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Measles — United States, January 4–April 2, 2015

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Measles is a highly contagious, acute viral illness that can lead to complications such as pneumonia, encephalitis, and death. As a result of high 2-dose measles vaccination coverage in the United States and improved control of measles in the World Health Organization's Region of the Americas, the United States declared measles elimination (defined as interruption of year-round endemic transmission) in 2000 (*1*). Importations from other countries where measles remains endemic continue to occur, however, which can lead to clusters of measles cases in the United States. To update surveillance data on current measles outbreaks, CDC analyzed cases reported during January 4–April 2, 2015. A total of 159 cases were reported during this period. Over 80% of the cases occurred among persons who were unvaccinated or had unknown vaccination status. Four outbreaks have occurred, with one accounting for 70% of all measles cases this year. The continued risk for importation of measles into the United States and occurrence of measles cases and outbreaks in communities with high proportions of unvaccinated persons highlight the need for sustained, high vaccination coverage across the country.

Confirmed measles cases in the United States are reported by state and local health departments to CDC using a standard case definition (*2*). A measles case is considered confirmed if it is laboratory-confirmed or meets the clinical case definition (an illness characterized by a generalized rash lasting ≥3 days, a temperature of ≥101°F [≥38.3°C], and cough, coryza, or conjunctivitis) and is linked epidemiologically to a confirmed case. Measles cases are laboratory confirmed if there is detection in serum of measles-specific immunoglobulin M, isolation of measles virus, or detection of measles virus nucleic acid from a clinical specimen. Cases are considered imported if at least some of the exposure period (7–21 days before rash onset) occurred outside the United States and rash occurred within 21 days of entry into the United States, with no known exposure to measles in the United States during that period. Import-associated cases include 1) imported cases, 2) cases that are linked epidemiologically to imported cases, and 3) cases for which an epidemiologic link has not been identified but the viral genotype detected suggests recent importation.* An outbreak of measles is defined as a chain of transmission of three or more linked cases.

During January 4–April 2, 2015, a total of 159 measles cases (in 155 U.S. residents and four foreign visitors) from 18 states

* Additional information available at http://www.cdc.gov/vaccines/pubs/surv-manual/chpt07-measles.html.

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

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and the District of Columbia were reported to CDC (Figure 1). Patients ranged in age from 6 weeks to 70 years; 26 (16%) were aged <12 months, 18 (12%) were aged 1–4 years, 27 (17%) were aged 5–19 years, 58 (36%) were aged 20–39 years, and 30 (19%) were aged ≥40 years. Twenty-two patients (14%) were hospitalized, including five with pneumonia. No other complications and no deaths have been reported.

A total of 111 cases (70%) have been associated with an outbreak that originated in late December 2014 in Disney theme parks in Orange County, California. The source of the initial exposure has not been identified, but measles cases associated with this outbreak have been reported in seven U.S. states, Mexico, and Canada (*3*). Measles was laboratory confirmed in 101 (91%) of these cases, either by detection of measles-specific IgM or of measles virus RNA. The B3 genotype was identified in specimens from at least 40 patients associated with this outbreak. B3 is a common measles genotype that has been identified in multiple states and countries (*4*). Other smaller measles outbreaks in 2015 without a link to Disney theme parks have been reported in Illinois (15 cases), Nevada (nine), and Washington (five).

The majority of the 159 patients with reported measles in the 2015 outbreaks were either unvaccinated (71 [45%]) or had unknown vaccination status (60 [38%]); 28 (18%) had received measles vaccine. Among the 68 U.S. residents who had measles and were unvaccinated, 29 (43%) cited philosophical or religious objections to vaccination, 27 (40%) were ineligible because they were too young to receive vaccination (26 patients) or had a medical contraindication (one), three (4%) represented missed opportunities for vaccination, and nine (13%) had other reasons for not being vaccinated (Figure 2).

Of the 159 measles cases, 153 (96%) were import-associated. Ten cases were classified as direct importations, (six among unvaccinated U.S. residents returning from overseas travel, of whom three were aged 6–11 months and age-eligible for vaccination before departure, and four among foreign visitors). Countries associated with direct importations included Azerbaijan, China, Germany, India, Indonesia, Kyrgyzstan, Pakistan, Qatar, Singapore, and United Arab Emirates (one import each).

Discussion

High population immunity secondary to high measles vaccination coverage has maintained measles elimination in the United States since declaration of elimination in 2000 (*5*). Worldwide, however, approximately 20 million measles cases occur annually, and importations to the U.S. will continue to place unvaccinated populations at risk for measles. Measles transmission in pockets of unvaccinated persons increases the risk for transmission to vulnerable groups, such as those who cannot be vaccinated because of underlying medical conditions, or infants too young to be vaccinated.

As in previous years, a sizeable proportion of U.S. residents who became infected with measles had an unknown vaccination status (*6*). This occurred primarily among adults and reflects the lack of immunization data in registries on adults

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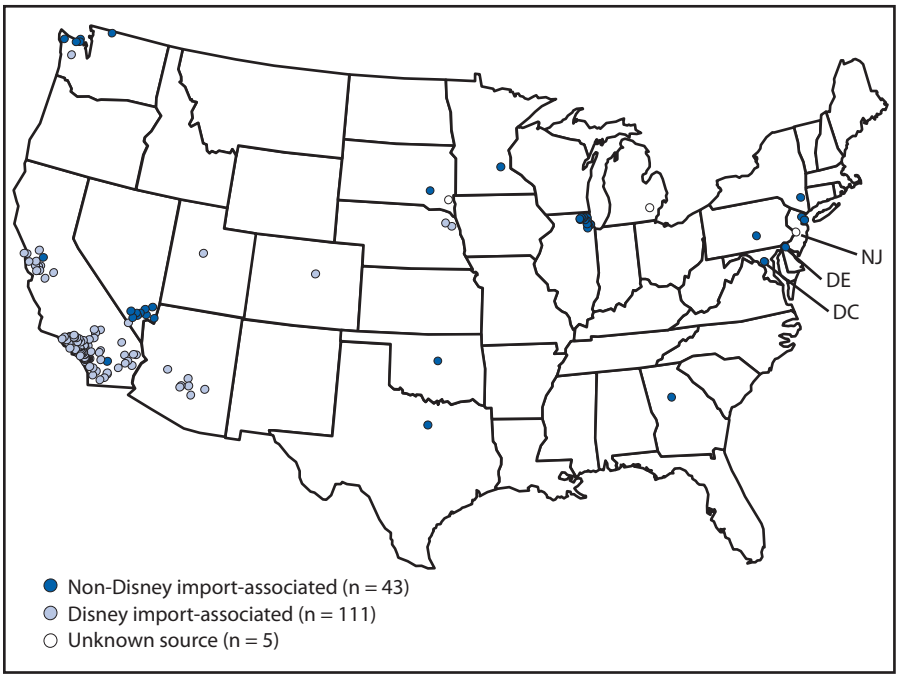
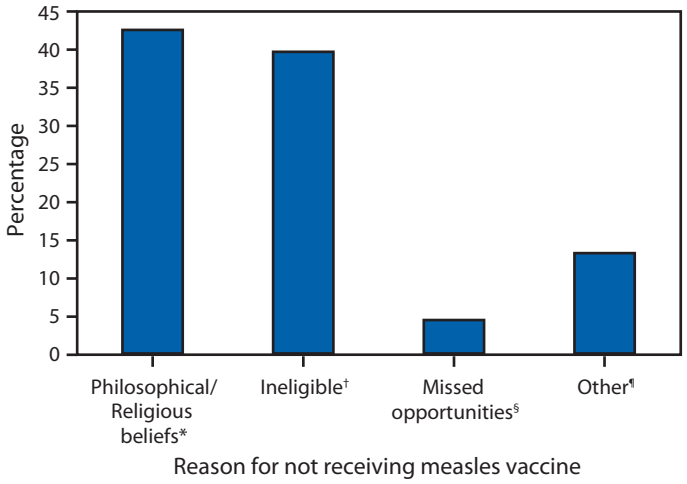
FIGURE 1. Number of reported measles cases (N = 159), by infection source, state, and county* — United States, January 4–April 2, 2015



Abbreviations: DC = District of Columbia; DE = Delaware; NJ = New Jersey.
* Cases were reported from 18 states and the District of Columbia, and from 37 counties.

FIGURE 2. Percentage of U.S. residents with measles who were unvaccinated (n = 68), by reason for not receiving measles vaccine — United States, January 4–April 2, 2015



* Includes persons who were unvaccinated because of their own or a parent's beliefs.
† Includes persons ineligible for measles vaccination, generally those aged <12 months and those with medical contradictions.
§ Includes eligible children aged 16 months–4 years who had not been vaccinated and international travelers aged 6–11 months who were unvaccinated.
¶ Includes persons who were known to be unvaccinated and the reason was unknown, and those who were born before 1957 and presumed to be immune.

in the United States. Among the U.S.-resident patients who were confirmed as unvaccinated, the numbers who were ineligible for vaccination and who cited philosophical or religious beliefs as the reason they declined vaccination were similar. Exemptions from mandated immunizations have been shown to increase risk for acquiring disease as well as increasing the risk of a disease outbreak at the community level. Exemption rates are higher in jurisdictions where exemption requirements are procedurally easier to meet (*7*).†

Health care providers should encourage vaccination of all eligible patients who do not have other evidence of measles immunity. Children without contraindications should receive their first dose of measles, mumps, and rubella (MMR) vaccine at age 12–15 months and a second dose at age 4–6 years. Before international travel, infants aged 6-11 months should receive one dose of MMR and children aged 12 months and older should receive two doses of MMR vaccine separated by at least 28 days. Adults born during or after 1957 who are at high risk for measles (i.e., health care personnel, international travelers, and students at postsecondary educational institutions) and who do not have other evidence of measles immunity should also receive 2 doses of MMR vaccine. Other adults without evidence of measles immunity should receive at least 1 dose of MMR vaccine. 1 dose of MMR vaccine administered to those aged ≥12 months is approximately 93% effective at preventing measles and 2 doses approximately 97% effective (*8*).

Measles should be considered in the differential diagnosis of patients with febrile illness and rash. Patients with clinical symptoms compatible with measles should be asked about recent travel abroad or contact with travelers, and their vaccination status should be verified. Patients with suspected measles should be promptly screened before entering waiting rooms and appropriately isolated (i.e., in an airborne isolation room or, if not available, in a separate room with the door closed), or have their doctor's office appointments scheduled at the end of the day to prevent exposure of other patients (*9*). Serology as well as viral specimens should be collected for laboratory testing. Viral genetic sequencing can be used to detect the genotype of the infection, which can be used to suggest the

† Additional information available at http://www.cdc.gov/vaccines/imz-managers/laws/state-reqs.html and at http://www.cdc.gov/phlp/publications/topic/vaccinations.html.

source of an imported virus and track global transmission patterns (*10*). To assist state and local public health departments with rapid investigation and control efforts to limit the spread of disease, suspected measles cases should be reported to local health departments immediately. State health departments are required to notify cases of measles to CDC within 24 hours of detection.[§]

Maintenance of high 2-dose MMR vaccine coverage has been crucial in limiting measles spread from importations in the United States. Most measles importations occur when U.S. citizens travel abroad and have not been appropriately vaccinated. Therefore, it is important to encourage timely delivery of measles vaccination for U.S. residents before overseas travel. In addition, early detection of cases and rapid public health response to outbreaks can serve to limit the spread of illness.

[§] Additional information available at http://c.ymcdn.com/sites/www.cste.org/resource/resmgr/pdfs/cstenotifiableconditionlista.pdf.

What is already known on this topic?

Measles elimination (i.e., interruption of year-round endemic transmission) has been maintained in the United States since 2000. Despite progress in global measles control, measles remains common in many countries of the world, and measles is imported regularly into the United States.

What is added by this report?

During January 4–April 2, 2015, a total of 159 measles cases (in 155 U.S. residents and four foreign visitors) were reported to CDC. Twenty-two patients (14%) were hospitalized, including five with pneumonia. Over 80% of all cases occurred among persons who were unvaccinated or had unknown vaccination status. One outbreak accounted for 70% of all measles cases this year.

What are the implications for public health practice?

Importations of measles into communities with unvaccinated persons can lead to measles cases and outbreaks in the United States. Maintenance of high vaccination coverage, ensuring timely vaccination before travel, and early detection and isolation of cases are key factors to limit importations and the spread of disease.

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Morbidity and Mortality Weekly Report

Poisoning Deaths Involving Opioid Analgesics — New York State, 2003–2012

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Deaths involving opioid analgesics have increased dramatically in the United States. Approximately 4,000 such deaths were documented in 1999 (*1*), increasing to 16,235 in 2013, reflecting a nearly quadrupled death rate from 1.4 to 5.1 deaths per 100,000 (*2*). To investigate this increase in New York state, trends in poisoning deaths involving opioid analgesics from 2003 to 2012 were examined. Data sources used were New York state vital statistics multiple-cause-of-death data, consisting of data from both the New York City (NYC)* and non-NYC reporting jurisdictions, as well as statewide Medicaid enrollment data. Deaths involving opioid analgesics increased both in number and as a percentage of all drug poisoning deaths, and rates were highest among men, whites, persons aged 45–64 years, persons residing outside of NYC, and Medicaid enrollees. The analysis found that, in 2012, 70.7% of deaths involving opioid analgesics also involved at least one other drug, most frequently a benzodiazepine. These results underscore the potential to mitigate the trend of increasing opioid analgesic-related mortality through initiatives such as New York state's Internet System for Tracking Over-Prescribing (I-STOP) law,† which took effect on August 27, 2013. Provisions under I-STOP include the requirements that providers consult the Prescription Monitoring Program (PMP) Registry when writing prescriptions for controlled substances, and that they use electronic prescribing.

New York state vital statistics multiple-cause-of-death mortality data, and statewide Medicaid enrollment data were used for this investigation. All reported rates were calculated using U.S. Census Bureau bridged-race population estimates (*3*) for New York state for each year included in this report. Age-adjusted rates were calculated using the direct method based on the 2000 U.S. standard population (*4*). Medicaid enrollment figures were used to compare rates between Medicaid recipients and non-recipients. Decedents were classified as Medicaid recipients if there was any record of Medicaid enrollment in the previous 12 months. Adopting a previously reported coding methodology (*1*), the *International Classification of Diseases, Tenth Revision* (ICD-10), codes used for identifying deaths with drug poisoning of any intent as an underlying cause were X40–44, X60-X64, X85, and Y10-Y14. Among these deaths, those involving opioid analgesics were identified using codes T40.2–T40.4, benzodiazepines using code T42.4, cocaine using T40.5, and heroin using T40.1. ICD-10 codes T36–T50.8 were used to identify specified drugs, with T50.9 being unspecified. Only deaths of New York state residents were included in the analysis.

