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Heat-Related Deaths After an Extreme Heat Event — Four States, 2012, and United States, 1999–2009

On June 29, 2012, a rapidly moving line of intense thunderstorms with high winds swept across the midwestern and eastern United States, causing widespread damage and power outages. Afterward, the area experienced extreme heat, with maximum temperatures exceeding 100°F (37.8°C) (*1*). This report describes 32 heat-related deaths in Maryland, Ohio, Virginia, and West Virginia that occurred during the 2 weeks following the storms and power outages. Median age of the decedents was 65 years, and most of the excessive heat exposures occurred within homes. During 1999–2009, an annual average of 658 heat-related deaths occurred in the United States (*2*). Heat-related deaths are preventable, and heat response plans should be in place before an extreme heat event (EHE). Interventions should focus on identifying and limiting heat exposure among vulnerable populations.

During June 30–July 13, 2012, an EHE occurred; maximum daily temperatures in Maryland, Ohio, Virginia, and West Virginia ranged from 83°F to 104°F (28.3°C to 40.0°C), averaging 9.5°F (5.3°C) warmer than normal (*1*). The EHE followed a series of powerful thunderstorms with wind gusts up to 80 miles (129 km) per hour that caused widespread damage across parts of the Ohio Valley and the Mid-Atlantic regions. The resultant power outages affected approximately 3.8 million persons and lasted 8 days in some areas. To describe the epidemiology of heat-related deaths that occurred during the EHE, information was collected from the state offices of the medical examiner or vital statistics. These offices analyzed death certificates and medical examiners' records and recorded deaths in which exposure to excessive heat either caused or significantly contributed to a death.* For comparison, a baseline number of heat-related deaths† in these four states over the same 2-week summer period each year of 1999–2009 was calculated using mortality data from CDC (*2*).

During June 30–July 13, 2012, a total of 32 deaths (0.11 deaths per 100,000 population) from excessive heat exposure were reported, including 12 in Maryland, 12 in Virginia, seven in Ohio, and one in West Virginia. In comparison, a median of four and average of eight (range: 1–29) heat-related deaths occurred in the four states during the same 2-week summer period each year of 1999–2009. The median age of the 32 decedents was 65 years (range: 28–89 years); 72% were male. Most decedents (75%) were unmarried or living alone. Common

* The underlying cause of death was defined as the disease or injury that initiated the chain of events that led directly and inevitably to death. Contributing conditions, or factors, were defined as diseases, injuries, or complications that contributed to the death and were a result of the underlying cause. A sample death certificate, showing underlying and contributing causes of death, is available at http://www.cdc.gov/nchs/data/dvs/death11-03final-acc.pdf.

† Deaths from excessive heat exposure were defined using codes from the *International Classification of Diseases, 10th Revision*. Such deaths included those in which exposure to excessive natural heat (X30) was reported as either the underlying or a contributing cause of death. Deaths from exposure to excessive heat of man-made origin (W92) were excluded. Guidance for certification of death is available in the *Medical Examiners' and Coroners' Handbook on Death Registration and Fetal Death Reporting* (2003 revision), available at http://www.cdc.gov/nchs/data/misc/hb_me.pdf.

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underlying or contributing conditions included cardiovascular disease (14) and chronic respiratory disease (four). In at least seven (22%) of the deaths, loss of power from the storms was known to be a contributing factor. Overall, 22 (69%) decedents died at home, with lack of air conditioning reported in 20 (91%) of these deaths. In the homes of five persons who died, a functioning air conditioner was present but not turned on. Of the seven deaths in which housing type was specified, six occurred in multifamily dwellings. Heat exposure occurred outdoors in three deaths, and two deaths occurred in a vehicle.

To compare the 2012 EHE with previously reported EHEs without concurrent power outages, a search was conducted using PubMed for reports of deaths from EHEs that occurred in the United States during the previous 20-year period. The search was conducted using the key words "heat wave," "extreme heat," or "extreme heat event" plus the key words "mortality" or "death." Only reports that covered a similar length of time (10–14 days) were included; a total of three reports met these criteria. During July 6–16, 1993, an EHE in Philadelphia, Pennsylvania, resulted in 118 deaths (7.5 deaths per 100,000) (*3*). Two years later, 514 deaths (9.7 deaths per 100,000) occurred during July 10–20, 1995, in Chicago, Illinois (*4*). In 2005, a 14-day heat wave resulted in 28 reported deaths (0.77 deaths per 100,000) in Maricopa County, Arizona (*5*). A lower fatality rate for heat-related deaths was reported in the 2012 EHE than in previous EHEs lasting 10–14 days. Public health and emergency management officials in Maryland, Ohio, Virginia, and West Virginia rapidly initiated preplanned heat response activities, which might have led to a decrease in the number of expected deaths.

To better understand the scope of heat exposure, mortality data for 1999–2009 (*2*) were used to review heat-related deaths in the United States overall. During this period, 7,233 heat-related deaths occurred, an average of 658 per year (Figure). In 5,201 (72%) of these deaths, the underlying cause was exposure to excessive heat, and heat was a contributing factor in the remaining 2,032 (28%) deaths. Heat-related deaths were reported most frequently among males (4,955; 69%) and among adults aged ≥65 years (2,621; 36%). Almost all heat-related deaths occurred during May–September (6,821; 94%), with the highest numbers reported during July (2,825; 39%) and August (1,925; 27%).[§]

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[§] Additional analyses are available at www.ephtracking.cdc.gov/showhome.action.

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Editorial Note

EHEs, defined as summer temperatures substantially hotter or more humid than the norm for the location and time of year, lead to increased numbers of heat-related illnesses and deaths. The number of heat-related deaths reported during the 2012 EHE, which coincided with widespread power outages, was higher than the average number of heat-related deaths reported in these four states in the same 2-week period for previous years. Of the 32 persons who died, half were aged ≥65 years. Based on medical examiner reports, lack of air conditioning and the type of housing contributed to some of these deaths.

Heat-related deaths are preventable, and advanced planning for EHEs is recommended to minimize mortality during these events (*6,7*). Identifying vulnerable populations (e.g., the elderly, very young persons, persons with chronic illnesses, or those with altered mental status) and targeting interventions to those most at risk are keys to prevention. Interventions during an EHE include staying cool, hydrated, and informed about extreme heat alerts in the area and symptoms of heat illness.

Several states developed interventions targeting the elderly during the 2012 EHE. In Ohio, the Emergency Management Agency, the Department of Health, and the Department of Aging collaborated to identify areas of high concentrations of power outages and high populations of older residents. Beginning July 1, approximately 200 National Guard personnel conducted home visits to the elderly to identify persons experiencing signs of heat exhaustion using wellness toolkits prepared by these three organizations. On July 2, Ohio launched a "Check on Your Neighbor" campaign to encourage residents to help identify and assist persons at risk. On July 3, the Ohio Board of Regents and Department of Aging enlisted the aid of university and college students as part of the "Knock and Talk" effort targeting the elderly. The National Guard in West Virginia also participated in home visits to the elderly and other socially isolated persons, with approximately 100 health and wellness teams going door-to-door in communities throughout the state. In Maryland, assisted-living programs servicing ≥50 persons are required to have an emergency electrical power generator onsite.¶

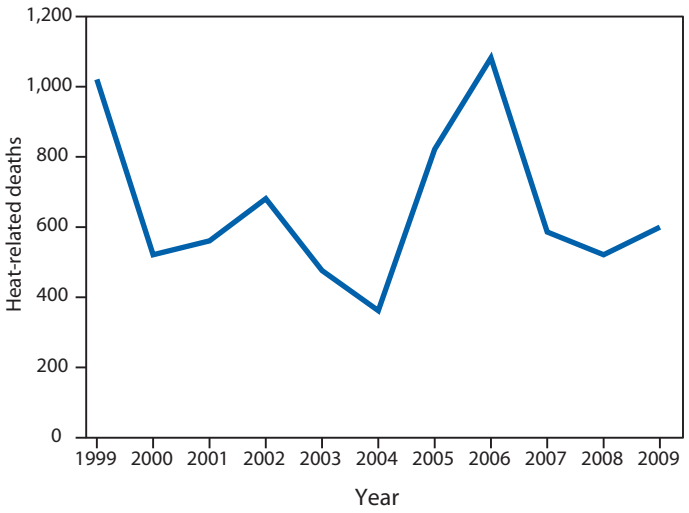
Utility companies in Virginia and West Virginia were represented in the emergency operations centers from the onset of the EHE and worked with the states to prioritize power restoration to vulnerable populations. States also used multiple media formats (e.g., press releases, media interviews, social media, reverse 911 calls, and daily web updates) to communicate rapidly and frequently with the public and provide educational messages and increased awareness of resources.

In Virginia, pre-scripted public information messages about the dangers of excessive heat exposure and available resources are prepared before summer begins. Developing communication plans before an event allows for a quicker response (*8*), and enables staff to focus on other intervention activities.**

Municipalities can develop heat response plans in preparation for EHEs. In 2011, the Maryland Department of Health and Mental Hygiene developed a heat emergency plan that outlines actions to be taken before the beginning of the extreme heat season and provides guidance during an EHE. Under this plan, educational messages regarding heat exposure risks are issued beginning in June. Although the combination of widespread power outages and high temperatures was unexpected, public awareness in Maryland of the risks associated with excessive heat exposure likely was heightened as a result of educational messages.††

In the 2012 EHE, 69% of decedents were found at home without air conditioning. Five decedents had an air conditioner that was not turned on. Power loss might have contributed to these deaths; decedents might have been unaware that power had been restored before they succumbed to heat. To increase access to air conditioning, cooling stations or other public locations could be opened to provide residents temporary relief

FIGURE. Heat-related deaths — United States, 1999–2009



Source: National Vital Statistics System. Mortality public use data files, 1999–2009. Available at http://www.cdc.gov/nchs/data_access/vitalstatsonline.htm.

¶ Emergency electrical power generator. Maryland Code Health–General, Title 19, Subtitle 18, Sect. 19-1812 (2010).

** A media toolkit for extreme heat, including resources targeted at specific groups, is available at http://www.cdc.gov/nceh/extremeheat.

†† Sample educational materials are available at http://www.cdc.gov/nceh/extremeheat/materials.html.

What is already known on this topic?

Excessive heat is a leading cause of preventable, weather-related deaths, particularly among the elderly. Recommended interventions for individuals include staying cool, hydrated, and informed.

What is added by this report?

During June 30–July 13, 2012, a total of 32 persons died from excessive heat exposure in four states. Their median age was 65 years (range: 28–89 years); 72% were male, and 75% were unmarried or living alone. Overall, 22 (69%) decedents died at home, with lack of air conditioning reported in 20 (91%) of these deaths. Despite widespread power outages, the numbers of heat-related deaths were lower than expected compared with the numbers occurring in previous extreme heat events.

What are the implications for public health practice?

Although evaluating the efficacy of heat response plans is difficult, advanced planning for extreme heat events and rapid, coordinated responses among state and local agencies and public and private entities might minimize the loss of life during a heat event and should be encouraged.

from heat, particularly when elevated temperatures occur for several consecutive days. However, qualitative studies suggest that cooling stations are not well-used because of perceived and real barriers, including lack of transportation access, safety issues, stigma of public shelters, inability to bring pets, and limited operating hours (Sabrina McCormick, PhD, George Washington University, personal communication, 2013).

The findings in this report are subject to at least four limitations. First, because only deaths in which excessive heat exposure was recorded on the death certificate were reported, the number of deaths in which heat was a contributing factor might be underestimated (*7*). Second, although the 14-day reporting period was chosen on the basis of surveillance data, maximum daily temperatures, and time to power restoration, some deaths caused by this event might have occurred after July 13. Third, because historical numbers were based on codes assigned by the National Vital Statistics System (NVSS) and deaths reported in the 2012 EHE were based on death certificates, discrepancies might have occurred in how deaths were classified. Finally, because a few heat-related deaths occur each year in these four states, some of the deaths captured might have been part of the background rate and not a result of loss of power during the EHE. The number of deaths that might have occurred in these states regardless of the 2012 EHE could not be quantified because the historical numbers varied from year to year.

