Centers for Disease Control and Prevention
MMWR
Morbidity and Mortality Weekly Report
Weekly / Vol. 61 / No. 25
June 29, 2012

Sodium Azide Poisoning at a Restaurant — Dallas County, Texas, 2010

In April 2010, Dallas County Health and Human Services (DCHHS) staff members investigated reports of acute-onset dizziness among patrons in a local restaurant. Symptoms, which included fainting resulting from low blood pressure, occurred within minutes of consuming food from the restaurant and were consistent with chemical poisoning. Toxicologic and epidemiologic investigations were begun to determine the cause of the poisonings and identify potentially exposed persons. This report summarizes the results of those investigations, including a case-control study that identified iced tea as the likely contaminated food or drink (odds ratio [OR] = 65; 95% confidence interval [CI] = 2.4–3,292). Approximately 5 months after the incident, extensive laboratory testing identified sodium azide (NaN_3) and hydrazoic acid (formed when sodium azide contacts water) as the toxic agents in the iced tea. All five ill restaurant patrons recovered from their symptoms. For rapid-onset foodborne illnesses, chemical poisons should be considered as a potential cause, regardless of negative initial toxicologic screening tests. Although unusual chemicals can be challenging to detect, a multidisciplinary approach involving public health officials and forensic and medical toxicologists can lead to appropriate testing. In the absence of an identified agent, epidemiologic tools are valuable for active case-finding and confirming suspected contaminated food vehicles.

Multi-Agency Investigation

In April 2010, city fire and police departments notified a city health department in Texas of four persons transported from a restaurant to an emergency department (ED) over a period of 4 hours, after developing similar symptoms minutes after consuming iced tea from paper cups filled from a self-serve urn. Symptoms included lightheadedness, nausea, and diaphoresis (Table). The city fire department, responding to emergency medical services calls, contacted the police and the city environmental health departments after a third call came from the same restaurant. These agencies conducted a site visit that evening and temporarily suspended further sale of the iced tea. Samples of the iced tea were collected by authorities from restaurant tea urns and from two patients who brought their paper cups of iced tea to the ED.

Laboratory and radiographic diagnostic tests performed in the ED did not reveal a cause for the illness; none of the four patients were acidotic. Toxicologic evaluation in the ED, consisting of serum ethanol concentrations and urine drug screens, was nondiagnostic. All four patients received supportive treatment and were discharged either that night or after an overnight hospitalization. Upon learning of the cases, DCHHS epidemiology and environmental health staff members obtained and reviewed medical records, interviewed the patients and restaurant staff members, and conducted a site visit. Because of a high suspicion for chemical etiology, DCHHS staff members consulted with multiple agencies, including the Dallas County Southwestern Institute of Forensic Sciences (SWIFS), Food and Drug Administration, Texas Department of State Health Services, and medical toxicologists

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TABLE. Exposure and clinical characteristics for five persons poisoned with sodium azide at a restaurant — Dallas County, Texas, 2010*

Characteristic	Patient 1	Patient 2	Patient 3†	Patient 4	Patient 5
Exposure					
Food	One bite of a sandwich	Cookie	One bite of a sandwich	Cookie	Two bites of a sandwich
Drink (iced tea)§	Two sips	8 oz	1/4 cup	4 oz	Two sips
Signs and symptoms					
Headache	Yes	No	Yes	No	No
Fainting	Yes	No	Yes	Yes	Yes
Vomiting	Yes	Yes	Yes	Yes	Yes
Diaphoresis	Yes	Yes	Yes	Yes	Yes
Sense of impending doom	Yes	Yes	No	Yes	No
Initial heart rate (bpm)	72	110	62	127	94
Initial blood pressure (mmHg)	92/64	110/68	84/42	89/54	86/54
Treatment	Normal saline	Normal saline Lorazepam Ondansetron Promethazine	Normal saline Ondansetron	Normal saline Ondansetron Promethazine Morphine	Normal saline Lorazepam Ondansetron Promethazine
ED disposition	Discharged	Admitted	Discharged	Admitted	Discharged

Abbreviation: ED = emergency department.
* The five patients ranged in age from 32 to 52 years; three were women. Among the five, comorbidities included hypertension, anemia, hypothyroidism, hyperlipidemia, and a bicuspid aortic valve condition.
† This patient left the initial ED before receiving medical evaluation. After evaluation by another physician, the patient was sent to another ED for further treatment.
§ None of the patients reported drinking anything other than iced tea.

at the University of Texas Southwestern School of Medicine (UTSW) and the North Texas Poison Center, regarding testing for possible etiologic agents. A comprehensive list of potential agents was developed by medical toxicologists; the list included metabolic inhibitors (e.g., cyanide and sodium azide), heavy metals (e.g., arsenic), antihypertensives, organophosphates, and sedatives. Toxicologists at SWIFS and UTSW assisted in identification of laboratories capable of conducting appropriate testing.

To determine whether other cases existed, the Electronic Surveillance System for the Early Notification of Community-based Epidemics (ESSENCE) database was searched for patients with similar symptoms visiting any of 18 area EDs on the same day and during the same timeframe as the four

The *MMWR* series of publications is published by the Office of Surveillance, Epidemiology, and Laboratory Services, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services, Atlanta, GA 30333.

Suggested citation: Centers for Disease Control and Prevention. [Article title]. MMWR 2012;61:[inclusive page numbers].

patients. Of 1,827 ED visits recorded in ESSENCE that day, 81 patients reported symptoms of altered mental status, dizziness, fainting, tingling, or hypotension. Records of these cases were reviewed by DCHHS staff members and excluded if alternate diagnoses were well documented. Of 29 cases selected for further review, one additional case belonging to the restaurant cluster was identified. The patient (Table, patient 3) initially was taken by relatives to the same hospital as the other four patients and registered a chief symptom of "tingling" at triage, but left the ED before evaluation by a physician. The patient was then examined at an outpatient clinic and referred to a different ED because of hypotension and arrhythmia.

The five patients visited the restaurant separately, over a 4.5-hour period, beginning in the afternoon. All five patients reported that iced tea was the only beverage they consumed at the restaurant; the amount of consumption ranged from two sips to 8 ounces (Table). All of the tea came from a single self-serve urn that was in service during the period the five visited the restaurant. Regarding the food items in common, two reported eating a cookie and three reported eating bites of a sandwich. The five patients ranged in age from 32 to 52 years; three were women. Among the five, comorbidities included hypertension, anemia, hypothyroidism, hyperlipidemia, and a bicuspid aortic valve condition. Their initial heart rates at examination ranged from 62 bpm to 127 bpm; blood pressures ranged from 84/42 mmHg to 110/68 mmHg. Three of the five were discharged from the ED, and two were hospitalized (Table).