From 2003 to 2012, the number of deaths with drug poisoning as an underlying cause increased from 750 to 1,869. During the same period, deaths involving opioid analgesics increased from 179 in 2003 to 883 in 2012 (Table). In addition, drug poisoning deaths without a drug specified, for which opioid analgesics might account partially, increased from 326 deaths in 2003 to 423 in 2012. Over this period, the percentage of drug deaths that involved opioid analgesics increased from 23.9% in 2003 to 47.2% in 2012, reaching a high of 54.0% in 2010.

Demographic differences were found in mortality involving opioid analgesics. Rates were consistently highest among New York state residents who were men, whites, non-NYC residents, and Medicaid enrollees (Table). Analysis of trends in crude death rates for poisonings involving opioid analgesics by age group showed rates were consistently highest among those aged 45–64 years, followed by those aged 20–44 (Figure 1). Rate ratios (RRs) comparing death rates between 2003 and 2012 (Table) indicate that the highest rate of increase in deaths involving opioid analgesics was among those aged 65–84 years (RR = 6.9). Persons in the race category "Other" and those residing in NYC also showed higher rates of increase in opioid analgesic-related mortality (RR = 6.3 and 7.5, respectively).

New York state Medicaid enrollees had higher death rates for opioid analgesic poisonings than did those not enrolled in Medicaid, and the differences increased over time (Table). Deaths per 100,000 among all New York state residents not enrolled in Medicaid increased from 0.73 in 2003 to 2.82 in 2012, while among Medicaid enrollees, the rates increased from 1.57 to 8.31 over the same period. Medicaid enrollees tend to be younger than persons not enrolled, and are more likely to be women. To control for the demographic differences between the two populations, age-adjusted death rates for poisonings involving opioid analgesics were stratified by sex (Figure 2). In each year and across both sexes, the age-adjusted death rates

* New York City vital statistics data were provided by the New York City Department of Health and Mental Hygiene and used under the terms of a memorandum of understanding with the New York State Department of Health.

† Additional information at https://www.health.ny.gov/professionals/narcotic/prescription_monitoring/.

TABLE. Number and crude death rates for poisonings involving opioid analgesics, by year and demographic characteristics — New York state, 2003–2012

Characteristic	Year										Ratio
	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2012:2003
Number of deaths											
All drug poisonings	**750**	**522**	**891**	**952**	**1,581**	**1,679**	**1,566**	**1,415**	**1,853**	**1,869**	**2.5**
Drug poisonings involving opioid analgesics	179	120	287	394	660	769	734	764	909	883	4.9
Opioid analgesics–related deaths per 100,000 population											
Total	**0.93**	**0.62**	**1.49**	**2.04**	**3.42**	**3.95**	**3.76**	**3.94**	**4.67**	**4.51**	**4.8**
Age group (yrs)											
<15	0.00	0.03	0.05	0.03	0.03	0.06	0.08	0.06	0.09	0.11	-
15–19	0.23	0.39	0.61	0.94	0.64	1.78	1.39	1.39	1.28	1.15	5.0
20–44	1.22	0.84	1.97	2.68	4.82	5.15	5.06	5.40	6.74	6.22	5.1
45–64	1.84	1.10	2.74	3.71	6.28	7.23	6.8	6.99	7.90	7.82	4.3
65–84	0.19	0.14	0.42	0.74	0.32	1.00	0.76	0.85	0.88	1.32	6.9
≥85	0.29	0.28	0.27	0	0.78	0.50	0.26	0.26	0.49	0.72	2.5
Sex											
Females	0.70	0.48	0.88	1.35	2.26	2.57	2.69	2.58	3.39	3.18	4.5
Males	1.19	0.77	2.14	2.78	4.65	5.40	4.88	5.40	6.03	5.76	4.8
Race											
Black	0.45	0.20	0.61	0.93	1.85	1.78	2.10	2.21	2.36	2.48	5.5
White	1.12	0.76	1.81	2.47	4.07	4.79	4.45	4.77	5.67	5.39	4.8
Other	0.28	0.28	0.48	0.53	0.92	0.96	1.14	0.79	1.43	1.77	6.3
Region											
NYC	0.52	0.37	0.69	0.75	2.80	3.52	3.28	3.67	3.64	3.89	7.5
New York state, excluding NYC	1.23	0.81	2.08	2.99	3.88	4.27	4.13	4.14	5.43	4.98	4.0
Medicaid status											
Medicaid	1.57	1.06	2.74	3.22	6.50	7.23	6.81	7.06	8.40	8.31	5.3
Non-Medicaid	0.73	0.47	1.03	1.61	2.32	2.78	2.61	2.66	3.06	2.82	3.9

Abbreviation: NYC = New York City

among Medicaid enrollees were higher than among those not enrolled in Medicaid.

Deaths involving opioid analgesics tend to involve multiple drugs. In 2012, of the 883 fatalities in New York state that involved opioid analgesics, 624 (70.7%) had at least one other specified drug documented on the death certificate, 27 (3.1%) involved an unspecified drug, with the remaining 232 (26.3%) opioid analgesic deaths involving no other drug. Benzodiazepines were the single most frequently documented drugs on the death certificate in addition to opioid analgesics. Of the 624 deaths involving opioid analgesics with at least one other specified drug, 308 (49.4%) involved benzodiazepines, followed by 153 (24.5%) involving cocaine, and 119 (19.1%) involving an unspecified antidepressant.

FIGURE 1. Death rates for poisonings involving opioid analgesics, by age group (yrs) — New York state, 2003–2012

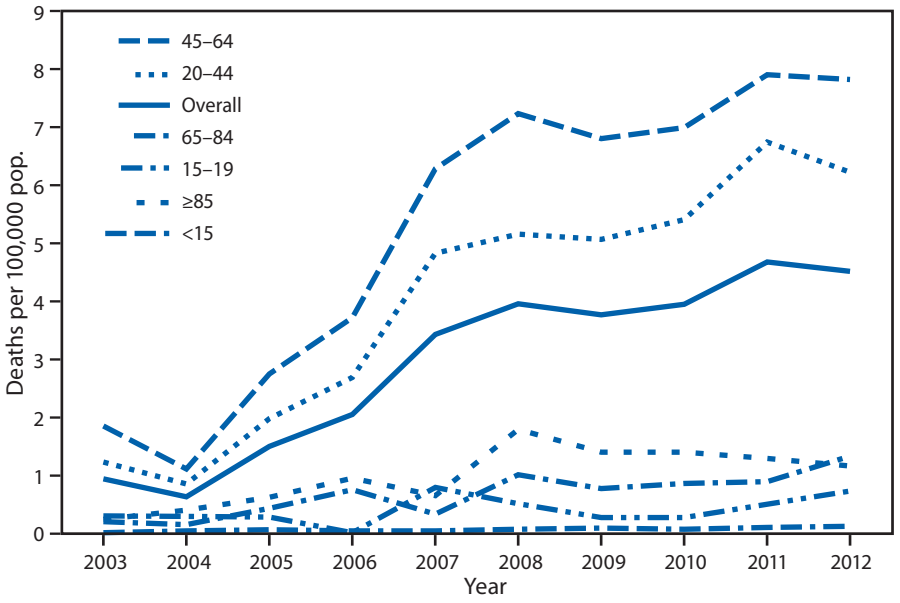
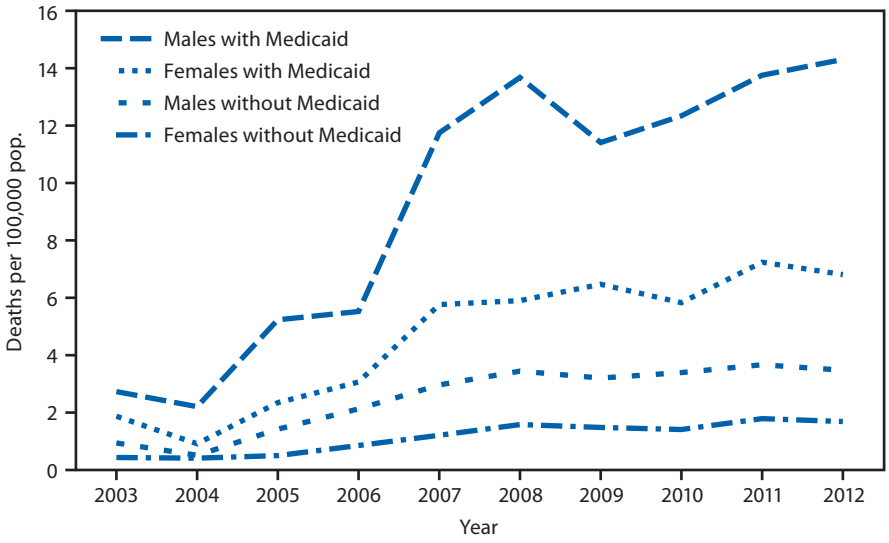


FIGURE 2. Age-adjusted death rates for poisonings involving opioid analgesics, by Medicaid enrollment status and sex — New York state, 2003–2012



Discussion

Increasing mortality associated with opioid analgesics has followed a similar upward trend in New York state and the nation since the late 1990s (*2*). While poisoning deaths involving any drugs have increased, opioid analgesics have accounted for an increasing proportion, with the percentage doubling over the 10-year period. Unlike the national trend of a more rapid increase in opioid analgesic-related deaths among women (*5*), the rate of increase, as indicated by the rate ratios, is slightly higher in New York state for men.

Comparison of opioid analgesic-related mortality between those enrolled or not enrolled in Medicaid shows considerably higher death rates and a more rapid increase in mortality among Medicaid enrollees. The consistently higher age-adjusted death rates for poisonings involving opioid analgesics among Medicaid enrollees (after stratifying data by sex) suggest that differences in age and sex distributions do not underlie these Medicaid/non-Medicaid differences. Other factors, such as the greater prevalence of mental illness and substance abuse in the Medicaid population (*6*), might contribute to the observed differences.

Deaths involving opioid analgesics in New York state tended to involve at least one other drug. In 2012, of the 883 drug poisoning fatalities in New York state that involved opioid analgesics, 624 (70.7%) had at least one other specified drug documented on the death certificate as having contributed to the death, and of these, 308 (49.4%) involved benzodiazepines. The tendency in New York state for opioid analgesic-related deaths to involve at least one other drug is greater than a national estimate of deaths in 2006, in which 51% of opioid analgesic-related deaths involved at least one other specified drug, with benzodiazepines involved in 17% of those deaths (*7*). It has been suggested that increases in opioid analgesic-related mortality might be related to an overall increase in prescribing these medications out of concern for the under-treatment of pain (*8*) accompanied by inappropriate prescribing and monitoring of patients to whom opioid analgesics are prescribed (*9*).

The findings in this report are subject to at least four limitations. First, heightened attention to the issue of opioid analgesic poisoning might have resulted in changes to reporting practices over time, increasing the likelihood of opioid involvement being reported on the death certificate. Second, geographic variation in cause of death determination or reporting could have influenced findings of regional differences in opioid analgesic-related mortality. Third, deaths involving opioid analgesics might have been undercounted because post-mortem drug test results might not have been available at the time the death certificate was completed. Finally, deaths associated with unspecified drugs account for a significant proportion of total drug mortality, resulting in the possibility that statistics for specific drug types, including opioid analgesics, are underestimated.

The increasing rates of opioid analgesic-related deaths among all groups, coupled with the multiple drug involvement in a high proportion of these deaths, suggest the need for a statewide system to prevent the abuse of prescription medications by ensuring that prescribers review a patient's prescription history before prescribing these drugs. The recently implemented I-STOP initiative is an example. Such efforts to address the problem of opioid analgesic-related mortality might be especially important for the Medicaid population, in which prescription opioid-related deaths are more common.

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What is already known on this topic?

Prescription drug abuse is an urgent public health problem facing the United States. Nationally, deaths caused by drug poisonings have increased over the last decade, with deaths associated with opioid analgesics showing the most rapid increases.

What is added by this report?

In New York state during 2003–2012, poisoning deaths involving opioid analgesics increased both in number and as a percentage of all drug poisoning deaths. Rates were highest among men, whites, persons aged 45–64 years, non-New York City residents, and Medicaid enrollees. In 2012, 70.7% of deaths involving an opioid analgesic also involved at least one other drug, most frequently a benzodiazepine.

What are the implications for public health practice?

Increasing mortality involving opioid analgesics and the multiple drug involvement in many of these deaths highlight the importance of efforts to ensure that prescribers of controlled substances consult a prescription registry for their patients' histories of dispensed prescriptions for these medications. The New York state I-STOP law, with the requirements that prescribers consult the PMP Registry when writing prescriptions for controlled substances and that they use electronic prescribing, is one such effort. Such steps are especially important for Medicaid patients, who are at higher risk of opioid-associated poisoning death.

Tobacco Use Among Middle and High School Students — United States, 2011–2014

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Tobacco use and addiction most often begin during youth and young adulthood (*1,2*). Youth use of tobacco in any form is unsafe (*1*). To determine the prevalence and trends of current (past 30-day) use of nine tobacco products (cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and bidis) among U.S. middle (grades 6–8) and high school (grades 9–12) students, CDC and the Food and Drug Administration (FDA) analyzed data from the 2011–2014 National Youth Tobacco Surveys (NYTS). In 2014, e-cigarettes were the most commonly used tobacco product among middle (3.9%) and high (13.4%) school students. Between 2011 and 2014, statistically significant increases were observed among these students for current use of both e-cigarettes and hookahs ($p<0.05$), while decreases were observed for current use of more traditional products, such as cigarettes and cigars, resulting in no change in overall tobacco use. Consequently, 4.6 million middle and high school students continue to be exposed to harmful tobacco product constituents, including nicotine. Nicotine exposure during adolescence, a critical window for brain development, might have lasting adverse consequences for brain development (*1*), causes addiction (*3*), and might lead to sustained tobacco use. For this reason, comprehensive and sustained strategies are needed to prevent and reduce the use of all tobacco products among youths in the United States.

