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National Preparedness Month — September 2015

Throughout September, CDC and more than 3,000 organizations (including national, regional, and local governments, as well as private and public institutions) will support emergency preparedness efforts and encourage U.S. residents to take action to become more prepared for emergencies. For Preparedness Month 2015 (*1*), CDC's Office of Public Health Preparedness and Response plans to focus on the importance of community resilience.

A resilient community is one that can withstand, adapt, and quickly recover from events while minimizing negative health impacts. Building a strong, resilient community requires preparedness efforts at all levels, starting at home with the family, and expanding to include neighborhoods, workplaces and schools, travel plans, and online communities.

Following the theme of community resilience, CDC's *Public Health Matters* (*2*) blog will feature stories about sheltering with children, Los Angeles County discussions on community preparedness, a medication dispensing exercise in Virginia, a world traveler's take on preparedness when on the move, and a look at using online networks in emergencies. Preparedness Month will also feature the release of the reports in this issue of *MMWR*, infographics, social media messages, and a Twitter Chat on community resilience on September 16. The month will culminate in the PrepareAthon's National Day of Action (*3*) on September 30. Additional information about CDC's Preparedness Month activities is available at http://www.cdc.gov/phpr/preparedness_month.htm.

References

1. CDC. National Preparedness Month. Available at http://www.cdc.gov/phpr/preparedness_month.htm.
2. CDC. Public Health Matters Blog. Available at http://blogs.cdc.gov/publichealthmatters.
3. Federal Emergency Management Agency. Ready. Available at http://www.ready.gov.

Influences of Preparedness Knowledge and Beliefs on Household Disaster Preparedness

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In response to concern about strengthening the nation's ability to protect its population and way of life (i.e., security) and ability to adapt and recover from emergencies (i.e., resilience), the President of the United States issued Presidential Policy Directive 8: National Preparedness (PPD-8) (*1*). Signed on March 30, 2011, PPD-8 is a directive for the U.S. Department of Homeland Security to coordinate a comprehensive campaign across government, private and nonprofit sectors, and individuals to build and sustain national preparedness. Despite efforts by the Federal Emergency Management Agency (FEMA) and other organizations to educate U.S. residents on becoming

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prepared, growth in specific preparedness behaviors, including actions taken in advance of a disaster to be better prepared to respond to and recover, has been limited (*2*). In 2012, only 52% of U.S. residents surveyed by FEMA reported having supplies for a disaster (*2*), a decline from 57% who reported having such supplies in 2009 (*3*). It is believed that knowledge influences behavior, and that attitudes and beliefs, which are correlated with knowledge, might also influence behavior (*4*). To determine the association between knowledge and beliefs and household preparedness, CDC analyzed baseline data from *Ready CDC*, a personal disaster preparedness intervention piloted among Atlanta- and Morgantown-based CDC staff members during 2013–2015. Compared with persons with basic preparedness knowledge, persons with advanced knowledge were more likely to have assembled an emergency kit (44% versus 17%), developed a written household disaster plan (9% versus 4%), and received county emergency alert notifications (63% versus 41%). Similarly, differences in household preparedness behaviors were correlated with beliefs about preparedness. Persons identified as having strong beliefs in the effectiveness of disaster preparedness engaged in preparedness behaviors at levels 7%–30% higher than those with weaker preparedness beliefs. Understanding the influences of knowledge and beliefs on household disaster preparedness might provide an opportunity to inform messages promoting household preparedness.

In 2013, CDC partnered with the American Red Cross and state and local Georgia emergency management agencies to develop and pilot *Ready CDC* among CDC staff members living in metropolitan Atlanta. Co-branded with FEMA's *Ready* campaign, the program consisted of a pre-assessment of household preparedness behaviors, a 1-hour in-person workshop with local experts, a workshop evaluation, receipt of three behavioral reinforcement messages, and a post-assessment evaluation 3 months after the workshop. Eleven *Ready CDC* recruitment campaigns were held from September 2013 through June 2015. All participants provided informed consent and completed a pre-assessment survey before enrollment. Approval of data collection activities was granted by CDC's institutional review board (Protocol #6472). This analysis includes data from the pre-assessment only.

The pre-assessment survey collected information about respondent demographics, disaster deployment experience, and several household preparedness indicators, including possession of emergency kit items, existence of a written household disaster plan, and community planning characteristics. To assess the association of knowledge with preparedness, pre-assessment respondents were dichotomized based on their level of knowledge. Participants who reported they were aware of the need to assemble an emergency kit, the need to develop a written household disaster plan, that disasters were likely to occur in their county of residence, the meaning of outdoor warning sirens, and where to sign up for free cardiopulmonary resuscitation (CPR) and first aid training were categorized as having advanced knowledge. Participants who did not meet

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all the criteria for having advanced knowledge were classified as having basic knowledge.

To assess the influence of beliefs on preparedness behavior, three belief domains were constructed: risk perception, preparedness, and self-efficacy. A seven-point Likert scale was used to assess level of participant agreement with beliefs about risk perception (belief that participant was at risk for experiencing a disaster and that a potential disaster was likely serious); preparedness (belief that assembling a kit and/or having a written disaster plan would mitigate the harmful effects of a disaster); and self-efficacy (perceived ability to easily assemble a kit and/or develop a written disaster plan). Participants reporting that they "somewhat agree," "agree," or "strongly agree" were categorized as having strong beliefs for the respective belief domains; all others were categorized as having weak beliefs.

Household preparedness measures assessed included possession or maintenance of an assembled emergency kit and written emergency plan, defined based on the Transtheoretical Model of Behavior Theory stage of change (*5*), possession of 16 recommended kit items, and having practiced the written plan (*6*). Community planning preparedness behaviors, such as receipt of emergency alert notifications from the county, encouraging friends and neighbors to be personally prepared, and having someone in the home trained in CPR and first aid were also assessed. High adoption of household preparedness was defined as reported adoption of ≥11 of 21 preparedness measures (having 16 emergency kit items, having a written emergency household plan, and participating in the four community preparedness behaviors).

Reported preparedness behaviors were analyzed according to knowledge and belief levels. Estimates were adjusted for demographics that differed significantly in Chi-square tests across categories of knowledge and beliefs, including sex, disaster deployment experience (field or emergency operations center deployment or participation in emergency response exercise versus none), age (<45 and ≥45 years), education (college degree or less versus postgraduate education) and having adults >65 years living at home.

Logistic regression was used to identify factors associated with high household preparedness adoption, including, demographics, knowledge, risk perception beliefs, personal or awareness of friends' experiences with a disaster, and social connectedness. Factors significantly associated with high adoption by univariate analysis were entered into a step-wise multivariate model to determine the final model. Odds ratios and corresponding 95% confidence intervals were reported where applicable.

A total of 439 (10.0%) of 4,402 CDC staff members invited to one of the 11 *Ready CDC* sessions enrolled and completed the pre-assessment. The majority of participants were aged ≥45 years (63%), female (64%), part of an unmarried or married couple (73%), had a master's degree or higher (67%), owned their home (85%), and had no disaster deployment experience (54%). Overall, 123 (28%) participants had advanced preparedness knowledge. Significant differences in reported preparedness behaviors were observed between knowledge levels (Table 1). The largest differences related to emergency kit items between those with advanced and basic knowledge were possession of a multipurpose tool (83% versus 58%), an emergency blanket (67% versus 42%), and a first aid kit (84% versus 59%) (p<0.001). In terms of community planning preparedness behaviors, 65% of participants with advanced knowledge reported encouraging others to be personally prepared, compared with 40% of participants with basic knowledge (p<0.001).

The correlation of beliefs with personal preparedness behaviors varied across the three belief domains (Table 2). Risk perception beliefs were associated with having a kit, with 30%

Summary

What is already known on this topic?

Various factors are associated with household disaster preparedness behaviors, including age, income, awareness, and individual health status. Rates of reported household disaster preparedness in the United States have been stable, though low, since 2007.

What is added by this report?

Among CDC employees participating in the *Ready CDC* household preparedness behavioral intervention, reported household and community preparedness behaviors, including having an emergency kit and encouraging neighbors to be personally prepared, were higher among participants with advanced preparedness knowledge than among participants with basic preparedness knowledge. Belief in the ability to prepare for a disaster by assembling an emergency kit and developing a written disaster plan and belief that preparing mitigates the harmful effects of a disaster were more correlated with personal preparedness adoption behaviors than was the perception of being at risk for experiencing a disaster. Preparedness messaging and campaigns might not be effective if preparedness knowledge and self-efficacy and preparedness beliefs are not addressed.

What are the implications for public health practice?

Public information campaigns and education programs focusing on increasing perceptions of self-efficacy and the mitigating effects of preparedness behaviors and encouraging social connectedness might improve household preparedness. Understanding how knowledge and beliefs are related to household preparedness might inform the design and implementation of more effective emergency preparedness messaging and risk communication strategies, resulting in increased disaster household preparedness behaviors.

