pain. Laboratory tests revealed the presence of HCV RNA and elevated liver enzymes: alanine aminotransferase (635 IU/L [normal: 1–43 IU/L]) and aspartate aminotransferase (313 IU/L [normal: 1–40 IU/L]). The patient had no history of HCV testing. His liver enzymes were monitored routinely because of unrelated medications and had been normal during February 2006–November 2007. Following DOHMH's approach, a limited investigation was

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BOX 1. New York City Department of Health and Mental Hygiene (DOHMH) approach to initial epidemiologic investigation of suspected health-care–associated hepatitis B virus (HBV) or hepatitis C virus (HCV) infection

Some activities may be conducted simultaneously.

- Determine whether index patient meets the CDC/Council of State and Territorial Epidemiologists case definition for acute hepatitis B or C, or had documented seroconversion ≤1 year after the potential exposure.
- Interview index patient to determine whether he or she had behavioral risk factors for infection, or had invasive health-care procedures (including injections) during the likely exposure period.
- Interview the primary-care physician to discuss index patient, including possible risk exposures.
- Determine whether the clinician(s) who performed an implicated procedure was associated previously with cases of health-care–associated or potentially health-care–associated HBV or HCV infection; a database is maintained by DOHMH for this purpose.
- Consider requesting a list of patients who had procedures on day of implicated procedure and surrounding 1–2 days. Match these records against DOHMH hepatitis B and C surveillance databases to determine whether any patients who had procedures on the same day as index patient had been reported previously with acute or chronic HBV or HCV infections.
- Verify that all clinicians and health-care providers in the implicated health-care setting have valid New York state medical and professional licenses, and determine if any previous violations have been reported.
- Consider educating health-care providers about appropriate infection control (e.g., safe injection practices) by telephone, especially if an onsite visit will not occur immediately.

If any of these activities increases concern that health-care–associated transmission occurred at the health-care setting in question, proceed with a full investigation (Box 2).

initiated (Box 1). No risk factors for HCV infection (e.g., injection drug use or blood transfusion before 1992) other than the colonoscopy were identified.

On May 29, 2007, DOHMH contacted the gastroenterologist who had performed the colonoscopy. The gastroenterologist and anesthesiologist who were involved in the index patient's procedure had valid medical licenses, without any disciplinary actions; neither was aware of other new hepatitis C diagnoses among their patients.

Records indicated that the index patient received 2 doses of intravenous propofol (1 dose = 6–8 cc). In a telephone interview conducted on May 29, 2007, the anesthesiologist stated that he routinely reused single-use propofol vials (including both 20 cc and 50 cc vials) for more than one patient. DOHMH advised the anesthesiologist to discontinue this practice immediately. According to the procedure log, six additional patients had undergone endoscopy procedures on the same day as the index patient; all received anesthesia. DOHMH matched the patient names and birth dates against its HCV surveillance database; two matches were identified. Both patients had HCV infections before the procedure date. One of these patients had an esophagogastroduodenoscopy (EGD) immediately before the index patient, increasing concerns that health-care–associated transmission had occurred. Accordingly, DOHMH proceeded with a full investigation (Box 2).

At the time of the initial investigation (May 2007), the anesthesiologist was no longer working in the gastroenterology practice where the procedures had occurred. Onsite investigation of the medical office where the anesthesiologist was currently practicing was delayed until December 2007 because of limited DOHMH resources and competing priorities. During the onsite investigation of the anesthesiologist, no obvious infection control lapses were identified. The anesthesiologist stated that he had stopped reusing single propofol vials for multiple patients since the telephone interview with DOHMH. During the observation of two procedures, the anesthesiologist was not observed to reuse needles or syringes to enter medication vials, even when obtaining additional doses for the same patient. In January 2008, DOHMH conducted an onsite investigation of the gastroenterologist's office; no infection control lapses were identified.

The remaining four patients who had had procedures on the same day as the index patient and the possible source patient were contacted; all tested negative for HCV antibodies, as did the anesthesiologist. An electronic database from the anesthesiologist's billing company was obtained, and 2,907 patients treated by the anesthesiologist during January 1, 2005–November 30, 2007 were matched against the DOHMH hepatitis C surveillance database in an attempt to identify additional clusters. A potential cluster was defined as two or more patients with a positive HCV test who had

BOX 2. New York City Department of Health and Mental Hygiene (DOHMH) approach to full epidemiologic investigation of health-care–associated hepatitis B virus (HBV) or hepatitis C virus (HCV) infection, after completion of an initial epidemiologic investigation

Some activities may be conducted simultaneously.

- Conduct onsite visit of medical practice under the authority of DOHMH.
  - Review infection control procedures (e.g., safe injection practices).
  - Observe at least one procedure or mock procedure, including preparation and administration of anesthesia/sedation, if applicable.
  - Review medical records for index case(s) and patients examined during the same day and surrounding 1–2 procedure days.
  - Interview all staff members, eliciting any concerns about infection control practices and procedures as well as possible drug abuse or narcotics diversion by staff members.
  - Observe security measures in place for access to narcotic and anesthetic medications, if used on site.
- Recommend HBV or HCV testing for other patients examined during the same procedure day as the index patient, as well as patients examined during the surrounding 1–2 procedure days, if warranted.
- Obtain patient databases (e.g., billing databases) to match against DOHMH hepatitis B and C surveillance databases. The period covered by these databases should be determined by the period over which cases occurred, the period over which any known aberrant practices took place, and what feasibly can be obtained.
- Obtain information on equipment used for each patient (e.g., medication packaging [single versus multidose vials] and serial numbers of endoscopes).
- Collect blood specimens from patients known to be positive for chronic HBV or HCV infection for genotyping or molecular sequencing, if necessary. Obtain patients' consent, disclosing how specimens will be used.
- Consider collecting blood specimens for HBV and HCV testing from the clinician(s) who performed the procedure in question or administered anesthesia during the procedure, as well as any other medical practice staff members who might have had access to anesthetics or narcotics.
- Consider broader notification of patients treated by the implicated health-care provider or practice to inform them of possible exposure to bloodborne pathogens and to advise that testing is recommended.

procedures on the same day, at least one of whom was first diagnosed with HCV infection after the procedure date. Such a cluster might indicate a separate transmission event that had occurred during procedures performed by the anesthesiologist. However, no additional clusters were identified.

Serum specimens from the index patient and the possible source patient were analyzed by the New York State Department of Health laboratory using methods described previously (*3*). Both patients were infected with HCV genotype 2b strains; the two strains also exhibited matching viral sequences. On the basis of the epidemiologic and laboratory findings, DOHMH concluded that health-care–associated transmission between these patients most likely occurred as a result of incorrect use of needles, syringes, or medication vials. Endoscopes were ruled out as a likely transmission vehicle because the index patient and source patient had different types of procedures with different types of scopes. Because no specific transmission mechanism or additional cases were identified, a decision was made not to notify additional patients beyond those who had been tested as part of the initial investigation.

Case 2. In April 2009, DOHMH was notified by an attorney regarding a case of acute HCV infection in a woman in her 40s after an EGD procedure in April 2006. Five weeks after her procedure, the woman was hospitalized and diagnosed with acute HCV infection. Although acute HCV is a reportable condition in New York City, the patient's health-care providers had not reported this case to DOHMH at the time of diagnosis. DOHMH interviewed the patient and her primary-care provider; no behavioral risk factors for HCV infection were identified. The patient had no previous history of HCV testing.

The anesthesiologist for the EGD procedure was the same anesthesiologist associated with case 1, and the procedure date was during a period when the anesthesiologist routinely reused single-use propofol vials for multiple patients. A different gastroenterologist had performed this procedure in a different outpatient practice. Given the absence of other risk factors, timing of symptom onset, and association with the anesthesiologist who was implicated in case 1, DOHMH revised its previous decision and proceeded to notify all 3,287 patients who received care from this anesthesiologist during

January 1, 2005–July 30, 2008.* Patients were notified by mail with a recommendation to be tested for HBV, HCV, and human immunodeficiency virus.

Reported by

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Editorial Note

Transmission of HBV and HCV has occurred in a broad range of U.S. health-care settings (*1,2,4,5*), and recognized transmission events likely represent only a small proportion of a larger problem (*1,6*). Public health investigations of case reports of acute HBV and HCV infections suspected to be HAIs play an essential role in identifying unsafe practices and controlling health-care–associated viral hepatitis transmission. In the two cases described in this report, transmission likely resulted from breaches in aseptic technique when preparing and administering parenteral injections. Similar breaches have been identified in the majority of outbreaks that involved patient-to-patient HCV transmission (*4,6*).

Despite the public health importance of investigations of HBV and HCV infections suspected to be HAIs, current capacity to fully investigate cases in a timely manner and identify and respond to outbreaks in health-care settings is lacking (*7*). Confirmation of health-care–associated transmission of HBV and HCV generally relies on 1) functioning public health surveillance and reporting, 2) thorough case investigation and successful identification of breaches in infection control during health care delivery, and 3) case finding to identify additional persons who might be infected. These activities are resource-intensive and pose numerous challenges. In many cases, despite intensive investigation, transmission associated with health-care delivery cannot be confirmed. Onsite assessments might not identify infection control breaches. For example, infection control breaches might be intermittent, especially if health-care providers are aware of proper technique but lapse when they are distracted or busy (*8*), or knowledge that an investigation is under way might lead to changes in practice. Additionally, in NYC, health-care providers are educated regarding appropriate infection control practices when first contacted by DOHMH, and are directed to immediately change any unsafe practices that are identified in initial telephone interviews. Finally, although single cases might be evidence of a larger problem, transmission also can represent an isolated event. Determining when to investigate a case report, how many resources to dedicate to the investigation, and when to notify persons of potential exposure, can be difficult for health departments. The DOHMH approach to investigating these case reports has provided a framework to guide public health investigation and response in the context of the resources available in NYC. In this approach, as illustrated by the cases described in this report, the least resource-intensive investigation components are conducted for each case, and decisions to expand the investigation to more resource-intensive components are guided by the likelihood that a single case report represents a cluster of HAIs.

Components of the DOHMH approach might be helpful to other health departments that are developing their own approaches to this type of investigation. In addition, CDC recently has developed a toolkit of recommended steps for the investigation of single cases of HBV or HCV infection suspected to be associated with health-care delivery (*9*). This toolkit, which was developed with input from DOHMH along with other state and local health departments, provides a useful framework for state and local health departments to develop an approach to these investigations that suits the resources available in their jurisdictions.

What is already known on this topic?

Transmission of hepatitis B virus (HBV) and hepatitis C virus (HCV) in health-care settings is an increasingly recognized public health problem. Investigations of potentially health-care–associated HBV or HCV can be resource-intensive.

What is added by this report?

The New York City Department of Health and Mental Hygiene (DOHMH) developed a systematic approach to guide investigation and public health response to single case reports of acute HBV or HCV infection in patients whose infection potentially was associated with health-care delivery. This report describes this approach in the context of two single case reports. In both cases, transmission most likely was associated with a single anesthesiologist who had drawn medication for multiple patients from single-dose vials.

What are the implications for public health practice?

DOHMH follows a consistent approach to deciding the extent of case investigations which it believes protects the public's health while conserving the public's resources. Aspects of the DOHMH approach might be relevant for public health practitioners in other jurisdictions.

* In July 2008, the anesthesiologist provided invoices documenting that he had purchased only the smaller, 20cc vials; although he stated that he was no longer reusing single-use vials on multiple patients in May 2007, July 2008 was chosen as the more conservative date.

