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Invasive Cancer Incidence and Survival — United States, 2011

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Because of improvements in early detection and treatment of cancer, the proportion of persons with cancer who survive ≥5 years after diagnosis has increased (*1*). To assess progress toward achieving *Healthy People 2020* objectives (*2*),* CDC analyzed data from U.S. Cancer Statistics (USCS) for 2011, the most recent data available. USCS includes incidence and survival data from CDC's National Program of Cancer Registries (NPCR) and the National Cancer Institute's Surveillance, Epidemiology, and End Results (SEER) program and mortality data from the National Vital Statistics System (*3*). In 2011, a total of 1,532,066 invasive cancers were reported to cancer registries in the United States (excluding Nevada), for an annual incidence rate of 451 cases per 100,000 persons. Cancer incidence rates were higher among males (508) than females (410), highest among black persons (458), and ranged by state, from 374 to 509 per 100,000 persons (339 in Puerto Rico). The proportion of persons with cancer who survived ≥5 years after diagnosis was 65% and was similar among males (65%) and females (65%) but lower among black persons (60%) compared with white persons (65%). Surveillance of cancer incidence and survival are essential for identifying population groups with high cancer incidence rates and low cancer survival rates as well as for estimating the number of cancer survivors, which was 13.7 million in 2012 (*1*). These data are being used by states to effectively develop comprehensive cancer control programs, including supporting the needs of cancer survivors.

Invasive cancers are all cancers excluding in situ cancers (except in the urinary bladder) and basal and squamous cell skin cancers. Data on new cases of invasive cancer diagnosed during 2011 were obtained from population-based cancer registries affiliated with the NPCR and/or SEER programs in each state, the District of Columbia (DC), and Puerto Rico (*3*). For comparability with past estimates, data for the United States are restricted to the states and DC, and data for Puerto Rico are analyzed and presented separately. Data from DC and all states except Nevada met USCS publication criteria for 2011†; consequently, data in this report cover 99% of the U.S. population. Cases were first classified by anatomic site using the *International Classification of Diseases for Oncology, Third*

* As of 2014, *Healthy People 2020* objectives included improving to 71.7% the proportion of persons surviving ≥5 years after cancer diagnosis, reducing colorectal cancer incidence to 41.6 per 100,000 persons, reducing late-stage breast cancer incidence to 38.9 per 100,000 women, and reducing cervical cancer incidence to 7.5 per 100,000 women.

† Cancer registries demonstrated that cancer incidence data were of high quality by meeting the six USCS publication criteria: 1) case ascertainment is ≥90% complete; 2) ≤5% of cases are ascertained solely on the basis of a death certificate; 3) ≤3% of cases are missing information on sex; 4) ≤3% of cases are missing information on age; 5) ≤5% of cases are missing information on race; and 6) ≥97% of the registry's records passed a set of single-field and inter-field computerized edits that test the validity and logic of data components. Additional information available at http://www.cdc.gov/uscs.

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Edition. Cases with hematopoietic histologies were further classified using the *World Health Organization Classification of Tumours of Haematopoietic and Lymphoid Tissues, Fourth Edition*. Breast cancers were characterized by stage at diagnosis using SEER *Summary Staging Manual 2000*[§]; late-stage cancers include those diagnosed after they had spread regionally or metastasized.

Population denominators for incidence rates are race-, ethnicity-, and sex-specific county population estimates from the 2010 U.S. Census, as modified by SEER and aggregated to the state and national level.[¶] Annual incidence rates per 100,000 population were age-adjusted by the direct method to the 2000 U.S. standard population.

For the first time, a subset of the USCS dataset includes the 5-year relative survival rate, defined as the proportion of persons surviving ≥5 years after cancer diagnosis compared with the proportion of survivors expected in a set of comparable cancer-free persons. These estimates are based on data from NPCR-funded states that met USCS publication criteria and conducted active case follow-up or linkage with CDC's National Center for Health Statistics National Death Index (*4*). For this report, 30 states met these criteria, covering 71% of the U.S. population. The 5-year relative survival rates were calculated for cases diagnosed during 2003–2010 with follow-up through 2010 (*4*).

In 2011, a total of 1,532,066 invasive cancers were diagnosed and reported to central cancer registries in the United States (excluding Nevada), including 786,102 among males and 745,964 among females (Table 1). The age-adjusted annual incidence for all cancers was 451 per 100,000 population: 508 per 100,000 in males and 410 per 100,000 in females. Among persons aged <20 years, 14,754 cancer cases were diagnosed in 2011 (Table 1). By age group, rates per 100,000 population in 2011 were 18 among persons aged <20 years, 154 among those aged 20–49 years, 816 among those aged 50–64 years, 1,840 among those aged 65–74 years, and 2,223 among those aged ≥75 years (Table 1).

By cancer site, rates were highest for cancers of the prostate (128 per 100,000 men), female breast (122 per 100,000 women), lung and bronchus (61 per 100,000 persons), and colon and rectum (40 per 100,000 persons) (Table 1). These four sites accounted for half of cancers diagnosed in 2011, including 209,292 prostate cancers, 220,097 female breast cancers, 207,339 lung and bronchus cancers, and 135,260 colon and rectum cancers. In 2011, the cervical cancer incidence rate was 7.5 per 100,000 women, representing 12,109 reported cancers.

[§] Additional information available at http://seer.cancer.gov/tools/ssm.

[¶] Population estimates incorporate bridged single-race estimates derived from the original multiple race categories in the 2010 U.S. Census. Additional information available at http://seer.cancer.gov/popdata/index.html and http://www.census.gov/popest/topics/methodology.

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TABLE 1. Number of invasive cancers* and annual rate,† by sex, primary site, race/ethnicity,§ and age group — National Program of Cancer Registries, and Surveillance, Epidemiology, and End Results Program, United States,¶ 2011

Characteristic	Overall			Males			Females		
	Rate	No.	(%)	Rate	No.	(%)	Rate	No.	(%)
All sites	**450.6**	**1,532,066**		**507.5**	**786,102**		**410.3**	**745,964**	
Prostate	NA	209,292	(14)	128.3	209,292	(27)	NA	NA	
Female breast	NA	220,097	(14)	NA	NA		122.0	220,097	(30)
Late-stage female breast	NA	73,485		NA	NA		41.4	73,485	
Lung and bronchus	61.0	207,339	(14)	73.0	110,322	(14)	52.0	97,017	(13)
Colon and rectum	39.9	135,260	(9)	46.1	70,099	(9)	34.9	65,161	(9)
Cervix uteri	NA	12,109	(1)	NA	NA		7.5	12,109	(2)
Race/Ethnicity									
White	449.7	1,286,265	(84)	499.7	658,861	(84)	414.8	627,404	(84)
Black	458.3	165,062	(11)	554.5	84,664	(11)	393.8	80,398	(11)
American Indian/Alaska Native	273.4	7,877	(1)	293.5	3,776	(<1)	261.0	4,101	(1)
Asian and Pacific Islander	290.4	43,738	(3)	310.1	19,882	(3)	279.8	23,856	(3)
Hispanic	350.6	109,279	(7)	393.5	53,066	(7)	324.2	56,213	(8)
Age group (yrs)									
0–19	17.9	14,754	(1)	18.4	7,780	(1)	17.3	6,974	(1)
20–49	154.3	189,430	(12)	114.2	70,352	(9)	194.0	119,078	(16)
50–64	816.1	505,334	(33)	887.1	267,543	(34)	750.6	237,791	(32)
65–74	1,840.0	406,275	(27)	2,258.3	231,725	(29)	1,477.5	174,550	(23)
≥75	2,223.2	416,273	(27)	2,819.2	208,702	(27)	1,830.3	207,571	(28)

Abbreviation: NA = not available.
* Excludes basal and squamous cell carcinomas of the skin except when these occur on the skin of the genital organs, and *in situ* cancers except urinary bladder.
† Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.
§ Racial categories are not mutually exclusive from Hispanic ethnicity. Rates are not presented for persons with unknown or other race.
¶ Compiled from cancer registries that meet the data quality criteria for all invasive cancer sites combined (covering approximately 99% of the U.S. population).

By state in 2011, all-sites cancer incidence rates ranged from 374 to 509 per 100,000 persons (Figure). State site-specific cancer incidence rates ranged from 79 to 195 per 100,000 men for prostate cancer, 106 to 153 per 100,000 women for female breast cancer, 29 to 93 per 100,000 persons for lung cancer, 33 to 49 per 100,000 persons for colorectal cancer, and 4.5 to 13.7 per 100,000 women for cervical cancer (Figure). *Healthy People 2020* targets were reached in 37 states for incidence of colorectal cancer and in 28 states for incidence of cervical cancer. Compared with the states and DC, cancer incidence rates in Puerto Rico in 2011 were lower for all-sites cancer (339 per 100,000 persons), lung cancer (17 per 100,000 persons), and breast cancer (93 per 100,000 women), but higher for prostate cancer (150 per 100,000 men), colorectal cancer (43 per 100,000 persons), and cervical cancer (13.5 per 100,000 women).

Among persons with cancer diagnosed during 2003–2010, the 5-year relative survival rate was 65% (Table 2). This percentage was similar for males and females. The 5-year relative survival was highest among those diagnosed with cancer before age 45 years (81%) and decreased with increasing age (Table 2). Among the most common cancer sites, 5-year relative survival was highest for prostate cancer (97%) and breast cancer (88%), intermediate for colorectal cancer (63%), and lowest for lung cancer (18%) (Table 2). The 5-year relative survival after any cancer diagnosis was lower for black persons (60%) than for white persons (65%) and for each cancer site (Table 2).