NYTS is a cross-sectional, school-based, self-administered, pencil-and-paper questionnaire administered to U.S. middle and high school students. Information is collected on tobacco control outcome indicators to monitor the impact of comprehensive tobacco control policies and strategies (*4*) and inform FDA's regulatory actions (*5*). A three-stage cluster sampling procedure was used to generate a nationally representative sample of U.S. students who attend public and private schools in grades 6–12. This report includes data from 4 years of NYTS (2011–2014), using an updated definition of current tobacco use that excludes kreteks (sometimes referred to as clove cigarettes).* Of 258 schools selected for the 2014 NYTS, 207 (80.2%) participated, with a sample of 22,007 (91.4%) among 24,084 eligible students; the overall response rate was 73.3%. Sample sizes and overall response rates for 2011, 2012, and 2013 were 18,866 (72.7%), 24,658 (73.6%), and 18,406 (67.8%), respectively. Participants were asked about current (past 30-day) use of cigarettes, cigars (defined as cigars, cigarillos, or little cigars), smokeless tobacco (defined as chewing tobacco, snuff, or dip), e-cigarettes,† hookahs,§ tobacco pipes (pipes),¶ snus, dissolvable tobacco (dissolvables), and bidis. Current use for each product was defined as using a product on ≥1 day during the past 30 days. Tobacco use was categorized as "any tobacco product use," defined as use of one or more tobacco products and "≥2 tobacco product use," defined as use of two or more tobacco products. Data were weighted to account for the complex survey design and adjusted for nonresponse; national prevalence estimates with 95% confidence intervals and population estimates rounded down to the nearest 10,000 were computed. Estimates for current use in 2014 are presented for any tobacco use, use of ≥2 tobacco products, and use of each tobacco product, by selected demographics for each school level (high and middle). Orthogonal polynomials were used with logistic regression analysis to examine trends from 2011 to 2014 in any tobacco use, use of ≥2 tobacco products, and use of each tobacco product by school level, controlling for grade, race/ethnicity, and sex and simultaneously assessing for linear and nonlinear trends.** A p-value <0.05 was considered statistically significant. SAS-Callable SUDAAN was used for analysis.

* Kreteks no longer are sold legally in the United States and therefore data on these products were not collected in the 2014 cycle of NYTS. Kreteks also were not included in the definition of tobacco in years (2011, 2012, and 2013) in which the data were collected in order to be enable researchers to assess trends across the study period.

† In 2014, current use of e-cigarettes was assessed by the question, "During the past 30 days, on how many days did you use e-cigarettes such as Blu, 21st Century Smoke, or NJOY?", and in 2011 to 2013, such use was assessed by the question, "In the past 30 days, which [tobacco products] have you used on at least 1 day?"

§ In 2014, current use of hookahs was assessed by the question, "In the past 30 days, which [tobacco products] have you used on at least one day?" and was the first response option available to be selected; whereas from 2011 to 2013, hookah was the fourth or fifth response option.

¶ In 2014, current use of tobacco pipes was assessed by the question, "In the past 30 days, which [tobacco products] have you used on at least 1 day?" and in 2011 to 2013, it was assessed by the question, "During the past 30 days, on how many days did you smoke tobacco in a pipe?"

** A test for linear trend is significant if an overall statistically significant decrease or increase occurs during the study period. Data also were assessed for the presence of nonlinear trends; a significant nonlinear trend indicates that the rate of change changed across the study period.

In 2014, a total of 24.6% of high school students reported current use of a tobacco product, including 12.7% who reported current use of ≥2 tobacco products. Among all high school students, e-cigarettes (13.4%) were the most common tobacco products used, followed by hookahs (9.4%), cigarettes (9.2%), cigars (8.2%), smokeless tobacco (5.5%), snus (1.9%), pipes (1.5%), bidis (0.9%), and dissolvables (0.6%) (Table). Among high school non-Hispanic whites, Hispanics,[††] and persons of non-Hispanic other races, e-cigarettes were the most used product, whereas among non-Hispanic blacks, cigars were used most commonly. Current use of any tobacco and ≥2 tobacco products among middle school students was 7.7%

[††]Persons of Hispanic ethnicity can be of any race or combination of races.

TABLE. Estimated percentage of tobacco use in the preceding 30 days by product,* school level, sex, and race/ethnicity — National Youth Tobacco Survey, United States, 2014

	Sex				Race/Ethnicity										
	Female		Male		Non-Hispanic White		Non-Hispanic Black		Hispanic†		Non-Hispanic other race		Total		
Tobacco product	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	%	(95% CI)	Estimated no. of users§
High school students															
Electronic cigarettes	11.9	(9.7–14.5)	15.0	(12.4–18.2)	15.3	(12.4–18.8)	5.6	(3.7–8.5)	15.3	(11.8–19.5)	9.4	(6.8–12.9)	13.4	(11.2–16.1)	2,010,000
Hookah	9.8	(8.3–11.5)	8.9	(7.5–10.4)	9.4	(8.0–11.0)	5.6	(4.3–7.2)	13.0	(10.5–16.0)	6.0	(4.0–8.8)	9.4	(8.2–10.7)	1,380,000
Cigarettes	7.9	(6.8–9.1)	10.6	(9.0–12.4)	10.8	(9.3–12.5)	4.5	(3.6–5.8)	8.8	(7.2–10.7)	5.3	(3.5–7.8)	9.2	(8.1–10.4)	1,370,000
Cigars	5.5	(4.6–6.7)	10.8	(9.5–12.3)	8.3	(7.1–9.7)	8.8	(6.8–11.4)	8.0	(6.5–9.8)	2.6	(1.7–4.2)	8.2	(7.2–9.2)	1,200,000
Smokeless tobacco	1.2	(0.9–1.6)	9.9	(8.1–12.1)	7.8	(6.4–9.5)	1.1	(0.6–2.0)	3.1	(2.3–4.1)	—¶	—	5.5	(4.6–6.7)	830,000
Snus	0.8	(0.6–1.2)	3.0	(2.2–4.0)	2.4	(1.8–3.2)	0.6	(0.4–1.1)	1.5	(1.0–2.3)	—	—	1.9	(1.5–2.4)	280,000
Pipes	0.9	(0.7–1.3)	2.1	(1.6–2.9)	1.9	(1.4–2.5)	—	—	1.5	(1.0–2.2)	—	—	1.5	(1.2–2.0)	220,000
Bidis	0.6	(0.4–0.8)	1.2	(0.9–1.6)	0.8	(0.6–1.2)	—	—	1.1	(0.7–1.7)	—	—	0.9	(0.7–1.2)	130,000
Dissolvable tobacco	0.4	(0.2–0.6)	0.8	(0.5–1.1)	0.6	(0.4–0.9)	—	—	0.7	(0.4–1.2)	—	—	0.6	(0.5–0.8)	80,000
Any tobacco product use**	20.9	(18.8–23.2)	28.3	(25.6–31.1)	26.5	(23.9–29.4)	17.2	(14.8–20.0)	26.7	(23.0–30.7)	15.3	(11.5–20.1)	24.6	(22.6–26.7)	3,720,000
≥ 2 tobacco product use††	10.0	(8.6–11.6)	15.3	(13.4–17.4)	15.1	(13.3–17.1)	5.4	(4.0–7.3)	12.6	(10.5–15.1)	7.0	(4.7–10.1)	12.7	(11.2–14.3)	1,910,000
Middle school students															
Electronic cigarettes	3.3	(2.5–4.3)	4.5	(3.4–5.9)	3.1	(2.2–4.2)	3.8	(2.5–5.6)	6.2	(4.8–7.9)	—	—	3.9	(3.0–5.0)	450,000
Hookah	2.6	(1.9–3.5)	2.4	(1.9–3.0)	1.4	(1.1–1.9)	—	—	5.6	(4.4–7.1)	—	—	2.5	(2.0–3.0)	280,000
Cigarettes	2.0	(1.5–2.6)	3.0	(2.3–3.9)	2.2	(1.6–3.1)	1.7	(1.1–2.9)	3.7	(2.7–5.1)	—	—	2.5	(2.1–3.0)	290,000
Cigars	1.4	(1.0–2.1)	2.4	(1.7–3.5)	1.4	(0.9–2.4)	2.0	(1.3–2.9)	2.9	(2.2–3.8)	—	—	1.9	(1.5–2.5)	220,000
Smokeless tobacco	—	—	2.1	(1.4–3.1)	1.7	(1.1–2.6)	—	—	1.3	(0.9–2.0)	2.4	(1.4–4.1)	1.6	(1.2–2.2)	180,000
Snus	—	—	0.7	(0.4–1.2)	—	—	—	—	—	—	—	—	0.5	(0.3–0.8)	50,000
Pipes	—	—	0.6	(0.4–0.9)	0.5	(0.3–0.8)	—	—	0.9	(0.6–1.4)	—	—	0.6	(0.4–0.8)	60,000
Bidis	0.3	(0.2–0.5)	—	—	—	—	—	—	0.6	(0.4–0.9)	—	—	0.5	(0.3–0.9)	60,000
Dissolvable tobacco	—	—	0.4	(0.2–0.6)	—	—	—	—	—	—	—	—	0.3	(0.1–0.5)	30,000
Any tobacco product use	6.6	(5.4–8.1)	8.8	(7.6–10.1)	6.2	(5.1–7.4)	7.3	(5.6–9.3)	11.8	(9.9–14.1)	6.4	(4.1–9.9)	7.7	(6.7–8.9)	910,000
≥2 tobacco product use	2.4	(1.8–3.1)	3.8	(3.0–4.7)	2.5	(1.9–3.3)	2.0	(1.3–3.2)	5.0	(4.2–5.9)	—	—	3.1	(2.6–3.7)	360,000

Abbreviation: CI = confidence interval

* Preceding 30-day use of cigarettes was determined by asking, "During the past 30 days, on how many days did you smoke cigarettes?"; preceding 30-day use of cigars was determined by asking, "During the past 30 days, on how many days did you smoke cigars, cigarillos, or little cigars?"; preceding 30 day use of smokeless tobacco was determined by asking, "During the past 30 days, on how many days did you use chewing tobacco, snuff, or dip?"; preceding 30-day use of electronic cigarettes was determined by asking, "During the past 30 days, on how many days did you use electronic cigarettes or e-cigarettes such as Blu, 21st Century Smoke, or NJOY?"; preceding 30-day use of hookahs, pipe (not hookah), snus, dissolvable tobacco, and bidis was determined by asking, "In the past 30 days, which of the following products have you used on at least 1 day?"

† Persons of Hispanic ethnicity can be of any race or combination of races.

§ Estimated total number of users is rounded down to the nearest 10,000.

¶ Data are statistically unreliable because sample size was <50 or relative standard error was >0.3.

** Defined as preceding 30-day use of cigarettes, cigars, smokeless tobacco, electronic cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis on ≥1 day in the past 30 days.

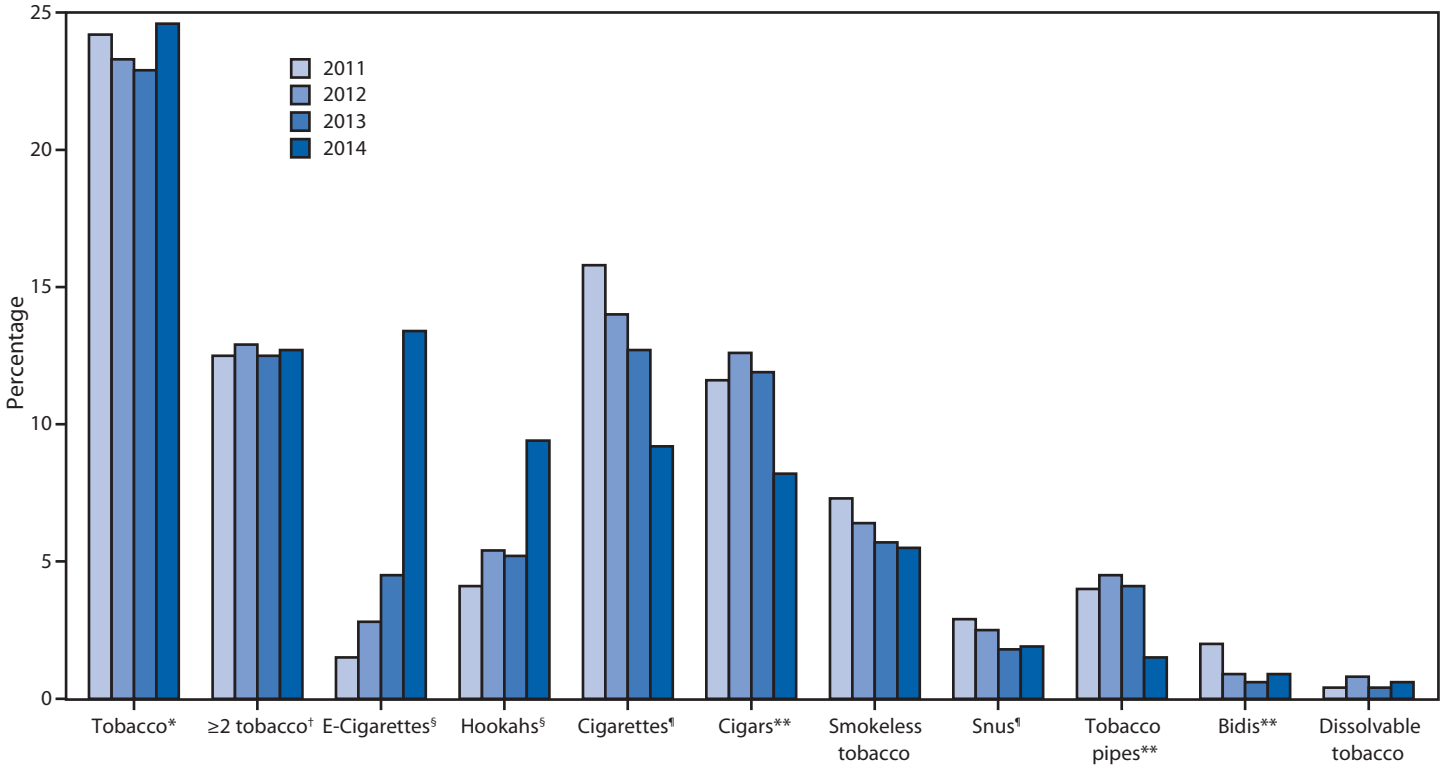
†† Defined as preceding 30-day use of two or more of cigarettes, cigars, smokeless tobacco, electronic cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis on ≥1 day in the past 30 days.

and 3.1%, respectively. E-cigarettes (3.9%) were the tobacco product used most commonly by middle school students, followed by hookahs (2.5%), cigarettes (2.5%), cigars (1.9%), smokeless tobacco (1.6%), pipes (0.6%), bidis (0.5%), snus (0.5%), and dissolvables (0.3%).

From 2011 to 2014, statistically significant nonlinear increases were observed among high school students for current e-cigarette (1.5% to 13.4%) and hookah (4.1% to 9.4%) use (Figure 1). Statistically significant linear decreases were observed for current cigarette (15.8% to 9.2%) and snus (2.9% to 1.9%) use. Statistically significant nonlinear decreases were observed for current cigar (11.6% to 8.2%), pipe (4.0% to 1.5%), and bidi (2.0% to 0.9%) use. Current use of any tobacco product (24.2% to 24.6%) and use of ≥2 tobacco products (12.5% to 12.7%) did not change significantly from 2011 to 2014. Among middle school students, similar trends were observed during 2011–2014 (Figure 2). A statistically significant linear decrease was observed only in middle school students currently using ≥2 tobacco products (3.8% to 3.1%).

