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National Epilepsy Awareness Month — November 2014

November is National Epilepsy Awareness Month. Epilepsy is a brain disorder characterized by recurrent seizures and affects an estimated 2.3 million adults and 450,000 children in the United States (*1,2*). Eighty-seven percent of parents of children with epilepsy have reported needing care coordination, and of these, 45% had unmet needs (*3*).

Community-based care coordination can improve outcomes and reduce health care costs for children with special health care needs (*4*). But more research regarding its effectiveness in epilepsy is required (*2*). The Health Resources and Services Administration funds community-based demonstration projects to improve access to coordinated care for children with epilepsy (*2*). These projects promote partnerships between health care providers and patients and their families, link care with other community resources, and address barriers to care (*2,5*).

CDC also supports community-based resources and services for children with epilepsy and their families. Additional information is available at http://www.epilepsy.com/get-help.

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Premature Deaths Among Children with Epilepsy — South Carolina, 2000–2011

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Epilepsy is a common childhood neurologic disorder. In 2007, epilepsy affected an estimated 450,000 children aged 0–17 years in the United States (*1*). Approximately 53% of children with epilepsy and special health care needs have co-occurring conditions (*2*), and only about one third have access to comprehensive care (*3*). The few studies of mortality risk among children with epilepsy as compared with the general population generally find a higher risk for death among children

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with epilepsy with co-occurring conditions but a similar risk for death among children with epilepsy with no co-occurring conditions (*4*). However, samples from these mortality studies are often small, limiting comparisons, and are not representative (*4*). This highlights the need for expanded mortality surveillance among children with epilepsy to better understand their excess mortality. This report describes mortality among children with epilepsy in South Carolina during 2000–2011 by demographic characteristics and underlying causes of death. The overall mortality rate among children with epilepsy was 8.8 deaths per 1,000 person-years, and the annual risk for death was 0.84%. Developmental conditions, cardiovascular disorders, and injuries were the most common causes of death among children with epilepsy. Team-based care coordination across medical and nonmedical systems can improve outcomes and reduce health care costs for children with special health care needs (*5*), but they require more study among children with epilepsy (*6,7*). Ensuring appropriate and timely health care and social services for children with epilepsy, especially those with complications, might reduce the risk for premature death. Health care providers, social service providers, advocacy groups and others can work together to assess whether coordinated care can improve outcomes for children with epilepsy.

To assess the burden of premature mortality among children with epilepsy, statewide data in South Carolina were analyzed. Four data sources were used: hospital discharges, emergency department visits, hospital-based outpatient clinics, and multiple-cause-of-death data during 2000–2011. Providers in South Carolina are required to submit selected health care encounter data to the state Office of Research and Statistics for planning, intervention, and evaluation of health programs and to support studies related to health and socioeconomic issues in the state.* This office created a unique identifier for children with epilepsy to make it possible to link these data sources while preserving confidentiality (*8*). The unique identifier was used to identify children with epilepsy across encounters over the course of the study. The probability that two persons had the same unique identifier or a single person had more than one unique identifier is extremely low (*8*). Duplicate counts for the same encounter were excluded, whereas repeat encounters on different dates were preserved.

Epilepsy was ascertained using diagnosis codes based on the *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) for epilepsy (345.0, 345.1, 345.3–345.9) and for seizures not otherwise specified (ICD-9-CM 780.39). The positive predictive value of this group of diagnostic codes for an epilepsy diagnosis in children is 96.5% (95% confidence interval [CI] = 88.1%–99.0%) (*9*). For each case, these diagnosis codes had to be present two or more times within a year, or current procedure terminology codes had to strongly suggest an epilepsy diagnosis (for example, the occurrence of epilepsy treatments such as a ketogenic diet or epilepsy surgery).

* Additional information available at http://rfa.sc.gov/healthcare/dataoversight.

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Causes of death for children with epilepsy were identified using underlying causes of death grouped by ICD-10 codes. Categorical variables were described using frequencies and proportions and continuous variables using medians and their CIs to minimize the effect of outliers. Children with epilepsy who died were compared with children with epilepsy alive at the end of follow-up by comparing their proportions, medians, or mortality rates, assuming independent samples. In this study, the median durations of follow-up and their CIs distinguish those who died and those who remained alive, characterize the current relative percentages of different causes of death, and allow comparisons with future studies of mortality and the effects of interventions among these children and among other children with epilepsy. All reported differences are statistically significant at a two-sided significance level of $p<0.05$.

The sum of years from the date of diagnosis or the year 2000 (whichever was later) to the date of death or the end of follow-up and data collection (December 31, 2011) provided person-year denominators to estimate mortality rates per 1,000 person-years by age group, sex, and race/ethnicity. Both the overall risk for death from the follow-up duration and the mortality rate were estimated for children with and without epilepsy (*10*). The annual mortality rates, age-adjusted to the 2000 U.S. population from 2000 through 2011, were plotted and tested for a linear trend using the Cochran-Armitage test. CIs for these rates were calculated assuming the observed deaths were distributed according to the Poisson distribution.

Two underlying causes of death, developmental conditions (i.e., congenital malformations, chromosomal abnormalities, intellectual disability, cerebral palsy) and cardiovascular disorders excluding congenital malformations, accounted for 30% of the deaths among children with epilepsy (Table 1). Cardiovascular disorders that excluded congenital cardiac malformations (mostly unspecified rheumatic heart disease) were more likely to cause death among older children, whereas other infective heart disease (e.g., infective pericarditis) was more likely to cause death among younger children. Unintentional and undetermined injuries accounted for 11% of deaths among children with epilepsy, 24% of which were side effects of exposure to therapeutic drugs and 16% of which were traffic injuries. Approximately 8% of deaths were caused by epilepsy-specific causes (e.g., status epilepticus).

During 2000–2011, a total of 13,099 children with epilepsy aged 0–18 years were identified (Table 2). These children were followed for a median follow-up period of 38 months (CI = 37–38 months) after diagnosis; median follow-up for the 447 (3.4%) who died was 17 months (CI = 15–21 months), and median follow-up for those who lived was 38 months (CI = 38–39 months). The overall mortality rate was 8.8 deaths per 1,000 person-years. The annual risk for death among children with epilepsy was 0.84% compared with 0.22% among children in the same age groups without epilepsy. The median age at diagnosis for the total cohort was 8 years.

Children with epilepsy who died did not differ from those who survived with respect to age at diagnosis, sex, race/ethnicity, and place of residence (Table 2). Although non-Hispanic blacks represented 29.0% of the state population, they accounted for 38.0% of the children with epilepsy and 41.4% of those who died. Children with epilepsy who died, however, were more likely to have Medicare as their primary health insurance payer (8.7% compared with 3.1%) and less likely to be uninsured (5.8% compared with 12.2%).

Deaths per 1,000 person-years indicate some differences by race/ethnicity, but not by sex, across age groups (Table 3). Among

TABLE 1. Distribution of underlying causes of death among 447 children aged 0–18 years with epilepsy — South Carolina, 2000–2011

Grouped underlying causes of death (ICD-10 codes)*	%	(95% CI)
Congenital, chromosomal, ID, cerebral palsy (Q00–Q99,F70–F79,R50–R69,G80–G83)	17.5	(13.9–21.0)
Cardiovascular disorders without congenital malformation (I00–I69)	12.8	(9.6–15.9)
Unintentional and undetermined injuries (V01–X59, Y10–Y34, S00–T88)	11.0	(8.0–13.9)
All other causes	10.7	(7.8–13.7)
Disorders of the brain and nervous system (G90–G99)	9.0	(6.3–11.6)
Sepsis or pneumonia (A30–A49, J10–J18)	8.7	(6.1–11.4)
Epilepsy; status epilepticus; seizure, unspecified (G40, G41, R56.8)	8.3	(5.7–10.9)
Malignant neoplasms (C00–C97, D37–D48)	7.2	(4.7–9.6)
Endocrine or metabolic (E00–E90)	4.9	(2.9–7.0)
Suicide or homicide (X60–X84, X85–Y09, Y85–Y89)	4.3	(2.3–6.2)
Liver and digestive disorders (K00–K93)	2.9	(1.3–4.5)
Genitourinary disorders (N00–N99)	2.9	(1.3–4.5)

Abbreviations: ID = intellectual disability; ICD-10 = *International Classification of Diseases, 10th Revision*; CI = confidence interval.

* For comparison, the leading causes of death among children aged 0–18 years who did not have epilepsy in South Carolina during 2000–2011, by cause of death (ICD-10 codes) and total number of deaths (n = 9,756, excluding children with epilepsy) included congenital, chromosomal, ID, and cerebral palsy, 12.2%; cardiovascular disorders without congenital malformation, 3.0%; unintentional and undetermined injuries, 25.0%; all other causes, 41.7%; disorders of the brain and nervous system, 2.2%; sepsis or pneumonia, 2.0%; epilepsy, status epilepticus, seizure, unspecified, 0%; malignant neoplasms, 3.5%; endocrine or metabolic, 1.2%; suicide or homicide, 6.9%; liver and digestive disorders, 1.8%; and genitourinary disorders, 0.5%.

non-Hispanic whites, the mortality rate among children aged 0–5 years (9.8) significantly exceeded that among children aged 6–12 years (5.7). Among non-Hispanic blacks, the mortality rate among adolescents aged 13–18 years (12.4) significantly exceeded that among children aged 0–5 years (7.4).

Annual age-adjusted mortality rates increased from 2000 through 2008, ranging from 2.1 to 5.6 per 100,000 (p = 0.015). But annual rates then decreased to 3.1 per 100,000 in 2011 (Figure).

Discussion

Epilepsy is one of the most common neurologic disorders in children and can vary widely in its severity and impact (*1,2,6*). Children with epilepsy are more likely to live in lower-income households and have higher levels of unmet medical needs, mainly because of lack of access to specialized care (*1,3*). More than one third of deaths among children with epilepsy in this study resulted from developmental conditions and brain disorders, including epilepsy-related causes. About one in nine deaths were associated with injuries. The higher risk for death among children with epilepsy and the higher

TABLE 2. Characteristics of children with epilepsy, by mortality status — South Carolina, 2000–2011

			Mortality status			
	Total (N = 13,099)		Deceased (n = 447)		Alive (n = 12,652)	
Characteristics	%	(95% CI)	%	(95% CI)	%	(95% CI)
Age group at diagnosis (yrs)						
0–5	41.7	(40.9–42.5)	39.4	(34.8–44.1)	41.8	(40.9–42.7)
6–12	24.8	(24.1–25.6)	22.6	(23.4–31.9)	24.9	(24.1–25.7)
13–18	33.5	(32.7–34.3)	38.0	(33.5–42.7)	33.3	(32.9–34.5)
Median age (95% CI)	8	(8–9)	10	(8–11)	8	(8–9)
Sex						
Male	51.2	(50.3–52.1)	53.7	(48.9–58.4)	51.2	(50.3–52.1)
Female	48.8	(47.9–49.7)	46.3	(41.6–51.1)	48.8	(47.9–49.7)
Race/Ethnicity						
White, non-Hispanic	58.4	(57.6–59.2)	56.4	(51.6–61.0)	58.5	(57.6–59.4)
Black, non-Hispanic	38.0	(37.2–38.8)	41.4	(36.8–46.1)	37.9	(37.1–38.8)
Hispanic	3.6	(3.3–3.9)	2.2	(1.1–4.1)	3.6	(3.3–3.9)
Primary insurance payer						
Commercial	34.4	(33.6–35.2)	30.0	(25.8–34.5)	34.6	(33.8–35.4)
Medicaid	50.3	(49.4–51.2)	55.5	(50.7–60.2)	50.1	(49.2–51.0)
Medicare	3.3	(3.0–3.6)	8.7	(6.3–11.7)	3.1	(2.8–3.4)
Uninsured	12.0	(11.4–12.6)	5.8	(3.8–8.4)	12.2	(11.6–12.8)
Place of residence						
Rural	36.3	(35.5–37.1)	38.5	(34.0–43.0)	36.2	(35.4–37.0)
Urban	63.7	(62.9–64.5)	61.5	(57.0–66.0)	63.8	(63.0–64.6)
Length of follow-up (mos)						
Median (95% CI)	*38*	*(37–38)*	*17*	*(15–21)*	*38*	*(38–39)*
Total person-years*	**50,787**		**984**		**49,803**	

Abbreviation: CI = confidence interval.
* The sum of the number of years from the date of diagnosis or the year 2000 (whichever was later) to the date of death or to the end of follow-up, as of December 31, 2011.

TABLE 3. Deaths per 1,000 person-years in children with epilepsy, by sex, race/ethnicity, and age group — South Carolina, 2000–2011

	Age group (yrs)							
	0–5		6–12		13–18		0–18	
Characteristic	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)	Rate	(95% CI)
Overall	**8.7**	**(7.4–10.0)**	**7.5**	**(6.1–9.1)**	**10.0**	**(8.5–11.6)**	**8.8**	**(8.0–9.7)**
Sex								
Male	8.2	(6.6–10.0)	8.2	(6.2–10.5)	11.3	(9.1–14.0)	9.1	(8.0–10.3)
Female	9.2	(7.3–11.5)	6.8	(4.9–9.1)	8.9	(7.1–11.0)	8.5	(7.4–9.7)
Race/Ethnicity								
White, non-Hispanic	9.8	(8.0–11.8)	5.7	(4.1–7.6)	9.0	(7.3–11.0)	8.4	(7.4–9.5)
Black, non-Hispanic	7.4	(5.7–9.5)	10.5	(7.9–13.8)	12.4	(9.7–15.7)	9.7	(8.3–11.2)
Hispanic	6.6	(2.4–14.4)	8.4	(1.7– 24.5)	2.5	(0.1–14.1)	6.0	(2. 9–11.1)

Abbreviation: CI = Poisson confidence interval.

burden of nonepilepsy-related causes of death supplement findings demonstrating higher risk for death among children with epilepsy with co-occurring conditions (*4*). Although some causes of death among children with epilepsy were associated with genetic disorders that are not yet preventable, other underlying disorders contributing to cause of death can be better managed with coordinated care (*5*), potentially reducing excess mortality risk.

Strengths of this study include the use of administrative data facilitating use of standardized diagnostic codes to identify and track large numbers of cases over time. The large sample size permitted subgroup analyses of mortality risk and found few differences by selected epilepsy-related factors or sociodemographic factors. Because children with complex health needs and associated impairments are more likely to be eligible for Medicare coverage, this might explain the higher rate of death among children with epilepsy with Medicare. Although epilepsy-related deaths were not as common as other causes, this study could not assess the level of seizure control, the quality of epilepsy treatment, and treatment complications among children with epilepsy with co-occurring conditions, all of which require further study to identify prevention opportunities.

Although the increased annual death rates through 2008 resulted from an increased case detection rate since the initiation of the study, the 44% decline from 2008 to 2011 is notable. The 2-year delay in documenting all deaths in these datasets could explain the reduced death rate in 2011 but not the reduced rate in 2010. Ascertaining further deaths occurring in 2011 but unreported until later would validate this explanation.

