

Usual Sodium Intakes Compared with Current Dietary Guidelines — United States, 2005–2008

High sodium intake can increase blood pressure and the risk for heart disease and stroke (1,2). According to the *Dietary Guidelines for Americans, 2010* (3), persons in the United States aged ≥ 2 years should limit daily sodium intake to $< 2,300$ mg. Subpopulations that would benefit from further reducing sodium intake to 1,500 mg daily include 1) persons aged ≥ 51 years, 2) blacks, and 3) persons with hypertension, diabetes, or chronic kidney disease (3). To estimate the proportion of the U.S. population for whom the 1,500 mg recommendation applies and to assess the usual sodium intake for those persons, CDC and the National Institutes of Health used data for 2005–2008 from the National Health and Nutrition Examination Survey (NHANES). This report summarizes the results of that assessment, which determined that, although 47.6% of persons aged ≥ 2 years meet the criteria to limit their daily sodium intake to 1,500 mg, the usual daily sodium intake for 98.6% of those persons was $> 1,500$ mg. Moreover, for 88.2% of the remaining U.S. population, daily sodium intake was greater than the recommended $< 2,300$ mg. New population-based strategies and increased public health and private efforts will be needed to meet the *Dietary Guidelines* recommendations.

NHANES is a nationally representative, multistage survey of the U.S. non-institutionalized population.* During NHANES 2005–2008, a total of 18,823 participants aged ≥ 2 years were interviewed and examined. Blood pressure was measured, blood and urine were collected for testing, and a 24-hour dietary recall was administered. A second 24-hour dietary recall was administered by telephone 3–10 days later. Dietary intake for children aged 2–5 years was recalled by a proxy, for children 6–11 years by the participant assisted by a proxy, and for all others by the participant. Examination response rates were 76% during the study period. Excluded from the initial sample were pregnant women, women whose pregnancy status was

not recorded (694), and participants who reported being on renal dialysis (39). Among participants aged ≥ 12 years, 5,508 were randomly assigned to a morning examination, fasted for 8–24 hours, and had fasting plasma glucose, glycohemoglobin (HbA1c), serum creatinine concentration, and urine albumin and creatinine measured. Excluded were persons with missing diabetes data (18) or blood pressure data (898), yielding an analytic sample of 9,468 participants, 4,268 aged 2–11 years and 5,200 aged ≥ 12 years.

Persons with a recommended daily sodium intake of 1,500 mg had at least one of the following characteristics: age ≥ 51 years, non-Hispanic black race, or hypertension, diabetes, or chronic kidney disease. Hypertension was defined as mean systolic blood pressure ≥ 140 mm Hg, mean diastolic blood pressure ≥ 90 mm Hg, or self-reported use of antihypertensive

INSIDE

- 1418 Carbapenem-Resistant *Klebsiella pneumoniae* Associated with a Long-Term-Care Facility — West Virginia, 2009–2011
- 1421 State Electronic Disease Surveillance Systems — United States, 2007 and 2010
- 1424 Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine (Tdap) in Pregnant Women and Persons Who Have or Anticipate Having Close Contact with an Infant Aged < 12 Months — Advisory Committee on Immunization Practices (ACIP), 2011
- 1427 Addition of History of Intussusception as a Contraindication for Rotavirus Vaccination
- 1428 Notes from the Field: *Yersinia enterocolitica* Infections Associated with Pasteurized Milk — Southwestern Pennsylvania, March–August, 2011
- 1429 QuickStats

*Additional information available at <http://www.cdc.gov/nchs/nhanes.htm>.



medication; diabetes as self-reported diagnosis by a health-care provider, HbA1c $\geq 6.5\%$, or fasting plasma glucose ≥ 126 mg/dL; and chronic kidney disease as an estimated glomerular filtration rate < 60 mL/min/1.73 m² or urinary albumin-creatinine ratio > 30 mg/g (4,5).

Mean usual sodium intakes and proportions of the subpopulation with intake above 1,500 mg/day and at or above 2,300/mg day were estimated from up to two 24-hour dietary recalls using statistical software to account for day-to-day variation in intake with jackknife replicate weights based on survey sample weights to estimate standard errors and confidence intervals. For all other analyses, statistical software for complex surveys was used with the survey sample weights. For participants aged ≥ 12 years, survey sample weights for the fasting subsample were used. For participants aged 2–11 years, survey sample weights for the medical examination and first day diet sample were used.

Among the U.S. population aged ≥ 2 years in 2005–2008, an estimated 47.6% of the population met the criteria to limit sodium intake to 1,500 mg daily, according to the 2010 *Dietary Guidelines* (Table 1). Although this proportion differed by sex, that difference was not statistically significant after adjusting for age and race/ethnicity. The proportion of the population with a 1,500 mg daily recommendation was higher among adults (57.1%) than among children (16.2%). Among non-Hispanic blacks, non-Hispanic whites, and Mexican Americans aged ≥ 2 years, 100.0%, 44.1%, and 23.7%, respectively, were advised to limit their sodium intake to 1,500 mg daily.

Among persons aged ≥ 2 years with a 1,500 mg daily recommendation, 98.6% consumed $> 1,500$ mg sodium on a usual daily basis, including 99.4% of those aged ≥ 18 years (Table 2). Among those with a sodium recommendation of $< 2,300$ mg daily, 88.2% consumed $\geq 2,300$ mg on a usual daily basis, including 95.0% of those aged ≥ 18 years.

Reported by

Catherine M. Loria, PhD, Michael E. Mussolino, PhD, Div of Cardiovascular Sciences, National Heart, Lung, and Blood Institute, National Institutes of Health. Mary E. Cogswell, DrPH, Cathleen Gillespie, MS, Janelle P. Gunn, MPH, Darwin R. Labarthe, MD, PhD, Div for Heart Disease and Stroke Prevention; Sharon Saydah, PhD, Meda E. Pavkov, MD, Div of Diabetes Translation, National Center for Chronic Disease Prevention and Health Promotion, CDC. **Corresponding contributor:** Mary E. Cogswell, mcogswell@cdc.gov, 770-488-8053.

Editorial Note

The findings in this report indicate that 47.6% of the U.S. population aged ≥ 2 years meet the criteria of the 2010 *Dietary Guidelines* for persons who should limit sodium consumption to 1,500 mg daily (3). For the *Dietary Guidelines*, the 2005 Institute of Medicine (IOM), *Dietary Reference Intakes* were used to define the specific subpopulations for whom the 1,500 mg recommendation applies (2). These subpopulations tend to be more responsive than others to the blood pressure-raising

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

Suggested citation: Centers for Disease Control and Prevention. [Article title]. *MMWR* 2011;60:[inclusive page numbers].

Centers for Disease Control and Prevention

Thomas R. Frieden, MD, MPH, *Director*
Harold W. Jaffe, MD, MA, *Associate Director for Science*
James W. Stephens, PhD, *Director, Office of Science Quality*
Stephen B. Thacker, MD, MSc, *Deputy Director for Surveillance, Epidemiology, and Laboratory Services*
Stephanie Zaza, MD, MPH, *Director, Epidemiology and Analysis Program Office*

MMWR Editorial and Production Staff

Ronald L. Moolenaar, MD, MPH, *Editor, MMWR Series*
John S. Moran, MD, MPH, *Deputy Editor, MMWR Series*
Robert A. Gunn, MD, MPH, *Associate Editor, MMWR Series*
Teresa F. Rutledge, *Managing Editor, MMWR Series*
Douglas W. Weatherwax, *Lead Technical Writer-Editor*
Donald G. Meadows, MA, Jude C. Rutledge, *Writer-Editors*
Martha F. Boyd, *Lead Visual Information Specialist*
Maureen A. Leahy, Julia C. Martinroe,
Stephen R. Spriggs, Terraye M. Starr
Visual Information Specialists
Quang M. Doan, MBA, Phyllis H. King
Information Technology Specialists

MMWR Editorial Board

William L. Roper, MD, MPH, Chapel Hill, NC, *Chairman*
Virginia A. Caine, MD, Indianapolis, IN
Jonathan E. Fielding, MD, MPH, MBA, Los Angeles, CA
David W. Fleming, MD, Seattle, WA
William E. Halperin, MD, DrPH, MPH, Newark, NJ
King K. Holmes, MD, PhD, Seattle, WA
Deborah Holtzman, PhD, Atlanta, GA
John K. Iglehart, Bethesda, MD
Dennis G. Maki, MD, Madison, WI
Patricia Quinlisk, MD, MPH, Des Moines, IA
Patrick L. Remington, MD, MPH, Madison, WI
Barbara K. Rimer, DrPH, Chapel Hill, NC
John V. Rullan, MD, MPH, San Juan, PR
William Schaffner, MD, Nashville, TN
Anne Schuchat, MD, Atlanta, GA
Dixie E. Snider, MD, MPH, Atlanta, GA
John W. Ward, MD, Atlanta, GA

TABLE 1. Percentage of persons aged ≥ 2 years for whom recommended daily sodium intake of 1,500 mg applies,* by sex, age group, and racial/ethnic subpopulation — National Health and Nutrition Examination Survey (NHANES), United States, 2005–2008

Subpopulation	No. in sample [†]	(%) [§]	(95% CI)
Total	9,468	(47.6)	(45.1–50.1)
Sex			
Male	4,826	(45.9)	(42.9–49.0)
Female	4,642	(49.2)	(46.5–52.0)
Age group (yrs)			
2–17	5,188	(16.2)	(13.3–19.6)
≥ 18	4,280	(57.1)	(54.3–60.0)
18–50	2,334	(30.6)	(27.8–33.6)
≥ 51	1,946	(100.0)	—
Race/Ethnicity[¶]			
White, non-Hispanic	3,589	(44.1)	(40.6–47.7)
Black, non-Hispanic	2,268	(100.0)	—
Mexican-American	2,408	(23.7)	(21.0–26.8)

Abbreviation: CI = confidence interval.

* According to the *Dietary Guidelines for Americans, 2010*, U.S. residents aged ≥ 2 years should limit daily sodium intake to $< 2,300$ mg. Population subgroups that would benefit from further reducing sodium intake to 1,500 mg daily include 1) persons aged ≥ 51 years, 2) blacks, and 3) persons with hypertension, diabetes, or chronic kidney disease. Hypertension was defined as a mean systolic blood pressure ≥ 140 mm Hg, mean diastolic blood pressure ≥ 90 mm Hg, or self-reported use of antihypertensive medication. Diabetes was defined as self-reported diagnosis by a health-care provider, glycohemoglobin (HbA1c) $\geq 6.5\%$, or fasting plasma glucose ≥ 126 mg/dL. Chronic kidney disease was defined as an estimated glomerular filtration rate < 60 mL/min/1.73 m² or urinary albumin to creatinine ratio > 30 mg/g.

[†] Unweighted sample size based on examination participants among persons aged 2–11 years, and fasting participants among persons aged ≥ 12 years. Excludes pregnant females and females whose pregnancy status was unknown, persons who self-reported renal dialysis, and persons missing information regarding blood pressure, diabetes, and chronic kidney disease.

[§] Proportion weighted to the national population, using the examination survey sample weights for children aged 2–11 years and fasting survey sample weights for persons aged ≥ 12 years.

[¶] Includes only NHANES racial/ethnic populations with adequate sample size.

effects of sodium (2,3). Additionally, IOM recommends that sodium intake not exceed the tolerable upper intake level of 1,500 mg/day for all children aged 2–3 years. The tolerable upper intake level is defined as the highest daily nutrient intake level that is likely to pose no risk of adverse health effects to nearly all persons in the general population (2). When the IOM recommendation for children aged 2–3 years is combined with the subpopulations recommended in the 2010 *Dietary Guidelines* to reduce intake to 1,500 mg, 50.0% (95% confidence interval [CI] = 47.6%–52.5%) of the U.S. population aged ≥ 2 years and 30.6% (CI = 27.8%–33.6%) of persons aged 2–17 years are advised to limit sodium intake to 1,500 mg daily.