Case-Control Study

Because no contaminated vehicle was confirmed immediately, a case-control study was conducted to assess the association of the illnesses with specific food and drink. Potential controls were identified among the restaurant patrons and contacted by using records of credit card transactions. A case-patient was defined as a restaurant patron reporting dizziness or fainting within a 6-hour period that encompassed the time of symptom onset for the five known patients. Controls were patrons who purchased food or drink at the restaurant during the same timeframe and did not report dizziness or fainting after their meal. Thirteen of the 14 controls said they did not consume iced tea. The fourteenth control recalled drinking iced tea but having no symptoms; however, further investigation revealed that this person drank iced tea from a different self-serve urn, before the urn used by the five case-patients was placed in service. The case-control study found that consuming iced tea was 65 times more likely among the case-patients than the controls (OR = 65.0; CI = 2.4–3,292).

Testing of iced tea samples by SWIFS was negative for approximately 100 different chemicals and drugs, except for caffeine. The following analyses were performed: gas chromatography/mass spectrometry to screen for drugs (including gamma-hydroxybutyric acid, diltiazem, labetalol, metoprolol, propranolol, and verapamil), atomic absorption spectrometry with hydride generation for arsenic analysis, chemical tests for cyanide, a Geiger counter scan for radioactivity, and gas chromatography to identify alcohols and other volatiles. Samples also were sent to a private toxicology laboratory to test for nitrites and nitrates; all of those samples were positive because nitrites and nitrates were components of the leaves used to brew the tea. SWIFS then referred tea samples to the Federal Bureau of Investigation (FBI).

What is already known on this topic?

Sodium azide is a toxic chemical used widely in industry that has been added to beverages, either intentionally or unintentionally, in foodborne poisoning incidents in the United States and Japan. However, few details of these cases and their investigations have been reported previously.

What is added by this report?

This is the first detailed report of sodium azide poisonings at a public venue and the subsequent investigation. All five patients experienced rapid-onset of similar symptoms, requiring emergency department evaluation; all recovered quickly after supportive care, without sequelae. A multi-agency investigation led to conclusive identification of the poison.

What are the implications for public health practice?

Chemical poisoning should be considered as a potential cause of any rapid-onset foodborne illness. However, unusual chemicals can be challenging to detect in food, drink, and biologic specimens with traditionally available screening tests. A multidisciplinary approach, including consultations with public health officials, forensic toxicologists, and medical toxicologists, can lead to successful referral for appropriate testing. In the absence of an identified etiologic agent, epidemiologic tools can be of value in active case-finding and in confirming contaminated food vehicles.

Detection of Sodium Azide

Nearly 5 months after the restaurant incident, headspace gas chromatography/mass spectrometry analysis by the FBI laboratory detected hydrazoic acid, which is formed when sodium azide contacts water. The presence of hydrazoic acid led to the use of infrared spectroscopy to detect sodium azide. Both chemicals were found in three samples: two from patients' paper cups and one from the tea urn in use at the time of the incident. No sodium azide or hydrazoic acid was found in a control sample from a second tea urn used earlier that day. Neither chemical compound was used in the FBI laboratory or at the restaurant.

The mechanism by which the tea became contaminated with sodium azide remains unknown. Investigators learned

that water for the tea and soda served in the restaurant came from a common line. The self-serve iced tea urns were kept in an open location in the restaurant, accessible by customers, and out of the direct line-of-sight of employees.

After receiving notification of sodium azide as the etiologic agent, all five patients were evaluated in the medical toxicology clinic at UTSW and were confirmed to have fully recovered, without clinical sequelae. The police investigation is now closed.

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Editorial Note

Sodium azide is an odorless, tasteless, water-soluble crystalline powder that has been used in the manufacture of automobile airbags and explosives, and as a laboratory preservative (*1,2*). In the 1950s, sodium azide was used to treat hypertension because of its profound vasodilatory effects, possibly resulting from the production of nitric oxide (*2,3*). Systemic absorption of sodium azide can result in hypotension, loss of consciousness, headache, dyspnea, nausea, vomiting, metabolic acidosis, dysrhythmias, and death. The mechanism of poisoning with sodium azide is similar to cyanide, which suggests that use of traditional cyanide antidotes such as nitrite therapy and sodium thiosulfate might be beneficial. However, experience with antidotes in humans is limited mainly to case reports, and none have shown a conclusive, convincing, or consistent benefit. Therefore, good supportive care remains the cornerstone of treatment.

Previous reports of sodium azide poisoning primarily are limited to case reports involving ingestion of sodium azide either by accident or during attempted suicide. Patients at a dialysis center became symptomatic when treatment filters preserved with sodium azide were not rinsed properly (*4*). Two foodborne sodium azide mass poisonings have been described briefly, but neither report included clinical or epidemiologic details regarding the victims or the investigations (*3,5*). In 2009, six workers at Harvard Medical School became ill after drinking from a communal coffee pot that was contaminated with sodium azide; whether or not the poisoning was intentional is unknown (*3*). Within minutes of ingestion, the laboratory workers had palpitations and diaphoresis; two fainted. All of their symptoms rapidly resolved. In 1998, sodium azide was deliberately added to a teapot in Niigata, Japan, poisoning nine persons (*5*). No clinical data or other details about these two poisoning incidents have been reported (*3,5*).

The potential for future incidents and the challenges in identification of unusual chemicals reinforce the need to continue educating health-care providers regarding the possibility of such poisonings. Public health agencies should consider such incidents and the complexity of such investigations in their emergency response planning (*6,7*).

Acknowledgments

John T. Carlo, MD, Joey Stringer, Tony Jenkins, Dallas County Dept of Health and Human Svcs; Richard T. Briley, Garland Health Dept; David Klein PhD, Linda Gaul PhD, Texas Dept of State Health Svcs. William H. Keene, PhD, Oregon Health Svcs. Larry Enmon, Food and Drug Administration. Marc A. LeBeau, PhD, Eileen M. Waninger, Federal Bureau of Investigation Laboratory.