What is already known on this topic?

Children with epilepsy might have an increased risk for death compared with children without epilepsy.

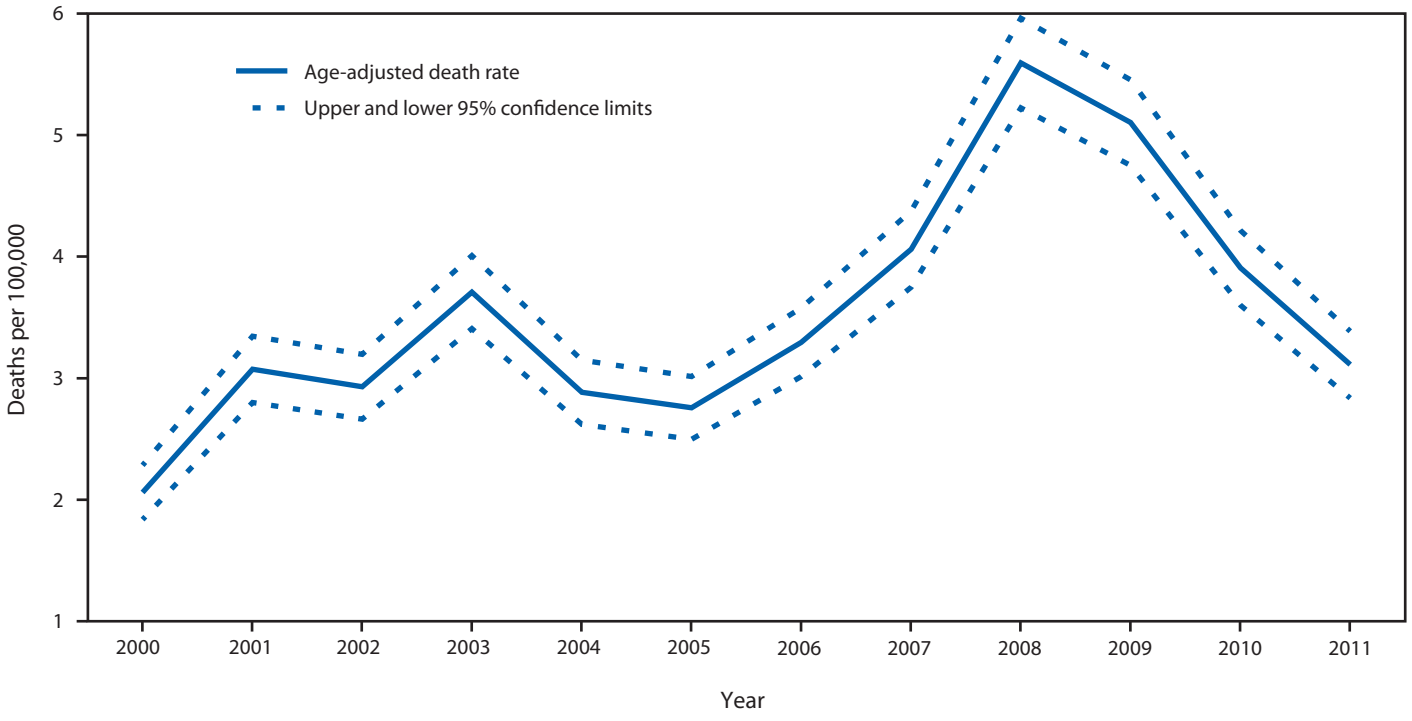
What is added by this report?

Analysis of administrative data from several sources showed that among children with epilepsy in South Carolina during 2000–2011, the overall mortality rate was 8.8 deaths per 1,000 person-years and the annual risk for death was 0.84% compared with 0.22% among children of the same ages without epilepsy. Developmental conditions, cardiovascular disorders, and injuries were the most common causes of death among children with epilepsy.

What are the implications for public health practice?

Ensuring appropriate and timely health care and social services for children with epilepsy, especially those with complications, might reduce the risk for premature death. Health care providers, social service providers, advocacy groups and others interested in improving outcomes for children with epilepsy can work together to assess whether coordinated care for these children can prevent complications associated with epilepsy and reduce their risk for premature death.

FIGURE. Age-adjusted death rate per 100,000 children aged 0–18 years with epilepsy, by year — South Carolina, 2000–2011



The findings in this study are subject to at least four limitations. First, because administrative data designed for billing purposes were the main data sources, certain hospitals might have underreported cases of epilepsy, lowering overall mortality rates from epilepsy in this study. Second, Hispanics accounted for 5.7% of the South Carolina population in 2010, and the 2.2% of deaths among children with epilepsy of Hispanic ethnicity likely underestimates the actual percentage because of coding errors or lack of information on Hispanic patients at free clinics where uninsured migrant farm workers get their medical care. Third, because the study did not consider duration of epilepsy before the start of follow-up in 2000, person-year calculations did not account for earlier years. Finally, causes of death might have been misclassified.

Ensuring appropriate and timely health care and social services for children with epilepsy, especially those with complications, might reduce the risk for premature death. Health care providers, social service providers, advocacy groups, and others interested in improving outcomes for children with epilepsy can work together to assess whether coordinated care for these children can prevent complications associated with epilepsy and reduce their risk for premature death (*5*–*7*).

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Declines in Pneumonia Hospitalizations of Children Aged <2 Years Associated with the Use of Pneumococcal Conjugate Vaccines — Tennessee, 1998–2012

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The 7-valent pneumococcal conjugate vaccine (PCV7) was added to the U.S. infant immunization schedule in the year 2000. By 2009, PCV7 introduction was associated with a 43% decline in all-cause pneumonia among U.S. children aged <2 years (*1*). In 2010, a new 13-valent pneumococcal conjugate vaccine (PCV13) replaced PCV7 in the infant immunization schedule, expanding protection from seven to 13 pneumococcal serotypes. To examine changes in all-cause pneumonia hospitalizations among children aged <2 years after the switch to PCV13, Tennessee hospital discharge data for 1998–2012 were analyzed. By 2012, all-cause pneumonia hospitalizations in children aged <2 years had declined an additional 27%, relative to the PCV7 years. Pneumonia hospitalizations were estimated to be 4.1 per 1,000 population in 2012, a historically low rate that represents a 72% decline from the rate before PCV7 introduction. Tennessee children aged <2 years experienced about 1,300 fewer pneumonia hospitalizations annually in 2011 and 2012 than in the years before pneumococcal conjugate vaccine (PCV) use. These data attest to the powerful impact of the PCV program on pneumonia in Tennessee children. The observed trend likely represents a major decline in pneumococcal pneumonia, which should stimulate a reassessment of current causes and appropriate management of pneumonia in children.

Streptococcus pneumoniae is widely recognized as the primary bacterial pathogen causing community-acquired pneumonia in children (*2*). However, identifying the cause of pneumonia in individual cases is difficult (*3*). An overall reduction in pneumonia was an expected outcome of PCV7 vaccination because the major U.S. pre-licensure trial reported 30% efficacy against radiographically defined pneumonia (*4*). However, short term clinical trials might not predict effectiveness over time and outside of clinical trials, and no comparable efficacy trial has been performed for PCV13. To examine changes in rates of all-cause pneumonia among children aged <2 years after the switch to PCV13, Tennessee hospital discharge data for 1998–2012 were analyzed. The Tennessee Hospital Discharge Data System records data on hospitalizations and emergency department (ED) visits from all nonfederal hospitals in Tennessee. Tennessee's population is about 6.5 million and includes 2% of the U.S. population. Tennessee's Hospital Discharge Data System data from 1998 through 2012 were used to identify Tennessee residents aged <2 years with hospital admissions or ED visits for pneumonia. This age group was chosen because most children aged <2 years would have received PCV13 by 2012, and this age group experienced the earliest and steepest decline in pneumonia rates after PCV7 introduction (*1,5*). All-cause pneumonia hospitalizations were defined by *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) codes as a first-listed discharge diagnosis of pneumonia (480.xx–486.xx or 487.0) or by a first-listed discharge diagnosis of meningitis (321.xx, 013.0.x, 003.21, 036.0, 036.1, 047, 047.0, 047.1, 047.8, 047.9, 049.1, 053.0, 054.72, 072.1, 091.81, 094.2, 098.82, 100.81, 112.83, 114.2, 115.01, 115.11, 115.91, 130.0, 320, 320.0, 320.1, 320.2, 320.3, 320.7, 320.81, 320.82, 320.89, 320.8, 320.9, 322, 322.0, or 322.9), septicemia (038.1x, 038.4x, 003.1, 020.2, 022.3, 031.2, 036.2, 038, 038.0, 038.2, 038.3, 038.8, 038.9, 054.5, 785.52, 790.7, 995.91, or 995.92) or empyema (510.xx) and a pneumonia code in another diagnosis field. Codes considered specific for pneumococcal infections were 481.xx, 038.2, 041.2, or 320.1 (*1,5,6*). To explore whether changes in rates of all-cause pneumonia were specifically related to the vaccination programs, comparisons were made with changes in rates of ED visits and hospitalizations for the treatment of bone fractures (ICD-9-CM codes 800–829.xx).

Monthly annualized rates for hospitalizations and ED visits for all-cause pneumonia and fractures were obtained by multiplying monthly numbers of hospitalizations and ED visits by 365.25 divided by the number of days in each month, and dividing this result by the respective annual Tennessee population estimate for children aged <2 years from the U.S. Census Bureau. Rates were expressed as hospitalizations and ED visits per 1,000 children annually.

Three periods were defined: pre-PCV (January 1998–December 1999), PCV7 (January 2001–June 2009), and PCV13 (July 2010–December 2012) years. Two years were omitted from the analyses, calendar year 2000, when PCV7 was introduced, and July 2009–June 2010, which encompassed the atypical pandemic influenza period and the introduction of PCV13. Annualized monthly rates were modeled using negative binomial regression accounting for seasonal variation. Modelling rates over the three periods allowed estimation of linear trends in these three periods as well as comparison of rates

in the PCV13 period to rates that would have been expected if trends in the PCV7 and pre-PCV7 periods, respectively, had not changed. Relative rates (RR) were used to compare study periods and calculate percentage changes from PCV7 years and pre-PCV years to PCV13 years ([1 - RR] x 100); annual rate differences between these periods were also calculated.

The annual number of hospitalizations for pneumonia of Tennessee children aged <2 years were >2,000 in 1998 and 1999, before PCV7 introduction, and declined to <1,000 by 2010 through 2012, after introduction of PCV13 (Table 1). Only ≤2% of all pneumonias were coded as pneumococcal, and these declined as well. The median length of stay was 3–4 days throughout this period; in-hospital deaths were uncommon but appeared to decline.

Monthly annualized pneumonia hospitalization rates for Tennessee children aged <2 years showed the typical seasonal pattern with increases during winter (Figure). Pneumonia hospitalization rates were fairly stable in the pre-PCV period, declined substantially after PCV7 introduction, and were lower yet after PCV13 introduction.

Annual pneumonia hospitalization rates in Tennessee children aged <2 years decreased from 14.5 to 4.1 per 1,000 from pre-PCV years to PCV13 years. Compared with PCV7 years, the rate after introduction of PCV13 was 27% lower, indicating 1.5 fewer hospitalizations per 1,000 children. The total decline after the years before PCV7 introduction was 72%, or 10.5 fewer hospitalizations per 1,000 children annually (Table 2). There was a corresponding 83% decline in pneumonia hospitalizations coded as pneumococcal. In this analysis, visits classified as observation stays were counted as ED visits, not hospitalizations. If observation stays were counted as hospitalizations, pneumonia hospitalization rates declined 64%, from 15.2 per 1,000 in the pre-PCV period to 5.6 per 1,000 in the PCV13 period. There were no statistically significant changes in pneumonia ED visit rates and no significant declines in ED visits or hospitalizations for fractures.

TABLE 1. Pneumonia hospitalizations for children aged <2 years, by selected characteristics — Tennessee, 1998–2012

Year	No. of pneumonia hospitalizations	No. with a pneumococcal code	Median stay (no. of days, interquartile range)	No. of in-hospital deaths
1998	2,047	44 (2.1)	4 (3,5)	4
1999	2,181	48 (2.2)	3 (3,5)	5
2000	1,744	32 (1.8)	3 (3,4)	2
2001	1,505	15 (1.0)	3 (3,4)	5
2002	1,518	10 (0.7)	3 (3,4)	3
2003	1,482	14 (0.9)	3 (3,5)	1
2004	1,306	12 (0.9)	3 (3,4)	4
2005	1,391	14 (1.0)	3 (3,4)	1
2006	1,364	18 (1.3)	3 (3,4)	2
2007	1,077	21 (1.9)	3 (3,4)	2
2008	1,114	17 (1.5)	3 (3,5)	0
2009	1,057	11 (1.0)	3 (3,4)	0
2010	829	17 (2.1)	4 (3,5)	1
2011	663	9 (1.4)	4 (3,5)	1
2012	673	8 (1.2)	3 (3,5)	1

Discussion

The decrease in pneumonia rates described in this report suggests substantial direct benefits of PCV13 use in the early years after its introduction. All-cause pneumonia hospitalizations in children aged <2 years in Tennessee declined 27% after introduction of PCV13 in 2010 and a total of 72% after the introduction of PCV7 into the routine childhood immunization schedule in 2000. Among Tennessee children aged <2 years, these rate reductions meant >1,300 fewer pneumonia hospitalizations annually compared with the years before introduction of PCVs. During the full 12 years after PCVs were introduced, approximately 11,000 fewer children were hospitalized with pneumonia than would have been expected based on rates in the pre-vaccine years.