According to IOM, a usual sodium intake of 1,500 mg daily is adequate for most adults, allowing for sweat loss among moderately active persons or those exposed to high temperatures after living in a moderate temperature environment (2). The 1,500 mg level does not apply to highly active persons (e.g., competitive athletes) or to workers exposed to high

What is already known on this topic?

Dietary Guidelines for Americans, 2010 recommends that persons in the United States aged ≥ 2 years limit sodium intake to $< 2,300$ mg daily and that 1) persons aged ≥ 51 years, 2) blacks, and 3) persons with hypertension, diabetes, or chronic kidney disease should limit sodium intake to 1,500 mg daily to reduce their risk for hypertension, heart disease, and stroke.

What is added by this report?

According to the 2005–2008 National Health and Nutrition Examination Survey, the recommendations to restrict daily sodium intake to 1,500 mg applied to 47.6% of persons in the United States aged > 2 years. However, 98.5% of those persons consumed more than the recommended amount of sodium on a usual daily basis, and among those with a sodium recommendation of $< 2,300$ mg daily, 88.2% consumed more than the recommended amount on a usual daily basis.

What are the implications for public health practice?

Because usual sodium intake for nearly all U.S. residents exceeds the 2010 Dietary Guidelines, increased efforts involving the public and private sectors (e.g., voluntary reductions in processed and restaurant food) will be needed to help the public follow sodium intake recommendations and reduce medical costs and deaths associated with stroke and cardiovascular disease.

temperatures (e.g., foundry workers or firefighters) because of increased loss of sodium via sweat. However, the proportion of U.S. adults who are competitive athletes, firefighters, or foundry workers is estimated to be $< 0.2\%$.[†]

The analysis in this report confirms that mean sodium intake in 2005–2008 exceeded guidelines for persons in all subpopulations by sex, age group, race/ethnicity, and certain chronic diseases. The results generally are consistent with previous findings that the 1,500 mg recommendation applies to the majority of U.S. adults (6) and sodium intake exceeds guidelines substantially (7).

The findings in this report are subject to at least four limitations. First, NHANES data exclude institutionalized populations such as persons who reside in long-term care or correctional facilities. Second, hypertension in children aged 2–7 years or chronic kidney disease in children aged 2–11 years were not considered because both conditions are relatively rare and their precise prevalence is unknown. Third, the assessment of sodium intake excluded table salt and sodium from dietary supplements and antacids, underestimating intake by approximately 6% (1,8). Finally, dietary data are self-reported

[†] Based on the estimated number of persons who were firefighters (305,500), competitive athletes (13,620), and foundry mold and coremakers (13,550) as of May 2009 (data available at http://www.bls.gov/oes/current/oes_alpha.htm), divided by the estimated U.S. Census Population as of July 1, 2009 (307,006,550).

TABLE 2. Mean usual daily sodium intake for persons aged ≥ 2 years and percentage exceeding the recommended intake, by sex, age group, and racial/ethnic subpopulations — National Health and Nutrition Examination Survey (NHANES), United States, 2005–2008*

Subpopulation	Recommended sodium intake of 1,500 mg [†]					Recommended sodium intake of <2,300 mg [†]				
	No. in sample [§]	Mean (mg)	(SE)	%	(95% CI)	No. in sample [§]	Mean (mg)	(SE)	%	(95% CI)
Total	4,101	3,264	(6)	98.6	(98.6–98.7)	4,783	3,513	(6)	88.2	(88.0–88.5)
Sex										
Male	2,090	3,862	(9)	99.6	(99.6–99.6)	2,445	4,023	(8)	92.3	(92.1–92.5)
Female	2,011	2,765	(6)	96.0	(95.9–96.1)	2,338	3,026	(7)	80.9	(80.4–81.3)
Age group (yrs)										
2–17	1,106	2,965	(12)	97.4	(97.3–97.5)	3,408	2,985	(7)	76.2	(75.7–76.7)
≥ 18	2,795	3,289	(6)	98.8	(98.7–98.8)	1,375	3,840	(8)	95.0	(94.9–95.2)
18–50	898	3,650	(13)	99.4	(99.4–99.4)	1,375	3,840	(8)	95.0	(94.9–95.2)
≥ 51	1,897	3,111	(6)	98.7	(98.7–98.8)	—	—	—	—	—
Race-ethnicity[¶]										
White, non-Hispanic	1,319	3,295	(7)	99.2	(99.1–99.2)**	2,114	3,588	(8)	89.6	(89.3–89.9)
Black, non-Hispanic	2,114	3,198	(8)	98.2	(98.2–98.3)	—	—	—	—	—
Mexican-American	387	3,194	(21)	97.4	(97.2–97.6)	1,835	3,196	(11)	81.3	(80.7–82.0)

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

* Sodium intake includes sodium from food and beverages, including tap water and excluding salt added at the table, salt in supplements, and antacids. Mean usual sodium intakes and proportions of the subpopulation with intake $> 1,500$ mg/day and $\geq 2,300$ mg/day and SEs for all measures were estimated from up to two 24-hour dietary recalls using statistical software to account for day-to-day variation in intake with jackknife replicate weights. Among the 8,884 participants, 8,345 (93.9%) had two 24-hour dietary recalls. Estimates were adjusted for interview method (i.e., in person or by phone), day of the week, and sex. Estimates were weighted to the national population, using the first day diet sample weights for children aged 2–11 years and fasting survey sample weight for persons aged ≥ 12 years.

[†] According to the *Dietary Guidelines for Americans, 2010*, all U.S. residents aged ≥ 2 years should limit daily sodium intake to $< 2,300$ mg. Population subgroups that would benefit from further reducing sodium intake to 1,500 mg daily include 1) persons aged ≥ 51 years, 2) blacks, and 3) persons with hypertension, diabetes, or chronic kidney disease. Hypertension was defined as a mean systolic blood pressure ≥ 140 mm Hg, mean diastolic blood pressure ≥ 90 mm Hg, or self-reported use of antihypertensive medication. Diabetes was defined as self-reported diagnosis by a health-care provider, glycohemoglobin (HbA1c) $\geq 6.5\%$, or fasting plasma glucose ≥ 126 mg/dL. Chronic kidney disease was defined as an estimated glomerular filtration rate < 60 mL/min/1.73 m² or urinary albumin to creatinine ratio > 30 mg/g.

[§] Unweighted sample size based on examination participants among persons aged 2–11 years, and fasting participants among persons aged ≥ 12 years. Excludes pregnant females and females whose pregnancy status was unknown, persons who self-reported renal dialysis, and persons missing information regarding blood pressure, diabetes, and chronic kidney disease. Additionally excludes 586 participants with missing or unreliable dietary data.

[¶] Includes only NHANES racial/ethnic populations with adequate sample size.

** Might not meet standard of statistical reliability because SE is $\geq 30\%$.

and subject to bias because of changes in food composition not reflected in nutrient databases and because of underreporting of foods or portion sizes.

Approximately 75% of sodium consumed is added to commercial foods during processing or to restaurant foods during preparation; only about 25% occurs naturally or is added at the table or in cooking by the consumer (1,8). In 2010, IOM outlined new strategies to reduce sodium intake (1). The primary strategy is to set mandatory sodium targets for processed and restaurant foods, with supporting strategies including improved sodium content labeling, and encouraging organizations (e.g., governments or businesses) to implement procurement policies that establish sodium limits for foods they distribute (1). Recent examples of efforts to reduce populationwide sodium intake include strategies implemented by five local communities that participate in CDC's Sodium Reduction in Communities Program,[§] CDC's procurement

guideline for limiting sodium, which provides guidance to state and local governments on improving the food environment through nutrition standards,[¶] recently released HHS standards providing guidelines that limit the sodium content of foods purchased for federal concessions and vending machines,** and U.S. Department of Agriculture (USDA) policies related to provision of low-sodium food commodities (e.g., < 140 mg of sodium per serving for all canned beans and vegetables) in the National School Lunch Program.^{††} In addition, the U.S. Department of Health and Human Services (HHS) recently launched the Million Hearts initiative to prevent a million heart attacks and strokes in the next 5 years. As a component of this initiative, HHS and USDA formally requested comments, data, and approaches designed to promote sodium reduction.^{§§}

[¶] Additional information available at http://www.cdc.gov/salt/pdfs/dhdsp_procurement_guide.pdf.

** Additional information available at <http://www.gsa.gov/portal/content/104429>.

^{††} Additional information available at <http://www.fns.usda.gov/fdd/news/schupdates1010.pdf>.

^{§§} Additional information available at <http://www.fda.gov/food/newsevents/constituentupdates/ucm271915.htm>.

[§] Additional information available at http://www.cdc.gov/dhdsp/programs/sodium_reduction.htm.

Reductions in sodium intake can be achieved through population level strategies, as demonstrated by an estimated 9.5% reduction in salt intake over 7–8 years in the United Kingdom.^{¶¶} The reductions were associated with a government-manufacturer partnership to reduce sodium through use of voluntary maximum targets for specific processed foods.^{***} Similar reductions, if achieved in the United States, are estimated to save \$4 billion in health-care costs per year and \$32.1 billion over the lifetime of adults aged 40–85 years today (9,10). In the United States, the New York City-led National Salt Reduction Initiative set sodium benchmarks for processed and restaurant foods. To date, 28 companies have committed to meeting various benchmarks.^{†††} In collaboration with USDA, the Food and Drug Administration, and the National Institutes of Health, CDC is monitoring sodium in the food supply, sodium intake, hypertension, and consumer readiness for programs and policies. Additional coordinated efforts involving the public and private sectors are needed to help U.S. residents follow sodium intake recommendations and to reduce medical costs and deaths from stroke and cardiovascular disease.

References

1. Institute of Medicine. Strategies to reduce sodium intake in the United States. Washington, DC: The National Academies Press; 2010.
2. Institute of Medicine. Dietary reference intakes for water, potassium, sodium, chloride, and sulfate. Washington DC: The National Academies Press; 2005.
3. US Department of Health and Human Services, US Department of Agriculture. Dietary guidelines for Americans, 2010. 7th ed. Washington DC: US Department of Health and Human Services, US Department of Agriculture; 2011. Available at <http://health.gov/dietaryguidelines/2010.asp>. Accessed October 18, 2011.
4. Levey AS, Coresh J, Balk E, et al. National Kidney Foundation practice guidelines for chronic kidney disease: evaluation, classification, and stratification. *Ann Intern Med* 2003;139:137–47.
5. Levey AS, Stevens LA, Schmid CH, et al. A new equation to estimate glomerular filtration rate. *Ann Intern Med* 2009;150:604–12.
6. CDC. Application of lower sodium intake recommendations to adults—United States, 1999–2006. *MMWR* 2009; 58: 281–3.
7. CDC. Sodium intake among adults—United States, 2005–2006. *MMWR* 2010;59:746–9.
8. Mattes RD, Donnelly D. Relative contributions of dietary sodium sources. *J Am Coll Nutr* 1991;10:383–93.
9. Smith-Spangler CM, Juusola JL, Enns EA, Owens DK, Garber AM. Population strategies to decrease sodium intake and the burden of cardiovascular disease. *Ann Intern Med* 2010;152:481–7.
10. Bibbins-Domingo K, Chertow GM, Coxson PG, et al. Projected effect of dietary salt reductions on future cardiovascular disease. *N Engl J Med* 2010;372:590–9.

^{¶¶} Additional information available at <http://www.food.gov.uk/multimedia/pdfs/08sodiumreport.pdf>.

^{***} Additional information available at <http://www.food.gov.uk/multimedia/pdfs/consultation/iarevsaltredtargets.pdf>.

^{†††} Additional information available at <http://www.nyc.gov/html/doh/html/cardio/cardio-salt-initiative.shtml>.