TABLE 1. Preparedness knowledge and reported measures of household preparedness among CDC staff members — *Ready CDC*, 2013–2015*

Household preparedness measures	Preparedness knowledge level†		
	Basic (n = 316) % (SE)	Advanced (n = 123) % (SE)	p-value
Emergency kit preparedness			
Possession or maintenance of an assembled emergency kit	17 (2.0)	44 (1.0)	**<0.001**
Possession of specific kit items			
3-day water supply	37 (3.0)	53 (5.0)	**0.003**
3-day food supply	49 (3.0)	70 (4.0)	**0.001**
Copies of personal documents	50 (3.0)	69 (4.0)	**0.001**
Flashlight or head lamp	85 (2.0)	98 (1.0)	**0.002**
7-day supply of medications	62 (3.0)	70 (4.0)	0.114
Family and emergency contact information	51 (3.0)	66 (4.0)	**0.006**
NOAA battery-powered or hand-crank radio	41 (3.0)	63 (5.0)	**0.003**
Multipurpose tool	58 (3.0)	83 (4.0)	**<0.001**
Cash	37 (3.0)	52 (4.0)	**0.005**
Whistle	27 (3.0)	45 (5.0)	**0.001**
Extra batteries	60 (3.0)	84 (3.0)	**<0.001**
Emergency blanket	42 (3.0)	67 (5.0)	**<0.001**
First aid kit	59 (3.0)	84 (3.0)	**<0.001**
Sanitation and personal hygiene items	58 (3.0)	79 (4.0)	**0.001**
Cell phone with chargers	78 (2.0)	91 (3.0)	**0.004**
Map(s) of area	22 (2.0)	30 (4.0)	0.069
Household disaster plan preparedness			
Possession or maintenance of a written disaster plan	4 (1.0)	9 (3.0)	0.06
If have plan, practiced the written disaster plan	54 (14.0)	85 (11.0)	0.13
Community planning preparedness			
Receive emergency alert notifications from county	41 (3.0)	63 (5.0)	**0.002**
Encourage friends and neighbors to be personally prepared	40 (3.0)	65 (5.0)	**<0.001**
Personally and/or someone in household trained in CPR	71 (3.0)	84 (3.0)	**0.008**
Personally and/or someone in household trained in first aid	64 (3.0)	81 (4.0)	**0.002**

Abbreviations: CPR = cardiopulmonary resuscitation; NOAA = National Oceanic and Atmospheric Administration; SE = standard error.
* Logistic regression estimates are adjusted for sex and disaster deployment experience.
† Participant classified as having advanced knowledge if reported awareness of all of the following: need to assemble an emergency kit, need to develop a written household disaster plan, disasters likely to occur in county of residence, meaning of outdoor warning sirens in county of residence, and where to sign up for free CPR and first aid training; otherwise, classified as having basic knowledge. Significant differences, defined by p<0.050, shown in bold.

of those having strong beliefs reporting having a kit, compared with 21% of those with weak risk perception beliefs (p = 0.041). However, risk perception beliefs were not associated with having a written emergency plan or engaging in community planning preparedness. Preparedness and self-efficacy beliefs were associated with both emergency kit and written plan preparedness. Participants who strongly believed having a kit and plan would mitigate the effects of a disaster (i.e., strong preparedness belief) were more likely to report having a kit or plan. Among participants with strong preparedness beliefs, 26% possessed an emergency kit, compared with 14% of participants with weak preparedness beliefs (p = 0.048). Among participants with strong self-efficacy beliefs, 29% possessed an emergency kit, compared with only 8% of participants with weak self-efficacy beliefs (p = 0.001). Significant differences in the proportion of participants reporting possession of specific kit items were observed by strength of self-efficacy beliefs, but not preparedness beliefs. The greatest reported differences in reported possession of emergency kit items between participants with strong and weak self-efficacy beliefs were a 3-day food supply (59% versus 29% [p<0.001]) and a 3-day water supply (46% versus 18% [p = 0.001]).

Demographic characteristics associated with household preparedness adoption included age and sex. (Table 3). Additionally, participants reporting preparedness knowledge and social connectedness (i.e., neighbors willing to help in the community) were more likely identified as high adopters of household preparedness.

Discussion

Among *Ready CDC* participants representing the metropolitan Atlanta CDC workforce, household preparedness was associated with preparedness knowledge and beliefs. Findings were consistent with studies that found that exposure to a greater number of preparedness information sources was positively associated with having a household plan (*7*) and that persons who were exposed to more emergency-related news in the media were more likely to have emergency preparedness items and engage in a higher stage of preparation actions than persons with lower exposure to emergency-related news (*8*).

TABLE 2. Preparedness beliefs and reported measures of household preparedness among CDC staff members — *Ready CDC*, 2013–2015

Household preparedness measures	Risk perception beliefs*			Preparedness beliefs†			Self-efficacy beliefs§		
	Less strong (n = 225) % (SE)	Strong (n = 214) % (SE)	p-value	Less strong (n = 62/101)¶ % (SE)	Strong (n = 372/332)¶ % (SE)	p-value	Less strong (n = 63/95)** % (SE)	Strong (n = 369/339)** % (SE)	p-value
Emergency kit preparedness									
Possession or maintenance of an assembled emergency kit	21 (3.0)	30 (3.0)	**0.041**	14 (4.0)	26 (2.0)	**0.048**	8 (3.0)	29 (2.0)	**0.001**
Possession of specific kit items									
3-day water supply	41 (3.0)	42 (3.0)	0.957	32 (6.0)	43 (3.0)	0.109	18 (5.0)	46 (3.0)	**0.001**
3-day food supply	55 (3.0)	54 (3.0)	0.923	49 (7.0)	56 (3.0)	0.339	29 (6.0)	59 (3.0)	**<0.001**
Copies of personal documents	59 (3.0)	50 (3.0)	0.07	47 (6.0)	56 (3.0)	0.185	45 (6.0)	56 (3.0)	0.085
Flashlight or head lamp	87 (2.0)	88 (2.0)	0.602	87 (4.0)	88 (2.0)	0.791	69 (6.0)	91 (1.0)	**<0.001**
7-day supply of medications	65 (3.0)	63 (3.0)	0.621	62 (6.0)	65 (3.0)	0.65	53 (6.0)	65 (3.0)	0.07
Family and emergency contact information	54 (3.0)	57 (3.0)	0.558	51 (7.0)	56 (3.0)	0.48	44 (6.0)	57 (3.0)	**0.046**
NOAA battery-powered or hand-crank radio	44 (3.0)	48 (3.0)	0.387	39 (7.0)	48 (3.0)	0.248	28 (6.0)	50 (3.0)	**0.002**
Multipurpose tool	64 (3.0)	63 (3.0)	0.767	63 (6.0)	65 (3.0)	0.742	46 (6.0)	68 (2.0)	**0.002**
Cash	43 (3.0)	39 (3.0)	0.413	33 (6.0)	43 (3.0)	0.169	28 (6.0)	44 (3.0)	**0.02**
Whistle	32 (3.0)	32 (3.0)	0.964	34 (6.0)	31 (3.0)	0.667	20 (5.0)	35 (3.0)	**0.024**
Extra batteries	62 (3.0)	68 (3.0)	0.192	61 (6.0)	66 (3.0)	0.431	48 (6.0)	69 (2.0)	**0.003**
Emergency blanket	48 (3.0)	49 (3.0)	0.824	44 (6.0)	50 (3.0)	0.406	32 (6.0)	53 (3.0)	**0.004**
First aid kit	64 (3.0)	67 (3.0)	0.474	60 (6.0)	67 (3.0)	0.28	55 (6.0)	67 (2.0)	0.066
Sanitation and personal hygiene items	66 (3.0)	62 (3.0)	0.375	69 (6.0)	64 (3.0)	0.486	56 (6.0)	66 (2.0)	0.13
Cell phone with chargers	81 (3.0)	79 (3.0)	0.617	79 (5.0)	81 (2.0)	0.764	70 (6.0)	82 (2.0)	**0.022**
Map(s) of area	23 (3.0)	27 (3.0)	0.336	14 (4.0)	25 (2.0)	0.057	12 (4.0)	27 (2.0)	**0.017**
Household disaster plan preparedness									
Possession or maintenance of a written disaster plan	5 (1.0)	7 (2.0)	0.264	1 (1.0)	8 (1.0)	**0.042**	0 (2.0)	8 (1.0)	**<0.001**
If have plan, practiced the written disaster plan	90 (9.0)	56 (12.0)	0.097	50 (24.0)	72 (9.0)	**<0.0001**	—	—	—
Community planning preparedness									
Receive emergency alert notifications from county	46 (3.0)	49 (4.0)	0.508	N/A	N/A	N/A	N/A	N/A	N/A
Encourage friends and neighbors to be personally prepared	44 (3.0)	51 (3.0)	0.168	N/A	N/A	N/A	N/A	N/A	N/A
Personally and/or someone in household trained in CPR	70 (3.0)	78 (3.0)	0.068	N/A	N/A	N/A	N/A	N/A	N/A
Personally and/or someone in household trained in first aid	67 (3.0)	68 (3.0)	0.751	N/A	N/A	N/A	N/A	N/A	N/A

Abbreviations: CPR = cardiopulmonary resuscitation; NOAA = National Oceanic and Atmospheric Administration; SE = standard error.