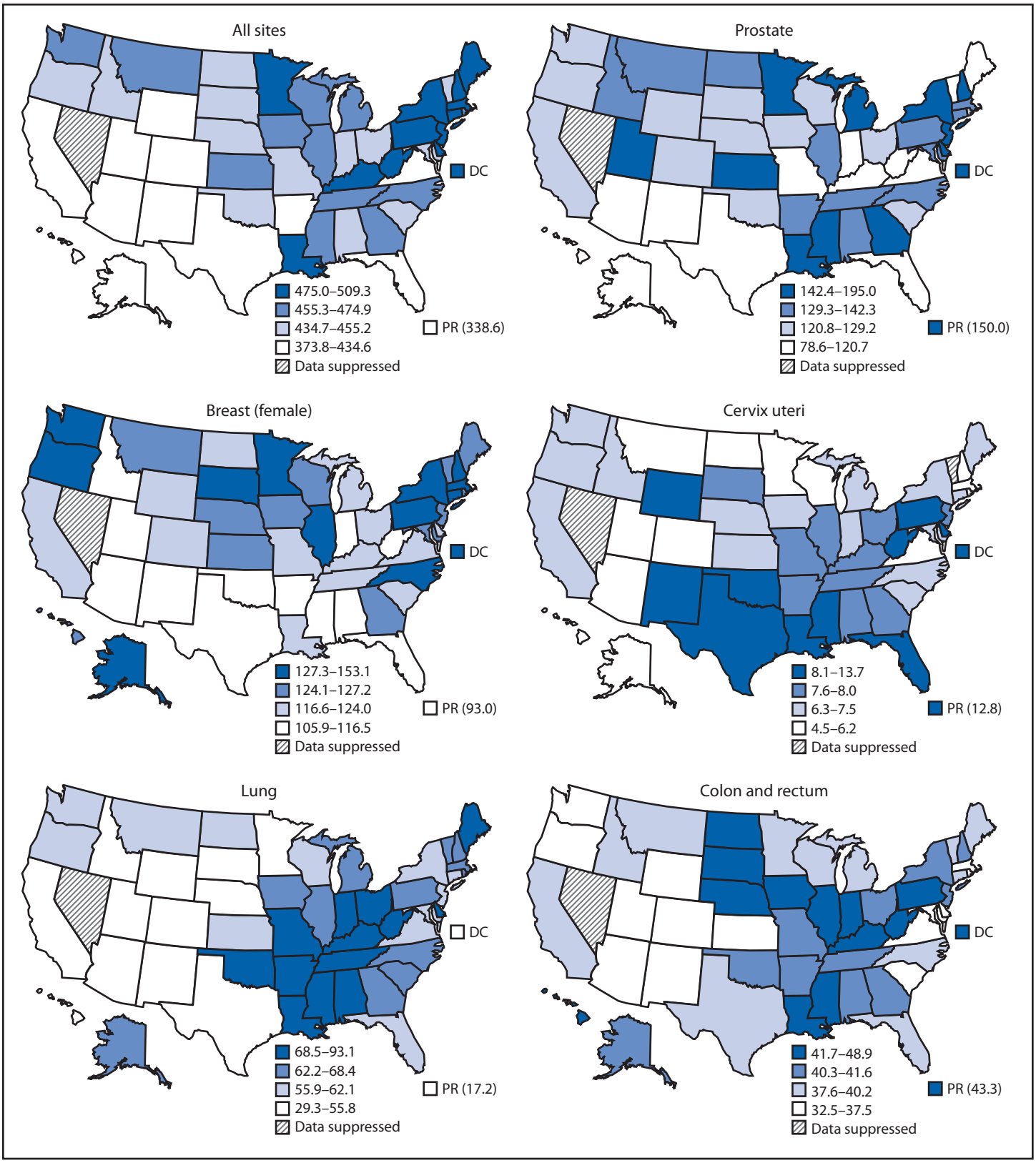
Discussion

This report provides estimates of cancer incidence for 2011 in the United States and shows that *Healthy People 2020* targets were achieved in 37 states for reduced colorectal cancer incidence and 28 states for reduced cervical cancer incidence. For the first time, cancer incidence rates in Puerto Rico are included with the state-specific cancer incidence rates. Cancer incidence rates in Puerto Rico reflect screening practices and risk factors that might differ from those in the U.S. states.

Also for the first time, data on survival are included. In the United States, about two of three persons diagnosed with cancer survive ≥5 years after diagnosis. This depends on the type of cancer and age at diagnosis, and was lower among black persons compared with white persons. Differences in survival after cancer diagnosis might be attributable to differences in type of cancer, stage at diagnosis, timeliness of follow-up after diagnosis, appropriate treatment after diagnosis, or having a chronic condition (*5*). Cancer itself is considered a chronic condition, and many cancer survivors face physical, psychological, social, spiritual, and economic challenges because of their cancer diagnosis and treatment (*6*). CDC strives to address health and quality-of-life issues of cancer survivors through programs and research related to coordination of care, patient-provider communication, health promotion, supportive services, fertility preservation, and health equity.**

** Additional information available at http://www.cdc.gov/cancer/survivorship.

FIGURE. Rate* of invasive cancer, by primary cancer site — National Program of Cancer Registries and Surveillance, Epidemiology, and End Results Program, United States, 2011



* Per 100,000 persons, age-adjusted to the 2000 U.S. standard population.

TABLE 2. 5-year relative survival (percentage) after cancer diagnosis,* by race, sex, primary site, and age group — National Program of Cancer Registries, United States†

Characteristic	All races			White			Black		
	Overall	Males	Females	Overall	Males	Females	Overall	Males	Females
All sites	**65**	**65**	**65**	**65**	**65**	**66**	**60**	**62**	**57**
Prostate	**NA**	97	NA	NA	97	NA	NA	96	NA
Female breast	**NA**	NA	88	NA	NA	89	NA	NA	79
Lung and bronchus	**18**	15	21	18	16	21	15	13	18
Colon and rectum	**63**	63	64	64	63	64	57	56	59
Cervix uteri	**NA**	NA	68	NA	NA	69	NA	NA	58
Age group at diagnosis (yrs)									
0–44	**81**	76	84	82	77	85	70	63	74
45–54	**71**	66	76	73	66	78	62	60	65
55–64	**68**	68	69	69	68	70	63	65	59
65–74	**64**	67	60	64	66	61	60	66	52
≥75	**52**	55	49	52	55	50	45	50	40

Abbreviation: NA = not available.
* Based on cases diagnosed during 2003–2010 and follow-up of patients through 2010.
† Compiled from 30 cancer registries that met data quality criteria for survival analysis, covering approximately 71% of the U.S. population.

Cancer incidence and survival data can guide the planning and evaluation of cancer prevention and control programs. In Vermont, for example, cancer registry data were used to identify two counties with high melanoma incidence rates in which to pilot a new program for skin cancer prevention (*7*). These data can also assist long-term planning for cancer diagnostic and treatment services. The Colorado Central Cancer Registry, in collaboration with CDC, has built a free, user-friendly web-based module for clinicians that uses cancer registry data to create treatment summaries and personalized cancer survivorship plans (*8*). Finally, these data can help public health officials set priorities for allocating health resources. For example, data from the North Carolina Central Cancer Registry are linked into North Carolina's Integrated Cancer Information and Surveillance System, which overlays the cancer data with census data, health indicators, and socioeconomic variables to facilitate cancer-focused research, from prevention through diagnosis, treatment, survival, and end-of-life care (*9*). CDC annually provides cancer surveillance via several products, including USCS, CDC WONDER, State Cancer Profiles, and CDC's National Center for Health Statistics Research Data Centers.††

The findings in this report are subject to at least three limitations. First, analyses based on race and ethnicity might be biased if race and ethnicity were systematically misclassified; ongoing efforts are made to ensure that this information is as accurate as possible.§§ Second, delays in cancer reporting might result in an underestimate of certain cancers; reporting delays are more common for cancers such as melanoma that are diagnosed and treated in nonhospital settings such as physicians' offices (*10*). Finally, relative survival rates could be calculated only for white and black racial groups because accurate life tables were not available for other racial/ethnic groups.

National cancer surveillance data are essential for public health officials to monitor cancer incidence, mortality, and

What is already known on this topic?

Cancer is a leading cause of illness in the United States. Because of earlier detection of cancers with effective treatments, improved cancer treatments, and better general medical care, the percentage of persons living after a cancer diagnosis has increased over the past decades.

What is added by this report?

National cancer surveillance data indicate that 1,532,066 new cases of invasive cancer were diagnosed in the United States (excluding Nevada) in 2011, an annual incidence rate of 508 cases per 100,000 among males and 410 among females. All-sites cancer incidence rates ranged by state from 374 to 509 per 100,000 persons and was 339 per 100,000 persons in Puerto Rico. *Healthy People 2020* targets were reached in 37 states for reduced incidence of colorectal cancer and in 28 states for reduced incidence of cervical cancer. About two of three persons diagnosed with cancer survived ≥5 years after diagnosis.

What are the implications for public health practice?

Public health officials can use cancer incidence and survival data to identify population groups with high cancer incidence rates and low cancer survival rates who might benefit most from targeted cancer prevention and control efforts. Using these data to effectively develop comprehensive cancer control programs, including supporting the needs of cancer survivors, can help reduce cancer incidence and improve survival.

†† Additional information available at http://www.cdc.gov/cancer/npcr/datarelease.htm, http://wonder.cdc.gov, http://www.statecancerprofiles.cancer.gov/incidencerates/index.php, and http://www.cdc.gov/rdc/b1datatype/dt131.htm.

§§ Additional information available at http://www.cdc.gov/cancer/npcr/uscs/technical_notes/interpreting/race.htm.

survival in the United States; identify populations that might benefit most from targeted cancer prevention and control efforts; help guide the planning of health care allocation and support services; and track progress toward the national cancer objectives set forth in *Healthy People 2020*.

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Missed Opportunities for Tetanus Postexposure Prophylaxis — California, January 2008–March 2014

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Tetanus is an acute and sometimes fatal disease characterized by sudden muscle contractions. The number of tetanus cases reported annually in the United States has declined significantly since the 1930s and 1940s as a result of the introduction of tetanus vaccines (*1*). However, sporadic cases continue to occur in persons who are not up-to-date with tetanus toxoid-containing vaccinations (TT) and do not receive appropriate postexposure prophylaxis (PEP). To assess the extent of these cases, the California Department of Public Health reviewed all tetanus cases reported during January 2008–March 2014. A total of 21 tetanus patients were reported; five (24%) died. An average of three cases were reported each year during 2008–2013; the average annual incidence among patients aged ≥65 years (0.23 cases per 1 million population) was twice that among patients aged 21–64 years (0.10 cases per 1 million population). Of 16 patients with an acute injury before illness and diagnosis, nine (56%) sought medical care, and two (22%) of the nine received appropriate PEP. Although tetanus is rare, it is a life-threatening disease that is preventable. Health care providers should ensure that their patients are up-to-date with TT vaccination and provide appropriate postexposure prophylaxis for patients with wounds.

During 2008–2010, a confirmed case was defined by the Council of State and Territorial Epidemiologists (CSTE) as a patient with acute onset of hypertonia or painful muscular contractions (usually of the muscles of the jaw and neck) and generalized muscle spasms without other apparent medical cause.* In 2010, CSTE removed the "confirmed" classification and defined all clinically compatible cases as probable.† The California Department of Public Health analyzed all confirmed and probable cases in accordance with CSTE case definitions. Using the CDC tetanus surveillance worksheet, local health department and California Department of Public Health staff reviewed case surveillance and medical record data, including demographics, clinical presentation and course, vaccination status, and wound management. Vaccination and wound data were reviewed to determine whether health care providers followed wound management and PEP recommendations (*2,3*). Tetanus incidence rates were calculated using population estimates from the California Department of Finance. Hospitalization costs were estimated using discharge data from the Office of Statewide Health Planning and Development.

During January 2008–March 2014, a total of 21 tetanus cases were reported; five (24%) were fatal (Table 1). The patients were all adults ranging in age from 21 to 89 years (median = 52 years); 15 (71%) were male. An average of three cases were reported each year during 2008–2013 (range = 0–5). The average annual tetanus incidence rate during 2008–2013 was 0.09 cases per 1 million population, compared with 0.19 cases during 2002–2007. During 2008–2013, the average annual incidence among patients aged ≥65 years (0.23 cases per 1 million population) was twice that among patients aged 21–64 years (0.10 cases per 1 million population). The case-fatality rate among patients aged ≥65 years was 50%, compared with 13% among patients aged 21–64 years. Race and ethnicity were reported for 18 (86%) patients. The average annual incidence rates among Hispanics (0.08 cases per 1 million population), non-Hispanic whites (0.09), non-Hispanic blacks (0.07), and non-Hispanic Asians/Pacific Islanders (0.03) were similar.

All 21 tetanus patients were hospitalized; 19 (90%) were admitted to an intensive care unit, and nine required mechanical ventilation. The median number of days hospitalized was 18 (range = 2–65); of 15 patients for whom data were available, the median cost of total hospital charges per patient was $166,259 (range = $22,229–$1,024,672). Seven patients had conditions associated with increased risk for tetanus; four were diabetic, and three were injection-drug users (*1*).TT history was reported for 12 (57%) patients; three (25%) could not recall receiving any doses, and nine (75%) recalled receiving ≥1 dose. Among the nine patients who recalled receiving ≥1 dose, six received their last dose 10 to 50 years before their illness, and three could not recall when they received their last dose.