Carbapenem-Resistant *Klebsiella pneumoniae* Associated with a Long-Term-Care Facility — West Virginia, 2009–2011

On January 27, 2011, a West Virginia county health department was notified of a cluster of carbapenem-resistant *Klebsiella pneumoniae* (CRKP) cases detected by a local hospital (hospital A). CRKP infections frequently are resistant to a majority of antimicrobial agents and have an increased risk for morbidity and mortality (1). The West Virginia Bureau for Public Health (WVBPH) conducted field investigations to identify all cases, characterize risk factors for infection, and abstract data for a matched case-control study. Nineteen case-patients and 38 control patients were identified. Infection with CRKP was associated with admission from or prior stay at a local long-term-care facility (LTCF A). Pulsed-field gel electrophoresis (PFGE) analysis indicated that all five hospital A clinical specimens and all 11 point prevalence survey isolates from LTCF A were closely related. This is the first outbreak of CRKP identified in West Virginia. Recommendations to LTCF A included the following: 1) initiate surveillance for multidrug resistant organisms; 2) revise and improve infection prevention and control activities within the facility; 3) educate residents and their families, physicians, and staff members about CRKP; and 4) identify qualified personnel to coordinate infection control functions within the facility. Although LTCF A has made significant improvements, the outbreak investigation is ongoing. Additional site visits have been conducted, and additional colonized residents have been identified; the last clinical case was detected in July. These findings demonstrate the interconnectedness of the health-care system and factors potentially contributing to transmission of infection. Interventions targeting all levels of care are needed to prevent further CRKP transmission.

In collaboration with the local health department and hospital A, WVBPH conducted an initial field investigation during February 7–9 to identify all cases and characterize infection risk factors. A case was defined as the first detection of CRKP in a patient admitted to a hospital A unit during April 2009–February 2011. Descriptive analysis was conducted to evaluate patient demographics, admitting hospital unit, reason for admission, admitting source for patient, and time between admission and collection of culture specimen.

A second field investigation was conducted during February 21–24 to complete data abstraction for a matched case-control study. Control patients were identified among patients admitted to a hospital A unit with a clinical culture of carbapenem-susceptible *K. pneumoniae* during April 2009–February 2011. Where possible, each case-patient was matched within 10 years

of age with two control patients and by date of specimen collection within 14 days. Data regarding patient demographics, initial admission to hospital A, indwelling devices and procedures, history of multidrug-resistant organisms (MDROs), history of stays in hospital A and LTCFs, and comorbid medical conditions (reported as Charlson comorbidity index scores*) were collected for both case-patients and controls.

Site visits to hospital A and LTCF A were conducted during the initial field investigation. Surveillance data and practices and infection control policies and practices of both facilities were reviewed. A point prevalence survey to identify the baseline prevalence of CRKP was conducted according CDC's recommended protocol (2) in the oncology and medical/surgical units at hospital A and facilitywide at LTCF A.

Data from the field investigation and matched case-control study were analyzed using statistical software. Risk factors for CRKP were assessed by performing exact conditional logistic regression to calculate exact odds ratio (OR) estimates and 95% confidence intervals for dichotomous variables. Because of nonnormal distribution of continuous variables, median two-sample tests were used to estimate statistically significant differences between case-patients and control patients.

A total of 19 cases were identified with specimen collection dates of April 4, 2009–February 21, 2011. Among those cases, 16 patients had been admitted from LTCFs, 14 of whom were from LTCF A (Table 1). Cultures were collected from 10 of the 14 LTCF A case-patients ≤ 2 calendar days after admission to hospital A, indicating they likely arrived at the hospital with infection.

A total of 38 control patients were identified. Multiple characteristics of case-patients and control patients were compared (Table 1). Age, race, and Charlson comorbidity scores were similar for both groups, but case-patients (58%) were more likely than control patients (16%) to be male. Case-patients had a longer length of hospital stay (mean = 11.4 days) and a higher number of previous hospitalizations (mean = 2.5).

Because of the small number of case-patients, risk factors for CRKP infection (Table 2) were evaluated by exact conditional logistic regression. Risk for CRKP infection was most strongly associated with a prior stay at LTCF A (OR = 46.6) and being admitted from LTCF A (OR = 35.1). Case-patients were significantly less likely than control patients to be ambulatory at the time of diagnosis and to have spent time at home during the previous year.

*Additional information is available in Extermann M. Measuring comorbidity in older cancer patients. *Eur J Cancer* 2000;36:453–71.

TABLE 1. Characteristics of carbapenem-resistant *Klebsiella pneumoniae* case-patients and control patients — West Virginia, 2009–2011

Characteristics	Case-patients (n = 19)	Control patients (n = 38)
Mean age (yrs)	75.5	75.1
Sex		
Male	11	6
Female	8	32
Race		
White	17	35
Black	2	3
Reason for admission		
Urinary tract infection	8	13
Altered mental status	2	3
Other	9	22
Admitting service		
Medical/Surgical	10	16
Telemetry	4	12
Admitting source		
Long-term-care facility A (LTCF A)	14	2
Other LTCF	2	0
Home	3	36
Mean length of stay (days)		
Hospital	11.4	7.4
Intensive-care unit	2.1	1.4
Mean days between admission and specimen collection	3.4	0.7
Mean number of previous hospitalizations	2.5	1.1
Patient outcome		
Discharged home	0	16
Discharged to LTCF	15	13
Transferred to another health-care facility	2	5
Died	1	3
Charlson comorbidity index score	2.0	1.1

Hospital A surveillance and infection control practices were determined to be sufficient, whereas evaluation of surveillance and infection control practices at LTCF A revealed deficiencies. The infection preventionist position at LTCF A had been vacant for 9 months. An electronic surveillance system was available, but the facility did not record laboratory reports or MDRO status of residents in this system. LTCF A used a medical laboratory that does not report carbapenem resistance, and no record existed of CRKP infection among LTCF A residents. Staff hand hygiene stations were not conveniently located, and supplies (e.g., gloves, gowns, and waste containers) were missing for compliance with contact precautions. Point prevalence surveys were conducted; none of 29 hospital A patient samples were positive for CRKP, whereas 11 (9%) of 118 resident samples, including eight from residents with previously unrecognized CRKP colonization, were positive from LTCF A. Five clinical isolates from hospital A and 11 surveillance isolates from LTCF A's point prevalence survey were forwarded to CDC for confirmation and PFGE analysis.

TABLE 2. Risk factors for infection with carbapenem-resistant *Klebsiella pneumoniae* — West Virginia, 2009–2011

Potential risk factor	Case-patients (n = 19)	Control patients (n = 38)	Odds ratio*	(95% confidence interval)
Prior stay at LTCF A [§]	17	4	46.6	(8.0–∞)
Admitted from LTCF A	14	2	35.1	(5.9–∞)
Prior stay at hospital A [¶]	16	20	4.8	(1.0–46.3)
Prior time at home**	12	36	0.08	(<0.01–0.6)
Indwelling urinary catheter	11	14	6.3	(0.8–295.6)
History of multidrug-resistant organism	11	7	7.9	(1.6–75.6)
Ambulatory	8	32	0.06	(<0.01–0.5)

* Calculated by exact conditional logistic regression.

[†] Any documented stay at a LTCF ≤1 year before incident admission to hospital A.

[§] Any documented stay at LTCF A ≤1 year before incident admission to hospital A.

[¶] Any hospitalization ≤1 year before incident admission to hospital A.

** Any documented time at home ≤1 year before incident admission to hospital A.

All 16 isolates were confirmed as carbapenemase (KPC)-producing *K. pneumoniae* and shared >88% similarity in their PFGE patterns.

Reported by

Diana Gaviria, MD, Victoria Greenfield, Berkeley County Health Dept; Danae Bixler, MD, Carrie A. Thomas, PhD, Sherif M. Ibrahim, MD, West Virginia Bur for Public Health. Alex Kallen, MD, Brandi Limbago, PhD, Brandon Kitchel, MS, Div of Healthcare Quality Promotion, National Center for Emerging and Zoonotic Infectious Diseases; Tegwin K. Taylor, DVM, EIS Officer, CDC. **Corresponding contributor:** Tegwin K. Taylor, tkktaylor@cdc.gov, 304-356-4007.

Editorial Note

This report describes the first outbreak of CRKP detected in West Virginia. CRKP is the most common carbapenem-resistant *Enterobacteriaceae* in the United States (1). CRKP spread has been driven by dissemination of *Enterobacteriaceae* producing the KPC enzyme, which confers resistance to all beta-lactam antimicrobials (3). Delaying further spread of these organisms, especially in areas where they remain uncommon, is a public health priority. Aggressive infection control interventions have been successful in reducing outbreaks of these organisms in acute care and long-term-care settings (4–6).

CRKP infections frequently are resistant to the majority of antimicrobial agents and are associated with increased morbidity and mortality (1). In one report, nearly half of 99 patients with CRKP infection died during hospitalization (7). CRKP isolates from these patients were resistant to beta-lactams, fluoroquinolones, and sulfonamides, and the isolates demonstrated variable susceptibility to aminoglycosides, polymyxin B, tetracycline, and tigecycline, substantially limiting treatment

What is already known on this topic?

Carbapenem-resistant *Klebsiella pneumoniae* (CRKP) is the most common carbapenem-resistant *Enterobacteriaceae* in the United States. CRKP infections often are associated with health-care settings, including long-term-care facilities (LTCFs), whose residents are vulnerable to increased morbidity and mortality caused by CRKP infections.

What is added by this report?

This report describes the first identified outbreak of CRKP in West Virginia, confirming the further spread of CRKP in the United States. In this outbreak, CRKP infection was associated with a local LTCF. Point prevalence studies revealed that intrafacility transmission occurred in the LTCF.

What are the implications for public health practice?

Although control of CRKP is challenging and multifactorial, thorough implementation of infection control interventions has decreased CRKP prevalence in health-care settings. Regional interventions targeting all levels of care are needed to prevent CRKP transmission, and continued CRKP surveillance is needed to further understand its epidemiology.

options (7). CRKP infections resistant to all antimicrobial agents tested, including carbapenems, polymyxin B, and tigecycline, have been reported recently (8).

LTCFs can be a challenging setting for preventing spread of MDRO infections, including CRKP. LTCFs serve as permanent homes for their residents, making restrictions on residents' activities undesirable. In addition, LTCFs often have multiple-occupancy rooms, and residents often share common living areas, including bathrooms, which might facilitate MDRO transmission. In addition, lack of resources, including infection control expertise, often is a concern. LTCF residents typically have underlying health conditions and regular exposure to antimicrobial agents, both of which are risk factors for MDRO colonization and infection. LTCF residents frequently are transferred to acute care hospitals for higher levels of medical care, allowing ample opportunity for movement of an MDRO to these facilities.

Because of the interconnectedness of health-care facilities, successful control of MDROs often requires a regional approach. Local and state health departments are positioned to facilitate and coordinate prevention efforts across the continuum of health care, even in the absence of regulatory authority. In one example of a coordinated regional approach to MDRO control, facilities in a common region implemented active surveillance, enhanced infection control measures (e.g., barrier precautions and hand hygiene), provided staff education, and improved intrafacility communication regarding patients' MDRO status. This community was able to lower

its vancomycin-resistant enterococci prevalence in health-care facilities from 2.2% to 0.5% during a 2-year period (9).

With only 19 case-patients, this study sample was small, which restricts the precision of results and the types of analyses that can be conducted for a matched case-control study. Data abstraction relied solely on information provided in Hospital A medical records. Therefore, data for individual case-patients might be inconsistent or missing. Residual confounding is a known limitation of case studies and might exist in this study.

In response to the outbreak, WVBPB recommended that LTCF A group residents with CRKP infection or colonization, use contact precautions during care, conduct active surveillance for CRKP with periodic point prevalence surveys, improve communication of MDRO status when transferring residents to other facilities, and monitor staff member compliance with hand hygiene and contact precautions. This outbreak demonstrated the crucial role that LTCFs can have in the ongoing CRKP spread and verified that local and state health departments are vital to the public health response to MDRO outbreaks.