* Participants classified as having strong risk perception beliefs if reported on a 7-point Likert scale "somewhat agree," "agree," or "strongly agree" to 1) believing they are at risk for experiencing a disaster and 2) a potential disaster is likely serious; otherwise, classified as having weak beliefs. Logistic regression estimates given are unadjusted.

† Participants classified as having strong preparedness beliefs reported on a 7-point Likert scale "somewhat agree," "agree," or "strongly agree" believing that assembling a kit/having a written emergency plan will mitigate the harmful effects of a disaster; otherwise, classified as having weak beliefs. Assessed reported measures of kit preparedness by kit preparedness beliefs; estimates adjusted for age and education. Assessed family disaster plan preparedness by plan preparedness beliefs; estimates unadjusted.

§ Participants classified as having strong self-efficacy beliefs reported on a 7-point Likert scale "somewhat agree," "agree," or "strongly agree" believing they are easily able to assemble an emergency kit/develop a written emergency plan; otherwise, classified as having weak beliefs. Assessed reported measures of kit preparedness by kit self-efficacy beliefs; estimates adjusted for having older adults aged >65 years in home. Assessed disaster plan preparedness by disaster plan self-efficacy beliefs; estimates unadjusted.

¶ Weak beliefs: kit preparedness belief, n = 62 and plan preparedness belief, n = 101; strong beliefs: kit preparedness belief, n = 372 and plan preparedness belief, n = 332.

** Weak beliefs: kit self-efficacy belief, n = 63 and plan self-efficacy belief, n = 95; strong beliefs: kit self-efficacy belief, n = 369 and plan self-efficacy belief, n = 339. Significant differences are defined by p<0.050, shown in bold.

Additionally, these findings were consistent with those of a study that examined beliefs about earthquake hazards and household preparedness, which reported that beliefs related to threat inevitability, preparedness effectiveness, and self-efficacy influence adoption of preparedness behaviors (*9*).

TABLE 3. Factors associated with household preparedness among CDC staff members — *Ready CDC*, 2013–2015

Characteristic	No.	High adoption of household preparedness*	
		Unadjusted OR (95% CI)†	Adjusted OR (95% CI)†
Demographics			
Age ≥45 yrs	270	1.9 (1.3–2.8)	1.8 (1.2–2.9)
Male sex	154	2.6 (1.7–4.0)	2.3 (1.4–3.8)
Married/Unmarried couple	306	1.8 (1.2–2.8)	
College degree or less	139	0.8 (0.5–1.3)	
Own home	366	2.1 (1.2–3.6)	
Adults aged >65 yrs living in home	59	0.9 (0.5–1.7)	
Children aged <18 yrs living in home	157	1.0 (0.6–1.4)	
Previous disaster deployment	196	1.4 (0.9–2.0)	
Preparedness knowledge			
Aware of need to assemble emergency kit	408	NC§	
Aware of need to develop written family disaster plan	340	4.0 (2.5–6.4)	4.2 (2.4–7.4)
Aware of types of disasters likely to occur in county of residence	368	4.8 (2.7–8.4)	2.6 (1.5–5.6)
Aware of county outdoor warning sirens	208	2.2 (1.5–3.2)	
Aware of where to sign up for free CPR training	308	2.2 (1.5–3.4)	1.7 (1.1–2.9)
Risk perception beliefs			
Agrees is at risk for a disaster¶	260	0.9 (0.6–1.4)	
Agrees potential disaster is likely to be serious¶	288	1.2 (0.8–1.8)	
Disaster experience			
Experienced personal disaster	210	2.0 (1.3–2.9)	
Knows others with personal disaster experience	255	1.4 (1.0–2.1)	
Social connectedness			
Neighbors willing to help with routine activities**	171	2.4 (1.6–3.6)	2.4 (1.5–3.9)
Agrees strong sense of community in neighborhood††	182	1.5 (1.0–2.3)	
Agrees most persons in neighborhood can be trusted††	235	1.8 (1.2–2.7)	

Abbreviations: CI = confidence interval; CPR = cardiopulmonary resuscitation, NC = noncalculable; OR = odds ratio.

* Participants classified as having high adoption of household preparedness if reported engagement in at least 11 of 21 (16 emergency kit items, written plan, and four community preparedness behaviors) selected preparedness measures.

† Significant factors are defined by CIs excluding 1.0 (null association), shown in bold.

§ No participants unaware of need to assemble an emergency kit categorized as having sufficient household preparedness.

¶ Agree includes, "somewhat agree," "agree," and "strongly agree" (7-point Likert scale).

** Willing includes "often" and "always" (5-point Likert scale).

†† Agree includes "agree" and "strongly agree" (5-point Likert scale).

Differences in possession of specific emergency kit items by knowledge level might reflect items that are more commonly referenced in disaster-related messaging. For example, persons with advanced preparedness knowledge were more aware than those with basic preparedness knowledge of items such as emergency blankets and first-aid kits; whereas both groups were aware of items that are referenced in everyday messaging, such as medications and flashlights. The lack of correlation between risk perception beliefs and certain household preparedness behaviors — specifically having a written emergency plan and engaging in community preparedness — might be explained by findings from other studies that suggest even if an person perceives a risk, that perception might not lead to preparedness behaviors, particularly if the risk is not perceived to be imminent (*8,9*). Correlation of preparedness beliefs with possession or maintenance of an emergency kit, but not specific kit items, might be attributable to lack of knowledge of items recommended in an emergency kit. The correlation of self-efficacy beliefs with preparedness behavior is consistent with findings in a study that suggested that persons who believed they could prepare and respond were more likely to adopt those behaviors, and that preparedness is stronger when undertaking simple tasks, but wanes as tasks become more complex (*9*). Thus, potential barriers such as cost and lack of storage space might add to the complexity of gathering and storing certain items, and thereby explain the most notable differences in possession of 3-day water and food supplies among those with strong versus less strong self-efficacy beliefs.

This study identified demographic and social connectedness characteristics as correlates of household preparedness adoption. In this study, men were more likely to report personal preparedness than women. A 2009 personal preparedness survey conducted by FEMA suggested that education and income are correlated with preparedness behaviors (*3*). A previous study found that the belief that an individual has some responsibility to take care of others is correlated with preparedness behaviors (*9*). Further research regarding the sociodemographic determinants of household preparedness is warranted.

The findings in this report are subject to at least four limitations. First, survey data are self-reported and might not reflect actual levels of emergency preparedness behaviors. Second, participants were dichotomized into subjective categories. Third, this population of public health employees was a convenience sample with a low enrollment rate, and thus might not be representative or generalizable. Finally, reported knowledge,

beliefs, and preparedness behavior measures might have been biased toward responses deemed more socially desirable among a population of public health employees.

Risk communication messaging and strategies designed to encourage household preparedness behaviors should incorporate approaches that will lead to higher levels of preparedness knowledge. Additionally, understanding the influences of beliefs on personal preparedness and promoting beliefs that encourage preparedness behaviors might improve risk communication and campaigns designed to encourage household preparedness. Education, training, and messaging aimed at changing behaviors need to address beliefs that are more likely to impact preparedness behaviors. Messaging that focuses on preparedness tasks that are simple and incorporates evidence-based findings into household disaster preparedness behaviors might improve community disaster response, mitigation, and recovery.

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References

1. US Department of Homeland Security. Presidential Policy Directive (PPD-8): national preparedness. Available at http://www.dhs.gov/presidential-policy-directive-8-national-preparedness.
2. Federal Emergency Management Agency. Personal preparedness in America: findings from the 2012 FEMA National Survey. Available at http://www.fema.gov/media-library-data/662ad7b4a323dcf07b829ce0c5b77ad9/2012+FEMA+National+Survey+Report.pdf.
3. Federal Emergency Management Agency. Personal preparedness in America: findings from the 2009 Citizen Corps National Survey. Available at www.ready.gov/personal-preparedness-survey-2009.
4. Fabrigar L, Petty R, Smith S, et al. Understanding knowledge effects on attitude-behavior consistency: the role of relevance, complexity, and amount of knowledge. J Pers Soc Psychol 2006;90:556–77.
5. Glanz K, Rimer B, Viswanath K. Health behavior and health education: theory, research, and practice. 4th ed. San Francisco, CA: Josey-Bass; 2008.
6. Federal Emergency Management Agency. Emergency supply list. Available at http://www.fema.gov/media-library-data/1390846764394-dc08e309debe561d866b05ac84daf1ee/checklist_2014.pdf.
7. Basolo V, Steinberg L, Burby R, et al. The effects of confidence in government and information on perceived and actual preparedness for disasters. Environ Behav 2009;41:338–64.
8. Paek HJ, Hilyard K, Freimuth V, et al. Theory-based approaches to understanding public emergency preparedness: implications for effective health and risk communication. J Health Commun 2010;15:428–44.
9. Becker J, Paton D, Johnston D, et al. Salient beliefs about earthquake hazards and household preparedness. Risk Anal 2013;33:1710–27.