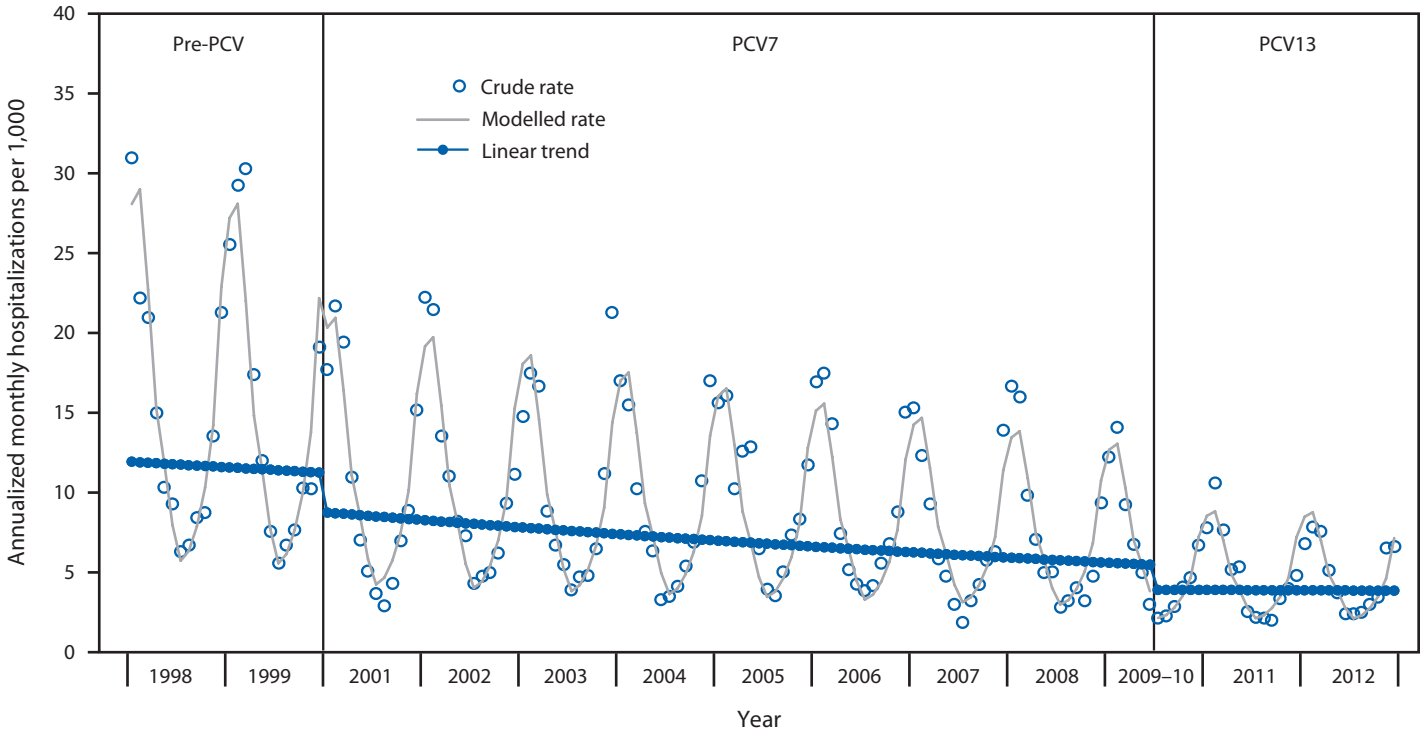
Declines in pneumonia hospitalizations in children aged <2 years in Tennessee in the first 10 years after PCV7 introduction were similar to those previously reported for U.S. children overall. Pneumonia hospitalizations in U.S. children aged <2 years declined 43.2% (95% confidence interval = 34.9%–51.6%) during 2000–2009 (*1*), nearly identical to changes observed in Tennessee by 2009. Consistent declines in childhood pneumonia have also been observed in multiple countries where PCVs have been introduced (*7–9*).

These findings indicate that the expanded coverage of six additional serotypes with PCV13 has also expanded the effectiveness of the U.S. PCV program against pneumonia. However, no serotype information is available to quantify the vaccine effectiveness against individual serotypes.

The findings in this report are subject to at least three limitations. First, this is an ecologic study that evaluated the impact of the U.S. PCV program in Tennessee; individual level vaccination data were not examined. However, since 2008, coverage with ≥3 doses of PCV was >93% among young Tennessee children, with similar high vaccination coverage levels maintained since PCV13 introduction.* Second, other factors (e.g., changes in admission criteria) might have influenced the observed changes in pneumonia hospitalizations. Nevertheless, a planned analysis of hospitalizations for fractures revealed no systematic declines during the study years, indicating the observed declines were not part of a generalized reduction in hospital admissions. Furthermore, the 72% decline in all-cause pneumonia observed since PCV introduction was

* Additional information available at http://www.cdc.gov/vaccines/imz-managers/coverage/nis/child/index.html.

FIGURE. Annualized monthly all-cause pneumonia hospitalizations per 1,000 children aged <2 years during pre-pneumococcal conjugate vaccine (PCV), PCV7, and PCV13 years — Tennessee, 1998–2012



Abbreviations: PCV7 = 7-valent pneumococcal conjugate vaccine; PCV13 = 13-valent pneumococcal conjugate vaccine.

TABLE 2. Annual hospitalizations and emergency department visits per 1,000 children aged <2 years for pneumonia and fractures during pre-pneumococcal conjugate vaccine (PCV), PCV7, and PCV13 years, and percentage change and rate differences comparing PCV13 years (July 2010–December 2012) with PCV7 years (January 2001–June 2010) and pre-PCV years (January 1998–December 1999)* — Tennessee, 1998–2012

Condition	Annual events per 1,000 children aged <2 years			PCV13 years compared with PCV7 years†				PCV13 years compared with pre-PCV7 years†			
	Pre-PCV years	PCV7 years	PCV13 years	% change in rates	(95% CI)	Rate difference per 1,000	(95% CI)	% change in rates	(95% CI)	Rate difference per 1,000	(95% CI)
Pneumonia											
Hospitalizations	14.5	8.6	4.1	-27	(-41 to -10)	-1.5	(-2.3 to -0.6)	-7.2	(-77 to -65)	-10.5	(-11.3 to -9.5)
ED visits	18.4	21.5	19.7	-8	(-21 to 7)	-1.8	(-4.6 to 1.5)	7	(-9 to 26)	1.3	(-1.6 to 4.7)
Fractures											
Hospitalizations	1.2	1.1	1.0	-15	(-35 to 11)	-0.2	(-0.4 to 0.1)	-12	(-33 to 16)	-0.1	(-0.4 to 0.2)
ED visits	5.5	6.1	6.4	0	(-11 to 12)	0	(-0.7 to 0.8)	17	(4 to 32)	1	(0.2 to 1.8)

Abbreviations: CI = confidence interval; PCV7 = 7-valent pneumococcal conjugate vaccine; PCV13 = 13-valent pneumococcal conjugate vaccine.
* The same calculations for fractures are included for comparison.
† Change in rates reflects changes in modeled trends and are not computed from rates displayed in columns 2–4.

accompanied by an 83% decline in pneumonias with a specific pneumococcal code. In addition, disease severity as judged by length of stay and in-hospital mortality did not increase, and there was no compensatory increase in pneumonia ED visits, further supporting a lack of change in admission practices that might account for the observed trends. One previous study of changes in all-cause pneumonia since PCV13 introduction from a nationally representative U.S. private insurance inpatient discharge record database reported a 21% decline in all-cause pneumonia for children aged <2 years coincident with introduction of PCV13, which is similar to these findings in Tennessee (*10*). Finally, this study is restricted to the first 2 years after PCV13 introduction and although this assessment indicates an early impact on pneumonia hospitalizations,

What is already known on this topic?

Introduction of the 7-valent pneumococcal conjugate vaccine (PCV7) in 2000 was associated with a 43% decline in pneumonia hospitalizations in U.S. children aged <2 years by 2009.

What is added by this report?

Tennessee hospital discharge data documented a 27% decline in pneumonia hospitalizations in children aged <2 years by 2012, after the switch from PCV7 to 13-valent pneumococcal conjugate vaccine in 2010. The rate was estimated to be 4.1 per 1,000 population in 2012, a historically low rate that represents a 72% decline from the rate before PCV7 introduction in 2000. Tennessee children aged <2 years experienced about 1,300 fewer pneumonia hospitalizations annually in 2011 and 2012 than in the years before the use of pneumococcal conjugate vaccines (PCVs).

What are the implications for public health practice?

State health departments can use administrative data to evaluate the local impact of PCV vaccination programs. Decreases in pneumonia hospitalizations for children aged <2 years in Tennessee highlight the need to reassess current causes and appropriate management of childhood pneumonia.

longer-term monitoring of changes in pneumonia incidence is warranted to obtain the full picture of vaccination effects.

Although the pneumococcus was reported to be responsible for 20%–60% of community-acquired pneumonias before PCV introduction (*2*), the proportion caused by serotypes included in PCVs was unknown. These findings suggest that in the pre-PCV era, a large proportion of childhood pneumonia hospitalizations were caused by the pneumococcal serotypes included in PCV13. The introduction of PCVs into the U.S. infant immunization schedule has resulted in a major change in the epidemiology of pneumonia in young children and, importantly, these vaccine-induced changes can be monitored using readily available, state-based hospital discharge data. These results are an incentive to maintain high vaccination coverage with PCVs. In addition, the causes and appropriate treatment of childhood pneumonia in the era of PCVs needs to be continually assessed because the distribution of bacterial and other causes of pneumonia will likely change.

Acknowledgments

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Morbidity and Mortality Weekly Report

Arthritis Among Veterans — United States, 2011–2013

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Arthritis is among the most common chronic conditions among veterans and is more prevalent among veterans than nonveterans (*1,2*). Contemporary population-based estimates of arthritis prevalence among veterans are needed because previous population-based studies predate the Persian Gulf War (*1*), were small (*2*), or studied men only (*2*) despite the fact that women comprise an increasing proportion of military personnel and typically have a higher prevalence of arthritis than men (*1,3*). To address this knowledge gap, CDC analyzed combined 2011, 2012, and 2013 Behavioral Risk Factor Surveillance System (BRFSS) data among all adults aged ≥18 years, by veteran status, to estimate the total and sex-specific prevalence of doctor-diagnosed arthritis overall and by sociodemographic categories, and the state-specific prevalence (overall and sex-specific) of doctor-diagnosed arthritis. This report summarizes the results of these analyses, which found that one in four veterans reported that they had arthritis (25.6%) and that prevalence was higher among veterans than nonveterans across most sociodemographic categories, including sex (prevalence among male and female veterans was 25.0% and 31.3%, respectively). State-specific, age-standardized arthritis prevalence among veterans ranged from 18.8% in Hawaii to 32.7% in West Virginia. Veterans comprise a large and important target group for reducing the growing burden of arthritis. Those interested in veterans' health can help to improve the quality of life of veterans by ensuring that they have access to affordable, evidence-based, physical activity and self-management education classes that reduce the adverse effects of arthritis (e.g., pain and depression) and its common comorbidities (e.g., heart disease and diabetes).

BRFSS is an annual, cross-sectional, random-digit–dialed telephone (landline and cell phone) survey of the 50 U.S. states, territories, and the District of Columbia (DC). BRFSS is designed to collect data that are representative of the noninstitutionalized adult civilian population in each state. All analyses used combined 2011, 2012, and 2013 BRFSS data. Median state-specific BRFSS response rates, based on American Association for Public Opinion Research definition no. 4, were 49.7% in 2011, 45.2% in 2012, and 45.9% in 2013.* BRFSS respondents were defined as having arthritis if they responded "yes" to the question, "Have you ever been told by a doctor or other health professional that you have some form of arthritis, rheumatoid arthritis, gout, lupus, or fibromyalgia?" Veterans were defined as those who responded "yes" to the question, "Have you ever served on active duty in the United States Armed Forces, either in the regular military or in a National Guard or military Reserve unit? Active duty does not include training for the Reserves or National Guard, but does include activation, for example, for the Persian Gulf War."

CDC estimated annualized crude and age-specific prevalence of doctor-diagnosed arthritis stratified by veteran status and sex, age-standardized overall and sex-specific prevalence by veteran status across categories of race/ethnicity, highest educational attainment, employment status, income, and body mass index (under/normal weight, overweight, and obese), age-standardized prevalence overall and by sex among veterans for the 50 states, DC, Guam, and Puerto Rico. Data were analyzed using software that accounted for the complex sampling design, including application of sampling weights so that estimates were representative of the noninstitutionalized adult civilian population in each state. Variance was estimated with 95% confidence intervals (CIs) that accounted for the clustered design using the Taylor series linearization method. The 2000 U.S. Projected Population, in three age groups (18–44, 45–64, and ≥65 years) was used for age-standardization.†

Veterans had a higher overall prevalence of reported arthritis than nonveterans, 25.6% (CI = 25.2%–26.1%) versus 23.6% (CI = 23.4%–23.7%). For both men and women, arthritis prevalence was higher among veterans than nonveterans (Table 1). Among male veterans (compared with male nonveterans) arthritis prevalence was higher for all age groups, and age-standardized arthritis prevalence was ≥5 percentage points higher across most of the sociodemographic categories examined (race/ethnicity, education, income, employment status, and body mass index) (Table 1). Among female veterans (compared with female nonveterans) arthritis prevalence was higher for young (18–44 years) and middle aged (44–64 years) women; age-standardized arthritis prevalence was ≥5 percentage points higher across most of the sociodemographic categories examined (Table 1). Of the estimated 9.0 million veterans with arthritis, 8.3 million were men and 670,000 were women.

*Additional information available at http://www.cdc.gov/brfss/annual_data/annual_data.htm.

†Additional information available at http://www.cdc.gov/nchs/data/statnt/statnt20.pdf.

TABLE 1. Crude, age-specific, and age-standardized* estimated prevalence of arthritis among veterans and nonveterans, by sex and selected sociodemographic characteristics — United States, 2011, 2012, and 2013 Behavioral Risk Factor Surveillance System surveys