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Multiple Outbreaks of Hepatitis B Virus Infection Related to Assisted Monitoring of Blood Glucose Among Residents of Assisted Living Facilities — Virginia, 2009–2011

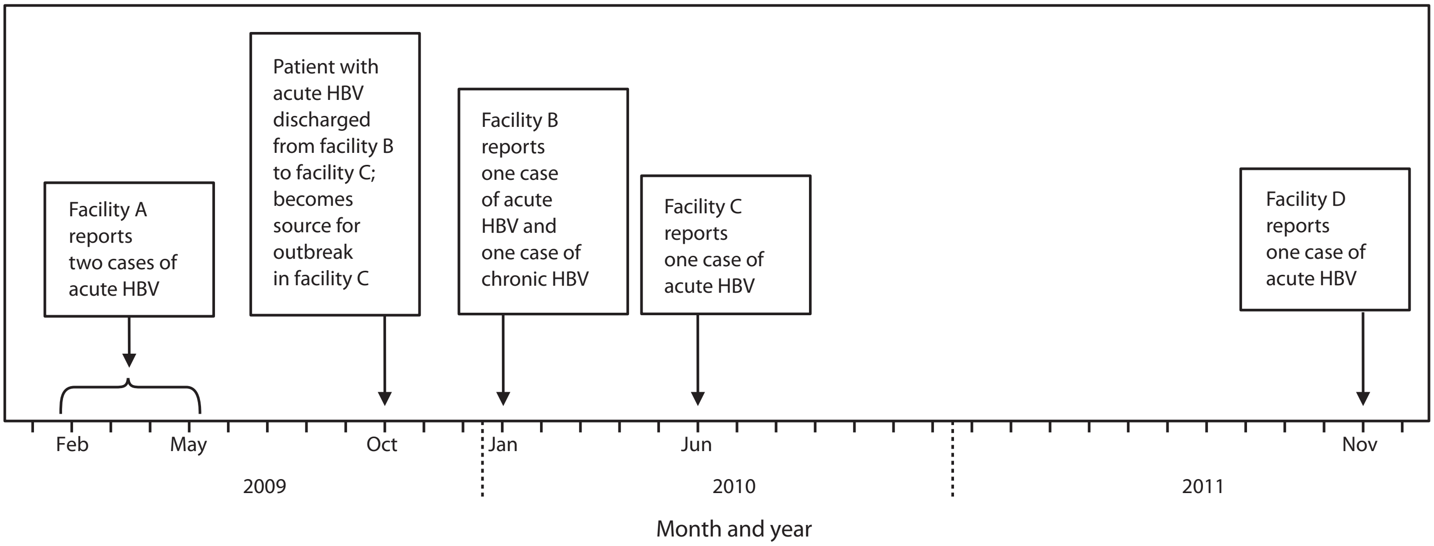
Between February 2009 and November 2011, the Virginia Department of Health (VDH) was notified of acute hepatitis B virus (HBV) infections occurring in residents of four separate assisted living facilities (ALFs) in the Central Health Planning Region of Virginia. In each outbreak, the initial acute HBV infections were identified through routine viral hepatitis surveillance. VDH conducted epidemiologic and laboratory investigations of these reports. Infection control practices, particularly surrounding assisted monitoring of blood glucose (AMBG), were assessed by direct observation and staff member interviews. Further investigation and subsequent screening of ALF residents for hepatitis B uncovered additional acute HBV infections at each of the ALFs. ALF residents screened for HBV infection were categorized on the basis of published criteria as having acute or chronic infection, or being susceptible or immune to infection (*1*). All acute HBV infections were among residents receiving AMBG for management of diabetes. AMBG is safe when properly performed, but lapses in infection prevention practices during AMBG were identified at three of the four facilities. These outbreaks highlight the role of hepatitis B surveillance in detecting disease outbreaks and the need for a comprehensive strategy to prevent HBV transmission in ALFs, including vaccination, improved infection control oversight at ALFs, appropriate training of staff members performing AMBG, and prompt investigation of acute HBV infections.

Facility A. Facility A was primarily an elder-care ALF. Median resident age was 85 years (range: 61–97 years). In February 2009, VDH was notified of one case of acute HBV infection in a resident, aged 71 years, who was receiving AMBG (Figure). On-site observations did not identify any infection control lapses related to AMBG. In May 2009, VDH was notified of another case of acute HBV infection in a facility A resident receiving AMBG. An investigation was initiated, and 41 of the 47 residents were screened for HBV; two additional acute HBV cases and five previously unidentified chronic infections were identified. With the availability of additional laboratory results, a case initially misclassified as a chronic infection in an October 2008 surveillance report was determined to have been an acute infection. Residents in all five acute cases and four of the five chronic cases were receiving AMBG. Full HBV genomic sequencing was successful for isolates from three acute cases and four of the residents found to have chronic infection at screening. All but one of these residents had received AMBG. All sequences shared 99.9%–100.0% genetic identity, suggesting patient-to-patient transmission through cross-contamination among the acute and chronic cases.

Facility B. Facility B was an ALF that primarily housed residents with neuropsychiatric disorders in two adjacent buildings. Median age of residents was 59 years (range: 28–93 years). In January 2010, VDH received reports of two HBV infections (one acute and one chronic) among residents aged 59 years and 62 years. Screening of 126 of the 139 residents for HBV infection detected 13 additional acute cases, and one previously known and four newly identified chronic infections. Of 19 residents with diabetes, 13 received AMBG, among whom 12 (92%) had acute HBV infection. HBV molecular sequencing identified clusters within each building. Three related cases (two acute and one chronic) occurred among residents of one building, and 11 related cases (nine acute and two chronic) occurred among residents of the other building. In each cluster, cases shared 99.8%–100.0% nucleotide identity across the entire genome. The two clusters were not related to each other, suggesting patient-to-patient transmission of HBV within each building. One previously identified chronic case did not belong to either cluster. The investigation found that multiple procedural breaches by various staff members occurred during AMBG, including shared use of penlet-style reusable fingerstick devices (intended only for a single patient) between more than one resident, failure to perform hand hygiene consistently, and failure to clean and disinfect shared blood glucose meters (glucometers) used for more than one resident.

Facility C. Facility C was primarily an elder-care ALF. Median resident age was 83 years (range: 44–105 years). In June 2010, VDH received a report of an acute HBV infection in a resident, aged 76 years, who received AMBG at the facility. Through screening in October 2010, two additional acute HBV infections were diagnosed in residents receiving AMBG who lived on the same floor, although investigation later revealed one of these residents actually had a chronic HBV infection. Review of medical records revealed that the resident with chronic HBV infection had transferred from facility B in October 2009, shortly after a diagnosis of acute HBV. Among persons who had resided in facility C at any time during October 2009–October 2010, 131 current residents and 100 former residents were identified. Among those 231 persons, 151 were screened, and three additional acute HBV infections were identified. All cases had received AMBG at facility C.

FIGURE. Sequence of outbreaks of hepatitis B virus (HBV) infection at four assisted living facilities — Virginia, 2009–2011



HBV sequences of three acute cases and the chronic case shared a 99.8%–100.0% genetic identity with one of the HBV clusters previously identified at facility B. The investigation revealed that each resident had a dedicated blood glucose meter and fingerstick device, but that staff members occasionally used the same penlet-style fingerstick device for more than one resident. Staff members also occasionally reused blood glucose meters for more than one resident without cleaning and disinfection. Fingerstick devices are designed for single resident use and should never be used on more than one person. CDC recommends using a dedicated blood glucose meter for each person; however, the devices may be reused if cleaned and disinfected between persons, as per manufacturers' instructions.*

Facility D. Facility D was an ALF primarily serving residents with neuropsychiatric disorders. Median age of residents was 56 years (range: 20–83 years). In November 2011, VDH received a report of acute HBV infection in a resident aged 55 years. In the course of the initial case investigation, VDH identified a second hospitalized resident, aged 64 years, with acute HBV not yet reported. Screening of 103 of the 120 current residents identified six additional acute cases (including two recently resolved cases) and four chronic HBV infections. Molecular analysis revealed that eight residents with HBV infections, including the index case, matched into a cluster; five with acute HBV infection and three with chronic infection, indicating patient-to-patient transmission for the acute and chronic cases. Insufficient viral material was available for genetic sequencing from three patients with resolving acute infection and one patient with chronic infection. Although one of the chronic cases involved a patient who had been a resident at facility B, HBV genome sequencing demonstrated a distinct phylogenetic cluster from those identified in facilities B and C. All residents with acute or chronic HBV infections had received AMBG. The investigation revealed infection control lapses similar to those identified at the other facilities, despite a policy for use of single-use, auto-disabling, disposable lancets and available supplies at the facility.

Overall, 121 of 536 (23%) residents of the four ALFs had diabetes (Table). Of the 121 residents with diabetes, 109 (90%) were tested for hepatitis B serologic markers. Among the 109 tested, at least 73 (67%) were susceptible to HBV infection before the outbreaks (Table). Of 73 residents initially susceptible to HBV infection, 16 (22%) were aged <60 years. By facility, attack rates among susceptible residents with diabetes ranged from 14.3% to 71.4%, and when analysis was restricted to residents with diabetes receiving AMBG, attack rates by facility ranged from 16.7% to 92.3%. Newly identified chronic infection cases at each facility were not included in the calculation of attack rates. However, those newly identified chronic infections that matched the molecular genetic clusters likely represent outbreak-related cases. Given the extended incubation period of hepatitis B (6 weeks to 6 months), and that elderly persons are more likely to progress to chronic infection than other adults, the outbreaks might have been ongoing for several months before investigations began.

Staff members who provided patient care at two of the facilities (A and D) also were screened. At all facilities, staff member HBV vaccination status was assessed and recommendations made to ensure that unvaccinated patient-care staff members receive vaccination. No HBV cases were reported or detected

* Additional information available at http://www.cdc.gov/injectionsafety/blood-glucose-monitoring.html.

TABLE. Acute hepatitis B virus (HBV) infection during outbreaks among residents of four assisted living facilities, by selected characteristics — Virginia, 2009–2011

	Facility A		Facility B		Facility C		Facility D		Total	
Characteristic	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Residents during outbreak period*	47		139		231		120		536	
Age group (yrs)										
19–59	0		70	(50)	8	(3)	99	(83)	**177**	**(33)**
≥60	47	(100)	69	(50)	223	(97)	21	(18)	**360**	**(67)**
Tested for HBV	41	(87)	126	(91)	151	(65)	103	(86)	**420**	**(78)**
HBV immune	0		33	(26)	11	(7)	28	(27)	**72**	**(17)**
HBV susceptible†	27	(66)	88	(70)	138	(91)	70	(68)	**323**	**(77)**
Chronic HBV infection	5	(12)	5	(4)	1	(1)	5	(5)	**16**	**(4)**
Indeterminate	9	(22)	0	(0)	1	(1)	0	(0)	**10**	**(2)**
Acute cases§ (attack rate¶)	5	(18.5)	14	(15.9)	5	(3.6)	7	(10.0)	**31**	**(9.6)**
Residents with diabetes	15	(32)	32	(23)	50	(22)	24	(20)	**121**	**(23)**
Tested for HBV	14	(93)	32	(100)	39	(78)	24	(100)	**109**	**(90)**
HBV susceptible†	7	(50)**	19	(59)	35	(90)	12	(50)**	**73**	**(67)**
HBV susceptible, by age group (yrs)										
19–59	—		6	(32)	—	—	9	(75)	**15**	**(21)**
≥60	7	(100)	13	(68)	35	(100)	3	(25)	**58**	**(79)**
Acute cases§ (attack rate¶)	5	(71.4)	12	(63.2)††	5	(14.3)¶¶	7	(58.3)	**29**	**(39.7)**

* At facilities A and B, current residents at time of outbreak investigation were screened; at facilities C and D, in addition to current residents, former residents during the estimated outbreak period (up to 6 months before the first reported case) were contacted for screening.
† Patients who were acutely infected during the outbreak were considered to have been susceptible before the outbreak.
§ Initial acute hepatitis B case finding based on surveillance case reports. Acute cases were defined as positive tests of immunoglobulin M core antibody in a patient with no previous history of HBV infection (acute infection). Cases of very early acute infection with detectable virus and initially negative surface antigen or total core antibody, with subsequent development of positive surface antigen and total core antibody, also were detected.
¶ Attack rate = no. cases / no. susceptible. Newly identified chronic infection cases at each facility were not included in the calculation of attack rates.
** All susceptible persons with diabetes received assisted monitoring of blood glucose (AMBG).
†† Attack rate was 92.3% among the 13 (68%) persons with diabetes receiving AMBG.
¶¶ Attack rate was 16.7% among the 30 (60%) persons with diabetes receiving AMBG.

among staff members at facilities B, C, and D. At Facility A, two of 17 staff members tested had acute HBV. Investigators identified that after performing AMBG, personnel manually removed used, exposed lancets from the fingerstick device, placing themselves at risk for exposure via a sharps injury. Neither staff member had received HBV vaccination.