The targeted interventions for vulnerable populations that were implemented by the affected states might have reduced the loss of life from this EHE. Interventions, including rapid distribution of public health messages (e.g., reverse 911 calls), visits to persons at high risk, and laws to provide additional resources, (e.g., back-up power supplies to vulnerable populations), might have contributed to lower numbers of heat-related deaths. Public health and emergency management personnel should work together to identify vulnerable populations in their area and design response plans to guide actions during an EHE.

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Timothy Powell, Virginia Dept of Health. Joseph Annelli, Maryland Dept of Health and Mental Hygiene. West Virginia Health Statistics Center.

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Workers' Compensation Claims for Musculoskeletal Disorders Among Wholesale and Retail Trade Industry Workers — Ohio, 2005–2009

Work-related musculoskeletal disorders (WMSDs) resulting from ergonomic hazards are common in the United States. Recent data from the Bureau of Labor Statistics (BLS) indicate that in 2011, one third of occupational injuries and illnesses resulting in lost time from work were WMSDs (*1*). Based on data from the 2010 BLS Survey of Occupational Injuries and Illnesses, a higher rate of WMSDs resulting in lost time from work occurred in the Wholesale and Retail Trade (WRT) industry compared with most other industries (*2*). To assess trends and identify WRT subsectors and subgroups associated with high rates of WMSD workers' compensation claims, the Ohio Bureau of Workers' Compensation (OBWC) and CDC analyzed OBWC claims data for single-location WRT employers in Ohio for the period 2005–2009. From 2005 to 2009, the rate of WMSD claims declined from 86.3 to 52.8 per 10,000 employees. The three WRT industry subsectors with the highest rates of WMSD claims were Merchant Wholesalers, Nondurable Goods; Furniture and Home Furnishings Stores; and Merchant Wholesalers, Durable Goods. Within those three WRT subsectors, the highest rates of WMSD claims were noted in five subgroups: furniture stores and wholesalers of alcoholic beverages, groceries and related products, metal and minerals, and motor vehicle parts. Providing recommendations for WMSD prevention is particularly important for these WRT subgroups.

OBWC is the largest of four state-run workers' compensation systems in the United States where the state is the sole provider of workers' compensation insurance.* Data for OBWC-insured, single-location† employers in the WRT industry were used for this report; subsectors and subsector groups were categorized according to the North American Industry Classification System (NAICS). With few exceptions, WMSD claims were defined according to BLS case definitions.§ Coded injury/illness diagnosis data and narrative text on causation were used to identify WMSD claims; a Bayesian auto-coding technique (*3*) used both data elements to identify WMSDs by using a "training" and "testing" set of manually coded claims. The sensitivity and specificity of this auto-coding technique when applied to a test set were 0.90 and 0.98, respectively. Auto-coded WMSD claims were flagged for manual, expert review when the injury/illness diagnosis was not a WMSD. Lost-time claims for WMSDs were defined as claims resulting in more than 7 days away from work. To calculate incidence rates, OBWC claims data were linked with denominator data (number of employees) from the Ohio Department of Jobs and Family Services by federal employer identification numbers. Trends in rates were tested using Poisson regression analysis. Disallowed and dismissed claims were excluded from all analyses.

In 2009, CDC identified 31,599 OBWC-insured, single-location employers in the WRT industry, employing at least 289,441 workers. Of those identified WRT employers, 13,930 (44%) were in the wholesale category of the industry. The proportion of all claims attributable to WMSDs was relatively stable at approximately 20% throughout 2005–2009; the proportion of WMSD lost-time claims decreased from 37.4% in 2005 to 31.8% in 2009 ($p<0.05$) (Table 1). During 2005–2009, the majority of claimants were men aged 25–54 years, who worked for employers with 11–249 employees. The greatest number of WMSD claims occurred in the WRT subsector Merchant Wholesalers, Durable Goods (Table 1).

The rate of WMSDs resulting in a claim or a lost-time claim decreased significantly from 2005 to 2009 for WRT industry employers overall but not for all WRT subsectors. Overall in the WRT industry, the respective rates of WMSD claims and lost-time WMSD claims per 10,000 employees decreased from 86.3 and 28.7 in 2005 to 52.8 and 14.1 in 2009 (Table 2). Employers with more employees tended to have higher rates of total and lost-time WMSD claims. During 2005–2009, lost-time WMSD claim rates per 10,000 employees for three WRT subsectors were among the highest five each year: Merchant Wholesalers, Nondurable Goods (29.2 in 2009); Furniture and Home Furnishings Stores (21.7); and Merchant Wholesalers, Durable Goods (15.5) (Figure, Table 2). The high lost-time WMSD rates in these three WRT subsectors were consistently attributable to high rates in five subgroups within the subsectors: wholesalers of alcoholic beverages (114.8 in 2009), grocery and related products (30.9), metal and minerals (28.0), and motor vehicle parts and supplies (25.4); and furniture stores (27.2).

* All public Ohio employers and private employers (except sole proprietorships or partnerships) with fewer than 500 employees must participate in the OBWC system. Other private employers have the option to self-insure for workers' compensation insurance. OBWC provides workers' compensation insurance for approximately two thirds of Ohio workers but a smaller proportion of WRT workers.

† OBWC claims cannot be linked to a particular employer if the policy includes more than one location. Therefore, these analyses are confined to single-location employers. In 2009, among identified OBWC-insured WRT employers, employees at 31,599 single-location employers filed 7,661 workers' compensation claims and employees at 882 multiple-location employers filed 3,441 claims.

§ BLS case definitions are available at http://www.bls.gov/iif/oshdef.htm. This analysis used a definition for musculoskeletal disorders that included Raynaud's phenomenon, tarsal tunnel syndrome, and herniated spinal discs, similar to the revised BLS case definition (2011 and forward). Also, the work-related musculoskeletal disorders case definition used in this analysis excluded events or exposures resulting from a single episode of overexertion/bodily reaction from climbing down, stepping down, or walking or running without other incident (i.e., missteps).

TABLE 1. Number and percentage of WRT musculoskeletal disorder workers' compensation claims, by claim status, age group, sex, single-location–employer size, and WRT NAICS code — Ohio, 2005, 2007, and 2009

	2005				2007				2009			
	Total		LT		Total		LT		Total		LT	
Characteristic	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)	No.	(%)
WRT NAICS total	**3,019**	**(21.6)**	**1,006**	**(37.4)**	**2,407**	**(21.1)**	**709**	**(33.8)**	**1,552**	**(20.3)**	**413**	**(31.8)**
Age group (yrs)												
14–17	7	(0.2)	0	0.0	12	(0.5)	2	(0.3)	4	(0.3)	0	0.0
18–19	78	(2.6)	19	(1.9)	40	(1.7)	6	(0.8)	19	(1.2)	2	(0.5)
20–24	313	(10.4)	66	(6.6)	250	(10.4)	41	(5.8)	137	(8.8)	21	(5.1)
25–34	787	(26.1)	215	(21.4)	600	(24.9)	150	(21.2)	368	(23.7)	71	(17.2)
35–44	880	(29.1)	297	(29.5)	706	(29.3)	223	(31.5)	420	(27.1)	113	(27.4)
45–54	685	(22.7)	283	(28.1)	544	(22.6)	190	(26.8)	391	(25.2)	131	(31.7)
55–64	244	(8.1)	116	(11.5)	229	(9.5)	89	(12.6)	199	(12.8)	69	(16.7)
≥65	24	(0.8)	9	(0.9)	26	(1.1)	8	(1.1)	14	(0.9)	6	(1.5)
Unknown	1	(0.0)	1	(0.1)	0	(0.0)	0	(0.0)	0	(0.0)	0	(0.0)
Sex												
Female	604	(20.0)	196	(19.5)	461	(19.2)	119	(16.8)	309	(19.9)	69	(16.7)
Male	2392	(79.2)	809	(80.4)	1919	(79.7)	589	(83.1)	1233	(79.4)	343	(83.1)
Unknown	23	(0.8)	1	(0.1)	27	(1.1)	1	(0.1)	10	(0.6)	1	(0.2)
Employer size (no. of employees)												
1–10	418	(13.8)	164	(16.3)	325	(13.5)	113	(15.9)	242	(15.6)	93	(22.5)
11–49	1104	(36.6)	373	(37.1)	838	(34.8)	258	(36.4)	508	(32.7)	132	(32.0)
50–249	1251	(41.4)	378	(37.6)	1044	(43.4)	277	(39.1)	642	(41.4)	142	(34.4)
≥250	237	(7.9)	86	(8.5)	192	(8.0)	58	(8.2)	137	(8.8)	41	(9.9)
Unknown	9	(0.3)	5	(0.5)	8	(0.3)	3	(0.4)	23	(1.5)	5	(1.2)
WRT NAICS code												
423 Merchant Wholesalers, Durable Goods	1008	(33.4)	333	(33.1)	787	(32.7)	221	(31.2)	463	(29.8)	115	(27.8)
424 Merchant Wholesalers, Nondurable Goods	559	(18.5)	207	(20.6)	468	(19.4)	137	(19.3)	376	(24.2)	101	(24.5)
425 Wholesale Electronic Markets and Agents and Brokers	119	(3.9)	31	(3.1)	101	(4.2)	19	(2.7)	76	(4.9)	20	(4.8)
441 Motor Vehicle and Parts Dealers	367	(12.2)	122	(12.1)	327	(13.6)	106	(15.0)	222	(14.3)	68	(16.5)
442 Furniture and Home Furnishings Stores	144	(4.8)	50	(5.0)	101	(4.2)	27	(3.8)	50	(3.2)	16	(3.9)
443 Electronics and Appliance Stores	46	(1.5)	10	(1.0)	29	(1.2)	7	(1.0)	26	(1.7)	4	(1.0)
444 Building Material and Garden Equipment and Supplies Dealers	220	(7.3)	69	(6.9)	155	(6.4)	54	(7.6)	81	(5.2)	20	(4.8)
445 Food and Beverage Stores	226	(7.5)	79	(7.9)	182	(7.6)	63	(8.9)	104	(6.7)	30	(7.3)
446 Health and Personal Care Stores	18	(0.6)	5	(0.5)	14	(0.6)	4	(0.6)	18	(1.2)	3	(0.7)
447 Gasoline Stations	52	(1.7)	17	(1.7)	44	(1.8)	18	(2.5)	30	(1.9)	12	(2.9)
448 Clothing and Clothing Accessories Stores	48	(1.6)	14	(1.4)	38	(1.6)	9	(1.3)	19	(1.2)	4	(1.0)
451 Sporting Goods, Hobby, Book, and Music Stores	31	(1.0)	8	(0.8)	20	(0.8)	4	(0.6)	14	(0.9)	3	(0.7)
452 General Merchandise Stores	6	(0.2)	3	(0.3)	14	(0.6)	3	(0.4)	9	(0.6)	2	(0.5)
453 Miscellaneous Store Retailers	80	(2.6)	22	(2.2)	60	(2.5)	18	(2.5)	26	(1.7)	6	(1.5)
454 Nonstore Retailers	95	(3.1)	36	(3.6)	67	(2.8)	19	(2.7)	38	(2.4)	9	(2.2)

Abbreviations: WRT = wholesale retail trade; NAICS = North American Industry Classification System; LT = lost-time claims (excluding claims for which the size of the employer was unknown).