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Human Exposures to Marine *Brucella* Isolated from a Harbor Porpoise — Maine, 2012

On February 10, 2012, the Maine Center for Disease Control and Prevention (Maine CDC) was notified of a positive *Brucella* culture from a harbor porpoise (*Phocoena phocoena*) found on the coast of southern Maine. Maine CDC, in consultation with CDC, initiated an investigation of potential occupational exposures of staff members at university A and at diagnostic laboratories known to have handled samples from the porpoise. This report describes the results of that investigation. In humans, brucellosis can cause fever, sweats, headaches, back pains, physical weakness, and sometimes severe infections of the brain, bone, heart, liver, or spleen. Because staff members at university A did not use respiratory protection while handling the porpoise or its specimens, the four exposed staff members were advised to begin immediately a 3-week regimen of rifampicin and doxycycline for antimicrobial prophylaxis, conduct daily fever checks, be monitored for symptoms of acute febrile illness weekly, and have their serum tested for *Brucella* antibodies immediately and at regular intervals for 24 weeks after the last known exposure. As of June 26, none of the four persons had seroconverted or become ill. The potential for human infection and illness as well as the intensity, duration, and expense of the follow-up recommended for *Brucella* exposure highlights the need for facilities to develop standard protocols for preventing exposures during the handling of marine mammals, particularly during aerosol-generating procedures.

On January 28, 2012, a porpoise carcass was recovered by a rescue team affiliated with a marine mammal facility at university A. On January 29, a necropsy of the porpoise was performed in a small room at university A by a faculty member, two students, and a community volunteer. All wore gloves and gowns but worked without respiratory protection. The necropsy included removal of necrotic tissue from the uterine horn and the use of an electric saw with an oscillating blade to cut the skull to evaluate the brain. The same four persons who performed the necropsy also cleaned the room after the procedure. The necropsy room did not have a separate air supply, but the air was exhausted directly outdoors; therefore, persons in rooms adjacent to the necropsy room were considered to have minimal to no risk for exposure to *Brucella*. A swab of the uterine horn tissue was sent to laboratory A, which specializes in veterinary diagnostics. The sample was sent as an unknown diagnostic sample to laboratory A and successfully cultured. The cultured organism had morphologic and microscopic characteristics of *Brucella*, and the isolate was forwarded to laboratory B for identification. Once a high suspicion that the isolate might be a *Brucella* species was noted, standard biosafety level 3 (BSL-3) laboratory precautions were taken at both laboratories, including use of a biosafety cabinet for specimen manipulation. On February 15, samples from laboratory B were received at CDC for confirmatory testing. The isolate was identified by multilocus sequence typing as sequence type 23, a known sequence type associated with harbor porpoises. DNA tests for further differentiating the marine species (*Brucella pinnepedialis* and *Brucella ceti*) are limited. Based on the fact that the isolate originated from a cetacean, it likely was *B. ceti*.

On February 10, 2012, Maine CDC was notified by laboratory B of the positive *Brucella* culture. Maine CDC initiated an investigation to determine the potential for occupational exposure among persons who had handled the porpoise or the specimens. Because of the potential for aerosolization of *Brucella* organisms during the necropsy and the lack of respiratory precautions taken, the four persons who performed the necropsy were assessed to be at high risk for *Brucella* exposure. Laboratories A and B reported using proper procedures in handling unknown samples, and no potential laboratory exposures were identified. Maine CDC consulted with CDC, and recommendations for the four exposed persons included 1) an immediate 3-week course of antimicrobial prophylaxis with rifampicin and doxycycline, 2) *Brucella* serologic monitoring performed by CDC laboratories, 3) self-administered daily fever checks, and 4) weekly monitoring for symptoms of acute febrile illness for 24 weeks (*1*).

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Editorial Note

Brucellosis is a zoonotic infection uncommon in the United States but endemic in many parts of the world, where it most commonly affects cattle, swine, goats, and sheep. During 2000–2009, an average of 113 human cases was reported to

CDC annually (*2*). Human cases in the United States commonly are associated with consuming unpasteurized milk, hunting feral swine, and inadvertent exposure among laboratory workers who handle *Brucella* species. Brucellosis can have an incubation period ranging from days to months. Brucellosis can cause fever, sweats, headache, back pain, physical weakness, and sometimes severe infections of the brain, bone, heart, liver, or spleen. Moreover, human cases of brucellosis have been associated with marine mammals. Four human cases of brucellosis caused by marine mammal *Brucella* species have been reported since 2001. Three cases were attributed to environmental exposures (*3,4*); two of the patients reported symptoms consistent with neurobrucellosis, and the third was diagnosed with spinal osteomyelitis. The single laboratory-acquired infection caused a mild form of brucellosis (*5*).

Antimicrobial postexposure prophylaxis recommendations are based on risk assessment for the exposed person. A 3-week course of doxycycline and rifampicin is recommended for persons at high risk (*1*). For persons at high risk who cannot tolerate doxycycline, a 3-week course of trimethoprim-sulfamethoxazole and rifampicin is recommended. Persons who are at low risk for exposure should discuss the need for antimicrobial therapy with their health-care provider, and antimicrobial therapy should be based on individual health factors. Symptom surveillance includes regular (e.g., weekly) symptom watch and self-administered daily fever checks for 24 weeks after last known exposure for persons at low and high risk. Serologic testing is recommended for persons at high risk immediately and at regular intervals for 24 weeks after the last known exposure (*1*).

An increase in strandings and deaths of marine mammals along U.S. coastlines during 2010–2012 has increased the likelihood of human/animal interactions, which increase the risk for exposure to *Brucella* species and other pathogenic organisms (*6*). Persons who handle stranded marine mammals or carcasses should be made aware of any potential health risks associated with these activities and use appropriate personal protective equipment (*7*).

The potential for human infection and illness, as well as the intensity, duration, and expense of the follow-up recommended for *Brucella* exposures, highlights the need for standard protocols for preventing exposures during the handling of marine mammals, particularly during aerosol-generating procedures. When developing protocols for the rescue, care, treatment of marine mammals, or the performance of laboratory procedures or necropsies on these animals, precautions should be focused widely to protect workers from a broad range of infectious organisms.

What is already known on this topic?

Brucellosis is a zoonosis caused by bacteria of the genus *Brucella*. Various *Brucella* species affect sheep, goats, cattle, deer, elk, pigs, dogs, and marine mammals. In humans, brucellosis can cause fever, sweats, headaches, back pains, physical weakness, and sometimes severe infections of the brain, bone, heart, liver, or spleen.

What is added by this report?

