Centers for Disease Control and Prevention

MMWR

Morbidity and Mortality Weekly Report

Weekly / Vol. 61 / No. 36 September 14, 2012

Household Preparedness for Public Health Emergencies — 14 States, 2006–2010

Populations affected by disaster increase the demand on emergency response and public health systems and on acute care hospitals, often causing disruptions of services (*1*). Household preparedness measures, such as having a 3-day supply of food, water, and medication and a written household evacuation plan, can improve a population's ability to cope with service disruption, decreasing the number of persons who might otherwise overwhelm emergency services and health-care systems (*2*). To estimate current levels of self-reported household preparedness by state and sociodemographic characteristics, CDC analyzed Behavioral Risk Factor Surveillance System (BRFSS) survey data collected in 14 states during 2006–2010. The results of this analysis indicated that an estimated 94.8% of households had a working battery-operated flashlight, 89.7% had a 3-day supply of medications for everyone who required them, 82.9% had a 3-day supply of food, 77.7% had a working battery-operated radio, 53.6% had a 3-day supply of water, and 21.1% had a written evacuation plan. Non-English speaking and minority respondents, particularly Hispanics, were less likely to report household preparedness for an emergency or disaster, suggesting that more outreach activities should be directed toward these populations.

BRFSS is a state-based, random-digit–dialed telephone survey of the noninstitutionalized U.S. civilian population aged ≥18 years.* The survey collects information on health risk behaviors, preventive health practices, health-care access, and disease status. The General Preparedness module was included in BRFSS surveys conducted by 14 states during 2006–2010. Two states, Nebraska and Montana, collected data for multiple years. Comparison of data collected by these two states showed no significant increases or decreases in preparedness measures over time. Therefore, data for Nebraska and Montana were combined across years. Significance of differences between percentages was determined by chi-square test ($p<0.05$).

During 2006–2010, preparedness data were collected (with Council of American Survey and Research Organizations response rates indicated) from the following states: 2006, Connecticut (44.3%), Montana (54.8%), Nevada (50.1%), and Tennessee (56.7%); 2007, Delaware (43.2%), Louisiana (41.0%), Maryland (31.4%), Nebraska (65.4%), and New Hampshire (37.7%); 2008, Georgia (55.1%), Montana (48.3%), Nebraska (65.5%), New York (40.0%), and Pennsylvania (45.6%); 2009, Mississippi (49.3%); and 2010, Montana (65.4%) and North Carolina (41.1%).

Household disaster preparedness measures, as defined by the BRFSS questionnaire, included the following items: having 3-day supplies of food, prescription medications, and water, a written evacuation plan, a working battery-powered radio, and a working battery-powered flashlight. Respondents were asked the following six questions: 1) "Does your household have a 3-day supply of nonperishable food for everyone who lives there? By nonperishable we mean food that does not require refrigeration or cooking." 2) "Does your household have a 3-day supply of water for everyone who lives there? A

INSIDE

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

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

U.S. Department of Health and Human Services
Centers for Disease Control and Prevention

3-day supply of water is 1 gallon of water per person per day." 3) "Does your household have a 3-day supply of prescription medications for each person in your household who takes prescription medications?" 4) "Does your household have a working battery-operated radio and working batteries for use if the electricity is out?" 5) "Does your household have a working flashlight and working batteries for use if the electricity is out?" 6) "Does your household have a written evacuation plan for how you will leave your home in case of a large-scale disaster or emergency that requires evacuation?"

Overall, an estimated 94.8% of households had a working battery-operated flashlight, 89.7% had a 3-day supply of medications for everyone who required them, 82.9% had a 3-day supply of food, 77.7% had a working battery-operated radio, 53.6% had a 3-day supply of water, and 21.1% had a written evacuation plan (Table 1). With the exception of having a 3-day supply of medication and a written evacuation plan, which were not significantly different by sex, men were significantly more likely than women to report their households were prepared. Significant differences ranged from 1.6 percentage points (95.6% compared with 94.0%) for having a working, battery-powered flashlight to 6.9 percentage points (57.2% compared with 50.3%) for having a 3-day supply of water (Table 1). By race/ethnicity, Hispanics were significantly less likely than all other race/ethnicities to have a 3-day supply of food (75.0%), a 3-day supply of medication (69.0%), and a working battery-operated radio (67.1%), and flashlight (84.4%). In general, as the age of respondents increased, reported household preparedness increased. With the exceptions of having a 3-day supply of water and a written evacuation plan, persons with a high school diploma were more likely to indicate preparedness than those with less than a high school diploma. With the exception of having a written evacuation plan, which was most prevalent among respondents who were unable to work, in general, retired respondents were most likely to indicate that their household was prepared.

Respondents who requested that the survey be conducted in Spanish (68.2%) were less likely to report their households had a 3-day supply of food than those administered the survey in English (83.2%) (Figure). A similar pattern was observed for having a 3-day supply of medication (Spanish, 51.7%; English, 90.6%), a working battery-operated radio (Spanish, 56.5%; English, 78.1%), and a working battery-operated flashlight (Spanish, 74.7%; English, 95.2%). However, respondents who requested the survey be conducted in Spanish were significantly more likely to report their households had a 3-day supply of water (Spanish, 64.5%; English, 53.6%) and were as likely as those interviewed in English to report that the household had a written evacuation plan (Spanish, 25.6%; English, 20.6%; p=0.066).

By state, Montana respondents were most likely (88.1%) and Nevada respondents were least likely (78.5%) to report their household had a 3-day supply of food (Table 2). Pennsylvania respondents were most likely (93.7%) and Nevada respondents were least likely (80.7%) to report a 3-day supply of

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 2012;61:[inclusive page numbers].

BOX. Recommendations to prepare a household for emergency or disaster — Federal Emergency Management Agency, 2012

Be informed

Knowing about the local emergency plans for shelter and evacuation and local emergency contacts will help you develop your household plan and also will aid you during a crisis.

Make a kit

A disaster supplies kit is simply a collection of basic items your household might need in the event of an emergency.

- Water, 1 gallon of water per person per day for at least 3 days, for drinking and sanitation.
- Food, at least a 3-day supply of nonperishable food.
- At least a 3-day supply of medications for each person who takes prescription medications.
- Battery-powered or hand crank radio and a National Oceanic Atmospheric Administration weather radio with tone alert and extra batteries for both.
- Flashlight and extra batteries.

Have a plan

Emergency planning should address the care of pets, aiding family members with access and functional needs and safely shutting off utilities. Practice your plan at least twice a year and update it according to any issues that arise.

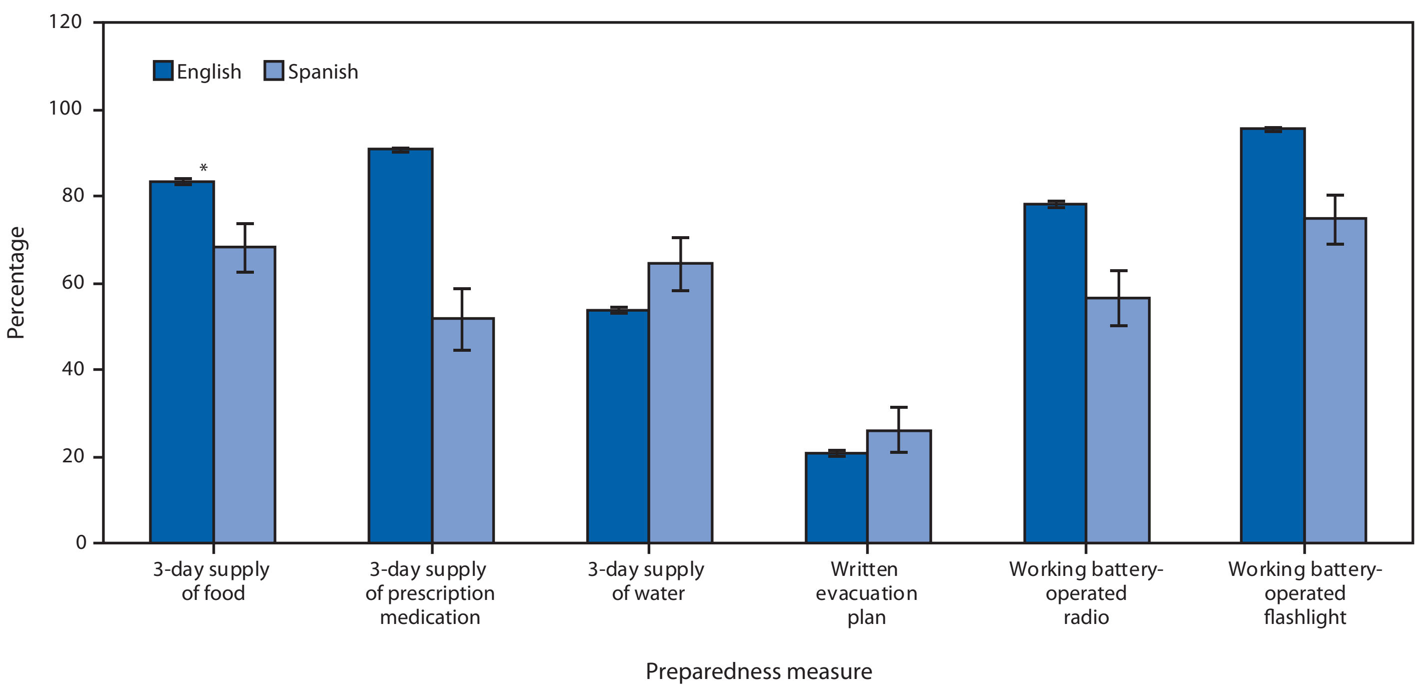
Source: Federal Emergency Management Agency. Ready. Washington, DC: Federal Emergency Management Agency; 2012. Available at http://www.ready.gov.

medication. Louisiana respondents were most likely (67.1%) and Nebraska respondents were least likely (45.5%) to report a 3-day supply of water. Louisiana respondents were most likely (54.0%) and Pennsylvania respondents were least likely (15.0%) to have a written evacuation plan. Louisiana respondents were most likely (85.2%) and Nevada respondents were least likely (72.3%) to report a working battery-powered radio. New Hampshire respondents were most likely (97.2%) and New York respondents were least likely (93.4%) to report a working battery-powered flashlight.