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Editorial Note

Improved surveillance of work-related WMSDs is a national priority (*4*). This report demonstrates how workers' compensation claims data can be used for public health surveillance. The results indicate that although the rate of WMSD claims (overall and lost-time) among workers employed by OBWC-insured employers declined from 2005 to 2009 for most WRT subsectors, workers in some subsectors experienced higher rates of WMSD claims than workers in other WRT

TABLE 2. Rate and trend of musculoskeletal disorder workers' compensation claims per 10,000 employees, by claim status, WRT NAICS code, and single-location–employer size — Ohio, 2005–2009

WRT NAICS code employer size (no. of employees)	2005		2009		Trend analysis*					
					Total			LT		
	Total	LT	Total	LT	Slope	(95% CLs)	p-value	Slope	(95% CLs)	p-value
WRT NAICS total	**86.3**	**28.7**	**52.8**	**14.1**	**-0.12**	**(-0.14, -0.10)**	**<0.001**	**-0.17**	**(-0.20, -0.13)**	**<0.001**
Employer size										
1–10	43.8	17.2	27.6	10.6	-0.12	(-0.13, -0.11)	<0.001	-0.15	(-0.21, -0.08)	<0.001
11–49	80.3	27.1	44.1	11.5	-0.15	(-0.16, -0.13)	<0.001	-0.19	(-0.24, -0.15)	<0.001
50–249	127.1	38.4	86.5	19.1	-0.09	(-0.12, -0.06)	<0.001	-0.14	(-0.22, -0.07)	<0.001
≥250	135.2	49.1	109.8	32.9	-0.05	(-0.08, -0.02)	0.003	-0.11	(-0.22, 0.00)	0.048
423 Merchant Wholesalers, Durable Goods	119.3	39.2	62.7	15.5	-0.15	(-0.17, -0.13)	<0.001	-0.22	(-0.25, -0.20)	<0.001
1–10	61.6	25.0	31.0	10.2	-0.17	(-0.18, -0.16)	<0.001	-0.27	(-0.40, -0.15)	<0.001
11–49	110.4	39.3	56.2	12.8	-0.16	(-0.19, -0.13)	<0.001	-0.25	(-0.32, -0.17)	<0.001
50–249	165.9	48.4	98.8	25.1	-0.12	(-0.14, -0.10)	<0.001	-0.16	(-0.26, -0.06)	0.002
≥250	208.7	51.1	107.1	17.1	-0.12	(-0.24, 0.01)	0.066	-0.36	(-0.58, -0.14)	0.001
424 Merchant Wholesalers, Nondurable Goods	138.9	51.3	108.8	29.2	-0.07	(-0.08, -0.05)	<0.001	-0.13	(-0.18, -0.09)	<0.001
1–10	53.7	21.2	45.6	21.3	-0.06	(-0.15, 0.02)	0.150	-0.06	(-0.22, 0.10)	0.478
11–49	112.5	40.6	70.3	12.2	-0.15	(-0.21, -0.08)	<0.001	-0.31	(-0.41, -0.20)	<0.001
50–249	206.1	66.9	154.6	34.5	-0.06	(-0.10, -0.03)	<0.001	-0.13	(-0.21, -0.05)	0.001
≥250	156.6	77.5	234.2	100.4	0.09	(0.01, 0.18)	0.032	0.07	(-0.02, 0.17)	0.136
425 Wholesale Electronic Markets and Agents and Brokers	61.4	16.3	37.4	10.5	-0.13	(-0.22, -0.05)	0.001	-0.16	(-0.29, -0.03)	0.017
1–10	35.2	7.9	23.6	9.0	-0.11	(-0.26, 0.04)	0.154	0.01	(-0.18, 0.20)	0.916
11–49	72.9	24.3	47.0	15.0	-0.12	(-0.24, 0.00)	0.060	-0.22	(-0.55, 0.12)	0.211
50–249	124.2	24.1	61.1	10.2	-0.21	(-0.44, 0.02)	0.079	-0.26	(-0.58, 0.05)	0.105
≥250	55.2	20.1	11.6	0.0	-0.25	(-0.61, 0.12)	0.184	-0.55	(-1.44, 0.35)	0.231
441 Motor Vehicle and Parts Dealers	66.1	22.0	46.7	14.4	-0.09	(-0.12, -0.06)	<0.001	-0.10	(-0.15, -0.06)	<0.001
1–10	69.5	27.8	42.3	18.3	-0.10	(-0.21, 0.01)	0.062	-0.14	(-0.22, -0.05)	0.002
11–49	58.2	22.1	35.1	15.9	-0.10	(-0.19, 0.00)	0.048	-0.08	(-0.14, -0.02)	0.008
50–249	67.8	20.9	55.3	12.0	-0.08	(-0.16, 0.00)	0.040	-0.13	(-0.16, -0.10)	<0.001
≥250	128.6	12.2	110.7	6.9	-0.05	(-0.13, 0.03)	0.210	-0.12	(-0.52, 0.29)	0.573
442 Furniture and Home Furnishings Stores	133.0	45.6	67.7	21.7	-0.17	(-0.25, -0.09)	<0.001	-0.23	(-0.34, -0.12)	<0.001
1–10	55.5	26.7	36.1	22.2	-0.16	(-0.36, 0.04)	0.126	-0.14	(-0.47, 0.19)	0.405
11–49	152.2	42.9	35.1	15.6	-0.33	(-0.42, -0.24)	<0.001	-0.29	(-0.51, -0.08)	0.007
50–249	296.2	107.1	192.3	21.4	-0.07	(-0.26, 0.12)	0.480	-0.28	(-0.72, 0.16)	0.208
≥250	—	—	341.3	68.3	NC	NC	NC	NC	NC	NC
443 Electronics and Appliance Stores	58.9	12.8	38.6	5.9	-0.13	(-0.25, -0.02)	0.024	-0.19	(-0.44, 0.06)	0.141
1–10	33.4	13.4	39.1	0.0	0.01	(-0.19, 0.22)	0.896	-0.58	(-1.17, 0.01)	0.053
11–49	75.3	19.6	39.4	9.8	-0.20	(-0.38, -0.01)	0.034	-0.13	(-0.46, 0.20)	0.452
50–249	92.7	0.0	54.1	12.0	-0.14	(-0.37, 0.08)	0.206	0.41	(-0.29, 1.12)	0.247
≥250	0.0	0.0	0.0	0.0	0.34	(-1.44, 2.12)	0.709	NC	NC	NC
444 Building Material and Garden Equipment and Supplies Dealers	109.8	34.5	54.1	13.5	-0.17	(-0.22, -0.11)	<0.001	-0.16	(-0.26, -0.07)	0.001
1–10	58.2	21.6	33.1	11.0	-0.16	(-0.28, -0.04)	0.011	-0.18	(-0.39, 0.02)	0.082
11–49	119.3	37.8	57.9	12.1	-0.17	(-0.25, -0.10)	<0.001	-0.17	(-0.30, -0.03)	0.014
50–249	167.5	45.9	99.0	26.1	-0.10	(-0.2, 0.00)	0.052	-0.08	(-0.27, 0.11)	0.384
≥250	—	—	—	—	NC	NC	NC	NC	NC	NC
445 Food and Beverage Stores	63.7	22.4	34.5	10.0	-0.14	(-0.19, -0.09)	<0.001	-0.16	(-0.24, -0.07)	<0.001
1–10	36.8	10.9	26.2	11.5	-0.05	(-0.17, 0.06)	0.385	0.02	(-0.16, 0.21)	0.829
11–49	50.2	19.6	27.5	6.9	-0.13	(-0.22, -0.05)	0.002	-0.24	(-0.40, -0.08)	0.003
50–249	97.1	36.2	54.6	10.2	-0.12	(-0.19, -0.04)	0.002	-0.20	(-0.34, -0.06)	0.006
≥250	172.4	30.4	39.1	29.3	-0.38	(-0.55, -0.21)	<0.001	-0.09	(-0.38, 0.21)	0.571

See table footnotes on the next page.

TABLE 2. (*Continued*) Rate and trend of musculoskeletal disorder workers' compensation claims per 10,000 employees, by claim status, WRT NAICS code, and single-location–employer size — Ohio, 2005–2009

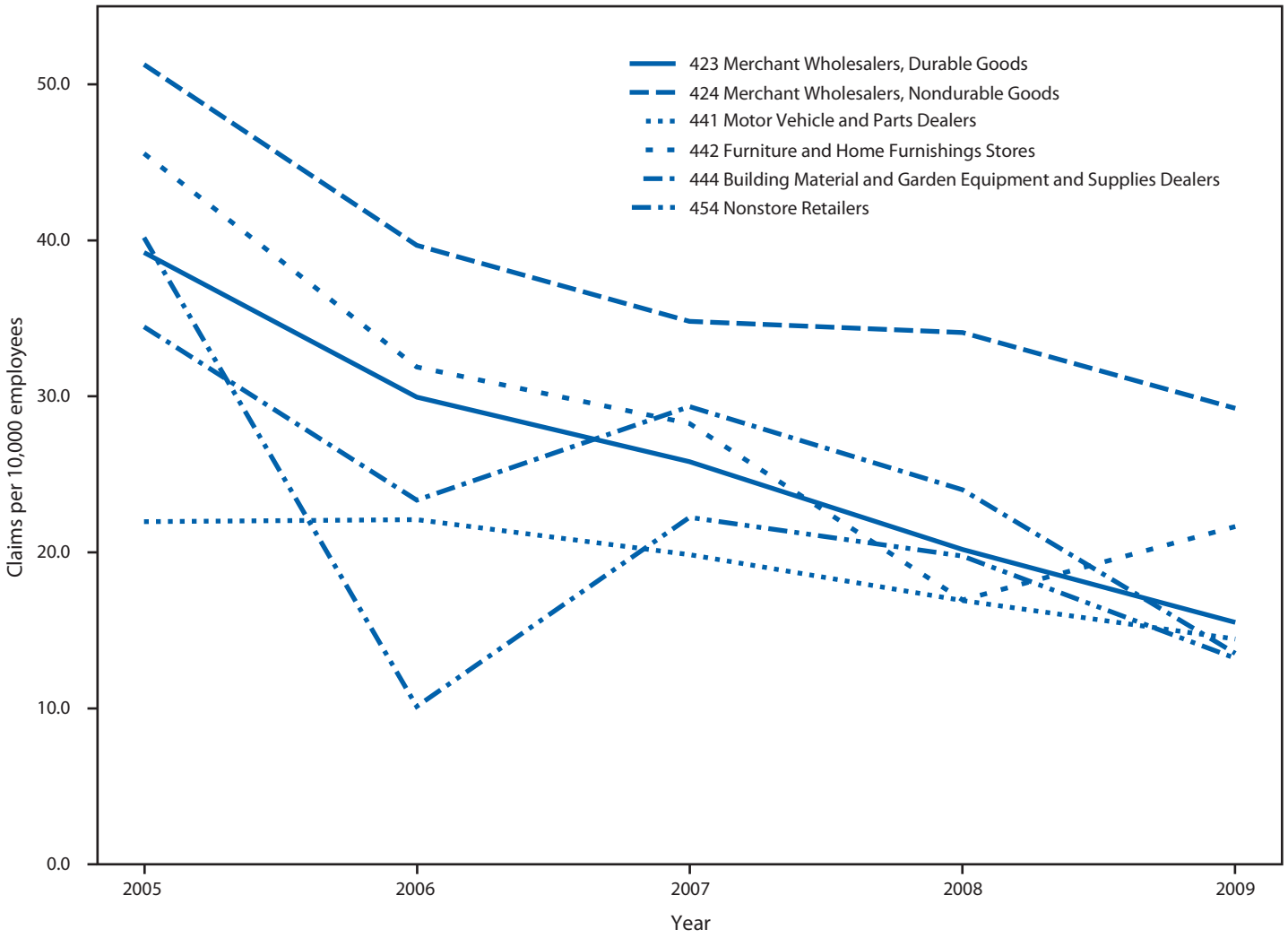
WRT NAICS code employer size (no. of employees)	2005		2009		Trend analysis*					
					Total			LT		
	Total	LT	Total	LT	Slope	(95% CLs)	p-value	Slope	(95% CLs)	p-value
446 Health and Personal Care Stores	17.0	4.7	17.4	2.9	-0.02	(-0.16, 0.13)	0.839	-0.11	(-0.44, 0.22)	0.512
1–10	6.0	3.0	6.3	3.2	-0.21	(-0.75, 0.33)	0.452	-0.16	(-0.97, 0.66)	0.705
11–49	13.5	1.9	15.6	4.4	0.03	(-0.24, 0.30)	0.813	0.47	(-0.23, 1.17)	0.188
50–249	54.3	18.1	56.5	0.0	-0.04	(-0.25, 0.17)	0.723	-0.53	(-1.16, 0.11)	0.105
≥250	0.0	0.0	7.8	0.0	-0.01	(-0.44, 0.42)	0.968	-0.31	(-1.11, 0.48)	0.440
447 Gasoline Stations	41.4	13.5	30.6	12.3	-0.07	(-0.16, 0.03)	0.185	-0.02	(-0.19, 0.15)	0.791
1–10	36.3	21.0	28.3	12.1	-0.02	(-0.17, 0.14)	0.823	-0.08	(-0.32, 0.17)	0.528
11–49	21.7	4.0	24.5	7.4	0.00	(-0.16, 0.16)	0.966	-0.01	(-0.29, 0.28)	0.964
50–249	86.2	17.2	99.0	59.4	-0.03	(-0.25, 0.19)	0.797	0.26	(-0.21, 0.73)	0.278
≥250	135.1	19.3	37.9	0.0	NC	NC	NC	NC	NC	NC
448 Clothing and Clothing Accessories Stores	38.2	11.1	21.5	4.5	-0.18	(-0.29, -0.08)	0.001	-0.15	(-0.36, 0.05)	0.145
1–10	6.1	4.1	2.3	2.3	-0.16	(-0.51, 0.19)	0.378	0.03	(-0.53, 0.59)	0.918
11–49	19.2	5.5	11.6	3.9	-0.25	(-0.52, 0.02)	0.071	-0.04	(-0.54, 0.45)	0.864
50–249	121.6	32.0	75.4	10.1	-0.16	(-0.29, -0.03)	0.014	-0.22	(-0.48, 0.04)	0.101
≥250	0.0	0.0	—	—	NC	NC	NC	NC	NC	NC
451 Sporting Goods, Hobby, Book, and Music Stores	32.6	8.4	17.7	3.8	-0.17	(-0.30, -0.03)	0.016	-0.15	(-0.41, 0.10)	0.241
1–10	17.2	4.9	15.2	3.0	-0.18	(-0.43, 0.07)	0.154	-0.35	(-0.9, 0.19)	0.204
11–49	26.0	7.8	13.7	6.9	-0.19	(-0.43, 0.05)	0.121	-0.07	(-0.43, 0.30)	0.717
50–249	105.9	22.7	11.3	0.0	-0.30	(-0.55, -0.04)	0.022	-0.06	(-0.56, 0.44)	0.817
≥250	0.0	0.0	48.4	0.0	0.88	(-0.05, 1.81)	0.065	NC	NC	NC
452 General Merchandise Stores	28.1	14.0	64.8	14.4	0.09	(-0.13, 0.31)	0.427	-0.10	(-0.55, 0.36)	0.680
1–10	38.8	25.9	48.7	0.0	0.05	(-0.40, 0.51)	0.818	-0.79	(-1.95, 0.37)	0.184
11–49	29.9	10.0	43.9	14.6	0.00	(-0.34, 0.34)	0.995	-0.01	(-0.64, 0.61)	0.973
50–249	0.0	0.0	333.3	111.1	0.45	(0.03, 0.86)	0.034	0.74	(-0.42, 1.89)	0.211
≥250	—	—	—	—	NC	NC	NC	NC	NC	NC
453 Miscellaneous Store Retailers	40.5	11.1	18.6	4.3	-0.16	(-0.24, -0.07)	<0.001	-0.17	(-0.32, -0.01)	0.035
1–10	25.6	8.5	12.1	6.7	-0.19	(-0.35, -0.03)	0.019	-0.03	(-0.29, 0.23)	0.846
11–49	48.5	10.0	22.0	2.0	-0.16	(-0.29, -0.03)	0.016	-0.16	(-0.40, 0.09)	0.203
50–249	65.3	20.8	38.7	0.0	-0.07	(-0.23, 0.10)	0.425	-0.31	(-0.65, 0.03)	0.074
≥250	—	—	—	—	NC	NC	NC	NC	NC	NC
454 Nonstore Retailers	106.0	40.2	55.8	13.2	-0.14	(-0.22, -0.05)	0.001	-0.22	(-0.37, -0.06)	0.006
1–10	83.2	41.6	22.6	0.0	-0.21	(-0.43, 0.00)	0.054	-0.50	(-0.90, -0.09)	0.017
11–49	80.9	17.6	56.3	18.8	-0.09	(-0.26, 0.07)	0.268	0.12	(-0.19, 0.43)	0.455
50–249	91.1	30.4	68.4	16.1	-0.03	(-0.17, 0.12)	0.720	-0.04	(-0.31, 0.24)	0.784
≥250	185.2	84.7	117.9	23.6	-0.17	(-0.34, -0.01)	0.037	-0.59	(-0.98, -0.21)	0.002