Four persons participated in the necropsy of a harbor porpoise that was found subsequently to be infected with a *Brucella* species. They were a university faculty member, two students, and a community volunteer. Because they did not wear respiratory protection, they were advised to take antimicrobial prophylaxis and be monitored for brucellosis for 24 weeks. As of June 26, 2012, none of the four persons had become ill, and none had seroconverted.

What are the implications for public health practice?

Persons who handle marine mammals should be educated on the potential for infection associated with their activities and the precautions necessary to avoid being exposed to infectious agents. Failure to use primary protection to avoid exposure necessitates using more costly and time-consuming secondary strategies, such as prophylactic antimicrobials and clinical and laboratory monitoring.

Given the extensive involvement of students and volunteers in the rescue and handling of stranded marine mammals, facilities should provide the same level of training and protection for this population as they do for employees. If this is not feasible for administrative reasons, facilities should restrict the participation of nonemployees in procedures deemed to be of higher risk based on the facility's risk assessment, such as aerosol-generating procedures or cleaning of facilities and equipment after necropsy. The recently published *Guidelines for Safe Work Practices in Human and Animal Medical Diagnostic Laboratories* (*8*) provides a comprehensive approach to safe work practices in various human and animal diagnostic laboratory settings, including animal necropsy facilities. The guidelines emphasize prevention of occupational injury and illness in laboratory settings through the use of engineering tools, administrative policies, and personal protective equipment.

Acknowledgments

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Progress in Immunization Information Systems — United States, 2010

Immunization information systems (IIS) are confidential, computerized, population-based systems that collect and consolidate vaccination data from vaccination providers and provide important tools for designing and sustaining effective immunization strategies at the provider and immunization program levels (*1*). These tools include clinical decision support, vaccination coverage reports, interoperability with electronic health record systems, vaccine inventory management, and the ability to generate reminder and recall messages. In 2010, based on strong evidence of effectiveness, the Task Force on Community Preventive Services recommended IIS use as a means of increasing vaccination rates (*2*). A *Healthy People 2020* target (IID-18) is to increase to 95% the proportion of children aged <6 years whose immunization records are in fully operational, population-based IIS (*3*). To monitor progress toward program goals, CDC annually surveys 56 immunization program grantees (50 states, five cities, and the District of Columbia) using the IIS Annual Report (IISAR). Results from the 2010 IISAR (completed by 54 grantees) indicate that 82% (18.8 million) of U.S. children aged <6 years participated in IIS, as defined by having at least two recorded vaccinations, an increase from 78% (18.0 million) in 2009 (*1*). Among 52 grantees who responded to questions about the Vaccine Tracking System (VTrckS), CDC's new national vaccine ordering and inventory management system for publicly purchased vaccine, 38 (73%) indicated their intention to use the IIS in their state or city to interface with VTrckS. Use of IIS to interface with VTrckS might provide additional incentive for vaccination providers to participate in IIS and enhance IIS utility by supporting efficient and effective methods for providers to order vaccine and track inventory and by promoting greater accountability of publicly purchased vaccine.

Of 56 immunization program grantees (50 states, five cities,* and the District of Columbia), 2010 IISAR data† were available for 54 grantees (Massachusetts was excluded because of an incomplete report and New Hampshire was not eligible because it did not have an IIS in 2010). The self-administered survey asked about child, adolescent, and adult participation in IIS, vaccination coverage for these groups, provider participation in IIS, and IIS functionality (e.g., interoperability with electronic health records, data quality, vaccine inventory management, and use of IIS data).

* Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; and San Antonio, Texas.

† Additional information available at http://www.cdc.gov/vaccines/programs/iis/annual-report-iisar/index.html.

Child Participation

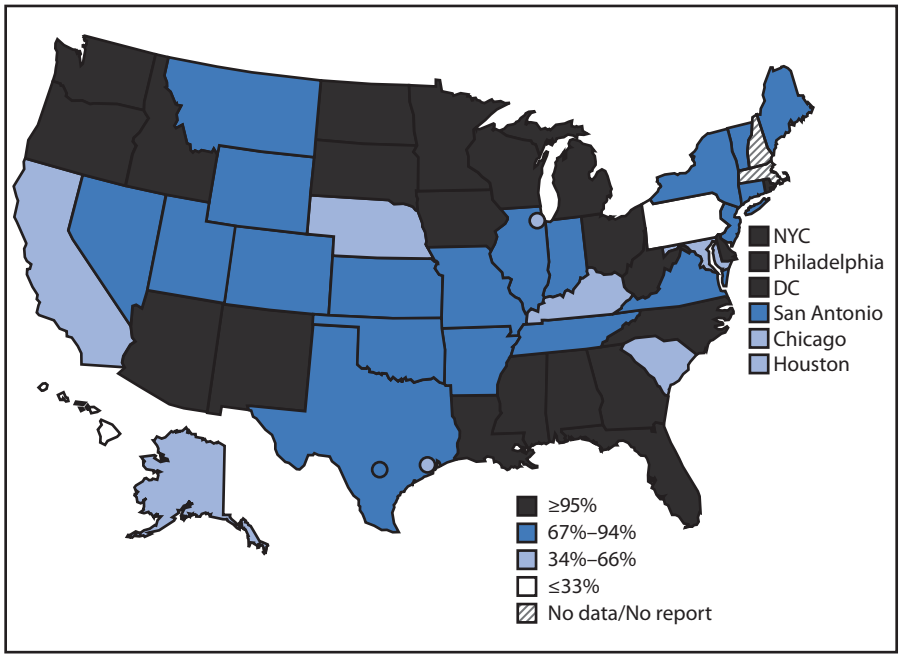
Child participation was defined as having two or more vaccinations documented in an IIS. Participation was calculated by dividing the number of children aged <6 years in an IIS meeting this criteria by the 2010 U.S. Census estimate for the number of children in this age group in that grantee's geographic area. Demographic data in IIS are obtained from birth certificates and birth hospital records, which often also contain records of the birth dose of hepatitis B vaccine. Defining participation in an IIS as having ≥2 recorded doses ensures that the child received at least one vaccination from a provider who participates in an IIS. Nationally, 18.8 million U.S. children aged <6 years (82%) participated in an IIS in 2010. Child participation in IIS has increased steadily, from 63% in 2006§ to 82% in 2010, with an average 4.8 percentage point increase each year. Of the 54 grantees with available data in 2010, 24 (44%) reported that >95% of children aged <6 years in their geographic area participated in their IIS. An additional 14 (26%) grantees reported child participation rates ranging from 80% to 94% (Figure 1).