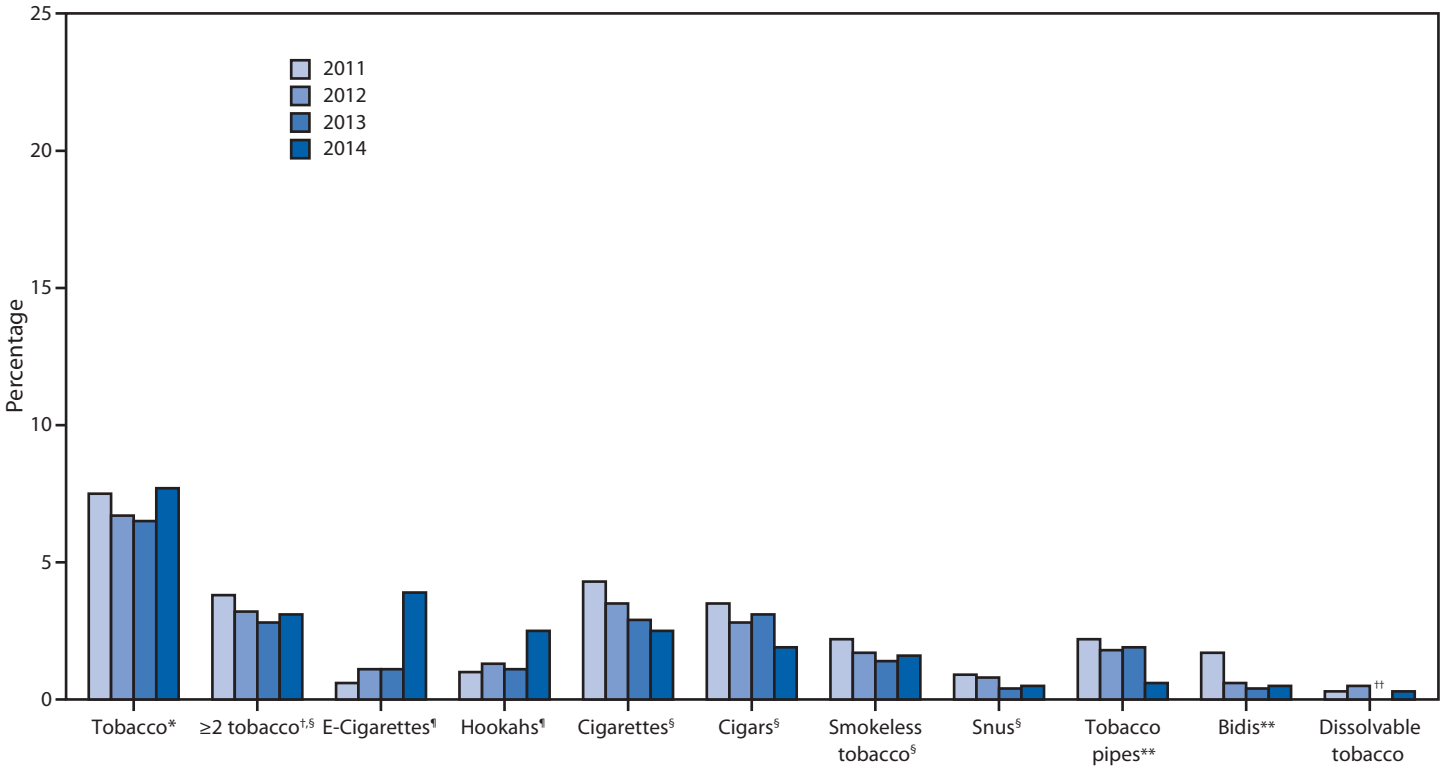
In 2014, an estimated 4.6 million middle and high school students currently used any tobacco product, of which an estimated 2.2 million students currently used ≥2 tobacco products. Of current tobacco users, 2.4 million used e-cigarettes and 1.6 million used hookahs. The largest increase in current e-cigarette use occurred from 2013 to 2014. Current e-cigarette use tripled from 2013 (660,000 [4.5%]) to 2014 (2 million [13.4%]) among high school students (Figure 1); and among middle school students, prevalence increased by a similar magnitude, from 1.1% (120,000) to 3.9% (450,000) (Figure 2). From 2013 to 2014, substantial increases also were observed for current hookah use, with prevalence almost doubling for high school students from 5.2% (770,000) to 9.4% (1.3 million) and for middle school students from 1.1% (120,000) to 2.5% (280,000) over this period.

FIGURE 1. Estimated percentage of high school students who used tobacco in the preceding 30 days, by tobacco product — National Youth Tobacco Survey, United States, 2011–2014



* Defined as preceding 30-day use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis.
† Defined as preceding 30-day use of two or more of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis.
§ Linear decrease ($p<0.05$).
¶ Nonlinear increase ($p<0.05$).
** Nonlinear decrease ($p<0.05$).

FIGURE 2. Estimated percentage of middle school students who used tobacco in the preceding 30 days, by tobacco product — National Youth Tobacco Survey, United States, 2011–2014



* Defined as preceding 30-day use of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis.
† Defined as preceding 30-day use of two or more of cigarettes, cigars, smokeless tobacco, e-cigarettes, hookahs, tobacco pipes, snus, dissolvable tobacco, and/or bidis.
§ Linear decrease ($p<0.05$).
¶ Nonlinear increase ($p<0.05$).
** Nonlinear decrease ($p<0.05$).
†† Data statistically unstable.

Discussion

From 2011 to 2014, substantial increases were observed in current e-cigarette and hookah use among middle and high school students, resulting in an overall estimated total of 2.4 million e-cigarette youth users and an estimated 1.6 million hookah youth users in 2014. Statistically significant decreases occurred in the use of cigarettes, cigars, tobacco pipes, bidis, and snus. The increases in current use of e-cigarettes and hookahs offset the decreases in current use of other tobacco products, resulting in no change in overall current tobacco use among middle and high school students. In 2014, one in four high school students and one in 13 middle school students used one or more tobacco products in the last 30 days. In 2014, for the first time in NYTS, current e-cigarette use surpassed current use of every other tobacco product, including cigarettes.

These findings are subject to at least three limitations. First, data were collected only from youths who attended either public or private schools and might not be generalizable to all middle and high school-aged youth. Second, current tobacco use was estimated by including students who reported using at least one of the nine tobacco products asked in the survey but might have had missing responses to any of the other eight tobacco products; missing responses were considered as nonuse, which might have resulted in underestimated results. Finally, changes between 2013 and 2014 in the wording and placement of questions about the use of e-cigarettes, hookahs, and tobacco pipes might have had an impact on reported use of these products. Despite these limitations, overall prevalence estimates are similar to the findings of other nationally representative youth surveys (*6,7*).

Tobacco prevention and control strategies, including increasing tobacco product prices, adopting comprehensive smoke-free laws, and implementation of national public education media campaigns, might have influenced the reduction of cigarette smoking in youths (*2*). However, the lack of decline in overall tobacco use from 2011 to 2014 is concerning and indicates that an estimated 4.6 million youths continue to be exposed to harmful constituents, including nicotine, present

What is already known on this topic?

Tobacco use and addiction most often begins during youth and young adulthood. Youth use of tobacco in any form is unsafe and might have lasting adverse consequences on their developing brains.

What is added by this report?

In 2014, an estimated 4.6 million youths, including 3.7 million high school and 900,000 middle school students, reported current use (use on one or more days in the past 30 days) of any tobacco product. From 2011 to 2014, statistically significant increases were observed in e-cigarette and hookah use among high school and middle school students, while statistically significant decreases were observed in the use of cigarettes, cigars, tobacco pipes, bidis, and snus. The increases in current use of e-cigarettes and hookahs offset the decreases in other tobacco products, resulting in no change in overall current tobacco use among youths.

What are the implications for public health practice?

In 2014, nearly one in four high school students and one in 13 middle school students reported current use of any tobacco product. Because the use of emerging tobacco products (e-cigarettes and hookahs) is on the rise among middle and high school students, it is critical that comprehensive tobacco control and prevention strategies for youths should address all tobacco products and not just cigarettes.

in tobacco products (Table). Youth use of tobacco in any form, whether it be combustible, noncombustible, or electronic, is unsafe (*1*); regardless of mode of delivery, nicotine exposure during adolescence, a critical time for brain development, might have lasting adverse consequences for brain development (*1*), causes addiction (*3*), and might lead to sustained use of tobacco products. Rapid changes in use of traditional and emerging tobacco products among youths underscore the importance of enhanced surveillance of all tobacco use.

Sustained efforts to implement proven tobacco control policies and strategies are necessary to prevent youth use of all tobacco products. In April 2014, FDA issued a proposed rule to deem all products made or derived from tobacco subject to FDA jurisdiction, and the agency is reviewing public comments on the proposed rule (*8*). Regulation of the manufacturing, distribution, and marketing of tobacco products coupled with full implementation of comprehensive tobacco control and prevention strategies at CDC-recommended funding levels could reduce youth tobacco use and initiation (*1,2,9*). Because use of emerging tobacco products (e-cigarettes and hookahs) is increasing among middle and high school students, it is critical that comprehensive tobacco control and prevention strategies for youths should address all tobacco products and not just cigarettes.

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Ebola Transmission Linked to a Single Traditional Funeral Ceremony — Kissidougou, Guinea, December, 2014–January 2015

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On December 18, 2014, the Guinea Ministry of Health was notified by local public health authorities in Kissidougou, a prefecture in southeastern Guinea (pop. 284,000), that the number of cases of Ebola virus disease (Ebola) had increased from one case reported during December 8–14, 2014, to 62 cases reported during December 15–21. Kissidougou is one of the four Guinea prefectures (the others are Macenta, Gueckedou, and Conakry) where Ebola was first reported in West Africa in March 2014 (*1*), and the mid-December increase was the largest documented by any prefecture in Guinea in a single week since the beginning of the epidemic. The Guinea Ministry of Health requested assistance from CDC and the World Health Organization to investigate the local outbreak, identify and isolate persons with suspected Ebola, assess transmission chains, and implement control measures. The investigation found that 85 confirmed Ebola cases were linked to one traditional funeral ceremony, including 62 (73%) cases reported during December 15–21. No additional cases related to this funeral ceremony were reported after January 10, 2015. After the outbreak was identified, rapid implementation of interventions limited additional Ebola virus transmission. Improved training for prompt reporting of cases, investigation, and contact tracing, and community acceptance of safe burial methods can reduce the risk for Ebola transmission in rural communities.

Epidemiology and Laboratory Testing

On December 19, 2014, rapid response teams including epidemiologists, clinicians, and local public health officials were deployed to villages where potential cases had been reported. The teams interviewed patients and household contacts and conducted active identification of cases and contacts. Ebola case investigation forms were reviewed to identify and characterize cases reported during December 1, 2014–January 10, 2015 as either suspected, probable, or confirmed. A suspected case was defined as one with Ebola-compatible symptoms (i.e., fever and malaise with other nonspecific signs and symptoms, including myalgia, headache, vomiting, and diarrhea) in a Kissidougou resident; a probable case was defined as Ebola-compatible symptoms reported for a decedent for whom no specimens were collected; and a confirmed case was defined as Ebola-compatible symptoms in a person with ≥1 Ebola virus–positive specimen tested by reverse transcription–polymerase chain reaction (RT-PCR) (*2*). Patients with suspected Ebola were isolated and transported to an Ebola treatment center (ETC) for confirmation of Ebola virus by RT-PCR. For decedents with suspected Ebola, oral swabs were collected within 24 hours upon notification of death, and the swabs were sent to an ETC for confirmation of Ebola.

Specimens from 62 persons tested positive for Ebola virus by RT-PCR. Review of case investigation forms and reports indicated that all 62 confirmed cases lived in Kissidougou and were clustered in six villages: 29 (47%) in Ouendero, 13 (21%) in Kamandou, eight (13%) in Mandou, five (8%) in Kongola, four (6%) in Tangolto, and three (5%) in Gbeninkoro. Thirty-two (52%) of the patients were male. Median age was 35 years (range = 2–80 years); four (6%) patients were aged <15 years, 37 (60%) were aged 15–49 years, and 21 (34%) were aged ≥50 years.

Fifty-six (90%) of the 62 patients had Ebola-compatible symptoms. Fifty-one (82%) died; 33 (65%) died in an ETC, and 18 (35%) decedents were reported as community deaths. These community deaths occurred during December 14–17 in three villages in Kissidougou: Mandou (seven deaths), Kamandou (six), and Ouendero (five). Patients who died in the community had not sought medical treatment; instead, family members reported the deaths to local health authorities, who considered them as suspected Ebola cases. Oral swabs were collected from all 18 decedents within 24 hours upon notification of death; all tested positive for Ebola virus and were reclassified as confirmed Ebola cases.

The Funeral of the Midwife Assistant

Interviews with household contacts of the 18 decedents reported from the community revealed that they all occurred in persons who had attended the funeral ceremony in early December of a well-known local male midwife assistant (patient 1) who regularly performed circumcisions in the community. Patient 1 had traveled from Ouendero to Djomakoidou, a village 3 hours away in Macenta, to perform a circumcision on an infant in mid-November 2014; a villager reported that the child subsequently died of an unknown cause. Approximately 1 week after he returned to Ouendero, patient 1 reportedly became ill with Ebola-compatible symptoms and died on December 4, 2014. However, he did not seek medical attention, and the cause of his death was reported as unknown.

What is already known on this topic?

Ebola can be transmitted through direct contact with the corpse or body fluids of an infected person, including during traditional funeral ceremonies.

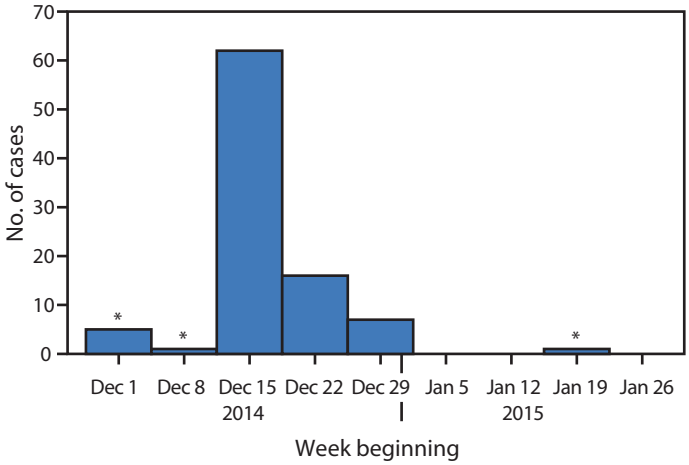
What is added by this report?

During December 1, 2014–January 10, 2015, an outbreak of 85 confirmed Ebola cases was linked to one traditional funeral ceremony in Kissidougou, Guinea. Eighteen (21%) of the 85 with confirmed infection attended the funeral and had direct contact with the corpse, and 67 (79%) had direct contact with at least one attendee of the funeral.

What are the implications for public health practice?

Training in and adherence to hygienic burial of corpses infected with Ebola and community acceptance of culturally sensitive safe burial practices is an important component of the successful management of Ebola and prevention of further transmission.