Abbreviations: WRT = wholesale retail trade; NAICS = North American Industry Classification System; LT = lost-time claims (excluding claims for which the size of the employer was unknown); CLs = confidence limits; NC = not calculable.
* Trend analysis is based on 5 years of data. Trends were not calculable where rates were missing for ≥1 years.

subsectors. The factors responsible for the downward trends in WMSD claims in Ohio in the WRT industry are unclear. At the national level, a downward trend for incident WMSDs from 2005 to 2009 also has been observed (*2*). For all workers' compensation claims and industry sectors, the National Council on Compensation Insurance has reported downward trends among many states since the 1990s (*5*), attributing the trends, at least in part, to 1) advances in automation, technology, and production; 2) an aging workforce (older workers tend to have fewer claims [*6*]); and 3) increased focus on workplace safety and loss control.

Workers in the WRT subsectors with the highest rates of workers' compensation claims are exposed to physical risk factors for WMSDs such as overexertion or repetitive motion (*7*). Work tasks in subgroups among those with the highest claim rates within the WRT subsectors (e.g., furniture stores and wholesalers of alcoholic beverages) commonly include lifting and transporting large, heavy objects. The Occupational

FIGURE. Rates of workers' compensation claims for musculoskeletal disorders resulting in lost-time per 10,000 employees, among the WRT NAICS subsectors with the highest rates — Ohio, 2005–2009



Abbreviations: WRT = wholesale retail trade; NAICS = North American Industry Classification System.

Safety & Health Administration has created ergonomic training tools that outline injury prevention activities for beverage delivery and grocery warehousing.[¶] Certain interventions (e.g., stair-climbing dollies, keg-handling equipment, and forklifts) can reduce many but not all manual material-handling tasks in these subgroups.

The findings in this report are subject to at least three limitations. First, this report is only representative of smaller employers (<500 employees) with a single location in Ohio. Second, the Bayesian auto-coding method used to identify WMSD claims introduces the potential for misclassification. However, misclassification is not expected to create bias in WMSD rates by WRT subsector. Finally, studies have estimated that workers' compensation claims data underreport work-related injuries and illnesses by 40%–80% (*8*–*10*). However, whereas underreporting of injuries and illnesses might reduce the size of claim rates, whether the differences observed among WRT subsectors or employers of different sizes were affected by underreporting is unknown.

The findings in this report suggest that the number and rate of WMSD claims declined from 2005 to 2009 among small WRT employers in Ohio, but relatively high rates of WMSD claims occurred among certain WRT subsectors and subgroups. Interventions to reduce exposure to ergonomic hazards in these subsectors and subgroups should continue to be developed and

[¶] Available at http://www.osha.gov/dts/osta/oshasoft/index.html.

What is already known on this topic?

Workers in the Wholesale and Retail Trade (WRT) industry have more work-related musculoskeletal disorders (WMSDs) resulting in lost work days than do most other workers.

What is added by this report?

Based on an analysis of claims filed with the Ohio Bureau of Workers' Compensation by single-location WRT employers, WMSD claims decreased from 86.3 per 10,000 employees in 2005 to 52.8 in 2009. The WRT industry subsectors with the highest rates of WMSD claims during 2005–2009 were Wholesalers, Nondurable Goods; Furniture and Home Furnishings Stores; and Wholesalers, Durable Goods. Within those three WRT subsectors, the highest rates of WMSD claims were noted in five subgroups: furniture stores and wholesalers of alcoholic beverages, groceries and related products, metal and minerals, and motor vehicle parts.

What are the implications for public health practice?

Although the rate of claims for WMSD resulting in lost work days has decreased in the WRT industry in Ohio, workers continue to experience WMSDs, and some WRT subsectors are experiencing higher rates of WMSD claims than others. Prevention efforts are most needed in the WRT subgroups, wholesalers of alcoholic beverages and groceries and related products.

implemented to prevent WMSDs. Given the large workforce employed in the WRT industry, declines in the number of WMSDs could substantially reduce the number of workplace injuries and illnesses overall.

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Progress Toward Measles Elimination — Western Pacific Region, 2009–2012

In 2005, the World Health Organization (WHO) Regional Committee for the Western Pacific Region (WPR) resolved that WPR should aim to eliminate measles* by 2012 (*1*). The recommended measles elimination strategies (*2*) in WPR include 1) achieving and maintaining high (≥95%) coverage with 2 doses of measles-containing vaccine (MCV) through routine immunization services and by implementing supplementary immunization activities (SIAs), when required; 2) conducting high-quality, case-based measles surveillance; 3) ensuring high-quality laboratory surveillance, with timely and accurate testing of specimens to confirm or discard suspected cases and detect measles virus for genotyping and molecular analysis; and 4) establishing and maintaining measles outbreak preparedness for rapid response and ensuring appropriate case management. This report updates the previous report (*3*) and describes progress toward eliminating measles in WPR during 2009–2012. During this period, measles incidence reached a historic low, decreasing by 83%, from 34.0 to 5.9 cases per million population. However, to achieve measles elimination in WPR, additional efforts are needed to strengthen routine immunization services in countries and areas with <95% coverage with the routine first (MCV1) or second dose of MCV (MCV2), to introduce a MCV2 dose in the four remaining countries and areas that do not yet have a routine 2-dose MCV schedule, and to use SIAs to close immunity gaps among measles-susceptible populations in countries and areas that have ongoing measles virus transmission.

Immunization Activities

Annual data on MCV coverage are reported from 36 of the 37 WPR countries and areas to WHO and the United Nations Children's Fund (UNICEF).† MCV1 coverage in WPR increased from 96% in 2009 to 98% in 2012. The number of countries with ≥95% MCV1 coverage increased from 12 (33%) in 2009 to 15 (42%) in 2012. MCV1 was administered at 8 months in one (3%), at age 9 months in six (17%),§ at age 10 months in one (3%), at age 12 months in 24 (67%), and at age >12 months in four (11%) (Table 1).

The number of countries and areas that provide routine MCV2 increased from 32 (89%) in 2009 to 33 (92%) in 2012, and the number reporting ≥95% MCV2 coverage increased from 10 (28%) in 2009 to 11 (31%) in 2012. Among the 33 countries and areas reporting MCV2 coverage in 2012, the scheduled age of MCV2 administration ranged from 12 months to 7 years. During 2009–2012, approximately 226 million children were vaccinated during 16 measles SIAs (Table 2); of these, seven (44%) SIAs included rubella vaccine, and 10 (63%) added at least one other child health intervention.

Surveillance Activities

During 2009–2012, measles case-based surveillance was conducted in all 37 WPR countries and areas, including 14 countries and two areas that report data individually, and 21 countries and areas of the Pacific Islands that report data as one epidemiologic block.¶ Measles surveillance data are reported monthly to WHO and supported by 385 laboratories participating in the WHO Global Measles and Rubella Laboratory Network** (*4*). Suspected measles cases were confirmed based on laboratory findings, an epidemiologic link, or clinical criteria.†† Key indicators of surveillance performance include 1) the number of suspected measles cases discarded as nonmeasles (target: ≥2 per 100,000 population); 2) the proportion of second-level administrative units with ≥1 nonmeasles discarded case per 100,000 population (target: ≥80%); 3) the percentage of suspected measles cases with adequate investigation that includes all essential data elements§§ (target: ≥80%); 4) the percentage of suspected measles cases with adequate specimens collected within 28 days of rash onset (target: ≥80%, excludes epidemiologically linked cases) (*5*); and 5) the percentage of specimens with laboratory results available within 7 days after receipt in the

* Measles elimination is defined as the absence of endemic measles virus transmission in a defined geographic area (e.g., region or country) for ≥12 months in the presence of a well-performing surveillance system.

† The Pitcairn Islands, with a population of approximately 50 persons, does not report immunization coverage data to WHO/UNICEF.