Reported by

Summer D. DeBastiani MPH, Tara W Strine, PhD, Office of Public Health Preparedness and Response, CDC. ***Corresponding contributor:*** *Summer D. DeBastiani, sdebastiani@cdc.gov, 404-639-3101.*

FIGURE. Percentage of participants reporting household disaster or emergency preparedness, by preparedness measure and language used in the interview — Behavioral Risk Factor Surveillance System, 14 states, 2006–2010



* 95% confidence interval.

TABLE 1. Percentage of participants reporting household disaster or emergency preparedness, by preparedness measures and sociodemographic characteristics — Behavioral Risk Factor Surveillance System, 14 states, 2006–2010

	Have a 3-day supply of food				Have a 3-day supply of medication				Have a 3-day supply of water			
Characteristic	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)
Overall	**83,965**	**49,939,735**	**82.9**	**(82.4–83.5)**	**80,351**	**47,083,817**	**89.7**	**(89.2–90.1)**	**55,323**	**32,222,914**	**53.6**	**(52.9–54.3)**
Sex												
Men	31,975	24,297,666	84.2	(83.3–85.0)	29,855	22,484,121	90.2	(89.4–90.9)	22,374	16,514,103	57.2	(56.1–58.3)
Women	51,990	25,642,069	81.8	(81.1–82.5)	50,496	24,599,696	89.2	(88.6–89.8)	32,949	15,708,811	50.3	(49.4–51.1)
Race/Ethnicity*												
White	79,764	38,059,253	84.8	(84.2–85.4)	67,007	36,730,925	92.8	(92.4–93.2)	44,179	23,349,524	52.1	(51.3–52.9)
Black	7,889	6,322,382	77.9	(76.1–79.5)	7,423	5,726,674	82.6	(81.0–84.2)	6,078	4,733,017	58.2	(56.3–60.2)
Hispanic	2,262	2,744,511	75.0	(71.6–78.1)	1,849	2,060,575	69.0	(65.1–72.7)	1,715	2,025,186	55.0	(51.4–58.7)
Other race/Multirace	3,753	2,365,541	78.7	(75.5–81.6)	3,378	2,159,139	84.9	(81.7–87.6)	2,789	1,780,008	60.4	(57.0–63.7)
Age group (yrs)												
18–24	2,576	4,683,190	79.7	(77.1–82.1)	2,102	3,918,690	79.8	(76.9–82.4)	1,689	3,088,207	53.1	(50.0–56.3)
25–34	7,241	8,345,572	77.8	(76.1–79.5)	5,871	7,000,146	83.7	(82.0–85.3)	4,294	5,202,686	48.4	(46.5–50.4)
35–44	12,053	10,274,805	80.8	(79.5–82.1)	10,610	9,310,066	87.7	(86.5–88.9)	7,251	6,166,027	48.6	(47.0–50.2)
45–54	16,863	9,621,520	83.5	(82.5–84.5)	15,961	9,248,143	90.5	(89.6–91.3)	10,821	6,093,993	52.9	(51.6–54.3)
≥55	44,575	16,673,720	87.9	(87.4–88.5)	45,192	17,268,658	95.8	(95.4–96.1)	30,764	11,402,504	60.2	(59.4–61.1)
Education												
Less than a high school diploma	7,910	4,316,121	80.0	(78.0–81.8)	7,632	3,831,918	79.3	(77.0–81.3)	6,013	3,199,648	59.7	(57.4–61.9)
High school diploma	26,255	15,048,742	83.8	(82.8–84.7)	25,123	13,965,053	88.3	(87.3–89.1)	17,666	10,206,329	57.0	(55.7–58.2)
More than a high school diploma	49,670	30,516,047	83.0	(82.3–83.7)	47,472	29,231,941	92.0	(91.4–92.5)	31,535	18,764,811	51.0	(50.2–51.9)
Employment status												
Currently employed	43,599	30,335,878	82.4	(81.7–83.2)	39,696	27,434,623	88.7	(88.0–89.4)	27,586	18,994,551	51.7	(50.7–52.6)
Unemployed	3,409	2,686,613	78.5	(75.4–81.2)	3,135	2,500,045	84.9	(82.1–87.3)	2,346	1,834,715	53.5	(50.2–56.8)
Retired	23,643	8,673,886	89.2	(88.4–89.9)	24,209	9,107,235	96.5	(96.1–96.9)	16,496	6,092,790	62.9	(61.7–64.0)
Unable to work	5,568	2,619,215	78.4	(76.2–80.5)	6,106	2,895,877	89.2	(87.4–90.7)	4,028	1,852,808	55.7	(53.2–58.3)
Housewife/Student	7,551	5,528,482	81.5	(79.7–83.1)	7,020	5,051,584	86.5	(84.8–88.1)	4,720	3,376,956	49.9	(47.7–52.1)
Marital status												
Currently married	48,066	30,831,168	84.3	(83.7–85.0)	46,635	29,645,628	91.7	(91.1–92.2)	30,395	19,343,368	52.9	(52.1–53.8)
Previously married†	25,166	8,731,801	83.0	(82.0–84.0)	24,297	8,419,916	90.1	(89.2–90.9)	17,555	5,930,648	56.6	(55.3–57.8)
Never married§	10,469	10,227,723	78.9	(77.4–80.4)	9,193	8,875,935	83.3	(81.7–84.7)	7,178	6,825,329	52.9	(51.0–54.7)
Interview language												
English	82,140	47,896,583	83.2	(82.7–83.8)	78,730	45,313,761	90.6	(90.1–91.1)	54,047	30,767,692	53.6	(52.9–54.3)
Spanish	552	666,986	68.2	(62.1–73.7)	348	432,069	51.7	(44.6–58.6)	514	627,984	64.5	(58.2–70.2)
Children in household												
Yes	23,462	20,454,775	80.9	(80.0–81.9)	20,767	18,129,679	86.7	(85.7–87.6)	13,764	12,200,949	48.4	(47.2–49.6)
No	60,392	29,425,652	84.4	(83.8–85.1)	59,498	28,905,485	91.7	(91.1–92.2)	41,481	19,981,656	57.4	(56.6–58.2)

See table footnotes on page 717.

Editorial Note

Similar to previous studies, the findings in this report generally indicate increased levels of disaster and emergency preparedness among men, English-speaking persons, and adults with more education (*3,4*). Also similar to previous research, this analysis indicates limited evacuation planning among households (*3,4*). With the notable exception of Louisiana, where in 2007, 2 years after devastating Hurricane Katrina, 54.0% of respondents said they had a written evacuation plan, no state reported a prevalence as high as 35%. Therefore, increased efforts encouraging the adoption of a written household evacuation plan are needed.

Beginning in 2003, the federal government launched two preparedness campaigns for the purpose of increasing household preparedness: Ready.gov and the Citizen Corps (*5,6*). Both campaigns encourage the general population to prepare for disasters by being informed, assembling an emergency kit, and having a plan (Box). Ready.gov is an Internet-based disaster preparedness initiative, and the Citizen Corps encourages government and community leaders to involve the general population in all-hazards emergency preparedness activities (*5,6*). The primary method to access preparedness materials and information through these organizations is via predominantly English language websites, creating a possible barrier for non-English speaking adults, persons of low socioeconomic

TABLE 1. (*Continued*) Percentage of participants reporting household disaster or emergency preparedness, by preparedness measures and sociodemographic characteristics — Behavioral Risk Factor Surveillance System, 14 states, 2006–2010