FIGURE 1. Number of confirmed Ebola cases, by week — Kissidougou, Guinea, December, 2014–January 2015



* Cases not related to the midwife assistant's funeral cemerony.

His funeral ceremony on December 4, 2014 was attended by approximately 100 persons from Ouendero and neighboring villages. Traditional burial practices in Guinea and other West African countries typically involve washing, touching, and kissing of the body of the deceased; therefore, it is likely that several attendees could have had direct contact with the body and body fluids. On December 18, 2014, patient 1 was classified as having probable Ebola.

As of January 31, 2015, a total of 85 confirmed Ebola cases were linked to this one traditional funeral ceremony, including 62 (73%) cases reported during December 15–21 (Figure 1, Figure 2). Eighteen (21%) Ebola patients attended the funeral and had direct contact with the body of patient 1, and 67 (79%) had direct contact with at least one attendee of the funeral. Forty-one (48%) patients were male; median age was 33 years (range = 2–85 years). Sixty-three of the 85 patients with confirmed Ebola died (case-fatality rate = 74%). No additional cases related to this funeral ceremony were reported after January 10. Additionally, a total of 780 contacts were monitored in 12 villages by nine contact-tracing teams for 21 days following their last potential exposure. However, this effort might not have covered all contacts. Local public health authorities reported that they were not allowed to enter some villages and identify all contacts because of mistrust and resistance in several communities.

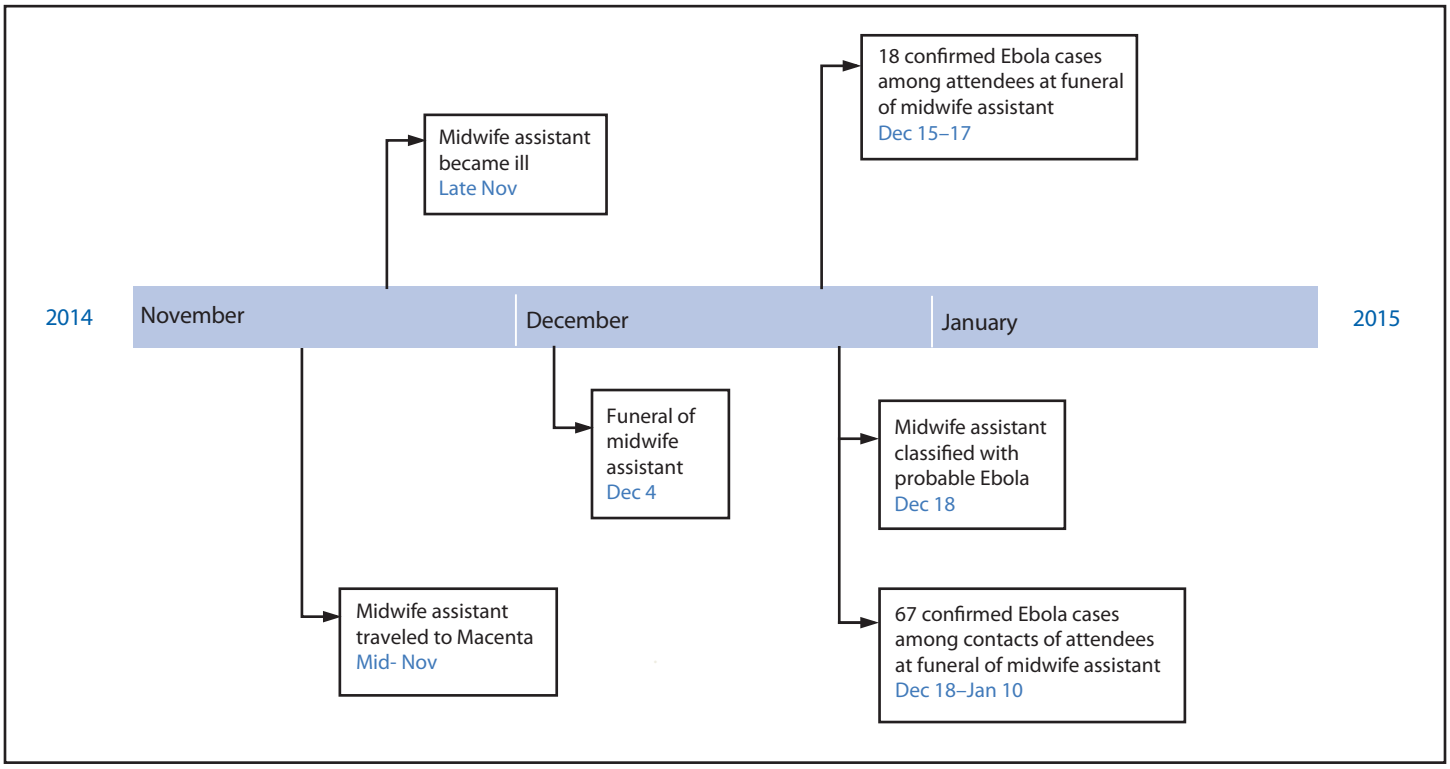
Discussion

This investigation encountered challenges associated with responding to the Ebola epidemic in Guinea, including incomplete ascertainment, reporting, and investigation of cases; unsafe burial practices; and community reticence, particularly in remote areas. To control Ebola transmission in Kissidougou and other difficult-to-reach communities in Guinea, targeted involvement of community leaders and enhancement of public health interventions are crucial for the proper implementation of Ebola prevention and control strategies. These enhancements include 1) educating the community regarding the signs and symptoms of Ebola and its modes of transmission, 2) stressing the importance of seeking medical care and reporting suspected Ebola cases, and 3) emphasizing the potential benefit of early diagnosis and treatment. Targeted education strategies and health communication messages in local languages can help decrease the concerns of groups resistant to the Ebola intervention efforts of local public health officials (*3*) and can facilitate the isolation and limited treatment of patients who are unwilling or unable to seek care at an ETC (*4*).

This investigation also revealed that although mechanisms have been recommended for transporting persons with suspected Ebola to the nearest ETCs, intrinsic challenges of transportation in rural communities (i.e., poor transportation and communication infrastructure) remain a major problem. In Kissidougou, patients were transferred to one of the nearest ETCs in either Gueckedou (52 miles [2-hour drive]) or Macenta (83 miles [3-hour drive]), which delayed the time from identification to isolation, diagnosis, and treatment at an ETC, and created the potential for exposure of additional persons. Safe transportation support to link persons with suspected Ebola to treatment centers should be facilitated immediately after the cases are reported to health authorities. Special strategies such as implementation of communication plans to alert local public health authorities and deployment of rapid response teams have been shown to be very effective, especially in rural areas (*4*,*5*).

Ebola can be transmitted through direct contact with the corpse or body fluids of an infected person, especially during traditional funeral ceremonies. As evidenced by this

FIGURE 2. Timeline of events regarding Ebola cases linked to a single funeral ceremony — Kissidougou, Guinea, November, 2014–January 2015



investigation, these exposures can result in outbreaks when there are obstacles to educating populations on adequate public health interventions. Improved training in hygienic burial of dead bodies and community acceptance of culturally sensitive safe burial are needed to ensure successful management of Ebola cases and prevent further transmission (*6*).

The findings of this investigation highlight the importance of controlling local outbreaks in difficult-to-reach communities as a key component of the effort to eliminate Ebola (5). Although public health interventions were established before this local outbreak, they were not fully implemented in Kissidougou, where they could have prevented or reduced Ebola transmission at the funeral ceremony. After the outbreak was identified, rapid implementation of interventions limited further Ebola virus transmission.

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Invasive Cancer Incidence — Puerto Rico, 2007–2011

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Cancer is a leading cause of morbidity and death in Puerto Rico (*1*). To set a baseline for identifying new trends and patterns of cancer incidence, Puerto Rico Central Cancer Registry staff and CDC analyzed data from Puerto Rico included in U.S. Cancer Statistics (USCS) for 2007–2011, the most recent data available. This is the first report of invasive cancer incidence rates for 2007–2011 among Puerto Rican residents by sex, age, cancer site, and municipality. Cancer incidence rates in Puerto Rico were compared with those in the U.S. population for 2011. A total of 68,312 invasive cancers were diagnosed and reported in Puerto Rico during 2007–2011. The average annual incidence rate was 330 cases per 100,000 persons. The cancer sites with the highest cancer incidence rates included prostate (152), female breast (84), and colon and rectum (43). Cancer incidence rates varied by municipality, particularly for prostate, lung and bronchus, and colon and rectum cancers. In 2011, cancer incidence rates in Puerto Rico were lower for all cancer sites and lung and bronchus, but higher for prostate and thyroid cancers, compared with rates within the U.S. population. Identifying these variations can aid evaluation of factors associated with high incidence, such as cancer screening practices, and development of targeted cancer prevention and control efforts. Public health professionals can monitor cancer incidence trends and use these findings to evaluate the impact of prevention efforts, such as legislation prohibiting tobacco use in the workplace and public places and the Puerto Rico Cessation Quitline (*2*) in decreasing lung and other tobacco-related cancers.

Data on new cases of invasive cancer* diagnosed during 2007–2011 were abstracted from medical records at health-care facilities, including hospitals, physician's offices, and pathology laboratories, following the North American Association of Central Cancer Registries data standards (*3*).The USCS dataset includes incidence data from CDC's National Program of Cancer Registries and the National Cancer Institute's Surveillance, Epidemiology, and End Results program (*3*,*4*). The National Program of Cancer Registries incidence data in this report were reported to the CDC as of November 30, 2013, and are the most recent available data.

Completeness of case ascertainment is one of six USCS publication criteria† (*3*,*4*). It is estimated using North American Association of Central Cancer Registries' completeness algorithm (*3*), which is based on comparing observed cancer incidence and death rates with expected rates.§ A variation on this algorithm was used to derive the completeness of case ascertainment in Puerto Rico because of differences in population attributes: expected rates were based on U.S. Hispanic data only rather than on expected rates for the total U.S. population.

Incident cases were classified by anatomic site using the *International Classification of Diseases for Oncology, Third Edition* (ICD-O-3). Cases with hematopoietic histologies were further classified using the *WHO Classification of Tumours of Haematopoietic and Lymphoid Tissues, Fourth Edition*. Denominators for Puerto Rico's incidence rates were sex-specific population estimates for Puerto Rico from the 2010 U.S. Census;¶ denominators used to calculate Puerto Rico municipality incidence rates were sex- and municipality-specific population estimates provided by the U.S. Census Bureau.** Annual incidence rates per 100,000 population were age-adjusted by the direct method to the 2000 U.S. standard population using 19 age-categories. When <16 cases were reported, the number and rate are not presented because of the potential for statistically unreliable estimates and the need to protect confidentiality (*3*).

* Invasive cancers are all cancers excluding basal and squamous cell skin cancers except when these occur on the skin of the genital organs, and in situ cancers except in the urinary bladder.

† 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 is available at http://www.cdc.gov/cancer/npcr/uscs/index.htm.

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

¶ The 2007–2009 Puerto Rico population estimates were abstracted from the file "2000–2010 Puerto Rico Characteristics Intercensal Population Estimates," source: U.S. Census Bureau, Population Division; release date: October 2012. The 2010–2011 Puerto Rico population estimates were abstracted from the file "Annual Estimates of the Resident Population by Single Year of Age and Sex for the United States, States, and Puerto Rico Commonwealth: April 1, 2010 to July 1, 2012." U.S. Census Bureau, Population Division, release date June 2013.

** Annual estimates of the resident population by sex for Puerto Rico municipalities were provided by the U.S. Census Bureau, Population Division using the Vintage 2013 and 2000–2010 intercensal estimates series.

Incidence rates of selected cancers over a 5-year period (2007–2011) were calculated for Puerto Rico. The incidence rates in 2011 of selected cancers in Puerto Rico and the United States (total population and by racial and ethnic groups) were compared. All central cancer registries included in the U.S. comparison met the USCS publication criteria for 2011, representing 99% coverage of the U.S. population (*3*). Maps were created using ArcGIS by rank-ordering the Puerto Rico municipalities' incidence rates and then grouping into quartiles.

From 2007 to 2011, a total of 68,312 invasive cancers were diagnosed in Puerto Rico, approximately 13,662 invasive cases per year. The average annual age-adjusted incidence rate was 330 cases per 100,000 persons over the 5-year period. Age-adjusted incidence rates were higher among males (395 per 100,000) than among females (281 per 100,000) (Table). By age group, rates per 100,000 population during 2007–2011 were 14 among persons aged 0–19 years, 128 among those aged 20–49 years, 594 among those aged 50–64 years, 1,281 among those aged 65–74 years, and 1,597 among those aged ≥75 years (Table).

By cancer site, average annual rates were highest for cancers of the prostate (152 per 100,000 men), female breast (84 per 100,000 women), and colon and rectum (43 overall, 53 among men, and 35 among women) (Table). These three sites combined accounted for approximately half of cancers diagnosed between 2007 and 2011 (Table). Among men, the first, second, and third most common cancers were prostate, colon and rectum, and lung and bronchus (rates of 152, 53, and 25 per 100,000 men, respectively), while among women the leading sites were breast, colon and rectum, and thyroid (rates of 84, 35, and 29 per 100,000 women, respectively).

In 2011, Puerto Rico had a lower age-adjusted all-sites cancer incidence rate (339 per 100,000) than the United States (451), regardless of U.S. racial or ethnic group (467 for U.S. non-Hispanic blacks, 462 for U.S. non-Hispanic whites, and 351 for U.S. Hispanics) (data not shown). Prostate cancer

TABLE. Age-adjusted rates* and numbers† of cancer incidence by sex, selected primary sites, and age group — National Program of Cancer Registries (NPCR), Puerto Rico, 2007–2011

	Incidence					
	Overall		Males		Females	
Characteristic	Rate	No.	Rate	No.	Rate	No.
All cancer sites combined	**329.7**	**68,312**	**395.1**	**37,068**	**281.3**	**31,244**
Brain and other nervous system	4.7	925	5.2	477	4.2	448
Breast (female)	NA	9,389	NA	NA	84.2	9,389
Cervix uteri	NA	1,215	NA	NA	12.2	1,215
Colon and rectum	42.6	8,891	52.5	4,880	34.8	4,011
Corpus and uterus, NOS	NA	2,332	NA	NA	20.5	2,332
Esophagus	3.7	776	6.6	620	1.3	156
Hodgkin lymphoma	2.5	481	3.0	267	2.1	214
Kaposi sarcoma	0.7	121	1.2	103	0.2	18
Kidney and renal pelvis	6.9	1,429	9.7	914	4.5	515
Larynx	3.5	743	7.0	664	0.7	79
Leukemias	6.8	1,338	8.3	734	5.7	604
Liver and intrahepatic bile duct	7.8	1,660	12.2	1,157	4.3	503
Lung and bronchus	17.0	3,575	24.5	2,274	11.2	1,301
Melanomas of the skin	2.7	547	3.5	313	2.2	234
Mesothelioma	0.2	40	0.4	34	DS	DS
Myeloma	3.9	818	4.9	446	3.2	372
Non-Hodgkin lymphoma	12.2	2,479	13.9	1,269	10.8	1,210
Oral cavity and pharynx	9.6	2,008	15.9	1,505	4.5	503
Ovary	NA	795	NA	NA	7.2	795
Pancreas	6.3	1,313	7.1	664	5.6	649
Prostate	NA	14,725	152.1	14,725	NA	NA
Stomach	8.4	1,752	11.4	1,030	6.2	722
Testis	NA	282	3.3	282	NA	NA
Thyroid	18.9	3,601	7.1	637	29.2	2,964
Urinary bladder	10.7	2,198	18.0	1,613	5.0	585
Age group						
0–19 years	13.5	701	13.9	368	13.0	333
20–49 years	127.5	9,152	85.4	2,933	165.6	6,219
50–64 years	594.2	20,875	683.7	11,200	518.6	9,675
65–74 years	1281.4	19,481	1762.7	12,177	880.5	7,304
≥75 years	1596.9	18,103	2235.7	10,390	1149.0	7,713

Abbreviations: DS = data suppressed (<16 cases were reported in the category); NA = not available; NOS = not otherwise specified.
* Incidence rates are per 100,000 persons and are age-adjusted to the 2000 U.S. standard population.
† 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.