§ Papua New Guinea also provides a supplementary dose of MCV at age 6 months.

¶ The epidemiologic block of the Pacific Islands countries and areas includes American Samoa, Cook Islands, Fiji, French Polynesia, Guam, Kiribati, the Marshall Islands, the Federated States of Micronesia, Nauru, New Caledonia, Niue, the Commonwealth of the Northern Mariana Islands, Palau, the Pitcairn Islands, Samoa, Solomon Islands, Tokelau, Tonga, Tuvalu, Vanuatu, and Wallis and Futuna.

** This network includes one WHO global specialized laboratory in Japan, three regional reference laboratories (in Melbourne, Australia; Beijing, China; and Hong Kong, China), 19 national or subnational laboratories, and 31 provincial and 331 prefecture-level laboratories in China.

†† Cases that meet the WHO clinical case definition of measles for which no adequate specimen was collected and cannot be epidemiologically linked to a laboratory-confirmed case of measles.

§§ Essential data elements include name or identifier, date of birth or age, sex, place of residence, vaccination status or date of last vaccination, date of rash onset, date of notification, date of investigation, date of specimen collection, and place of infection or travel history.

TABLE 1. Reported coverage with the first and second dose of measles-containing vaccine (MCV),* age of vaccination, number of confirmed measles cases, and confirmed measles incidence, by country/area — World Health Organization Western Pacific Region, 2009 and 2012

Country/Area	2009						2012					
	% coverage with the first MCV dose	% coverage with the second MCV dose	Country or area MCV schedule†		No. of confirmed measles cases	Measles incidence per million population	% coverage with the first MCV dose	% coverage with the second MCV dose	Country or area MCV schedule		No. of confirmed measles cases	Measles incidence per million population
			1st dose	2nd dose					1st dose	2nd dose		
American Samoa	NR§	NR	M12	Y4	0	0.0	NR	NR	M12	Y4	0	0.0
Australia	94	83	Y1	Y4	104	5.0	94	91	M12	Y4	199	8.7
Brunei Darussalam	100	99	Y1	Y3	2	5.0	99	96	Y1	Y3	1	2.4
CNMI	87	84	M12	Y4	0	0.0	68	65	M12	Y4–6	0	0.0
Cambodia	92	NA¶	M9–11	NA	865	58.9	93	82	M9	M18	0	0.0
China	99	98	M8	M18–24	52,461	39.5	100	100	M8	M18	6,183	4.6
Cook Islands	78	61	M15	Y4	0	0.0	97	98	M15	Y4	0	0.0
Fiji	72	57	M12	Y6	4	1.3	90	NR	M12	Y6	0	0.0
French Polynesia	99	84	M12	M24	0	0.0	NR	99	M10	M15	0	0.0
Guam	NR	NR	M12	Y4–6	0	0.0	51	44	Y1	Y4–6	0	0.0
Hong Kong (China)	98	99	M12	P1	22	3.1	96**	98	M12	P1	8	1.1
Japan	94	92	Y1	Y5	705	5.5	95	93	Y1	Y5	228	1.8
Kiribati	82	35	Y1	Y6	0	0.0	91	61	M12	P1	0	0.0
Lao People's Democratic Republic	59	NA	M9	NA	72	12.1	72	NA	M9	NA	36	5.6
Macao (China)	91	88	M12	M18	0	0.0	93	89	M12	M18	1	1.8
Malaysia	95	95	Y1††	Y7	56	2.1	86	99	Y1††	Y7	1,868	63.7
Marshall Islands	78	66	M12	M13	0	0.0	78	58	M12	M15	0	0.0
Micronesia	86	82	M12	M13	0	0.0	91	70	M12	M13	0	0.0
Mongolia	94	97	M9	Y2	8	3.0	99	98	M9	Y2	0	0.0
Nauru	100	92	M12	M15	0	0.0	96	81	M12	M15	0	0.0
New Caledonia	99	78	M12	Y2	0	0.0	96	86	M12	Y2	0	0.0
New Zealand	89	NR	M15	Y4	253	60.0	92	85	M15	Y4	55	12.3
Niue	100	100	M15	Y4	0	0.0	100	98	M15	Y4	0	0.0
Palau	75	NR	M12	M15	0	0.0	91	86	M12	M15	0	0.0
Papua New Guinea	58	NA	M9§§	NA	0	0.0	67	NA	M9§§	NA	0	0.0
Philippines	88	58¶¶	M9	M12–15	1,490	16.6	85**	38**	M9	M12–15	1,536	15.9
Republic of Korea	93	100	M12–15	Y4–6	17	0.4	99	97	M12–15	Y4–6	2	0.0
Samoa	49	29	M12	M15	0	0.0	85	67	M12	M15	0	0.0
Singapore	95	93	Y1–2	Y6–7	16	3.6	NR	NR	M12	M15–18	40	7.6
Solomon Islands	60	NA	M12	NA	0	0.0	85	NA	M12	NA	0	0.0
Tokelau	100	100	M12	M15	0	0.0	100	85	M12	M15	0	0.0
Tonga	99	98	M12	M18	0	0.0	95	95	M12	M18	0	0.0
Tuvalu	90	84	M12	M18	0	0.0	98	93	M12	M18	0	0.0
Vanuatu	80	NA	Y1	NA	0	0.0	94	NA	Y1	NA	0	0.0
Vietnam	97	96	M9	Y6	5,222	59.0	96	83	M9	M18	637	7.1
Wallis and Futuna Islands	NR	NR	M9	M18	0	0.0	120	107	M12	M18	0	0.0
Western Pacific Region	**96**	**94**			**54,291**	**34**	**98**	**97**			**8,524**	**5.9**

Abbreviation: CNMI = Commonwealth of the Northern Mariana Islands.
* Country or area reported coverage for first or second dose of MCV based on administrative data or coverage survey data, if available.
† Country MCV schedule abbreviations: M = month of age when dose is given; Y = years of age when dose is given; and P = primary grade of school when dose is given.
§ NR = not reported (country did not report coverage in the year specified).
¶ NA = not applicable (dose was not included in the vaccination schedule for that year).
** Data are preliminary.
†† Additional 6-month dose provided subnationally.
§§ Additional 6-month dose provided nationally.
¶¶ Second dose administered at subnational level; therefore, the denominator is from the population served only.

laboratory (target: ≥80%). The number of countries and areas with adequate data that met the target for suspected cases discarded as nonmeasles per 100,000 population increased from seven (50%) of 14 in 2009 to nine (64%) of 14 in 2012 (Table 3). From 2009 to 2012, suspected cases with adequate investigations increased from 38% to 89%, suspected cases with adequate specimens collected for laboratory testing increased from 79% to 93%, and the proportion of blood specimens received by the laboratory with results available within 7 days increased from 55% to 96% (Table 3).

Measles Disease Incidence and Measles Virus Genotypes

From 2009 to 2012, confirmed measles cases decreased 84%, from 54,291 to 8,524, and confirmed measles incidence per million population decreased 83%, from 34.0 to 5.9 (Table 1). In 2012, the highest confirmed measles incidence was reported from Malaysia (63.7 per million), the Philippines (15.9 per million), and New Zealand (12.3 per million) (Table 1). The highest number of confirmed cases was reported from China and decreased 88%, from 52,461 in 2009 to 6,183 in 2012 (Figure). During 2009–2012, the predominant measles virus

TABLE 2. Characteristics of measles supplementary immunization activities (SIAs),* by year and country/area — World Health Organization Western Pacific Region, 2009–2012

Year	Country/Area	Age group targeted (mos)	Measles-containing vaccine used	Children reached in targeted age group		Other interventions delivered			
				No.	(%)	Oral polio vaccine	Vitamin A	Deworming medication	Tetanus toxoid vaccination
2009	China	8–179†	M	94,167,415	(98)				
	Kiribati	12–59	MR	9,865	(106)		Yes	Yes	
	Papua New Guinea	6–83	M	945,582	(86)				
	Solomon Islands	12–59	M	60,025	(90)				
	Vanuatu	12–59	M	29,919	(97)				
2010	China	8–179†	M	102,300,000	(97)				
	Federated States of Micronesia	12–83	MMR	11,485	(90)		Yes	Yes	
	Papua New Guinea	6–35	M	464,973	(83)	Yes	Yes	Yes	
	Tuvalu	12–71	MR	1,095	(79)		Yes	Yes	
	Vietnam	9–71	M	7,034,895	(96)				
2011	Cambodia	9–119	M	1,819,360	(100)	Yes	Yes	Yes	Yes
	Lao People's Democratic Republic	9–228	MR	2,614,002	(97)	Yes	Yes	Yes	
	Philippines	9–95	MR	15,649,907	(84)	Yes			Yes
2012	Mongolia	36–179	MR	522,414	(91)	Yes			
	Papua New Guinea	6–35	M	552,872	(88)	Yes	Yes	Yes	Yes
	Solomon Islands	12–59	MR	68,261	(102)		Yes	Yes	
2009–2012	**Western Pacific Region**			**226,252,070**	**(96)**				

Abbreviations: M = measles vaccine; MR = measles and rubella vaccine; MMR = measles, mumps, and rubella vaccine.

* SIAs generally are carried out using two approaches. An initial, nationwide catch-up SIA targets all children aged 9 months–14 years; it has the goal of eliminating susceptibility to measles in the general population. Periodic follow-up SIAs then target all children born since the last SIA. Follow-up SIAs generally are conducted nationwide every 2–4 years and generally target children aged 9–59 months; their goal is to eliminate any measles susceptibility that has developed in recent birth cohorts and to protect children who did not respond to the first measles vaccination. The exact age range for follow-up SIAs depends on the age-specific incidence of measles, coverage with measles-containing vaccine through routine services, and the time since the last SIA.

† Targeted age groups varied by province.

genotypes detected in WPR were H1 in China, D9 in the Philippines, Malaysia, and Singapore; and D8 in Malaysia. Other measles virus genotypes that were identified and determined to have been related to measles virus importations from outside WPR included B3, D4, and G3.

Reported by

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Editorial Note

In 2012, the WPR Regional Committee reaffirmed its commitment to eliminate measles and urged member states to interrupt all residual endemic measles virus transmission as rapidly as possible (*6*). To achieve elimination, intensified efforts are needed to identify and close gaps in population

What is already known on this topic?

The World Health Organization (WHO) Regional Committee for the Western Pacific Region (WPR) has resolved to eliminate measles by 2012. Substantial progress had been made in reducing the burden from measles by most countries in the region by 2008. The number of reported measles cases in WPR (excluding China) decreased 86%, from 106,172 (255.6 per million population) in 2000 to 14,724 (32.6 per million population) in 2008.

What is added by this report?

This report updates the previous report that summarized progress during 1990–2008 and describes progress toward measles elimination in WPR during 2009–2012. During this period, measles incidence in the region reached a historic low, decreasing by 83%, from 34.0 to 5.9 cases per million population. In China, a nationwide measles vaccination campaign was implemented in 2010 and reported confirmed measles cases decreased 88%, from 52,461 in 2009 to 6,183 in 2012.

What are the implications for public health practice?

Despite the progress to date, achieving measles elimination in WPR will require additional efforts. These include 1) introducing a routine second dose of measles-containing vaccine (MCV) in the four remaining countries and areas that do not yet have a routine 2-dose MCV schedule; 2) strengthening routine immunization services in countries and areas with <95% coverage with the routine first or second dose of MCV; and 3) closing immunity gaps through supplementary immunization activities in measles-susceptible populations in countries and areas that have ongoing measles virus transmission.