Provider Site Participation

Vaccination provider sites enroll in IIS to share vaccination data and to use IIS functions and features that support vaccine delivery. In the 2010 IISAR, sites were considered to participate in IIS if they submitted data to the IIS in their state or city in the previous six months (i.e., from July 1 through December 31, 2010), indicating recent submissions. Data were collected separately for public and private provider sites. In 2010, a total of 11,536 public and 36,512 private provider sites participated in IIS. Provider site participation rates were not calculated because the number of vaccination providers in the United States is not known. From 2006 through 2010, 49 grantees (excluding Alaska, Georgia, Hawaii, Kentucky, Massachusetts, New Hampshire, and South Carolina) reported data each year. Among grantees with available data, the number of participating public provider sites increased from a low of 6,745 in 2006 to a high of 11,536 in 2010; private provider site participation also increased annually during the period, from 27,894 to 36,512 (Figure 2). Although the number of public and private provider sites that participated in IIS increased from 2006 to 2010, these counts lagged behind the number enrolled each year (40,075 enrolled provider sites in 2006; 88,061 enrolled provider sites in 2010). The substantial

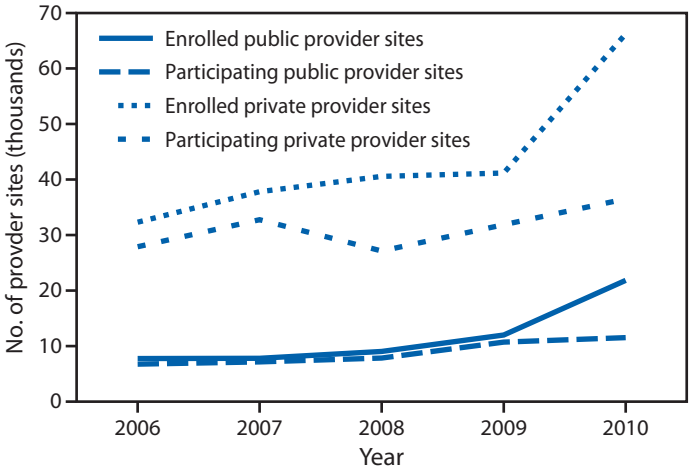
§ An error was identified in previously published 2006–2009 child participation rates. Data have been corrected in this report.

FIGURE 1. Percentage of children aged <6 years participating* in an Immunization Information System (IIS) — United States, five cities,† and the District of Columbia, 2010



Abbreviations: NYC = New York City; DC = District of Columbia.
* Defined as having two or more vaccinations recorded in the IIS.
† Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; and San Antonio, Texas.

FIGURE 2. Number of public and private vaccination provider sites enrolled and participating* in an Immunization Information System (IIS), by year — United States, 2006–2010



* Defined as having submitted data to the IIS in the last 6 months.

increase in enrolled public and private provider sites in 2010 likely represents response to the 2009 influenza A (H1N1) pandemic; most immunization programs required providers to enroll in the IIS in their state or city to obtain influenza A (H1N1)pdm09 vaccine.

Vaccine Inventory and Management

In 2010, CDC developed VTrckS,¶ a vaccine tracking system to facilitate vaccine ordering, inventory management, and related processes for publicly purchased vaccine. Vaccination providers can report inventory and order vaccine in three ways: 1) providers can access VTrckS directly through a web service, 2) immunization program grantees can manually enter vaccine orders and inventory into the VTrckS web service on behalf of providers, and 3) providers can enter vaccine orders and inventory into an IIS, which interfaces with VTrckS through a file upload. Immunization program grantees can select one or more options for vaccination providers in their jurisdiction. In the 2010 IISAR, 38 (73%) of the 52 grantees that responded to VTrckS questions indicated their intention to use their IIS to interface with VTrckS. Among those 38 grantees, 32 (84%) planned to implement this functionality within 12 months. Of the 14 grantees not intending to use their IIS to interface with VTrckS, 11 (79%) planned to manually enter vaccine orders into VTrckS on behalf of providers and eight (57%) planned to allow providers to access VTrckS directly.

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Editorial Note

Data from the IISARs demonstrate that increases in child and provider site participation in IIS have been achieved in recent years. However, challenges to meeting the *Healthy People 2020* objective and other program goals remain. Because IIS rely on providers to submit vaccination data to the system, ensuring that immunization programs identify, recruit, and train all vaccination providers in their jurisdictions to participate in IIS is essential.

One of several challenges to achieving those goals is that no master list or database of U.S. vaccination provider sites exists. Provider sites begin and cease operations often, making it difficult for immunization programs to ensure that all

¶ Additional information available at http://www.cdc.gov/vaccines/programs/vtrcks.

vaccination provider sites in a state or city have been identified and enrolled. Immunization programs use multiple resources to identify all vaccination providers in their jurisdictions. However, systematic solutions to this challenge that can be applied across all grantees in the United States are not yet available. The population of providers currently enrolled in IIS likely does not represent all vaccination providers in the United States. This, in addition to the gap between enrolled and participating provider sites in IIS from 2006–2010, suggests that additional progress can be made. Another challenge is that, although several states and cities have legal mandates requiring some or all vaccination providers to report vaccinations to the IIS, these mandates are difficult to enforce.

The 2009 influenza A (H1N1) pandemic highlighted another challenge in measuring provider site participation in IIS. Most immunization programs required providers who wished to obtain influenza A (H1N1)pdm09 vaccine to enroll in the IIS. Because of the high public demand for vaccine and the need for diverse health-care providers to offer the vaccine to persons, many providers who do not typically engage in routine vaccination activities enrolled in IIS. Some of these providers ultimately did not order and administer influenza A (H1N1)pdm09 vaccine. Those who did might have administered influenza vaccine only during the first half of 2010, during the national response to the pandemic. After August 2010, when the pandemic was determined to have ended, those providers likely did not administer or report influenza A (H1N1)pdm09 vaccine doses during the rest of the year, when provider site participation was measured. This might have resulted in a substantial increase in the number of provider sites enrolled in IIS, without a corresponding increase in the number of participating provider sites. Thus, tracking provider site participation rates, rather than counts, can lead to misinterpretations of IIS achievements.

To encourage participation among routine vaccinators, IIS offer many tools to benefit providers (e.g., vaccine forecasting, reminder and recall messaging, and provider assessment and feedback). The recent inclusion of vaccine inventory and management tools in IIS might further support vaccination providers and encourage participation in IIS.