Sixteen (76%) patients reported that an acute injury had occurred before illness onset; including punctures (seven), abrasions (four), linear lacerations (three), compound fracture (one) and animal bite (one). Of six patients with data on wound depth, two had wounds that were >1 cm deep. Seven of 11 patients with available data had wounds that appeared infected, and two of seven patients with available data had wounds with devitalized, ischemic, or denervated tissue. Five

*Additional information available at http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=864&DatePub=1/1/1996.

†Additional information available at http://wwwn.cdc.gov/NNDSS/script/casedef.aspx?CondYrID=865&DatePub=1/1/2010.

TABLE 1. Number of tetanus cases (N = 21), by selected characteristics and outcome — California, January 2008–March 2014

Characteristic	Died		Survived		Total	
	No.	(%)	No.	(%)	No.	(%)
Sex						
Male	3	(60)	12	(75)	15	(71)
Female	2	(40)	4	(25)	6	(29)
Age group (yrs)						
21–49	2	(40)	8	(50)	10	(48)
50–64	0	—	5	(31)	5	(24)
≥65	3	(60)	3	(19)	6	(29)
Clinical course						
Hospitalized	5	(100)	16	(100)	21	(100)
Admitted to ICU	5	(100)	14	(88)	19	(90)
Median no. of days hospitalized (range)	19 (4–38)		17 (2–65)		17 (2–65)	
Underlying conditions						
Diabetes	1	(33)	3	(19)	4	(19)
Injection drug user	0	—	3	(19)	3	(14)
Tetanus vaccination history						
Zero doses	2	(40)	1	(6)	3	(14)
At least one dose*	1	(20)	8	(50)	9	(43)
Unknown	2	(40)	7	(44)	9	(43)
Injury history						
Acute injury before illness	5	(100)	11	(69)	16	(76)
Puncture	2	(40)	5	(45)	7	(44)
Abrasion	1	(20)	3	(27)	4	(25)
Linear laceration	1	(20)	2	(18)	3	(19)
Compound fracture	1	(20)	0	—	1	(6)
Animal bite	0	—	1	(9)	1	(6)
Sought medical care for acute injury	5	(100)	4	(36)	9	(56)
Received recommended postexposure prophylaxis	1	(20)	1	(25)	2	(22)

* Of patients who had received at least one dose of TT-containing vaccine, none recalled receiving a dose in the preceding 10 years.

patients reported no acute injuries before onset; of these, three were injection-drug users. The remaining two patients could not recall any acute injuries; however, one reported an insect bite, and the other reported chronic abrasions on the hands and feet and exposure to soil.

Of the 16 patients who reported acute injuries before illness onset, nine had sought medical care for their injuries (Table 2). Of the nine, only two received appropriate PEP before the onset of tetanus symptoms as recommended by the Advisory Committee on Immunization Practices (ACIP) (Table 3) (*2,3*). Of the seven patients who did not receive appropriate PEP, five had punctures or contaminated wounds and unknown TT vaccination histories, and should have received both TT and tetanus immune globulin (TIG) as recommended. However, four patients did not receive any PEP, and one received TT PEP only. Of the two remaining patients, one had a clean, minor wound and reported receiving at least one TT dose more than 10 years ago, but was not offered TT PEP as recommended; the other patient was contraindicated for TT because of a history of anaphylaxis, but was not offered TIG as an alternative.

Following their tetanus diagnoses, all 21 patients were treated with TIG; six were treated ≤1 day after symptom onset, eight ≤4 days, six ≤9 days, and one was treated >2 weeks after onset. Among the five fatal cases, one patient was treated ≤1 day after symptom onset, two were treated ≤4 days, and two ≤9 days after onset. Of 15 patients for whom data on TIG dosage were available, five received less than the 3,000–6,000 U that is generally recommended for treatment (*4*); two received less than 500 U, and three received 500–1,000 U.

Discussion

Although rates of tetanus have declined, sporadic cases continue to occur, particularly in adults who are not up-to-date with TT. Vaccination coverage among children is higher; in 2012, an estimated 82.5% of U.S. children aged 19–35 months and 84.6% of U.S. children aged 13–17 years had received ≥4 doses of diphtheria toxoid-tetanus toxoid-acellular pertussis vaccine (DTaP) and ≥1 dose of tetanus, diphtheria, acellular pertussis vaccine (Tdap), respectively (*5,6*). In contrast, only 62% of adults aged ≥19 years had received TT during the preceding 10 years; coverage for adults aged ≥65 years was 55% (*7*). All of the tetanus patients reported in California during January 2008–March 2014 were adults aged ≥21 years. Among the 12 patients with verified vaccination histories, none recalled receiving TT during the preceding 10 years. Health care providers should assess patient vaccination status

TABLE 2. Therapeutic treatment of tetanus patients (n = 9) with an acute wound who had sought medical care before illness and diagnosis — California, January 2008–March 2014

Patient No.	Age	Sex	TT history	When last dose received	Wound type	Received TT	Received appropriate PEP	Units of therapeutic TIG received	Outcome
1	48	Female	Unknown	Unknown	Abrasion	Yes	Yes	5,000	Survived
2	38	Male	Zero doses	N/A	Linear laceration	Yes	Yes	5,000	Died
3	73	Male	At least one dose	Unknown	Compound fracture	No*	No	1,000	Died
4	45	Male	Unknown	Unknown	Puncture	No	No	250	Died
5	47	Female	Unknown	Unknown	Animal bite	No	No	500	Survived
6	68	Male	Unknown	Unknown	Puncture	No	No	Unknown	Survived
7	71	Male	At least one dose	50 years ago	Abrasion	No	No	Unknown	Survived
8	86	Female	Zero doses	N/A	Puncture	No	No	3,000	Died
9	89	Female	Unknown	Unknown	Abrasion (contaminated)	Yes	No	5,000	Died

Abbreviations: TT = tetanus toxoid; TIG = tetanus immune globulin; N/A = not applicable.
* Patient reported allergy to TT.

TABLE 3. Recommended management of tetanus wounds — Advisory Committee on Immunization Practices

Vaccination history	Clean, minor wounds		All other wounds	
	Administer Td*	Administer TIG	Administer Td*	Administer TIG
Unknown or <3 doses	Yes	No	Yes	Yes
≥3 doses	No†	No	No§	No

Abbreviations: Td = tetanus and diphtheria vaccine; TIG = tetanus immune globulin.
Sources: CDC. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine (Tdap). Recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendations of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. MMWR Recomm Rep 2006;55(No. RR-17).
CDC. 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. MMWR Morb Mortal Wkly Rep 2012;61:468–70.
* Tdap (tetanus, diphtheria, acellular pertussis vaccine) may be substituted for Td if the person has not previously received Tdap and is aged ≥10 years.
† Yes, if >10 years since last dose.
§ Yes, if >5 years since last dose.

during routine visits to determine whether TT is needed. ACIP recommends that after receiving a primary childhood series, a tetanus and diphtheria vaccine (Td) dose should be given during adolescence and every 10 years thereafter. For added protection against pertussis, one of the Td booster doses should be Tdap if it was not previously administered (*2,3*).

Even minor wounds or abrasions can result in tetanus, highlighting the importance of ensuring that patients are up to date for TT (*8,9*). Providers should assess vaccination status in patients with wounds and in particular older adults, injection-drug users, patients with diabetes, and those with chronic wounds, all of whom are considered at increased risk for tetanus (*1*). Patients who have completed the 3-dose primary TT series need a booster dose as part of wound management if they have a clean, minor wound and received their last TT dose more than 10 years prior to injury, or if they have any other type of wound and received their last TT dose more than 5 years prior to injury (*2*). ACIP recommends that persons with unknown or incomplete histories receive TT as part of routine wound management; patients with wounds that are neither clean nor minor should receive TIG in addition to TT. Although the dosage of TIG for PEP is not specified in the recommendations, dosage information is provided in the product insert.§

In this analysis, only nine of 16 patients with acute injuries had sought medical care before their tetanus illness onset and diagnosis, and only two of the nine received PEP with TT or TT plus TIG as recommended (*2–4*). Health care providers might fail to provide TIG PEP because of a lack of knowledge about current recommendations or because the assessment of wound severity and whether a patient should be managed with TIG according to ACIP recommendations can be subjective (*2,10*). All tetanus patients required considerable and costly medical care, including hospitalization, and almost all (90%) were admitted to intensive care. Among patients who received TIG as treatment, there was variability in the dose administered. In the United States, 3,000–6,000 U, given in a single intramuscular dose with part of the dose infiltrated around the wound if it can be identified, is generally recommended for treatment. However, the optimal therapeutic dose has not been established, and some experts contend that a dose of 500 U, as recommended by the World Health Organization,¶ is as effective as higher doses and causes less discomfort (*4*). It is also possible that some providers treating tetanus patients inadvertently prescribed the PEP dosage of TIG rather than the treatment dosage. Among five treated patients who received <3,000 U of TIG as treatment, three survived and two died. Among 10 treated patients who received ≥3,000 U of TIG, seven survived, and three died.

§ Additional information available at http://www.talecris-pi.info/inserts/BayTet.pdf.
¶ Additional information available at http://www.who.int/diseasecontrol_emergencies/who_hse_gar_dce_2010_en.pdf.

What is already known on this topic?

The incidence of tetanus has declined significantly since the introduction of tetanus vaccines. However, sporadic cases continue to be reported, particularly in adults who are not up-to-date with tetanus vaccinations.

What is added by this report?

During January 2008–March 2014 in California, a total of 21 tetanus patients were reported. All were hospitalized, including 19 in intensive care units; five (24%) died. Of 16 patients with an acute injury prior to illness, only nine had sought medical care, and only two of the nine received appropriate postexposure prophylaxis. In addition, some patients with tetanus were not administered the recommended dosage of tetanus immune globulin.

What are the implications for public health practice?

Routine vaccination of patients every 10 years is important to prevent tetanus, particularly in settings where patients do not seek medical care following an injury, where no injury is evident to the patient, or where appropriate postexposure prophylaxis is not provided following an injury. Efforts to educate health care providers might lead to better tetanus postexposure prophylaxis for patients with wounds and better use of therapeutic tetanus immune globulin for patients with tetanus.

The findings in this report are subject to at least three limitations. First, although California health care providers are required to report tetanus cases, surveillance is passive, and underreporting is likely. Second, because there is no laboratory testing for tetanus and case identification depends solely on clinical assessment, some cases might be misclassified. Finally, some of the case reports were incomplete, particularly with regard to TT history.

Although significant progress has been made in reducing the morbidity and mortality caused by tetanus, cases of this vaccine-preventable disease continue to be reported. Health care providers should assess the tetanus vaccination status of their patients during routine visits. All providers who provide care for patients with wounds should have protocols for tetanus PEP and ensure that appropriate PEP is provided for such patients.