	Sex-specific												Overall (N = 1,464,060)					
	Men (n = 586,401)						Women (n = 875,889)											
	Nonveterans (n = 417,572)			Veterans (n = 168,829)			Nonveterans (n = 860,024)			Veterans (n = 15,865)			Nonveterans (n = 1,277,596)			Veterans (n = 111,934)		
Characteristic	No.†	%†	95% CI†	No.†	%†	95% CI†	No.†	%†	95% CI†	No.†	%†	95% CI†	No.†	%†	95% CI†	No.†	%†	95% CI†
Overall																		
Crude	98,604	17.6	(17.4 – 17.8)	66,723	35.0	(34.6 – 35.4)	324,533	28.9	(28.7 – 29.1)	6,037	31.3	(29.9 – 32.7)	423,137	24.0	(23.8 – 24.1)	72,760	34.7	(34.3 – 35.1)
Age-standardized	98,103	19.5	(19.3 – 19.7)	66,385	25.0	(24.5 – 25.4)	321,422	26.1	(26.0 – 26.3)	5,963	31.3	(29.9 – 32.7)	419,525	23.6	(23.4 – 23.7)	72,348	25.6	(25.2 – 26.1)
Age group (yrs)																		
18–44	12,309	6.9	(6.7–7.2)	2,473	11.6	(10.9–12.4)	24,859	9.8	(9.6–10.0)	813	17.3	(15.3–19.5)	37,168	8.4	(8.3–8.6)	3,286	12.6	(11.9–13.3)
45–64	52,662	27.4	(27.0–27.8)	19,514	36.0	(35.3–36.8)	126,332	36.8	(36.5–37.2)	2,942	40.3	(38.1–42.4)	178,994	32.7	(32.5–33.0)	22,456	36.4	(35.7–37.1)
≥65	33,132	44.5	(43.8–45.3)	44,398	47.1	(46.5–47.7)	170,231	58.2	(57.9–58.6)	2,208	58.9	(55.8–61.8)	203,363	54.6	(54.3–54.9)	46,606	47.4	(46.8–48.0)
Race/Ethnicity§																		
White, non-Hispanic	78,495	21.2	(21.0–21.5)	55,836	25.1	(24.6–25.7)	258,029	27.2	(27.0–27.4)	4,549	31.8	(30.2–33.4)	336,524	24.9	(24.7–25.0)	60,385	25.7	(25.2–26.2)
Black, non-Hispanic	6,934	19.5	(18.8–20.3)	4,031	25.1	(23.6–26.6)	30,127	28.1	(27.6–28.6)	738	27.7	(24.0–31.7)	37,061	24.9	(24.5–25.3)	4,769	25.8	(24.4–27.3)
Hispanic	5,536	14.3	(13.6–15.0)	2,057	21.9	(20.3–23.6)	17,350	22.7	(22.1–23.2)	245	28.8	(23.6–34.7)	22,886	18.9	(18.5–19.3)	2,302	22.7	(21.1–24.4)
Other, non-Hispanic	6,002	16.2	(15.2–17.2)	3,602	28.4	(26.4–30.4)	14,791	23.0	(22.1–23.9)	414	33.5	(28.1–39.3)	20,793	20.2	(19.6–20.9)	4,016	29.1	(27.2–31.1)
Highest educational attainment§																		
Less than high school	13,840	22.9	(22.3–23.6)	4,806	31.7	(28.5–35.0)	39,011	31.2	(30.7–31.8)	¶	¶	¶	52,851	27.4	(27.0–27.9)	4,941	32.9	(29.4–36.6)
High school or equivalent	31,252	20.7	(20.4–21.1)	21,041	25.0	(24.2–25.9)	110,453	27.8	(27.4–28.1)	1,163	30.1	(27.2–33.1)	141,705	25.0	(24.8–25.2)	22,204	25.3	(24.5–26.1)
Technical degree/ Some college	22,770	20.4	(20.0–20.9)	19,939	26.1	(25.3–26.8)	92,571	26.7	(26.4–27.0)	2,386	33.2	(31.0–35.5)	115,341	24.5	(24.3–24.7)	22,325	26.9	(26.2–27.7)
College degree or higher	30,421	15.0	(14.7–15.3)	20,775	21.5	(20.7–22.3)	81,415	20.9	(20.7–21.2)	2,339	28.5	(26.7–30.3)	111,836	18.4	(18.3–18.6)	23,114	22.4	(21.7–23.2)
Employment status§																		
Working	44,285	15.7	(15.4–16.0)	16,092	20.5	(19.9–21.0)	89,980	21.3	(21.1–21.6)	1,986	24.8	(22.7–27.0)	134,265	18.7	(18.5–18.9)	18,078	20.9	(20.3–21.4)
Not working	6,261	19.3	(18.2–20.4)	2,209	27.3	(25.1–29.6)	14,569	27.7	(27.0–28.5)	326	35.6	(29.7–41.9)	20,830	24.2	(23.6–24.8)	2,535	28.2	(26.2–30.3)
Homemaker/ student	791	18.6	(15.7–21.8)	291	22.5	(18.6–26.9)	33,544	22.9	(22.4–23.3)	447	30.2	(26.6–33.9)	34,335	22.2	(21.8–22.6)	738	25.8	(23.2–28.6)
Retired	31,111	33.4	(28.4–38.8)	41,535	37.3	(32.5–42.3)	136,637	33.5	(29.9–37.3)	¶	¶	¶	167,748	34.3	(31.0–37.8)	43,801	38.8	(34.3–43.5)
Unable to work	15,746	44.3	(42.9–45.8)	6,341	54.1	(50.5–57.8)	48,246	58.3	(57.2–59.4)	982	67.9	(60.6–74.5)	63,992	52.9	(52.0–53.7)	7,323	56.5	(53.2–59.8)
Annual household income§																		
<$15,000	13,544	25.1	(24.4–25.8)	5,274	32.7	(30.4–35.1)	53,074	34.4	(33.9–35.0)	740	42.7	(37.9–47.6)	66,618	31.0	(30.5–31.4)	6,014	33.9	(31.8–36.0)
$15,000 to <$25,000	16,443	22.5	(21.9–23.1)	11,629	30.5	(29.1–32.0)	65,049	30.0	(29.6–30.5)	1,071	35.9	(32.0–40.1)	81,492	27.1	(26.8–27.4)	12,700	31.1	(29.8–32.5)
$25,000 to <$50,000	22,202	19.5	(19.0–19.9)	19,869	25.6	(24.7–26.5)	73,142	26.5	(26.1–26.8)	1,572	31.0	(28.6–33.6)	95,344	23.7	(23.4–24.0)	21,441	26.1	(25.2–26.9)
≥$50,000	36,178	17.1	(16.8–17.4)	22,271	22.3	(21.6–22.9)	74,785	21.9	(21.6–22.2)	1,874	28.0	(25.8–30.4)	110,963	19.8	(19.6–20.0)	24,145	22.9	(22.3–23.6)
Body mass index§																		
Underweight/ Normal weight (<25)	19,994	15.5	(15.1–15.8)	14,741	19.9	(19.1–20.7)	97,371	20.5	(20.3–20.7)	1,792	25.1	(23.0–27.3)	117,365	19.0	(18.8–19.2)	16,533	20.8	(20.1–21.6)
Overweight (25 to <30)	39,025	18.0	(17.7–18.3)	28,729	23.0	(22.3–23.6)	95,942	25.6	(25.3–25.9)	1,863	31.6	(29.2–34.2)	134,967	22.0	(21.8–22.2)	30,592	23.6	(23.0–24.3)
Obese (≥30)	38,114	26.0	(25.6–26.4)	22,537	32.4	(31.4–33.4)	109,627	35.5	(35.2–35.9)	2,039	39.9	(36.9–43.0)	147,741	31.5	(31.3–31.8)	24,576	33.0	(32.0–34.0)

Abbreviation: CI = confidence interval.
* Age-standardized to 2000 U.S. projected population (age groups 18–44, 45–64, and ≥65 years); includes only those for whom age was reported.
† Number of respondents (unweighted) who reported having arthritis.
§ Weighted to noninstitutionalized U.S. civilian population using sampling weights provided in Behavioral Risk Factor Surveillance System survey data.
¶ Estimates not presented if number of respondents was <50 or relative standard error was ≥30 because estimate might be unreliable.

Among the 50 states and DC, the median state-specific arthritis prevalence among veterans was 25.4% (range = 19.7% in DC to 32.7% in West Virginia) (Table 2, Figure). Among male veterans, the median state-specific prevalence was 24.7% (range = 18.4% in Hawaii to 32.7% in West Virginia); among women the median was 30.3% (range = 22.4% in Hawaii to 42.7% in Oregon) (Table 2). In each state, veterans comprised a substantial proportion of all persons with arthritis (median = 15.9%; range = 12.6% in Illinois and New Jersey to 22.2% in Alaska) (Table 2).

Discussion

Veterans reported arthritis frequently and more often than nonveterans among both men and women and across all sociodemographic groups. Although a high level of physical fitness and good health are required for entry into military service,

TABLE 2. State-specific, age-standardized* estimated prevalence of arthritis among veterans, by sex — United States, 2011, 2012, and 2013 Behavioral Risk Factor Surveillance System surveys (N = 1,464,060)

State	Sex-specific								All veterans				Veterans with arthritis as % of all persons in state with arthritis¶
	Men				Women								
	No.†	No. (1,000s)§	%§	95% CI§	No.†	No. (1,000s)§	%§	95% CI§	No.†	No. (1,000s)§	%§	95% CI§	
Alabama	1,233	165	26.8	(24.4–29.2)	149	16	34.1	(28.7–39.9)	1,382	182	27.8	(25.7–30.0)	15.4
Alaska	612	24	26.6	(24.1–29.4)	65	2	26.4	(19.8–34.3)	677	26	26.6	(24.2–29.1)	22.2
Arizona	1,061	194	23.9	(21.1–27.0)	102	24	40.0	(29.7–51.2)	1,163	218	25.9	(22.9–29.2)	18.5
Arkansas	746	89	25.6	(22.5–29.0)	78	9	34.5	(26.3–43.7)	824	98	26.7	(23.8–29.8)	14.9
California	1,694	754	23.6	(21.7–25.5)	158	58	34.4	(28.9–40.4)	1,852	811	24.7	(22.9–26.6)	13.8
Colorado	1,941	141	24.7	(23.0–26.5)	176	14	31.1	(26.5–36.1)	2,117	155	25.4	(23.8–27.1)	17.7
Connecticut	905	87	24.9	(21.6–28.4)	66	5	27.6	(20.9–35.6)	971	92	25.0	(22.0–28.2)	14.1
Delaware	777	30	23.5	(20.5–26.7)	94	3	30.1	(23.4–37.7)	871	33	24.3	(21.6–27.2)	17.6
District of Columbia	420	10	19.9	(16.8–23.4)	§	§	§	§	468	10	19.7	(16.9–22.8)	10.3
Florida	3,276	639	23.8	(21.8–25.8)	313	60	34.4	(27.7–41.8)	3,589	699	25.0	(23.0–27.1)	17.5
Georgia	1,110	263	24.1	(22.0–26.3)	155	31	30.4	(25.5–35.7)	1,265	294	24.8	(22.9–26.9)	16.8
Hawaii	866	33	18.4	(16.5–20.5)	77	2	22.4	(17.6–28.2)	943	36	18.8	(17.0–20.7)	17.1
Idaho	891	50	28.9	(24.7–33.5)	76	3	30.1	(22.8–38.6)	967	53	28.7	(24.8–33.0)	18.7
Illinois	721	284	25.1	(21.4–29.3)	53	17	29.9	(22.0–39.3)	774	301	25.4	(22.0–29.1)	12.6
Indiana	1,182	171	27.3	(24.6–30.2)	90	10	31.0	(24.6–38.2)	1,272	181	27.3	(24.8–30.0)	13.3
Iowa	956	81	22.8	(20.3–25.4)	64	4	27.5	(19.4–37.4)	1,020	86	23.2	(20.8–25.9)	14.8
Kansas	2,497	80	26.2	(24.5–27.9)	223	7	33.8	(29.0–39.0)	2,720	87	26.9	(25.3–28.6)	17.2
Kentucky	1,417	134	30.2	(27.7–32.8)	133	7	29.3	(23.1–36.4)	1,550	141	30.2	(27.9–32.6)	12.9
Louisiana	1,018	117	23.4	(21.1–25.9)	88	9	31.1	(24.2–39.0)	1,106	126	24.4	(22.1–26.9)	13.7
Maine	1,678	52	28.7	(26.3–31.2)	125	3	28.1	(22.8–34.2)	1,803	55	28.5	(26.3–30.8)	17.5
Maryland	1,590	150	24.5	(22.2–27.1)	234	18	28.2	(24.2–32.6)	1,824	168	24.9	(22.8–27.1)	15.9
Massachusetts	2,159	159	23.6	(21.2–26.2)	188	12	33.1	(26.4–40.6)	2,347	171	24.9	(22.6–27.4)	13.9
Michigan	1,737	301	31.5	(28.3–34.8)	107	15	30.0	(23.5–37.5)	1,844	316	31.2	(28.3–34.2)	13.3
Minnesota	1,500	127	22.6	(20.0–25.5)	123	8	25.9	(19.5–33.5)	1,623	135	22.7	(20.2–25.4)	16.1
Mississippi	1,057	84	30.0	(26.9–33.4)	97	7	31.5	(25.2–38.5)	1,154	90	30.1	(27.2–33.1)	13.6
Missouri	1,058	190	28.4	(25.3–31.7)	86	13	33.5	(26.1–41.7)	1,144	203	28.7	(25.8–31.8)	15.3
Montana	1,585	37	26.4	(24.1–28.9)	127	3	32.0	(26.5–38.2)	1,712	40	26.9	(24.8–29.2)	19.0
Nebraska	2,946	53	25.7	(23.6–28.0)	212	4	39.5	(33.2–46.2)	3,158	57	26.8	(24.8–29.0)	17.0
Nevada	793	80	24.6	(21.2–28.2)	65	4	22.6	(17.1–29.2)	858	84	23.9	(20.9–27.1)	18.1
New Hampshire	1,077	44	28.1	(24.7–31.8)	92	3	29.2	(22.8–36.4)	1,169	48	27.8	(24.7–31.0)	17.3
New Jersey	1,524	179	21.6	(19.5–23.8)	120	10	23.8	(18.3–30.3)	1,644	190	22.0	(20.1–24.0)	12.6
New Mexico	1,225	56	23.9	(21.8–26.2)	131	5	28.1	(23.0–33.8)	1,356	61	24.2	(22.3–26.3)	16.1
New York	714	365	22.7	(20.0–25.8)	55	18	31.8	(24.4–40.1)	769	384	23.5	(20.8–26.3)	10.3
North Carolina	1,508	277	24.2	(22.3–26.2)	132	19	23.2	(18.9–28.1)	1,640	297	24.1	(22.4–25.9)	15.5
North Dakota	763	19	24.3	(21.8–27.0)	58	1	27.4	(20.6–35.4)	821	21	24.7	(22.3–27.3)	15.5
Ohio	1,566	351	26.7	(24.5–29.0)	115	20	30.9	(24.9–37.6)	1,681	372	27.2	(25.1–29.4)	14.2
Oklahoma	1,258	120	29.2	(26.6–31.9)	104	8	29.6	(24.5–35.3)	1,362	129	28.9	(26.7–31.3)	16.3
Oregon	864	120	27.6	(24.4–31.2)	93	12	42.7	(32.4–53.6)	957	133	29.1	(25.8–32.5)	16.1
Pennsylvania	2,014	384	28.4	(26.0–30.8)	159	24	35.0	(27.0–43.9)	2,173	409	29.1	(26.8–31.6)	14.1
Rhode Island	905	33	28.7	(25.3–32.5)	68	2	24.5	(18.4–31.9)	973	35	28.2	(25.0–31.6)	15.6
South Carolina	1,994	154	27.3	(25.2–29.6)	192	14	35.7	(30.5–41.2)	2,186	169	28.3	(26.3–30.3)	16.1
South Dakota	1,078	25	26.3	(22.7–30.2)	82	1	29.4	(22.8–36.9)	1,160	27	26.2	(22.9–29.7)	17.8
Tennessee	818	203	25.8	(22.2–29.7)	85	20	33.6	(24.3–44.4)	903	223	26.8	(23.4–30.4)	16.6
Texas	1,441	573	23.8	(21.7–26.0)	167	65	32.1	(25.4–39.6)	1,608	637	24.9	(22.9–27.0)	16.3
Utah	1,332	49	22.5	(20.5–24.5)	86	3	32.3	(25.4–40.0)	1,418	53	23.3	(21.4–25.3)	13.5
Vermont	891	19	24.4	(21.6–27.3)	61	1	32.8	(24.1–42.9)	952	20	25.4	(22.8–28.3)	14.8
Virginia	1,043	243	22.6	(20.7–24.6)	151	32	26.9	(22.9–31.3)	1,194	275	23.0	(21.2–24.8)	17.3
Washington	2,109	207	23.8	(22.0–25.6)	257	22	29.9	(25.4–34.8)	2,366	229	24.4	(22.8–26.1)	17.6
West Virginia	916	73	32.7	(29.8–35.8)	65	4	34.7	(27.6–42.6)	981	76	32.7	(30.0–35.6)	14.5
Wisconsin	742	154	22.0	(19.1–25.1)	55	10	28.5	(20.5–38.1)	797	164	22.4	(19.8–25.3)	14.8
Wyoming	1,054	18	24.7	(22.0–27.5)	85	1	28.1	(20.4–37.3)	1,139	20	25.0	(22.4–27.8)	18.3
Median			*24.7*				*30.3*				*25.4*		*15.9*
Guam	131		18.6	(15.3–22.3)	**		**	**	145		18.2	(15.2–21.6)	16.3
Puerto Rico	330		20.9	(18.0–24.1)	**		**	**	368		22.6	(19.1–26.5)	5.9

* Age-standardized to 2000 U.S. projected population (age groups 18–44, 45–64, and ≥65 years); includes only those for whom age was reported.
† Number of respondents (unweighted) who reported having arthritis.
§ Weighted to noninstitutionalized U.S. civilian population using sampling weights provided in Behavioral Risk Factor Surveillance System survey data.
¶ Number of veterans with arthritis / total number of adults in state with arthritis.
** Estimates not presented if number of respondents was <50 or relative standard error was ≥30 because estimate might be unreliable.