In 2010, CDC introduced VTrckS, which replaced several older systems at CDC. VTrckS is designed to enhance internal controls and help standardize and improve processes for contract management and reconciliation, vaccine ordering, and inventory tracking. Before VTrckS became available, some IIS grantees had added, or were in the process of adding, vaccine ordering components to their IIS. To support these grantees and others who planned to add similar components to their IIS, CDC developed software capabilities, referred to as the VTrckS ExIS interface, to facilitate sharing data between other vaccine inventory systems (e.g., IIS) and VTrckS. Grantees that choose to use the VTrckS ExIS interface are not required to use their IIS; grantees may choose instead to use another external system for that function. However, the majority of immunization program grantees have indicated that they plan to use their IIS. Providers benefit by this approach because they can access a single system (the IIS) to order publicly funded vaccines and to otherwise participate in the state's immunization program. In 2010, the ExIS interface was successfully pilot tested with two IIS, which were included among the 38 that indicated interest in using the interface. Since completion of the 2010 IISAR and the ExIS pilot, three additional grantees committed to using their IIS to interface with VTrckS, for a total of 41 of 56 grantees. Deployment is scheduled to occur between May 2012 and May 2013.

The findings in this report are subject to at least three limitations. First, although CDC provides guidance to grantees to validate IISAR responses, data are self-reported and self-validated, which might overestimate or underestimate participation rates. Second, because some of the 56 grantees did not report data during the period studied, nationwide child and provider site participation estimates might be underestimated. Finally, the full universe of vaccination providers in the United States is not known, thus limiting accurate assessment of provider site participation. The mass enrollment of provider sites during the 2009 influenza A (H1N1) pandemic biased participation rates in 2010 and limited the assessment of trends.

VTrckS was designed to modernize the vaccine ordering and management process. Use of IIS to interface with VTrckS allows grantees to manage vaccine ordering and distribution at the local

What is already known on this topic?

In 2006, a total of 34,639 vaccination provider sites participated in immunization information systems (IIS). In 2009, 78% of all U.S. children aged <6 years (18.0 million) participated in IIS.

What is added by this report?

In 2010, the number of vaccination provider sites participating in IIS increased to 48,048, and 82% of all U.S. children aged <6 years (18.8 million) participated in IIS. Among immunization program grantees, 73% reported that they intended to use their IIS to interface with the Vaccine Tracking System (VTrckS), CDC's new vaccine ordering and inventory management system for publicly purchased vaccine; the remaining grantees intended to access VTrckS directly.

What are the implications for public health practice?

Use of IIS to interface with VTrckS might provide an additional incentive for vaccine providers to participate in IIS and further enhance the utility of IIS by supporting efficient and effective methods for providers to order vaccine and track inventory and by promoting greater accountability of publicly purchased vaccine.

level, submit data to the national system, and maintain control of their processes and communications with providers. Providers save time by logging on to a single system to report vaccinations, review patient vaccine histories, track inventory, order vaccines, and use other IIS functions and features. The success of these efforts reinforces the benefits of IIS for immunization programs and vaccination providers. Use of IIS to interface with VTrckS might provide an additional incentive for vaccination providers to participate in IIS. The interface with VTrckS might further enhance the utility of IIS by supporting efficient and effective methods for providers to order vaccine and track inventory and by promoting greater accountability for publicly purchased vaccine.

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Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid, and Acellular Pertussis (Tdap) Vaccine in Adults Aged 65 Years and Older — Advisory Committee on Immunization Practices (ACIP), 2012

Since 2005, the Advisory Committee on Immunization Practices (ACIP) has recommended a tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccine booster dose for all adolescents aged 11 through 18 years (preferred at 11 through 12 years) and for those adults aged 19 through 64 years who have not yet received a dose (*1,2*). In October 2010, despite the lack of an approved Tdap vaccine for adults aged 65 years and older, ACIP recommended that unvaccinated adults aged 65 years and older be vaccinated with Tdap if in close contact with an infant, and that other adults aged 65 years and older may receive Tdap (*3*). In July 2011, the Food and Drug Administration (FDA) approved expanding the age indication for Boostrix (GlaxoSmithKline Biologicals, Rixensart, Belgium) to aged 65 years and older (*4*). In February 2012, ACIP recommended Tdap for all adults aged 65 years and older. This recommendation supersedes previous Tdap recommendations regarding adults aged 65 years and older.

The Pertussis Vaccines Work Group of ACIP reviewed the epidemiology of pertussis in adults aged 65 years and older and two cost-effectiveness models to assess the epidemiologic and economic impact of pertussis vaccination in this population. The Work Group also considered safety and immunogenicity data from clinical trials and observational studies on the use of Tdap in adults aged 65 years and older (*3*).

The two Tdap vaccines available in the United States, Boostrix and Adacel (Sanofi Pasteur, Toronto, Canada), differ in composition and approved age for use (Table). Only Boostrix is approved for adults aged 65 years and older; however, ACIP discussed the use of Adacel in this age group. On February 22, 2012, ACIP approved use of Tdap for all adults aged 65 years and older. This report summarizes data considered and conclusions made by ACIP and provides guidance for implementing the recommendation.

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Epidemiology of Pertussis in Older Adults

Because pertussis is underdiagnosed and underreported substantially in all age groups, the actual burden of disease in adults aged 65 years and older is unknown (*5*). During 2000–2010, an annual average of 318 pertussis cases (range: 71–719 cases) in adults aged 65 years and older were reported each year through the National Notifiable Diseases Surveillance System (CDC, unpublished data, 2011). Challenges to diagnosing and reporting pertussis in all adults include 1) underrecognition of pertussis as a cause for cough illness, 2) atypical presentation of symptoms in adults, and 3) a low index of suspicion among providers (*6,7*). Few studies are focused on the burden of pertussis in adults aged 65 years and older. Among reported prospective studies, the calculated pertussis incidence ranged from 66 to 500 cases per 100,000 persons per year (*8–11*). Reported pertussis incidence ranges from one to five cases per 100,000 in adults of similar age ranges (CDC, unpublished data, 2011); this 70-fold to 100-fold difference suggests that actual pertussis incidence in older adults is much higher than reported (CDC, unpublished data, 2011). ACIP supported the conclusion that the actual burden of pertussis in adults aged 65 years and older likely is at least 100 times greater than that reported.