Reported by

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Editorial Note

ALFs provide housing and care to persons unable to live independently in their own homes, but who do not require the level of care provided at a nursing home. ALF capacity in the United States is approximately 1 million beds, with this number expected to grow in response to an aging population and a shift in custodial care from nursing homes to assisted living (*2*). Although ALFs primarily provide support for activities of daily living, health care (including AMBG) routinely is delivered on-site at ALFs by various unlicensed or licensed personnel, including medication aides, nurses, and others (*3*). In the United States, 27 (93%) of the 29 HBV outbreaks involving adults in long-term–care facilities reported to CDC since 1996 have been among residents with diabetes receiving AMBG (*4*), and in recent years, the majority of these outbreaks have occurred in ALFs (*5*). Other avenues of infection have included infection control breaks during podiatry or the provision of other health care, and sexual or other person-to-person household transmission. The four outbreaks in Virginia demonstrate the challenges in implementing infection prevention and control measures during AMBG in ALFs, despite ongoing efforts by VDH to enhance infection control education and oversight in ALFs.† These outbreaks lend support to an increasing body of evidence suggesting the need for a comprehensive strategy to ensure safe AMBG in ALFs.

† VDH has created and distributed an infection control toolkit to all ALFs in the state through the Virginia Healthcare-Associated Infections program. Ad hoc training sessions and in-service programs also are provided by local health departments on occasion. Additional information available at http://www.vdh.virginia.gov/epidemiology/surveillance/hai/longterm.htm#assisted.

What is already known on this topic?

In the United States, 27 hepatitis B virus (HBV) outbreaks involving adults with diabetes receiving assisted monitoring of blood glucose (AMBG) have been reported to CDC since 1996. In October 2011, the Advisory Committee on Immunization Practices recommended that adults aged 19 through 59 years with diabetes mellitus (type 1 and type 2) be vaccinated against hepatitis B.

What is added by this report?

Failures to adhere to infection control practices in four assisted living facilities (ALFs) in Virginia led to the transmission of HBV to 31 of 323 (9.6%) susceptible residents. Attack rates among susceptible residents with diabetes ranged by facility from 14.3% to 71.4%, and when analysis was restricted to residents with diabetes receiving AMBG, attack rates ranged from 16.7% to 92.3%.

What are the implications for public health practice?

Hepatitis surveillance and follow-up investigations of reported acute HBV infections among the elderly by the Virginia Department of Health played an essential role in identifying unsafe practices and implementing appropriate control measures. In addition to HBV vaccination, interventions should include improved infection control oversight at ALFs, appropriate training of staff members performing AMBG, and prompt investigation of acute HBV infections.

Hepatitis B is a vaccine-preventable disease. In October 2011, the Advisory Committee on Immunization Practices recommended that adults aged 19–59 years with diabetes mellitus (type 1 and type 2) be vaccinated against HBV. In addition, adults aged ≥60 years with diabetes may be vaccinated at the discretion of the treating clinician (*6,7*). A high proportion of residents with diabetes in the four ALFs in this report were susceptible to HBV infection, although many residents of these facilities were aged ≥60 years. Decisions to vaccinate adults with diabetes in this age group should be made after considering the patient's diminished likelihood of responding to vaccine and the likelihood of acquiring HBV infection, including the risk posed by an increased need for AMBG in long-term–care facilities (*6,7*). The risk for progression to chronic infection, morbidity, and mortality from acute HBV infection is higher among the elderly than other adults (*8*). Vaccination alone is unlikely to completely eliminate HBV transmission risk in ALFs. In addition to HBV vaccination, other interventions should include improving infection control oversight at ALFs, training staff members to appropriately perform AMBG, and ensuring that each ALF has a sufficient number of trained personnel to perform AMBG 7 days per week (*9*).

In nursing homes, which are regulated by the federal Centers for Medicare and Medicaid Services, practices such as shared use of fingerstick devices for multiple patients can result in a loss of billing privileges for the nursing home. In contrast, ALFs are regulated by state agencies. VDH recently has begun working with the Virginia Department of Social Services to incorporate assessment of infection control practices into ALF inspections. Similar activities by other health departments and facilities will help ensure that ALF staff members nationally are performing AMBG appropriately.

Because of pervasive lack of awareness of the risks for bloodborne pathogen transmission related to AMBG, CDC issued updated guidance on infection control practices during AMBG in 2011, including recommendations for the use of single-use, auto-disabling, disposable lancets and dedication of blood glucose monitors to individual patients when possible. Persons responsible for providing AMBG in any setting should be trained to use proper procedures, but maintaining a trained group of ALF staff members is hindered by high turnover and a lack of licensed health-care personnel employed by ALFs (*2*). Following an outbreak of HBV infections among ALF residents in North Carolina that resulted in six deaths (*10*), the North Carolina Department of Health and Human Services worked with legislators and industry representatives to update infection control requirements for ALF staff members.[§] Studies of evidence-based approaches to address the persistent problem of maintaining appropriate levels of infection control training among ALF staff members also are needed.

Acute hepatitis B surveillance requires laboratory and provider reports of potential acute hepatitis B cases to health departments, which conduct follow-up to supplement important epidemiologic information. Because of the long incubation period of hepatitis B (6 weeks to 6 months), and given that most hepatitis B cases (>50%) are asymptomatic, these outbreaks are very difficult to detect. The four ALF outbreaks in Virginia were detected by an effective hepatitis B surveillance system accompanied by prompt and thorough epidemiologic and laboratory investigation of acute HBV infection reports by VDH, with assistance from CDC. Investigation of these reports plays an essential role in identifying unsafe practices and implementing appropriate control measures. A systematic approach to guide investigations and public health response in these situations was developed with collaboration between CDC and state and local health departments.[¶] The delivery of health care, whether in a hospital, nursing home, or ALF, should offer no avenue for transmission of viral hepatitis. To ensure patient safety in ALFs, a strategy that incorporates viral hepatitis surveillance, HBV vaccination, improved infection control oversight at ALFs, appropriate training of staff members performing AMBG, and prompt investigation of acute HBV infections is needed.

§ Additional information available at http://www.ncleg.net/enactedlegislation/sessionlaws/pdf/2011-2012/sl2011-99.pdf.

¶ Additional information available at http://www.cdc.gov/hepatitis/outbreaks/healthcareinvestigationguide.htm.

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Drowning — United States, 2005–2009

Drowning is a leading cause of unintentional injury death worldwide, and the highest rates are among children (*1*). Overall, drowning death rates in the United States have declined in the last decade; however, drowning is the leading cause of injury death among children aged 1–4 years (*2,3*). In 2001, approximately 3,300 persons died from unintentional drowning in recreational water settings, and an estimated 5,600 were treated in emergency departments (EDs) (*4*). To update information on the incidence and characteristics of fatal and nonfatal unintentional drowning in the United States, CDC analyzed death certificate data from the National Vital Statistics System and injury data from the National Electronic Injury Surveillance System – All Injury Program (NEISS-AIP) for 2005–2009. The results indicated that each year an average of 3,880 persons were victims of fatal drowning and an estimated 5,789 persons were treated in U.S. hospital EDs for nonfatal drowning. Death rates and nonfatal injury rates were highest among children aged ≤4 years; these children most commonly drowned in swimming pools. The drowning death rate among males (2.07 per 100,000 population) was approximately four times that for females (0.54). To prevent drowning, all parents and children should learn survival swimming skills. In addition, 1) environmental protections (e.g., isolation pool fences and lifeguards) should be in place; 2) alcohol use should be avoided while swimming, boating, water skiing, or supervising children; 3) lifejackets should be used by all boaters and weaker swimmers; and 4) all caregivers and supervisors should have training in cardiopulmonary resuscitation.

Death certificate data for 2005–2009 were obtained from the National Vital Statistics System.* Fatal unintentional drowning was defined as any death for which the underlying cause recorded on death certificates was one of the following *International Classification of Diseases, 10th Revision* codes: W65–W74, V90, or V92. By international standards, boating-related drowning (V90 and V92) is classified as transportation-related death.† Boating-related deaths are presented in this report as a subcategory to allow for international comparison, although most boating in the United States is not for transportation.

Data on nonfatal drowning were gathered from NEISS-AIP, which is operated by the U.S. Consumer Product Safety Commission. NEISS-AIP collects data annually on approximately 500,000 initial visits for all types of injuries treated in U.S. EDs.§ Data are drawn from a nationally representative subsample of 66 hospitals out of 100 NEISS hospitals selected as a stratified probability sample of hospitals in the United States and its territories; the hospitals have a minimum of six beds and a 24-hour ED.

Nonfatal cases included those classified as having a precipitating or immediate cause of "drowning/near-drowning," a diagnosis of "submersion," or the mention of "drown" or "submersion" in the comment field. To collect and classify nonfatal cases in a manner similar to deaths, case narratives were reviewed and intentional and motor vehicle crash–related drownings were excluded. Persons who were dead on arrival or who died in the ED also were excluded. Each case was assigned a sample weight on the basis of the inverse probability of selection; these weights were summed to provide national estimates. National estimates were based on 605 patients treated for nonfatal drowning at NEISS-AIP hospital EDs during 2005–2009. Confidence intervals were calculated using statistical software to account for the complex sample design. Because of the small sample size, percentages of nonfatal injuries for location by age group were based on unweighted data and thus are not nationally representative.

Drowning was examined by age group, sex, race/ethnicity, location, disposition (e.g., treated and released, hospitalized or transferred), day of week, and month of year when possible. Persons identified as Hispanic might be of any race. Persons identified as white, black, or other race all were non-Hispanic. Rates were calculated using U.S. Census bridged-race intercensal population estimates.¶ Significant differences ($p<0.05$) between rates were determined using a t-test for nonfatal drowning rates and a z-test for death rates.

During 2005–2009, overall, an average of 3,880 persons died from unintentional drowning (including boating incidents) annually in the United States (1.29 deaths per 100,000 population) (Table). Rates were highest among children aged ≤4 years (2.55), and the death rate for males (2.07) was nearly four times that for females (0.54). The death rate for blacks (1.40) was significantly higher than the overall death rate (1.29), and the death rate for Hispanics was significantly lower (1.19). Racial/ethnic disparity in drowning death rates was greatest among children aged 5–14 years (blacks, 1.34; Hispanics, 0.46; and whites, 0.48). Approximately half (51.1%) of fatal drownings occurred in natural bodies of water. From 2005 to 2009, death rates declined significantly from 1.34 per 100,000 to 1.25 ($p=0.002$).

* Additional information available at http://www.cdc.gov/nchs/deaths.htm.

† Additional information available at http://www.cdc.gov/nchs/injury/injury_tools.htm.

§ Additional information available at http://www.cdc.gov/ncipc/wisqars/nonfatal/datasources.htm#5.2.

¶ Additional information available at http://www.cdc.gov/nchs/nvss/bridged_race.htm.