	Have a written evacuation plan				Have a working battery-operated radio				Have a working battery-operated flashlight			
Characteristic	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)
Overall	**22,522**	**12,661,492**	**21.1**	**(20.6–21.7)**	**74,331**	**46,538,951**	**77.7**	**(77.2–78.3)**	**93,831**	**57,256,195**	**94.8**	**(94.4–95.1)**
Sex												
Men	8,385	6,051,319	21.0	(20.2–21.9)	28,986	22,906,709	79.6	(78.6–80.5)	35,529	27,730,509	95.6	(95.1–96.1)
Women	14,137	6,610,173	21.3	(20.6–21.9)	45,345	23,632,242	76.1	(75.3–76.8)	58,302	29,525,687	94.0	(93.6–94.4)
Race/Ethnicity*												
White	17,498	8,761,404	19.6	(19.0–20.2)	61,565	35,783,853	80.4	(79.8–81.0)	77,536	43,646,594	97.0	(96.7–97.2)
Black	2,620	2,103,974	26.2	(24.7–27.9)	6,931	5,878,861	72.4	(70.5–74.1)	8,703	7,232,129	89.1	(87.8–90.2)
Hispanic	907	980,547	26.8	(23.9–29.9)	2,005	2,465,690	67.1	(63.5–70.4)	2,559	3,116,057	84.4	(81.5–86.9)
Other race/Multirace	1,272	706,156	23.9	(21.3–26.7)	3,195	2,021,506	67.3	(63.7–70.8)	4,206	2,747,172	90.8	(88.4–92.8)
Age group (yrs)												
18–24	694	1,038,145	17.9	(15.9–20.1)	2,389	4,401,518	75.6	(72.8–78.2)	2,940	5,408,379	92.0	(90.2–93.5)
25–34	1,896	1,959,055	18.3	(17.0–19.8)	6,667	7,937,548	74.2	(72.4–75.9)	8,450	9,962,729	92.7	(91.6–93.6)
35–44	3,235	2,660,066	21.0	(19.7–22.3)	11,455	9,925,954	78.4	(77.0–79.8)	13,920	12,025,987	94.3	(93.5–95.1)
45–54	4,453	2,471,297	21.5	(20.5–22.6)	15,444	9,077,234	79.5	(78.4–80.5)	19,108	11,047,242	95.8	(95.2–96.3)
≥55	12,036	4,419,004	23.5	(22.8–24.2)	37,769	14,866,044	78.8	(78.1–79.5)	48,663	18,405,331	96.5	(96.1–96.8)
Education												
Less than a high school diploma	2,502	1,408,864	26.7	(24.8–28.6)	6,414	3,651,230	67.8	(65.6–70.0)	8,677	4,761,831	88.3	(86.6–89.8)
High school diploma	7,757	4,415,355	24.8	(23.8–25.8)	23,338	14,060,524	78.6	(77.5–79.6)	29,233	17,045,577	94.5	(94.0–95.1)
More than a high school diploma	12,219	6,813,722	18.6	(17.9–19.2)	44,467	28,769,462	78.8	(78.1–79.5)	55,771	35,376,690	95.8	(95.4–96.2)
Employment status												
Currently employed	10,867	7,144,636	19.5	(18.8–20.2)	39,991	28,909,540	79.0	(78.2–79.7)	49,522	35,152,226	95.3	(94.9–95.7)
Unemployed	958	742,373	22.0	(19.5–24.8)	3,025	2,452,521	72.5	(69.3–75.4)	3,865	3,146,645	91.9	(89.9–93.5)
Retired	6,688	2,457,513	25.6	(24.6–26.6)	19,787	7,642,923	79.0	(78.1–79.9)	25,535	9,457,148	96.6	(96.2–97.0)
Unable to work	1,891	904,303	27.5	(25.4–29.8)	4,640	2,280,968	68.7	(66.2–71.1)	6,169	2,952,544	88.4	(86.6–90.0)
Housewife/ Student	2,048	1,372,799	20.2	(18.7–21.9)	6,721	5,162,344	76.5	(74.5–78.4)	8,518	6,430,010	94.1	(93.0–95.0)
Marital status												
Currently married	12,082	7,572,189	20.7	(20.1–21.4)	44,388	29,358,964	80.8	(80.1–81.5)	53,879	35,453,676	96.7	(96.3–97.0)
Previously married†	7,499	2,614,001	25.1	(24.1–26.2)	20,383	7,540,051	71.9	(70.8–73.0)	27,707	9,762,064	92.4	(91.7–93.1)
Never married§	2,855	2,434,013	19.0	(17.7–20.3)	9,334	9,492,166	73.8	(72.1–75.4)	11,941	11,863,771	91.3	(90.3–92.3)
Interview language												
English	21,689	11,819,518	20.6	(20.1–21.2)	72,706	44,672,616	78.1	(77.5–78.7)	91,753	54,940,267	95.2	(94.8–95.5)
Spanish	251	249,308	25.6	(20.7–31.2)	451	555,298	56.5	(50.0–62.7)	615	735,069	74.7	(68.7–79.9)
Children in household												
Yes	6,540	5,239,598	20.8	(20.0–21.8)	22,172	19,678,184	78.2	(77.2–79.2)	26,937	23,878,858	94.3	(93.7–94.8)
No	15,934	7,392,433	21.3	(20.7–21.9)	52,054	26,797,544	77.4	(76.7–78.1)	66,771	33,299,418	95.1	(94.7–95.5)

Abbreviation: CI = confidence interval.
* Persons identified as Hispanic might be of any race. Persons identified as white, black, or other race/multirace are all non-Hispanic. The four racial/ethnic categories are mutually exclusive.
† Includes divorced, widowed, and separated persons.
§ Includes never married persons and members of unmarried couples.

status, and those without Internet access. An increased effort to make household preparedness materials and information more accessible, particularly by those with resource and language barriers, is needed.

The findings in this report are subject to at least five limitations. First, during 2006–2010, BRFSS sampled only households with a landline telephone, thus excluding homes with only cellular telephones. Second, responses were dependent on the participant's understanding of preparedness measures taken in the household; for example, some respondents might not have known that the household had a 3-day supply of food, water, and medications. In addition, respondents were not required to present any evidence that a preparedness measure (e.g., 3-day supply of water or a working flashlight) had been met. Third, the response rates were low; only approximately one of every two persons contacted agreed to participate in the survey. Fourth, several of the questions failed to account for all types of preparedness technology (e.g., hand-cranked flashlights). Finally, the General Preparedness module was only implemented in 14 states during 2006–2010, with only a few states using the module in any given year; therefore, the findings are not generalizable to the U.S. population.

TABLE 2. Percentage of participants reporting household disaster or emergency preparedness, by preparedness measures and state — Behavioral Risk Factor Surveillance System, 14 states, 2006–2010

		Have a 3-day supply of food				Have a 3-day supply of medication				Have a 3-day supply of water			
State	Year	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)
Overall		**83,965**	**49,939,735**	**82.9**	**(82.4–83.5)**	**80,351**	**47,083,817**	**89.7**	**(89.2–90.1)**	**55,323**	**32,222,914**	**53.6**	**(52.9–54.3)**
Connecticut	2006	3,483	1,953,333	80.7	(78.1–82.3)	3,430	1,897,278	88.5	(87.0–89.8)	2,289	1,250,486	51.6	(49.7–53.6)
Delaware	2007	3,402	559,508	85.6	(83.9–87.1)	3,232	519,317	91.5	(90.0–92.8)	2,374	393,933	60.2	(58.0–62.4)
Georgia	2008	4,686	5,704,548	83.8	(82.1–85.3)	4,552	5,326,005	91.0	(89.7–92.2)	2,952	3,548,334	52.2	(50.2–54.2)
Louisiana	2007	5,263	2,503,903	84.7	(83.4–86.0)	4,840	2,225,833	85.2	(83.8–86.4)	4,180	1,986,970	67.1†	(65.5–68.8)
Maryland	2007	3,377	3,081,163	79.7	(77.7–81.5)	3,393	2,971,525	86.3	(84.2–88.1)	2,309	2,141,650	55.1	(52.9–57.3)
Mississippi	2009	8,780	1,665,142	83.3	(82.2–84.4)	8,829	1,602,641	90.8	(89.7–91.7)	6,051	1,129,593	56.6	(55.1–58.0)
Montana	2006 2008 2010	16,737	1,827,338	88.1†	(87.4–88.8)	15,185	1,620,819	91.1	(90.4–91.9)	10,896	1,133,622	54.7	(53.6–55.8)
Nebraska	2007 2008	8,736	2,082,276	83.8	(82.1–85.4)	8,398	1,957,109	91.0	(89.5–92.3)	4,745	1,130,401	45.5*	(43.5–47.6)
Nevada	2006	2,772	1,300,038	78.5*	(76.1–80.7)	2,559	1,170,845	80.7*	(78.1–83.1)	2,102	1,041,549	63.0	(60.4–65.5)
New Hampshire	2007	4,615	776,298	81.7	(80.3–82.9)	4,540	752,438	90.8	(89.6–91.9)	3,122	5,167,704	54.2	(52.6–55.9)
New York	2008	3,032	11,086,539	79.8	(78.0–81.4)	3,040	10,742,654	89.6	(87.9–91.0)	1,953	6,979,891	50.4	(48.4–52.5)
North Carolina	2010	10,227	5,869,875	84.7	(84.5–86.8)	9,803	5,367,481	91.4	(90.3–92.4)	6,707	3,866,292	56.7	(55.2–58.1)
Pennsylvania	2008	5,435	7,995,514	86.1	(84.7–87.5)	5,246	7,614,674	93.7†	(92.5–94.8)	3,579	4,947,353	53.4	(51.5–55.4)
Tennessee	2006	3,420	3,534,261	82.0	(80.2–83.6)	3,304	3,315,199	84.4	(82.5–86.2)	2,064	2,156,136	50.0	(47.7–52.3)

See table footnotes below.