Cost Effectiveness Analysis

ACIP reviewed two unpublished cost-effectiveness models, developed independently by GlaxoSmithKline and CDC (*12,13*). Both models were developed to assess the epidemiologic and economic impact of Tdap vaccination in adults aged 65 years and older and demonstrated that a dose of Tdap for older adults resulted in a moderate decrease in the number of cases and outcomes (e.g., outpatient visits, hospitalizations, and deaths), which might represent a cost-effective intervention. Model results were most sensitive to incidence of pertussis; however, sensitivity analyses showed that even with a range of underreporting of incidence, Tdap vaccination might be cost-effective in this population. Reassured by the concordance between the two cost-effectiveness models, ACIP's interpretations were that the cost per case averted and cost per quality-adjusted life-year saved were modest, and pertussis incidence estimates accounting for underreporting were reasonable based on limited data and expert opinion.

TABLE. Composition and approved age for use of tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) vaccines, by trade name — United States, 2012

Trade name	Manufacturer	FDA-approved age for use* (yrs)	Pertussis antigens (μg)				Diphtheria toxoid (Lf)	Tetanus toxoid (Lf)
			PT	FHA	PRN	FIM		
Boostrix	GlaxoSmithKline Biologicals	10 and older	8	8	2.5	—	2.5	5
Adacel	Sanofi Pasteur	11 through 64	2.5	5	3	5†	2	5

Abbreviations: FDA = Food and Drug Administration; PT = pertussis toxin; FHA = filamentous hemagglutinin; PRN = pertactin; FIM = fimbriae; Lf = limit of floccuation units.
* Indicated as a single dose.
† Types 2 and 3.

Tdap Products in the United States

Safety and immunogenicity data of Tdap administered to adults aged 65 years and older were reviewed by ACIP in October 2010 and in February 2012 (*3*). Published and unpublished data from clinical trials of Boostrix (N = 1,104) and Adacel (N = 1,170) on the safety and immunogenicity of Tdap in adults aged 65 years and older who received vaccine were provided by GlaxoSmithKline and Sanofi Pasteur.

Safety. For both Tdap products, the frequency and severity of adverse events in persons aged 65 years and older were comparable to those among persons aged less than 65 years. No increase in local or generalized reactions in Tdap recipients was observed, compared with persons who received Td. No serious adverse events were considered related to vaccination (*3*). Postmarketing data from the Vaccine Adverse Event Reporting System (VAERS) suggest that the safety profile of Tdap vaccine in adults aged 65 years and older was comparable to that of Td vaccine (*14*).

Boostrix immunogenicity. For diphtheria and tetanus, immune responses to Boostrix were noninferior to the immune responses elicited by a comparator Td vaccine (*15*). Immune responses to pertussis antigens (i.e., pertussis toxin [PT], filamentous hemagglutinin [FHA], and pertactin [PRN]) were noninferior to those observed following a 3-dose primary DTaP series with Infanrix (GlaxoSmithKline), according to predefined criteria discussed with and agreed to by FDA before study initiation (*16*). Boostrix contains the same three pertussis antigens as Infanrix, but in reduced quantities. The geometric mean concentrations for antibodies to PT, FHA, and PRN after Boostrix administration increased 7.4-fold to 13.7-fold over baseline levels (*15*).

Adacel immunogenicity. Antibody responses to diphtheria and tetanus toxoids in Adacel were noninferior to a comparator Td vaccine. Because a limited quantity of sera remained from infant efficacy trials, immune responses to three of the four pertussis antigens (FHA, PRN, and fimbriae [FIM]) in Adacel were bridged to a 3-dose DTaP (Daptacel [Sanofi Pasteur]) series, and PT was bridged to a 4-dose series. Immune responses were observed to all Adacel pertussis antigens but some did not meet predefined noninferiority criteria as agreed upon by FDA and Sanofi Pasteur (*16*); however, a 4.4-fold to 15.1-fold increase in anti-pertussis antibodies, depending on the antigen, was observed. Multiple other countries, including Canada, Australia, and European Union members have approved Adacel for use in persons aged 65 years and older. ACIP concluded that Adacel likely would provide protection in adults aged 65 years and older.

Guidance for Use

Tdap use in adults. ACIP recommends that all adults aged 19 years and older who have not yet received a dose of Tdap should receive a single dose. Tdap should be administered regardless of interval since last tetanus or diphtheria toxoid-containing vaccine. After receipt of Tdap, persons should continue to receive Td for routine booster immunization against tetanus and diphtheria, according to previously published guidelines (*1,2*). Currently, Tdap is recommended only for a single dose across all age groups. ACIP will begin discussions on the need for additional doses of Tdap and timing of revaccination of persons who have received Tdap previously.

Tdap products in adults aged 65 years and older. Providers should not miss an opportunity to vaccinate persons aged 65 years and older with Tdap. Therefore, providers may administer the Tdap vaccine they have available. When feasible, Boostrix should be used for adults aged 65 years and older; however, ACIP concluded that either vaccine administered to a person 65 years or older is immunogenic and would provide protection. A dose of either vaccine may be considered valid.

Tetanus prophylaxis in wound management for adults. As part of standard wound management care to prevent tetanus, a tetanus toxoid–containing vaccine might be recommended for wound management in adults aged 19 years and older if 5 years or more have elapsed since last receiving Td. If a tetanus booster is indicated, Tdap is preferred over Td for wound management in adults aged 19 years and older who have not received Tdap previously.

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Notes from the Field

Norovirus Outbreak at a Boys' Basketball Tournament — Kentucky, February 2012

On February 6, 2012, the Kentucky Department for Public Health was notified by a local health department of multiple cases of vomiting and diarrhea among participants in a statewide, 7th grade boys' basketball tournament that was held February 3–5. State and local health officials partnered with CDC in an investigation to determine the extent of the outbreak, confirm the cause, and assess potential modes of transmission.

Basketball coaches were asked about any known ill players or spectators. Regional epidemiology staff members worked with school nurses to conduct interviews and check absentee data to identify players with acute gastroenteritis (AGE), defined as vomiting or diarrhea ≤72 hours after tournament attendance. Kentucky Department for Public Health staff members interviewed employees who had worked at the tournament to identify additional AGE cases. Patients were asked about their illness history, food and water exposures, and lodging during the tournament. Based on clinical histories, norovirus disease was suspected initially. Stool specimens were requested from persons with AGE for norovirus testing and characterization by reverse transcription–polymerase chain reaction.