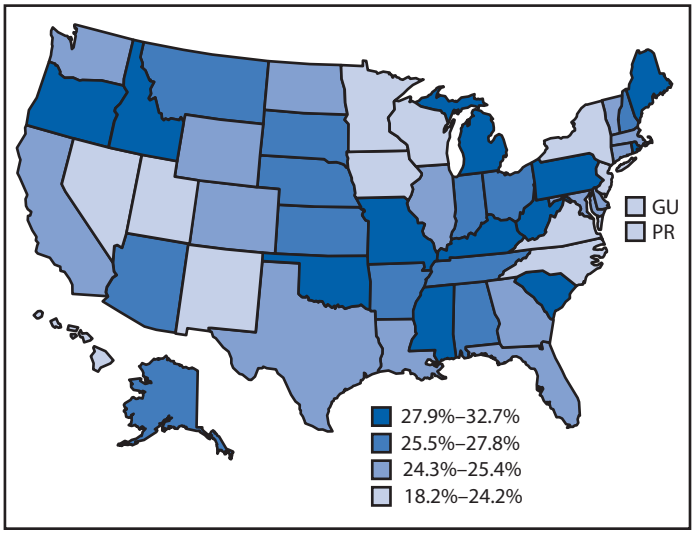
traumatic and overuse injuries are common during active duty (*4*). A recent study found that the incidence of osteoarthritis (a condition that represents the largest portion of arthritis cases and for which musculoskeletal injuries are a potent risk factor) was higher among an active duty sample than osteoarthritis incidence reported in civilian populations (*5*).

One of the few previous population-based studies of arthritis prevalence among veterans was a small study based on 2010 BRFSS data from men in five states (Indiana, Mississippi, South Carolina, West Virginia, and Wisconsin) (*2*). In that study, 44.8% (unadjusted) had arthritis, whereas in the current study, arthritis prevalence in these same five states was lower, ranging from 32.7% in West Virginia to 22.0% in Wisconsin. Two changes in the BRFSS methodology since 2011 might account for this difference. First, cell phone users are now sampled. Inclusion of cell phones captures younger adults who might be missed with previous landline-only data collection; the latter is more likely to capture age groups (middle aged and older adults) with a higher prevalence of arthritis. Second, sampling weights, which are applied to make estimates representative of each states' population, are now calculated using iterative proportional fitting (raking) methods, whereas before 2011, sampling weights were derived using post-stratification procedures.[§]

Arthritis prevalence was consistently higher among female veterans than their male counterparts. A previously reported estimate among women using U.S. Department of Veterans Affairs (VA) health system services indicated that three in four (77.6% in 2008) had arthritis (*6*). Although this estimate is considerably higher than the estimate for women overall in the current study (31.3%), VA health system consumers represent a subset of veterans who are more likely to have military service–associated disability (*7*). In the current study, arthritis prevalence among women veterans who reported being unable to work (67.9%) was almost as high as that in the previous study. This subgroup might be most similar to VA system users.

Although the prevalence of arthritis was higher among women, the relative differences in prevalence between veterans and nonveterans was higher for men than women. Patterns across age were also noteworthy. Arthritis was not only highly prevalent among middle aged (45–64 years) veterans (40.3% among women and 36.0% among men) but also among younger veterans (prevalences of 17.3% and 11.6% among women and men aged 18–44 years, respectively) indicating that arthritis and its effects need to be addressed among male and female veterans of all ages. Reducing the impact of arthritis among younger adults might help to stem its debilitating effects in later life.

FIGURE. State-specific, age-standardized estimated prevalence of arthritis among veterans — United States, 2011, 2012, and 2013 Behavioral Risk Factor Surveillance System surveys



Abbreviations: GU = Guam; PR = Puerto Rico.

The findings in this report are subject to at least five limitations. First, arthritis was based on self-report. Although recall bias is possible, a validation study among health plan enrollees found that this definition had a positive predictive value of 74.9% among persons aged 45–64 years and a 91.0% positive predictive value among persons ages ≥65 years (*8*) and is acceptable for public health surveillance of arthritis. Second, there was insufficient sample size to estimate state-specific arthritis prevalence across the same sociodemographic categories as for the overall estimates (Table 1). Nevertheless, BRFSS collection of veteran status in 2011, 2012, and 2013 allowed analysis of arthritis prevalence across finer sociodemographic categories than previously possible, which was especially important in calculating sex-specific estimates. Third, similar to civilian jobs, there is considerable heterogeneity in military occupations, ranging from sedentary office jobs to physically demanding roles, including combat. BRFSS did not collect information about duration of active duty and work-related risk factors for arthritis during service (e.g., trauma/injury versus physical work demand), and therefore arthritis prevalence across these groups cannot be determined. Fourth, data are cross-sectional and not longitudinal, and therefore, attributing onset of arthritis to veteran status is not appropriate; furthermore, arthritis among veterans might be unrelated to service and attributable instead to risk factors for arthritis (e.g., obesity for osteoarthritis or smoking for rheumatoid arthritis). Finally, results might be subject to selection bias because the median BRFSS response

[§] Post-stratified weights are calculated by aligning each individual characteristic (e.g., sex and age) of the sample with the target population; iterative proportional fitting (raked weights) are calculated by iteratively aligning each specific combination of characteristics (e.g., women aged 18–25 years). Additional information available at http://www.cdc.gov/brfss/annual_data/2013/pdf/weighting_data.pdf.

What is already known on this topic?

Arthritis is a common chronic condition among veterans, and at least two population-based studies have reported a higher prevalence of arthritis among veterans compared with nonveterans. These arthritis prevalence studies of veterans were conducted before the Persian Gulf War, were small, or examined men only.

What is added by this report?

To assess the prevalence of doctor-diagnosed arthritis among male and female veterans, CDC analyzed Behavioral Risk Factor Surveillance System survey data from 2011, 2012, and 2013. The analysis found that 25.6% of veterans reported having arthritis (25.0% among men and 31.3% among women) and that prevalence was higher among veterans than nonveterans across most sociodemographic categories. State-specific, age-standardized arthritis prevalence among veterans ranged from 18.8% in Hawaii to 32.7% in West Virginia.

What are the implications for public health practice?

The high prevalence of arthritis, combined with the large number of persons affected, indicate that strategies are needed to reduce the adverse effects of arthritis. Interventions to improve the quality of life of persons with arthritis include providing access to affordable physical activity and self-management education classes.

rates were <50% in all three survey years. Nevertheless, the population-based estimates for veterans overall and across sociodemographic categories in this study demonstrate that arthritis among veterans is an important public health concern.

The contemporary, state-specific arthritis prevalence estimates provided in this report indicate that veterans with arthritis represented a sizeable portion (with a median of approximately one in six) of adults with arthritis in each state. Because most veterans use health systems other than the VA system (*9*), strategies for managing arthritis that are accessible to all veterans are essential. Fortunately, multiple self-management strategies have been proven to decrease the adverse effects of arthritis and improve the quality of life of persons with arthritis. These include courses that teach persons with arthritis how to achieve recommended levels of physical activity (e.g., Walk with Ease and EnhanceFitness)¶ and those that teach skills for better managing arthritis and other chronic conditions, including diabetes, heart disease, and chronic lung diseases (e.g., self-management education classes such as the Chronic Disease Self-Management Program).** Although these courses are increasingly available in communities across the United States, even greater availability is needed to ensure they are readily available for the large and growing number of adults with arthritis, including veterans (*10*). General community offerings of these programs might not appeal to some veterans or accommodate their specific needs or preferences. The high prevalence of arthritis among veterans, coupled with the large absolute number of veterans affected, suggests that dedicated veterans' service organizations in the community and other settings are well-positioned to offer these evidence-based programs to the veteran population. Additionally, health care professionals can have a meaningful impact on improving veterans' quality of life and function by recommending these programs to their patients with arthritis.

¶ Additional information available at http://www.cdc.gov/arthritis/interventions/physical_activity.htm.

** Additional information available at http://www.cdc.gov/arthritis/interventions/self_manage.htm.

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Vital Signs: Cervical Cancer Incidence, Mortality, and Screening — United States, 2007–2012

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Abstract

Background: Cervical cancer screening is one of the greatest cancer prevention achievements, yet some women still develop or die from this disease.

Objective: To assess recent trends in cervical cancer incidence and mortality, current screening percentages, and factors associated with higher incidence and death rates and inadequate screening.

Methods: Percentages of women who had not been screened for cervical cancer in the past 5 years were estimated using data from the 2012 Behavioral Risk Factor Surveillance System survey. State-specific cervical cancer incidence data from the United States Cancer Statistics and mortality data from the National Vital Statistics System were used to calculate incidence and death rates for 2011 by state. Incidence and death rates and annual percentage changes from 2007 to 2011 were calculated by state and U.S. Census region.

Results: In 2012, the percentage of women who had not been screened for cervical cancer in the past 5 years was estimated to be 11.4%; the percentage was larger for women without health insurance (23.1%) and for those without a regular health care provider (25.5%). From 2007 to 2011, the cervical cancer incidence rate decreased by 1.9% per year while the death rate remained stable. The South had the highest incidence rate (8.5 per 100,000), death rate (2.7 per 100,000), and percentage of women who had not been screened in the past 5 years (12.3%).

Conclusions: Trends in cervical cancer incidence rates have decreased slightly while death rates have been stable over the last 5 years. The proportion of inadequately screened women is higher among older women, Asians/Pacific Islanders, and American Indians/Alaska Natives.

Implications for Public Health Practice: There continue to be women who are not screened as recommended, and women who die from this preventable cancer. Evidence-based public health approaches are available to increase women's access to screening and timely follow-up of abnormal results.

Introduction

Since the introduction and widespread use of the Papanicolaou (Pap) test in the 1950s in the United States, cervical cancer incidence and mortality have decreased dramatically (*1,2*). In addition to screening with a Pap test alone every 3 years, recent cervical cancer screening recommendations now include the use of the human papillomavirus (HPV) test (used to detect infection with oncogenic HPV types associated with cervical cancers) with the Pap test among women aged 30–65 years every 5 years (*1,3*). Despite evidence that cervical cancer screening saves lives, the incidence and death rates from cervical cancer remain substantial, especially among populations with limited access to care (*4*). Over half of all new cases occur in women who have never or rarely been screened (*5*). Recent findings have reported that uninsured women or those without a regular health care provider were significantly less likely to receive cervical cancer screening (*6*).

Healthy People 2020 (HP2020) cervical cancer objectives include increasing screening rates to a target of 93%, reducing the incidence rate to 7.1 per 100,000 women, and reducing the death rate to 2.2 per 100,000 women (available at: http://www.healthypeople.gov). This report presents state-specific screening prevalence data from the 2012 Behavioral Risk Factor Surveillance System (BRFSS) survey, state-specific cervical cancer incidence and death rates for 2007 to 2011 (combined) and 2011 (alone), and annual percentage changes in the incidence and death rates from 2007 to 2011 to examine progress toward these objectives.

Key Points

- In 2011 in the United States, 12,109 women developed cervical cancer and 4,092 died.
- Approximately 1 in 10 women aged 21–65 years had not been screened for this preventable disease in the past 5 years.
- Approximately 1 in 4 women ages 21–65 years without health insurance or a regular health care provider had not been screened for cervical cancer in the past 5 years.
- The South had the highest incidence of cervical cancer cases and deaths and the lowest prevalence of screening.
- The greatest impact on current cervical cancer will be to screen women who have not been screened within the past 5 years.

Methods

The BRFSS survey is a state-based, random-digit–dialed telephone survey of the civilian, noninstitutionalized adult population of the United States that collects information on health risk behaviors, preventive health practices, and health care access in the United States (available at http://www.cdc.gov/brfss). Survey data were available for all 50 states and the District of Columbia (DC) in 2012 with a median survey response rate of 49.7%.

Female BRFSS respondents were asked about having a Pap test ("A Pap test is a test for cancer of the cervix. Have you ever had a Pap test?") and when this test was last performed. For this study, it was impossible to determine whether a woman was screened with both a Pap and HPV test (co-test) because HPV testing questions were not collected in the 2012 BRFSS survey. Because screening intervals vary depending on the type of test, and to include women who might have been screened with a co-test, respondents were categorized as not screened in the past 5 years if they reported not having had a Pap test at all or in the past 5 years. For consistency with current screening recommendations (*1*,*3*), analyses were restricted to women aged 21–65 years who reported not having had a hysterectomy. For analysis by age, women aged 21–22 years, who might not have had an opportunity to get screened within the first year of the recommended screening age, were excluded (*1*,*3*). Respondents who refused to answer or answered "don't know/not sure" were excluded. BRFSS data were weighted using advanced raking techniques (*7*).

United States Cancer Statistics (USCS) (available at http://www.cdc.gov/uscs) provide official federal cancer incidence statistics in each state, using data from the National Program of Cancer Registries and the Surveillance, Epidemiology, and End Results (SEER) Program. Forty-nine states and DC met USCS publication criteria for the period 2007–2011, representing 99.1% of the U.S. population. Incident cervical cancers were coded according to the *International Classification of Disease for Oncology, Third Edition*.

Cancer mortality statistics are based on all death certificates filed in the 50 states and DC, covering 100% of the U.S. population. The mortality data are provided by the National Center for Health Statistics. All reported deaths with cervical cancer identified as the underlying cause of death according to the *International Classification of Diseases, Tenth Revision* during 2007–2011 were included.