TABLE 2. (*Continued*) Percentage of participants reporting household disaster or emergency preparedness, by preparedness measures and state — Behavioral Risk Factor Surveillance System, 14 states, 2006–2010

		Have a written evacuation plan				Have a working battery-operated radio				Have a working battery-operated flashlight			
State	Year	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)	No. in sample	Weighted no.	%	(95% CI)
Overall		**22,522**	**12,661,492**	**21.1**	**(20.6–21.7)**	**74,331**	**46,538,951**	**77.7**	**(77.2–78.3)**	**93,831**	**57,256,195**	**94.8**	**(94.4–95.1)**
Connecticut	2006	967	544,187	22.4	(20.8–24.1)	3,338	1,915,855	79.2	(77.6–80.8)	4,121	2,328,965	95.5	(94.6–96.2)
Delaware	2007	947	148,878	22.8	(20.8–25.0)	3,062	514,735	79.0	(77.1–80.7)	3,771	627,163	95.7	(94.7–96.6)
Georgia	2008	957	1,082,355	16.0	(14.7–17.5)	4,027	5,088,753	75.1	(73.3–76.8)	5,172	6,461,497	94.6	(93.6–95.4)
Louisiana	2007	3,224	1,585,357	54.0†	(52.3–55.7)	5,191	2,513,071	85.2†	(83.9–86.4)	5,882	2,836,825	95.4	(94.6–96.1)
Maryland	2007	1,136	1,031,932	26.9	(25.0–28.8)	3,207	3,050,542	79.7	(77.7–81.5)	3,910	3,668,318	94.9	(93.6–95.9)
Mississippi	2009	1,901	357,999	18.0	(16.9–19.3)	7,842	1,568,763	78.7	(77.6–79.9)	9,946	1,896,225	94.7	(94.1–95.3)
Montana	2006 2008 2010	3,776	397,797	19.2	(18.4–20.1)	13,284	1,522,456	74.2	(73.3–75.2)	18,177	2,004,263	96.4	(96.0–96.8)
Nebraska	2007 2008	2,231	519,381	21.0	(19.4–22.7)	8,197	2,043,232	82.6	(81.0–84.1)	9,793	2,404,766	96.5	(95.7–97.2)
Nevada	2006	1,029	473,114	28.6	(26.4–30.9)	2,479	1,191,252	72.3*	(69.7–74.7)	3,148	1,505,890	90.5	(88.3–92.2)
New Hampshire	2007	1,252	196,826	20.7	(19.5–22.1)	4,318	751,036	79.4	(78.1–80.7)	5,446	926,119	97.2†	(96.5–97.7)
New York	2008	669	2,272,831	16.5	(15.1–18.0)	2,828	10,608,454	76.7	(74.9–78.4)	3,514	3,059,551	93.4*	(92.3–94.4)
North Carolina	2010	1,883	1,171,601	17.2	(16.1–18.5)	8,692	5,251,368	77.2	(76.0–78.5)	11,153	6,543,028	95.2	(94.5–95.8)
Pennsylvania	2008	1,081	1,392,433	15.0*	(13.7–16.4)	4,720	7,159,537	77.7	(76.0–79.3)	6,017	8,976,868	96.3	(95.5–97.0)
Tennessee	2006	1,469	1,486,798	34.6	(32.5–36.8)	3,146	3,359,894	78.5	(76.6–80.3)	3,881	4,016,717	93.8	(92.5–94.9)

Abbreviation: CI = confidence interval.
* Lowest percentage for preparedness measure among the 14 states.
† Highest percentage for preparedness measure among the 14 states.

Since the 2001 terrorist attacks, the federal government has increased its emphasis on emergency preparedness, including the response and recovery capabilities of emergency management agencies, hospitals, and public health systems (*7*). CDC uses preparedness metrics to assess systems, with the findings disseminated to states and used to inform *Healthy People 2020* objectives. Outcomes associated with individual household preparedness activities, however, are not similarly assessed or shared (*3,8*). To help improve household disaster preparedness in the general population and to inform national and state preparedness planning and policy, systematically measured, generalizable state-based household preparedness data are needed (*9*).

What is already known on this topic?

Household preparedness measures, such as having a 3-day supply of food, water, and medications and a written household evacuation plan, can improve a population's ability to cope with disasters and emergencies, decreasing the number of persons who might otherwise strain emergency and health-care services.

What is added by this report?

Results from Behavioral Risk Factor Surveillance System surveys of household preparedness in 14 states during 2006–2010 indicated that an estimated 94.8% of households had a working battery-operated flashlight, 89.7% had a 3-day supply of medications for everyone who required them, 82.9% had a 3-day supply of food, 77.7% had a working battery-operated radio, 53.6% had a 3-day supply of water, and only 21.1% of U.S. residents had a written evacuation plan.

What are the implications for public health practice?

Greater effort is needed to stress the importance of disaster and emergency preparedness, especially the need for a written evacuation plan. Public health and emergency services agencies should increase the accessibility of household preparedness materials and information to the Hispanic population and persons with resource and language barriers.

References

1. Hick JL, Hanfling D, Burstein JL, et al. Health care facility and community strategies for patient care surge capacity. Ann Emerg Med 2004;44:253–61.
2. Paton D, Johnston DM. Disaster resilience: an integrated approach. Springfield, IL: Charles C. Thomas; 2006:105–6.
3. Ablah E, Konda K, Kelley CL. Factors predicting individual emergency preparedness: a multi-state analysis of the 2006 BRFSS data. Biosecur Bioterror 2009;7:317–30.
4. Murphy ST, Cody M, Frank LB, Glik D, Ang A. Predictors of emergency preparedness and compliance. Disaster Med Public Health Prep 2009;7:S1–8.
5. Federal Emergency Management Agency. Ready. Washington, DC: Federal Emergency Management Agency; 2012. Available at http://www.ready.gov. Accessed September 7, 2012.
6. Federal Emergency Management Agency. Citizen Corps. Washington, DC: Federal Emergency Management Agency; 2012. Available at http://citizencorps.gov. Accessed September 7, 2012.
7. CDC. Public health preparedness capabilities: national standards for state and local planning. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. Available at http://www.cdc.gov/phpr/capabilities. Accessed September 7, 2012.
8. CDC. Public Health Emergency Preparedness Program: budget period 1. Performance measures specifications and implementation guidance. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://www.cdc.gov/phpr/documents/phep+bp1+pm+specifications+and+implementation+guidance_v1_1.pdf. Accessed September 7, 2012.

Assessment of Household Preparedness Through Training Exercises — Two Metropolitan Counties, Tennessee, 2011

Public health emergency preparedness involves improving both workforce and household capacity to manage disasters. To improve preparedness at both levels, the Tennessee Department of Health (TDH) formed a Rapid Assessment of Populations Impacted by Disasters (RAPID) team. In 2011, the team used Community Assessment for Public Health Emergency Response (CASPER) two-stage cluster sampling methodology to measure household preparedness for disasters or emergencies in two metropolitan counties. In the two counties, 23% and 31% of households reported being "well-prepared" to handle disasters or emergencies, 43% and 44% reported being "somewhat prepared," and 25% and 20% reported being "not at all prepared." As a result of this experience, RAPID teams were able to improve their methods, streamline processes, and create a better community assessment toolkit. To increase preparedness at both the community and workforce levels, public health departments should assess community preparedness to inform the planning process and provide field training and exercise opportunities for public health workers.

Public health preparedness programs are charged with building capability to respond to disasters and improving community preparedness (*1*). To help achieve these goals, TDH formed a RAPID team in 2010 made up of local and state health department staff members. Using CASPER methods, the RAPID team, in conjunction with two metropolitan county health departments and volunteers, conducted community assessments in 2011 to 1) assess household-level preparedness in two major metropolitan areas in Tennessee, 2) evaluate the field team deployment process, and 3) train and exercise the emergency response workforce in postdisaster survey methods. Although CASPER methodology has been used and validated during disaster response (*2*) and nondisaster scenarios (*3*), assessing community preparedness is a new use for these methods.

For both surveys, RAPID team leaders with previous experience conducting CASPER surveys used materials from a rapid community assessment toolkit developed by TDH. The toolkit was intended to facilitate the field survey deployment process by providing premade training in methodology, safety and logistics, plus maps of sampling areas, logistics forms, census data, databases, and survey templates. The two surveys provided opportunities to test and improve several of these tools.

Knox County, which includes the city of Knoxville, had a 2010 population of 423,237. Davidson County, which includes the city of Nashville, had a 2010 population of 626,681 (*4*). The two counties were selected for these exercises because their health departments expressed interest in assessing community preparedness. Before deployment to the field to conduct household interviews, approximately 80 public health workers, university students, and volunteers attended 4 hours of training. The trainings included modules on 1) basic concepts of CASPER methodology, 2) team logistics (e.g., communications, navigation in the field), 3) use of survey and household tracking forms, and 4) personal safety procedures while in the field. Before going into the field, teams conducted mock interviews using the survey questionnaire to ensure interview consistency and understanding of the survey aims. Rosters of those completing the training and field portions of the exercises were retained by the health departments to facilitate redeployment of experienced personnel during future rapid community assessments.