TABLE 3. Measles surveillance indicators and targets, by country, area, or epidemiologic block* — World Health Organization, Western Pacific Region, 2009 and 2012

Country, area, or epidemiologic block	2009					2012				
	Discarded nonmeasles rate per 100,000	Second-level units with ≥1 discarded cases per 100,000	Suspected cases with adequate investigation	Suspected cases with adequate blood specimens†	Laboratory results in ≤7 days of specimen reception	Discarded nonmeasles rate per 100,000	Second-level units with ≥1 discarded cases per 100,000	Suspected cases with adequate investigation	Suspected cases with adequate blood specimens†	Laboratory results in ≤7 days of specimen reception
Target	*≥2*	*≥80%*	*≥80%*	*≥80%*	*≥80%*	*≥2*	*≥80%*	*≥80%*	*≥80%*	*≥80%*
Australia§	ID ¶	ID	ID	ID	100.0	ID	ID	ID	ID	100.0
Brunei Darussalam	1.5	100.0	75.0	75.0	NA**	1.5	100.0	71.4	85.7	NA
Cambodia	26.4	58.3	62.0	98.4	38.7	6.8	58.3	56.1	99.2	98.3
China	1.3	54.8	86.9	70.1	76.2	2.3	71.0	99.0	97.9	97.1
Hong Kong (China)	0.1	100.0	46.9	71.9	96.2	2.5	100.0	92.0	97.3	98.7
Macao (China)	3.7	100.0	100.0	100.0	98.2	3.9	100.0	95.7	100.0	96.6
Japan	0.0	0.0	ID	ID	ID	0.1	0.0	ID	ID	ID
Lao People's Democratic Republic	2.5	35.3	57.8	60.0	94.0	7.6	64.7	49.3	76.6	93.7
Malaysia	7.9	86.7	34.1	72.4	100.0	22.7	93.8	74.4	83.4	97.7
Mongolia	6.4	47.6	34.5	98.9	100.0	22.0	40.9	64.2	100.0	100.0
New Zealand	ID	ID	ID	ID	99.5	ID	ID	ID	ID	99.3
Papua New Guinea	1.2	15.0	26.8	2.4	NA	0.6	10.0	61.9	81.0	57.6
Philippines	1.6	82.4	29.4	73.8	73.5	2.1	64.7	56.5	79.4	95.3
Republic of Korea	0.1	0.0	40.3	62.7	96.1	0.3	6.3	84.0	90.4	100.0
Singapore	ID	ID	ID	ID	96.4	ID	ID	ID	ID	96.9
Vietnam	4.5	78.1	27.5	72.4	42.5	0.9	25.0	44.3	55.0	96.6
Pacific Islands countries and areas	2.6	13.0	9.9	14.3	100.0	5.7	ID	0.0	ID	93.4
Western Pacific Region	**2.8**	**43.1**	**38.0**	**78.8**	**54.9**	**2.4**	**35.1**	**88.8**	**93.1**	**96.0**

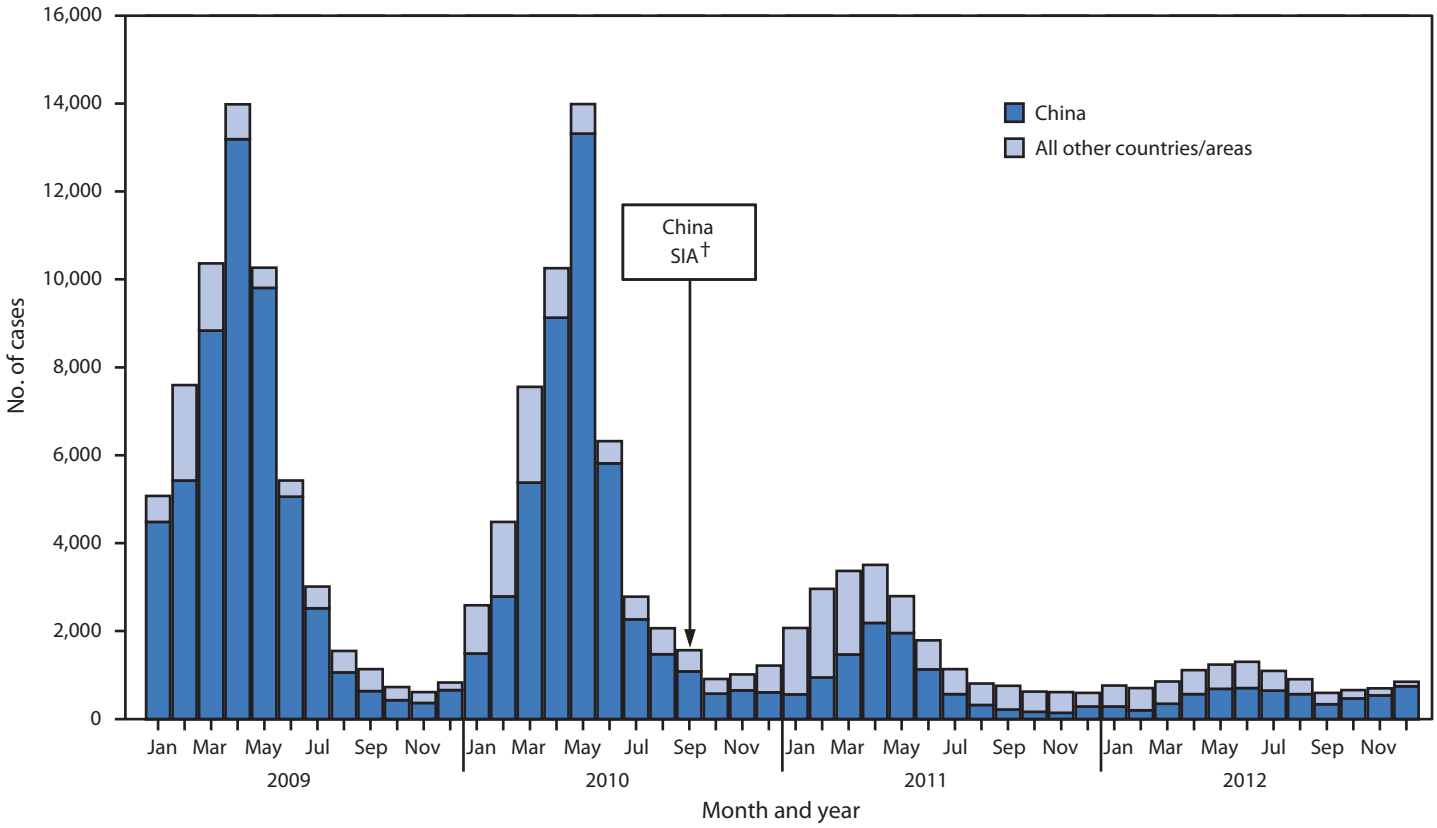
* The 21 Pacific Islands countries and areas are considered as one epidemiologic block for purposes of measles surveillance.
† Excludes epidemiologically linked cases.
§ Reports only confirmed cases.
¶ ID = Insufficient data reported by the country to calculate the indicator.
** NA = not available; no World Health Organization–accredited laboratory in the country.

immunity, by increasing coverage with MCV2 to ≥95% in all countries and areas and by conducting high-quality SIAs in countries with sustained measles virus transmission (e.g., China, Malaysia, and the Philippines). In countries and areas with <95% MCV1 or MCV2 coverage, urgent action is needed to strengthen routine immunization services and to identify and implement targeted SIAs for measles-susceptible populations. In the four remaining countries and areas (Lao People's Democratic Republic, Papua New Guinea, Solomon Islands, and Vanuatu) that do not provide MCV2 in the routine childhood vaccination schedule, strategies are needed to increase MCV1 coverage, conduct periodic SIAs to provide a second opportunity for all birth cohorts to receive MCV, and prepare for introduction of routine MCV2.

The WPR *Guidelines on Verification of Measles Elimination* (*7*) were finalized in March 2013; progress toward measles elimination in WPR will be monitored by the Regional Verification Commission through annual progress reports from each country or area and from the Pacific Islands countries and areas reporting as one epidemiologic block. High-quality case-based measles surveillance is critical to the verification process. Despite overall improvement in measles surveillance performance, gaps persist, as reflected by the low proportion of second-level administrative units with one or more nonmeasles discarded case per 100,000 population. Additionally, incomplete investigations of suspected measles cases in some countries challenge efforts to rapidly identify and respond to outbreaks and to measure and document progress toward elimination. For example, in Vietnam, only six (0.8%) of the 771 suspected measles cases with specimens available for testing reported in 2012 were laboratory confirmed. However, 631 additional cases did not have specimens collected but were reported as clinically confirmed measles. The sensitivity of the measles surveillance system in other countries with discarded nonmeasles reporting rates of <2 per 100,000 population might be insufficient to rapidly detect and respond to outbreaks or to meet verification criteria.

The WHO *Global Vaccine Action Plan* calls for the elimination of rubella and congenital rubella syndrome in five of the six WHO regions by 2020 (*8*). In April 2012, the Measles and Rubella Initiative launched the 2012–2020 Global Measles and Rubella Strategic Plan to integrate rubella with measles elimination efforts (*9*). Rubella-containing vaccine is not provided in six WPR countries and areas; five of these countries (Cambodia, Lao People's Democratic Republic, Papua New Guinea, Solomon Islands, and Vietnam) are eligible for financial support offered

FIGURE. Confirmed measles cases,* by month of rash onset — World Health Organization Western Pacific Region (WPR), 2009–2012



Abbreviation: SIA = supplementary immunization activity.

* Confirmed measles cases reported by countries and areas to World Health Organization. A case of measles is confirmed by serology when measles-specific immunoglobulin M antibody is detected in a person who was not vaccinated in the previous 30 days. A case of measles is confirmed by epidemiologic linkage when linked in time and place to a laboratory-confirmed measles case but lacks serologic confirmation. During 2009–2012, a case of measles meeting the case definition but without a specimen collected could be reported as clinically confirmed.

† SIA conducted in China in which approximately 100 million children aged 8–179 months were vaccinated against measles, with targeted age group varying by province.

by the GAVI Alliance to conduct a wide-age-range SIA using combined measles-rubella vaccine followed by the introduction of rubella vaccine in their national routine immunization programs. In addition to contributing to rubella elimination, these SIAs would provide a unique opportunity to boost population immunity to measles and contribute momentum to achieve and sustain measles elimination in WPR.

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Vital Signs: *Listeria* Illnesses, Deaths, and Outbreaks — United States, 2009–2011

On June 4, 2013, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Abstract

Background: Older adults, pregnant women, and persons with immunocompromising conditions are at higher risk than others for invasive *Listeria monocytogenes* infection (listeriosis), a rare and preventable foodborne illness that can cause bacteremia, meningitis, fetal loss, and death.

Methods: This report summarizes data on 2009–2011 listeriosis cases and outbreaks reported to U.S. surveillance systems. The *Listeria* Initiative and PulseNet conduct nationwide surveillance to rapidly detect and respond to outbreaks, the Foodborne Diseases Active Surveillance Network (FoodNet) conducts active, sentinel population–based surveillance to track incidence trends, and the Foodborne Disease Outbreak Surveillance System (FDOSS) receives reports of investigated outbreaks to track foods and settings associated with outbreaks.

Results: Nationwide, 1,651 cases of listeriosis occurring during 2009–2011 were reported. The case-fatality rate was 21%. Most cases occurred among adults aged ≥65 years (950 [58%]), and 14% (227) were pregnancy-associated. At least 74% of nonpregnant patients aged <65 years had an immunocompromising condition, most commonly immunosuppressive therapy or malignancy. The average annual incidence was 0.29 cases per 100,000 population. Compared with the overall population, incidence was markedly higher among adults aged ≥65 years (1.3; relative rate [RR]: 4.4) and pregnant women (3.0; RR: 10.1). Twelve reported outbreaks affected 224 patients in 38 states. Five outbreak investigations implicated soft cheeses made from pasteurized milk that were likely contaminated during cheese-making (four implicated Mexican-style cheese, and one implicated two other types of cheese). Two outbreaks were linked to raw produce.

Conclusions: Almost all listeriosis occurs in persons in higher-risk groups. Soft cheeses were prominent vehicles, but other foods also caused recent outbreaks. Prevention targeting higher-risk groups and control of *Listeria monocytogenes* contamination in foods implicated by outbreak investigations will have the greatest impact on reducing the burden of listeriosis.

Implications for Public Health Practice: Careful attention to food safety is especially important to protect vulnerable populations. Surveillance for foodborne infections like listeriosis identifies food safety gaps that can be addressed by industry, regulatory authorities, food preparers, and consumers.