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Stressful Life Events Experienced by Women in the Year Before Their Infants' Births — United States, 2000–2010

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Epidemiologic studies suggest that prenatal stress is associated with preterm birth, low birth weight (*1*–*3*), and peripartum anxiety and depressive symptoms (*4*). The most recent population-based study, assessing trends in stress experienced in the year before an infant's birth, used 1990–1995 data from 11 states participating in the Pregnancy Risk Assessment Monitoring System (PRAMS) (*5*). That study found that 64% of women surveyed reported experiencing at least one stressful life event (SLE), although the prevalence declined slightly over the study period. PRAMS data for 2000–2010 were used to examine more recent trends and to determine if the prevalence of SLEs has continued to decrease in the past decade. Additionally, 2010 data were used to determine the extent that maternal demographics and state of residence are associated with SLEs. This report describes the results of those analyses, which found that most women in the sample reported experiencing ≥1 SLEs in the year before their infant's birth, although the prevalence of experiencing SLEs decreased during 2000–2010. In 2010, based on data from 27 states, 70.2% of women reported ≥1 SLEs. The mean number of SLEs was 1.81, ranging from 1.41 in New York City to 2.26 in Oklahoma. SLEs were most frequently financial. Prevalence of SLEs varied by PRAMS reporting site and maternal demographics. Younger, less educated, unmarried, and Medicaid-covered women had the highest prevalence of SLEs. Public health practitioners and clinicians can use the information on trends and risk factors for SLEs to determine the likelihood that pregnant women might benefit from screening for stressors during pregnancy.

PRAMS is a population-based surveillance system administered by CDC in conjunction with state and New York City health departments (http://www.cdc.gov/PRAMS). PRAMS collects self-reported information on maternal experiences and behaviors before, during, and after pregnancy among women who delivered a live infant. Collection occurs annually, and, as of 2013, a total of 40 states and New York City participate, representing approximately 78% of all U.S. live births. Each site surveys by mail a stratified, systematic sample of 1,300–3,400 women identified from birth certificate data 2–6 months after a live birth. Up to three attempts are made to contact the woman by unregistered mail, followed by a maximum of 15 telephone calls per available telephone number to reach nonresponders. The PRAMS protocol was approved by institutional review boards at each site and CDC. Each participant provides written informed consent. Response rates must exceed 65% for the data from a site to be reported; 2010 response rates for the sites included in this analysis ranged from 65% to 83%.

PRAMS includes 13 questions about maternal SLEs experienced in the year preceding the birth of the child. Based on previous research (*6*), SLEs were grouped into four dichotomous constructs: 1) emotional stressors (family member was ill and hospitalized or someone very close died); 2) financial stressors (moved to a new address, lost job, partner lost job, or unable to pay bills); 3) partner-associated stressors (separated/divorced, argued more than usual with partner/husband, or husband/partner said he did not want pregnancy); and 4) traumatic stressors (homeless, involved in a physical fight, partner or self went to jail, or someone very close had a problem with drinking or drugs). Women who reported ≥1 SLEs in a group were categorized as experiencing the construct. Trends in prevalence of SLEs and the SLE constructs from 2000–2010 were assessed using five logistic regression models, one for each construct and one for overall SLEs. Infant birth year was used as the independent variable. Unadjusted trends and trends adjusted for maternal demographic characteristics (marital status, race/ethnicity, age, education, and Medicaid coverage during pregnancy and/or delivery) were examined. For statistically significant trends ($p<0.05$), annual percentage point change was assessed using logistic regression and estimated from the beta coefficient of the infant's birth year. Using 2010 data only, prevalence of each construct, prevalence of experiencing ≥1 SLEs, and mean number of SLEs were calculated by PRAMS reporting site and by maternal demographic characteristics. Differences in prevalence of SLEs and mean number of SLEs by maternal demographic characteristics were assessed using chi-square tests and analysis of variance, respectively.

For trend analyses, data from 10 sites that participated in PRAMS every year during 2000–2010 and had sufficient response rates (≥65%) for all years* (n = 187,390 women) were

*Alaska, Arkansas, Colorado, Hawaii, Maine, Nebraska, Oklahoma, Utah, Washington, and West Virginia.

analyzed. Prevalences by reporting site and maternal demographics for 2010 were estimated using data from 27 sites[†] (n = 38,255 women) that met or exceeded the response rate threshold. Women were excluded if they had missing data for one or more questions on SLEs (n = 6,488 for 2000–2010 [3.5%]; n = 1,364 for 2010 [3.6%]). All analyses were weighted to produce population-based estimates.

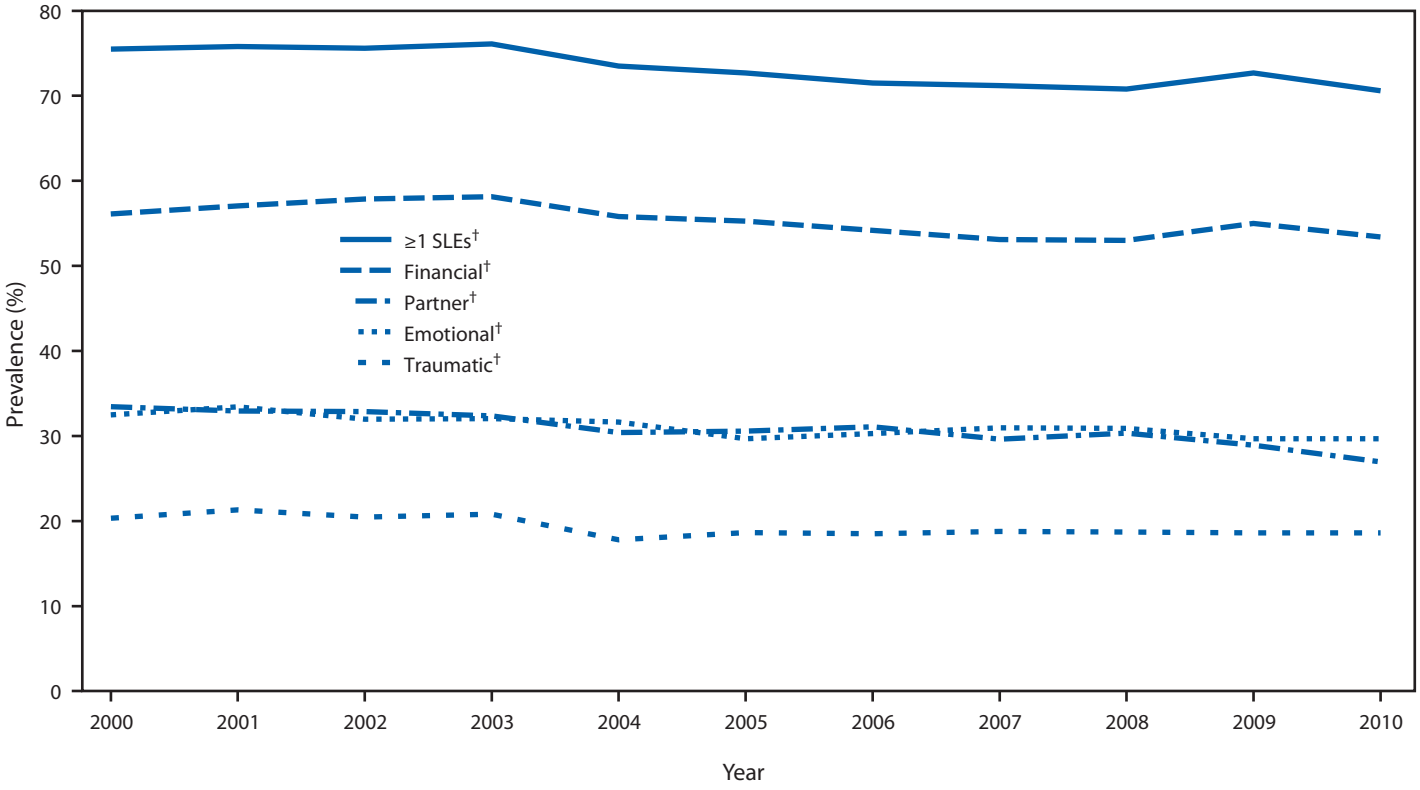
Modest but statistically significant decreases occurred during 2000–2010 in self-reported prevalence of ≥1 SLEs and all four constructs of SLEs (financial, emotional, partner-related, and traumatic) (p-value for trend <0.05 for all) (Figure). During 2000–2010 prevalence of ≥1 SLEs decreased 0.54 percentage points per year, financial stressors decreased 0.44 percentage points per year, emotional stressors decreased 0.35 percentage points per year, partner-related stressors decreased 0.58 percentage points per year, and traumatic stressors decreased 0.26 percentage points per year. Results remained significant after adjusting for maternal demographics. For all years, financial SLEs were the most frequently reported type of SLE, and traumatic SLEs were the least frequently reported type.

In 2010, the prevalence of individual SLE constructs, ≥1 SLEs, and mean number of SLEs varied by site (Table 1). For all sites combined, 51.0% of women reported ≥1 financial SLEs in the year before their infant's birth (range = 42.2% in Georgia to 58.1% in Oklahoma), 29.6% reported ≥1 emotional SLEs (range = 22.3% in Georgia to 40.0% in West Virginia), 28.5% reported ≥1 partner-related SLEs (range = 22.7% in Utah to 35.5% in Arkansas), and 17.6% reported ≥1 traumatic SLEs (range = 11.3% in New Jersey to 25.9% in West Virginia). Overall, 70.2% of women reported ≥1 SLEs in 2010 (range = 58.5% in Georgia to 77.5% in West Virginia). In 2010, the mean number of SLEs was 1.81 (standard error [SE] = 0.02) overall and ranged from 1.41 (SE = 0.05) in New York City to 2.26 (SE = 0.09) in Oklahoma.

In 2010, the prevalence of experiencing SLEs in the year before the infant's birth varied by the women's demographic characteristics (Table 2). Women who were married, were

[†] Alaska, Arkansas, Colorado, Delaware, Georgia, Hawaii, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York (excluding New York City), New York City, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Washington, West Virginia, and Wyoming.

FIGURE. Prevalence of self-reported stressful life events (SLEs) in the year before an infant's birth among mothers who had live births — Pregnancy Risk Assessment Monitoring System, 10 states,* 2000–2010



* Alaska, Arkansas, Colorado, Hawaii, Maine, Nebraska, Oklahoma, Utah, Washington, and West Virginia.
† P-value for trend <0.05.

aged ≥30 years, had ≥16 years of education, or had private insurance reported the lowest prevalence of all SLE constructs and reported the lowest mean number of SLEs. Prevalence of all constructs decreased with increasing age. Asian/Pacific Islanders reported the lowest point prevalence for all SLE constructs, and 95% confidence intervals did not overlap with any other racial/ethnic groups. Black women reported the highest point prevalence of emotional, partner-related, and traumatic SLEs; however, the 95% confidence intervals overlapped with other racial/ethnic groups. Unmarried women had the highest absolute mean number of SLEs (2.48; SE = 0.04), and Asian/Pacific Islanders reported the lowest mean number of SLEs (1.11; SE = 0.04).

Discussion

The prevalence of the four SLE constructs during the year preceding a live birth decreased slightly during 2000–2010, and the downward trend remained statistically significant after adjusting for women's demographic characteristics. In 2010, report of SLEs varied by site and demographic characteristics, with women in Oklahoma and West Virginia, younger women, less educated women, unmarried women, and women covered by Medicaid reporting the highest number of SLEs. However, more than 70% of women delivering a live birth in 2010 reported experiencing ≥1 SLEs, with financial SLEs the most commonly reported. A 2005 U.S. population-based survey reported that 40.1% of women in the general population experienced an SLE in the past year (*7*). However, these results are not directly comparable because of differences in methodology, stressors assessed, and survey year.