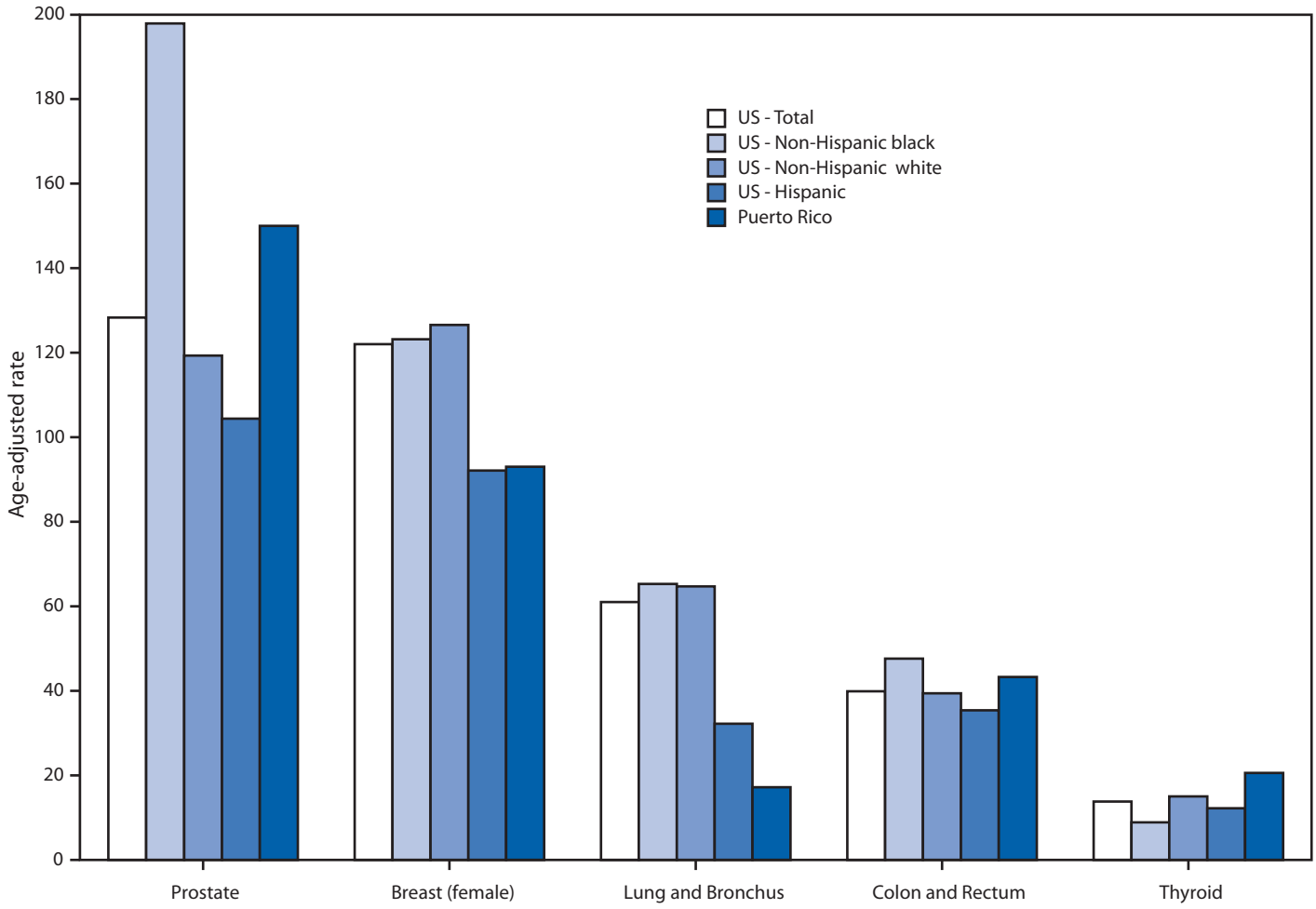
incidence was higher in Puerto Rico (150 per 100,000 men) than the U.S. overall (128) and the U.S. Hispanic population (104), but lower than the U.S. non-Hispanic black population (198) (Figure 1). Breast cancer incidence in Puerto Rico (93 per 100,000 women) was similar to the U.S. Hispanic incidence (92), both of which were lower than the U.S. overall population (122). Lung and bronchus cancer incidence in Puerto Rico was lower than in the U.S. overall population (17 versus 61 per 100,000). Colon and rectum cancer incidence in Puerto Rico (43 per 100,000) was similar to the U.S. overall population (40), regardless of race or ethnicity (Figure 1). Thyroid cancer incidence in Puerto Rico (21 per 100,000) was higher than in U.S. non-Hispanic white (15), U.S. Hispanic (12), and U.S. non-Hispanic black populations (9) (Figure 1).

Prostate cancer had notably higher incidence rates in the southeastern municipalities than in the west; colon and rectum cancer appeared to be more commonly diagnosed in the south and west (Figure 2). Lung cancers were prominent in the eastern and central municipalities; female breast cancer rates are highest among many coastline municipalities. Thyroid cancer incidence rates were highest in the north-central region of Puerto Rico (Figure 2).

Discussion

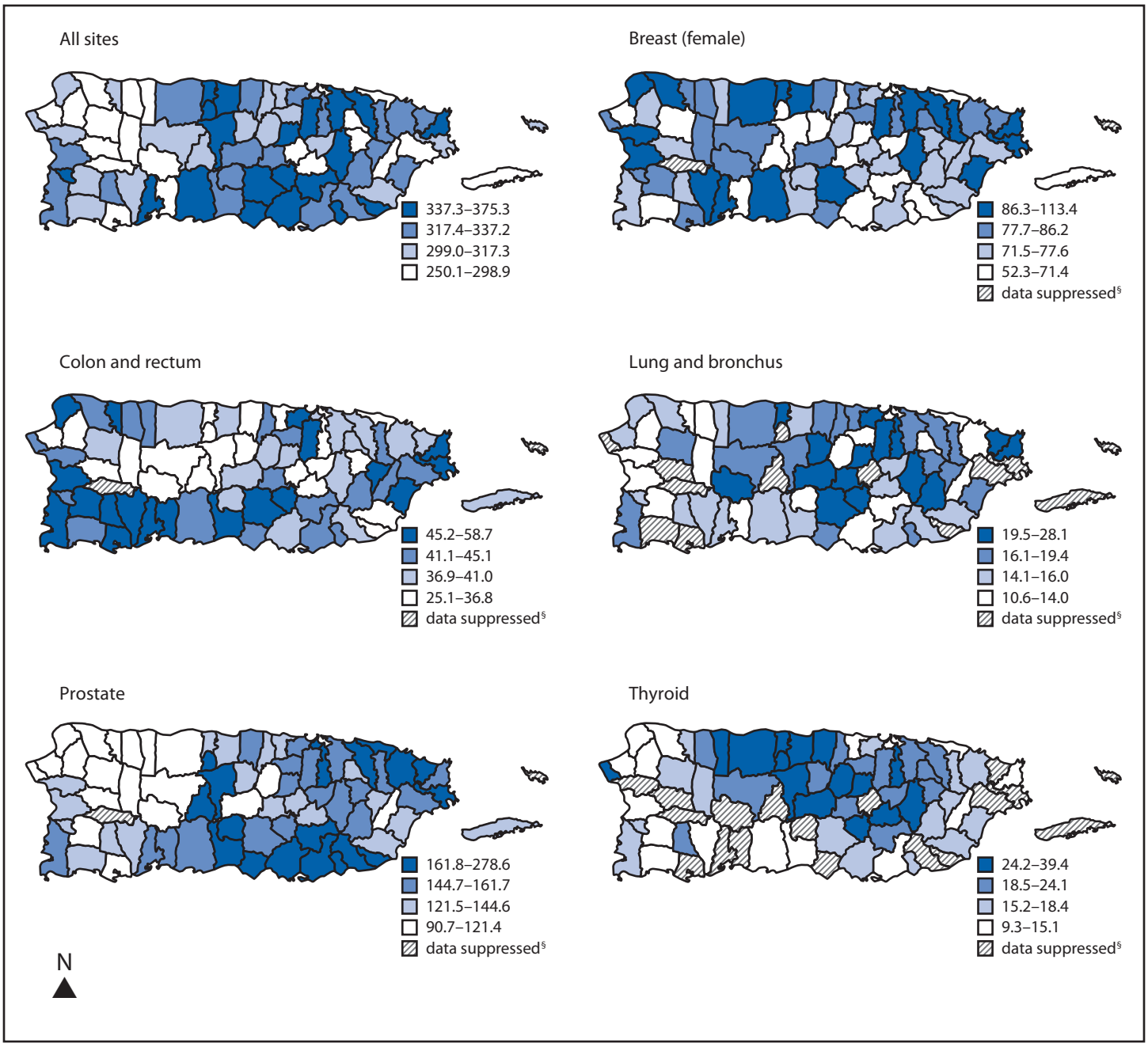
The Puerto Rico Central Cancer Registry has been collecting data on cancer in Puerto Rico since 1951 and has been part of National Program of Cancer Registries since 1997. This is the first report of the USCS dataset with the Puerto Rico cancer registry data and it shows that for 2011, the latest year

FIGURE 1. Age-adjusted rates* of invasive cancer† incidence by selected primary cancer site, geographic location, race and ethnicity — National Program of Cancer Registries and the Surveillance, Epidemiology, and End Results program§, Puerto Rico and United States, 2011



* Incidence rates are per 100,000 persons and are age-adjusted to the 2000 U.S. standard population.
† 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.
§ Compiled from cancer registries that meet the data-quality criteria for all invasive cancer sites combined (representing 99% of the U.S. population).

FIGURE 2. Age-adjusted incidence rates* of invasive cancer† by selected primary cancer sites and municipality – National Program of Cancer Registries, Puerto Rico, 2007–2011



* Incidence rates are per 100,000 persons and are age-adjusted to the 2000 U.S. standard population.
† 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.
§ Data not given because <16 cases were reported.

for which data are available for comparison, the overall cancer incidence rate in Puerto Rico was lower than in the U.S. population. Puerto Rico had a lower rate of female breast cancer compared with U.S. non-Hispanic whites and blacks and the lowest rate of lung cancer compared with all race and ethnic groups included in this analysis. However, Puerto Rico had the second highest prostate cancer incidence rates after U.S. non-Hispanic blacks and it also had the highest incidence rate of thyroid cancer. Puerto Rico had similar incidence rates to U.S. populations for colon and rectum cancer.

Differences in reported cancer incidence rates between U.S. and Puerto Rican residents might be partly explained by

What is already known on this topic?

As of 2012, cancer is a leading cause of illness and death in Puerto Rico. Many cancers are preventable.

What is added by this report?

Data on cancer incidence in Puerto Rico are now included in U.S. Cancer Statistics and show that during 2007–2011, the overall, age-adjusted, annual cancer incidence rate was 330 cases per 100,000 persons and varies by municipality. Cancer sites with the highest incidence included prostate (152), female breast (84), and colon and rectum (43). In 2011, overall, age-adjusted, annual cancer incidence in Puerto Rico was 339 cases per 100,000 persons compared with 451 in the United States, and incidence rates in Puerto Rico were lower for lung and bronchus cancer but higher for prostate and thyroid cancers.

What are the implications for public health practice?

Differing rates of cancer by municipality indicate a need to assess geographic variations in risk factor prevalence and cancer screening practices. The cancer rates for 2007–2011 will be critical for assessing the effectiveness of cancer prevention programs.

differences in the prevalence of risk factors such as behaviors associated with cancers or in the use of cancer screening tests. Lower rates of female breast cancer incidence might be attributable to the protective effect of young age at first live birth, which is more common in Puerto Rico than in the United States (*5*). Also, CDC's Behavioral Risk Factor Surveillance System data show that the prevalence of current cigarette smoking in Puerto Rico is low compared with U.S. states; only Utah is lower (*6*). Consistent with these data, National Health Interview Survey data show that U.S. Hispanics' current cigarette smoking rate is generally lower than the rate in the general U.S. population (*7*), which might explain the lower rates of lung cancer.

There are also geographic variations in cancer incidence by cancer site. As has been shown in previous investigations in Puerto Rico, the incidence rates of cancers of the kidney, pancreas, prostate, breast, colon and rectum, thyroid, and lung were higher in areas of Puerto Rico with higher socioeconomic position (*8*). However, prostate cancer incidence was also found to be high in the southeastern portion of the country, an area with a lower socioeconomic position. Possible explanations include higher rates of prostate-specific antigen testing in this region (*9*).

The findings in this report are subject to at least two limitations. First, delays in cancer reporting can result in an undercount of cancer incidence, particularly for the most recent years (*10*). Second, the 2011 population was estimated from the 2010 U.S. Census, which might lead to under- or overestimations of incidence rates.

Data from population-based central cancer registries are important for monitoring trends over time and identifying opportunities to reduce cancer incidence and mortality, particularly among high-risk groups and underserved areas (*3*). Data from the Puerto Rico Central Cancer Registry are used to identify and select cancer control priorities, identify populations of interest for implementation of cancer control strategies[††], and respond to concerns about possible cancer clusters on the island, as well as for evaluation of the impact of cancer control strategies (*2*).

[††] Additional information available at: http://ftp.cdc.gov/pub/Publications/Cancer/ccc/puerto_rico_ccc_plan_2008_2012.pdf.