During 2005–2009, an estimated 5,789 persons on average were treated annually in U.S. EDs for nonfatal drowning (Table). Children aged ≤4 years accounted for 52.8% of the ED visits, and children aged 5–14 years accounted for 17.5%. Males accounted for 60.2% of nonfatal drowning patients, and 50.2% of the ED patients required hospitalization or transfer for further care. In addition, of nonfatal drowning injuries among those aged ≥15 years, 21.8% were associated with alcohol use.

Nonfatal (45.5%) and fatal (37.1%) incidents occurred most commonly on weekends and during June–August, 57.5% and 46.7%, respectively. Among children aged ≤4 years, 50.1% of fatal incidents and 64.6% of nonfatal incidents occurred in swimming pools (Figure). Drownings in natural water settings increased with increasing age group. Incidents in bathtubs accounted for approximately 10% of both fatal and nonfatal drownings and were most common among children aged ≤4 years.

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Editorial Note

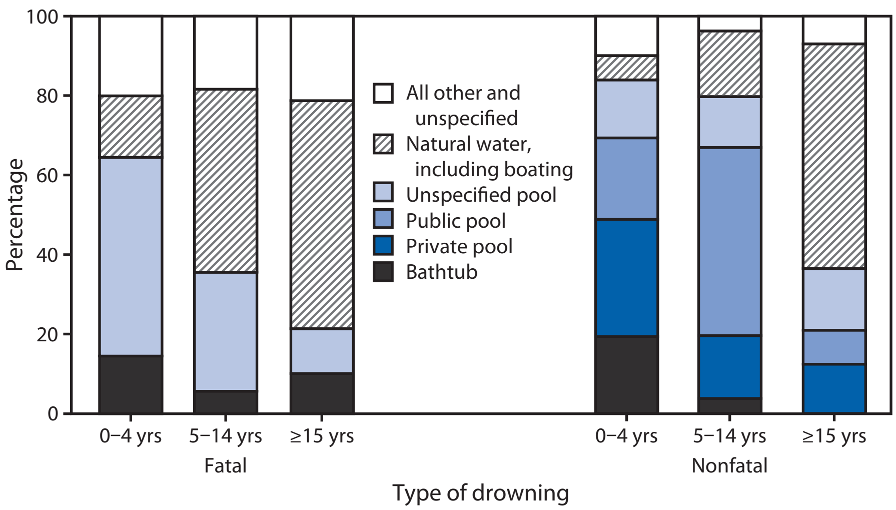
In the United States, children aged 1–4 years continue to have the highest drowning death rates, and those rates are

TABLE. Annual number, percentage, and rate* of nonfatal and fatal unintentional drownings,† by selected characteristics — National Vital Statistics System and National Electronic Injury Surveillance System – All Injury Program, United States, 2005–2009

	Nonfatal				Fatal		
Characteristic	**Estimated no.**	**(%)**	**Rate**	**(95% CI)**	**No.**	**(%)**	**Rate**
Age (yrs)							
0–4	3,057	(52.8)	15.21	(6.86–23.56)	513	(13.2)	2.55
5–14	1,012	(17.5)	2.49	(1.62–3.36)	252	(6.5)	0.62
≥15	1,718	(29.7)	0.71	(0.38–1.05)	3,107	(80.1)	1.29
Unknown	2	(0.03)	—	—	9	(0.2)	—
Sex							
Male	3,486	(60.2)	2.35	(1.24–3.47)	3,057	(78.8)	2.07
Female	2,301	(39.7)	1.50	(0.87–2.13)	823	(21.2)	0.54
Unknown	2	(0.03)	—	—	—	—	—
Race/Ethnicity§							
White	—	—	—	—	2,561	(66.0)	1.28
Black	—	—	—	—	566	(14.6)	1.40
Other race	—	—	—	—	209	(5.4)	1.21
Hispanic	—	—	—	—	524	(13.5)	1.19
Unknown	—	—	—	—	20	(0.5)	—
Location of drowning¶							
Bathtub	534	(9.2)	—	—	403	(10.4)	—
Swimming pool	3,341	(57.7)	—	—	683	(17.6)	—
Private pool**	1,616	(27.9)	—	—	—	—	—
Public pool	956	(16.5)	—	—	—	—	—
Unspecified pool	769	(13.3)	—	—	—	—	—
Natural water	1,460	(25.2)	—	—	1,982	(51.1)	—
Fresh water	525	(9.1)	—	—	—	—	—
Ocean**	412	(7.1)	—	—	—	—	—
Boating/Water transport**	400	(1.2)	—	—	347	(8.9)	—
Unspecifed natural water**	123	(7.8)	—	—	1,635	(42.1)	—
Other/Unspecified**	454	(7.8)	—	—	813	(21.0)	—
Disposition							
Treated and released	2,540	(43.9)	0.84	(0.46–1.23)	—	—	—
Hospitalized/Transferred	2,908	(50.2)	0.97	(0.40–1.53)	—	—	—
Other/Unknown	340	(5.9)	0.11	(0.05–0.18)	—	—	—
Overall	**5,789**	**(100.0)**	**1.92**	**(1.07–2.78)**	**3,880**	**(100.0)**	**1.29†**

Abbreviation: CI = Confidence interval.
* Per 100,000 population.
† Includes drowning deaths associated with boating incidents, a type of transportation injury death. The overall death rate excluding boating-related drowning was 1.17 per 100,000 population.
§ Persons identified as Hispanic might be of any race. Persons identified as white, black, or other race are all non-Hispanic. Nonfatal rates are not presented for racial/ethnic groups because race/ethnicity was unknown for a substantial percentage of persons with nonfatal injuries.
¶ Location of drowning by specific pool and natural water type is unavailable for mortality data. Rates are not presented for location because the denominator for each is the entire population.
** Nonfatal estimates might be unstable because the coefficient of variation is >30%, unweighted count <20, or 5-year weighted estimate <1,200.

FIGURE. Distribution* of fatal and nonfatal drownings, by location and age group — National Vital Statistics System and National Electronic Injury Surveillance System – All Injury Program, United States, 2005–2009



* Distribution of nonfatal drownings are based on unweighted data for 604 National Electronic Injury Surveillance System – All Injury Program cases (342 cases in persons aged 0–4 years, 133 in persons aged 5–14 years, and 129 cases in persons aged ≥15 years) and therefore are not nationally representative. Distribution for fatal drownings are based on 19,358 counted deaths.

higher than the rates for all other causes of death in that age group except congenital anomalies (*3*). Other groups at greater risk for drowning include males, who account for approximately 80% of fatal drowning victims, and blacks, whose drowning death rate is 9% higher than that of the overall population (and, among those aged 5–14 years, 116% higher than the overall population) (*4,5*). Males might be at greater risk because they are more likely to overestimate their swimming ability, choose higher risk activities, or more commonly use alcohol (*6*). Blacks might be at greater risk because they often lack survival swimming skills (*7,8*).

Age, race/ethnicity, sex, and socioeconomic factors have been associated with lack of swimming ability among urban children (*7*). Swimming skills have been promoted as a means to reduce drowning risk, although concerns have been raised that initiating swimming lessons in young children might increase their risk for drowning (*9*). Teaching basic survival skills (e.g., ability to right oneself after falling into water, proceed a short distance, and float or tread water) to children aged ≥4 years in Bangladesh significantly reduced drowning rates (*10*). Furthermore, formal swimming lessons have been shown to reduce the risk for fatal drowning among children aged 1–4 years in the United States and China and might also reduce risk among older age groups (*9*). Other effective interventions include bystander cardiopulmonary resuscitation, four-sided pool fencing that separates the pool from the house and yard, and use of lifejackets (*1,9*).

Death certificates and ED records lack critical pieces of information, such as details on the victim's activities and swimming ability, the body of water, weather conditions, health conditions, use of life jackets, type and functionality of fences or barriers, supervision type and quality (e.g., impaired), presence of lifeguards, and whether cardiopulmonary resuscitation was performed by a bystander. These data are needed to better understand drowning incidents, design interventions, and track their effectiveness. Among children aged <18 years, these data could be obtained by full implementation and analysis of data from the National Child Death Review Case Reporting System.** This system, managed by the National Center for Child Death Review in Okemos, Michigan, could provide data compiled by state and local teams to more completely describe drowning circumstances. Currently, 40 states voluntarily submit data to the system, and a public use data set is available to researchers through application to the center.

The findings in this report are subject to at least three limitations. First, whereas fatalities occurring in EDs were excluded from the nonfatal data presented, NEISS-AIP does not provide information on outcomes after hospitalization; therefore, data for fatal and nonfatal drownings might not be mutually exclusive. Second, some unintentional drownings might have been classified as undetermined and some homicides or suicides as unintentional. Finally, the extent of exposure to recreational water settings might vary by age, sex, season, level of swimming skill, or other factors; however, these data were not available. As a result, rates are population-based and do not account for exposure.

Parents and caregivers of children, and participants in and supervisors of activities in or near water, should be aware of drowning hazards, use appropriate prevention strategies, and be prepared with life-saving skills in the event of emergencies. Additional information regarding drowning risk factors and prevention strategies is available at http://www.cdc.gov/homeandrecreationalsafety/water-safety/index.html and at http://www.cdc.gov/safechild.

** Additional information available at http://www.childdeathreview.org/reporting.htm.

What is already known on this topic?

Drowning is recognized worldwide as a leading cause of unintentional injury death that disproportionately affects children.

What is added by this report?

In the United States, an average of 3,880 persons died from unintentional drowning each year during 2005–2009, and an estimated 5,789 received emergency department care for nonfatal drowning. Children aged ≤4 years had the highest rates of both fatal and nonfatal drowning, and the death rate for males was approximately four times the rate for females. Among children aged ≤4 years, 50.1% of fatal incidents occurred in swimming pools.

What are the implications for public health practice?

Because swimming pools (often at their own home) remain high risk locations for children aged ≤4 years and research shows that early formal swimming lessons reduce risk among children aged 1–4 years, public health and medical professionals should encourage and support swimming lessons as a life-saving skill along with other proven interventions. This skill also might reduce the risk for drowning among older age groups and in other settings.

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Promotion of Healthy Swimming After a Statewide Outbreak of Cryptosporidiosis Associated with Recreational Water Venues — Utah, 2008–2009

During the summer of 2007, Utah experienced a statewide outbreak of gastrointestinal illness caused by *Cryptosporidium*, a parasite transmitted via the fecal-oral route. Approximately 5,700 outbreak-related cases were identified across the state (*1*). Of 1,506 interviewed patients with laboratory-confirmed cryptosporidiosis, 1,209 (80%) reported swimming in at least one of approximately 450 recreational water venues during their potential 14-day incubation period (*2*). *Cryptosporidium* is extremely chlorine-tolerant, and secondary or supplemental disinfection with ultraviolet light or ozone can control but not prevent outbreaks. Because swimmers are the primary source of *Cryptosporidium* contamination, healthy swimming campaigns are needed to increase awareness and practice of healthy swimming behaviors, especially not swimming while ill with diarrhea (i.e., swimming while ill with diarrhea can lead to gross contamination of recreational water). Before the 2008 summer swimming season, Utah public health agencies launched a multimedia healthy swimming campaign. To assess knowledge of healthy swimming, a survey of Utah residents was conducted during July–September 2008. The results of that survey found that 96.1% of respondents correctly indicated that "it is not OK to swim if you have diarrhea." In a separate national survey in 2009, 100% of Utah residents but only 78.4% of residents of other states correctly indicated that "not swimming while ill with diarrhea protects others from recreational water illnesses (RWIs)." No recreational water–associated outbreaks were detected in Utah during 2008–2011. The healthy swimming campaign, as part of a multipronged prevention effort, might have helped prevent recreational water–associated outbreaks of cryptosporidiosis in Utah.