Introduction

Listeria monocytogenes infection (listeriosis), recognized as a foodborne illness in the 1980s (*1*), leads to invasive disease during vulnerable stages of life (*2*). Older adults and persons with immunocompromising conditions are at higher risk for *Listeria* bacteremia and meningitis (*3*), which can be fatal. Listeriosis usually is a mild illness in pregnant women, but it can cause severe outcomes for the fetus or newborn infant, including fetal loss, preterm labor, and neonatal sepsis, meningitis, and death. Listeriosis is rare (*3*). However, hospitalization is much more common than with other foodborne infections (*4*), and listeriosis is the third leading cause of death among major pathogens transmitted commonly by food (*5*). Listeriosis incidence decreased by 24% from 1996 through 2001 but has not changed significantly since then (*3,4*). Although most cases are sporadic (i.e., not outbreak-related) (*6*), outbreaks occur regularly (*7*). In 2011, contaminated cantaloupe from a single farm caused the deadliest U.S. foodborne disease outbreak in nearly 90 years (*8*). Public health officials rapidly implicated whole cantaloupe, and their actions prevented additional cases and deaths. Outbreak investigations also can reveal unrecognized food sources and food safety gaps that can be closed by regulatory and industry intervention.

This report provides an overview of recent surveillance data on listeriosis, highlighting actions needed to protect vulnerable populations.

Methods

The objectives of this report are to 1) summarize demographic and clinical characteristics of patients with listeriosis, 2) estimate incidence overall and in demographic subgroups, and 3) describe foods associated with outbreaks. Data from three surveillance systems for the period 2009–2011 were analyzed to provide this comprehensive picture. A case of invasive listeriosis was defined as isolation of *L. monocytogenes* from a normally sterile site (e.g., blood or cerebrospinal fluid) or from products of conception. When *L. monocytogenes* was isolated from multiple sites, a single site is reported (priority order: cerebrospinal fluid, blood, other normally sterile site, products of conception). A case was considered pregnancy-associated when it occurred in a pregnant woman, a fetus, or an infant ≤31 days old; mother-infant pairs were counted as a single case. The case-fatality rate (CFR) was calculated as the percentage of cases with a fatality. Fetal losses were tallied separately from deaths but were included in CFR calculations. Live-born infants were assumed to have survived unless reported to have died.

The primary data source for the first objective was the *Listeria* Initiative,* a CDC-led enhanced nationwide surveillance system that collects demographic, clinical, and food exposure data for persons with laboratory-confirmed listeriosis. Patients are interviewed as they are reported, using a standard questionnaire. Isolates of *L. monocytogenes* from patients are subtyped in PulseNet,† the national molecular subtyping network. The *Listeria* Initiative facilitates investigation of possible outbreaks identified by PulseNet. *Listeria* Initiative participation has steadily improved since national implementation in 2005; 47 states reported at least one case in 2011.

Also for the first objective, the Foodborne Diseases Active Surveillance Network (FoodNet)§ contributed data on underlying conditions. FoodNet is a collaborative program among CDC, 10 state health departments, the U.S. Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS), and the Food and Drug Administration (FDA). FoodNet conducts active, population-based surveillance for laboratory-confirmed infections with *L. monocytogenes* and eight other pathogens among residents of 10 sites covering approximately 15% of the U.S. population (48 million persons in 2011). FoodNet does not routinely track underlying medical conditions; they can be reported voluntarily, but reporting is incomplete.

For the second objective, incidence rates were calculated by dividing FoodNet data on the number of laboratory-confirmed infections by U.S. Census estimates of the population of the surveillance area, both for the whole population and for subgroups. FoodNet and *Listeria* Initiative data were linked to improve completeness of information on ethnicity and pregnancy.

For the third objective, data from the Foodborne Disease Outbreak Surveillance System (FDOSS)¶ were used. State, local, and territorial health departments submit reports of investigated foodborne disease outbreaks to CDC. For each outbreak, FDOSS records the etiology, state(s), size (i.e., number of illnesses), setting, and food vehicle, among other data. A listeriosis outbreak was defined as ≥2 cases linked to a common source. Outbreaks were considered multistate if exposure to the implicated food occurred in more than one state.

Results

Nationwide, 1,651 invasive listeriosis cases were reported to the *Listeria* Initiative from 2009 through 2011; 292 deaths or fetal losses were reported (CFR: 21%). Most (58%) cases were in adults aged ≥65 years, and 14% were pregnancy-associated (Table 1). The median age of patients with listeriosis that was not pregnancy-associated was 72 years (interquartile range [IQR]: 61–81 years). Among pregnancy-associated cases with ethnicity data available, 43% (85 of 198) of mothers were Hispanic. Preterm labor was reported in 64% of pregnancy-associated cases. Among nonpregnant patients aged <65 years reported to FoodNet, an underlying medical condition was recorded for 74% (96 of 130); immunosuppressive therapy (i.e., steroids, chemotherapy, or radiation) was most commonly reported (32 cases), followed by malignancy (24), diabetes mellitus (11), cirrhosis or liver disease (seven), renal failure or nephrotic syndrome (seven), alcoholism (six), and human immunodeficiency virus/acquired immunodeficiency syndrome (six).

The average annual incidence was 0.29 cases per 100,000 population in FoodNet. In adults aged ≥65 years, the incidence was 1.3 cases per 100,000 population. The highest rates were among pregnant women (3.0 per 100,000), especially

* The main purpose of the *Listeria* Initiative is to facilitate outbreak investigations. Food exposure frequencies from cases associated with suspected outbreaks (identified by PulseNet) are compared with food history data from sporadic cases. This facilitates rapid identification and recall of contaminated foods. Additional information on the *Listeria* Initiative is available at http://www.cdc.gov/listeria/pdf/listeriainitiativeoverview_508.pdf.

† PulseNet, the national molecular subtyping network, subtypes all *L. monocytogenes* isolates using pulsed-field gel electrophoresis (PFGE). PulseNet is a network of laboratories in local, state, and federal health and regulatory agencies that use standard protocols, equipment, and nomenclature to test bacteria and submit their PFGE pattern combinations to a central database for comparison with one another. For *L. monocytogenes*, two patterns are submitted for most isolates (one for each of two restriction enzymes, *Asc*I and *Apa*I). Additional information about PulseNet is available at http://www.cdc.gov/pulsenet. Data on the proportion of patients with isolates submitted to PulseNet whose illnesses are reported to the *Listeria* Initiative are available at http://www.cdc.gov/listeria/pdf/listeria-annual-summary-2011-508c.pdf.

§ FoodNet is part of CDC's Emerging Infectious Diseases Program (http://www.cdc.gov/foodnet).

¶ Additional information on national outbreak reporting is available at http://www.cdc.gov/nors.

TABLE 1. Demographic and clinical characteristics of cases of invasive *Listeria* infection (listeriosis), by risk group — *Listeria* Initiative, United States, 2009–2011

			Not pregnancy-associated					
	Pregnancy-associated*		Patients aged <65 yrs		Patients aged ≥65 yrs		Total	
Characteristic	No.	(%)†	No.	(%)†	No.	(%)†	No.	(%)†
Total	**227**	**(100)**	**474**	**(100)**	**950**	**(100)**	**1,651**	**(100)**
Female sex	227	(100)	218	(46)	489	(51)	**910**	**(55)**
Hispanic ethnicity§	85	(43)	77	(20)	54	(7)	**216**	**(16)**
Isolate source¶								
Blood	150	(66)**	334	(70)	824	(87)	**1,308**	**(79)**
CSF	41	(18)**	119	(25)	98	(10)	**258**	**(16)**
Other sterile site††	NA	—	23	(5)	35	(4)	**58**	**(4)**
Product of conception††	36	(16)	NA	—	NA	—	**36**	**(2)**
Hospitalization§§	133	(90)	417	(93)	850	(94)	**1,400**	**(93)**
Death or fetal loss¶¶	46	(21)***	53	(14)	193	(24)	**292**	**(21)**

Abbreviations: CSF = cerebrospinal fluid; NA = not applicable.

* Pregnancy-associated cases include those in pregnant women, fetuses, and infants aged ≤31 days.

† Percentages may not sum to 100 because of rounding.

§ Among 1,327 (80%) patients with available ethnicity data.

¶ When *L. monocytogenes* is isolated from multiple anatomical sites, a single site is reported (priority order: CSF, blood, other normally sterile site, and products of conception).

** Isolates from neonatal blood (n = 72), maternal blood (69), and both (nine); isolates from neonatal CSF (38), maternal CSF (two), and both (one).

†† For non–pregnancy-associated cases, other sterile sites were pleural fluid (n = 18 isolates), peritoneal or ascites fluid (14), joint or synovial fluid (nine), brain tissue (three), aortic tissue (one), eye (one), liver abscess (one), lung tissue (one), and pericardial fluid (one). For pregnancy-associated cases, products of conception were placental tissue (31) and amniotic fluid (five).

§§ Hospitalizations among singleton neonates for 147 pregnancy-associated cases and among 1,358 non–pregnancy-associated cases with data available.

¶¶ Deaths or fetal losses among singleton neonates for 224 pregnancy-associated cases and among 1,179 non–pregnancy-associated cases with data available.

*** Forty fetal losses and six neonatal deaths.

Hispanics (7.0 per 100,000). Compared with the population as a whole, rates were four times higher for adults aged ≥65 years (RR: 4.4), 10 times higher for pregnant women (RR: 10.1), and 24 times higher for pregnant Hispanic women (RR: 24.0).

Twelve outbreaks, five of them multistate, and 224 outbreak-associated cases (14% of cases reported to the *Listeria* Initiative) were reported among residents of 38 states (Table 2). The median size was seven cases (range: two to 147 cases). In seven (58%), the implicated food was consumed primarily in private homes. Two were linked to hospital food services, one to a restaurant, and one to wedding banquets. Ten (83%) investigations implicated a food vehicle. Cheese was implicated in six outbreaks (50% of outbreaks) with 51 cases (23% of outbreak-associated cases). Soft cheeses labeled as made from pasteurized milk were implicated in five outbreaks: four implicated Mexican-style cheese and one implicated both chive cheese and ackawi cheese (a white brine cheese). An aged, blue-vein cheese made from unpasteurized milk was implicated in the sixth outbreak. Two raw produce items, pre-cut celery (an ingredient in chicken salad) and whole cantaloupe, were implicated as listeriosis outbreak vehicles.

Conclusions and Comment

This report details the epidemiology of invasive listeriosis, which often leads to bacteremia, meningitis, hospitalization, fetal loss, and death, and calls for actions that could protect the most vulnerable populations. Older adults and pregnant women, particularly pregnant Hispanic women, are at much higher risk than the population at large, as are persons with weakened immunity (*2*). Preventing infections in these populations can have substantial impact in averting these outcomes. Older adults and persons with weakened immunity, as well as infants and young children, are also prone to many other foodborne illnesses, including campylobacteriosis, salmonellosis, and Shiga toxin–producing *E. coli* infections (*4*). Accounting for underdiagnosis and underreporting, an estimated 1,662 cases of listeriosis occur each year (*5*). No progress in reducing the overall incidence of listeriosis has occurred in over a decade (*3,4*); renewed prevention efforts are needed from farm to table.

Foods associated with listeriosis outbreaks in this report,** soft cheese and raw produce items in particular, highlight opportunities for food safety improvements. *Listeria* is widespread in many environments, and reducing contamination of soft cheese and raw produce with *Listeria* and other pathogens will require implementation of proven measures as well as development of new ones. The Food Safety Modernization Act (FSMA) of 2011†† gives FDA additional authority to regulate food facilities, establish standards

** Listeriosis outbreaks were included in this report based on the date of onset of the first illness; an outbreak associated with raw sprouts, which began in 2008 and extended into 2009, was not included.

†† Additional information about FSMA, proposed standards for produce safety, and preventive controls during food processing is available at http://www.fda.gov/food/guidanceregulation/fsma/default.htm.