Incidence and death rates for 2007 to 2011 (combined) and 2011 (alone) and trend analyses for the period 2007–2011 were conducted. Population estimates by sex, age group, and race/ethnicity were from the U.S. Census, as modified by SEER (available at http://www.seer.cancer.gov/popdata).

Screening, incidence, and mortality data were age-adjusted to the 2000 U.S. standard population by the direct method. Incidence and mortality data reflect 99.1% and 100% of the population, not samples. However, to be able to compare rates among states, 95% confidence intervals (CIs) were calculated using the Tiwari method (*8*). Rates and annual percentage changes (APCs) were calculated for all races/ethnicities, and all age groups combined for each state and U.S. Census region (available at https://www.census.gov/geo/reference/gtc/gtc_census_divreg.html).

Results

The 2012 BRFSS survey was administered to 133,851 women aged 21–65 years who had complete Pap data and no hysterectomy, representing 70,462,535 women in the United States. Of these 70 million women, an estimated 8.2 million (11.4%) had not been screened for cervical cancer in the past 5 years, with higher percentages among women aged 23–29 years (13.4%), 60–65 years (12.6%), Asians/Pacific Islanders (19.7%), and American Indians/Alaska Natives (16.5%). Among women with no health insurance, 23.1% had not been screened in the past 5 years, including higher percentages among women aged 50–59 years (29.8%) and Asians/Pacific Islanders (32.5%) (Table 1). Among women with no regular health care provider, 25.5% had not been screened in the past 5 years, with the highest percentages among those aged 60–65 years (37.1%) and Asians/Pacific Islanders (40.8%).

During 2007–2011, there were 62,150 cervical cancer cases in the United States. From 2007 to 2011, age-adjusted cervical cancer incidence rates decreased significantly overall (1.9% per year) and in Arizona, California, Georgia, New York, and Rhode Island, which reported the largest annual percentage decrease (9.9%) (Table 2). Compared with other

Census regions, the South had the highest incidence rate (8.5 per 100,000) (Table 2). In 2011, the overall U.S. incidence rate was 7.5 per 100,000 women (12,109 new cases), ranging from 4.5 in New Hampshire to 13.7 in DC (Figure).

During 2007–2011, there were 19,969 cervical cancer deaths in the United States. The overall age-adjusted cervical cancer death rate remained stable (nonsignificant APC of -1.2% per year), but significantly decreased in two states from 2007 to 2011 (North Carolina, 4.1%, and Virginia, 11.5%) (Table 2). Compared with other Census regions, the South had the highest death rate (2.7 per 100,000) (Table 2). In 2011, the overall U.S. death rate was 2.3 per 100,000 women (4,092 deaths), ranging from 1.2 in Utah to 4.8 in West Virginia (Figure).

Conclusion and Comments

Important disparities persist in cervical cancer screening, incidence, and mortality. While overall cervical cancer death rates have remained stable in the United States, incidence rates declined 1.9% per year. By state, incidence rates were stable across most states, with five having a significant decrease. Incidence and death rates for the United States have remained above the HP2020 targets, but are close to reaching them. Previous data from a national survey has shown that 83% of women were up-to-date with current cervical cancer recommendations with a slight downward trend observed in the percentage of women screened during 2008–2010 (*6*). More progress needs to be made toward the HP2020 objective for cervical cancer screening, especially among women who lack access to health care because they lack health care coverage or a regular health care provider. The findings show that approximately 1 in 10 women had not been screened in the past 5 years, including 1 in 4 women who had no health insurance and 1 in 4 who had no regular health care provider.

Disparities by age, race/ethnicity, and geography exist in cervical cancer. Whereas younger and older women had comparable rates of not having been screened in the past 5 years, developing or dying from cervical cancer is rare in younger women (*9*). More concerning is higher percentages of inadequately screened women among those aged >40 years, who have the highest rates of cervical cancer incidence and death. Cervical cancer incidence rates are higher for black and Hispanic women than for white women, and death rates are higher for black women (available at http://www.cdc.gov/uscs). Higher incidence and death rates and percentages of not having been screened in the past 5 years were reported in the South compared with other Census regions. The findings regarding geographic differences support other studies with findings pertaining to Appalachia, southeastern Atlantic states, the lower Mississippi Valley, and along the United States–Mexico border (*10,11*).

TABLE 1. Percentage of women aged 21–65 years who had not been screened for cervical cancer in the past 5 years,* by age group and race/ethnicity — Behavioral Risk Factor Surveillance System, United States, 2012

	Overall % not screened in the past 5 years	% with no health insurance not screened in the past 5 years	% with no regular health care provider not screened in the past 5 years
Overall	**11.4**	**23.1**	**25.5**
Age group (yrs)†			
23–29	13.4	19.1	19.7
30–39	8.3	16.6	17.2
40–49	10.1	23.9	26.1
50–59	11.7	29.8	33.7
60–65	12.6	26.6	37.1
Race/Ethnicity			
White	10.8	28.8	27.7
Black	9.2	16.8	21.4
A/PI	19.7	32.5	40.8
AI/AN	16.5	26.9	29.2
Other	13.8	29.7	34.2
Hispanic	11.7	16.7	18.4

Abbreviations: A/PI = Asian/Pacific Islander; AI/AN = American Indian/Alaska Native.
* Percentage of women aged 21–65 years who reported not having a hysterectomy and not receiving a Papanicolaou (Pap) at all or in the past 5 years; age-standardized to the 2000 US Census standard population.
† Data are presented for 23–65 year olds because women aged 21–22 years might not have had the opportunity for screening in the first year of that recommendation.

Financial and nonfinancial barriers might explain some disparities in screening percentages. Of the estimated 8.2 million women who had not been screened in the past 5 years, 69.9% had insurance and had a regular health care provider, 9.6% had insurance but no regular health care provider, 9.8% had no insurance but did have a regular health care provider, and 10.7% had neither. For more than 20 years, the National Breast and Cervical Cancer Early Detection Program (available at http://www.cdc.gov/cancer/nbccedp) has provided free or low-cost screening and diagnostic breast and cervical cancer services to low-income, underinsured, and uninsured women and access to state Medicaid programs for treatment. In addition, the Affordable Care Act is reducing financial barriers to screening by increasing access to insurance coverage for clinical preventive services rated A or B by the U.S. Preventive Services Task Force. Cervical cancer screening is now provided with no cost-sharing for women covered by Medicare and in most private insurance plans and for newly eligible beneficiaries of the Medicaid expansion (*12*). Both could help in the effort to increase the cervical cancer screening proportion from 83% in 2010 to the HP2020 target of 93% (*6*). However, nonfinancial barriers, such as lack of awareness and lack of transportation also need to be addressed (*13*).

In addition to focusing on women who have not been screened in the past 5 years, continued timely and regular screening for women who are meeting current cervical cancer

TABLE 2. Age-adjusted cervical cancer incidence and death rates* (2007–2011), annual percentage change (APC)† from 2007 to 2011, and percentage of women aged 21–65 years in 2012 not screened for cervical cancer in the past 5 years,§ by Census region and state — United States

	Incidence rate				Death rate				% overall not screened		% with no insurance not screened		% with no provider not screened	
	2007–2011				2007–2011				2012					
Census region/State	Rate	(95% CL)	APC	(95% CL)	Rate	(95% CL)	APC	(95% CL)	%	(95% CI)	%	(95% CI)	%	(95% CI)
United States overall	**7.8**	**(7.8, 7.9)**	**-1.9¶**	**(-3.5, -0.3)**	**2.3**	**(2.3, 2.4)**	**-1.2**	**(-3.3, 0.9)**	**11.4**	**(11.1–11.8)**	**23.1**	**(22.0–24.3)**	**25.5**	**(24.3-26.7)**
Census region														
Northeast	7.5	(7.3, 7.6)	-2.7¶	(-4.8, -0.6)	2.1	(2.0, 2.1)	0.4	(-4.0, 5.0)	10.9	(10.1–11.9)	22.6	(19.7–25.8)	28.0	(24.5-31.9)
Midwest	7.4	(7.3, 7.5)	-1.2	(-3.3, 1.0)	2.2	(2.2, 2.3)	-0.6	(-3.2, 2.0)	10.6	(10.0–11.2)	25.9	(23.7–28.2)	28.1	(25.9-30.4)
South	8.5	(8.4, 8.6)	-1.4	(-3.6, 0.8)	2.7	(2.6, 2.7)	-1.9	(-4.5, 0.7)	12.3	(11.6–12.9)	23.8	(22.1–25.6)	25.4	(23.6-27.4)
West	7.3	(7.2, 7.5)	-2.8¶	(-4.7, -0.8)	2.1	(2.0, 2.2)	-1.8	(-3.7, 0.3)	11.5	(10.7–12.4)	20.6	(18.6–22.7)	23.3	(21.1-25.8)
State														
Alabama	8.6	(8.0, 9.1)	-4.3	(-11.9, 3.8)	3.0	(2.8, 3.4)	1.4	(-6.3, 9.7)	12.5	(10.8–14.5)	27.7	(22.7–33.4)	26.9	(21.5-32.9)
Alaska	7.1	(5.8, 8.5)	-8.2	(-33.2, 26.2)	2.4	(1.6, 3.3)	—**	—	12.4	(10.0–15.4)	21.6	(15.8–28.8)	23.3	(18.2-29.3)
Arizona	6.9	(6.5, 7.4)	-4.9¶	(-9.4, -0.2)	2.0	(1.8, 2.2)	2.2	(-3.1, 7.9)	13.8	(11.5–16.6)	22.9	(17.5–29.4)	23.3	(17.8-29.9)
Arkansas	10.0	(9.3, 10.7)	-3.8	(-14.9, 8.7)	3.4	(3.0, 3.8)	0.8	(-10.9, 14.1)	15.9	(13.4–18.7)	27.4	(22.2–33.4)	32.8	(26.5-39.7)
California	7.8	(7.7, 8.0)	-3.8¶	(-6.2, -1.4)	2.3	(2.2, 2.4)	-1.0	(-5.9, 4.2)	10.5	(9.0–12.1)	17.8	(14.6–21.6)	20.7	(17.0-25.0)
Colorado	6.2	(5.8, 6.6)	-3.9	(-8.3, 0.7)	1.6	(1.4, 1.9)	-6.2	(-24.2, 16.1)	9.3	(8.1–10.7)	22.0	(18.0–26.5)	25.4	(21.3-30.0)
Connecticut	6.2	(5.7, 6.8)	1.6	(-10.7, 15.5)	1.6	(1.3, 1.8)	3.2	(-6.8, 14.3)	8.6	(7.2–10.3)	24.1	(18.1–31.3)	28.3	(22.2-35.4)
Delaware	8.8	(7.6, 10.1)	-0.3	(-2.8, 2.2)	2.5	(1.9, 3.3)	—	—	7.3	(5.8–9.2)	18.6	(13.3–25.5)	23.7	(16.1-33.5)
District of Columbia	10.3	(8.7, 12.1)	3.7	(-20.3, 34.8)	2.6	(1.8, 3.5)	—	—	8.8	(6.3–12.2)	13.3	(6.0–27.0)	14.7	(8.5-24.3)
Florida	9.0	(8.8, 9.3)	-0.9	(-5.8, 4.3)	2.6	(2.5, 2.8)	2.4	(-2.3, 7.4)	14.7	(12.4–17.5)	29.0	(23.4–35.4)	26.8	(21.7-32.5)
Georgia	8.2	(7.8, 8.5)	-3.4¶	(-5.8, -0.9)	2.7	(2.5, 2.9)	-3.7	(-7.6, 0.3)	10.9	(9.0–13.2)	22.6	(17.6–28.5)	23.0	(17.6-29.5)
Hawaii	7.3	(6.4, 8.3)	-4.7	(-23.3, 18.3)	1.8	(1.4, 2.3)	—	—	13.0	(11.1–15.2)	25.0	(18.5–32.8)	27.6	(21.5-34.6)
Idaho	5.9	(5.1, 6.7)	9.7	(-5.0, 26.7)	2.1	(1.7, 2.6)	—	—	18.7	(15.6–22.3)	26.0	(19.5–33.6)	32.2	(24.8-40.6)
Illinois	8.4	(8.1, 8.7)	-3.5	(-10.7, 4.3)	2.6	(2.5, 2.8)	-1.1	(-5.9, 4.0)	9.4	(7.8–11.4)	17.8	(12.2–25.2)	26.8	(19.7-35.3)
Indiana	7.5	(7.1, 8.0)	0.0	(-1.9, 2.0)	2.4	(2.2, 2.6)	1.7	(-10.8, 16.0)	14.3	(12.5–16.3)	35.7	(30.1–41.8)	38.7	(32.8-45.0)
Iowa	6.8	(6.2, 7.4)	1.5	(-5.5, 9.0)	2.1	(1.8, 2.4)	-0.4	(-6.3, 5.8)	9.5	(8.0–11.3)	25.1	(18.8–32.8)	25.3	(19.4-32.3)
Kansas	7.2	(6.5, 7.8)	3.5	(-11.5, 21.1)	1.9	(1.6, 2.2)	-0.1	(-8.8, 9.3)	11.4	(10.0–12.9)	25.4	(21–30.4)	28.3	(23.3-34)
Kentucky	8.7	(8.1, 9.3)	-2.0	(-8.4, 4.7)	3.1	(2.8, 3.4)	1.5	(-13.5, 19.1)	13.6	(11.9–15.5)	25.2	(20.8–30.3)	27.9	(22.9-33.5)
Louisiana	9.4	(8.9, 10.0)	-2.2	(-11.8, 8.5)	3.1	(2.8, 3.5)	-4.5	(-14.7, 6.8)	12.1	(10.2–14.3)	20.5	(16.2–25.5)	28.7	(22.8-35.3)
Maine	6.8	(5.9, 7.7)	-0.8	(-10.4, 9.9)	1.6	(1.2, 2.0)	—	—	6.9	(5.8–8.2)	18.8	(14.4–24.1)	34.6	(27.5-42.4)
Maryland	6.8	(6.4, 7.2)	0.8	(-6.4, 8.6)	2.2	(2.0, 2.5)	-5.2	(-11.0, 1.1)	8.7	(7.2–10.4)	18.8	(13.5–25.6)	16.2	(11.9-21.6)
Massachusetts	5.5	(5.1, 5.8)	-0.3	(-3.8, 3.3)	1.4	(1.2, 1.6)	6.2	(-9.6, 24.8)	7.8	(6.9–8.9)	19.6	(14.0–26.7)	22.7	(18.1-27.9)
Michigan	7.3	(6.9, 7.6)	-3.8	(-8.4, 1.0)	2.1	(1.9, 2.3)	2.1	(-1.8, 6.0)	9.8	(8.5–11.2)	26.9	(22.0–32.5)	30.7	(25.5-36.5)
Minnesota	6.0	(5.6, 6.4)	1.8	(-2.9, 6.7)	1.4	(1.2, 1.6)	1.2	(-19.1, 26.5)	8.4	(7.1–9.9)	19.2	(14.4–25.2)	19.6	(16.0-23.7)
Mississippi	9.7	(9.0, 10.4)	1.5	(-7.3, 11.2)	3.5	(3.1, 3.9)	-8.1	(-16.7, 1.3)	14.9	(13.0–17.1)	26.4	(21.6–31.8)	26.0	(21.1-31.6)
Missouri	8.1	(7.7, 8.6)	-0.7	(-7.7, 6.8)	2.5	(2.3, 2.8)	0.9	(-12.4, 16.2)	13.1	(11.1–15.3)	32.3	(26.0–39.3)	26.9	(21.2-33.4)
Montana	6.3	(5.3, 7.3)	1.1	(-7.4, 10.4)	1.5	(1.1, 2.0)	—	—	11.6	(10.0–13.4)	24.2	(19.7–29.4)	23.9	(19.8-28.6)
Nebraska	7.2	(6.4, 8.0)	-1.6	(-16, 15.4)	1.9	(1.5, 2.3)	—	—	11.1	(10.0–12.3)	21.9	(18.2–26.2)	26.8	(22.4-31.8)
Nevada	NS	NS	NS	NS	2.1	(1.8, 2.5)	-4.3	(-24.3, 20.9)	17.7	(15.1–20.6)	28.0	(22.5–34.3)	29.0	(23.4-35.2)
New Hampshire	5.2	(4.4, 6.0)	-4.6	(-13.0, 4.6)	1.8	(1.4, 2.3)	—	—	8.6	(7.0–10.6)	26.3	(20.2–33.5)	32.7	(25.4-41.0)
New Jersey	8.3	(8.0, 8.7)	-4.2	(-9.0, 0.9)	2.3	(2.1, 2.5)	6.0	(-0.4, 12.8)	11.8	(10.4–13.3)	22.9	(19.2–27.1)	25.7	(21.4-30.6)
New Mexico	7.6	(6.8, 8.4)	2.2	(-7.5, 13.0)	2.1	(1.7, 2.5)	-12.6	(-29.9, 9.0)	12.0	(10.5–13.6)	23.6	(19.9–27.9)	22.5	(18.9-26.5)
New York	8.1	(7.9, 8.4)	-3.8¶	(-6.8, -0.8)	2.3	(2.2, 2.4)	-2.1	(-11.4, 8.1)	12.0	(10.0–14.3)	20.3	(15.0–26.9)	26.6	(20.2-34.0)
North Carolina	7.0	(6.7, 7.3)	-0.8	(-5.8, 4.3)	2.1	(1.9, 2.3)	-4.1¶	(-7.7, -0.3)	9.6	(8.5–10.9)	21.8	(18.5–25.6)	25.6	(21.6-30.0)
North Dakota	6.2	(5.0, 7.6)	—	—	1.3	(0.9, 2.0)	—	—	10.2	(8.1–12.7)	22.4	(15.6–31.1)	26.5	(19.7-34.5)
Ohio	7.7	(7.4, 8.0)	-0.7	(-7.3, 6.3)	2.6	(2.5, 2.8)	-3.5	(-7.8, 0.9)	11.0	(9.7–12.5)	26.1	(21.8–31.0)	30.6	(25.8-35.8)
Oklahoma	9.9	(9.3, 10.6)	-2.2	(-9.7, 5.9)	2.8	(2.5, 3.2)	-5.4	(-21.9, 14.5)	14.0	(12.4–15.9)	26.0	(21.9–30.5)	30.9	(26.4-35.8)
Oregon	7.2	(6.7, 7.8)	-7.1	(-14.2, 0.5)	2.0	(1.7, 2.3)	3.4	(-16.5, 27.9)	12.0	(10.0–14.4)	22.9	(17.6–29.2)	35.6	(28.9-42.9)
Pennsylvania	7.9	(7.6, 8.2)	-1.6	(-8.0, 5.3)	2.1	(2.0, 2.3)	0.8	(-7.9, 10.3)	11.9	(10.4–13.6)	26.8	(22.0–32.1)	33.1	(27.2-39.6)
Rhode Island	6.2	(5.3, 7.2)	-9.9¶	(-15.7, -3.8)	1.4	(1.0, 1.9)	—	—	7.8	(6.2–9.7)	15.7	(11.3–21.6)	29.0	(22.1-37.0)
South Carolina	8.2	(7.7, 8.8)	-2.5	(-15.1, 12.0)	2.8	(2.6, 3.2)	-4.3	(-9.4, 1.1)	12.7	(11.1–14.4)	26.5	(22.3–31.2)	30.7	(26.0-35.7)
South Dakota	6.6	(5.5, 7.9)	5.5	(-9.4, 22.8)	2.1	(1.5, 2.8)	—	—	10.4	(8.3–12.9)	29.3	(21.9–38.1)	22.0	(16.1-29.1)
Tennessee	8.5	(8.1, 9.0)	-0.2	(-9.1, 9.5)	2.8	(2.6, 3.1)	1.7	(-10.5, 15.5)	11.4	(9.6–13.4)	24.2	(19.4–29.9)	28.1	(22.8-34.2)
Texas	9.4	(9.1, 9.6)	-1.5	(-3.6, 0.5)	2.8	(2.7, 2.9)	-2.2	(-6.1, 1.7)	13.7	(12.0–15.6)	21.6	(18.3–25.4)	23.7	(19.8-28.1)
Utah	5.3	(4.7, 5.9)	4.0	(-5.3, 14.2)	1.2	(0.9, 1.5)	—	—	14.0	(12.6–15.4)	22.0	(18.1–26.3)	27.1	(23.3-31.4)
Vermont	4.3	(3.3, 5.4)	—	—	1.3	(0.8, 1.9)	—	—	8.6	(7.0–10.4)	30.9	(22.8–40.5)	24.4	(17.7-32.6)
Virginia	6.3	(5.9, 6.6)	-1.6	(-4.0, 0.8)	2.1	(1.9, 2.3)	-11.5¶	(-18.0, -4.6)	9.0	(7.6–10.6)	19.9	(15.3–25.4)	17.7	(13.7-22.5)
Washington	6.9	(6.5, 7.3)	3.3	(-4.4, 11.6)	1.9	(1.7, 2.1)	-5.0	(-17.7, 9.8)	11.1	(9.8–12.5)	23.2	(19.5–27.4)	25.4	(21.6-29.6)
West Virginia	10.2	(9.3, 11.2)	3.2	(-4.4, 11.5)	3.3	(2.8, 3.8)	11.1	(-10.4, 37.7)	14.3	(12.2–16.6)	26.5	(21.1–32.6)	28.3	(22.7-34.7)
Wisconsin	5.9	(5.5, 6.3)	1.6	(-5.6, 9.4)	1.5	(1.4, 1.8)	-1.9	(-14.2, 12.1)	9.3	(7.3–11.9)	23.4	(15.6–33.6)	26.1	(18.4-35.6)
Wyoming	8.4	(6.9, 10.1)	11.0	(-2.0, 25.7)	2.8	(2.0, 3.8)	—	—	14.1	(11.6–17.2)	23.0	(17.6–29.6)	25.1	(19.3-32.0)