Before the 2008 summer swimming season, Utah's state and local public health agencies teamed with community partners to control recreational water–associated transmission of *Cryptosporidium* (*3*). For example, the Salt Lake Valley Health Department (SLVHD) collaborated with pool operators to establish fecal incident–response protocols and install secondary or supplement disinfection systems to inactivate *Cryptosporidium* at 75 treated recreational water venues. SLVHD also collaborated with the Utah Department of Health and diagnostic laboratories to expedite reporting of cryptosporidiosis cases to public health authorities. To engage the public in prevention, SLVHD led efforts to disseminate healthy swimming messages via a website, two television advertisements, public service radio announcements, and posters at pools (e.g., "A Swimming Pool is Like a Community Bathtub"). In addition, targeted messages were disseminated to schools, competitive water sports teams, and licensed child care facilities. SLVHD also conducted a press conference during Recreational Water Illness and Injury Prevention Week, which is held each year the week before the Memorial Day holiday.*

To assess awareness of the previous year's outbreak and the education campaign and knowledge of healthy swimming, the Utah Department of Health surveyed residents of four counties (Davis, Salt Lake, Utah, and Weber) during July–September 2008 using a Utah Behavioral Risk Factor Surveillance System (BRFSS) callback survey (*4*). The four counties represented 75% of the Utah population† and were the counties of residence for 86% of patients with laboratory-confirmed cryptosporidiosis in 2007. Eligible adults had participated in Utah's BRFSS survey previously and indicated a willingness to participate in future surveys. Of the 642 adults§ whom UDOH attempted to recontact, 499 (78%) completed interviews. Knowledge of RWIs¶ and healthy swimming also was assessed nationally during August–September 2009 using HealthStyles, a national postal survey that assesses adults' health-related knowledge, attitudes, and behaviors (*5*). HealthStyles surveys were mailed to a nationally representative sample of 7,004 households; an adult from 4,556 (65%) households returned the survey. Statistical software was used to apply sampling weights and account for the complex sample design of both survey. Statistical significance ($p \leq 0.05$) was determined using Rao-Scott adjusted chi-squares.

In the BRFSS callback survey, 91.3% of respondents reported being aware of the 2007 outbreak (Table 1). A greater percentage of women (36.2%) than men (16.7%) recalled seeing healthy swimming campaign posters at pools. Greater percentages of adults with children in their households compared with

* Additional information available at http:/www.cdc.gov/healthywater/swimming/rwi/rwi-prevention-week/index.html.

† Based on the U.S. Census Bureau's intercensal estimates of the resident population for counties of Utah, April 1, 2000 to July 1, 2010 (2011 vintage). Available at http://www.census.gov/popest/data/intercensal/county/county2010.html.

§ Of the 1,175 respondents who completed the Utah BRFSS survey during March–August 2008, a total of 671 (57%) indicated a willingness to participate in future surveys.

¶ RWIs are caused by infectious pathogens transmitted by ingesting or inhaling aerosols of, or having contact with contaminated water in swimming pools, hot tubs/spas, water parks, interactive fountains, lakes, rivers, and oceans. RWIs also can be caused by chemicals in the water or chemicals that volatilize from the water and cause indoor air quality problems.

TABLE 1. Weighted percentage of participants aware of 2007 statewide cryptosporidiosis outbreak and elements of 2008 healthy swimming campaign, by selected characteristics — Cryptosporidiosis Outbreak Callback Survey, Behavioral Risk Factor Surveillance System , Utah, 2008

	Aware of outbreak			Sought information about outbreak			Saw any posters at pools			Saw any television advertisements			Saw any posters at pools or television advertisements		
Characteristic	%	(95% CI)	p-value*	%	(95% CI)	p-value	%	(95% CI)	p-value	%	(95% CI)	p-value	%	(95% CI)	p-value
All participants	**91.3**	**(87.7–95.0)**		**17.5**	**(11.7–23.3)**		**25.9**	**(18.1–33.8)**		**42.3**	**(32.8–51.7)**		**57.4**	**(46.6–68.3)**	
Sex															
Men	89.7	(83.6–95.9)		16.7	(6.9–26.5)		16.7	(9.0–24.3)		36.2	(21.9–50.4)		46.3	(29.9–62.6)	
Women	93.0	(89.1–96.9)	0.368	18.3	(12.5–24.2)	0.781	36.2	(24.6–47.8)	0.001	48.7	(37.8–59.6)	0.158	69.2	(60.3–78.0)	0.004
Children in household															
Yes	92.1	(87.5–96.7)		24.6	(13.4–35.8)		35.3	(20.0–50.6)		34.1	(19.7–48.5)		56.5	(38.1–74.9)	
No	90.5	(84.8–96.1)	0.647	9.5	(5.8–13.2)	0.006	16.1	(10.2–22.0)	0.018	51.4	(41.5–61.2)	0.049	58.5	(48.5–68.6)	0.845
Swam in 2007															
Yes	90.7	(85.5–96.0)		20.6	(11.7–29.6)		32.3	(20.4–44.3)		37.1	(23.8–50.3)		57.3	(41.3–73.3)	
No	92.4	(88.3–96.5)	0.624	11.9	(7.1–16.8)	0.088	13.4	(6.8–20.1)	0.010	51.3	(41.3–61.3)	0.090	57.5	(47.2–67.9)	0.983
Race/Ethnicity†															
White	92.0	(88.3–95.6)		17.5	(11.5–23.4)		26.1	(18.1–34.2)		42.8	(32.9–52.6)		58.2	(46.9–69.5)	
Other race/ ethnicity	74.5	(52.8–96.2)	0.020	17.1	(0–39.9)	0.975	19.9	(0–40.6)	0.612	29.2	(4.5–53.8)	0.355	37.7	(11.5–63.9)	0.179
Household annual income															
<$25,000	90.0	(80.7–99.4)		15.0	(4.8–25.1)		12.2	(2.3–22.1)		54.5	(39.9–69.0)		61.4	(47.4–75.5)	
≥$25,000	91.8	(87.9–95.6)	0.720	19.5	(13.1–25.9)	0.482	30.4	(22.2–38.7)	0.021	44.9	(36.2–53.7)	0.272	62.7	(54.6–70.9)	0.877
Highest education															
No college	86.8	(78.8–94.8)		8.2	(3.0–13.4)		25.4	(14.1–36.6)		46.3	(32.8–59.9)		59.6	(45.7–73.5)	
Any college	92.5	(88.5–96.5)	0.160	19.9	(12.5–27.2)	0.020	26.1	(16.6–35.5)	0.924	41.2	(29.9–52.5)	0.562	56.9	(43.7–70.0)	0.780

Abbreviation: CI = confidence interval.
* p-values calculated using Rao-Scott adjusted chi-squares.
† Whites were all non-Hispanic. Other races were predominantly Hispanic.

those with no children in their households sought information about the outbreak (24.6% versus 9.5%) and saw posters at pools (35.3% versus 16.1%). Conversely, a greater percentage of those without children recalled seeing television advertisements (51.4%) compared with those with children (34.1%). Among all respondents, 96.1% correctly indicated that "it is not OK to swim if you have diarrhea," and 70.4% correctly indicated that "chlorine does not kill germs instantly" (Table 2). A greater percentage of those who reported seeing any television advertisements correctly indicated that "it is not OK to swim if you have diarrhea" (98.6% versus 94.2%) and that "pool water quality is not the same as drinking water quality" (90.9% versus 74.9%) than those reporting not seeing any posters at pools or television advertisements. All of the above differences were significant.

In the 2009 HealthStyles survey, 100% of Utah residents but only 78.4% of residents of other states correctly indicated that "not swimming when you have diarrhea" protects others from RWIs (Table 3). A greater percentage of Utah residents than residents of other states correctly responded to five of eight healthy swimming questions, and most differences were significant (Table 3). For example, 96.4% of Utah residents compared with 85.7% of residents of other states correctly identified "not swallowing water you swim in" as a healthy swimming behavior, and 85.8% of Utah residents compared with 65.9% of residents of other states correctly indicated that "chlorine does not kill germs instantly." However, a smaller percentage of Utah residents than residents of other states identified "making sure that pools are treated" as a healthy swimming behavior (49.3% versus 86.0%).

Reported by

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Editorial Note

This report is the first published assessment of healthy swimming knowledge either nationally or after a recreational water–associated outbreak. Greater percentages of Utah residents than residents of other states identified "not swimming when you have diarrhea" and "not swallowing water you swim in" as

TABLE 2. Weighted percentage of participants with correct responses to four survey questions, by exposure to healthy swimming campaign elements — Cryptosporidiosis Outbreak Callback Survey, Behavioral Risk Factor Surveillance System , Utah, 2008

	Overall		Did not see posters or television advertisements		Saw any posters at pools or television advertisements			Saw any posters at pools			Saw any television advertisements		
Survey question*	% correct	(95% CI)	% correct	(95% CI)	% correct	(95% CI)	p-value†	% correct	(95% CI)	p-value	% correct	(95% CI)	p-value
Yes or no: Is it ok to swim if you have diarrhea?	96.1	(94.1–98.1)	94.2	(90.0–98.5)	97.5	(95.6–99.4)	0.121	96.6	(93.4–99.8)	0.391	98.6	(96.9–100.0)	0.046
True or false: Chlorine kills germs instantly	70.4	(62.3–78.4)	68.2	(53.3–83.0)	72.0	(62.9–81.2)	0.666	81.1	(72.3–89.8)	0.149	69.1	(58.0–80.3)	0.919
True or false: Pool water quality is the same as drinking water	81.8	(68.4–95.1)	74.9	(48.5–100.0)	86.9	(77.2–96.6)	0.306	82.3	(62.1–100.0)	0.653	90.9	(87.0–94.8)	0.045
True or false: The outbreak could have been prevented if all pools were well maintained	53.3	(41.9–64.7)	42.3	(22.4–62.2)	60.6	(50.9–70.2)	0.065	64.4	(51.3–77.6)	0.022	56.8	(45.4–68.2)	0.172

Abbreviation: CI = confidence interval.
* Correct answers were no, false, false, false.
† p-values calculated using Rao-Scott adjusted chi-squares.

TABLE 3. Weighted percentage of participants with correct responses to questions regarding healthy swimming, Utah residents compared with residents of other states* — HealthStyles Survey, United States, 2009

	Utah residents		Residents of other states		
Survey question	% correct	(95% CI)	% correct	(95% CI)	p-value†
Not swimming when you have diarrhea	100.0	(100–100)	78.4	(76.5–80.2)	—
Not swallowing water you swim in	96.4	(90.8–100)	85.7	(84.4–87.1)	0.046
Washing hands after using the toilet or changing a diaper	91.7	(79.7–100)	80.6	(78.9–82.4)	0.206
Changing diapers in the bathroom or diaper changing area and not poolside	91.5	(80.1–100)	68.1	(66.1–70.2)	0.015
Chlorine does not kill germs instantly	85.8	(71.3–100)	65.9	(63.8–68.1)	0.048
Showering or bathing with soap before getting in the water	80.3	(61.2–99.5)	53.6	(51.4–55.9)	0.029
Heard of recreational water illnesses	76.6	(53.8–99.5)	19.1	(17.3–21.0)	<0.001
Taking young children on bathroom breaks often	52.2	(9.6–94.9)	69.6	(67.6–71.7)	0.385
Making sure that pools are treated§	49.3	(8.8–89.8)	86.0	(84.7–87.4)	0.010

Abbreviation: CI = confidence interval.
* Excludes residents of Alaska and Hawaii. Utah participants did not differ significantly from other HealthStyles participants by age, race/ethnicity, sex, annual household income, or education.
† p-values calculated using Rao-Scott adjusted chi-squares.
§ CDC recommends that swimmers check free chlorine and pH levels with pool test strips before entering treated recreational water venues. Proper free chlorine (1–3 mg/L) and pH (7.2–7.8) levels can prevent transmission of chlorine-susceptible infectious pathogens but not *Cryptosporidium*. Test strips can be purchased at pool supply or hardware stores.

healthy swimming behaviors. These differences might reflect significant differences in knowledge between Utah residents and residents of other states with regard to recognizing that chlorine does not kill pathogens instantly.