References

1. CDC. Guidance for control of infections with carbapenem-resistant or carbapenemase-producing *Enterobacteriaceae* in acute care settings. MMWR 2010;58:256–60.
2. CDC. Laboratory protocol for detection of carbapenem-resistant or carbapenemase-producing, *Klebsiella* spp. and *E. coli* from rectal swabs. Atlanta, GA: US Department of Health and Human Services, CDC; 2009. Available at http://www.cdc.gov/ncidod/dhqp/pdf/ar/klebsiella_or_ecoli.pdf. Accessed July 1, 2011.
3. Kallen, A, Srinivasan, A. Current epidemiology of multidrug-resistant gram-negative bacilli in the United States. Infect Control Hosp Epidemiol 2010;31(Suppl 1):S51–4.
4. Munoz-Price L, Hayden M, Lolans K, et al. Successful control of an outbreak of *Klebsiella pneumoniae* at a long-term acute care hospital. Infect Control Hosp Epidemiol 2010;31:341–7.
5. Gregory C, Lata E, Stine N, et al. Outbreak of carbapenem-resistant *Klebsiella pneumoniae* in Puerto Rico associated with a novel carbapenemase variant. Infect Control Hosp Epidemiol 2010;31:476–84.
6. Ben-David D, Maor Y, Keller N, et al. Potential role of active surveillance in the control of a hospital-wide outbreak of carbapenem-resistant *Klebsiella pneumoniae* infection. Infect Control Hosp Epidemiol 2010;31:620–6.
7. Patel G, Huprikar S, Factor SH, Jenkins SG, Calfee DP. Outcomes of carbapenem-resistant *Klebsiella pneumoniae* infection and the impact of antimicrobial and adjunctive therapies. Infect Control Hosp Epidemiol 2008;29:1099–106.
8. Elemam A, Rahimian J, Mandell W. Infection with panresistant *Klebsiella pneumoniae*: a report of 2 cases and a brief review of the literature. Clin Infect Dis 2009;49:271–4.
9. Ostrowsky B, Trick W, Sohn A, et al. Control of vancomycin-resistant enterococcus in health care facilities in a region. N Engl J Med 2001;334:1427–33.

State Electronic Disease Surveillance Systems — United States, 2007 and 2010

The National Electronic Disease Surveillance System (NEDSS) is a web-based infrastructure for public health surveillance data exchange between CDC and the 50 states (1). In 2007, the Council of State and Territorial Epidemiologists (CSTE) conducted an assessment to evaluate states' electronic disease surveillance capacity (2). In 2010, CSTE conducted a follow-up assessment to evaluate the operational status and progress of integration, interoperability, and capacity of state electronic disease surveillance systems. This report summarizes the results of that assessment, which indicated a 17.5% increase from 40 states in 2007 to 47 states in 2010 with fully operational general communicable disease (GCD) electronic surveillance systems, a 211.5% increase from 13 to 39 states in the number of systems that were interoperable, a 22.4% increase from 23 to 34 states in the number with integrated systems, and a 20.0% increase to 42 states with the capacity to receive electronic laboratory reports (ELRs). New Centers for Medicare and Medicaid Services rules for meaningful use of health information technology encourage data exchange between electronic health record systems and public health agencies, including submission of ELRs (3). To meet national goals for health information exchange to improve population health, variation in disease surveillance systems should decrease, and functionality should increase.

In 2009, an ad hoc CSTE working group developed a questionnaire to assess progress in electronic disease surveillance system development, functionality, and capacity. Within the assessment, "integrated" was defined as interconnected systems or applications (which can include modules) that shared a common database and user interface and "interoperable" was defined as the ability of two or more electronic systems to exchange and use information. In February 2010, the questionnaire was distributed via an online survey to NEDSS coordinators and state epidemiologists in all 50 states and the District of Columbia; representatives of all 50 states responded (47 NEDSS coordinators and three state epidemiologists). Respondents also were asked to identify the development source for their electronic disease surveillance systems, indicating whether they were 1) state developed, 2) commercial off-the-shelf (COTS), 3) CDC developed, or 4) hybrid (state developed combined with COTS or CDC developed).

In 2010, a total of 47 (94%) states reported fully operational and implemented electronic GCD surveillance systems, a 17.5% increase in the number of states compared with 2007 (Table 1). A total of 39 GCD surveillance systems were

interoperable, a 211.5% increase from 13 states in 2007.* In addition, 34 GCD surveillance systems were integrated, a 22.4% increase from 2007,† and 42 GCD surveillance systems had the capacity to receive electronic laboratory reports (ELRs), a 20.0% increase (Table 1).

COTS accounted for 24% of GCD surveillance system sources, states and CDC for 30% each, and hybrids for 16% (Table 2). Regardless of development stage, all hybrid systems were integrated and interoperable, whereas seven (44%) COTS systems were integrated, and 10 (71%) CDC-developed systems were interoperable. Weighted averages of interoperability and integration among all surveillance systems demonstrated that non-CDC-developed systems had higher levels of integration (22%) and interoperability (42%) than did CDC-developed systems (3% and 5%, respectively).

Of states responding to system-specific questions, 32 of 45 (71%) reported using CDC-developed systems for human immunodeficiency virus surveillance (Table 2). Twenty (43%) of 47 states reported their sexually transmitted disease surveillance systems were CDC developed, and 18 other states reported their systems were either state developed or hybrids. Most states with noninfectious health data surveillance systems used state-developed systems, including 12 (55%) of 22 for environmental disease and 12 (57%) of 21 for poisoning. Thirty-one (68%) of 45 responding states reported using more than one surveillance system to manage arboviral diseases, averaging 1.8 systems per state (range: 0–3). Eighteen (40%) of 45 used more than one to manage foodborne diseases, averaging 1.5 systems per state (range: 0–3).

In 2010, among GCD surveillance systems, 84% of states reported the capacity to receive ELRs, 15% to receive electronic health record data, and 47% to receive structured public health case reports. Among states with ELR capacity, 90% reported receiving at least some infectious disease laboratory reports through ELRs, and 22 (45%) reported receiving at least half of their infectious disease laboratory reports electronically. States tended to have less capacity for noninfectious disease ELRs than for infectious disease ELRs; however, 26 (59%) reported receiving at least some noninfectious disease laboratory reports (e.g., blood lead levels) electronically. Most (72%) reported

* In 2007, "interoperable" was defined as the extent to which the configuration of a surveillance system allowed exchange of information by electronically connecting various stand-alone, disease-specific modules within the state or allowed exchange of information among dissimilar systems in different states.

† In 2007, "integration" was defined as the extent to which a system included all of the separate disease modules in the same system.

TABLE 1. Status and functionality of 50 state general communicable disease electronic surveillance systems — United States, 2007 and 2010

System status or functionality	No. states (%)		% increase
	2007	2010	
Fully operational	40 (80)	47 (94)	17.5
Receive electronic laboratory reports	28 (70)	42 (84)	20.0
Integrated*	23 (58)	34 (71)	22.4
Interoperable†	13 (26)	39 (81)	211.5
Outbreak management	8 (16)	22 (47)	193.8
Case management	NA	34 (72)	—
Contact tracing	NA	37 (79)	—
Receive electronic health records	NA	7 (15)	—
Receive public health case reports	NA	18 (47)	—

Abbreviation: NA = not asked.

* In 2007, "integration" was defined as the extent to which a system included all of the separate disease modules in the same system. In 2010, it was defined as interconnected systems or applications (which can include modules) that share a common database and user interface.

† In 2007, "interoperability" was defined as the extent to which the configuration of a surveillance system allowed exchange of information by electronically connecting various stand-alone, disease-specific modules within the state or allowed exchange of information among dissimilar systems in different states. In 2010, it was defined as the ability of two or more electronic systems to exchange and use information.

at least one system had case-management functionality, 79% reported contact-tracing functionality, and 47% reported outbreak-management capability (Table 1).

On average, states reported using 7.6 (range: 0–28) full-time equivalents for information technology, programmatic, and administrative support of electronic disease surveillance systems, with most in information technology. On average, 35% of electronic surveillance systems funding was through the federal Epidemiology and Laboratory Capacity Cooperative Agreement and 50% through the Public Health Emergency Preparedness Cooperative Agreement. More than half (58%) of states responding reported receiving no funding from state sources to maintain or develop their electronic surveillance systems.

Reported by

Kathryn Turner, PhD, Idaho Dept of Health and Welfare. Lisa Ferland, MPH, Council of State and Territorial Epidemiologists, Atlanta, Georgia. Corresponding contributor: Kathryn Turner, turnerk@dhw.idaho.gov, 208-334-5939.

Editorial Note

The ability of public health agencies to receive and manage surveillance data has improved considerably since 2007, but progress has resulted in substantial variation among states in the electronic systems used for disease surveillance. Statutes, regulations, health department priorities, resources, and information technology requirements influence all aspects of these systems (e.g., design, implementation stage, diseases and conditions tracked, functionality, and use of standards). Over

What is already known on this topic?

A 2007 assessment of the 50 states by the Council of State and Territorial Epidemiologists (CSTE) demonstrated considerable ability of state health departments to receive, manage, and access surveillance data. However, the many different developers of electronic surveillance systems and the lack of standards have led to important variations in surveillance system design and function.

What is added by this report?

In 2010, CSTE assessed progress in state electronic disease surveillance systems since 2007, specifically examining the ability to meet national data exchange priorities, such as electronic laboratory reporting. The assessment documented a 17.5% increase from 2007 in fully operational general communicable disease electronic surveillance systems and found progress in interoperability, integration, and capacity to receive electronic laboratory reports.

What are the implications for public health practice?

Continued progress in electronic disease surveillance system functionality will improve public health agencies' ability to effectively address national health care and health-care data exchange priorities to improve the health of the U.S. population.

time, independent decisions have produced electronic surveillance systems that range from narrowly focused disease-specific systems to systems used for monitoring a broad spectrum of conditions of public health interest.

Since the 2007 assessment, states have improved interoperability, integration, and data exchange functionality as resources have allowed; however, the need to exchange information with external partners is escalating. For continued progress in supporting national and state-level electronic data exchange priorities, continued collaboration among states combined with financial support by funding agencies must be public health priorities.

Assessment findings could not be used to evaluate fully the use of multiple surveillance systems for single reportable conditions, and system redundancy is a subject for further investigation. Higher levels of integration and interoperability in non-CDC-developed systems than CDC-developed systems most likely results from states using CDC-developed human immunodeficiency virus and sexually transmitted disease systems designed before integration and interoperability were considered priorities or as a result of constraints on programmatic funding.

The findings of this assessment are subject to at least three limitations. First, state-specific systems have been implemented independently, and quantitative measurement of functionality and capacity concepts is difficult because of a lack of universal definitions. Second, different interpretations of questions

TABLE 2. Electronic disease surveillance system development source, by surveillance category — United States, 2010

Surveillance category	No. states (%)					Total
	COTS	State	CDC	Hybrid*	No response†	
General communicable disease	12 (24)	15 (30)	15 (30)	8 (16)	0	50
Human immunodeficiency virus	4 (9)	1 (2)	32 (71)	8 (18)	4	49
Sexually transmitted disease	7 (15)	11 (23)	20 (43)	9 (19)	2	49
Lead	1 (3)	15 (43)	14 (40)	5 (14)	8	43
Vectorborne/Zoonotic disease	10 (21)	12 (26)	14 (30)	11 (23)	0	47
Animal disease	8 (23)	12 (34)	9 (26)	6 (17)	10	45
Environmental diseases	2 (9)	12 (55)	2 (9)	6 (27)	18	40
Poisoning	2 (10)	12 (57)	3 (14)	4 (19)	19	40
Cancer	9 (29)	8 (26)	8 (26)	6 (19)	12	43
Injury	3 (23)	6 (46)	3 (23)	1 (8)	25	38
Occupational disease	0 (0)	7 (50)	4 (29)	3 (21)	24	38
Other chronic disease	2 (17)	6 (50)	1 (8)	3 (25)	25	37

Abbreviation: COTS = commercial off-the-shelf.