Abbreviations: CL = confidence limits; CI = confidence interval; NS = not shown; state did not meet US Cancer Statistics (USCS) publication criteria for 2007–2011.

Sources: Cancer incidence combines cancer registry data from the National Program of Cancer Registries and the Surveillance, Epidemiology, and End Results Program that met USCS publication criteria for 2007–2011, covering 99.1% of the U.S. population. Additional information available at http://www.cdc.gov/uscs. Mortality data are provided by the National Vital Statistics System, covering 100% of the U.S. population. Cervical cancer screening data are from the 2012 Behavioral Risk Factor Surveillance survey. Available at http://www.cdc.gov/brfss.

* Per 100,000 population, age-adjusted to the 2000 US standard population (19 age groups).

† Calculated using weighted least squares method and joinpoint regression modeling.

§ Percentage of women aged 21–65 years who reported not having a hysterectomy and not receiving a Papanicolaou (Pap) at all or in the past 5 years; age-standardized to the 2000 US standard population.

¶ The APC is significantly different from zero ($p<0.05$).

** Data suppressed because there were fewer than 16 cases or deaths in a single year.

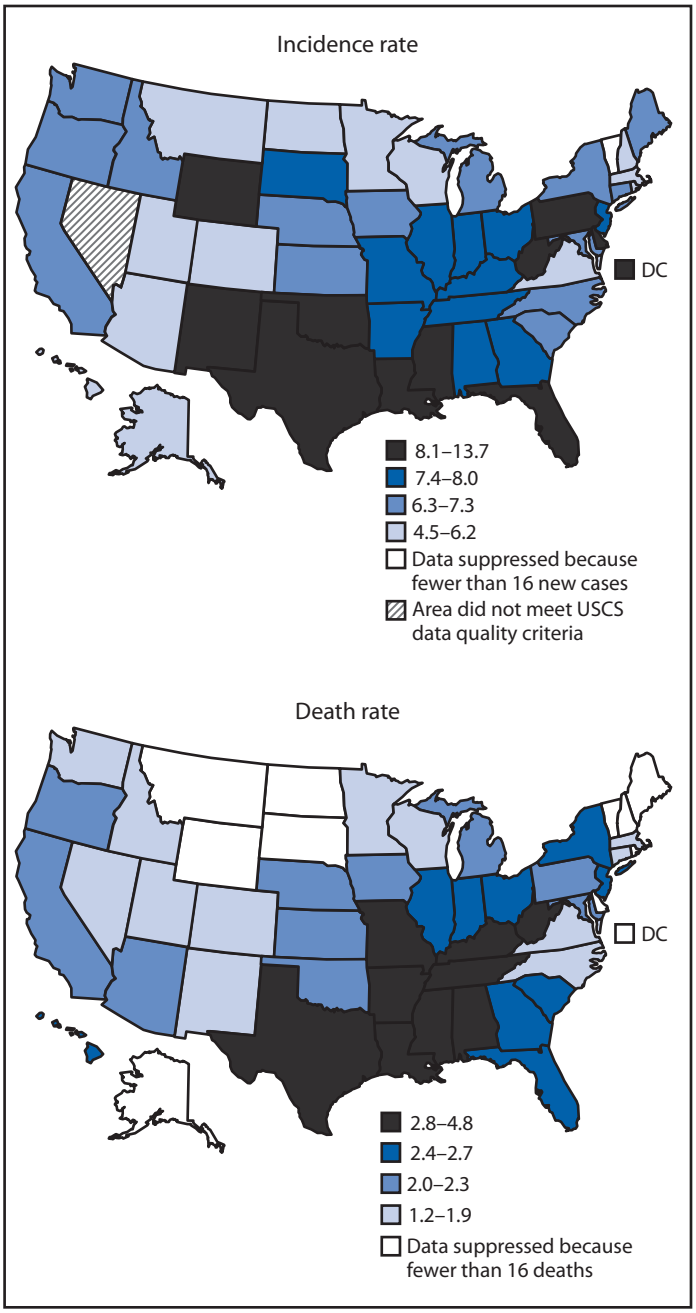
screening recommendations must continue. In 2012, for the first time, all national screening organizations (the U.S. Preventive Services Task Force, American Cancer Society, and American College of Obstetrics and Gynecology) agreed on when and how often to screen for cervical cancer (available at http://www.cdc.gov/cancer/cervical/pdf/guidelines.pdf). With multiple age-dependent options for screening and evolving technologies, there is a continuing need to clarify for providers and for women the best approach for screening.

The introduction of the HPV vaccine as a primary prevention measure to reduce cervical cancer cases and deaths is promising, but the vaccine continues to be underused. The Advisory Committee on Immunization Practices recommends routine HPV vaccination of children aged 11 or 12 years (*14*). Findings from the 2013 National Immunization Survey-Teen indicate that 37.6% of adolescent girls (aged 13–17 years) and 13.9% of adolescent boys completed the 3-dose series (*15*). Modeling studies have shown that HPV vaccination and cervical cancer screening combined could prevent nearly 93% of new cervical cancer cases (*16*). Efforts are needed to improve HPV vaccination as recommended. Current cervical cancer screening recommendations remain the same, regardless of vaccination status (available at http://www.cdc.gov/cancer/cervical/pdf/guidelines.pdf).

The findings in this report are subject to at least five limitations. First, because BRFSS is administered by telephone, only noninstitutionalized adults with landline telephones or cell phones are represented and might not be representative of the entire U.S. population. Second, recent trends in cervical cancer screening cannot be examined because of changes in BRFSS sampling methodology and weighting in 2011 (*7*). Third, responses regarding screening are self-reported and not confirmed by review of medical records. Fourth, the screening prevalence data included women without a hysterectomy; however, incidence rates did not adjust for hysterectomy and might be underreported (*17*). Finally, because the BRFSS median response rate was <50%, nonresponse bias might have affected the results.

A more thorough understanding of the etiologic role of HPV in cervical cancer has provided the foundation for targeted approaches for prevention, including the HPV vaccination and HPV-based screening. However, regardless of the improvement in prevention methods, most cervical cancer occurs in women who have not had recent screening. By addressing financial and nonfinancial barriers, there is the opportunity to see progress by increasing screening and reducing incidence and death from this disease.

FIGURE. Cervical cancer incidence and death rates*— United States, 2011



Abbreviation: USCS = U.S. Cancer Statistics.
Sources: Cancer incidence combines cancer registry data from the National Program of Cancer Registries and the Surveillance, Epidemiology, and End Results Program that met USCS publication criteria for 2011, covering 99.1% of the U.S. population. Additional information available at: http://www.cdc.gov/uscs. Mortality data are provided by the National Vital Statistics System, covering 100% of the U.S. population.
* Per 100,000 population, age-adjusted to the 2000 US standard population (19 age groups).

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Establishment of a Community Care Center for Isolation and Management of Ebola Patients — Bomi County, Liberia, October 2014

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On November 4, 2014, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

As of October 29, 2014, a total of 6,454 Ebola virus disease (Ebola) cases had been reported in Liberia by the Liberian Ministry of Health and Social Welfare, with 2,609 deaths (*1*). Although the national strategy for combating the ongoing Ebola epidemic calls for construction of Ebola treatment units (ETUs) in all 15 counties of Liberia, only a limited number are operational, and most of these are within Montserrado County. ETUs are intended to improve medical care delivery to persons whose illnesses meet Ebola case definitions (*2*), while also allowing for the safe isolation of patients to break chains of transmission in the community. Until additional ETUs are constructed, the Ministry of Health and Social Welfare is supporting development of community care centers (CCCs) for isolation of patients who are awaiting Ebola diagnostic test results and for provision of basic care (e.g., oral rehydration salts solutions) to patients confirmed to have Ebola who are awaiting transfer to ETUs. CCCs often have less bed capacity than ETUs and are frequently placed in areas not served by ETUs; if built rapidly enough and in sufficient quantity, CCCs will allow Ebola-related health measures to reach a larger proportion of the population. Staffing requirements for CCCs are frequently lower than for ETUs because CCCs are often designed such that basic patient needs such as food are provided for by friends and family of patients rather than by CCC staff. (It is customary in Liberia for friends and family to provide food for hospitalized patients.) Creation of CCCs in Liberia has been led by county health officials and nongovernmental organizations, and this local, community-based approach is intended to destigmatize Ebola, to encourage persons with illness to seek care rather than remain at home, and to facilitate contact tracing of exposed family members. This report describes one Liberian county's approach to establishing a CCC.