Chlorine is the primary barrier to pathogen transmission in treated recreational water venues. Historically, establishment and enforcement of water quality standards by public health authorities and maintenance of water quality by the aquatics sector has been sufficient to prevent RWI outbreaks. However, the emergence of *Cryptosporidium*, a chlorine-tolerant pathogen, has meant that chlorination alone is no longer sufficient to protect swimmer health. *Cryptosporidium* can survive in water at CDC-recommended free chlorine levels of 1–3 mg/L** for 3.5–10.6 days (*6*). Since the first reported U.S. swimming pool–associated outbreak of cryptosporidiosis in 1988, *Cryptosporidium* has been responsible for the significant (negative binomial regression, p<0.001) increase in the incidence of recreational water–associated outbreaks (CDC, unpublished data, 2012). During 2007–2008, a total of 59

** At water pH 7.5 and temperature 77°F (25°C).

(72%) of 82[††] treated recreational water–associated outbreaks with an identified infectious etiology were caused by *Cryptosporidium* (*1*).

To prevent recreational water–associated outbreaks of cryptosporidiosis, education of swimmers is needed. A single diarrheal contamination incident can introduce 10^7–10^8 *Cryptosporidium* oocysts to a typical treated recreational water venue, enough that a single mouthful could lead to infection (*7,8*). Moreover, a single infected swimmer potentially can contaminate multiple recreational water venues, causing a communitywide outbreak (*1,2*). Engineering (e.g., secondary or supplemental disinfection systems) and enforcement (e.g., the Model Aquatic Health Code,[§§] which addresses the public health threat presented by *Cryptosporidium*) can minimize contamination and help control recreational water–associated outbreaks of cryptosporidiosis. However, the highly infectious, chlorine-tolerant attributes of *Cryptosporidium* mean that effective prevention relies on swimmers practicing healthy swimming behaviors.

The findings in this report are subject to at least five limitations. First, the cross-sectional design of the ecologic studies does not permit any conclusions about the cause and effect relationship between the education campaign and respondent knowledge. Moreover, no baseline measurements of healthy swimming knowledge of Utah residents were taken before the outbreak or education campaign, so no direct evidence of an increase in healthy swimming knowledge in Utah exists. Second, assessment of healthy swimming knowledge might be susceptible to social desirability bias (e.g., respondents might answer a question about swimming while ill with diarrhea in a manner that will be viewed favorably by others). Third, the BRFSS and HealthStyles surveys assessed knowledge, not behavior. Whether increased healthy swimming knowledge translates to increased likelihood of healthy swimming behavior is unknown. However, no recreational water–associated outbreaks were detected in Utah during 2008–2011. Fourth, the nationally representative HealthStyles survey sample was drawn from a nonrandom sample, and the response rate was only 65%. Finally, respondents in the Utah BRFSS callback survey were from a pre-identified group of residents who had indicated a willingness to participate in future surveys and who might not be representative of the general population of Utah.

To reverse the increasing incidence of recreational water–associated outbreaks of cryptosporidiosis, healthy swimming campaigns must reach those persons (21.6% in the national HealthStyles survey) who do not know that swimming while ill with diarrhea is an unhealthy swimming behavior. Although the cost of airtime for television and radio advertising might appear prohibitive for many state and local public health agencies, such expenditures should be weighed against the cost (e.g., public health staff time and health-care expenditures) of communitywide cryptosporidiosis outbreaks (*3,9*). Health promotion efforts such as holding a press conference during Recreational Water Illness and Injury Prevention Week or developing Internet content are less costly opportunities to disseminate healthy swimming messages. Developing seasonally recurring health promotion activities that 1) increase the public's perception of their vulnerability to and the severity of RWIs, 2) emphasize the effectiveness of healthy swimming behaviors,[¶¶] and 3) increase swimmers' confidence in their ability to effectively implement these simple prevention steps might increase healthy swimming behaviors (*10*) and prevent future diarrheal contamination of recreational water and associated outbreaks of cryptosporidiosis.

What is already known on this topic?

Cryptosporidium has emerged as the leading cause of recreational water–associated outbreaks in the United States.

What is added by this report?

After the 2007 statewide outbreak of cryptosporidiosis involving approximately 5,700 outbreak-related cases and 450 recreational water venues, Utah public health agencies launched a multimedia healthy swimming campaign before the 2008 summer swimming season. In a 2008 Utah callback survey, respondents demonstrated high levels of knowledge of healthy swimming, and in a 2009 national survey, Utah residents correctly responded to questions assessing healthy swimming knowledge more frequently than residents of other states. No recreational water–associated outbreaks were detected in Utah during 2008–2011.

What are the implications for public health practice?

Because swimmers are the source of *Cryptosporidium* contamination of recreational water and *Cryptosporidium* is highly infectious and extremely chlorine tolerant, prevention of recreational water–associated outbreaks of cryptosporidiosis relies on increasing awareness and practice of healthy swimming behaviors, particularly by the 21.6% who failed to identify not swimming while ill with diarrhea as a behavior that protects other swimmers. Public health agencies might help prevent resource-intensive communitywide cryptosporidiosis outbreaks by regularly disseminating healthy swimming messages (e.g., holding a press conference during Recreational Water Illness and Injury Prevention Week).

[††] In all, 90 outbreaks were associated with treated recreational water and caused by an identified etiologic agent during 2007–2008 (*1*). Eight (8.9%) of the outbreaks were caused by a chemical or toxin and not included in the denominator.

[§§] Additional information available at http://www.cdc.gov/healthywater/swimming/pools/mahc.

[¶¶] Additional information available at http://www.cdc.gov/healthywater/swimming/pools/triple-a-healthy-swimming.html.

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Progress Toward Interruption of Wild Poliovirus Transmission — Worldwide, January 2011–March 2012

In January 2012, completion of polio eradication was declared a programmatic emergency for global public health by the Executive Board of the World Health Organization (WHO) (*1*). Despite major progress since the launch of the Global Polio Eradication Initiative (GPEI) in 1988, circulation of indigenous wild poliovirus (WPV) continues in three countries (Afghanistan, Nigeria, and Pakistan). India has not reported a polio case since January 2011, and is considered polio-free since February 2012. This report highlights progress toward global polio eradication during January 2011–March 2012. The number of polio cases reported globally decreased by 52%, from 1,352 in 2010 to 650 in 2011. Those 650 cases included 341 (53%) reported from the four polio-endemic countries (Afghanistan, India, Nigeria, and Pakistan), 230 (35%) from previously polio-free countries in which WPV importations led to reestablished transmission for ≥12 months (Angola, Chad, and Democratic Republic of the Congo [DRC]), and 79 (12%) from nine countries affected by outbreaks. Compared with 2010, WPV cases increased in 2011 in Afghanistan (69%), Nigeria (66%), and Pakistan (27%), but decreased in India (98%). During January–March 2012, 59% fewer cases were reported worldwide (as of May 15) compared with the same period in 2011, and all cases in 2012 have been reported from Afghanistan, Chad, Nigeria, and Pakistan. Although progress toward polio eradication was substantial in 2011, persistent WPV circulation in 2012, particularly in Nigeria and Pakistan, poses an ongoing threat to eradication efforts, underscoring the need for emergency measures by polio-affected countries and those at risk for outbreaks after importation.

Routine Vaccination Coverage

By the end of 2010, the latest year for which data are available, infant vaccination coverage with 3 doses of trivalent oral poliovirus vaccine (tOPV) by age 12 months was estimated to be 86% globally, 79% in the WHO African Region, 93% in the Region of the Americas, 96% in the European Region and Western Pacific Region, and 77% in the South-East Asia Region (*2*). However, coverage continues to vary substantially by country and subnationally.

Supplementary Immunization Activities (SIAs)

In 2011, 302 supplementary immunization activities (SIAs)* using oral polio vaccine (OPV) were conducted in 53 countries. The SIAs included 145 national immunization days, 130 subnational immunization days, 17 child health days, and 10 mop-up rounds. Geographically, the SIAs included 57 (19%) SIAs in the four endemic countries, 51 (17%) SIAs in the three countries with reestablished transmission, 61 (20%) SIAs in nine previously polio-free countries affected by outbreaks following importations,† and 133 (44%) preventive SIAs in 38 countries with no WPV cases reported during 2011. An estimated 2.35 billion doses of OPV were administered to 430 million persons, primarily children aged <5 years. Of these OPV doses, 41% were tOPV, 5% were monovalent OPV type 1 (OPV1), 1% were monovalent OPV type 3 (OPV3), and 53% were bivalent OPV types 1 and 3 (bOPV). In response to outbreaks with cases in persons aged >5 years, SIAs targeted persons aged ≤39 years in areas of China and the entire population in areas of DRC.

Poliovirus Surveillance

WPV transmission is monitored routinely through surveillance for acute flaccid paralysis (AFP) cases and by stool specimen testing in WHO-accredited laboratories. AFP surveillance performance is monitored using standard indicators for sensitivity (nonpolio AFP rate) and timeliness (stool specimen adequacy)§ (*3*). All polio-affected countries achieved surveillance performance quality targets during 2011 at the national level, except Côte d'Ivoire. However, the three countries with reestablished transmission and eight of nine countries with WPV outbreaks in 2011 had substantial proportions (>20%) of their populations living in subnational areas with underperforming surveillance systems (*3*).

Incidence of WPV Cases

Of 650 polio cases reported in 2011, 583 (90%) were WPV1 and 67 (10%) were WPV3, a reduction of 52% and 22%, respectively, compared with 2010. During January–March 2012, 52 cases (43 WPV1, eight WPV3, and one mixed WPV1/WPV3) were reported globally, representing a 63% reduction of WPV1 cases and a 31% reduction of WPV3 cases worldwide compared with the same period in 2011 (Table). In the polio-endemic countries of Afghanistan and Nigeria, more WPV cases were reported in each during January–March 2012 compared with the same period in 2011; in Pakistan, the number of cases

* Mass campaigns conducted during a short period (days to weeks) nationally or in selected parts of the country (i.e., subnational SIAs), during which a dose of OPV is administered to all children (generally aged <5 years), regardless of previous vaccination history.

† Previously polio-free countries with outbreaks include China, Central African Republic, Congo, Cote d'Ivoire, Gabon, Guinea, Kenya, Mali, and Niger.

§ AFP surveillance targets for countries with current or recent WPV transmission include a nonpolio AFP rate of ≥2 cases per 100,000 population aged <15 years, and adequate stool specimen collection from ≥80% of AFP cases.

decreased during January–March 2012. Since August 2011,[¶] WPV3 has been reported only from areas in northern Nigeria and the Federally Administered Tribal Areas of Pakistan.

Countries Considered Polio-Endemic in 2011

Afghanistan. In 2011, 80 cases (all WPV1) were reported, a 69% increase from 25 cases (17 WPV1 and eight WPV3) reported in 2010. As of May 15, 2012, six WPV1 cases were reported during January–March 2012, compared with one WPV1 case reported in the same period of 2011 (Table).

India. One WPV1 case was reported in West Bengal in January 2011, a 98% reduction from 42 WPV1 cases reported in 2010. No WPV cases or WPV isolates from environmental sampling were reported from India during February 2011–March 2012.

Nigeria. In 2011, 62 cases (47 WPV1 and 15 WPV3) were reported, a 66% increase compared with 21 cases (eight WPV1 and 13 WPV3) reported in 2010. During January–March 2012, 28 cases (21 WPV1 and seven WPV3) were reported, compared with eight cases (six WPV1 and two WPV3) reported during the same period of 2011[**]; foci of WPV transmission in Nigeria include the northwestern states (Sokoto/Zamfara), northcentral states (Kano/Katsina/Jigawa), and northeastern states (Borno/Yobe/Bauchi).