Three broad categories of household preparedness were assessed: 1) preparedness planning and supplies, 2) communication and information sources during disasters, and 3) the presence of household pets and pet-related evacuation plans. Survey questions were derived from the Behavioral Risk Factor Surveillance System (*5*) General Preparedness module. The Davidson County survey included a question asking about a written or spoken preparedness plan, whereas Knox County asked about a written evacuation plan. The CASPER two-stage cluster sampling design was used to obtain representative samples of approximately 210 households for interviews for each assessment. In the first stage, the RAPID team randomly selected 30 census blocks within each county, with probability of selection proportionate to population size (*6*). In the second stage, households were selected using sequential sampling, starting in the visually estimated center of each identified cluster. At each household that participated, one adult representative was interviewed. Of 252 Knox County and 316 Davidson County homes at which a resident answered the door, 197 (78%) and 184 (58%) interviews, respectively, were completed; residents at the remaining households declined participation.

Survey Results

Results of the interviews indicated that, in Knox County, 23% of respondents reported being "well-prepared" to handle disasters or emergencies, 43% reported being "somewhat prepared," and 25% reported being "not at all prepared" (9% responded: "don't know"). In Davidson County, the corresponding percentages were 31%, 44%, and 20% (5% responded: "don't know") (Table). In Knox County, 11% reported having a written disaster evacuation plan; in Davidson County, 40% reported having either a written or spoken plan for emergencies.

When asked about household supplies, 78% (Knox) and 87% (Davidson) of households reported having a working flashlight with batteries, and 60% (Knox) and 55% (Davidson) reported having a battery-operated radio with batteries. Eighty-four percent (Knox) and 82% (Davidson) of households reported having 3-day supplies of nonperishable food, 39% (Knox) and 54% (Davidson) reported 3-day stores of water, and 74% (Knox) and 91% (Davidson) reported 3-day supplies of prescription medications.

Mobile telephones were reported as the primary means of communicating during disasters in 83% (Knox) and 90% (Davidson) of households (Table). Television was reported to be the primary means of getting information during disasters in 45% (Knox) and 46% (Davidson) of households, with radio the primary source for 23% in both counties. Pet or livestock ownership was reported in 49% (Knox) and 47% (Davidson) of households (Table). During a disaster requiring evacuation, 63% (Knox) and 87% (Davidson) planned to bring their pets, whereas only 3% (Knox) and 4% (Davidson) anticipated leaving their pets or livestock with food.

Assessment Improvements

Based on the experience in these two surveys, the RAPID teams were able to revise and improve training on household selection in the field, navigation in the community using cluster maps, and use of associated tracking forms. The household selection training revisions include visual examples of cluster maps with displayed starting points and discussions pertaining to team strategies for sequential sampling in areas with dispersed households. To streamline future responses, the teams refined cluster map templates with navigation maps, added navigation elements to the premade presentations contained in the toolkit, and refined tracking and sign-in forms to efficiently manage team logistics. The teams strengthened the safety module with information on team identification in the field and routine communications with logistics personnel. The toolkits now contain all this information on single DVDs and have been distributed to public health emergency response teams in all regions of Tennessee. The improved kits have the potential to reduce the response time for community assessments.

Reported by

Kathleen C Brown, PhD, Knox County Health Dept, Knoxville; Nancy Horner, Metro Public Health Dept, Nashville; Melissa Fankhauser, MPH, Tennessee Dept of Health. Joseph Roth, Jr., MPH, Career Epidemiology Field Officer, Office of Science and Public Health Practice, Office of Public Health Preparedness and Response; Tristan Victoroff, MPH, Scientific Education and Professional Development Program Office, Office of Surveillance, Epidemiology, and Laboratory Svcs, CDC. ***Corresponding contributor:*** *Joseph Roth, Jr., jroth@cdc.gov, 615-253-8669.*

TABLE. Results of two training exercises that assessed household preparedness for disasters or emergencies — Knox and Davidson counties, Tennessee, 2011

Characteristic	% of households	
	Knox County	Davidson County
Planning and supplies		
How prepared do you feel your household is to handle a disaster or emergency?*		
Well-prepared	23	31
Somewhat prepared	43	44
Not at all prepared	25	20
Household has a disaster or emergency plan.	—	40†
Household has a written disaster evacuation plan for how you will leave your home, in case of a large-scale disaster that requires evacuation.	11§	—
Household has a working flashlight with batteries	78	87
Household has a battery-operated radio with batteries.	60	55
For every person in the household, there is a 3-day supply of nonperishable food.	84	82
For every person in the household, there is a 3-day supply of water.	39	54
For every person in the household who needs them, there is a 3-day supply of prescription medications.	74	91
Communication-related		
During a disaster or emergency, what would be your primary way of communicating with relatives and friends?		
Mobile phone	83	90
Landline telephone	12	6
Other	4	4
What would be your primary way of getting information during a disaster or emergency?		
Television	45	46
Radio	23	23
Internet	10	7
Pet-related		
Someone in your household has pets, service animals, or livestock.	49	47
If you were asked to evacuate, what would you do with your pets?		
Bring the pets	63	87
Leave pets with food	3	4
Other	6	9

* Response of "don't know" were excluded.
† In Davidson County, 40% of respondents reported having either a written or spoken plan for emergencies.
§ In Knox County, 11% of respondents reported having a written disaster plan for evacuation.

Editorial Note

Quantifying household-level preparedness provided planners the information needed to guide targeted program activities. Although public health emergency preparedness programs in each region continually bolster response plans, enhanced efforts to improve household preparedness are needed because substantial numbers of households report being unprepared or less than fully prepared for disasters. Based on the survey results in this report, plans for public health or other emergency messaging during a disaster should include television, radio, and the Internet because those are the primary means of obtaining information during a disaster for more than three fourths of those surveyed. Approximately half the population surveyed owned pets or livestock, and most owners plan to bring their pets during evacuations. Therefore, shelter and evacuation plans need to accommodate both evacuees and their animals, and plans for managing livestock should be made by the appropriate agencies. Planners should incorporate these findings into response strategies and coordinate community messaging both to improve household preparedness and to guide community actions.

During the survey periods, press releases pertaining to the surveys prompted print media and television dissemination of information in each county regarding preparedness and the role of public health, enabling planners to reinforce the CDC Get a Kit, Make a Plan, Be Prepared (*7*) themed messages to the communities. Moreover, the surveys provided the opportunity for direct interaction between public health staff members and hundreds of members of the community to discuss household preparedness strategies and distribute preparedness guidance.

The findings in this report are subject to at least four limitations. First, interviews were conducted in the daytime and early evenings, so households where the adults were working outside the home at the time of interviews had limited representation. Selection bias might have occurred if households were selected based on occupancy or interviewer safety concerns. Second, results are representative only of the populations in the two counties surveyed, thus limiting the ability to generalize to other regions in Tennessee or elsewhere. Third, all information was self-reported, and respondents were not required to present any evidence that a preparedness measure (e.g., 3-day supply of water or a working flashlight) had been met. Finally, widespread media coverage might have contributed to social desirability bias, resulting in an overestimate of households reporting that they are well-prepared or somewhat prepared.

These surveys provided valuable information about community preparedness in two of Tennessee's largest metropolitan areas, while providing staff members, students, and volunteers with experience conducting the type of surveys that will need to be done in postdisaster settings, when response demands can exceed normal operating capacity. CASPER surveys during emergency responses require organization of multiagency participation (e.g., public health, emergency response, and nongovernmental organizations), application of scientifically sound survey methods, and prompt data collection, analysis, and reporting to inform response activities. Knox County had not conducted such a field exercise previously, and Davidson County had conducted only one previous CASPER survey. By conducting surveys during nondisaster situations, both jurisdictions and team members gained valuable experience that can facilitate survey planning and implementation in future emergency responses. The field experience knowledge and confidence gleaned from successfully completing these exercises will better enable staff members to conduct community assessments during future emergency responses.

What is already known on this topic?

Community Assessment for Public Health Emergency Response (CASPER) methods are well established as an efficient means for assessing population needs and characteristics in both disaster and nondisaster settings.

What is added by this report?

In a two-county CASPER survey conducted in Tennessee, only 23% of respondents in Knox County and 31% in Davidson County reported being well-prepared for an emergency or disaster. Using CASPER in nondisaster settings to assess community preparedness enhances disaster response capabilities of health departments by simultaneously identifying community needs, strengthening workforce training, and improving Rapid Assessment of Populations Impacted by Disasters (RAPID) toolkits.

What are the implications for public health practice?

To increase preparedness at both community and professional levels, public health departments should use a combination of strategies including surveys, training exercises, and public communications to maximize preparedness and response effectiveness.

References

1. CDC. Public health preparedness capabilities: national standards for state and local planning, March 2011. Atlanta, GA: US Department of Health and Human Services, CDC; 2011. Available at http://www.cdc.gov/phpr/capabilities/dslr_capabilities_july.pdf. Accessed September 12, 2012.
2. Malilay J, Flanders WD, Brogan D. A modified cluster-sampling method for post-disaster rapid assessment of needs. Bull World Health Organ 1996;74:399–405.
3. CDC. Intent to receive influenza A (H1N1) 2009 monovalent and seasonal influenza vaccines—two counties, North Carolina, August 2009. MMWR 2009;58;1401–5.
4. US Census Bureau. State and county quickfacts. Washington, DC: US Census Bureau; 2012. Available at http://quickfacts.census.gov/qfd/maps/tennessee_map.html, Accessed September 7, 2012.
5. CDC. Behavioral Risk Factor Surveillance System 2007 questionnaire. Atlanta, GA: US Department of Health and Human Services, CDC; 2006. Available at http://www.cdc.gov/brfss/questionnaires/pdf-ques/2007brfss.pdf. Accessed September 7, 2012.
6. US Census Bureau. State and county estimates for 2009. Washington, DC: US Census Bureau; 2010. Available at http://www.census.gov/did/www/saipe/data/statecounty/data/2009.html. Accessed September 7, 2012.
7. CDC. Emergency preparedness and response: emergency preparedness and you. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://emergency.cdc.gov/preparedness. Accessed September 7, 2012.