In March 2014, the Bomi County Community Health Department (BCCHD) built an isolation ward for Ebola patients adjacent to the county's single hospital after receiving news of the first Ebola case in Liberia (Figure). Because Bomi County (population: 84,000) borders Montserrado County (*3*), this 12-bed isolation ward was designed as part of a contingency plan in case patients in Bomi County could not be transferred to an ETU in Montserrado County. On June 19, the first Ebola case was reported in Bomi County in a man aged 40 years who was immediately taken to an ETU in Montserrado County. An additional 12 patients whose illnesses met case definitions for suspected or probable Ebola were identified in July 2014, 11 of whom were transferred to Montserrado County and one of whom died before transfer. Four of these 12 Ebola cases occurred among health care workers who had attended the same funeral, and mounting concerns about infection control prompted closure of the county hospital and all 23 clinics in Bomi County by late July. When the facilities reopened nearly 1 month later, ETUs in Montserrado County were no longer accepting transfers; on August 18, 2014, the Bomi County isolation ward therefore admitted its first patient with suspected Ebola. As the isolation ward's census grew, patients whose illnesses met case definitions for suspected, probable, and confirmed Ebola were assigned to different areas of the ward that were separated by incomplete partitions.

On October 9, 2014, a second newly constructed 15-bed ward was opened adjacent to the original isolation ward. Both wards are staffed by BCCHD health care workers 24 hours per day and by trained Ebola survivors from the community. BCCHD has also provided boarding space for relatives of admitted patients who do not live near the hospital to facilitate patient visits and provision of food and support for patients. Additional assistance with operations (e.g., performing safe burials) and supplies (e.g., personal protective equipment) have been provided by local civil society and concerned private citizens; the pivotal role played by various segments of the community led to these two complementary wards being labeled as a CCC.

Infection control is a major concern within the CCC for patients, health care workers, and the lay community. For example, patients suspected of having Ebola but who do not actually have Ebola will occasionally be admitted to the CCC. These patients might remain within the CCC for days before receiving their diagnostic test results confirming their Ebola-free status, during which time they are at risk for an Ebola virus exposure within the CCC itself. All patients discharged from the CCC after testing negative for Ebola are therefore monitored for Ebola symptoms daily for 21 days by trained BCCHD personnel, regardless of whether the patients are discharged to home or to the hospital for additional non-Ebola care. To reduce the risk for health care–associated Ebola virus infections within the CCC, BCCHD separates patients between the two

FIGURE. Bomi County community care center, Liberia*

Photo/Neil M. Vora

* The structure shown here was built by the Bomi County Community Health Department as an isolation ward for Ebola patients in March 2014 after receiving news of the first Ebola cases in Liberia. A second ward was opened adjacent to this one in September 2014, and together these wards function as a community care center. The ward shown here is exclusively for patients with confirmed Ebola and for patients with severe diarrhea, vomiting, or bleeding who have not been confirmed to have Ebola but who would be highly infectious if they had Ebola.

wards according to their risk for transmitting Ebola virus. The first ward is exclusively for patients with confirmed Ebola and for patients with severe diarrhea, vomiting, or bleeding who have not been confirmed to have Ebola but who would be highly infectious if they had Ebola. The second ward is designated for patients not confirmed to have Ebola and who do not have severe diarrhea, vomiting, or bleeding. Materials, patients, and staff move in one direction, from lower-risk areas (second ward) to higher-risk areas (first ward). For example, if a patient in the second ward experiences severe diarrhea, vomiting, or bleeding, or if laboratory testing confirms that the patient has Ebola, then the patient is moved to the first ward. Given the risks of working in the CCC, BCCHD staff and Ebola survivors undergo infection control training with personal protective equipment before being allowed to enter the CCC. Members of the community are not permitted to come into direct contact with patients and rely on staff to deliver goods to patients.

Since June 19, 2014, Bomi County has reported 72 confirmed, 43 probable, and 62 suspected Ebola cases (*1*). BCCHD established its own CCC in response to this growing case load and because ETUs in Montserrado County were not accepting patient transfers; this CCC now serves as a regional referral center for neighboring counties. An ETU supported by the U.S. Department of Defense is currently under construction in Bomi County, and BCCHD and community leaders are

discussing the possibility of building a second CCC in a more remote region of Bomi County where a cluster of cases was recently identified. Once the ETU is functional, the Bomi County CCCs will be disinfected and be used as a holding place for persons with high-risk Ebola virus exposures to allow for close follow-up and response in case any of these persons develop Ebola.

Although CCCs are being used as an interim solution to the current shortage of functioning ETUs, there is an urgent need to monitor and evaluate this strategy, including whether CCCs have an impact on Ebola virus transmission within the community. To promote consistency in layout, infection control, and clinical management within CCCs, the Ministry of Health and Social Welfare and international partners have developed operational guidelines for CCCs. Trainings are underway to address shortages of staff who are capable of working safely in CCCs to reduce the risk for health care–associated Ebola virus infections. Counties will need ongoing technical assistance to improve triage processes at all county health care facilities so that patients presenting for care whose illnesses meet suspected or probable Ebola case definitions are correctly identified, while also minimizing ETU referrals for patients whose illnesses do not meet suspected or probable Ebola case definitions. Given projections that this outbreak will continue for months (*4*), there is a need to develop decentralized capacity to manage patients with Ebola, and CCCs are a possible means for quickly developing a local infrastructure for isolation and care of ill persons.

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Notes from the Field

Severe Environmental Contamination and Elevated Blood Lead Levels Among Children — Zambia, 2014

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Lead poisoning can have devastating health consequences, especially for children, with childhood lead exposure estimated to contribute to 600,000 new cases globally of children with intellectual disabilities every year. Lead exposure is entirely preventable, yet is estimated to account for 0.6% of the global burden of disease, with the highest burden in developing regions (*1*). Kabwe, the second largest city in Zambia with a population of approximately 203,000, is located in Zambia's Copperbelt. During 1904–1994, lead mining and smelting operations contaminated the soil in residential areas, but no extensive environmental health assessment was completed (*2*). In 2003, the World Bank funded the Copperbelt Environmental Project to assist the Government of Zambia in addressing environmental health problems related to the mining sector. Components of the project included removal of mining waste materials, soil remediation, resident evacuation, and treatment of lead-exposed children. During July 22–28, 2014, a team from PureEarth/Blacksmith Institute, the City University of New York School of Public Health, and Green Cross Switzerland conducted extensive surface soil testing and blood lead testing of children in six communities adjacent to the now-closed Kabwe mines and smelters.

Surface soil lead concentrations were measured at 339 locations in residential areas using an X-ray fluorescence spectrometer. The approximately 4 km^2 sampling area encompassed 12 residential neighborhoods near the abandoned smelters and mine. Surface soil lead concentrations ranged from 139 mg/kg to 62,142 mg/kg, with a geometric mean concentration of 1,470 mg/kg. The highest results in soil were found in neighborhoods directly adjacent to the abandoned smelters. Of the 339 soil tests, 86 readings (25.4%) were above the U.S. Environmental Protection Agency lead in soil guidance value of 400 mg/kg (*3*), and 98% were above the Zambia guideline of 200 mg/kg. In comparison, lead concentrations in 25 surface soil samples taken in the capital city of Lusaka ranged from 12 mg/kg to 66 mg/kg.

In addition to soil testing, 196 children aged 2–8 years living within these communities were tested for blood lead using a LeadCare II blood testing system (Magellan Diagnostics, Inc., N. Billerica, Massachusetts) under the supervision of the district health center. The system uses capillary blood, and children's fingers were thoroughly cleaned before testing. The mean blood lead level (BLL) was 48.3 micrograms per deciliter (μg/dL) of whole blood. The lowest BLL measured was 13.6 μg/dL. The upper BLL of detection by the testing system is 65.0 μg/dL; 52 (26.5%) readings exceeded that limit. The upper value for the CDC reference range for BLLs in children is 5 μg/dL (*2*). CDC recommends that lead chelation therapy be considered when a child has a BLL ≥45 μg /dL.* Previous World Bank funding provided modest case-management assistance and chelation therapy for severe cases of lead poisoning; however, such efforts have been suspended and are currently unavailable.

Reports of lead poisoning from mining, smelters, and battery processing operations in other low-income countries demonstrate the severity of lead poisoning in children (*4*). In a review of 242 studies of known chemically contaminated sites, lead was the primary contaminant in 57 (25%) studies, representing 8,345 exposed children (*5*).

The economically disadvantaged communities living near the former lead mining and smelting site in Kabwe are at significant risk from lead contamination. Additional hotspot remediation and mine tailings dust control measures should be considered as a primary preventive measure. More urgent is the implementation of a BLL surveillance and treatment program for affected children and behavioral and educational interventions to reduce the extent of the poisoning and prevent continued exposure.

* Additional information available at http://www.cdc.gov/nceh/lead/acclpp/blood_lead_levels.htm.

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Announcement

World Pneumonia Day — November 12, 2014

The sixth annual World Pneumonia Day is being observed November 12, 2014, to raise awareness about pneumonia's toll and to promote interventions to protect against, treat, and prevent the disease globally. The United States has made great strides in protecting children from the serious, and sometimes deadly, effects of pneumonia through recent vaccination efforts. Tennessee, for example, is experiencing historically low rates of pneumonia hospitalizations in children aged <2 years since pneumococcal conjugate vaccines were introduced in 2000 (*1*). Data suggest that this progress also is being seen across the country (*2*). In spite of this success, however, pneumonia still kills approximately 50,000 people in the United States each year, 85% of whom are adults aged ≥65 years. In response, this year CDC recommended pneumococcal conjugate vaccine for adults aged ≥65 years.

Globally, pneumonia kills nearly 1 million children aged <5 years each year (*3*). In addition to bacterial pathogens, many viruses such as respiratory syncytial virus, influenza, and measles also are major causes of pneumonia globally. Many deaths and illnesses from pneumonia can be prevented with the use of 1) pneumococcal, *Haemophilus influenzae* type b (Hib), influenza, and measles vaccines; 2) appropriate antimicrobial therapy; and 3) supportive health care, among other strategies.

Communities around the world face a range of respiratory disease threats, including reemerging or newly identified pathogens. In late summer, infection with the uncommon enterovirus EV-D68 led to the hospitalization of hundreds of children in multiple states (*4*). In and around the Arabian Peninsula, a recently recognized coronavirus (Middle East respiratory syndrome coronavirus) has been fatal in about one third of reported cases (*5*). Vaccines are not available to provide protection against these or many of the other pathogens that commonly cause pneumonia, including respiratory syncytial virus, human metapneumovirus, and *Mycoplasma pneumoniae*, highlighting the importance of research into vaccine development as well as effective treatment and diagnostics for viral and bacterial pneumonia. Additional information regarding World Pneumonia Day is available at http://worldpneumoniaday.org.

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Erratum

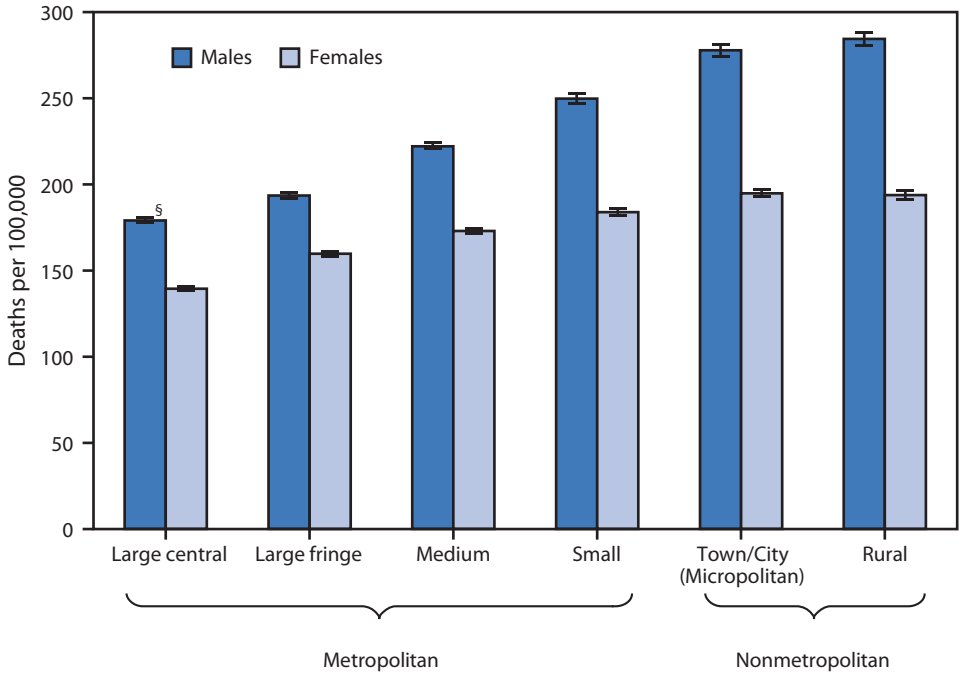
Vol. 63, No. Suppl 4

In the *MMWR* Supplement, "CDC National Health Report: Leading Causes of Morbidity and Mortality and Associated Behavioral Risk and Protective Factors—United States, 2005–2013," an error occurred in Table 4 on page 25. Three rates for 2013 for foodborne illness (0.26 for *Listeria* infection, 15.19 for *Salmonella* infection, and 1.15 for Shiga toxin–producing *Escherichia coli* infection) should have been footnoted as "data are preliminary."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Age-Adjusted Death Rates from Chronic Obstructive Pulmonary Disease (COPD)* Among Persons Aged ≥55 Years, by Sex and Urbanization of County of Residence†— United States, 2009–2011



* Per 100,000 standard population. Deaths from COPD are those coded J40–J44 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.

During 2009–2011, higher death rates for COPD among persons aged ≥55 years were associated with more rural localities, with rates increasing steadily from the least to the most rural county. For males, the age-adjusted COPD death rate in rural counties was 59% higher than in large central metropolitan counties (284.3 versus 178.9 deaths per 100,000 population). For females, the age-adjusted COPD death rate in rural counties was 39% higher than in large central metropolitan counties (193.6 versus 139.3 deaths per 100,000 population). COPD death rates for males were 21% to 47% higher than for females, with the largest differentials observed in nonmetropolitan counties (i.e., town/city and rural counties).

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

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