A previous study indicated that experiencing SLEs was common during 1990–1995, with 64% of women reporting ≥1 SLEs in the year before their infant's birth (*5*). When the current analysis using 2010 data was restricted to the same SLEs included in the previous report, 62.9% (95% confidence interval = 62.6%– 63.3%) of the sample reported experiencing ≥1 SLEs, consistent with the prevalence estimate for 1990–1995. The older study also reported that the prevalence of experiencing ≥1 SLEs varied by maternal demographics, with low socioeconomic status most strongly associated with

TABLE 1. Self-reported prevalence of stressful life events (SLEs) in the year before an infant's birth among mothers who had live births, by site — Pregnancy Risk Assessment Monitoring System, 27 sites,* 2010

	≥1 financial SLE		≥1 emotional SLE		≥1 traumatic SLE		≥1 partner SLE		≥1 SLE total		Mean no. of SLEs	
State	%†	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	Mean	(SE)
Alaska	49.6	(45.9–53.3)	26.5	(23.4–29.8)	21.0	(18.2–24.2)	26.6	(23.5–30.1)	68.7	(65.1–72.0)	1.73	(0.07)
Arkansas	57.1	(53.7–60.5)	35.9	(32.7–39.2)	25.9	(23.0–29.1)	34.5	(31.4–37.8)	78.7	(75.7–81.4)	2.22	(0.07)
Colorado	53.3	(50.2–56.4)	29.5	(25.8–31.4)	16.4	(14.2–18.8)	25.3	(22.7–28.1)	70.6	(67.6–73.3)	1.74	(0.06)
Delaware	49.9	(46.8–52.9)	31.7	(29.0–34.6)	18.1	(15.8–20.5)	29.0	(26.3–31.9)	71.4	(68.6–74.1)	1.83	(0.06)
Georgia	42.2	(37.4–47.1)	22.3	(18.5–26.6)	14.1	(11.0–17.9)	24.0	(20.0–28.4)	57.5	(52.6–62.3)	1.55	(0.11)
Hawaii	49.1	(45.9–52.3)	24.9	(22.3–27.8)	13.4	(11.4–15.7)	27.2	(24.4–30.1)	64.4	(61.2–67.4)	1.56	(0.06)
Maine	56.5	(53.0–60.0)	34.0	(30.7–37.5)	21.3	(18.4–24.5)	27.3	(24.2–30.7)	74.5	(71.4–77.4)	2.05	(0.07)
Maryland	50.4	(45.4–54.4)	28.9	(25.4–32.7)	16.0	(13.2–19.3)	27.8	(24.3–31.6)	69.3	(65.5–72.8)	1.80	(0.08)
Massachusetts	50.5	(46.9–54.1)	30.8	(27.6–34.3)	16.1	(13.6–19.0)	26.6	(23.6–29.8)	70.5	(67.2–73.7)	1.73	(0.07)
Michigan	53.0	(50.0–56.1)	34.1	(31.3–37.1)	19.2	(16.9–21.8)	31.4	(28.7–34.3)	73.8	(71.0–76.4)	1.92	(0.06)
Minnesota	47.4	(44.5–50.4)	26.6	(24.1–29.3)	15.4	(13.4–17.7)	25.0	(22.5–27.7)	65.4	(62.5–68.2)	1.55	(0.05)
Missouri	57.0	(53.9–60.0)	33.0	(30.2–36.0)	20.2	(17.7–22.8)	31.9	(29.0–34.9)	74.6	(71.9–77.1)	2.07	(0.07)
Nebraska	50.0	(47.3–52.8)	26.4	(24.0–29.0)	15.1	(13.3–17.2)	25.3	(23.0–27.8)	68.2	(65.6–70.7)	1.64	(0.05)
New Jersey	48.5	(45.7–51.4)	29.8	(27.2–32.4)	11.3	(9.7–13.2)	26.7	(24.3–29.2)	68.3	(65.6–70.9)	1.62	(0.05)
New York State§	50.6	(46.7–54.5)	30.7	(27.2–34.4)	18.0	(15.1–21.4)	27.9	(24.4–31.6)	70.0	(66.3–73.4)	1.76	(0.08)
New York City	43.1	(39.9–46.5)	23.9	(21.2–26.9)	13.2	(11.0–15.7)	25.9	(23.0–29.0)	64.8	(61.6–67.9)	1.41	(0.05)
Ohio	52.0	(48.3–55.7)	35.9	(32.4–39.5)	21.0	(18.2–24.2)	31.7	(28.4–35.2)	73.7	(70.4–76.8)	2.11	(0.08)
Oklahoma	58.1	(54.3–61.7)	33.4	(29.9–37.0)	24.3	(21.2–27.9)	32.9	(29.4–36.6)	74.3	(70.9–77.5)	2.26	(0.09)
Oregon	56.7	(53.3–60.0)	27.6	(24.6–30.8)	19.9	(17.3–22.8)	25.8	(22.9–28.9)	71.2	(68.0–74.1)	1.95	(0.07)
Pennsylvania	45.9	(42.3–49.5)	33.7	(30.5–37.2)	17.3	(14.6–20.3)	28.3	(25.1–31.7)	71.9	(68.6–74.9)	1.77	(0.07)
Rhode Island	48.8	(45.6–52.0)	30.0	(27.1–33.0)	17.5	(15.1–20.2)	27.9	(25.0–31.0)	71.5	(68.5–74.4)	1.77	(0.06)
Texas	54.7	(51.6–57.7)	28.6	(26.0–31.4)	19.1	(16.9–21.7)	32.1	(29.3–35.0)	73.3	(70.5–75.9)	1.92	(0.06)
Utah	50.1	(47.3–52.9)	26.5	(24.1–29.0)	14.8	(13.0–16.8)	22.7	(20.5–25.1)	67.2	(64.5–69.7)	1.54	(0.05)
Vermont	51.8	(48.8–54.9)	30.2	(27.4–33.1)	19.5	(17.1–22.1)	27.9	(25.2–30.7)	69.2	(66.4–71.9)	1.85	(0.06)
Washington	52.4	(49.1–55.7)	25.6	(22.8–28.7)	15.9	(13.6–18.6)	23.9	(21.2–26.8)	67.2	(64.0–70.2)	1.66	(0.06)
West Virginia	56.5	(53.2–59.6)	40.0	(36.9–43.2)	25.9	(23.1–28.8)	29.6	(26.7–32.6)	77.5	(74.7–80.1)	2.22	(0.07)
Wyoming	52.8	(49.1–56.4)	26.9	(23.8–30.2)	18.1	(15.5–21.1)	26.3	(23.2–29.6)	70.6	(67.2–73.8)	1.72	(0.06)
Total	**51.0**	**(50.1–51.9)**	**29.6**	**(28.8–30.4)**	**17.6**	**(16.9–18.3)**	**28.5**	**(27.7–29.4)**	**70.2**	**(69.3–71.0)**	**1.81**	**(0.02)**

Abbreviations: CI = confidence interval; SE = standard error.

* Alaska, Arkansas, Colorado, Delaware, Georgia, Hawaii, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York (excluding New York City), New York City, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Washington, West Virginia, and Wyoming.

† Percentages are weighted to reflect population-based estimates.

§ Excluding New York City.

TABLE 2. Self-reported prevalence of stressful life events (SLEs) in the year before an infant's birth among mothers who had live births, by maternal demographic characteristics — Pregnancy Risk Assessment Monitoring System, 27 sites,* 2010

Characteristic	≥1 financial SLE		≥1 emotional SLE		≥1 traumatic SLE		≥1 partner SLE		≥1 SLE total		Mean no of SLEs	
	%†	(95% CI)	%†	(95% CI)	%†	(95% CI)	%†	(95% CI)	%†	(95% CI)	Mean	(SE)
Age group (yrs)§												
<25	62.2	(60.5–63.9)	33.2	(31.6–34.8)	27.4	(25.9–29.0)	40.6	(38.9–42.3)	80.0	(78.6–81.4)	2.43	(0.04)
25–29	51.6	(49.9–53.3)	28.4	(26.9–29.9)	15.7	(14.5–17.0)	24.7	(23.3–26.2)	69.5	(67.9–71.0)	1.72	(0.03)
≥30	41.8	(40.4–43.2)	27.7	(26.5–29.0)	11.2	(10.4–12.2)	21.8	(20.6–23.0)	63.0	(61.6–64.3)	1.38	(0.02)
Race/Ethnicity§												
White, non-Hispanic	48.2	(47.0–49.3)	30.9	(29.8–31.9)	16.0	(15.2–16.9)	25.1	(24.1–26.1)	68.5	(67.4–69.5)	1.70	(0.02)
Black, non-Hispanic	57.6	(55.3–60.0)	32.9	(30.8–35.0)	23.0	(21.1–25.0)	41.7	(39.5–44.0)	76.5	(74.3–78.5)	2.32	(0.06)
Hispanic	55.7	(53.2–58.2)	26.7	(24.6–29.0)	20.7	(18.7–22.8)	30.7	(28.4–33.1)	73.9	(71.7–76.0)	1.92	(0.05)
Asian/Pacific Islander	42.1	(38.9–45.4)	18.4	(16.0–21.0)	5.4	(4.3–6.8)	21.3	(18.6–24.2)	56.9	(53.5–60.2)	1.11	(0.04)
Other	58.7	(54.1–63.1)	30.7	(26.8–35.0)	21.3	(18.0–25.0)	31.6	(27.7–35.8)	73.3	(68.8–77.4)	2.04	(0.10)
Education (yrs)§												
≤12	57.5	(56.0–59.0)	30.0	(28.7–31.4)	24.2	(22.9–25.5)	34.9	(33.5–36.4)	75.6	(74.3–76.9)	2.16	(0.03)
13–15	56.0	(54.2–57.7)	32.2	(30.6–33.9)	18.5	(17.2–19.9)	31.5	(29.9–33.1)	73.7	(72.1–75.2)	2.01	(0.03)
≥16	37.4	(35.9–39.0)	26.8	(25.5–28.2)	7.5	(6.7–8.4)	16.8	(15.7–18.0)	59.6	(58.0–61.1)	1.13	(0.02)
Marital status§												
Married	44.4	(43.3–45.5)	28.0	(27.0–29.0)	10.9	(10.1–11.6)	19.5	(18.6–20.4)	64.2	(63.1–65.2)	1.38	(0.02)
Not married	61.3	(59.7–62.8)	32.1	(30.7–33.6)	28.1	(26.8–29.5)	42.6	(41.1–44.2)	79.6	(78.3–80.9)	2.48	(0.04)
Health care coverage§												
Medicaid	63.1	(61.6–64.6)	31.2	(29.8–32.6)	25.9	(24.6–27.2)	38.1	(36.6–39.6)	78.7	(77.5–80.0)	2.41	(0.03)
Not Medicaid	42.4	(41.3–43.6)	28.5	(27.4–29.5)	11.7	(10.9–12.5)	21.7	(20.8–22.7)	64.2	(63.1–65.3)	1.38	(0.02)

Abbreviation: CI = confidence interval.

* Alaska, Arkansas, Colorado, Delaware, Georgia, Hawaii, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, New Jersey, New York (excluding New York City), New York City, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, Texas, Utah, Vermont, Washington, West Virginia, and Wyoming.

† Percentages are weighted to reflect population-based estimates.

§ Chi-square value p≤0.05 for relationship of selected maternal demographic with prevalence of selected SLE type. P≤0.05 for difference in mean by analysis of variance.

experiencing an SLE (*5*). Similarly, 78% of women covered by Medicaid for prenatal care or delivery reported ≥1 SLEs in 2010.