* Hybrid systems combine state-developed systems with elements from CDC or COTS systems.

† Not all respondents have each type of surveillance system listed.

based on perspectives of the person answering the assessment questions could result in higher or lower proportions in certain response categories. Finally, although the questionnaire allowed for open-ended comments to qualify quantitative responses, these comments did not result in changes being made to the quantitative data.

By looking to states with strong ELR capacity, best practices and strategies for achieving success might be learned that could lead to similar success in states with less-developed capacity. Two important challenges to electronic surveillance system implementation identified by states were funding shortages and lack of infrastructure support (e.g., number of staff members with appropriate skill sets, training opportunities for existing staff, policies and regulations, and information technology architecture). Funding to maintain surveillance systems and employing staff members with appropriate education and skills remain ongoing challenges and areas for focus in the future.

Requirements for Stage 1 of Meaningful Use include data exchange from electronic health records to public health agencies, specifically for immunizations, reportable laboratory results, and syndromic surveillance (4). Decreased variability and increased functionality and capacity in disease surveillance systems, and increased support resources, will be required to meet the goals of national health information technology initiatives. These initiatives have amplified the need for improved

surveillance system interoperability as pressure to comply with national standards for data exchange has increased. CSTE will continue to assist states in developing and using electronic disease surveillance systems and evaluating the results of those efforts.

Acknowledgments

Council of State and Territorial Epidemiologists Working Group members Hwa-Gan Chang, Sherri Davidson, Mark Conde, Jim Collins, Lesliann Helmus, Tom Safranek, Rita Altamore, Lynn Giljahn, JA Magnuson, Scott Danos, Sara Huston, Lindsay Oweida, Monica Huang.

References

1. CDC. National Electronic Disease Surveillance System. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. Available at <http://www.cdc.gov/phin/tools/nedss/index.html>. Accessed October 17, 2011.
2. CDC. Status of state electronic disease surveillance systems—United States, 2007. *MMWR* 2009;58:804–7.
3. Office of the National Coordinator for Health Information Technology. Health IT strategic framework: strategic themes, principles, objectives, and strategies. Version 31; 2010. Available at http://healthit.hhs.gov/portal/server.pt/document/911373/hit_strategic_framework_2010-04-01_pdf. Accessed October 17, 2011.
4. Centers for Medicare & Medicaid Services, US Department of Health and Human Services. Electronic health record incentive programs. Baltimore, MD: US Department of Health and Human Services, Centers for Medicare & Medicaid Services; 2011. Available at <https://www.cms.gov/ehrincentiveprograms>. Accessed October 17, 2011.

Updated Recommendations for Use of Tetanus Toxoid, Reduced Diphtheria Toxoid and Acellular Pertussis Vaccine (Tdap) in Pregnant Women and Persons Who Have or Anticipate Having Close Contact with an Infant Aged <12 Months — Advisory Committee on Immunization Practices (ACIP), 2011

Compared with older children and adults, infants aged <12 months have substantially higher rates of pertussis and the largest burden of pertussis-related deaths. Since 2004, a mean of 3,055 infant pertussis cases with more than 19 deaths has been reported each year through the National Notifiable Diseases Surveillance System (CDC, unpublished data, 2011). The majority of pertussis cases, hospitalizations, and deaths occur in infants aged ≤2 months, who are too young to be vaccinated; therefore, other strategies are required for prevention of pertussis in this age group. Since 2005, the Advisory Committee on Immunization Practices (ACIP) has recommended tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) booster vaccines to unvaccinated postpartum mothers and other family members of newborn infants to protect infants from pertussis, a strategy referred to as cocooning (1). Over the past 5 years, cocooning programs have proven difficult to implement widely (2,3). Cocooning programs might achieve moderate vaccination coverage among postpartum mothers but have had limited success in vaccinating fathers or other family members. On June 22, 2011, ACIP made recommendations for use of Tdap in unvaccinated pregnant women and updated recommendations on cocooning and special situations. This report summarizes data considered and conclusions made by ACIP and provides guidance for implementing its recommendations.

ACIP recommends a single Tdap dose for persons aged 11 through 18 years who have completed the recommended childhood diphtheria and tetanus toxoids and pertussis/diphtheria and tetanus toxoids and acellular pertussis (DTP/DTaP) vaccination series and for adults aged 19 through 64 years who have not previously received Tdap (1,4). ACIP also recommends that adults aged 65 years and older receive a single dose of Tdap if they have or anticipate having close contact with an infant aged <12 months and previously have not received Tdap (5). Two Tdap vaccines are available in the United States. Adacel (Sanofi Pasteur) is licensed for use in persons aged 11 through 64 years. Boostrix (GlaxoSmithKline Biologicals) is licensed for use in persons aged ≥10 years (6).

The ACIP Pertussis Vaccines Work Group reviewed unpublished Tdap safety data from pregnancy registries and the Vaccine Adverse Event Reporting System (VAERS) and published studies on use of Tdap in pregnant women. The Work Group also considered the epidemiology of pertussis in infants and provider and program feedback, and then presented policy

options for consideration to ACIP. These updated recommendations on use of Tdap in pregnant women are consistent with the goal of reducing the burden of pertussis in infants.

Safety of Tdap in Pregnant Women

In prelicensure evaluations, the safety of administering a booster dose of Tdap to pregnant women was not studied. Because information on use of Tdap in pregnant women was lacking, both manufacturers of Tdap established pregnancy registries to collect information and pregnancy outcomes from pregnant women vaccinated with Tdap. Data on the safety of administering Tdap to pregnant women are now available. ACIP reviewed published and unpublished data from VAERS, Sanofi Pasteur (Adacel) and GlaxoSmithKline (Boostrix) pregnancy registries, and small studies (7,8). ACIP concluded that available data from these studies did not suggest any elevated frequency or unusual patterns of adverse events in pregnant women who received Tdap and that the few serious adverse events reported were unlikely to have been caused by the vaccine. Both tetanus and diphtheria toxoids (Td) and tetanus toxoid vaccines have been used extensively in pregnant women worldwide to prevent neonatal tetanus. Tetanus- and diphtheria-toxoid containing vaccines administered during pregnancy have not been shown to be teratogenic (9,10). From a safety perspective, ACIP concluded that administration of Tdap after 20 weeks' gestation is preferred to minimize the risk for any low-frequency adverse event and the possibility that any spurious association might appear causative.

Transplacental Maternal Antibodies

For infants, transplacentally transferred maternal antibodies might provide protection against pertussis in early life and before beginning the primary DTaP series. Several studies provide evidence supporting the existence of efficient transplacental transfer of pertussis antibodies (7,11,12). Cord blood from newborn infants whose mothers received Tdap during pregnancy or before pregnancy had higher concentrations of pertussis antibodies when compared with cord blood from newborn infants of unvaccinated mothers (7,11). The half-life of transferred maternal pertussis antibodies is approximately 6 weeks (12). The effectiveness of maternal antipertussis antibodies in preventing infant pertussis is not yet known, but pertussis-specific antibodies likely confer protection and modify the severity of pertussis illness (13,14). In addition,

a woman vaccinated with Tdap during pregnancy likely will be protected at time of delivery, and therefore less likely to transmit pertussis to her infant. After receipt of Tdap, boosted pertussis-specific antibody levels peak after several weeks, followed by a decline over several months (15,16). To optimize the concentration of maternal antibodies transferred to the fetus, ACIP concluded that unvaccinated pregnant women should receive Tdap, preferably in the third or late second (after 20 weeks gestation) trimester.

Interference with Infant Immune Response to Primary DTaP Vaccination

Several studies have suggested that maternal pertussis antibodies can inhibit active pertussis-specific antibody production after administration of DTaP vaccine to infants of mothers vaccinated with Tdap during pregnancy, referred to as blunting (12,17). Because correlates of protection are not fully understood, the clinical importance of blunting of an infant's immune response is not clear. Evidence suggests that any blunting would be short-lived because circulating maternal antibodies decline rapidly (12,18). Circulating maternal pertussis antibodies might reduce an infant's risk for pertussis in the first few months of life but slightly increase risk for disease because of a blunted immune response after receipt of primary DTaP doses. The benefit would be to reduce the risk for disease and death in infants aged <3 months, but the trade-off might be to increase the occurrence of pertussis in older infants; however, this group experiences a substantially lower burden of hospitalizations and mortality (National Notifiable Diseases Surveillance System, CDC, unpublished data, 2011).

Currently, two clinical trials are being conducted to measure the immune response of infants receiving DTaP immunization at ages 2, 4, and 6 months whose mothers received Tdap during the third trimester of pregnancy (19,20). These trials also are designed to evaluate safety and immunogenicity of Tdap during pregnancy, but are not sufficiently powered to assess disease endpoints. Analysis of interim data from one trial (19, unpublished data) measured infant antibody to pertussis antigens in a blinded fashion for two groups: infants whose mothers received Tdap and infants whose mothers received Td. The first group had elevated antipertussis antibody levels compared with the second at birth and before dose 1, which might be the result of passive antibody transfer, but had lower antipertussis antibody levels after dose 3. In both groups, antipertussis antibody levels were comparable before doses 2 and 3. Although the first group had lower antipertussis antibody levels after dose 3, the evidence of sufficient immune response to DTaP doses compared with the second group was reassuring. ACIP concluded that the interim data are consistent with

previously published literature suggesting a short duration of blunting of the infant response, and that the potential benefit of protection from maternal antibodies in newborn infants outweighs the potential risk for shifting disease burden to later in infancy.

Cocooning

Cocooning is defined as the strategy of vaccinating pregnant women immediately postpartum and all other close contacts of infants aged <12 months with Tdap to reduce the risk for transmission of pertussis to infants. Cocooning has been recommended by ACIP since 2005. Cocooning programs have achieved moderate postpartum coverage among mothers but have had limited success in vaccinating fathers or other family members (3) (CDC, unpublished data, 2011). Programmatic challenges make implementation of cocooning programs complex and also impede program expansion and sustainability (2). The effectiveness of vaccinating postpartum mothers and close contacts to protect infants from pertussis is not yet known, but the delay in antibody response among those vaccinated with Tdap after an infant's birth might result in insufficient protection to infants during the first weeks of life (21). ACIP concluded that cocooning alone is an insufficient strategy to prevent pertussis morbidity and mortality in newborn infants. Regardless, ACIP concluded that cocooning likely provides indirect protection to infants and firmly supports vaccination with Tdap for unvaccinated persons who anticipate close contact with an infant.

Decision and Cost Effectiveness Analysis

A decision analysis and cost effectiveness model was developed to assess the impact and cost effectiveness of maternal Tdap vaccination during pregnancy compared with immediately postpartum. The model showed that Tdap vaccination during pregnancy would prevent more infant cases, hospitalizations, and deaths compared with the postpartum dose for two reasons: 1) vaccination during pregnancy benefits the mother and infant by providing earlier protection to the mother, thereby protecting the infant at birth; and 2) vaccination during late pregnancy maximizes transfer of maternal antibodies to the infant, likely providing direct protection to the infant for a period after birth. Model results were most sensitive to efficacy of maternal antibodies and risk for disease as a result of blunting; however, a sensitivity analysis in which infants were assumed to have as little as 20% efficacy of maternal antibodies and a 60% increase in risk for disease as a result of blunting found that maternal vaccination during pregnancy was more cost effective and prevented a greater proportion of infant cases and deaths than postpartum maternal vaccination (22).

Guidance for Use

Maternal vaccination. ACIP recommends that women's health-care personnel implement a Tdap vaccination program for pregnant women who previously have not received Tdap. Health-care personnel should administer Tdap during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation). If not administered during pregnancy, Tdap should be administered immediately postpartum.