Tuberculosis Genotyping — United States, 2004–2010

Tuberculosis (TB) genotyping is a laboratory-based genetic analysis of the bacteria that cause TB disease (i.e., any of the organisms in the *Mycobacterium tuberculosis* complex). When combined with epidemiologic data, TB genotyping has sufficient discriminatory power to help find TB cases likely to be in the same chain of transmission or determine that cases are not related (*1*). Since 2004, >70,000 *M. tuberculosis* isolates have been genotyped through partnerships between CDC, national genotyping laboratories, and state and local public health departments, with a goal to genotype at least one *M. tuberculosis* isolate for each case of culture-positive TB in the United States. National genotype surveillance coverage, or the proportion of culture-positive TB cases with a genotyped isolate, increased from 51.2% in 2004 to 88.2% in 2010. The TB Genotyping Information Management System (TB GIMS), accessible to public health departments through a secure, online web portal, was launched in 2010. TB GIMS enables systematic collection of genotyping results, which have been available since 2004, and integrates those results with epidemiologic, geographic, demographic, and clinical data collected by the National TB Surveillance System (NTSS) since 1993. Genotyping timeliness, represented by the median time from specimen collection until linked genotyping results and surveillance data are available to TB GIMS users, improved from 22 weeks in July 2010 to 11 weeks in December 2010. These improvements in genotype surveillance coverage and timeliness will improve outbreak detection efforts and enable more in-depth studies of TB epidemiology, leading to better use of limited public health resources.

Analysis of *M. tuberculosis* genotypes* has enhanced TB control with its ability to detect unsuspected transmission links between cases, confirm suspected links, identify unknown or difficult to investigate transmission settings, alert public health departments to possible transmission across geographic reporting areas, identify potential outbreaks (i.e., a group of TB cases with genotype results and epidemiologic links consistent with recent transmission, where control of transmission exceeds locally available resources), refine outbreak case definitions, and identify false-positive TB culture results (*2*). Cases with indistinguishable genotypes that are close in space and time are considered genotype clusters and might represent an outbreak. Cases with a genotype unique to a given time and place are less likely to be related to another case. The ability to detect outbreaks based on genotyping results depends on sufficient genotype surveillance data (*3*). Without adequate genotyping data, single genotyped isolates from chains of transmission will appear to be unique.

TB GIMS facilitates systematic data collection of genotyping results and integrates genotyping results with epidemiologic, geographic, demographic, and clinical data collected by NTSS (*4*). Genotype data are uploaded into TB GIMS by national genotyping laboratories as they become available, and surveillance data from NTSS are uploaded into TB GIMS at least biweekly at CDC. Although TB outbreaks tend to develop slowly (months to years), prompt intervention during an outbreak can interrupt transmission; thus, timeliness in linking genotyping results to surveillance data (by state and local public health departments) is essential for prompt outbreak detection. TB GIMS sends users automated e-mail alerts when a genotype cluster in their jurisdiction has grown to a higher than expected geospatial concentration in a specific county, compared with the national distribution of that genotype.

For this report, 2004–2010 TB GIMS data from 51 reporting areas in the United States (50 states and the District of Columbia) were analyzed. Measures of geospatial concentration were calculated by the log-likelihood ratio (LLR) for a given genotype cluster in a single county during a 3-year period.† An LLR >5.0 indicates a potential outbreak.§ TB GIMS timeliness data were examined during July–December 2010. For each isolate, the date of arrival at the national genotyping laboratory, date of genotyping result, and date that genotyping results and surveillance data were linked in the system were examined. A record was considered complete when genotyping results (from national genotyping laboratories) and surveillance data (from NTSS) both were entered in the system and linked by public health departments.

Genotype surveillance coverage has increased from 51.2% in 2004 to 88.2% in 2010 (Figure 1). In 2010, 40 (83.3%) of 48 reporting areas¶ had >80% genotype surveillance coverage, compared with 26 (51.0%) of 51 reporting areas in 2004. During 2008–2010, a total of 23,108 TB cases had at least one genotyped isolate; 7,942 (34.4%) were part of 2,184 county-based genotype clusters. Of these clusters, 1,679 (76.9%)

* In this report, a genotype is defined as a unique combination of spacer oligonucleotide typing results (spoligotype) and 12-locus mycobacterial interspersed repetitive unit–variable number tandem repeat typing results.

† A 3-year period was chosen to fit the natural history of TB. Among persons who develop TB disease, a majority likely will do so within 3 years of exposure.

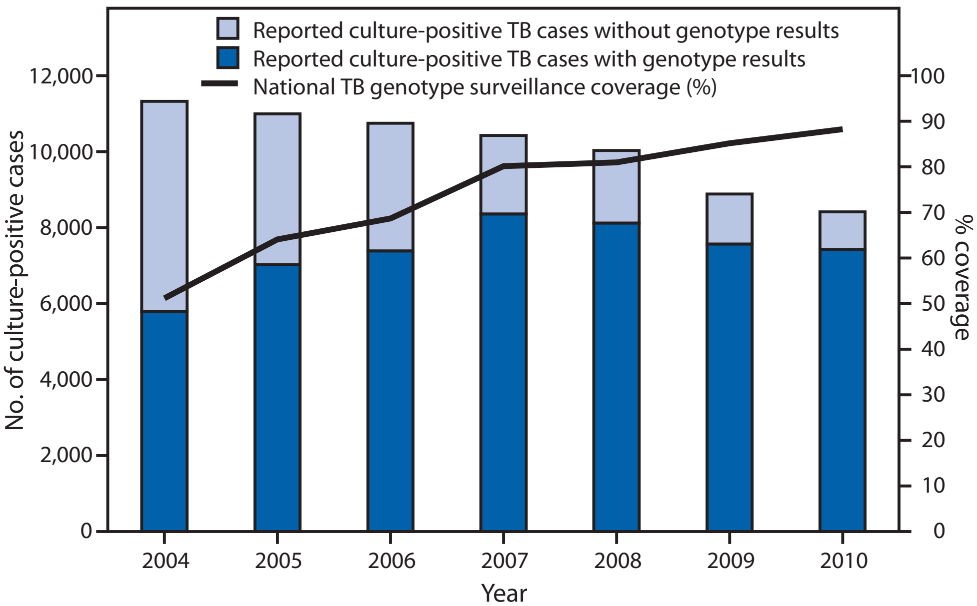
§ This cut point was derived from a preliminary analysis of internal CDC data using local expert opinion as the standard for defining a TB outbreak. Two validation studies currently are in progress.

¶ Three states among the 51 areas were excluded from the analysis because of delays resulting from technical problems.

clusters consisted of two or three cases, compared with 100 (4.6%) clusters with ≥10 cases (Figure 2). The most common genotype was seen in 932 (4.0%) of all genotyped cases; at least one case with this genotype was identified in 43 of the 51 reporting areas. Among all genotype clusters, 378 (17.3%) were identified as potential outbreaks based on elevated geospatial concentration (LLR >5.0) during 2008–2010.

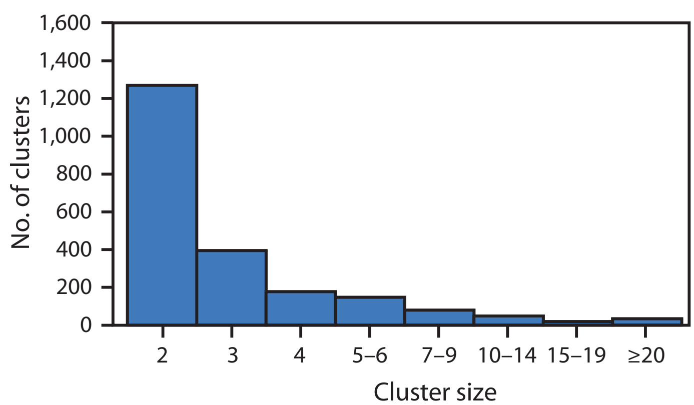
Since its launch in March 2010, TB GIMS use increased rapidly, with >28,000 logins by 349 state and local users in the first 10 months after release. During July–December 2010, the median time from specimen collection until a complete record was available (with linked genotyping results and surveillance data) in TB GIMS was 16 weeks (interquartile range: 12–22 weeks). This included medians of 8 weeks from specimen collection until the TB isolate arrived at the genotyping laboratory, 1 week for genotyping laboratory turnaround time, and 14 weeks for linking genotyping results with surveillance data in TB GIMS.** Median time to a complete record improved from 22 weeks (n = 547 isolates; interquartile range: 15–30 weeks) for specimens collected in July 2010, to 11 weeks (n = 289 isolates; interquartile range: 9–14 weeks) for specimens collected in December 2010.

FIGURE 1. Reported culture-positive tuberculosis (TB) cases and national TB genotype surveillance coverage* by year — United States,† 2004–2010



* Proportion of culture-positive TB cases with at least one genotyped isolate.
† Includes 50 states and the District of Columbia.