The findings in this report are subject to at least five limitations. First, data were available for only 10 sites for 2000–2010, and only 27 sites for 2010 prevalence estimates; hence, generalizability might be limited. Second, PRAMS measures 13 SLEs during the 12 months before a live birth and not the perceived level of stress experienced by the individual woman nor whether the SLE occurred during pregnancy. Third, PRAMS relies on self-reported, retrospective data, and respondents might not accurately recall or report certain SLEs. Fourth, 3.6% of women with missing information on SLEs were excluded, which could underestimate the prevalence. Finally, nonresponse bias is possible because response rates ranged from 65% to 83%.

Current research suggests that increased prenatal stress is associated with adverse pregnancy outcomes, including low birth weight, preterm birth (*1,2,3*), and peripartum depression (*4*). However, there is evidence that social support has a mitigating effect on the relationship between stress and adverse pregnancy outcomes (*1*). Therefore, public health efforts to identify and reduce stress among pregnant women might benefit the psychological and physical health of pregnant women and their infants. To this end, in 2006, the American College of Obstetricians and Gynecologists published a committee opinion recommending that all pregnant women, regardless of socioeconomic status, education level, or race/ethnicity, receive psychosocial screening and referral, as needed, during their prenatal visits (*8*). Additionally, current American College of Obstetricians and Gynecologists antepartum care guidelines recommend that women be screened for psychosocial complications and social support (*9*).

Despite recommendations for screening, there is limited information on effective interventions for stress reduction in pregnant women. Approaches to reducing stress have primarily examined three avenues: 1) reducing physical stress through meditation or yoga; 2) increasing education; and 3) providing additional social support (*1*). The effectiveness of such interventions remains uncertain, but interventions such as group prenatal care for women at higher risk for SLEs have shown promise in increasing self-efficacy and satisfaction with care, which can contribute to increased psychosocial well-being (*10*). Clinicians should be aware that although SLEs are especially prevalent among low-income, younger, unmarried, and less educated women, most women with ≥16 years of education (59.6%), with private insurance (64.2%), and who are married (64.2%) also experience SLEs.

What is already known on this topic?

Current research suggests that stress experienced during pregnancy increases the risk for preterm birth and low birth weight. Current American College of Obstetricians and Gynecologists antepartum care guidelines recommend that women be screened for psychosocial complications and social support during their prenatal visits. Population-based estimates from 1990–1995 indicated that 64% of women experienced stress in the year preceding the birth of a live infant.

What is added by this report?

The prevalence of self-reported stressful life events (SLEs) decreased modestly but significantly during 2000–2010. Despite this, 70.2% of women reported ≥1 SLEs in 2010. The mean number of SLEs was 1.81, ranging from 1.41 in New York City to 2.26 in Oklahoma. SLEs were most frequently financial. Prevalence of SLEs vary by state and maternal demographic characteristics and are especially prevalent among younger women, women with <16 years of education, unmarried women, and women that were covered by Medicaid for prenatal care or delivery of their child.

What are the implications for public health practice?

These findings provide support to the recommendation by the American College of Obstetricians and Gynecologists that clinicians screen all prenatal care patients for psychosocial issues. Prenatal care clinicians should be aware of the prevalence of stress in their patients' lives and provide referral to help alleviate stress, when needed.

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Bacterial Enteric Infections Detected by Culture-Independent Diagnostic Tests — FoodNet, United States, 2012–2014

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The increased availability and rapid adoption of culture-independent diagnostic tests (CIDTs) is moving clinical detection of bacterial enteric infections away from culture-based methods. These new tests do not yield isolates that are currently needed for further tests to distinguish among strains or subtypes of *Salmonella*, *Campylobacter*, Shiga toxin–producing *Escherichia coli*, and other organisms. Public health surveillance relies on this detailed characterization of isolates to monitor trends and rapidly detect outbreaks; consequently, the increased use of CIDTs makes prevention and control of these infections more difficult (*1*–*3*). During 2012–2013, the Foodborne Diseases Active Surveillance Network (FoodNet*) identified a total of 38,666 culture-confirmed cases and positive CIDT reports of *Campylobacter, Salmonella, Shigella*, Shiga toxin–producing *E. coli*, *Vibrio*, and *Yersinia*. Among the 5,614 positive CIDT reports, 2,595 (46%) were not confirmed by culture. In addition, a 2014 survey of clinical laboratories serving the FoodNet surveillance area indicated that use of CIDTs by the laboratories varied by pathogen; only CIDT methods were used most often for detection of *Campylobacter* (10%) and STEC (19%). Maintaining surveillance of bacterial enteric infections in this period of transition will require enhanced surveillance methods and strategies for obtaining bacterial isolates.

Culturing of organisms has been the mainstay of clinical diagnostic testing for bacterial enteric pathogens. Currently, isolates obtained from culture are forwarded from clinical laboratories to public health laboratories, where additional testing is performed, including antimicrobial susceptibility testing, serotyping, pulsed-field gel electrophoresis, and whole genome sequencing. Advances in clinical microbiology have led to the emergence of culture-independent diagnostic tests, such as those that detect the presence of a specific antigen or the DNA of an organism. Many of these new tests will likely improve patient care by allowing rapid diagnosis, improving sensitivity and simplicity, lowering costs, and by detection of a wider range of pathogens. However, current culture-independent diagnostic methods do not have subtyping ability that enables determination of antimicrobial resistance, detection of clusters of illness, and monitoring of trends. Currently, the extent of culture-independent diagnostic practices by clinical laboratories and the future impact on public health surveillance are unknown.

To address these knowledge gaps, in 2010 FoodNet began to survey clinical laboratories serving surveillance catchment area residents on the use of new testing methods to detect enteric pathogens in stool specimens. In 2011, FoodNet expanded surveillance to include the collection of epidemiologic and pertinent laboratory data on both culture-confirmed and positive CIDT reports of *Campylobacter*, *Salmonella*, Shiga toxin–producing *Escherichia coli* (STEC), *Shigella*, *Vibrio*, and *Yersinia* infections. Two data sources were examined: a survey of clinical laboratories conducted during January–March 2014 and surveillance data during January 2012–December 2013. Culture-confirmed infections were defined as the isolation of a bacterial enteric pathogen from a clinical culture from a patient residing in the surveillance area. A positive CIDT report was defined as the detection of the enteric pathogen, or for STEC, Shiga toxin or the genes that encode a Shiga toxin, in a stool specimen or enrichment broth using a CIDT. In some instances, stool culture was performed in conjunction with CIDT. All reports were classified into four mutually exclusive categories, based on whether stool culture was performed and culture results: culture-positive only, CIDT-positive and culture-positive, CIDT-positive and culture-negative, and CIDT-positive and no culture. CIDTs were categorized into four test types: commercial antigen-based tests (Food and Drug Administration [FDA]–approved), commercial DNA-based syndrome panels (FDA-approved), laboratory-developed tests (LDTs†) typically used in a single clinical laboratory, and LDTs

* FoodNet is a collaborative program among CDC, 10 state health departments, the Food Safety and Inspection Service and the Food and Drug Administration. Since 1996, FoodNet's core work has been active, population-based surveillance for culture-confirmed infections caused by *Campylobacter, Listeria, Salmonella*, Shiga toxin-producing *Escherichia coli* (STEC), *Shigella, Vibrio*, and *Yersinia* and laboratory-confirmed infections of *Cryptosporidium* and *Cyclospora*. The 10-site FoodNet surveillance area includes approximately 15% of the U.S. population (estimated 48 million in 2013). FoodNet site personnel regularly contact clinical laboratories to ascertain all laboratory-confirmed infections in residents of the surveillance area.

† FDA defines an LDT as an in vitro diagnostic test that is manufactured by and used within a single laboratory. LDTs do not require FDA approval, and there are no premarket review and quality system requirements on LDTs currently. However, FDA has released draft guidance for regulatory oversight of LDTs for public comment. Available at http://www.fda.gov/downloads/MedicalDevices/DeviceRegulationandGuidance/GuidanceDocuments/UCM416685.pdf.

used at a public health laboratory.[§] Incidence was calculated using U.S. Census estimates of the surveillance area populations for 2012 and 2013. Because there were few differences between 2012 and 2013 data, this report combines surveillance data for both years.

Survey of FoodNet Clinical Laboratories, 2014

The use of CIDTs by clinical laboratories varied by pathogen; CIDT methods were used most often for detection of *Campylobacter* and STEC. During January–March 2014, 446 (67%) of 664 of clinical laboratories serving the FoodNet surveillance area tested stool specimens for *Campylobacter*. Of these laboratories, 379 (85%) used only culture methods to detect *Campylobacter*, 45 (10%) used only CIDTs, and 22 (5%) used both culture and CIDTs. Among laboratories using CIDTs to detect *Campylobacter*, 62 (90%) used commercial antigen-based methods, three used commercial DNA-based syndrome panels, and two used LDTs.[¶] Of the 395 (60%) clinical laboratories that tested stool specimens for STEC, 187 (47%) used both culture and CIDTs, 135 (34%) used only culture, and 73 (19%) used only CIDTs. Among laboratories using CIDTs to detect Shiga toxin or the genes that encode the toxins, 258 (99%) used commercial antigen-based tests, three used commercial DNA-based syndrome panels, and two used LDTs.[**] Of the 453 (68%) laboratories that tested clinical specimens for *Salmonella*, six (1.3%) used CIDTs; among these, three used commercial DNA-based syndrome panels, and three used LDTs.[††]

FoodNet Surveillance, 2012–2013

FoodNet identified 38,666 culture-confirmed cases and reports of positive CIDTs during 2012–2013 (Table). Among the 5,614 reports of positive CIDTs, 2,595 (46%) were not confirmed by culture, either because a culture did not yield the pathogen or because the specimen was not cultured. Among the 2,497 positive CIDT reports of *Campylobacter*, 539 (22%) were confirmed by culture, 1,099 (44%) were culture-negative, and 859 (34%) had no culture. Among the 2,409 positive CIDT reports of STEC,[§§] 2,205 (92%) were confirmed by culture, 110 (5%) were culture-negative, and 94 (4%) had no culture. The Shiga toxin–positive result was confirmed for 2,241 (90%) of 2,494 enrichment broths sent to a public health laboratory. Among 308 positive CIDT reports of *Salmonella*,

[§] All reported LDTs used at public health laboratories were DNA-based assays to detect Shiga toxin 1 and Shiga toxin 2 genes for diagnosis and detection of STEC infection.

[¶] The reported commercial antigen-based tests used to detect Campylobacter included ImmunoCard STAT! CAMPY (Meridian), ProSpecTCampylobacter Microplate (Remel), and Premier CAMPY (Meridian), and the commercial DNA-based syndrome was xTAG GPP (Luminex).

[**] The reported commercial antigen-based antigen tests used to detect STEC included ImmunoCard STAT! EHEC (Meridian), Premier EHEC (Meridian), Shiga Toxin Quik Chek (Alere), ImmunoCard STAT! *E.coli* O157 Plus (Meridian), and ProSpecT Shiga Toxin *E. coli* (Remel), and the commercial DNA-based syndrome panels were xTAG GPP (Luminex). Three laboratories used both commercial antigen-based tests and commercial DNA-based syndrome panels to detect STEC.

[††] The reported commercial DNA-based syndrome panel used to detect *Salmonella* was xTAG GPP (Luminex). There are no commercial antigen-based tests to detect *Salmonella* in stool specimens.