CDC Grand Rounds: Addressing Preparedness Challenges for Children in Public Health Emergencies

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Recent public health emergencies including Hurricane Katrina (2005), the influenza H1N1 pandemic (2009), and the Ebola virus disease outbreak in West Africa (2014–2015) have demonstrated the importance of multiple-level emergency planning and response. An effective response requires integrating coordinated contributions from community-based health care providers, regional health care coalitions, state and local health departments, and federal agency initiatives. This is especially important when planning for the needs of children, who make up 23% of the U.S. population (*1*) and have unique needs that require unique planning strategies.

Across a wide range of chemical, biologic, radiological, and nuclear disasters, children (persons aged <18 years) have special physiologic, developmental, and social needs that must be addressed during public health emergencies (*2*). For example, school-aged children were disproportionately affected during the H1N1 pandemic, with higher rates of infection and death (*3*). Children were more likely to develop thyroid cancer than adults after the 1986 Chernobyl nuclear power plant explosion in Ukraine (*4*). After the 2011 earthquake in Japan, children living near the Fukushima power plant explosion experienced increased psychological problems in addition to concerns about cancer (*5*). Furthermore, adolescents affected by the 9/11 attacks have been shown to have higher rates of mental health concerns such as anxiety and depression, and young children have experienced increased rates of respiratory ailments (*6*,*7*). As a group, children are uniquely vulnerable during public health emergencies and often suffer both acute and long-term effects.

Role of Community-Level Pediatricians and State and Local Public Health

Pediatricians provide care for 84% of all well visits and 76% of all sick visits among infants and children aged <6 years; 87% of these visits occur in private solo or group practices (*8*). As a result, community pediatricians are well positioned to promote preparedness among families, practice effective risk communication, and ensure that their practices are ready to respond in the event of an emergency (*9*). Community pediatricians can assist with the distribution of medical countermeasures before, during, and after mass dispensing. They can adjust doses for children, educate parents on home formulation of liquid medication suspensions, look for adverse events or drug interactions, and administer vaccines or medications. Community pediatricians can provide long-term monitoring of health outcomes and can manage the behavioral health and psychological support that children and families need after a disaster. However, to effectively carry out these critical roles, pediatricians must have accurate, up-to-date information from public health agencies.

During the development of a strategic plan aimed at integrating the needs of children into state public health preparedness and emergency response, the Pennsylvania Department of Health, in collaboration with Drexel University and the American Academy of Pediatrics, conducted a series of 36 interviews and two planning meetings with subject matter experts from pediatric health care and public health. The interviews revealed that neither community-based pediatricians nor public health agencies had a clear understanding of the roles and communication needs that the other might fulfill during a public health emergency (*10*). Community pediatricians desired clearly defined roles in communitywide response and recovery efforts. However, public health authorities were unaware of the potential for pediatricians to serve as trusted sources of communication with children and families, and as subject matter experts in addressing the unique public health needs of children. The resulting strategic plan sought to address this situation by encouraging the exchange of information between community pediatricians and public health authorities, through the Health Alert Network, webinars, or targeted conference calls to keep community pediatricians informed and engaged. The plan encouraged practices to leverage patient-centered primary care resources, such as providing comprehensive care and coordinating with other parts of the health care system, to promote preparedness planning. In addition, the plan recommended use of electronic medical records to facilitate care coordination and communication.

This is another in a series of occasional MMWR *reports titled CDC Grand Rounds. These reports are based on grand rounds presentations at CDC on high-profile issues in public health science, practice, and policy. Information about CDC Grand Rounds is available at http://www.cdc.gov/about/grand-rounds.*

Role of Regional Coalitions

Pediatric hospitals account for approximately 5% of U.S. hospitals, with various distribution and density across the country (*11*). As a result, limited pediatric health care resources might become quickly overwhelmed following an influx of children in an emergency. When Hurricane Katrina struck the U.S. Gulf Coast in August 2005, hospitalized children were transferred to other children's hospitals both in and out of Louisiana (*12*). In October 2012, floodwaters from Hurricane Sandy caused a power outage in New York City that required the evacuation of 21 newborns from a neonatal intensive care unit that had no power to other facilities within the city (*13*). As demonstrated by these examples, regionalization of health care resources can help address inadequate local ability to manage a sudden influx of pediatric patients (*14*,*15*). To develop a functional regional pediatric coalition, stakeholders need to determine the appropriate region or area to include, as well as potential regional risks and triggers for activating shared resources, and identify care providers and other community agencies with a role in a disaster, such as law enforcement and public health agencies.

The National Advisory Committee on Children and Disasters (NACCD) was chartered in 2013 to provide expert advice and consultation to the Secretary of the U.S. Department of Health and Human Services (HHS) on the medical and public health needs of children in disasters. A recent report by the NACCD Surge Capacity Workgroup lists several successful coalitions that might serve as models, including the Southeastern Regional Pediatric Disaster Response Surge Network, the New York City Pediatric Disaster Coalition, and the Los Angeles County Pediatric Surge Plan (*15*). One approach, developed by Los Angeles County, includes a tiered system of health care facilities within the regional coalition. The tiers are determined by bed capacity and pediatric care capability (*16*). In this system, Tier 1 hospitals have pediatric intensive care units, inpatient pediatric units, and neonatal intensive care units (*16*). Tier 2 hospitals are adult trauma centers; however, they have the requisite resources and staff to adequately care for traumatic injuries in children. Tier 3 and 4 facilities can accept pediatric patients for inpatient admission. Tier 5 and 6 facilities have no capacity to provide emergency care, but could be used for children who are in stable condition. This tiered system allows hospitals to plan for the types of patients they would expect to receive in an emergency, and facilitates triage of pediatric patients by the regional coalition.

Role of Government

Successful public health initiatives at the local and regional level are frequently made possible by commensurate support policies at the federal level. During the past several years, the Office of the Assistant Secretary for Preparedness and Response (ASPR) has supported a variety of initiatives to improve the health and safety of children during public health emergencies. The Children's Health and Human Services Interagency Leadership on Disasters (CHILD) Working Group publishes an annual report on departmental activities and areas for future consideration (*17*). Recent accomplishments include a deliberate focus on children's countermeasure needs in the event of a chemical, biologic or radiological event, the integration of behavioral health and social support services into disaster response plans to support the needs of children and families, and a concerted effort to include pediatric expertise on all response teams. Furthermore, ASPR was instrumental in the creation of the National Advisory Committee on Children and Disasters, which has begun to systematically assess the nation's capability to protect children during public health emergencies and make recommendations for improvement.

A substantial obstacle in planning for the needs of children and other at-risk individuals during public health emergencies is proactively identifying these populations within the community. The HHS emPOWER Map uses Medicare claims data to help emergency planners and responders assess the density of electricity-dependent persons, such as those who rely on ventilators and electric wheelchairs, within their communities (*18*). Medicare claims data have been effectively used in evaluating whether a special needs adult population followed recommendations for early dialysis in advance of the landfall of Hurricane Sandy (*19*). The emPOWER map and evaluation project show that innovative mechanisms for identifying at-risk populations might help local and state health departments plan for, respond to, and recover from disasters, and there might be an opportunity for claims data to identify children and youth with special health care needs.

Children and Public Health Emergencies

Community pediatricians and local and state health departments have an opportunity to strengthen their communication and coordinate their efforts to address children's needs during a public health emergency. Regional pediatric health care coalitions offer a successful mechanism to combine limited resources and develop effective plans that account for the unique medical needs of children. Federal agencies can play a supportive role in enhancing national pediatric preparedness policies and planning by encouraging collaboration across local, regional, and federal levels in ways that ensure efficient and aligned planning. Strengthening emergency planning and response for children strengthens emergency planning and response for the entire population. By taking a systems-level

approach to emergency response planning for children, the health security of the nation is increased.