TABLE 2. Reported outbreaks of *Listeria* infection (listeriosis) — Foodborne Disease Outbreak Surveillance System, United States, 2009–2011

Year	Multistate	Total cases*	Consumption setting	Implicated food vehicle
2009	Yes	18	Private homes	Mexican-style cheese†
	Yes	8	Private homes§	Mexican-style cheese†
2010	No	8	Private homes	Hog head cheese¶
	No	2	Private homes	Sushi rolls (unspecified)
	No	4	Hospital food service	Undetermined
	No	10	Hospital food service	Pre-cut celery
	Yes	6	Private homes§	Mexican-style cheese†
2011	No	2	Unknown	Undetermined
	No	2	Private home and restaurant	Chive cheese† and ackawi cheese†**
	Yes	147	Private homes	Whole cantaloupe
	No	2	Private homes	Mexican-style cheese†
	Yes	15††	Wedding banquets	Aged, blue-veined cheese§§

* Total cases include laboratory-confirmed and epidemiologically linked cases.
† Soft cheese made from pasteurized milk.
§ *L. monocytogenes* isolates from these two outbreaks were indistinguishable by pulsed-field gel electrophoresis. The Food and Drug Administration sought a permanent injunction against the manufacturer after the first outbreak. The owners moved the manufacturing facility to a nearby location and reopened under a new name.
¶ Hog head cheese is a meat jelly made from swine heads and feet (i.e., it is not a dairy product).
** Ackawi is a white brine cheese.
†† Fourteen cases of febrile gastroenteritis (noninvasive, not culture-confirmed) and one case of culture-confirmed invasive disease reported.
§§ A blue cheese that was made from unpasteurized milk and aged for 60 days.

for safe produce, recall contaminated foods, and oversee imported foods. FDA has proposed new standards for produce safety and for preventive controls during food processing that hold promise for reducing listeriosis.

Over time, many outbreaks have been linked to soft cheese made with unpasteurized milk, and FDA and Health Canada[§§] estimate that the risk for listeriosis from soft-ripened cheeses is 50 to 160 times higher per serving when the cheese is made with unpasteurized milk rather than pasteurized milk. Nonetheless, investigations described in this report and elsewhere also have implicated cheeses made from pasteurized milk (*9*–*11*). Pasteurization eliminates *Listeria*, but contamination can occur after pasteurization. *Listeria* grows in moist environments, even at refrigeration temperatures, so it can thrive when soft cheeses that support its growth are contaminated. In addition to using pasteurized milk, soft cheese–making facilities need to use strict sanitation and microbiologic monitoring.

In the late 1990s and early 2000s, U.S. listeriosis incidence declined markedly after outbreak investigations prompted major industry and regulatory interventions, including using ingredients that inhibit growth of *Listeria* (*12*), to reduce contamination of processed meat (e.g., hot dogs and deli meat) (*7*). A risk assessment[¶¶] presented for public comment by USDA-FSIS and FDA will inform efforts to reduce further *Listeria* contamination of ready-to-eat foods in retail settings.

FSMA calls on CDC to strengthen foodborne illness surveillance and outbreak response. States' capacities vary considerably, and many lack sufficient staff and resources (*13*–*15*). CDC launched a collaborative network called FoodCore[***] to develop methods to make outbreak detection and response faster, and the Integrated Food Safety Centers of Excellence,[†††] to provide technical assistance and training of public health staff in other states. As more states use the *Listeria* Initiative to gather data on cases quickly, outbreak response improves. Faster investigations save lives.[§§§] During a 2011 multistate outbreak, the *Listeria* Initiative led to identification of cantaloupe as the food vehicle, and halt of its distribution, in less than 2 weeks (*8*); the response was much faster than previous investigations of large outbreaks of listeriosis, such as a 1985 outbreak associated with Mexican-style cheese in which 31 days elapsed between outbreak detection and product recall (*16*). Advanced laboratory methods will modernize diagnostics and surveillance; more outbreaks might be detected faster using real-time whole genome sequencing (*17*).

Consumers at higher risk for listeriosis and those who prepare their food can reduce their risk. Basic food safety measures (e.g., Clean, Separate, Cook and Chill[¶¶¶]) reduce the risk for listeriosis and other potentially serious infections. Persons at higher risk should follow the guidance for the general population not to consume unpasteurized milk or dairy products made from unpasteurized milk (e.g., soft cheese). They also should be aware that some Mexican-style soft cheeses made from pasteurized milk, like queso fresco, have been identified as a source of listeriosis. In addition, health-care providers are uniquely positioned to provide credible information about listeriosis prevention to patients at higher risk. Detailed advice on safely selecting, preparing, and refrigerating foods prone to *Listeria* contamination and other pathogens is available in

§§ Information about the *Quantitative Assessment of the Risk of Listeriosis From Soft-Ripened Cheese Consumption in the United States and Canada* available at http://www.fda.gov/downloads/food/foodscienceresearch/ucm338617.pdf.
¶¶ Additional information is available at http://www.fsis.usda.gov/science/risk_assessments/index.asp.
*** Additional information available at http://www.cdc.gov/foodcore/about.html.
††† Additional information available at http://www.cdc.gov/foodsafety/fsma.html.
§§§ An estimated 36 illnesses, 35 hospitalizations, and seven deaths were averted by recall of contaminated cantaloupe and consumer warnings (CDC, unpublished data, 2013).
¶¶¶ Additional information about the basics of food safety available at http://www.foodsafety.gov/keep/basics.

Key Points

- *Listeria monocytogenes* infection (listeriosis) is a rare foodborne disease that often leads to bacteremia, meningitis, hospitalization, fetal loss, and death.
- Careful attention to food safety is especially important for older adults, pregnant women, and persons with immunocompromising conditions because almost all cases of listeriosis occur among these three groups at higher risk.
- The average annual incidence of listeriosis for the period 2009–2011 (0.29 cases per 100,000 population) indicates that no progress in reducing the rate of listeriosis has occurred in over a decade.
- Foods associated with recent listeriosis outbreaks, especially soft cheese and raw produce, highlight food safety gaps that can be addressed by industry, regulatory authorities, food preparers, and consumers.
- Additional information is available at http://www.cdc.gov/vitalsigns.

English and Spanish at http://www.cdc.gov/*listeria*, http://www.fsis.usda.gov/fact_sheets/listeria_monocytogenes/index.asp, and http://www.fda.gov/food/resourcesforyou/consumers/ucm079667.htm.

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Notes from the Field

Investigation of High HIV Prevalence in Western Equatoria State — South Sudan, 2012

Data are limited on the human immunodeficiency virus (HIV) epidemic in South Sudan, which became an independent country on July 9, 2011, after decades of civil war. In 2009, estimated HIV prevalence in antenatal clinics across the 10 states that now make up South Sudan was 3.0%, ranging from zero in Northern Bahr el Ghazal to 7.2% in Western Equatoria State (WES) (*1,2*). A review of HIV programmatic data in February 2012 suggested consistently higher HIV prevalence in WES than in other states. Because of concerns about the high HIV prevalence and the threat of a worsening epidemic among postconflict communities, the Ministry of Health requested assistance from CDC to investigate the high HIV prevalence in WES and provide recommendations for the public health response.

A field investigation was conducted during June 10–30, 2012. The team observed and documented HIV services provided at four antenatal clinics and three voluntary counseling and testing facilities in WES. Laboratory data were reviewed and HIV testing practices were observed to verify adherence to recommended World Health Organization/United Nations Programme on HIV/AIDS HIV testing strategies (*3,4*). The team abstracted and analyzed HIV testing data from antenatal clinic registers and voluntary counseling and testing data collection forms to verify the reported epidemiologic data. Using standardized inquiry domains, focus group discussions and interviews were conducted with 75 stakeholders and key informants, including government and nongovernmental officials, religious leaders, community members, health-care workers, and persons living with HIV, to describe HIV risk factors in the region. Interviews were followed by observation of social interactions and cultural practices in the communities.

HIV testing procedures were determined to be in accordance with the standard two-test serial testing algorithm used in South Sudan, and test results were accurately interpreted at the sites visited. Examination of records, review of commodity storage procedures, and cross-matching of results from confirmatory laboratories raised no substantial concerns about testing and laboratory practices. Among 420 first-visit antenatal clinic attendees, HIV seropositivity was 10.7% (95% confidence interval [CI] = 8.0%–14.2%), and among 388 voluntary counseling and testing attendees, HIV seropositivity was 13.1% (CI = 10.0%–17.0%), indicating high HIV prevalence in WES. Only 8.5% (CI = 6.0%–11.9%) of voluntary counseling and testing attendees reported condom use at last sexual intercourse, with condom unavailability stated as a key barrier. The investigation also revealed a shortage of health-care workers and lack of supportive supervision in the facilities visited, limited HIV prevention services and access to HIV testing, and limited HIV care and treatment services.

Key informant interviews suggested sexual practices (i.e., multiple concurrent sexual partners, inconsistent condom use, transactional sex, and early sexual debut) as the driver of HIV transmission. When asked about factors potentially contributing to the spread of HIV in WES, interviewees reported residual effects of conflict, poverty, stigma toward persons living with HIV, increased commercial activity and road transport, and high HIV prevalence in neighboring regions of Central African Republic, Democratic Republic of Congo, and Uganda. No reports were obtained of men who have sex with men, unusual exposure to medical injections, other use of needles, scarification, cutting instruments, or practices leading to nonsexual blood or body fluid exposure.

Financial resources for HIV prevention and treatment typically have been distributed equally across all 10 states of South Sudan. To address the high HIV prevalence in WES, the state needs to be prioritized in the national HIV response. A comprehensive HIV prevention strategy is needed, including 1) ensured access to condoms; 2) prevention interventions focused on at-risk groups, especially young women and their sex partners; and 3) expanded voluntary counseling and testing services, with linkage of persons diagnosed with HIV to strengthened HIV care and antiretroviral treatment services. Expanded surveillance also is needed to fully characterize the HIV epidemic in South Sudan.

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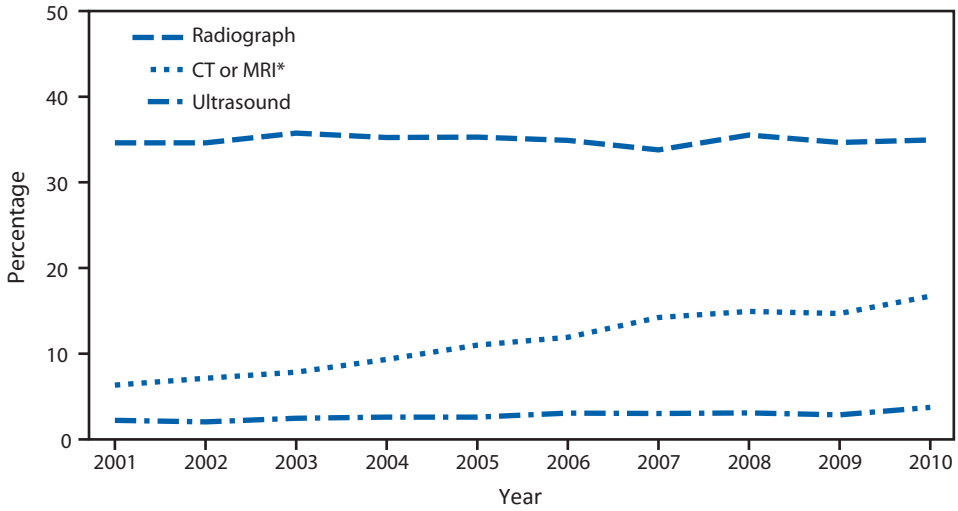
QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Annual Percentage of Emergency Department Visits with Selected Imaging Tests Ordered or Provided — National Hospital Ambulatory Medical Care Survey, United States, 2001–2010



Abbreviations: CT = computed tomography; MRI = magnetic resonance imaging.
* Separate estimates for MRIs and CTs are available only for the period 2005–2010. During that period, visits with only an MRI accounted for <4% of the combined CT/MRI category.

From 2001 to 2010, the percentage of emergency department visits with a CT or MRI test ordered or provided nearly tripled from 6% to 17%, and the percentage of visits with an ultrasound ordered or provided doubled from 2% to 4%. The percentage of emergency department visits with a radiograph ordered or provided did not change significantly. Throughout the period, the percentage of visits with a radiograph was higher than the percentage with a CT/MRI or ultrasound combined and remained steady at about 35%.

Source: CDC. National Hospital Ambulatory Medical Care Survey. Available at http://www.cdc.gov/nchs/ahcd/ahcd_questionnaires.htm.

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