Among 52 participating teams, 49 (94%) teams (comprising 573 players) were contacted. Thirty-six teams (73%) reported at least one ill player. Sixty-two employees were identified who had worked at the tournament, and 46 (74%) were interviewed. A total of 242 persons with AGE were identified and interviewed, including 154 (27%) of the 573 players, 12 (26%) of the 46 employees, 11 coaches, and 65 spectators (the total numbers of coaches and spectators attending could not be determined). Nineteen (8%) persons with AGE had sought medical care, including two children who were hospitalized. Three persons from three separate teams had experienced illness onset before the tournament, and one had vomited courtside in a crowded gymnasium on the first night of the tournament. The vomitus was cleaned up by tournament attendees, and janitorial staff members were notified 3 days later. Symptom onset occurred among 196 (81%) ill persons on days 2 and 3 after the vomiting episode. No common food or water sources were identified as potential vehicles for transmission.

Six stool specimens were collected from five players and one spectator; all tested positive for norovirus. Five were sent to CDC for sequencing, and results yielded the identical genogroup II type 7 (GII.7) strain, a relatively rare norovirus strain. These confirmed cases represented players or spectators from four different teams. The three persons who had arrived at the tournament with gastrointestinal symptoms were unable to provide stool specimens for norovirus testing. However, three of the six confirmed stool specimens came from participants who had played on the court where the vomiting episode occurred.

Norovirus is a highly contagious pathogen and the leading cause of AGE outbreaks worldwide (*1*). Abundantly shed in feces and vomitus, norovirus can be transmitted through direct person-to-person contact, contaminated food or water, and contaminated environmental surfaces (*1*). Investigation of this statewide basketball tournament in Kentucky identified evidence of direct and indirect person-to-person norovirus transmission, likely resulting from the courtside vomiting episode and subsequently from environmental surfaces contaminated by virus aerosolized from vomitus. Person-to-person transmission occurring during collegiate and professional sporting events has been documented previously (*2,3*). Exclusion of players experiencing gastroenteritis symptoms ≤24 hours preceding a sporting event, increased education regarding personal hygiene, and cleaning and disinfection of environmental surfaces that might have been contaminated with vomitus by using agents with demonstrated efficacy against norovirus (e.g., bleach) can reduce sports-associated norovirus outbreaks (*1*).

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Announcement

Interactive Atlas of Heart Disease and Stroke Available Online

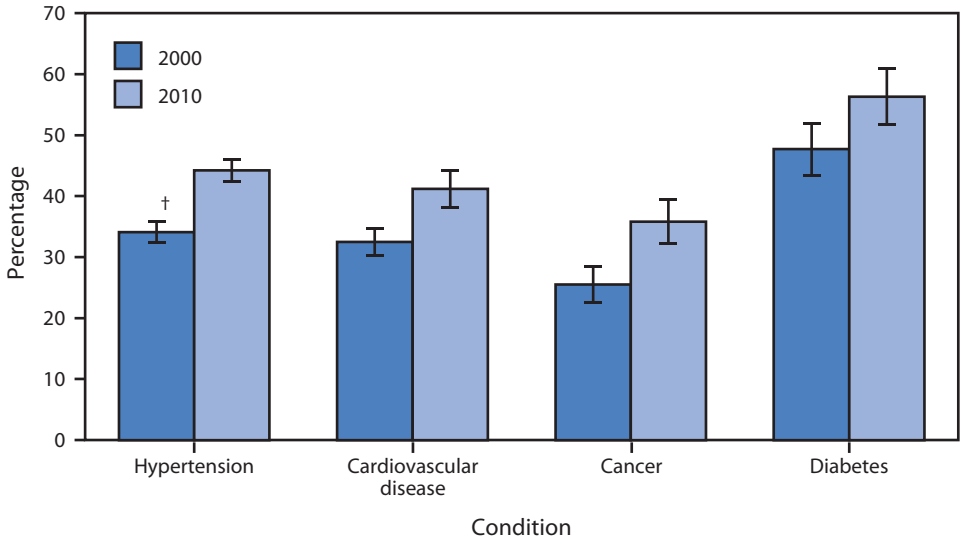
CDC's Division for Heart Disease and Stroke Prevention has created the Interactive Atlas of Heart Disease and Stroke, a new online mapping tool that documents geographic disparities in the burden of cardiovascular disease (CVD) at state and county levels. Users can create county-level maps of nine different CVD outcomes, by sex, race/ethnicity, and age group, and can overlay maps with congressional boundaries and locations of health-care facilities. Users also can view maps showing county-level social determinants of health and health services, including poverty, education, and food acquisition determinants.

The Interactive Atlas of Heart Disease and Stroke is available at http://apps.nccd.cdc.gov/dhdspatlas. The atlas is designed to be a valuable tool for public health professionals, researchers, community leaders, and others interested in monitoring CVD trends, setting research priorities, and planning patient services.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Adults with Selected Chronic Conditions Who Received Recommendations to Exercise or Engage in Physical Activity — National Health Interview Survey, United States, 2000 and 2010*



* Estimates were based on household interviews of a sample of the civilian, noninstitutionalized U.S. population. Respondents were asked, "During the past 12 months, did a doctor or other health-care professional recommend that you begin or continue to do any type of exercise or physical activity?" Denominator is adults who had visited a physician or other health-care professional in the past 12 months. Estimates were age-adjusted to the 2000 U.S. standard population, using four age groups: 18–24, 25–44, 45–64, and ≥65 years.
† 95% confidence interval.

Physicians and other health-care professionals were more likely in 2010 than in 2000 to recommend that adults with hypertension, cardiovascular disease, cancer, or diabetes begin or continue exercise or physical activity. In both years, adults who had diabetes (47.7% in 2000 and 56.3% in 2010) were more likely than adults with the other three chronic conditions to receive a recommendation for exercise or physical activity.

Source: Barnes PM, Schoenborn CA. Trends in adults receiving a recommendation for exercise or other physical activity from a physician or other health professional. NCHS data brief, no. 86. Hyattsville, MD: US Department of Health and Human Services, CDC, National Center for Health Statistics; 2012.

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The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format. To receive an electronic copy each week, visit *MMWR*'s free subscription page at *http://www.cdc.gov/mmwr/mmwrsubscribe.html*. Paper copy subscriptions are available through the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone 202-512-1800.

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U.S. Government Printing Office: 2012-523-043/02018 Region IV ISSN: 0149-2195