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References

1. US Census Bureau. Annual estimates of the resident population for selected age groups by sex for the United States, states, counties, and Puerto Rico Commonwealth and Municipios: April 1, 2010 to July 1, 2014. Washington, DC: US Census Bureau; 2015. Available at http://factfinder.census.gov.
2. Bartenfeld MT, Peacock G, Griese SE. Public health emergency planning for children in chemical, biological, radiological, and nuclear (CBRN) disasters. Biosecur Bioterror 2014;12:201–7.
3. CDC. Update: influenza activity—United States, 2009–10 season. MMWR Morb Mortal Wkly Rep 2010;59:901–8.
4. Cardis E, Howe G, Ron E, et al. Cancer consequences of the Chernobyl accident: 20 years on. J Radiol Prot 2006;26:127–40.
5. Yabe H, Suzuki Y, Mashiko H, et al. Psychological distress after the Great East Japan Earthquake and Fukushima Daiichi Nuclear Power Plant accident: results of a mental health and lifestyle survey through the Fukushima Health Management Survey in FY2011 and FY2012. Fukushima J Med Sci 2014;60:57–67.
6. Hoven CW, Duarte CS, Lucas CP, et al. Psychopathology among New York city public school children 6 months after September 11. Arch Gen Psychiatry 2005;62:545–52.
7. Stellman SD, Thomas PA, S Osahan S, Brackbill RM, Farfel MR. Respiratory health of 985 children exposed to the World Trade Center disaster: report on world trade center health registry wave 2 follow-up, 2007–2008. J Asthma 2013;50:354–63.
8. Tang S-FS. Profile of pediatric visits. Elk Grove Village, IL: American Academy of Pediatrics; 2010. Available at https://www.aap.org/en-us/professional-resources/practice-support/financing-and-payment/Billing-and-Payment/Documents/Profile_Pediatric_Visits.pdf.
9. Redlener I, Markenson D. Disaster and terrorism preparedness: what pediatricians need to know. Dis Mon 2004;50:6–40.
10. Chernak E, Hipper TJ, Kricun H, Yunghans SC, Wishner A, Needle S. Integrating community pediatricians into public health preparedness and response activities in Pennsylvania. Harrisburg, PA: Pennsylvania Department of Health; 2013. Available at http://www.portal.state.pa.us/portal/server.pt?open=514&objID=1586049&mode=2.
11. Children's Hospital Association. About children's hospitals. Overland Park, KS: Children's Hospital Associaton; 2015. Available at https://www.childrenshospitals.org/About-Us/About-Childrens-Hospitals.
12. Baldwin S, Robinson A, Barlow P, Fargason CA Jr. Moving hospitalized children all over the southeast: interstate transfer of pediatric patients during Hurricane Katrina. Pediatrics 2006;117:S416–20.
13. Espiritu M, Patil U, Cruz H, et al. Evacuation of a neonatal intensive care unit in a disaster: lessons from Hurricane Sandy. Pediatrics 2014;134:e1662–9.
14. Ginter PM, Wingate MS, Rucks AC, et al. Creating a regional pediatric medical disaster preparedness network: imperative and issues. Matern Child Health J 2006;10:391–6.
15. National Advisory Committee on Children and Disasters Surge Capacity Work Group. Near-term strategies to improve pediatric surge capacity during infectious disease outbreaks. Washington, DC: US Department of Health and Human Services, National Advisory Committee on Children and Disasters; 2015. Available at http://www.phe.gov/Preparedness/legal/boards/naccd/meetings/Documents/naccd-surge-capacity-rpt042815.pdf.
16. Berg BM, Muller VM, Wilson M, et al. Meeting children's needs: a mixed-methods approach to a regionalized pediatric surge plan—the Los Angeles County experience. Am J Disaster Med 2014;9:161–9.
17. US Department of Health and Human Services. 2012–2013 report of the Children's HHS Interagency Leadership on Disasters (CHILD) Working Group: update on departmental activities and areas for future consideration. Washington, DC: US Department of Health and Human Services; 2014. Available at http://www.phe.gov/Preparedness/planning/abc/Documents/child-wg-report2012-2013.pdf.
18. Office of the Assistant Secretary for Preparedness and Response. HHS emPOWER Map. Washington, DC: US Department of Health and Human Services, Office of the Assistant Secretary for Preparedness and Response; 2015. Available at http://www.phe.gov/emPOWERmap/Pages/default.aspx.
19. Lurie N, Finne K, Worrall C, et al. Early dialysis and adverse outcomes after Hurricane Sandy. Am J Kidney Dis; 2015. Available at http://www.researchgate.net/publication/279631731_Early_Dialysis_and_Adverse_Outcomes_After_Hurricane_Sandy.

Injuries and Traumatic Psychological Exposures Associated with the South Napa Earthquake — California, 2014

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On August 24, 2014, at 3:20 a.m., a magnitude 6.0 earthquake struck California, with its epicenter in Napa County (*1*). The earthquake was the largest to affect the San Francisco Bay area in 25 years and caused significant damage in Napa and Solano counties, including widespread power outages, five residential fires, and damage to roadways, waterlines, and 1,600 buildings (*2*). Two deaths resulted (*2*). On August 25, Napa County Public Health asked the California Department of Public Health (CDPH) for assistance in assessing postdisaster health effects, including earthquake-related injuries and effects on mental health. On September 23, Solano County Public Health requested similar assistance. A household-level Community Assessment for Public Health Emergency Response (CASPER) was conducted for these counties in two cities (Napa, 3 weeks after the earthquake, and Vallejo, 6 weeks after the earthquake). Among households reporting injuries, a substantial proportion (48% in Napa and 37% in western Vallejo) reported that the injuries occurred during the cleanup period, suggesting that increased messaging on safety precautions after a disaster might be needed. One fifth of respondents overall (27% in Napa and 9% in western Vallejo) reported one or more traumatic psychological exposures in their households. These findings were used by Napa County Mental Health to guide immediate-term mental health resource allocations and to conduct public training sessions and education campaigns to support persons with mental health risks following the earthquake. In addition, to promote community resilience and future earthquake preparedness, Napa County Public Health subsequently conducted community events on the earthquake anniversary and provided outreach workers with psychological first aid training.

Two sampling frames were selected for assessment: the entire city of Napa in Napa County and the western section of the city of Vallejo, the area where most earthquake-related structural damage in Solano County had occurred. Both included unincorporated areas within the cities' boundaries. According to the 2010 U.S. Census, the Napa sampling frame included 30,005 housing units and a population of 77,185, and western Vallejo's included 26,017 housing units and a population of 66,032.

To conduct the assessment, CDPH employed CDC's CASPER methodology, a two-stage cluster sampling method (*3*), using a single census block as a cluster. Thirty clusters were selected from each sampling frame, with the probability of selection proportional to the number of housing units in each census block. Two-person interview teams used systematic random sampling to select seven households in each cluster. The teams made three attempts to contact an adult resident in each household before replacing the household with another, with the goal of interviewing a resident in 210 households from each sampling frame.

Questions were selected or adapted from previous implementations of CASPER, other disaster surveys, and the Psychological Simple Triage and Rapid Treatment System (PsySTART), which can identify traumatic exposures known to be associated with posttraumatic stress disorder (PTSD) and other mental health disorders and has been used for mental health follow-up prioritization in American Red Cross shelters (*4*). Examples of assessed traumatic exposures included such situations as experiencing or observing a direct threat to one's own or a family member's life or being trapped during an evacuation (*5*). Because the Napa CASPER was conducted relatively soon after the earthquake, mental health symptom assessments would not have been predictive of longer-term mental health outcomes (*6*). Early recognition and treatment of PTSD can result in improved clinical outcomes, and timely information about affected areas can identify gaps in mental health services coverage (*4*,*5*).

During September 16–18 in Napa, interviews were completed in 201 households, 41% of selected households (62% of households where the door was answered). During October 17–20 in Vallejo, interviews were completed in 175 households, 38% of selected households (56% of those where the door was answered). Percentages and confidence intervals were weighted to account for the two-stage cluster sampling design by using the population of the sampling frame, the number of completed surveys per cluster, and the total number of clusters.

Compared with western Vallejo, approximately twice as many Napa households reported home structural damage that necessitated repairs (42% versus 20%), or damage to possessions within the home (94% versus 52%). One or more family members sustained an injury in 23% of Napa households and 4% of western Vallejo households. Among households that reported an injury, 48% had occurred during cleanup in Napa and 37% in western Vallejo (Table 1). The predominant injury types reported in Napa were soft tissue injuries, including deep cuts, puncture wounds, and large scrapes or bruises (16%).

TABLE 1. Number and percentage of households reporting injuries after the South Napa earthquake, by injury characteristics — Napa and Western Vallejo, California, September–October 2014

Characteristic	Napa (201 households)			Western Vallejo (175 households)		
	No.	%*	(95% CI)*	No.	%*	(95% CI)*
Injury resulting from the earthquake or cleanup	42	23	(14–32)	7	4	(0–8)
Injury occurring during cleanup ≤2 weeks after the earthquake†	23	48	(25–70)	3	37	(0–93)
Injury type						
Deep cut, puncture, large scrape, or bruise	28	16	(8–25)	3	2	(0–4)
Strain or sprain	7	3	(1–6)	2	1	(0–2)
Broken bone, fracture, or dislocation	3	2	(0–3)	1	1	(0–1)
Head injury	2	1	(0–2)	1	1	(0–2)
Other, including minor cuts and bruises	12	6	(2–9)	3	2	(0–3)

Abbreviation: CI = confidence interval.
* Percentages and confidence intervals calculated from weighted frequency data.
† Percentages calculated as proportion of households reporting one or more injury.