Cocooning. ACIP recommends that adolescents and adults (e.g., parents, siblings, grandparents, child-care providers, and health-care personnel) who have or anticipate having close contact with an infant aged <12 months should receive a single dose of Tdap to protect against pertussis if they have not previously received Tdap. Ideally, these adolescents and adults should receive Tdap at least 2 weeks before beginning close contact with the infant.

Special Situations

Pregnant women due for tetanus booster. If a tetanus and diphtheria booster vaccination is indicated during pregnancy for a woman who has previously not received Tdap (i.e., more than 10 years since previous Td), then Tdap should be administered during pregnancy, preferably during the third or late second trimester (after 20 weeks' gestation).

Wound management for pregnant women. As part of standard wound management care to prevent tetanus, a tetanus toxoid-containing vaccine might be recommended for wound management in a pregnant woman if 5 years or more have elapsed since last receiving Td. If a tetanus booster is indicated for a pregnant woman who previously has not received Tdap, Tdap should be administered.

Pregnant women with unknown or incomplete tetanus vaccination. To ensure protection against maternal and neonatal tetanus, pregnant women who have never been vaccinated against tetanus should receive three vaccinations containing tetanus and reduced diphtheria toxoids. The recommended schedule is 0, 4 weeks, and 6 to 12 months. Tdap should replace 1 dose of Td, preferably during the third or late second trimester (after 20 weeks' gestation) of pregnancy.

References

1. CDC. Preventing tetanus, diphtheria, and pertussis among adults: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine. Recommendations of the Advisory Committee on Immunization Practices (ACIP) and recommendation of ACIP, supported by the Healthcare Infection Control Practices Advisory Committee (HICPAC), for use of Tdap among health-care personnel. *MMWR* 2006;55(No. RR-17).
2. Healy CM, Rench MA, Castagnini LA, Baker CJ. Pertussis immunization in a high-risk postpartum population. *Vaccine* 2009;27:5599–602.
3. Healy CM, Rench MA, Baker CJ. Implementation of cocooning against pertussis in a high-risk population. *Clin Infect Dis* 2011;52:157–62.
4. CDC. Preventing tetanus, diphtheria, and pertussis among adolescents: use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccines. Recommendations of the Advisory Committee on Immunization Practices (ACIP). *MMWR* 2006;55(No. RR-3).
5. CDC. Updated recommendations for use of tetanus toxoid, reduced diphtheria toxoid and acellular pertussis (Tdap) vaccine from the Advisory Committee on Immunization Practices, 2010. *MMWR* 2011;60:13–5.
6. CDC. FDA approval of expanded age indication for a tetanus toxoid, reduced diphtheria toxoid and acellular pertussis vaccine. *MMWR* 2011;60:1279–80.
7. Gall SA, Myers J, Pichichero M. Maternal immunization with tetanus-diphtheria-pertussis vaccine: effect on maternal and neonatal serum antibody levels. *Am J Obstet Gynecol* 2011;204:334.e1–5.
8. Talbot EA, Brown KH, Kirkland KB, Baughman AL, Halperin SA, Broder KP. The safety of immunizing with tetanus-diphtheria-acellular pertussis vaccine (Tdap) less than 2 years following previous tetanus vaccination: experience during a mass vaccination campaign of healthcare personnel during a respiratory illness outbreak. *Vaccine* 2010;28:8001–7.
9. Czeizel AE, Rockenbauer M. Tetanus toxoid and congenital abnormalities. *Int J Gynecol Obstet* 1999;64:253–8.
10. Silveria CM, Caceres VM, Dutra MG, Lopes-Camelo J, Castilla EE. Safety of tetanus toxoid in pregnant women: a hospital-based case-control study of congenital anomalies. *Bull World Health Organ* 1995;73:605–8.
11. Leuridan E, Hens N, Peeters N, de Witte L, Van der Meeren O, Van Damme P. Effect of a prepregnancy pertussis booster dose on maternal antibody titers in young infants. *Pediatr Infect Dis J* 2011;30:608–10.
12. Van Savage J, Decker MD, Edwards KM, Sell SH, Karzon DT. Natural history of pertussis antibody in the infant and effect on vaccine response. *J Infect Dis* 1990;161:487–92.
13. Ward JI, Cherry JD, Chang SJ, et al. *Bordetella pertussis* infections in vaccinated and unvaccinated adolescents and adults, as assessed in a national prospective randomized Acellular Pertussis Vaccine Trial (APERT). *Clin Infect Dis* 2006;43:151–7.
14. Van Rie A, Wendelboe AM, Englund JA. Role of maternal pertussis antibodies in infants. *Pediatr Infect Dis J* 2005;24(5 Suppl):S62–5.
15. Le T, Cherry JD, Chang SJ, et al. Immune responses and antibody decay after immunization of adolescents and adults with an acellular pertussis vaccine: the APERT study. *J Infect Dis* 2004;190:535–44.
16. Kirkland KB, Talbot EA, Decker MD, Edwards KM. Kinetics of pertussis immune responses to tetanus-diphtheria-acellular pertussis vaccine in health care personnel: implications for outbreak control. *Clin Infect Dis* 2009;49:584–7.
17. Englund JA, Anderson EL, Reed GF, et al. The effect of maternal antibody on the serologic response and the incidence of adverse reactions after primary immunization with acellular and whole-cell pertussis vaccines combined with diphtheria and tetanus toxoids. *Pediatrics* 1995;96(3 Pt 2):580–4.
18. Hardy-Fairbanks AJ, Pan SJ, Johnson DR, Bernstein HH. Immune responses in infants following receipt of pertussis immunization by their mothers during pregnancy. Presented at the 48th Infectious Diseases Society of America Annual Meeting, Vancouver, Canada; October 21–24, 2010.
19. Dalhousie University. Pertussis maternal immunization study. Identifier: NCT00553228. Available at <http://clinicaltrials.gov/show/nct00553228>. Accessed October 13, 2011.
20. National Institute of Allergy and Infectious Diseases. Pertussis vaccine in healthy pregnant women. Identifier: NCT00707148. Available at <http://clinicaltrials.gov/show/nct00707148>. Accessed October 13, 2011.
21. Halperin BA, Morris A, Mackinnon-Cameron D, et al. Kinetics of the antibody response to tetanus-diphtheria-acellular pertussis vaccine in women of childbearing age and postpartum women. *Clin Infect Dis* 2011;53:885–92.
22. Terranella A, Asay G, Messonnier M, Clark T, Liang J. Preventing infant pertussis: a decision analysis comparing prenatal vaccination to cocooning. Presented at the 49th Infectious Diseases Society of America Annual Meeting, Boston, MA; October 20–23, 2011.

Addition of History of Intussusception as a Contraindication for Rotavirus Vaccination

The Food and Drug Administration (FDA) has approved revised prescribing information and patient labeling from GlaxoSmithKline Biologicals for the monovalent rotavirus vaccine (RV1, marketed as Rotarix) and revised prescribing information and patient labeling from Merck & Co. for the pentavalent rotavirus vaccine (RV5, marketed as RotaTeq) to include history of intussusception as a contraindication (1,2). FDA approved the revisions for RV1 in February 2011 and for RV5 in July 2011. In its rotavirus vaccination recommendations, CDC is updating the contraindications for rotavirus vaccine (RV1 and RV5) to include history of intussusception. Previously, CDC had considered history of intussusception a precaution but not a contraindication (3,4).

Intussusception is a telescoping of one portion of the intestine into another, which can result in bowel obstruction and subsequent bowel ischemia. Intussusception is treated in the hospital setting with a specialized enema or a surgical procedure. Before rotavirus vaccine was used, about 1,900 infants developed intussusception each year in the United States. Some, but not all, postmarketing studies of the currently licensed vaccines have detected an increased risk for intussusception following rotavirus vaccine administration, particularly during the first week following the first dose of vaccine. More information on the possible risk for intussusception in U.S. infants following rotavirus vaccination is available on CDC and FDA websites (5–8). If the risk exists, rotavirus vaccination could cause about 50–60 additional intussusception cases in the United States each year while preventing more than 50,000 hospitalizations each year from rotavirus disease.

Compared with infants who have never had intussusception, infants with a history of intussusception are at greater risk for intussusception. According to case series reports on intussusception (infants and young children combined), approximately 5%–10% of patients with intussusception have a subsequent episode (9). Specific data, however, are not available on the risk for a subsequent episode of intussusception following rotavirus vaccination of infants with a history of intussusception.

CDC is updating its contraindications for rotavirus vaccine (3,10). Rotavirus vaccination is now contraindicated for 1) infants with a history of severe allergic reaction (e.g.,

anaphylaxis) after a previous dose of rotavirus vaccine or exposure to a vaccine component, 2) infants diagnosed with severe combined immunodeficiency (SCID), and 3) infants with a history of intussusception.

References

1. Food and Drug Administration. Product-approval information-licensing action [package insert]. Rotarix (rotavirus vaccine, live, oral), GlaxoSmithKline Biologicals. Rockville, MD: US Department of Health and Human Services, Food and Drug Administration; 2011. Available at <http://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm133539.pdf>. Accessed October 17, 2011.
2. Food and Drug Administration. Product-approval information-licensing action [package insert] RotaTeq (rotavirus vaccine, live, oral, pentavalent), Merck & Co. Rockville, MD: US Department of Health and Human Services, Food and Drug Administration; 2011. Available at <http://www.fda.gov/downloads/biologicsbloodvaccines/vaccines/approvedproducts/ucm142288.pdf>. Accessed October 17, 2011.
3. CDC. Prevention of rotavirus gastroenteritis among infants and children: recommendations of the Advisory Committee on Immunization Practices (ACIP). MMWR 2009;58(No. RR-2).
4. Cortese M. Estimates of benefits and potential risks of rotavirus vaccination in the United States. Presented at the meeting of the Advisory Committee on Immunization Practices, Atlanta, GA; October 28, 2010. Available at <http://www.cdc.gov/vaccines/recs/acip/downloads/mtg-slides-oct10/12-3-rotav-estbenefitsrisks.pdf>. Accessed October 17, 2011.
5. CDC. Statement regarding Rotarix and RotaTeq rotavirus vaccines and intussusception. Atlanta, GA: US Department of Health and Human Services, CDC; 2010. Available at <http://www.cdc.gov/vaccines/vpd-vac/rotavirus/intussusception-studies-acip.htm>. Accessed October 17, 2011.
6. CDC. Monitoring of intussusception after RotaTeq vaccination 2011. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. Available at http://www.cdc.gov/vaccinesafety/vaccines/rotateq_intussusception.html. Accessed October 17, 2011.
7. CDC. Updated vaccine label for Rotarix: questions and answers for health-care professionals. Atlanta, GA: US Department of Health and Human Services, CDC; 2010. Available at <http://www.cdc.gov/vaccines/vpd-vac/rotavirus/vac-label-hcp.htm>. Accessed October 17, 2011.
8. Food and Drug Administration. Information on Rotarix—labeling revision pertaining to intussusception. Rockville, MD: US Department of Health and Human Services, Food and Drug Administration; 2010. Available at <http://www.fda.gov/biologicsbloodvaccines/vaccines/approvedproducts/ucm226690.htm>. Accessed October 17, 2011.
9. Daneman A, Alton DJ, Lobo E, Gravett J, Kim P, Ein SH. Patterns of recurrence of intussusception in children: a 17-year review. *Pediatr Radiol* 1998;28:913–9.
10. CDC. Addition of severe combined immunodeficiency as a contraindication for administration of rotavirus vaccine. MMWR 2010; 59:687–8.