FIGURE 2. Number of county-based tuberculosis genotype clusters,* by cluster size (number of isolates) — United States, 2008–2010



* Genotype cluster is defined as two or more *Mycobacterium tuberculosis* isolates that share matching genotypes in a county during 2008–2010.

Reported by

Juliana Grant, MD, Steve Kammerer, MBA, Div of Tuberculosis Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention; Brian Baker, MD, Lindsay Kim, MD, EIS officers, CDC. ***Corresponding contributor:*** *Lindsay Kim, lkim@cdc.gov, 404-639-5218.*

Editorial Note

TB genotyping has become a commonly used tool for TB outbreak detection and investigations in the United States (B. Baker, MD, CDC, unpublished survey of TB GIMS users, 2010). In one study examining the added value of TB genotyping, 38% of all epidemiologic links were discovered only after using genotyping to connect previously unlinked cases. In addition, of the epidemiologic links discovered during conventional contact investigations, assumed transmission among 29% of case pairs was refuted by genotyping data (*5*). Only 17.3% of the 2,184 genotype clusters in the United States during 2008–2010 had geospatial concentrations indicating a potential outbreak. Genotyping data such as these allow local or state public health departments to target interventions among the many cases and epidemiologic clusters identified in a jurisdiction, potentially saving financial and human resources.

** Users at state and local public health departments can link isolates to surveillance data even before the isolate has arrived at the genotyping laboratory. The time to a complete record depends on the rate-limiting step for each case (and is not a sum of each of the steps).

What is already known on this topic?

Tuberculosis (TB) genotyping, a laboratory-based genetic analysis of the bacteria that cause TB disease, provides sufficient discriminatory power to confirm or refute links in the chain of transmission. The TB Genotyping Information Management System (TB GIMS), a secure, online web portal accessible by public health authorities, facilitates systematic data collection of genotyping results and integrates genotyping results with epidemiologic, geographic, demographic, and clinical data.

What is added by this report?

Since 2004, >70,000 *Mycobacterium tuberculosis* isolates have been genotyped through partnerships between CDC, national genotyping laboratories, and state and local public health departments. National genotype surveillance coverage, or the proportion of culture-positive TB cases with a genotyped isolate increased from 51.2% in 2004 to 88.2% in 2010. Genotyping timeliness, represented by the median time from specimen collection until linked genotyping results and surveillance data are available to TB GIMS users, improved from 22 weeks in July 2010, to 11 weeks in December 2010.

What are the implications for public health practice?

As the United States strives toward TB elimination, genotype surveillance can lead to more timely outbreak detection and continued refinement of TB control activities, making the best use of limited public health resources at local, state, and national levels.

Because of the availability of several years of national surveillance data with accompanying high genotype coverage, population-level studies using genotyping data are now possible. Genotyping data can enable a broader understanding of TB epidemiology, which can be applied to future TB control efforts. As TB incidence declines in the United States, TB increasingly is found in harder-to-reach populations and locations, and genotyping data have been used to identify these pockets of transmission that require public health intervention (*6*). A recent study using national genotyping data found that most TB disease in the foreign-born population in the United States likely has resulted from activation of latent *M. tuberculosis* infection (rather than recent transmission in the United States), emphasizing the importance of identifying and treating latent infection to decrease the incidence of TB disease in this group (*7*). Another study used national genotyping data to demonstrate that as much as one fourth of TB cases might represent recent transmission, emphasizing the critical importance of early contact investigations to TB control (*8*). Finally, TB genotyping data can be used to better understand the development of outbreaks. Nationally, most county-based genotype clusters are small (Figure 2) and do not grow larger. For small genotype clusters (<4 cases) that grow in size and are classified as outbreaks using field data, linked genotyping and surveillance data have been used to identify factors that might increase the likelihood of clusters becoming an outbreak (CDC, unpublished data, 2012).

Analyses of large genotype datasets and prompt outbreak detection now are possible because of substantial increases in genotype surveillance coverage during 2004–2010. Improvements in the timeliness of linking genotyping results to surveillance data will improve TB outbreak detection efforts further. As the United States strives toward TB elimination, genotype surveillance can lead to continued refinement of TB control activities, making the best use of limited public health resources at local, state, and national levels.

Acknowledgments

Clinical laboratories and local and state public health department personnel. Sandy Althomsons, MA, Eleanor Click, MD, Lauren Cowan, PhD, Divia Forbes, MPH, Anne Marie France, PhD, Tracie J. Gardner, PhD, Smita Ghosh, MS, Michael Iademarco, MD, Philip LoBue, MD, Patrick Moonan, DrPH, Thomas Navin, MD, Jagadheeswari Adhimurthy, MS, Jeffrey Chrismon, Joel Haney, Shonna Luten, Div of TB Elimination, National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention, CDC.

References

1. Oelemann MC, Diel R, Vatin V, et al. Assessment of an optimized mycobacterial interspersed repetitive-unit-variable number tandem-repeat typing system combined with spoligotyping for population-based molecular epidemiology studies of tuberculosis. J Clin Microbiol 2007; 45:691–7.
2. McNabb SJ, Braden CR, Navin TR. DNA fingerprinting of *Mycobacterium tuberculosis*: lessons learned and implications for the future. Emerg Infect Dis 2002;8:1314–9.
3. Borgdorff MW, van den Hof S, Kalisvaart N, Kremer K, van Soolingen D. Influence of sampling on clustering and associations with risk factors in the molecular epidemiology of tuberculosis. Am J Epidemiol 2011;174: 243–51.
4. Ghosh S, Moonan PK, Cowan L, Grant J, Kammerer S, Navin TR. Tuberculosis Genotyping Information Management System: enhancing tuberculosis surveillance in the United States. Infect Genet Evol 2012;12:782–8.
5. McNabb SJ, Kammerer JS, Hickey AC, et al. Added epidemiologic value to tuberculosis prevention and control of the investigation of clustered genotypes of *Mycobacterium tuberculosis* isolates. Am J Epidemiol 2004; 160:589–97.
6. CDC. Tuberculosis cluster associated with homelessness—Duval County, Florida, 2004–2012. MWWR 2012;61:539–40.
7. Ricks PM, Cain KP, Oeltmann JE, Kammerer JS, Moonan PK. Estimating the burden of tuberculosis among foreign-born persons acquired prior to entering the United States, 2005–2009. PLoS One 2011;6:e27405.
8. Moonan PK, Ghosh S, Oeltmann JE, Kammerer JS, Cowan LS, Navin TR. Using genotyping and geospatial scanning to estimate recent *Mycobacterium tuberculosis* transmission, United States. Emerg Infect Dis 2012; 18:458–65.

Notes from the Field

Highly Pathogenic Avian Influenza A (H7N3) Virus Infection in Two Poultry Workers — Jalisco, Mexico, July 2012

During June–August 2012, Mexico's National Service for Health, Safety, and Food Quality reported outbreaks of highly pathogenic avian influenza (HPAI) A (H7N3) virus in poultry on farms throughout the state of Jalisco (*1,2*). This report describes two cases of conjunctivitis without fever or respiratory symptoms caused by HPAI A (H7N3) virus infection in humans associated with exposure to infected poultry.

Patient 1. On July 7, a poultry worker aged 32 years complaining of pruritus in her left eye was examined at a clinic in Jalisco. Physical findings included redness, swelling, and tearing. Conjunctivitis was diagnosed; the patient was treated symptomatically and recovered fully. Because the patient had collected eggs in a farm where HPAI A (H7N3) virus was detected, the Institute for Epidemiological Diagnosis and Reference, Mexico, tested ocular swabs from both of her eyes for influenza A (H7) by real-time reverse transcription–polymerase chain reaction (rRT-PCR), and embryonated chicken eggs were inoculated for viral isolation. The swab material was positive for influenza A (H7) virus by rRT-PCR and virus was isolated from each eye. These findings were reported to the World Health Organization on July 19, and full genome sequences (CY125725–32) were uploaded to GenBank. The virus was closely related by nucleotide sequence to previously reported HPAI A (H7N3) viruses collected during poultry outbreaks in Jalisco with sequences available in GenBank (JX397993, JX317626).

Patient 2. A man aged 52 years, who was a relative of patient 1 and worked on the same farm, developed symptoms consistent with conjunctivitis on July 10 and sought care at a local clinic on July 13. He was treated symptomatically and recovered without sequelae. When public health authorities became aware of this patient, they obtained eye swabs, which were tested by rRT-PCR, revealing influenza A (H7).

Mexico has continued its efforts to contain poultry outbreaks in affected areas in Jalisco. Those efforts include quarantining affected farms, culling infected birds, vaccinating uninfected birds, and disinfecting contaminated areas. Government agencies also have provided personal protective equipment to farm personnel and are conducting active surveillance for influenza-like illness (ILI) and severe acute respiratory illness at two sentinel sites near the outbreak.

Avian influenza A viruses are designated as HPAI or low pathogenicity avian influenza (LPAI) based on molecular characteristics of the virus and the ability of the virus to cause disease and mortality in birds (*3*). To date, only influenza A (H5) and (H7) subtypes have been described as HPAI. Influenza A (H7) subtype viruses have been detected in wild birds in many parts of the world and can cause outbreaks in poultry. Influenza A (H7) infection in humans is uncommon, but can occur after direct contact with infected birds, especially during outbreaks of influenza A (H7) virus among poultry (*4*). Illness can include conjunctivitis without fever, upper respiratory tract symptoms, or both (*4,5*), and severity can range from mild to fatal (*4*). In the United States, avian influenza outbreaks in poultry are rare, but they are detected and reported sporadically. In the United States, only two cases of illness with LPAI A (H7) virus infection are known to have occurred in humans, both of whom recovered (*6,7*).