Pakistan. In 2011, 198 cases (196 WPV1 and two WPV3) were reported, a 27% increase from 144 cases (120 WPV1 and 24 WPV3) reported in 2010. During January–March 2012, 15 cases were reported (13 WPV1, one WPV3, and one mixed WPV1/WPV3), compared with 36 WPV1 cases reported during the same period of 2011.[††] All WPV3 cases since January 2011 were reported from Khyber Agency, Federally Administrated Tribal Areas. WPV3 was not detected in Khyber from September 2011 to February 2012; the WPV1/WPV3 and WPV3 cases occurred there in March 2012.

Countries with Reestablished Transmission

Angola. In 2011, five WPV1 cases were reported, an 85% reduction from 33 WPV1 cases reported in 2010. The last indication of ongoing circulation of reestablished transmission was a cluster of four WPV1 cases in the southern province of Kuando-Kubango during January–March 2011 (Figure). The most recent WPV1 case, in July 2011, in the northern province of Uige, followed a new importation from DRC (Figure). No cases were reported during January–March 2012, as of May 15, compared with two WPV1 cases reported in the same period in 2011.

Chad. In 2011, 132 cases (129 WPV1 and three WPV3) were reported, an 80% increase from 26 cases (11 WPV1 and 15 WPV3) reported in 2010 (Figure). During January–March 2012, as of May 15, three WPV1 cases were reported, compared with 36 cases (33 WPV1 and three WPV3) reported during the same period of 2011.

DRC. In 2011, 93 cases were reported, compared with 100 in 2010; all were WPV1 (Figure). Two genetically distinct outbreaks occurred in 2011; 79 WPV1 cases reported from January to September in western provinces resulted from importations from Angola and the Republic of the Congo, and 14 WPV1 cases reported from October to December 2011 in the eastern provinces of Katanga and Maniema represented ongoing reestablished transmission originally from importations in 2006 from Angola and continuous circulation in eastern DRC since 2008 or earlier (Figure). No WPV cases were reported during January–March 2012, as of May 15, compared with 42 cases reported in the same period in 2011.

What is already known on this topic?

Despite major progress since the launch of the Global Polio Eradication Initiative in 1988, the number of countries that had never interrupted circulation of indigenous wild poliovirus (WPV) remained at four from 2006 until 2011. In the interim, many outbreaks originated from these countries. By the end of 2011, WPV circulation continues in three countries (Afghanistan, Nigeria, and Pakistan). India has not reported a polio case since January 2011, and is considered polio-free since February 2012.

What is added by this report?

Despite setbacks, reported WPV cases decreased 52% worldwide, from 1,352 cases in 2010 to 650 in 2011, including a >98% reduction in India and 22% reduction in WPV type 3 cases globally. However, compared with 2010, WPV cases increased in 2011 in Afghanistan (69%), Nigeria (66%), and Pakistan (27%); 11 different outbreaks occurred in China and in eight other polio-free countries in Africa during 2011. During January–March 2012, 59% fewer cases were reported worldwide compared with the same period in 2011; all of these cases were reported from Afghanistan, Chad, Nigeria, and Pakistan.

What are the implications for public health practice?

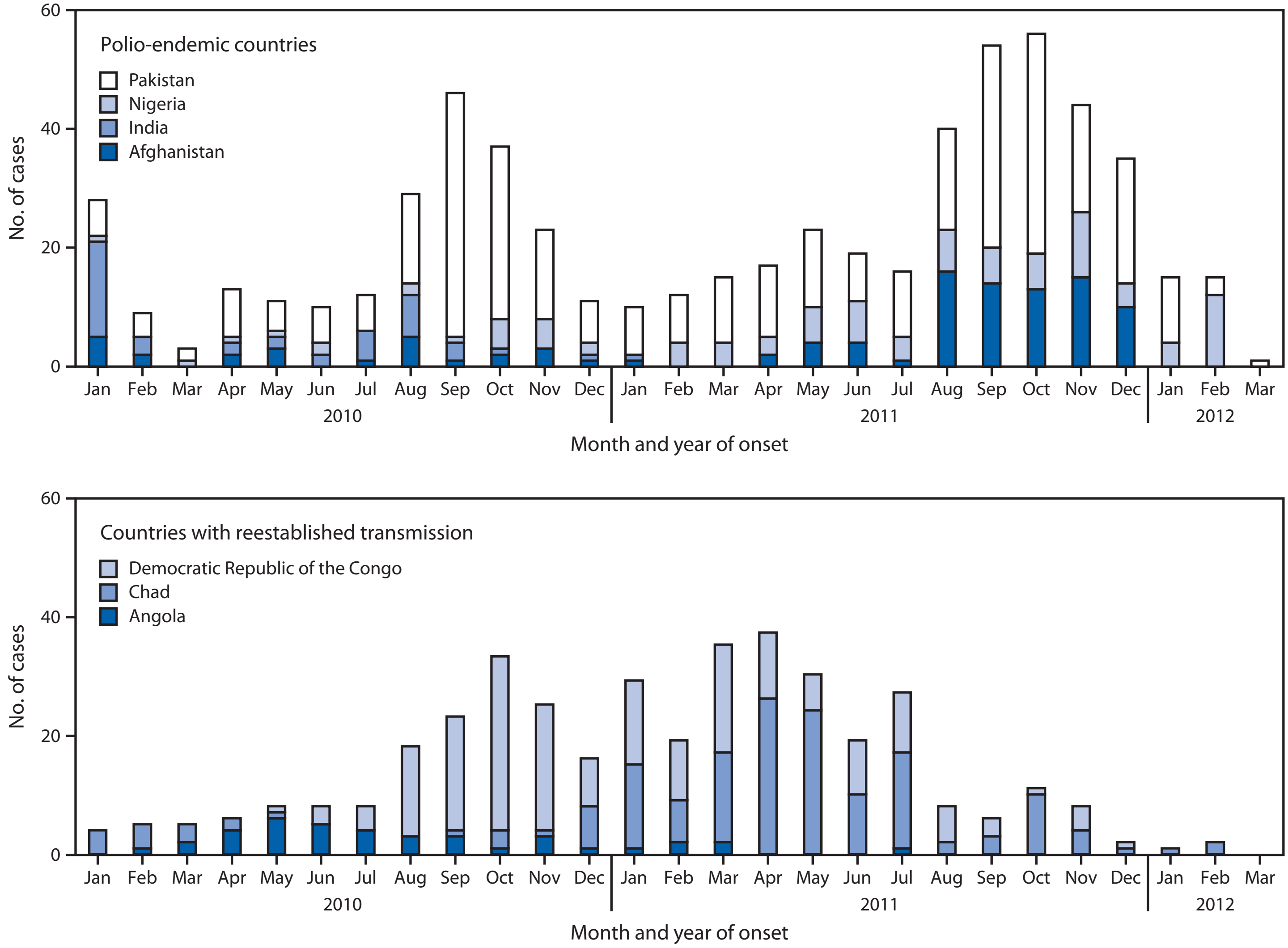
Completion of polio eradication has been declared a programmatic emergency for global public health by the Executive Board of the World Health Organization. Persistent WPV circulation, particularly in multiple locations in Nigeria and Pakistan, poses an ongoing threat to eradication efforts. CDC and other polio eradication partners are enhancing support to polio-affected countries. Polio-affected countries and countries at risk for poliovirus outbreaks must implement their national emergency plans fully and urgently to ensure timely and successful global polio eradication.

¶ Most recent WPV3 case reported from a country other than Nigeria or Pakistan had onset of paralysis on August 3, 2011, in Guinea.

** As of May 15, two additional WPV1 cases were reported with onset in April; the most recent case had onset of paralysis on April 7, 2012.

†† As of May 15, an additional WPV3 case was reported with paralysis onset on April 18, 2012.

FIGURE. Number of wild poliovirus cases,* by country, classification, and month of onset — worldwide, January 2010–March 2012



* Reported as of May 15, 2012.

Countries Affected by Outbreaks

In 2011, 11 WPV outbreaks occurred globally, including nine new outbreaks in eight countries and two outbreaks representing transmission from 2010 (WPV3 in Mali and WPV1 in Republic of the Congo) that continued into 2011. The nine new outbreaks in 2011 occurred in western China and in seven countries in Africa (WPV1 in Niger, Central African Republic, Gabon, and Kenya; WPV3 in Côte d'Ivoire, Mali, Niger, and Guinea). In China, 21 WPV1 cases among persons aged ≤53 years (median: 19 years) were reported in the western Xinjiang Uygur Autonomous Region after an importation from Pakistan; this was the first WPV outbreak reported in the WHO Western Pacific Region since 1997. Of the 11 outbreaks, eight were interrupted (i.e., no cases reported in more than 6 months) within 6 months of confirmation and two, in Central African Republic and Niger, are on track to be interrupted within 6 months (no cases have been reported in more than 3 months). The Mali WPV3 2010 outbreak that continued into 2011 was not interrupted within 6 months after confirmation. No new outbreaks have been reported in 2012, to date.

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TABLE. Reported wild poliovirus (WPV) cases,* by type (WPV1 or WPV3) and category of polio-affected country — worldwide, January 2011–March 2012

	2011						2012		
	January–March			Total 2011			January–March		
Category/Country†	WPV1	WPV3	All WPV	WPV1	WPV3	All WPV	WPV1	WPV3	All WPV
Polio-endemic countries	35	2	37	324	17	341	40	9	49
Afghanistan	1	—	1	80	—	80	6	—	6
India	1	—	1	1	—	1	—	—	—
Nigeria	6	2	8	47	15	62	21	7	28
Pakistan	27	—	27	196	2	198	13	2§	15
Countries with reestablished transmission	77	3	80	227	3	230	3	0	3
Angola	2	—	2	5	—	5	—	—	—
Chad	33	3	36	129	3	132	3	—	3
Democratic Republic of the Congo	42	—	42	93	—	93	—	—	—
Countries affected by outbreaks	3	8	11	32	47	79	0	0	0
Côte d'Ivoire	—	4	4	—	36	36	—	—	—
Gabon	1	—	1	1	—	1	—	—	—
Mali	—	3	3	—	7	7	—	—	—
Niger	—	1	1	4	1	5	—	—	—
Republic of Congo	1	—	1	1	—	1	—	—	—
Kenya	1	—	1	1	—	1	—	—	—
China	—	—	—	21	—	21	—	—	—
Guinea	—	—	—	—	3	3	—	—	—
Central African Republic	—	—	—	4	—	4	—	—	—
Total	**115**	**13**	**128**	**583**	**67**	**650**	**43**	**9**	**52**

* Case data reported to the World Health Organization as of May 15, 2012, by date of onset.
† Country category based on Global Polio Eradication Initiative 2010–2012 Strategic Plan.
§ Includes one mixed WPV1/WPV3.

Editorial Note

The most significant achievement of the GPEI during January 2011–March 2012 was the interruption of endemic WPV circulation in India, considered polio-free since February 2012. Success in India is attributed to creative approaches by the Indian government and partners, including 1) large-scale mobilization of human and financial resources to increase SIA coverage among children in high-risk endemic areas and migrant populations, 2) introduction of bOPV, 3) improvements in routine vaccination coverage, and 4) rapid responses to new outbreaks (*4*). India's success proves the technical feasibility of global polio eradication and highlights potential solutions to address operational challenges in other countries. Since 2010, an unprecedented reduction in WPV3 cases also has occurred. Use of bOPV has driven the reduction since 2010. Khyber Agency in Pakistan and several northern states in Nigeria are the only areas where WPV3 cases continue to be reported, a result of low routine vaccination and SIA coverage in limited-access areas (*5,6*).