TABLE 2. Number and percentage of households reporting psychological distress or traumatic experiences after the South Napa earthquake, by selected characteristics — Napa and Western Vallejo, California, September–October 2014

Characteristic	Napa (201 households)			Western Vallejo (175 households)		
	No.	%*	(95% CI)*	No.	%*	(95% CI)*
Feelings of distress†						
Feeling anxiety, fear, or distraction	149	75	(67–83)	89	50	(44–57)
Showing extreme panic	55	27	(20–34)	39	23	(15–30)
Any traumatic experience†§	56	27	(21–33)	17	9	(5–12)
Being separated from a family member and being unaware of their location or status during the event	25	12	(8–16)	6	3	(1–6)
Being trapped or delayed during evacuation	22	11	(6–15)	4	2	(0–4)
Seeing a serious injury of a nonfamily member	12	6	(3–9)	2	1	(0–3)
Seeing or hearing a direct threat to the life of yourself or a family member	7	4	(1–6)	2	1	(0–3)
Having a home uninhabitable because of disaster	6	3	(1–5)	2	1	(0–3)
Experiencing the death of a pet	4	2	(0–4)	2	1	(0–3)
Suffering substantial disaster-related illness or physical injury to self or family member	3	2	(0–3)	1	0	(0–1)
Having a child separated from all caretakers	2	1	(0–3)	3	2	(0–3)
Any distress or traumatic experience	155	78	(71–86)	98	55	(48–63)
Sought mental health help¶	59	41	(31–51)	26	28	(18–38)
Care from a medical or mental health professional¶	42	30	(20–41)	20	20	(11–29)
Counseling from a religious leader or friend**	32	24	(14–34)	11	13	(5–21)
Preexisting mental health condition	35	17	(11–23)	29	18	(12–24)
Worsened**	17	49	(29–69)	8	28	(9–27)
Additional medical care sought**	11	32	(12–52)	2	6	(0–15)

Abbreviation: CI = confidence interval.
* Percentages and confidence intervals calculated from weighted frequency data.
† Participants were asked, "During or since the earthquake, did you or anyone in your household experience any of the following?"
§ List of experiences derived from the Psychological Simple Triage and Rapid Treatment System.
¶ Percentages calculated as proportion of "Any distress or traumatic experience."
** Percentages calculated as proportions of "Preexisting mental health condition."

A majority of households (75% in Napa and 50% in western Vallejo) reported that one or more household members had experienced anxiety, fear, or distraction during or since the earthquake (Table 2). At least one member of 27% of Napa households and 9% of western Vallejo households reported a traumatic exposure, most commonly separation from a family member without knowing that person's status or location (12% in Napa and 3% in western Vallejo) and being trapped or delayed during evacuation (11% in Napa and 2% in western Vallejo).

Among the households with members who reported distress or a traumatic exposure, 30% in Napa and 20% in western Vallejo had members who sought mental health assistance from a medical or mental health professional, whereas support from a friend or religious leader was sought by 24% of respondents in Napa households and 13% of respondents in western Vallejo households. A preexisting mental health condition was reported for family members in 17%–18% of households, and among these, approximately half (49%) of the Napa households reported that the condition worsened, with 32% seeking additional medical care, whereas western Vallejo households reported fewer worsening conditions (28%) and seeking of medical care (6%).

Discussion

Interviews with members of households affected by the South Napa earthquake indicated that in addition to extensive property damage, many members of the community experienced injuries or mental health stressors, or both, and these findings suggest immediate public health and future preparedness priorities for affected communities. Injuries occurred among members of fewer than 25% of Napa and western Vallejo households and were less common than those

seen in larger-scale earthquakes (*7*), but were notable in their occurrence during cleanup.

The substantial prevalence of psychological distress observed is consistent with the frequency of distress observed in many disasters (*6*). However, although psychological distress following disasters is common, psychiatric disorders only emerge among a segment of a disaster-affected population (*6*). Studies have reported that a limited proportion of the general population (5%–10%) in the vicinity of a disaster might develop PTSD, compared with a larger proportion (30%–40%) of direct disaster survivors (*8*). Traumatic exposures during or after the earthquake were common in Napa, but were reported less frequently in western Vallejo, where there was less damage and fewer injuries. The only previous study to use a similar population-level rapid assessment to assess traumatic exposures following a natural disaster found that traumatic exposures were more frequently reported (by >50% of households) for the 2009 American Samoan earthquake and tsunami than the South Napa earthquake, reflecting the larger scale of the 2009 disaster (*5*).

The finding that many injuries occurred during postearthquake cleanup activities can help to guide preparedness messaging emphasizing specific safety measures during disaster aftermath and cleanup, including ensuring the availability of heavy gloves and sturdy shoes with emergency supplies (*9*). Since the earthquake, Napa County has conducted public outreach communicating the importance of having emergency supplies available and seeking medical evaluation for injuries. Solano County is planning similar outreach. To address psychological trauma associated with the disaster, CDPH recommended that Napa and Solano counties offer a continuum of disaster mental health services during the months following the earthquake. Napa County Mental Health used the information to guide its immediate-term mental health resource allocations and to conduct public training sessions and education campaigns to support those with mental health risks. To promote community resilience and future earthquake preparedness, Napa County Public Health conducted community social events on the earthquake anniversary date and psychological first aid training for outreach workers. Solano County Public Health is currently strengthening partnerships for optimizing mental health service programming in disaster settings.

Conducting rapid community assessments is consistent with guidance from the Substance Abuse and Mental Health Services Agency about mental health disaster management, which recommends ongoing needs assessments for local response planning and for determining need for mutual aid and requests under the Stafford Act Disaster Crisis Counseling Assistance and Training Program (*10*). Assessing traumatic exposures soon after a disaster is particularly important, because early recognition and treatment of PTSD, which can only be diagnosed ≥4 weeks after the disaster (*6*), and other mental health comorbidities can result in improved clinical outcomes.

The findings in this report are subject to at least three limitations. First, surveys were conducted primarily during daytime hours, and occupants who were not at home were missed, including those displaced because of damage, which could have resulted in an underestimate of outcomes; a Saturday survey in Vallejo attempted to address this limitation. Second, willingness to participate might have been related to the type of injuries and traumatic exposures experienced. Some households cited no harm to their family or property as a reason for nonparticipation (leading to a potential overestimate of outcomes), whereas traumatized persons might have been either more or less likely to participate. Finally, because the western Vallejo CASPER was conducted 3 weeks after the Napa CASPER, comparisons of results between the cities might be limited by differential recall; recovery time might have factored into

Summary

What is already known on this topic?

Natural disasters can result in substantial physical injuries and have been associated with posttraumatic stress disorder (PTSD). However, most postdisaster community health surveys do not enumerate traumatic exposures (e.g., observing a direct threat to a family member's life) that are associated with PTSD and other longer-term psychological sequelae.

What is added by this report?

After the 2014 South Napa Earthquake, approximately half the households in the city of Napa and in western Vallejo that reported an injury stated that the injury occurred during cleanup activities. After the earthquake, one or more types of traumatic exposure were reported among 27% and 4% of Napa and western Vallejo households, respectively; 20%–30% of these persons sought care from a medical or mental health professional.

What are the implications for public health practice?

Preparedness messages should emphasize specific safety measures during disaster aftermath and cleanup, including having heavy gloves and sturdy shoes available with emergency supplies. Including risk factor measurement for longer-term mental health outcomes in community health assessments can facilitate implementation of mental health services for immediate- and long-term needs. The rapid assessment in Napa County resulted in reallocation of mental health resources, public training sessions, and education campaigns to support persons with mental health risk, and plans for psychological first aid training for outreach workers and other community resiliency activities.

residents' perceptions of injury, traumatic exposure severity, and opportunity to seek care.

Rapid assessments after disasters are critical tools for evaluating immediate and longer-term resource needs and informing preparedness activities to prevent or treat injuries and adverse mental health events. Cataloging traumatic exposures associated with PTSD development could provide useful guidance for allocation of limited resources to those at greater risk for negative mental health effects.

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References

1. US Geological Survey. Update on the magnitude 6 South Napa earthquake of August 24, 2014. Reston, VA: US Department of the Interior, US Geological Survey; 2014. Available at http://www.usgs.gov/newsroom/article.asp?ID=3980&from=rss_home#.VUFt0_AmSuk.
2. The Safe States Alliance. Disaster Epidemiology Special Interest Group webinar. Results of the Community Assessment for Public Health Emergency Response (CASPER) to the 2014 South Napa (California) earthquake. Atlanta, GA: The Safe States Alliance; 2015. Available at http://www.safestates.org/?WebinarCASPER.
3. CDC. Community Assessment for Public Health Emergency Response (CASPER) toolkit. Second edition. Atlanta, GA: US Department of Health and Human Services, CDC; 2012. Available at http://emergency.cdc.gov/disasters/surveillance/pdf/casper_toolkit_version_2_0_508_compliant.pdf.
4. Schreiber MD, Yin R, Omaish M, Broderick JE. Snapshot from Superstorm Sandy: American Red Cross mental health risk surveillance in lower New York State. Ann Emerg Med 2014;64:59–65.
5. King ME, Schreiber MD, Formanski SE, Fleming S, Bayleyegn TM, Lemusu SS. A brief report of surveillance of traumatic experiences and exposures after the earthquake-tsunami in American Samoa, 2009. Disaster Med Public Health Prep 2013;7:327–31.
6. North CS, Pfefferbaum B. Mental health response to community disasters: a systematic review. JAMA 2013;310:507–18.
7. Kalantar Motamedi MH, Sagafinia M, Ebrahimi A, Shams E, Kalantar Motamedi M. Major earthquakes of the past decade (2000–2010): a comparative review of various aspects of management. Trauma Mon 2012;17:219–29.
8. Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: a systematic review. Psychol Med 2008;38:467–80.
9. CDC. Fact sheet: prevent injury after a disaster. Atlanta, GA: US Department of Health and Human Services, CDC; 2014. Available at http://emergency.cdc.gov/disasters/injury/facts.asp.
10. Substance Abuse and Mental Health Services Administration. Mental health all-hazards disaster planning guidance. DHHS Pub. No. SMA 3829. Rockville, MD: US Department of Health and Human Services, Substance Abuse and Mental Health Services Administration, Center for Mental Health Services; 2003.