Notes from the Field

***Yersinia enterocolitica* Infections Associated with Pasteurized Milk — Southwestern Pennsylvania, March–August, 2011**

On July 22, 2011, a pediatric infectious disease physician reported a culture-confirmed case of *Yersinia enterocolitica* infection to the Allegheny County Health Department (ACHD), Pennsylvania. Two additional cases in Allegheny County with onset around the same time were identified by Pennsylvania's version of the National Electronic Disease Surveillance System aberration detection algorithm, which routinely evaluates disease reports, searching for unusual events. During March–August for the 3-year period 2008–2010, three cases of *Y. enterocolitica* infection had been reported in Allegheny County and a total of five in southwestern Pennsylvania. Subsequent review of the surveillance data identified 16 culture-confirmed patients with symptom onset during March 24–August 5, 2011. Patients were aged 1–75 years (median: 26.5 years). Seven patients (44%) were hospitalized; three were admitted to an intensive care unit.

All 16 patients reported drinking glass-bottled, pasteurized milk from dairy A; three patients also reported eating dairy A ice cream. Dairy A is certified by the Pennsylvania Department of Agriculture to pasteurize milk onsite. The dairy distributes 10,000 containers of milk weekly to approximately 650 households and 40 retail outlets and restaurants in southwestern Pennsylvania; 85% of the milk is distributed to homes and stores in returnable glass bottles, which are washed and sanitized by the dairy.

On July 27, 2011, dairy A voluntarily halted onsite production and distribution of products and advised home delivery customers and retail stores to dispose of their remaining products. On July 29, ACHD and the Pennsylvania Department of Health (PADOH) issued a press release advising of possible health risks associated with consuming dairy A milk and recommending disposal of any remaining milk. Consumers with symptoms of abdominal pain, diarrhea, and fever were advised to seek medical care. Patients with confirmed illness were advised to submit remaining dairy A products for testing. Cohort studies of families receiving home delivery of dairy A milk and of purchasers of dairy A milk from a single retail outlet are ongoing.

ACHD, PADOH, and the Pennsylvania Department of Agriculture conducted site visits to dairy A; milk and environmental samples tested negative for *Yersinia*. One unopened container of ice cream from the home of a patient with culture-confirmed illness tested positive for *Y. enterocolitica*, as did

homemade yogurt made with dairy A milk in the home of an asymptomatic person. *Yersinia* cultured from the ice cream, from the homemade yogurt, and from stool samples from nine patients showed matching pulse-field gel electrophoresis (PFGE) patterns. On August 26, PADOH and ACHD issued another press release advising of possible health risks associated with consuming dairy A ice cream and recommending disposal of any remaining ice cream. The mechanism of milk and ice cream contamination remains unknown. Dairy A has resumed production and distribution following a Pennsylvania Department of Agriculture culture of a test batch of products that demonstrated no growth of *Yersinia*. No additional outbreak-associated cases of *Yersinia* have been reported since August 5.

Y. enterocolitica is a relatively infrequent cause of diarrhea and abdominal pain; approximately one culture-confirmed *Y. enterocolitica* infection per 100,000 persons is reported each year. *Yersinia* contamination of pasteurized milk is rare. In prior investigations, postpasteurization contamination with *Yersinia* was postulated (1,2). Yersiniosis can present as abdominal pain, acute mesenteric lymphadenitis mimicking appendicitis, fever, and systemic infection. Bloody diarrhea occurs in $\leq 25\%$ of patients, but diarrhea might be absent in $\leq 33\%$ (3). Diagnosis usually is made through stool or blood culture. Because *Yersinia* might not be detected using routine culture methods, specific testing to detect *Yersinia* should be requested when suspected (3).

Reported by

Ronald Voorhees, MD, Megan Casey, MPH, Sharon Silvestri, Gim Yee, Allegheny County Health Dept; Lydia Johnson, PhD, Pennsylvania Department of Agriculture; Stephen Ostroff, MD, Andre Weltman, MD, Kirsten Waller, MD, Maria Moll, MD, Atmaram Nambiar, MD, Pennsylvania Dept of Health. James Lando, MD, Career Epidemiology Field Officer; Allison Longenberger, PhD, Michael Gronostaj, MD, EIS officers, CDC. **Corresponding contributor:** Michael Gronostaj, vie0@cdc.gov, 412-228-0995.

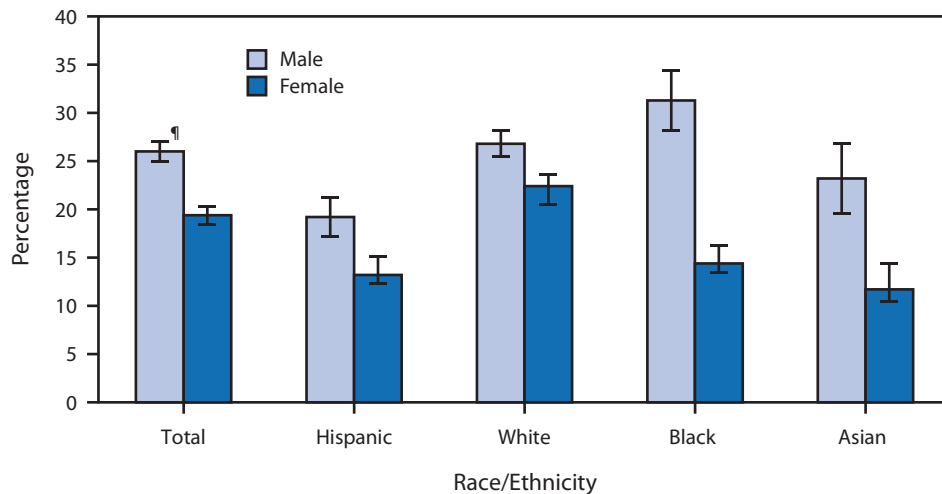
References

- Greenwood MH, Hooper WL, Rodhouse JC. The source of *Yersinia* spp. in pasteurized milk: an investigation at a dairy. *Epidemiol Infect* 1990; 104:351–60.
- Ackers M, Schoenfeld S, Markman J, et al. An outbreak of *Yersinia enterocolitica* O:8 infections associated with pasteurized milk. *J Infect Dis* 2000;181:1834–7.
- Heymann DL, ed. *Control of communicable diseases manual*. 19th ed. Washington, DC: American Public Health Association; 2008.

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Adults Aged ≥ 18 Years Who Engaged in Leisure-Time Strengthening Activities at Least Twice a Week,* by Race/Ethnicity[†] and Sex — National Health Interview Survey, United States, 2009[§]



* Based on responses to the following question: "How often do you do leisure-time physical activities specifically designed to strengthen your muscles, such as lifting weights or doing calisthenics?"

[†] All respondents categorized as white, black, or Asian are non-Hispanic. Data for non-Hispanic persons of other races or multiple races are not shown separately because of small sample sizes but are included in the total. Persons categorized as Hispanic might be of any race or combination of races.

[§] Estimates are based on household interviews of a sample of the civilian, noninstitutionalized U.S. population. Estimates are age-adjusted using the projected 2000 U.S. standard population as the standard population and using four age groups: 18–44 years, 45–64 years, 65–74 years, and ≥ 75 years.

[¶] 95% confidence interval.

Approximately 23% of adults participated in leisure-time strengthening activities at least two times a week in 2009. Men were more likely than women to engage in leisure-time strengthening activities. Black men (31.3%) were more likely to engage in leisure-time strengthening activities than Hispanic men (19.2%), white men (26.8%), and Asian men (23.2%). White women (22.4%) were more likely to engage in leisure-time strengthening activities than Hispanic women (13.2%), black women (14.4%), and Asian women (11.7%).

Source: National Health Interview Survey, 2009 data. Available at <http://www.cdc.gov/nchs/nhis.htm>.

Notifiable Diseases and Mortality Tables

TABLE I. Provisional cases of infrequently reported notifiable diseases (<1,000 cases reported during the preceding year) — United States, week ending October 15, 2011 (41st week)*

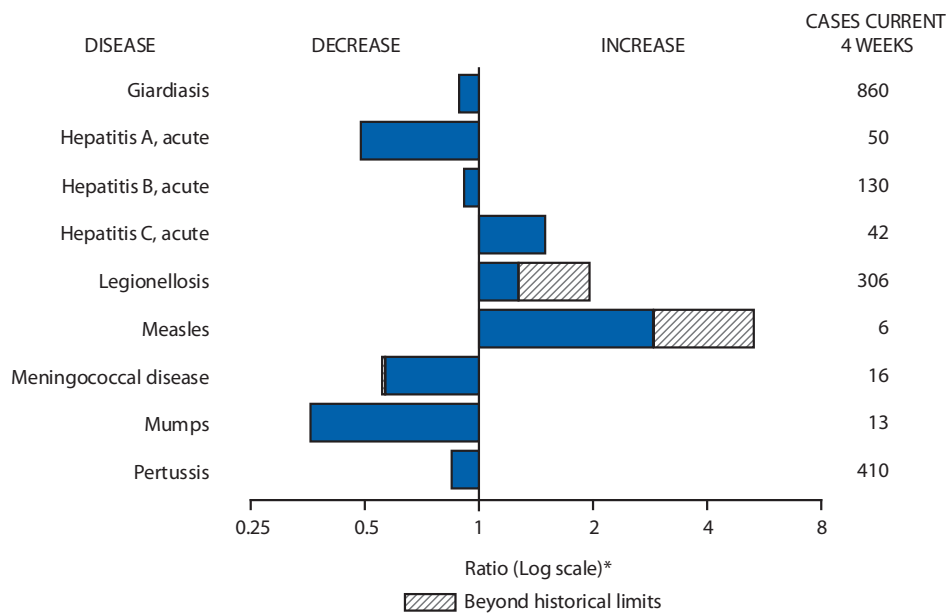
Disease	Current week	Cum 2011	5-year weekly average [†]	Total cases reported for previous years					States reporting cases during current week (No.)
				2010	2009	2008	2007	2006	
Anthrax	—	—	—	—	1	—	1	1	
Arboviral diseases ^{§, ¶} :									
California serogroup virus disease	—	90	1	75	55	62	55	67	
Eastern equine encephalitis virus disease	—	3	0	10	4	4	4	8	
Powassan virus disease	—	12	0	8	6	2	7	1	
St. Louis encephalitis virus disease	—	2	0	10	12	13	9	10	
Western equine encephalitis virus disease	—	—	—	—	—	—	—	—	
Babesiosis	5	562	1	NN	NN	NN	NN	NN	NY (5)
Botulism, total	1	76	2	112	118	145	144	165	
foodborne	—	8	0	7	10	17	32	20	
infant	1	60	2	80	83	109	85	97	PA (1)
other (wound and unspecified)	—	8	0	25	25	19	27	48	
Brucellosis	1	67	2	115	115	80	131	121	AZ (1)
Chancroid	3	27	0	24	28	25	23	33	NJ (3)
Cholera	—	28	0	13	10	5	7	9	
Cyclosporiasis [§]	1	141	1	179	141	139	93	137	NY (1)
Diphtheria	—	—	—	—	—	—	—	—	
<i>Haemophilus influenzae</i> ,** invasive disease (age <5 yrs):									
serotype b	—	6	1	23	35	30	22	29	
nonsensory type b	—	86	2	200	236	244	199	175	
unknown serotype	2	184	3	223	178	163	180	179	NYC (1), MO (1)
Hansen disease [§]	—	38	2	98	103	80	101	66	
Hantavirus pulmonary syndrome [§]	—	18	0	20	20	18	32	40	
Hemolytic uremic syndrome, postdiarrheal [§]	2	135	6	266	242	330	292	288	NY (1), CA (1)
Influenza-associated pediatric mortality ^{§, ††}	—	112	3	61	358	90	77	43	
Listeriosis	9	565	20	821	851	759	808	884	NY (4), MD (1), WA (2), CA (2)
Measles ^{§§}	1	201	1	63	71	140	43	55	MA (1)
Meningococcal disease, invasive ^{¶¶} :									
A, C, Y, and W-135	—	139	5	280	301	330	325	318	
serogroup B	—	72	2	135	174	188	167	193	
other serogroup	—	10	0	12	23	38	35	32	
unknown serogroup	3	320	8	406	482	616	550	651	NYC (1), FL (1), CO (1)
Novel influenza A virus infections ^{***}	—	6	0	4	43,774	2	4	NN	
Plague	—	2	0	2	8	3	7	17	
Poliomyelitis, paralytic	—	—	—	—	1	—	—	—	
Polio virus Infection, nonparalytic [§]	—	—	—	—	—	—	—	NN	
Psittacosis [§]	—	2	0	4	9	8	12	21	
Q fever, total [§]	—	84	3	131	113	120	171	169	
acute	—	63	2	106	93	106	—	—	
chronic	—	21	1	25	20	14	—	—	
Rabies, human	—	1	0	2	4	2	1	3	
Rubella ^{†††}	—	3	0	5	3	16	12	11	
Rubella, congenital syndrome	—	—	—	—	2	—	—	1	
SARS-CoV [§]	—	—	—	—	—	—	—	—	
Smallpox [§]	—	—	—	—	—	—	—	—	
Streptococcal toxic-shock syndrome [§]	1	91	2	142	161	157	132	125	SC (1)
Syphilis, congenital (age <1 yr) ^{§§§}	—	152	7	377	423	431	430	349	
Tetanus	—	7	1	26	18	19	28	41	
Toxic-shock syndrome (staphylococcal) [§]	3	65	2	82	74	71	92	101	NY (1), PA (1), GA (1)
Trichinellosis	—	8	0	7	13	39	5	15	
Tularemia	1	113	2	124	93	123	137	95	MO (1)
Typhoid fever	1	296	9	467	397	449	434	353	WA (1)
Vancomycin-intermediate <i>Staphylococcus aureus</i> [§]	—	51	1	91	78	63	37	6	
Vancomycin-resistant <i>Staphylococcus aureus</i> [§]	—	—	0	2	1	—	2	1	
Vibriosis (noncholera <i>Vibrio</i> species infections) [§]	10	558	14	846	789	588	549	NN	SC (1), FL (4), WA (1), CA (4)
Viral hemorrhagic fever ^{¶¶¶}	—	—	—	1	NN	NN	NN	NN	
Yellow fever	—	—	—	—	—	—	—	—	