[§§] The number of positive CIDT reports of STEC excludes 274 Shiga toxin–positive reports from clinical laboratories that were Shiga toxin–negative at a public health laboratory and 53 reports of detection of O157 antigen without a test result for Shiga toxin.

TABLE. Number of culture-confirmed cases and positive culture-independent diagnostic test (CIDT) reports (N = 38,666), by selected pathogens and culture results — FoodNet, United States, 2012–2013

			Positive CIDT reports						Total culture-confirmed infections and positive CIDT reports
	Culture-positive only		CIDT-positive and culture-positive		CIDT-positive and culture-negative		CIDT-positive and no culture		
Pathogen	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.
Campylobacter	12,894	(83.8)	539	(3.5)	1,099	(7.1)	859	(5.6)	15,391
Salmonella	15,034	(98.0)	115	(0.7)	8	(0.1)	185	(1.2)	15,342
Shigella	4,312	(91.8)	160	(3.4)	27	(0.6)	197	(4.2)	4,696
STEC*†	34	(1.4)	2,205	(90.3)	110	(4.5)	94	(3.8)	2,443
Vibrio	446	(98.0)	0	—	5	(1.1)	4	(0.9)	455
Yersinia	332	(98.0)	0	—	2	(0.6)	5	(1.4)	339
Total	**33,052**	**(85.5)**	**3,019**	**(7.8)**	**1,251**	**(3.2)**	**1,344**	**(3.5)**	**38,666**

Abbreviation: STEC = Shiga-toxin–producing *Escherichia coli*.
* Excludes 274 Shiga toxin–positive reports from clinical laboratories that were Shiga toxin–negative at a public health laboratory.
† Excludes 53 positive reports of detection of O157 antigen without testing for Shiga toxin.

115 (37%) were confirmed by culture, eight (3%) were culture-negative, and 185 (60%) had no culture. The incidence of culture-confirmed infections with *Campylobacter* was 14.1 per 100,000 population, compared with 2.1 for positive CIDT reports with no culture or negative culture. For *Salmonella*, the incidence was 16.0 per 100,000 population for culture-confirmed infections and 0.2 for positive CIDT reports with no culture or negative culture, and for STEC, the incidence was 2.4 per 100,000 population for culture-confirmed infections and 0.21 for positive CIDT reports with no culture or negative culture (Figure 1).

Among 2,497 positive CIDT reports of *Campylobacter*, 2,304 (92.3%) were detected using commercial antigen-based tests; among 1,618 antigen-positive specimens that were cultured, 1,091 (67%) were culture-negative. Among 2,409 positive CIDT reports of STEC, 1,850 (77%) were detected using commercial antigen-based tests (Figure 2). Among 308 positive CIDT reports for *Salmonella*, 303 (98%) were detected using an LDT in a clinical laboratory.

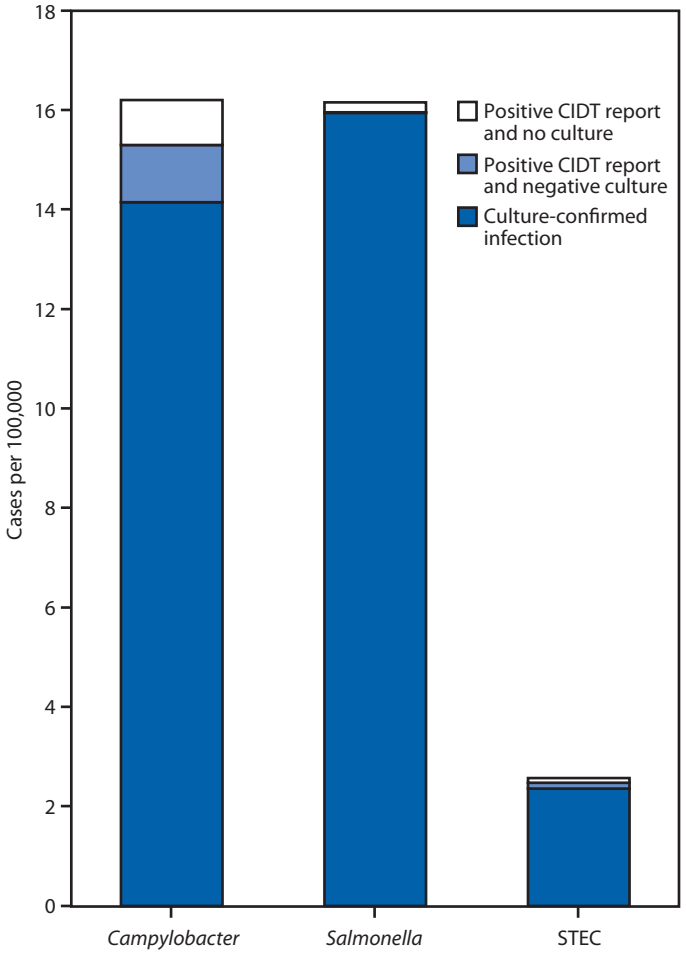
Discussion

FoodNet surveillance indicates CIDTs are being used in clinical care, currently most often to detect *Campylobacter* and STEC infections. Overall, a concerning proportion of positive CIDT reports were not confirmed by culture, either because the specimen was not cultured or because a culture did not yield the pathogen. The use of CIDTs for specific pathogens has increased over time. The use of the newer generation commercial DNA-based syndrome panels has been modest to date. However, with many recent approvals of CIDTs that offer advantages to clinicians and clinical laboratories over traditional culture-based methods, many clinical laboratories are in the process of switching to CIDTs and accelerated use is anticipated over the next year (FoodNet, unpublished data, 2014). Taken together, these findings warrant increased attention to surveillance for all bacterial enteric pathogens and critical examination of the results of CIDTs.

Campylobacter has been the most common pathogen detected using a CIDT; however, this could change as more laboratories adopt commercial DNA-based syndrome panels. Laboratory practices to detect *Campylobacter* infections have changed at FoodNet sites; the proportion of clinical laboratories using a CIDT increased from fewer than 3% of clinical laboratories in 2004 to 15% in 2014 (*4*). The corollary to this use by laboratories is that positive CIDT reports accounted for more than 16% of all *Campylobacter* reported (culture-confirmed infections and positive CIDT reports without culture confirmation). Among positive CIDT reports, almost all were results from commercial antigen-based tests, and almost half of the associated specimens were culture-negative. The high proportion of culture-negative reports might be explained by poor transport stability of the organism, but there is evidence the reports might represent false-positive results because of the widespread use of antigen-based tests with poor test performance (*5,6*). The impact of the variability in CIDT characteristics (i.e., sensitivity and specificity) on clinical practice is unknown.

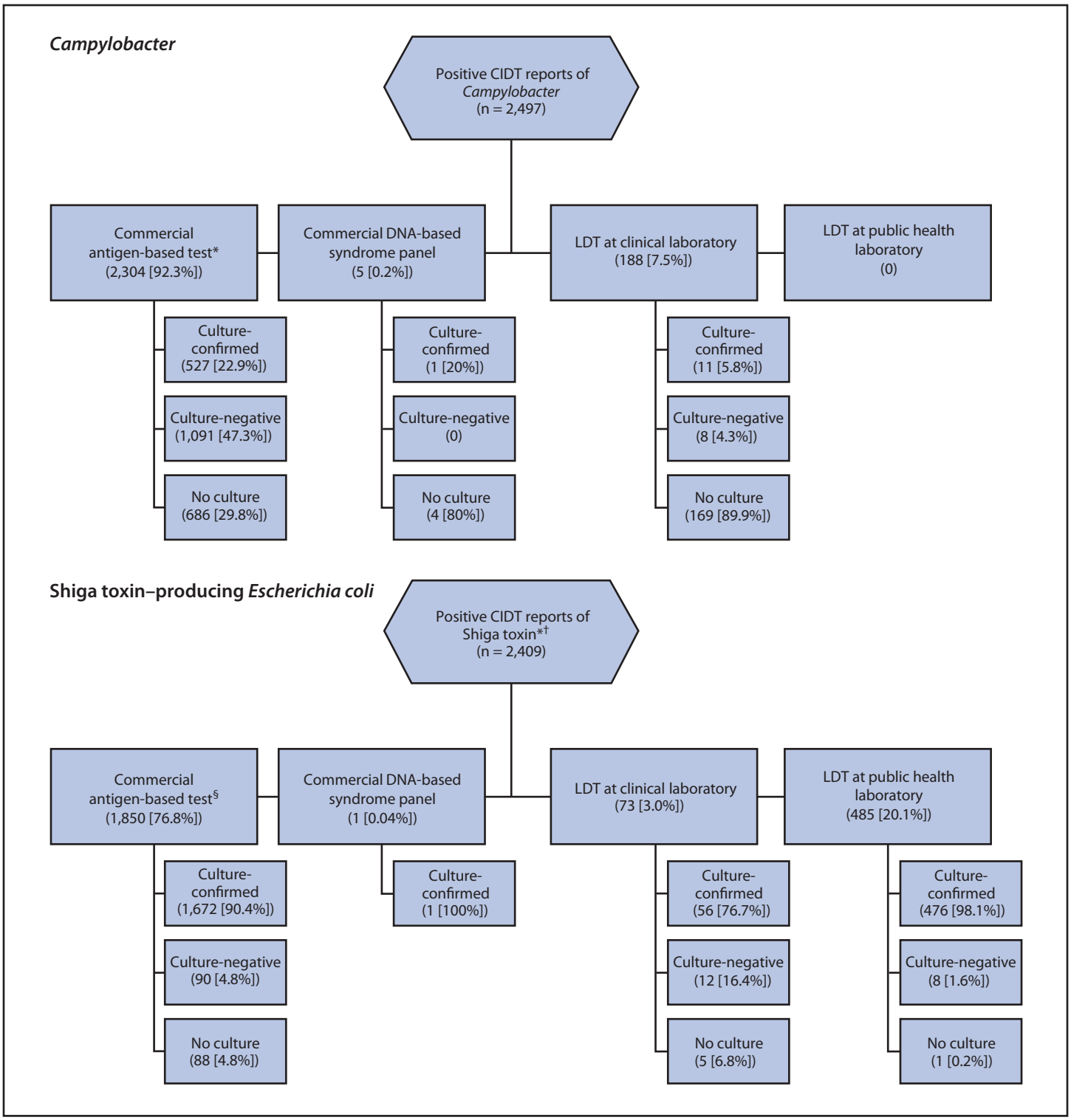
CIDTs are becoming more widely used for the diagnosis of STEC infections. Comparing clinical laboratory practices in 2007 and 2014, the use of antigen-based and DNA-based methods to detect Shiga toxin or the genes encoding the toxins increased from 11% to 60% of clinical laboratories (*7*). A positive CIDT report was associated with almost all STEC reports, and most of these reports (90.4%) were confirmed by culture. There are established best-practice recommendations, and in

FIGURE 1. Incidence of culture-confirmed bacterial infections and positive CIDT reports, by selected pathogen — FoodNet, United States, 2012–2013



Abbreviations: CIDT = culture- independent diagnostic test; STEC: Shiga toxin–producing *Escherichia coli*.

FIGURE 2. Positive CIDT reports of *Campylobacter* and Shiga toxin–producing *Escherichia coli*, by test type and culture result — FoodNet, United States, 2012–2013



Abbreviations: CIDT = culture- independent diagnostic test; LDT = laboratory-developed test.