Elimination of Ebola Virus Transmission in Liberia — September 3, 2015

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On September 3, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

Following 42 days since the last Ebola virus disease (Ebola) patient was discharged from a Liberian Ebola treatment unit (ETU), September 3, 2015, marks the second time in a 4-month period that the World Health Organization (WHO) has declared Liberia free of Ebola virus transmission (*1*). The first confirmed Ebola cases in West Africa were identified in southeastern Guinea on March 23, 2014, and within 1 week, cases were identified and confirmed in Liberia (*1*). Since then, Liberia has reported 5,036 confirmed and probable Ebola cases and 4,808 Ebola-related deaths. The epidemic in Liberia peaked in late summer and early fall of 2014, when more than 200 confirmed and probable cases were reported each week (Figure).

With partner support, the Liberia Ministry of Health (MoH) directed interventions that led to a progressive decline in cases (*2*–*6*). Beginning on December 29, 2014, a cluster of 21 cases (with 745 associated contacts) was identified in the St. Paul River Bridge community of Monrovia, and the last case associated with this cluster was in a patient admitted to an ETU on February 18, 2015. This chain of transmission was controlled through community engagement, early identification and triage of cases, and effective contact monitoring (*3*). Approximately 4 weeks later, on March 20, a single patient with Ebola was reported; this patient who possibly acquired the virus through sexual contact (*7*). This patient died and was buried on March 28. Forty two days later, on May 9, WHO declared Liberia free of Ebola virus transmission (*1*).

After this declaration, Liberia maintained WHO-recommended heightened surveillance for Ebola (*8*) by implementing community-based surveillance initiatives developed during the course of the outbreak and recommending postmortem Ebola testing for all reported deaths. In addition to emphasizing surveillance, other Ebola prevention activities included continuing to recommend safe burial of all dead bodies, establishment of a semen testing program for male Ebola survivors, and continued training and supervision of health care workers on Ebola infection prevention and control measures.

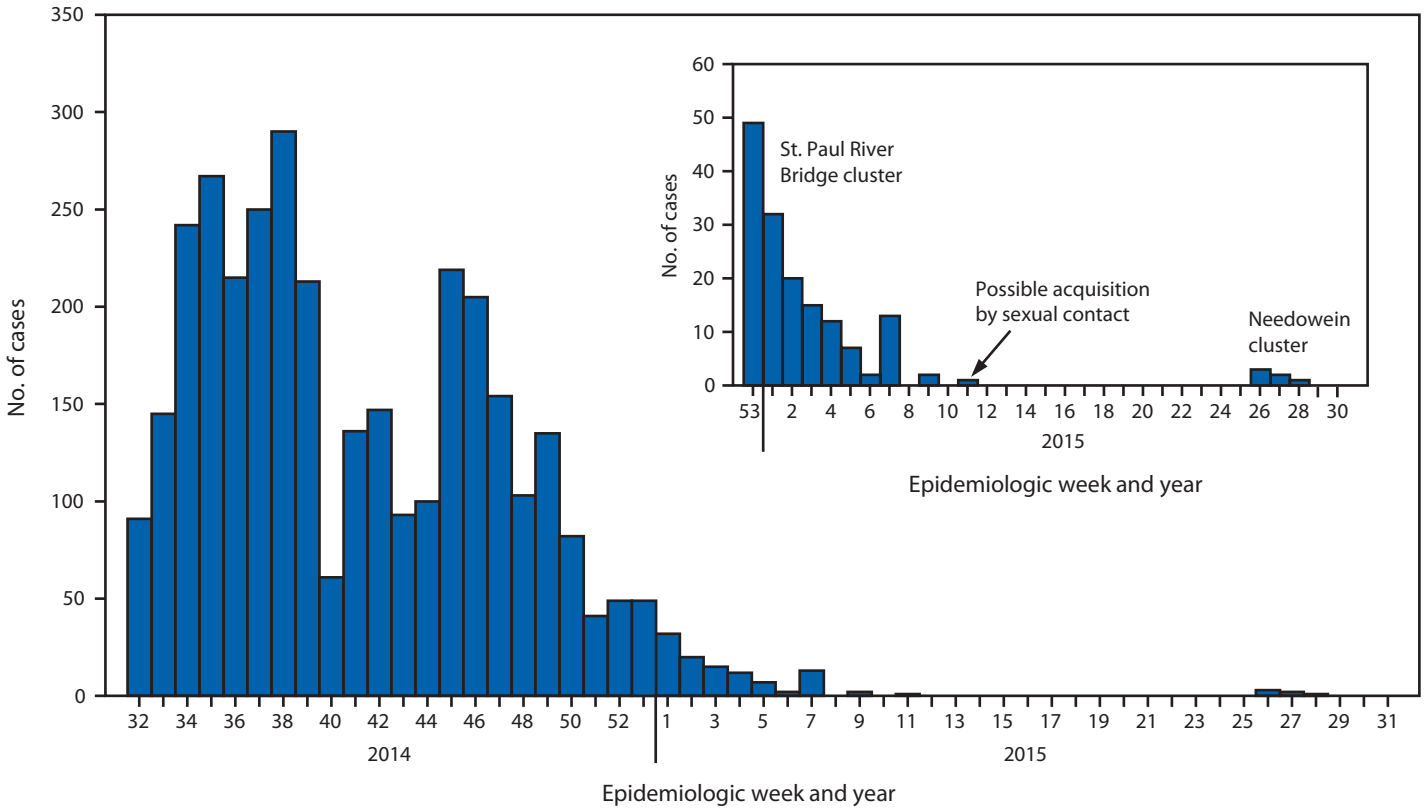
On June 29, approximately 50 days after WHO declared Liberia free of Ebola virus transmission, an Ebola case was identified through a postmortem swab collected from a patient from Needowein, Margibi County, 1 day after death. Through active case finding and contact tracing, an additional five confirmed cases (including an additional death), two probable cases, and 143 contacts were identified in Margibi and Montserrado counties. The last Ebola survivor was discharged from the ETU on July 23. Contacts were followed for 21 days, with the last contact completing monitoring on August 2. Investigations into the source of this cluster of cases are ongoing.

Several strategies were important for the rapid containment of this last cluster. First, command, control, and partner coordination were maintained through the existing MoH Incident Management System (*4*), which operated out of the National Emergency Operations Center in Monrovia (newly opened as of June 19, 2015), and a temporary field-based emergency operations center near Needowein. Rapid response plans that had been developed to address possible reintroduction of Ebola into Liberia were quickly executed. Field teams applied experience in contact tracing and active case finding accrued over the course of the previous year, such as during the Saint Paul Bridge cluster investigation (*3*). Health care worker surveillance and infection prevention and control strategies were implemented to prevent nosocomial transmission (*6*). Increased Ebola laboratory testing capacity, also developed over the course of the previous year, allowed for rapid testing and confirmation of cases. Throughout these efforts, ongoing community engagement was critical in building trust and cooperation within the affected community.

The rapid identification and control of this most recent Ebola cluster highlight the important achievements MoH has made in enhancing its public health response capacity. In addition, the occurrence of this cluster underscores the need for continued vigilance, postmortem testing, and adherence to WHO recommendations for heightened post-outbreak surveillance. Other public health activities are underway to strengthen surveillance, not just for Ebola but also for other diseases identified by MoH for inclusion in their revised integrated disease surveillance and response (IDSR) framework (*9*). Trainings are underway for county-level implementation of Liberia's revised IDSR framework. Work continues to improve public health laboratory capacity. In addition, a Field Epidemiology Training Program has been started in Liberia to increase public health workforce capacity at the national and local levels (*10*).

During the 2014–2015 Ebola outbreak, general health systems and public health capacity in Liberia were adversely

FIGURE. Number of confirmed and probable cases of Ebola virus disease, by week — Liberia, August 3, 2014–August 2, 2015



impacted. As Liberia transitions again from an emergency public health response to a phase of continued vigilance, many of the practices that have been put into place will, in addition to ensuring continued heightened surveillance for Ebola, facilitate the overall rebuilding of the country's public health infrastructure.