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Assessment of Epidemiology Capacity in State Health Departments — United States, 2013

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Since 2001, the Council of State and Territorial Epidemiologists (CSTE) periodically has conducted a standardized national assessment of state health departments' core epidemiology capacity (*1*–*4*). During August–September 2013, CSTE sent a web-based questionnaire to state epidemiologists in the 50 states and the District of Columbia. The questionnaire inquired into workforce capacity and technology advancements to support public health surveillance. Measures of capacity included the total number of epidemiologists, a self-assessment of the state's ability to carry out four of the 10 essential public health services* most relevant to epidemiologists, and program-specific epidemiology capacity. This report summarizes the results, which indicated that in 2013, most of these measures were at their highest level since assessments began in 2001, including the number of epidemiologists, the percentage of state health departments with substantial-to-full (>50%) capacity for three of the 10 essential public health services, and the percentage with substantial-to-full epidemiology capacity for eight of 10 program areas. However, >50% of states reported minimal-to-no (<25%) epidemiology capacity for four of 10 program areas, including occupational health (55%), oral health (59%), substance abuse (73%), and mental health (80%). Federal, state, and local agencies should work together to develop a strategy to address continued outstanding gaps in epidemiology capacity.

The main objectives of the periodic CSTE epidemiology capacity assessments (ECA) are to count and characterize the state-employed epidemiologist workforce and to measure current core epidemiology capacity. CSTE standardized assessments began in 2001 (*1*) and were conducted in 2004, 2006, 2009 (supplemented by a rapid enumeration in 2010), and 2013 (*2*–*4*). Some of the information sought by the assessments relate to the four most epidemiology-related essential public health services. These include 1) monitoring health status to identify and solve community health problems; 2) diagnosing and investigating health problems and health hazards in the community; 3) evaluating effectiveness, accessibility, and quality of personal and population-based health services; and 4) conducting and evaluating research for new insights and innovative solutions to health problems. The first three assessments evaluated capacity in eight program areas: infectious diseases, bioterrorism/emergency response, chronic disease, maternal and child health, environmental health, injury, occupational health, and oral health. In 2009, questions were added to assess substance abuse epidemiology capacity and implementation of selected surveillance-related technology advancements, and in 2013, to assess mental health epidemiology capacity.

After pilot testing, CSTE made the 2013 ECA questionnaire available online to all states during August 23–September 30, 2013. The state epidemiologist was designated the key informant, and lead epidemiologists added information for program-specific questions. The state epidemiologist also distributed a worksheet on training experience and program areas of work to each individual enumerated epidemiologist. All 50 states and the District of Columbia participated. An epidemiologist was defined as any person who, regardless of job title, performed functions consistent with the generally accepted definition† (*5*). Part-time positions and full-time positions in which epidemiologists did only part-time epidemiology work were reported as fractions of full-time equivalents. The state epidemiologist was asked whether the state health department had adequate epidemiology capacity to provide the services and to estimate the extent to which their department met the activity for the essential public health service.§ Estimates were categorized as follows: full capacity was defined as having 100% of the activity, knowledge, or resources described within the question; almost full capacity was defined as having 75%–99%; substantial capacity was defined as having 50%–74%; partial capacity was defined as having 25%–49%; minimal capacity was defined as having some but <25%; and no capacity was defined as having zero. For each program area, the extent of

* Additional information about the 10 essential public health services is available at http://www.cdc.gov/nphpsp/essentialservices.html.

† "An investigator who studies the occurrence of disease or other health-related conditions or events in defined populations. The control of disease in populations is often also considered to be a task for the epidemiologist, especially in speaking of certain specialized fields such as malaria epidemiology. Epidemiologists may study disease in populations of animals and plants, as well as among human populations." Source: Last JM, Spasoff RA, Harris SS, Thuriaux MC, eds. A dictionary of epidemiology. 4th ed. New York, NY: Oxford University Press; 2001.

§ The question asked was, "Does your state health department have adequate epidemiologic capacity to provide the following four essential public health services?"

epidemiology and surveillance capacity was assessed by using the same scale.[¶] The state epidemiologist also was asked to estimate the ideal number of epidemiologists needed to meet epidemiology and surveillance capacity for each program area fully. Population estimates from the U.S. Census for 2010 were used as denominators.

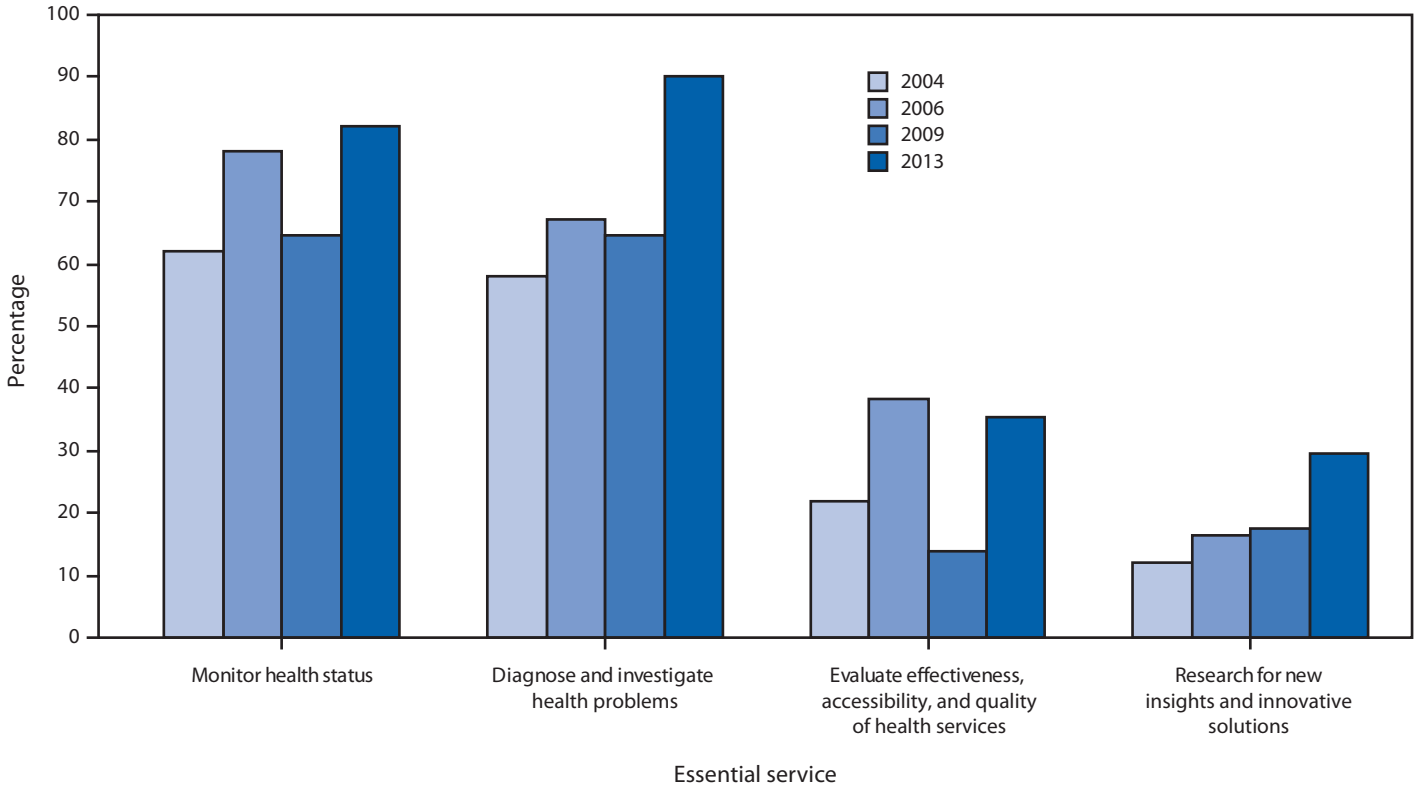
In 2013, a total of 2,752 epidemiologists worked for the 51 jurisdictions, a ratio of 0.87 epidemiologists per 100,000 population (state median: 1.04; range: 0.19–5.72), an increase of 25% from the 2,193 epidemiologists reported in 2009 and an increase of 10% from the previous high of 2,498 in 2004. Among respondents, 42 (82%) reported substantial-to-full capacity to monitor health status and solve community health problems, and 46 (90%) reported the same capacity to diagnose and investigate health problems and hazards in the community. In contrast, only 18 (35%) reported substantial-to-full capacity to evaluate effectiveness, accessibility, and quality of personal and population-based health services, and 15 (29%) reported the same capacity to conduct research for new insights and innovative solutions to health problems. Except for the evaluation EPHS, the percentage of states reporting substantial-to-full capacity was the highest to date (Figure 1).

When compared with results from the 51 jurisdictions from 2004 through 2009, all program areas except substance abuse showed increases in substantial-to-full capacity to their highest levels to date: infectious diseases (98%), bioterrorism/emergency response (82%), maternal-child health (73%), chronic disease (66%), environmental health (49%), injury (45%), occupational health (20%) and oral health (25%) (Figure 2). For four program areas, the majority reported minimal-to-no capacity: occupational health (28 [55%]), oral health (30 [59%]), substance abuse (37 [73%]) and mental health (41 [80%]). On the basis of responses about needs, and assuming that nonresponse meant no additional need, adding 1,374 epidemiologists (a 50% increase to 1.31 epidemiologists per 100,000 population nationally) is needed to achieve ideal epidemiology and surveillance capacity in all program areas.

The assessment of technology capacity to support surveillance showed that 33 states (67%) had fully automated electronic laboratory reporting, 15 (29%) used automated cluster

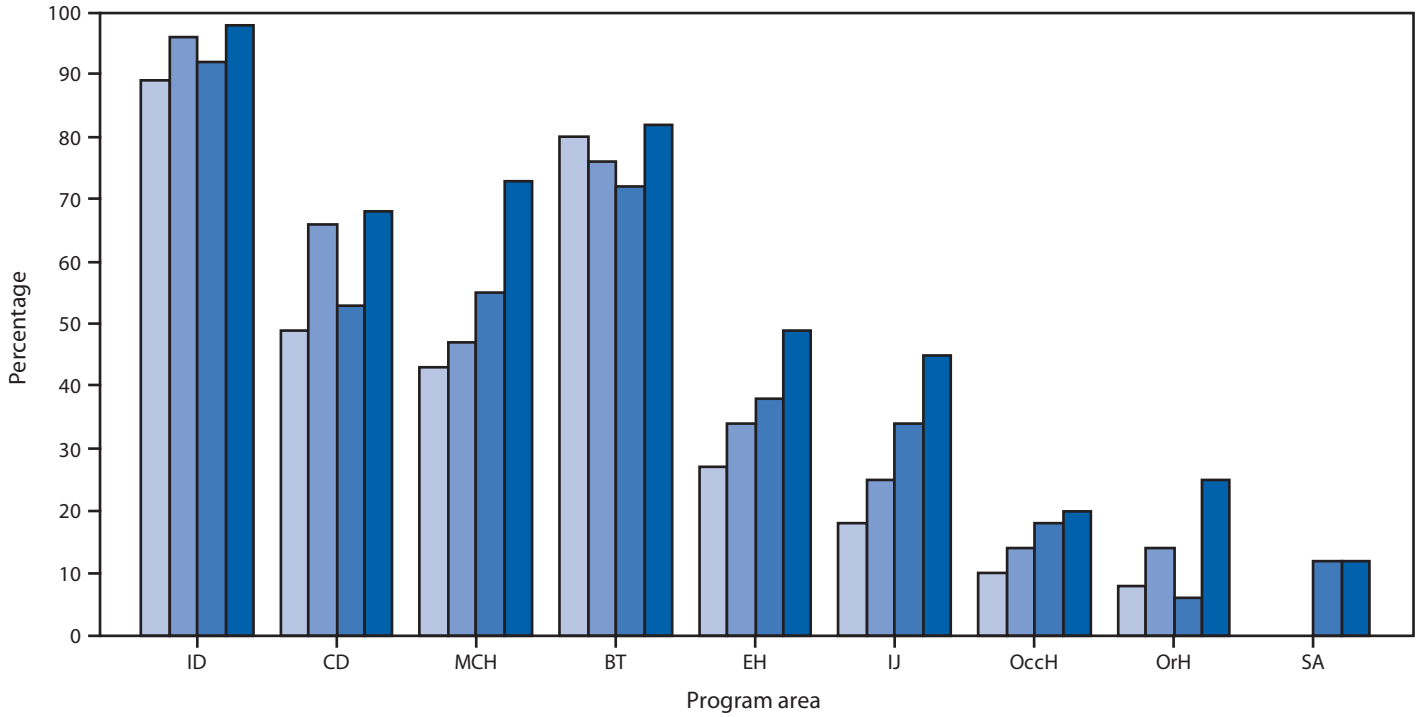
[¶] The question asked was, "What is the extent of the epidemiology and surveillance capacity in the following program areas in your state health department? If needed, please seek the guidance of other state health department staff within program specific areas when completing this question."

FIGURE 1. Percentage of state health departments reporting substantial-to-full (>50%) capacity in four essential services of public health — Council of State and Territorial Epidemiologists Epidemiology Capacity Assessment, United States,* 2004, 2006, 2009, and 2013



* 50 states and the District of Columbia.

FIGURE 2. Percentage of state health departments reporting substantial-to-full (>50%) capacity in epidemiology and surveillance programs, by program area — Council of State and Territorial Epidemiologists Epidemiology Capacity Assessment, United States,* 2004, 2006, 2009, and 2013



Abbreviations: ID = infectious diseases, CD = chronic diseases, MCH = maternal and child health, BT = bioterrorism and emergency response, EH = environmental health, IJ = injury, OccH = occupational health, OrH = oral health, SA = substance abuse.
* 50 states and the District of Columbia.

detection software, and fewer than half routinely geocoded reportable disease data (19 [37%]), births (25 [49%]) or deaths (24 [47%]), all improvements since 2009 (Table).

Among 2,752 enumerated epidemiologists, 1,586 (58%) completed worksheets describing their level of formal epidemiology training. Compared with the 2009 ECA, a nonstatistically significant slightly higher percentage had a master's or higher level degree in epidemiology (59% versus 56%) and a lower percentage had no formal training or academic coursework in epidemiology (12% versus 13%). State epidemiologists reported that 260 (11%) staff epidemiologists with advanced degrees retired or left their job during 2012; 18% of the current workforce anticipates leaving within 5 years.

Discussion

Epidemiology capacity is essential for detection, control, and prevention of major public health problems. Epidemiology provides information needed to perform four of the 10 essential public health services. *Healthy People 2020* calls for the United States to increase the proportion of tribal, state, and local public health agencies that provide or assure comprehensive epidemiology services to support essential public health services (*6*). CSTE's periodic ECA is the major data source for monitoring progress toward achieving this objective.

The 2013 ECA revealed the highest levels yet in most measured aspects of state-level epidemiology capacity. The factors leading to the improvements are unclear but were noted in the late 2010 rapid assessment which enumerated a 13% increase in state-level epidemiologists from the nadir in 2009 (*7*). The increase coincided with federal stimulus funding. Since then, the economy has strengthened and stimulus-supported initiatives, e.g., monitoring health care-associated infections, have continued.