See Table 1 footnotes on next page.

TABLE I. (Continued) Provisional cases of infrequently reported notifiable diseases (<1,000 cases reported during the preceding year) — United States, week ending October 15, 2011 (41st week)*

—: No reported cases. N: Not reportable. NN: Not Nationally Notifiable. Cum: Cumulative year-to-date counts.
 * Case counts for reporting year 2011 are provisional and subject to change. For further information on interpretation of these data, see http://www.cdc.gov/osels/ph_surveillance/nndss/phs/files/ProvisionalNationa%20NotifiableDiseasesSurveillanceData20100927.pdf.
 † Calculated by summing the incidence counts for the current week, the 2 weeks preceding the current week, and the 2 weeks following the current week, for a total of 5 preceding years. Additional information is available at http://www.cdc.gov/osels/ph_surveillance/nndss/phs/files/5yearweeklyaverage.pdf.
 ‡ Not reportable in all states. Data from states where the condition is not reportable are excluded from this table except starting in 2007 for the arboviral diseases, STD data, TB data, and influenza-associated pediatric mortality, and in 2003 for SARS-CoV. Reporting exceptions are available at http://www.cdc.gov/osels/ph_surveillance/nndss/phs/infdis.htm.
 ¶ Includes both neuroinvasive and nonneuroinvasive. Updated weekly from reports to the Division of Vector-Borne Infectious Diseases, National Center for Zoonotic, Vector-Borne, and Enteric Diseases (ArboNET Surveillance). Data for West Nile virus are available in Table II.
 ** Data for H. influenzae (all ages, all serotypes) are available in Table II.
 †† Updated weekly from reports to the Influenza Division, National Center for Immunization and Respiratory Diseases. Since October 2, 2011, no influenza-associated pediatric deaths occurring during the 2011-12 influenza season have been reported.
 ‡‡ The one measles case reported for the current week was imported.
 ¶¶ Data for meningococcal disease (all serogroups) are available in Table II.
 *** CDC discontinued reporting of individual confirmed and probable cases of 2009 pandemic influenza A (H1N1) virus infections on July 24, 2009. During 2009, four cases of human infection with novel influenza A viruses, different from the 2009 pandemic influenza A (H1N1) strain, were reported to CDC. The four cases of novel influenza A virus infection reported to CDC during 2010, and the six cases reported during 2011, were identified as swine influenza A (H3N2) virus and are unrelated to the 2009 pandemic influenza A (H1N1) virus. Total case counts are provided by the Influenza Division, National Center for Immunization and Respiratory Diseases (NCIRD).
 ††† No rubella cases were reported for the current week.
 §§§ Updated weekly from reports to the Division of STD Prevention, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention.
 ¶¶¶ There was one case of viral hemorrhagic fever reported during week 12 of 2010. The one case report was confirmed as lassa fever. See Table II for dengue hemorrhagic fever.

FIGURE I. Selected notifiable disease reports, United States, comparison of provisional 4-week totals October 15, 2011, with historical data



* Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

Notifiable Disease Data Team and 122 Cities Mortality Data Team

Jennifer Ward	Deborah A. Adams
Willie J. Anderson	Lenee Blanton
Rosaline Dhara	Diana Harris Onweh
Pearl C. Sharp	Michael S. Wodajo

Morbidity and Mortality Weekly Report

TABLE II. (Continued) Provisional cases of selected notifiable diseases, United States, weeks ending October 15, 2011, and October 16, 2010 (41st week)*

Reporting area	Dengue Virus Infection†									
	Dengue Fever§					Dengue Hemorrhagic Fever¶				
	Current week	Previous 52 weeks		Cum 2011	Cum 2010	Current week	Previous 52 weeks		Cum 2011	Cum 2010
	Med	Max				Med	Max			
United States	—	3	20	123	615	—	0	1	1	9
New England	—	0	3	1	6	—	0	0	—	—
Connecticut	—	0	0	—	—	—	0	0	—	—
Maine**	—	0	2	—	3	—	0	0	—	—
Massachusetts	—	0	0	—	—	—	0	0	—	—
New Hampshire	—	0	0	—	—	—	0	0	—	—
Rhode Island**	—	0	0	—	1	—	0	0	—	—
Vermont**	—	0	1	1	2	—	0	0	—	—
Mid. Atlantic	—	0	4	24	207	—	0	0	—	5
New Jersey	—	0	3	—	28	—	0	0	—	—
New York (Upstate)	—	0	1	—	29	—	0	0	—	2
New York City	—	0	2	10	131	—	0	0	—	3
Pennsylvania	—	0	2	14	19	—	0	0	—	—
E.N. Central	—	0	4	9	60	—	0	0	—	1
Illinois	—	0	2	1	18	—	0	0	—	—
Indiana	—	0	1	2	12	—	0	0	—	—
Michigan	—	0	1	2	9	—	0	0	—	—
Ohio	—	0	1	2	15	—	0	0	—	—
Wisconsin	—	0	2	2	6	—	0	0	—	1
W.N. Central	—	0	6	5	30	—	0	1	—	—
Iowa	—	0	1	3	2	—	0	0	—	—
Kansas	—	0	1	1	4	—	0	0	—	—
Minnesota	—	0	1	—	13	—	0	0	—	—
Missouri	—	0	1	1	4	—	0	0	—	—
Nebraska**	—	0	6	—	6	—	0	0	—	—
North Dakota	—	0	0	—	1	—	0	0	—	—
South Dakota	—	0	0	—	—	—	0	1	—	—
S. Atlantic	—	1	8	56	217	—	0	1	1	2
Delaware	—	0	0	—	—	—	0	0	—	—
District of Columbia	—	0	0	—	—	—	0	0	—	—
Florida	—	1	7	41	170	—	0	0	—	2
Georgia	—	0	1	3	11	—	0	0	—	—
Maryland**	—	0	2	4	—	—	0	0	—	—
North Carolina	—	0	1	1	7	—	0	0	—	—
South Carolina**	—	0	0	—	13	—	0	0	—	—
Virginia**	—	0	1	7	14	—	0	1	1	—
West Virginia	—	0	0	—	2	—	0	0	—	—
E.S. Central	—	0	2	3	6	—	0	0	—	—
Alabama**	—	0	1	2	3	—	0	0	—	—
Kentucky	—	0	0	—	2	—	0	0	—	—
Mississippi	—	0	0	—	—	—	0	0	—	—
Tennessee**	—	0	1	1	1	—	0	0	—	—
W.S. Central	—	0	2	6	25	—	0	0	—	1
Arkansas**	—	0	0	—	—	—	0	0	—	1
Louisiana	—	0	1	3	4	—	0	0	—	—
Oklahoma	—	0	1	—	4	—	0	0	—	—
Texas**	—	0	1	3	17	—	0	0	—	—
Mountain	—	0	2	4	18	—	0	0	—	—
Arizona	—	0	2	2	8	—	0	0	—	—
Colorado	—	0	0	—	—	—	0	0	—	—
Idaho**	—	0	1	—	2	—	0	0	—	—
Montana**	—	0	1	—	3	—	0	0	—	—
Nevada**	—	0	1	1	4	—	0	0	—	—
New Mexico**	—	0	0	—	1	—	0	0	—	—
Utah	—	0	1	1	—	—	0	0	—	—
Wyoming**	—	0	0	—	—	—	0	0	—	—
Pacific	—	0	4	15	46	—	0	0	—	—
Alaska	—	0	0	—	1	—	0	0	—	—
California	—	0	2	5	32	—	0	0	—	—
Hawaii	—	0	4	5	—	—	0	0	—	—
Oregon	—	0	0	—	—	—	0	0	—	—
Washington	—	0	1	5	13	—	0	0	—	—
Territories										
American Samoa	—	0	0	—	—	—	0	0	—	—
C.N.M.I.	—	—	—	—	—	—	—	—	—	—
Guam	—	0	0	—	—	—	0	0	—	—
Puerto Rico	—	25	215	881	9,645	—	0	3	15	223
U.S. Virgin Islands	—	0	0	—	—	—	0	0	—	—

C.N.M.I.: Commonwealth of Northern Mariana Islands.

U: Unavailable. —: No reported cases. N: Not reportable. NN: Not Nationally Notifiable. Cum: Cumulative year-to-date counts. Med: Median. Max: Maximum.

* Case counts for reporting year 2011 are provisional and subject to change. For further information on interpretation of these data, see http://www.cdc.gov/osels/ph_surveillance/nndss/phps/files/ProvisionalNationa%20NotifiableDiseasesSurveillanceData20100927.pdf. Data for TB are displayed in Table IV, which appears quarterly.

† Updated weekly from reports to the Division of Vector-Borne Infectious Diseases, National Center for Zoonotic, Vector-Borne, and Enteric Diseases (ArboNET Surveillance).

§ Dengue Fever includes cases that meet criteria for Dengue Fever with hemorrhage, other clinical and unknown case classifications.

¶ DHF includes cases that meet criteria for dengue shock syndrome (DSS), a more severe form of DHF.

** Contains data reported through the National Electronic Disease Surveillance System (NEDSS).

Morbidity and Mortality Weekly Report

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

Data presented by the Notifiable Disease Data Team and 122 Cities Mortality Data Team in the weekly *MMWR* are provisional, based on weekly reports to CDC by state health departments. Address all inquiries about the *MMWR* Series, including material to be considered for publication, to Editor, *MMWR* Series, Mailstop E-90, CDC, 1600 Clifton Rd., N.E., Atlanta, GA 30333 or to mmwrq@cdc.gov.

All material in the *MMWR* Series is in the public domain and may be used and reprinted without permission; citation as to source, however, is appreciated.

Use of trade names and commercial sources is for identification only and does not imply endorsement by the U.S. Department of Health and Human Services.

References to non-CDC sites on the Internet are provided as a service to *MMWR* readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of these sites. URL addresses listed in *MMWR* were current as of the date of publication.

U.S. Government Printing Office: 2012-523-043/21085 Region IV ISSN: 0149-2195