* Excludes 274 Shiga toxin–positive reports from clinical laboratories that were Shiga toxin–negative at a public health laboratory and 53 reports of detection of O157 antigen without a test result for Shiga toxin.

† For instances in which a positive result from a single specimen was reported from more than one laboratory (e.g., clinical laboratory and public health laboratory), test type was categorized according to the test type used for initial detection.

§ Conducted at a clinical laboratory or public health laboratory.

What is already known on this topic?

Culture-independent diagnostic tests (CIDTs) are increasingly used by clinical laboratories to diagnose bacterial enteric infections. CIDTs do not yield isolates, which are needed for further characterization by current methods, including antimicrobial susceptibility testing, serotyping, pulsed-field gel electrophoresis, and whole genome sequencing.

What is added by this report?

FoodNet surveillance indicates CIDTs are being used in clinical care, currently most often to detect *Campylobacter* and STEC infections. During 2012–2013, the Foodborne Diseases Active Surveillance Network (FoodNet) identified a total of 38,666 culture-confirmed cases and positive CIDT reports of *Campylobacter, Salmonella, Shigella*, Shiga toxin–producing *E. coli*, *Vibrio*, and *Yersinia*; among the 5,614 positive CIDT reports, 2,595 (46%) were not confirmed by culture, either because the specimen was not cultured or because a culture did not yield the pathogen. In addition, a 2014 survey of clinical laboratories serving the FoodNet surveillance area indicated that use of CIDTs by the laboratories varied by pathogen; only CIDT methods were used most often for detection of *Campylobacter* (10%) and STEC (19%).

What are the implications for public health practice?

Although CIDTs provide many advantages over culture to improve patient care, the increased reliance on CIDTs, coupled with the public health need to obtain subtype information about isolates to detect outbreaks and monitor disease trends, likely will result in a burden on public health laboratories.

most FoodNet sites,[¶¶] state requirements for the referral of Shiga toxin–positive broths to public health laboratories for confirmation (*8,9*). The high proportion of CIDTs performed in conjunction with culture and confirmed at a public health laboratory demonstrates that laboratory guidance and submission requirements are effective strategies to promote the testing of specimens by culture and the flow of isolates or clinical specimens to public health laboratories.

Quantifying the impact of CIDTs on trends in disease incidence and burden is complicated because of important limitations of the understanding of CIDTs and possible changes in laboratory practices surrounding them. First, it is difficult to draw conclusions from increases or decreases in the number of reports partly because many types of CIDTs are being used. Test performance characteristics differ among CIDTs and might differ among patient populations. Second, trends would be affected if CIDT testing practices were different from culture; for example, if CIDTs were used more frequently for specific patient populations or for different clinical indications. Finally, available CIDTs for enteric pathogens do not have subtyping capacity.

As more clinical laboratories adopt CIDTs, the collection and detailed characterization of bacterial isolates that support public health activities will fall more heavily on public health laboratories. The increased reliance on CIDTs will create a burden for public health laboratories and will have a significant impact on clinical practice, outbreak detection, and the ability to monitor disease burden and trends. Public health surveillance programs rely on the ability to distinguish among strains and serotypes of pathogens to detect foodborne outbreaks and monitor the effectiveness of specific public health and food safety interventions by regulatory agencies and the food industry. To maintain public health surveillance of foodborne and other bacterial enteric diseases and to maintain the quality of clinical decision-making, it will be necessary to 1) enhance surveillance methods to gather sufficient information on CIDT reports (e.g., type and brand of test) to allow critical examination of the data to assess case definitions and to inform both evidence-based best clinical and laboratory practices, 2) encourage and implement reflex culturing (culturing of a specimen with a positive CIDT result) at clinical laboratories or submission of appropriate specimens for culture to public health laboratories, and 3) develop further strain characterization methods that are themselves culture-independent for improved clinical management and public health surveillance.

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[¶¶] California, Connecticut, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee have state laws or regulations for the submission of Shiga toxin–positive broths to the state public health laboratory.

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Notes from the Field

Multistate Outbreak of Human *Salmonella* Infections Linked to Live Poultry from a Mail-Order Hatchery in Ohio — February–October 2014

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In early 2014, five clusters of human *Salmonella* infections were identified through PulseNet, the national molecular subtyping network for foodborne disease surveillance. Many ill persons in each of these clusters reported contact with live poultry, primarily chicks and ducklings, from a single mail-order hatchery; therefore, the clusters were merged into a single investigation. During February 3–October 14, 2014, a total of 363 persons infected with outbreak strains of *Salmonella* serotypes Infantis, Newport, and Hadar were reported from 43 states and Puerto Rico, making it the largest live poultry-associated salmonellosis outbreak reported in the United States.

Among the ill persons, 35% (122 of 353) were aged ≤10 years, and 33% (76 of 233) were hospitalized; no deaths were reported. Among those interviewed, 76% (174 of 230) reported live poultry contact in the week before illness onset. Among the ill persons who provided supplemental information on live poultry exposure, 80% (94 of 118) reported chick exposure and 26% (31 of 118) reported duckling exposure. Among 96 (81%) ill persons who were exposed to live poultry at their residence, 28 (29%) reported keeping poultry inside their home instead of outdoors, and 26 (27%) reported no direct contact with their poultry.

Of the 75 ill persons with live poultry purchase information, the average time from purchase to illness onset was 48 days (range = 2–730 days); 27 (36%) reported illness onset within 14 days of purchase. Hatchery source information was available for 69 purchases, of which 58 (84%) came from a single mail-order hatchery in Ohio. This same Ohio hatchery was previously linked with multiple, large human *Salmonella* infection outbreaks (*1*,*2*).

The U.S. Department of Agriculture's National Poultry Improvement Plan, a collaboration between industry and state and federal agencies, provides guidance on management and sanitation practices for mail-order hatcheries, including a Best Management Practices Handbook.* Comprehensive *Salmonella* prevention and control programs are needed at all hatcheries and associated breeder farms to prevent outbreaks.

The possibility of environmental contamination of the home by live poultry, suggested by the 27% of respondents who reported no direct contact with their poultry, illustrates a need for additional educational information advising customers on how to reduce the risk for *Salmonella* transmission from live poultry (*3*) to humans through environmental contamination. Educational information regarding zoonotic *Salmonella* outbreaks, including outbreaks associated with live poultry, is available from CDC (*4*). A comprehensive approach to illness prevention involving human and animal health officials and practitioners, industry, and backyard poultry flock owners is needed to prevent future outbreaks.

* Available at http://www.poultryimprovement.org/default.cfm.

[1]Epidemic Intelligence Service, CDC; [2]Division of Foodborne, Waterborne, and Environmental Diseases, National Center for Emerging and Zoonotic Infectious Diseases, CDC, [3]Ohio Department of Agriculture; [4]Ohio Department of Health; [5]US Department of Agriculture (Corresponding author: Colin Basler, cbasler@cdc.gov, 404-639-2214)

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1. CDC. Notes from the field: multistate outbreak of *Salmonella* Infantis, Newport, and Lille infections linked to live poultry from a single mail-order hatchery in Ohio—March–September, 2012. MMWR Morb Mortal Wkly Rep 2013;62:213.
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3. CDC. Risk of human *Salmonella* infections from live baby poultry. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at http://www.cdc.gov/Features/SalmonellaBabyBirds.
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Erratum

Vol. 62, No. RR-4

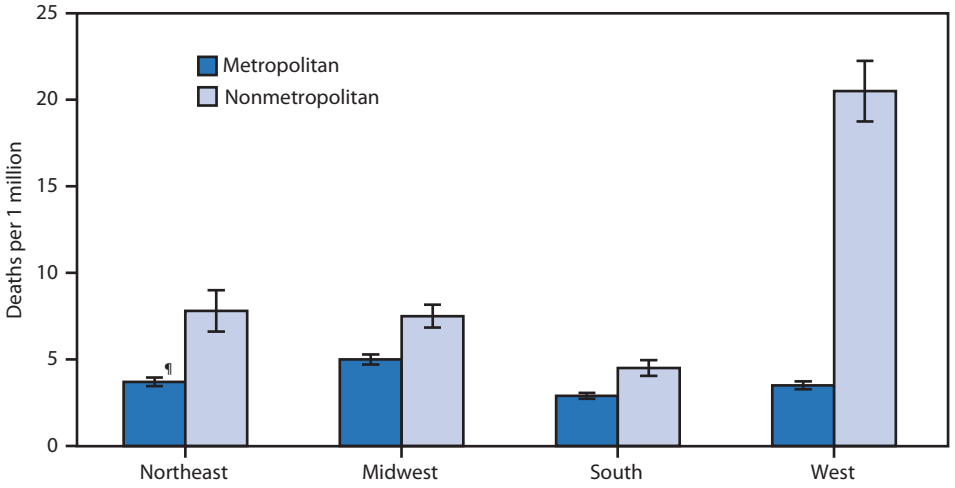
In the *MMWR* Recommendations and Reports, "Prevention of Measles, Rubella, Congenital Rubella Syndrome, and Mumps, 2013: Summary of Recommendations of the Advisory Committee on Immunization Practices (ACIP)," an error occurred in the third sentence of the first paragraph under the heading "Measles Component" on page 8. That sentence should read:

"Because of increased efficacy and fewer adverse reactions, the vaccine containing the Enders-Edmonston vaccine strain replaced previous vaccines: inactivated Edmonston vaccine (available in the United States from 1963 through **1967**), live attenuated vaccines containing the Edmonston B (available in the United States from 1963 through 1975), and Schwarz strain (available in the United States from 1965 through 1976).

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Rates for Cold-Related Deaths,* by U.S. Census Region† and Metropolitan Status of Place of Occurrence§ — United States, 2010–2013



* Age-adjusted rates per 1 million population; based on the 2000 U.S. standard population. Deaths attributed to exposure to excessive natural cold (X31) (underlying or contributing cause of death), hypothermia (T68) (contributing cause of death), or effect of reduced temperature, unspecified (T69.9) (contributing cause of death), or a combination of these, according to the *International Classification of Diseases, 10th Revision*. Rates computed by place of occurrence. During 2010–2013, 5,809 cold-related deaths occurred in the United States.

† *Northeast:* Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, New Jersey, New York, Pennsylvania, and Vermont; *Midwest:* Illinois, Indiana, Iowa, Kansas, Michigan, Minnesota, Missouri, Nebraska, North Dakota, Ohio, South Dakota, and Wisconsin; *South:* Alabama, Arkansas, Delaware, Florida, Georgia, Kentucky, Louisiana, Mississippi, Maryland, North Carolina, Oklahoma, South Carolina, Virginia, Tennessee, Texas, West Virginia, and District of Columbia; *West:* Alaska, Arizona, California, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming.

§ Counties were classified as metropolitan or nonmetropolitan based on the February 2013 Office of Management and Budget delineation.

¶ 95% confidence interval.

In all regions of the United States, cold-related mortality during 2010–2013 was higher in nonmetropolitan areas than in metropolitan areas. Age-adjusted cold-related death rates in nonmetropolitan areas of the West were markedly higher than those in the other regions (20.5 deaths per 1 million population compared with 4.5–7.8). Age-adjusted cold-related death rates in metropolitan areas ranged from 2.9 to 5.0 deaths per 1 million population, with the South having the lowest rate.

Sources: National Vital Statistics System. County-level mortality file. Available at http://www.cdc.gov/nchs/deaths.htm and http://wonder.cdc.gov/mcd.html.

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