Outbreaks following importations into polio-free countries pose a continued threat to the momentum of the GPEI. Large outbreaks occurred in the European Region and in Republic of Congo in 2010 (*7*); outbreaks in 2011 have been small because of timely detection and prompt response with SIAs. The outbreak in China in 2011 was contained quickly through large-scale SIAs, which in some areas included persons aged ≤39 years. Older age groups have been affected by paralytic polio with high fatality rates in recent outbreaks, and even when not clinically affected, older persons appear to enhance WPV transmission. To reduce the scale and duration of any new outbreaks, GPEI recommends vaccination of all children aged <15 years in the initial response SIAs. Reestablished transmission has continued in some countries because of chronic low population immunity (*5*). Until WPV transmission in all areas is interrupted, the threat of outbreaks in polio-free areas will continue, requiring all countries to maintain high routine vaccination coverage, sensitive AFP surveillance, and rapid response SIAs to WPV importations. Continued intense WPV transmission in northern Nigeria poses a significant threat for WPV importation and spread into other west and central African countries.

In October 2011, the Independent Monitoring Board of the GPEI stated that the program was not on track for its end of 2012 goal, or for any time soon after, unless fundamental problems were tackled (*8*). In January 2012, the Executive Board of WHO declared completion of poliovirus eradication a programmatic emergency for global public health (*9*). In response, each of the remaining countries with endemic or reestablished transmission has developed an emergency action plan for interrupting poliovirus transmission, which includes oversight and accountability mechanisms involving political and health leaders at all administrative levels. National emergency plans specify strategies to vaccinate chronically missed children, improve the quality of SIAs in persistently poor-performing areas, and achieve levels of immunity by end of 2012 that can lead to cessation of transmission. These strategies address inadequate micro-planning,[§§] poor selection and performance of vaccination teams, weak supervision, inadequate monitoring, and vaccine refusal. Special strategies were developed to access children in areas of armed conflict. National emergency plans also outline strategies to identify, map, and vaccinate children in migrant and mobile populations and to improve routine immunization services, particularly for high-risk population groups.

Based on national emergency plans and in recognition of global challenges, the GPEI has developed a Global Emergency Action Plan 2012–2013. Key elements include assisting Afghanistan, Nigeria, and Pakistan to significantly increase vaccination coverage by the end of 2012 to levels that will interrupt transmission shortly thereafter; helping to sustain the momentum achieved in Angola, Chad, and DRC to interrupt transmission in 2012; implementing a rigorous accountability process by which health-care workers and administrative leaders will monitor and be held accountable for program performance at the district and state levels; and further improving polio partner accountability and coordination. CDC activated its Emergency Operations Center to better support eradication efforts, in partnership with WHO, Rotary International, the United Nations Children's Fund (UNICEF), the Bill and Melinda Gates Foundation, national ministries of health, and other partner organizations. Funding requirements for the Global Emergency Action Plan 2012–2013 are $2.18 billion. Lack of sufficient funds in the first half of 2012 has forced cancellation and scaling-back of critical SIAs in 24 countries. Full implementation of the national emergency plans is urgently needed or the goal of a polio-free world is at risk.

[§§] Detailed pre-campaign planning and mapping at the lowest administrative level, specifying the resource needs and daily expectations for each team.

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Notes from the Field

Hepatitis C Virus Infections Among Young Adults — Rural Wisconsin, 2010

During November 2010, Wisconsin Division of Public Health (DPH) staff members noted the number of hepatitis C virus (HCV) infections reported annually among persons aged <30 years in six contiguous rural counties of Wisconsin had increased from an average of eight cases per year during 2004–2008 to an average of 24 cases per year during 2009–2010. To understand factors associated with this increase, DPH, local health departments, and CDC investigated the epidemiologic and laboratory characteristics of 25 cases reported during 2010 among adults aged <30 years who resided in these six counties.

Among the 25 patients investigated, medical records of 21 were reviewed, 17 were interviewed, and 16 provided blood samples for quasispecies analysis (*1*) to assess relatedness of their HCV. Of the 25 patients, seven (28%) had symptoms of jaundice, consistent with acute HCV infection. All 25 patients had antibodies to HCV by enzyme immunoassay; 21 were confirmed to have HCV by having an enzyme immunoassay with an appropriate signal-to-cutoff ratio for a given assay or by having the presence of HCV RNA by polymerase chain reaction. Sixteen (94%) of 17 interviewed patients admitted to sharing hypodermic needles, drug preparation equipment, or drug snorting equipment. Sixteen (94%) of 17 interviewed patients admitted to either injecting drugs (12 patients), snorting illicit drugs (16 patients), or both (12 patients). Three of eight patients who reported injecting opioid pain relievers started injecting prescription opioids and switched to injecting heroin or methamphetamine after a median of 3 years (range: 1–4 years). Six specimens could be analyzed at CDC for variations in the NS5B region, and four of them were genetically similar in that region. These underwent quasispecies analysis but were unrelated, suggesting that patients were infected through unrelated networks of HCV transmission and that many other undetected cases might exist.

Although most U.S. reports of acute HCV infections before 2001 occurred among persons aged 30–49 years, the highest age-adjusted reported incidence is now among persons aged 20–29 years (*2*), as observed and reported recently from Massachusetts (*3*). In Wisconsin, although most reported HCV infections have occurred among persons aged 45–54 years, 2009–2010 surveillance data suggests that incidence has been stable among this age group but has been increasing among younger persons, consistent with national trends (*4*). This investigation sheds light on a growing burden of hepatitis C in rural areas (*3*) and describes a transition among users from injection of prescription opioid drugs to injection of heroin, as noted elsewhere (*5*).

Public health practitioners should be mindful of the growing prevalence of hepatitis C in rural communities, which typically are harder to reach for prevention efforts. CDC recently awarded funds to seven state and local health departments to investigate risk factors and understand drug use behaviors associated with HCV transmission among adolescents and young adults. Efforts to improve monitoring and control of opioid prescribing and targeted interventions, including HCV education, access to new, sterile syringes, and improved access to opioid agonist treatment programs have been shown to reduce the incidence of HCV infection (*6*).*

* In December 2011, Congress reinstated a ban on the use of federal funds for carrying out any program of distributing sterile needles or syringes for hypodermic injection of illegal drugs.

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Announcements

Click It or Ticket Campaign — May 21–June 3, 2012

In 2010, approximately 22,000 passenger vehicle occupants (excluding motorcyclists) died in motor vehicle crashes in the United States, representing 67% of all motor vehicle crash deaths (*1*). An additional 2.7 million occupants were treated for injuries in emergency departments in the United States (*2*). Although seat belt use in the United States is now estimated at 85%, millions of persons continue to travel unrestrained (*3*). Using a seat belt is one of the most effective means of preventing serious injury or death in the event of a crash. Seat belts saved an estimated 12,546 lives in 2010. If everyone had been buckled up, approximately 3,300 additional lives could have been saved (*4*).

Click It or Ticket, a national campaign coordinated annually by the National Highway Traffic Safety Administration (NHTSA) to increase the proper use of seat belts, takes place May 21–June 3, 2012. Law enforcement agencies across the nation will conduct intensive, high-visibility enforcement of seat belt laws, during both daytime and nighttime hours. Campaign activities in 2012 continue to focus on young adult men (aged 18–34 years), a group that is less likely to wear seat belts and more likely to be killed in a motor vehicle crash than others (*2,3*). Additional information regarding activities for the 2012 Click It or Ticket campaign is available from NHTSA online at http://www.nhtsa.gov. Additional information on preventing motor-vehicle crash injuries is available from CDC at http://www.cdc.gov/motorvehiclesafety.

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Recreational Water Illness and Injury Prevention Week — May 21–27, 2012

May 21–27, 2012, marks the eighth annual Recreational Water Illness and Injury Prevention Week. This observance highlights simple steps swimmers and pool operators can take to reduce health and safety risks at pools, interactive fountains, and other recreational water venues.

Recreational water illness (RWI) can result from ingesting, inhaling aerosols, or having contact with contaminated water from swimming pools, hot tubs, water play areas, interactive fountains, lakes, rivers, or oceans. These illnesses also can be caused by chemicals in the water or chemicals that evaporate from the water. Injuries and drowning also can occur in and around recreational water. Drowning is the leading cause of injury death among children aged 1–4 years. On average, 10 persons die from drowning every day, including two aged <15 years (*1*).

With the number of RWI outbreaks increasing, swimmers need to take an active role in protecting themselves and preventing transmission of pathogens by not swimming when ill with diarrhea, not swallowing recreational water, and showering with soap before swimming (*2*).* To prevent drowning, adults and children should know how to swim, caregivers should know cardiopulmonary resuscitation, all boaters and weaker swimmers should use lifejackets, and backyard swimming pools should be separated from the house and yard by a fence with self-closing and self-latching gate.

Additional information on healthy swimming is available from CDC at http://www.cdc.gov/healthyswimming. Useful information on prevention of water-related injuries also is available at http://www.cdc.gov/homeandrecreationalsafety/water-safety/index.html.

* Additional information at http://www.cdc.gov/healthywater/swimming/pools/triple-a-healthy-swimming.html.

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Erratum

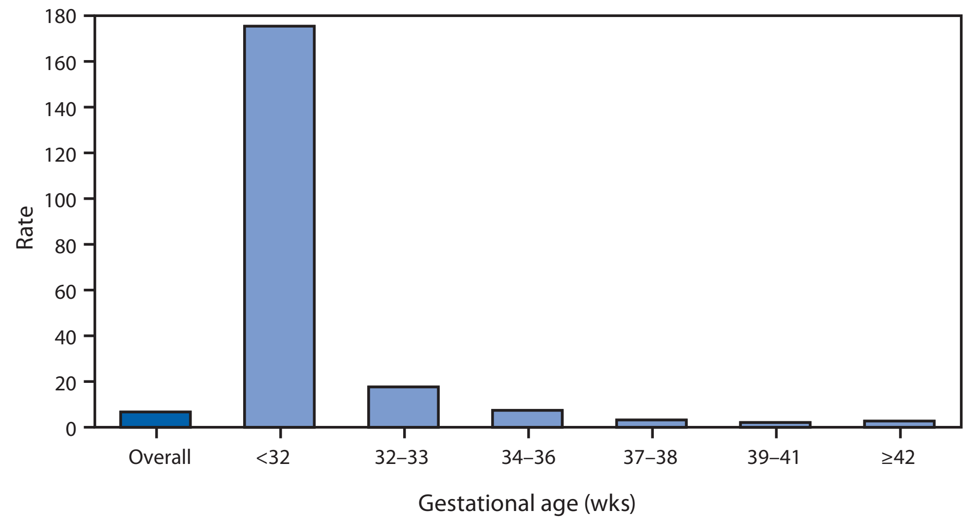
Vol. 61, No. 17

In the announcement, "Living Well with Chronic Illness: A Call for Public Action," on page 312, an error occurred. The title of the report was incomplete; the full title is *Living Well with Chronic Illness: A Call for Public* ***Health*** *Action*.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Infant Mortality Rate Per 1,000 Live Births,* by Gestational Age — United States, 2008



In 2008, the overall infant mortality rate was 6.6 infant deaths per 1,000 live births; however, infant mortality rates varied widely by gestational age. For infants born at <32 weeks of gestation, the infant mortality rate was 175.5 infant deaths per 1,000 live births, compared with a rate of 2.1 for infants born at 39–41 weeks of gestation, the age group with the lowest risk. Infant mortality rates generally decreased with increasing gestational age, and even infants born at 37–38 weeks had a mortality rate that was 50% higher than that for infants born at 39–41 weeks.

Source: Mathews TJ, MacDorman MF. Infant mortality statistics from the 2008 period linked birth/infant death data set. Natl Vital Stat Rep 2012;60(5). Available at http://www.cdc.gov/nchs/data/nvsr/nvsr60/nvsr60_05.pdf.

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