The 2013 ECA identified substantial ongoing gaps in epidemiology capacity. These included low levels of epidemiology capacity for occupational and oral health, very low levels of health department involvement in substance abuse and mental health surveillance and epidemiology, and continued lack of key technology capacity and capacity for evaluating effectiveness of prevention efforts and for conducting research for new insights and innovative solutions in many states. Without public health involvement, the contribution of these areas to the overall public health is not well measured or monitored, and primary and secondary prevention efforts are less likely to be implemented and evaluated at the population level. Without technology capacity to conduct state-of-the-art surveillance (e.g., automated electronic laboratory-based reporting, cluster-detection software, and geocoding), reporting will be less timely

TABLE. Number and percentage of state health departments with selected technology capacities to support epidemiology and surveillance — Council of state and Territorial Epidemiologists Epidemiology Capacity Assessment, United States,* 2009 and 2013

	2009		2013	
Technology capacity	**No.**	**(%)**	**No.**	**(%)**
Automated ELR	27	(53)	33	(66)
Expanded no. reportable conditions due to ELR (among those with ELR)	10	(37)	13	(39)
Cluster-detection software	12	(24)	15	(29)
Syndromic surveillance	–	–	40	(78)
Outbreak-management system	16	(31)	23	(45)
Geocode births	20	(39)	25	(49)
Geocode deaths	21	(41)	24	(47)
Geocode all reportable diseases	15	(29)	19	(37)
Geocode some reportable diseases	28	(55)	31	(61)

Abbreviation: ELR = electronic laboratory reporting

* 50 states and District of Columbia. All questions responded to by 51 jurisdictions except automated ELR had 50 respondents in 2013. Syndromic surveillance capacity not asked in 2009.

What is already known on this topic?

Data on state-level epidemiology capacity from surveys conducted by the Council of State and Territorial Epidemiologists (CSTE) since 2001 indicate that capacity in many areas previously peaked in 2004, a time of peak federal funding for public health preparedness, and then diminished to especially low levels by 2009.

What is added by this report?

Data from the most recent CSTE survey indicate that overall state-level epidemiology capacity and the epidemiology capacity in many program areas has increased markedly since 2009. The number of epidemiologists, the percentage of state health departments with substantial-to-full capacity for three essential public health services, and the percentage with substantial-to-full epidemiology capacity for eight of 10 program areas were at their highest level since assessments began in 2001. However, >50% of states reported minimal-to-no epidemiology capacity in occupational health, oral health, substance abuse, and mental health. Most health departments still lack critical technology capacity.

What are the implications for public health practice?

State, federal, and local agencies should work together to address underdeveloped surveillance and epidemiology capacity, particularly in mental health, substance abuse, oral health, and occupational health by reaching a consensus on optimal levels and developing a strategy to achieve them.

and less complete, the ability to detect outbreaks rapidly and expand laboratory-based surveillance will be reduced, and less use will be made of geographic information systems to describe and respond to inequities in health better. The fewer the number of states with capacity to evaluate any prevention efforts or to conduct research for new insights and innovative solutions to public health problems, the smaller our national capacity to explore new ideas and identify successful ones.

The findings of this report are subject to at least two limitations. First, the 2013 assessment only measured epidemiology capacity of state health departments. Approximately one third of all public health epidemiology capacity located in states is in local health departments (*7*). Second, the methods used by respondents to estimate their capacity to perform the essential services of public health, program-specific epidemiology capacity, and the numbers needed to reach ideal capacity were self-reported.

State, federal, and local agencies should work together to address underdeveloped surveillance and epidemiology capacity, particularly in mental health, substance abuse, oral health, and occupational health by reaching a consensus on optimal levels and developing a strategy to achieve them.

Acknowledgments

Members of the 2013 ECA Workgroup: Matthew Boulton, MD, University of Michigan School of Public Health; Robert Harrison, MD, California Department of Public Health; Sara Huston, PhD, Maine Department of Health and Human Services; Stephen Ostroff, MD, US Food and Drug Administration; CSTE interns: Jessica Wurster, Monica Lachey; CSTE Executive Board members: Alfred DeMaria, MD, Massachusetts Department of Public Health; Timothy Jones, MD, Tennessee Department of Health; Joseph McLaughlin, Alaska Department of Health and Social Services; Sarah Park, MD, Hawaii Department of Health; Kristy Bradley, DVM, Oklahoma State Department of Health; Renee Calanan, PhD, Colorado Department of Public Health and Environment; Sharon Watkins, PhD, Florida Department of Health; Megan Davies, MD, North Carolina Department of Health and Human Services; Marcelle Layton, MD, New York City Department of Health and Mental Hygiene; Janet Hamilton, MPH, Florida Department of Health.

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Notes from the Field

Campylobacteriosis Outbreak Associated with Consuming Undercooked Chicken Liver Pâté — Ohio and Oregon, December 2013–January 2014

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On January 8, 2014, the Ohio Department of Health notified the Oregon Public Health Division (OPHD) of campylobacteriosis in two Ohio residents recently returned from Oregon. The travelers reported consuming chicken liver pâté* at an Oregon restaurant. On January 10, OPHD received additional reports of campylobacteriosis in two persons who had consumed chicken liver pâté at another Oregon restaurant. *Campylobacter jejuni* was isolated in cultures of fecal specimens from three patients. OPHD investigated to determine the sources of the illnesses and to institute preventive measures.

Both restaurants reported using undercooked chicken livers to prepare their pâté; an environmental health investigation revealed that the livers were purchased from the same U.S. Department of Agriculture Food Safety and Inspection Service (FSIS)–regulated establishment in the state of Washington. The establishment reported that livers were rinsed with a chlorine solution before packaging. However, culture of five of nine raw liver samples from both restaurants and from the establishment yielded *C. jejuni*; none of three pâté samples from the restaurants yielded *C. jejuni.* One human stool specimen and three liver samples were typed by pulsed-field gel electrophoresis (PFGE); the human isolate and one liver sample had indistinguishable PFGE patterns when digested by the restriction enzyme *Sma*I. The human isolate was susceptible to all antimicrobials tested by CDC's National Antimicrobial Resistance Monitoring System.

A presumptive case was defined as diarrhea lasting >2 days, within 7 days after consumption of undercooked chicken liver; a confirmed case was defined as laboratory evidence of *C. jejuni* infection within 7 days after consumption of undercooked chicken liver. In all, three laboratory-confirmed and two presumptive cases of campylobacteriosis following consumption of chicken livers were reported in Ohio and Oregon. Illness onsets ranged from December 24, 2013, to January 17, 2014. Patient age range was 31–76 years; three were women. Based on OPHD's recommendation, both restaurants voluntarily stopped serving liver. The FSIS-regulated establishment also voluntarily stopped selling chicken livers.

This is the second multistate outbreak of campylobacteriosis associated with consumption of undercooked chicken liver reported in the United States (*1*). Outbreaks caused by chicken liver pâté are well documented in Europe (*2*,*3*). Chicken livers and pâté should be considered inherently risky foods, given the methods by which they are routinely prepared. Pâté made with chicken liver is often undercooked to preserve texture. Consumers might be unable to discern whether pâté is cooked thoroughly because partially cooked livers might be blended with other ingredients and chilled. At FSIS-regulated establishments, such as the one involved in this outbreak, livers are inspected to ensure that they are free from visible signs of disease, but they are not required to be free from bacteria (*4*). A recent study isolated *Campylobacter* from 77% of chicken livers cultured (*5*). Washing is insufficient to render chicken livers safe for consumption; they should be cooked to an internal temperature of 165°F (74°C).

During the outbreak investigation, OPHD learned of a campylobacteriosis case in a Washington state resident who had eaten raw chicken livers that had been chopped into pill-sized pieces and frozen, as prescribed by a naturopathic physician. The livers were from the same establishment that supplied the Oregon restaurants. No isolate from the case was available for subtyping, but culture of frozen pieces of liver collected from this patient yielded *C. jejuni*.

This report illustrates that follow-up of possible outbreaks identified by routine interviewing by health departments can identify sources of illnesses and result in control measures that protect public health. *Campylobacter* is thought to be the most common bacterial cause of diarrheal illness in the United States (*6*), and infection is now nationally notifiable.

* A spreadable paste made from cooked ground meat (often poultry livers) combined with various other ingredients.

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Notes from the Field

Infant Botulism Caused by *Clostridium baratii* Type F — Iowa, 2013

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In June 2013, a male newborn aged 9 days (delivered after a full-term pregnancy) was brought to a hospital emergency department with a 2-day history of constipation, fussiness, and poor feeding. The mother reported her son's symptoms as excessive crying, reluctance to suck, and difficulty in swallowing milk. Within hours of arrival, the infant became less responsive and "floppy," and was intubated for respiratory failure. Infant botulism was suspected and Botulism Immune Globulin Intravenous (Human) (BIG-IV), licensed for the treatment of infant botulism types A and B, was administered on hospital day 2. Results of preliminary stool studies were reported positive for botulinum toxin type F on hospital day 3. *Clostridium baratii* type F was subsequently isolated in stool culture.

National experience with type F botulism in newborns and infants indicates that rapid clinical improvement could occur even without the administration of anti-type F antitoxin. However, 3 days after treatment with BIG-IV the newborn continued to require ventilator support and showed no signs of clinical improvement. On hospital day 6, equine-derived botulism antitoxin heptavalent (A-G) (BAT) was administered to the boy, despite the limited experience reported for its use in pediatric cases. This is the second newborn treated with BAT in the United States; the first was treated in 2008 in Colorado (*1*).

Within 24 hours of BAT treatment, spontaneous movements of the newborn's extremities increased. On hospital day 8 the endotracheal tube was removed. By the following day, the boy could tolerate oral feedings, had regained muscle tone and strength in his extremities, and had normal pupillary responses. The only adverse event associated with BAT treatment was an intermittent, low-grade fever that developed within 1 hour of BAT administration and lasted 72 hours. Blood, urine, stool, and cerebrospinal fluid bacterial cultures were otherwise negative. Contrast magnetic resonance imaging of his brain showed normal findings, and cerebrospinal fluid studies for herpes simplex virus and enterovirus also were negative. The newborn was discharged on hospital day 12. At the 2-week follow-up examination, his mother reported he was doing well: taking 100% of his feedings orally, exhibiting no residual weakness, and having normal bowel movements.

The parents reported feeding the newborn ready-to-feed and powdered formula from the same brand. No other solid or liquid foods or homeopathic remedies or supplements were given before symptom onset. No classic risk factors for infant botulism were reported, such as exposure to honey or soil. The parents reported strong winds and minor construction in the area surrounding their home. Pets present in the home included cats, turtles, fish, geckos, sugar gliders, and a mouse.

Environmental samples were collected from 1) feces from all animals in the home, 2) food and water from the turtle enclosure, 3) dust from the vacuum cleaner bag and the windowsill and ceiling fan closest to where the child slept, and 4) potting soil from the only indoor plant in the home. Although *Clostridium* species were isolated in several of the samples, none produced botulinum toxin.

Through 2012, only 13 cases of *C. baratii* type F infant botulism have been reported in the United States; this is the third confirmed case in Iowa. Extensive investigations for an environmental source of toxigenic *C. baratii* have been undertaken, including for all three cases in Iowa (*2*). Unlike typical infant botulism caused by *C. botulinum* (*3*), no source has been identified and prevention strategies remain unknown for *C. baratii*. While *C. baratii* infant botulism remains a rarely diagnosed disease, health care providers should maintain a high index of suspicion especially in very young infants who present with new onset floppiness or progressive respiratory failure.

Acknowledgment

Minnesota Department of Health Epidemiology and Public Health Laboratory.

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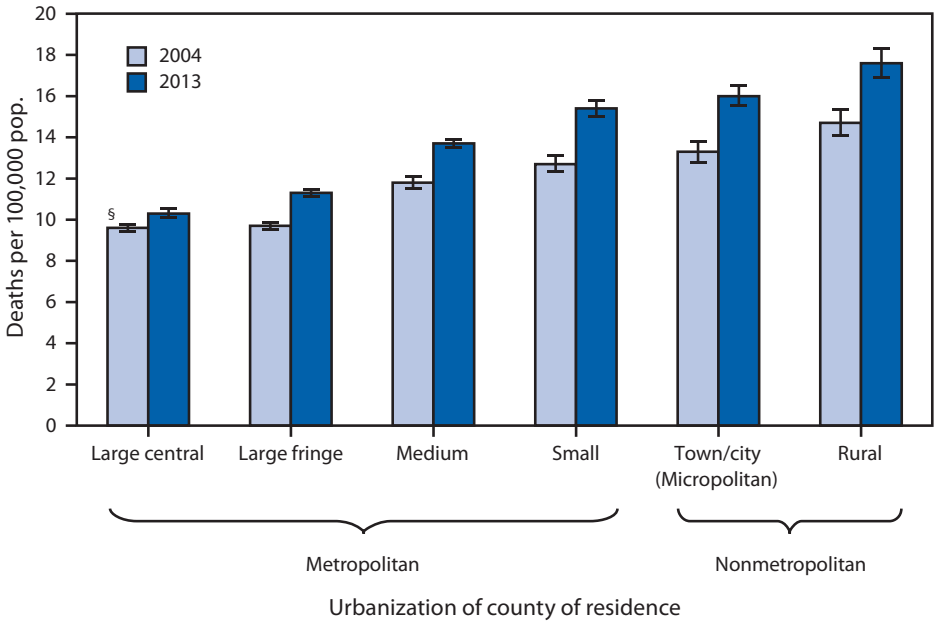
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Rates for Suicide,* by Urbanization of County of Residence† — United States, 2004 and 2013



* Age-adjusted rates per 100,000, based on the 2000 U.S. standard population. Suicides are coded as *U03, X60–X84, and Y87.0 in the *International Classification of Diseases, 10th Revision*.
† Counties were classified into urbanization levels based on a classification scheme that considers metropolitan/nonmetropolitan status, population, and other factors.
§ 95% confidence interval.

The overall age-adjusted suicide rate was 11.0 deaths per 100,000 population in the United States in 2004 and 12.6 in 2013. From 2004 to 2013, the suicide rate increased in all county urbanization categories, with the smallest increase (7%) in large central metropolitan counties and the largest increases in small metropolitan, town/city (micropolitan) and rural counties (approximately 20% in each). For both years, suicide rates were increasingly higher as counties became less urbanized. For 2013, the age-adjusted suicide rate in rural counties was 1.7 times the rate for large central metropolitan counties (17.6 compared with 10.3 deaths per 100,000).

Sources: National Vital Statistics System. County-level mortality file. Available at http://wonder.cdc.gov/mortSQL.html. Ingram DD, Franco SJ. 2013 NCHS urban-rural classification scheme for counties. Vital Health Stat 2014;2(166). Available at http://www.cdc.gov/nchs/data/series/sr_02/sr02_166.pdf.

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