The conjunctivitis cases in Jalisco most likely represent HPAI A (H7N3) virus transmission from infected poultry to humans through direct contact. United States agricultural, public health, and clinical personnel should be aware of these poultry outbreaks with transmission to humans in a neighboring country. Persons working with poultry known or suspected to be infected with influenza A viruses should use appropriate personal protective equipment, including face masks, gloves and eye protection (e.g., goggles). Clinicians and epidemiologists should consider avian influenza A virus infection in patients who have conjunctivitis or ILI and have contact with poultry in areas with known avian influenza outbreaks. Clinicians who suspect avian influenza A virus infections in humans should obtain a conjunctival or respiratory specimen, or both, depending on signs and symptoms, and submit samples to a national, regional, or state public health laboratory to enable specific influenza testing. Clinicians also should consider early empiric antiviral treatment of suspected cases with a neuraminidase inhibitor (*8,9*). Public health officials should survey family members and contacts of infected persons to find cases of human-to-human transmission.

Reported by

Gisela Barrera-Badillo, MSc, Ernesto Ramirez-Gonzalez, PhD, Rodrigo Aparicio-Antonio, Tatiana Nuñez-Garcia, Dayanira Arellano-Suarez, Patricia Alcantara-Perez, MSc, Abril Rodriguez-Maldonado, Brisia Rodriguez-Reyes, Claudia Wong-Arambula, Elizabeth Gonzalez-Duran, MSc, Joanna Ortiz-Alcantara, MSc, Alberto Diaz-Quiñonez, PhD, Irma Lopez-Martinez, MSc, Instituto de Diagnóstico y Referencia Epidemiológicos; Gustavo Reyes-Teran, MPH, Joel Vazquez-Perez, PhD, Santiago

Avila-Rios, PhD, Instituto Nacional de Enfermedades Respiratorias; Guadalupe Castañeda-Lopez, MD, Armando Robles-Cruz, MD, Hector Montoya-Fuentes, PhD, Victor Borja-Aburto, PhD, Instituto Mexicano del Seguro Social; Cuitlahuac Ruiz-Matus, MD, Jesus Felipe Gonzalez-Roldan, MD, Dirección General de Epidemiología; Pablo Kuri-Morales, MD, Subsecretaría de Prevención y Promoción de la Salud, Mexico. Todd Davis, PhD, Julie Villanueva, PhD, Vic Veguilla, MPH, Marc-Alain Widdowson, DVM, Joseph Bresee, MD, Eduardo Azziz-Baumgartner, MD, Jerome Tokars, MD, Timothy Uyeki, MD, Alexander Klimov, PhD, Stephen Lindstrom, PhD, Bo Shu, MD, Nancy Cox, PhD, Influenza Div, National Center for Immunization and Respiratory Diseases, CDC. ***Corresponding contributor:*** *Alberto Díaz-Quiñonez, alberto.diaz@salud.gob.mx, 555-341-1101 (Mexico).*

References

1. Food and Agriculture Organization. Highly pathogenic avian influenza in Mexico (H7N3)—a significant threat to poultry production not to be underestimated. Empress Watch 2012;26:1–9.
2. World Organization for Animal Health. Update on highly pathogenic avian influenza in animals (type H5 and H7). Paris, France: World Organization for Animal Health; 2012. Available at http://www.oie.int/animal-health-in-the-world/update-on-avian-influenza/2012. Accessed September 4, 2012.
3. Infection with viruses of notifiable avian influenza. [Chapter 10.4]. In: Terrestrial Animal Health Code. Paris, France: World Organization for Animal Health; 2012. Available at http://www.oie.int/fileadmin/home/eng/health_standards/tahc/2010/en_chapitre_1.10.4.htm. Accessed September 11, 2012
4. Koopmans M, Wilbrink B, Conyn M, et al. Transmission of H7N7 avian influenza A virus to human beings during a large outbreak in commercial poultry farms in the Netherlands. Lancet 2004;363:587–93.
5. Skowronski D, Tweed S, Petric M, Booth T, Li Y, Tam T. Human illness and isolation of low-pathogenicity avian influenza virus of the H7N3 subtype in British Columbia, Canada. J Infect Dis 2006;193:899–900.
4. Ostrowsky B, Huang A, Terry W, et al. Low pathogenic avian influenza A (H7N2) virus infection in an immunocompromised adult, New York, USA, 2003. Emerg Infect Dis 2012;18:1128–31.
7. Edwards LE, Terebuh P, Adija A, et al. Serological diagnosis of human infection with avian influenza A (H7N2) virus [Abstract 60, Session 44]. Presented at the International Conference on Emerging Infectious Diseases 2004, Atlanta, Georgia, February 22–March 3, 2004.
8. CDC. Antiviral agents for the treatment and chemoprophylaxis of influenza: recommendations of the Advisory Committee on immunization Practices (ACIP). MMWR 2011;60(No. RR-1).
9. World Health Organization. WHO guidelines for pharmacological management of pandemic influenza A(H1N1) 2009 and other influenza viruses. Part I: recommendations. Geneva, Switzerland: World Health Organization; 2010. Available at http://www.who.int/csr/resources/publications/swineflu/h1n1_guidelines_pharmaceutical_mngt.pdf. Accessed September 11, 2012.

Announcement

Clinical Vaccinology Course — November 2–4, 2012

CDC and seven other national organizations are collaborating with the National Foundation for Infectious Diseases (NFID), Emory University School of Medicine, and the Emory Vaccine Center to sponsor a Clinical Vaccinology Course November 2–4, 2012, at the Hyatt Regency Miami in Miami, Florida. Through lectures and interactive case presentations, the course will focus on new developments and concerns related to the use of vaccines in pediatric, adolescent, and adult populations. Leading infectious disease experts, including pediatricians, internists, and family physicians, will present the latest information on newly available vaccines and vaccines in the pipeline, as well as established vaccines, for which continued administration is essential to improving disease prevention efforts.

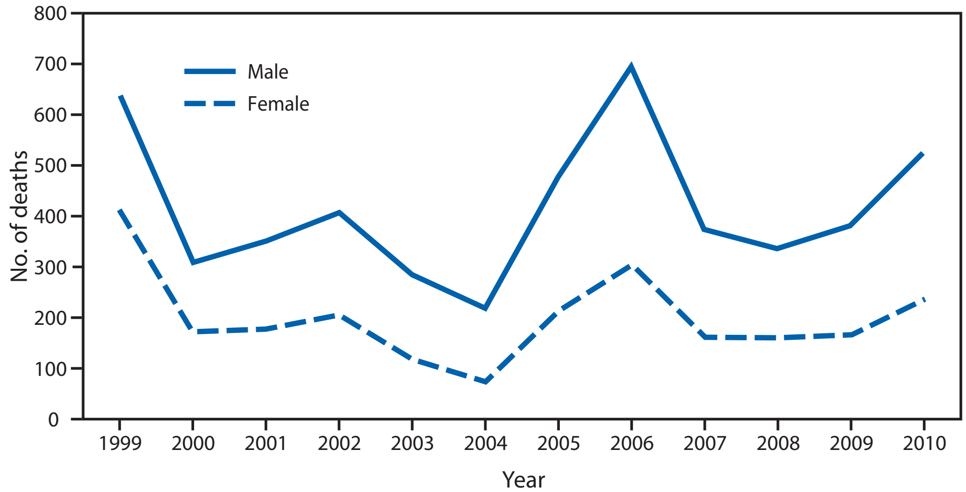
This course is designed specifically for physicians, nurses, nurse practitioners, physician assistants, pharmacists, vaccine program administrators, and other health-care professionals involved with or interested in the clinical use of vaccines. The course also will be of interest to health-care professionals involved in the prevention and control of infectious diseases, such as federal, state, and local public health officials. Course participants should have a knowledge of or interest in vaccines and vaccine-preventable diseases.

Continuing education credits will be offered. Information regarding the program, registration, and hotel accommodations is available at http://www.nfid.org, or by e-mail (idcourse@nfid.org), fax (301-907-0878), telephone (301-656-0003, ext. 19), or mail (NFID, 4733 Bethesda Avenue, Suite 750, Bethesda, MD 20814-5228).

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Number of Heat-Related Deaths,* by Sex — National Vital Statistics System, United States,† 1999–2010§



* Deaths attributed to exposure to natural heat, as the underlying and contributing causes of death, are coded as X30 and T67, according to the *International Classification of Diseases, 10th Revision*.

† U.S. residents only.

§ Data for 2010 are preliminary.

From 1999 to 2010, a total of 7,415 deaths in the United States, an average of 618 per year, were associated with exposure to excessive natural heat. The highest yearly total of heat-related deaths (1,050) was in 1999 and the lowest (295) in 2004. Approximately 68% of heat-related deaths were among males.

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

Reported by: Jiaquan Xu, MD, jax4@cdc.gov, 301-458-4086.

U.S. Government Printing Office: 2012-523-043/02029 Region IV ISSN: 0149-2195