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References

1. World Health Organization. The Ebola outbreak in Liberia is over. Available at http://www.who.int/mediacentre/news/statements/2015/liberia-ends-ebola/en.
2. Reaves EJ, Mabande LG, Thoroughman DA, Arwady MA, Montgomery JM. Control of Ebola virus disease—Firestone District, Liberia, 2014. MMWR Morb Mortal Wkly Rep 2014;63:959–65.
3. Nyenswah T, Fallah M, Sieh S, et al. Controlling the last known cluster of Ebola virus disease–Liberia, January–February 2015. MMWR Morb Mortal Wkly Rep 2015;64:500–4.
4. Pillai SK, Nyenswah T, Rouse E, et al. Developing an incident management system to support Ebola response—Liberia, July–August 2014. MMWR Morb Mortal Wkly Rep 2014;63:930–3.
5. Kateh F, Nagbe T, Kieta A, et al. Rapid response to Ebola outbreaks in remote areas—Liberia, July–November 2014. MMWR Morb Mortal Wkly Rep 2015;64:188–92.
6. Nyenswah T, Massaquoi M, Gbanya MZ, et al. Initiation of a ring approach to infection prevention and control at non-Ebola health care facilities—Liberia, January–February 2015. MMWR Morb Mortal Wkly Rep 2015;64:505–8.
7. Christie A, Davies-Wayne GJ, Cordier-Lasalle T, et al. Possible sexual transmission of Ebola virus—Liberia, 2015. MMWR Morb Mortal Wkly Rep 2015;64:479–81.
8. World Health Organization. Criteria for declaring the end of the Ebola outbreak in Guinea, Liberia or Sierra Leone. Available at http://www.who.int/csr/disease/ebola/declaration-ebola-end/en.
9. World Health Organization, Regional Office for Africa. Integrated disease surveillance and response. Available at http://www.afro.who.int/en/clusters-a-programmes/dpc/integrated-disease-surveillance/integrated-disease-surveillance-and-response.html.
10. Nguku P, Mosha F, Prentice E, Galgalo T, Olayinka A, Nsubuga P. Field Epidemiology and Laboratory Training Programs have been in Africa for 10 years, what is their effect on laboratory-based surveillance? Reflections from a panel at the African Society of Laboratory Medicine December 2014 Cape Town meeting. Pan Afr Med J 2015;20:451.

Ebola Virus Disease — Sierra Leone and Guinea, August 2015

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On September 3, this report was posted as an MMWR *Early Release on the* MMWR *website (http://www.cdc.gov/mmwr).*

The Ebola virus disease (Ebola) outbreak in West Africa began in late 2013 in Guinea (*1*) and spread unchecked during early 2014. By mid-2014, it had become the first Ebola epidemic ever documented. Transmission was occurring in multiple districts of Guinea, Liberia, and Sierra Leone, and for the first time, in capital cities (*2*). On August 8, 2014, the World Health Organization (WHO) declared the outbreak to be a Public Health Emergency of International Concern (*3*). Ministries of Health, with assistance from multinational collaborators, have reduced Ebola transmission, and the number of cases is now declining. While Liberia has not reported a case since July 12, 2015, transmission has continued in Guinea and Sierra Leone, although the numbers of cases reported are at the lowest point in a year. In August 2015, Guinea and Sierra Leone reported 10 and four confirmed cases, respectively, compared with a peak of 526 (Guinea) and 1,997 (Sierra Leone) in November 2014. This report details the current situation in Guinea and Sierra Leone, outlines strategies to interrupt transmission, and highlights the need to maintain public health response capacity and vigilance for new cases at this critical time to end the outbreak.

Data on reported Ebola cases from January 2014 through August 30, 2015 were obtained from daily situation reports from each country, supplemented by information from Guinea's viral hemorrhagic fever database. Individual case reports were obtained from in-country field investigators. In Sierra Leone, 13,609 cases (8,698 [63.9%] confirmed) with 3,953 (29.0%) deaths were reported (Figure 1). All 14 districts reported at least one confirmed case. During August 2015, Sierra Leone had a 22-day interval without a reported case, but on August 29, a new confirmed case in an adult female was reported as a community death in Kambia District. The source of this case is under investigation. During November 2014, an average of 15,361 identified contacts needed to be visited daily; during August 1–30, 2015, the average number of contacts followed was 334. In Guinea, 3,792 cases (3,337 [88.0%] confirmed) and 2,529 (66.7%) deaths were reported (Figure 1); 26 (79%) of 33 prefectures reported at least one confirmed case, but as of August 30, active cases were reported only in Forécariah and Dubreka prefectures and in the capital city Conakry (Figure 2). At the peak of the outbreak (November 2014), an average of 3,394 identified contacts needed to be visited daily; during August 1–30, 2015, the average number of contacts being followed was 728.

Despite progress in controlling the outbreak, a number of factors have led to ongoing transmission. Cases should be recognized and isolated quickly, and should arise from among known Ebola contacts. During the peak of the outbreak in Guinea, patients were isolated an average of 5.0 days after symptom onset. During August 2015, some patients with confirmed Ebola died in the community as unknown contacts (two patients), were known contacts lost to follow-up (one patient), or were isolated in an Ebola treatment unit (seven patients) an average of 3.3 days following symptom onset, suggesting that identification and monitoring of all contacts remains challenging.

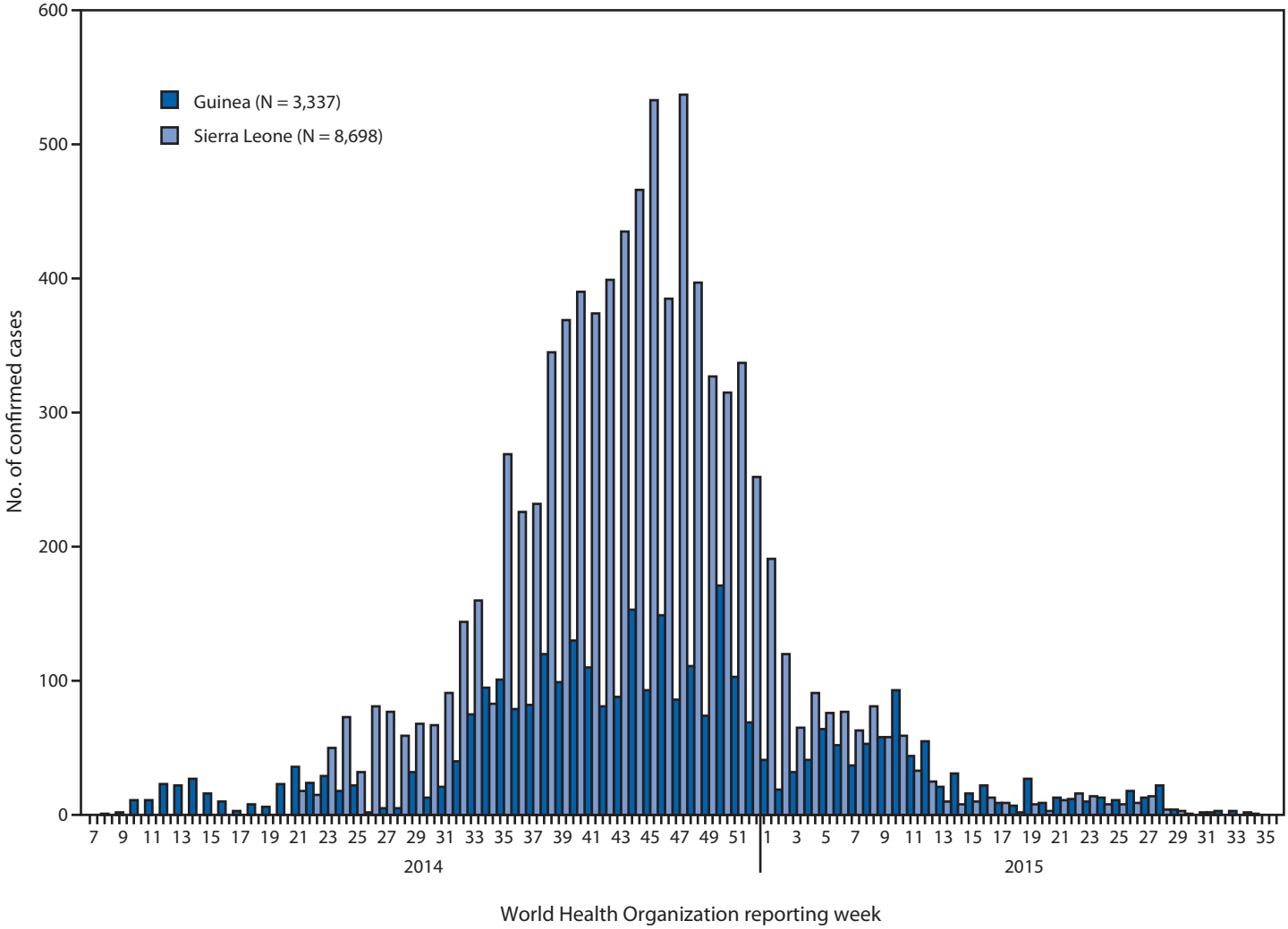
Recent Case Reports, 2015

In August 2015, inability to find a known contact led to ongoing transmission in Guinea. A medical student who did not report his Ebola exposure and did not adhere to contact follow-up procedures was admitted to a hospital in Conakry, where he shared a room with another patient. Before receiving a diagnosis of Ebola, the medical student was assisted by one of his roommate's visitors. When Ebola was diagnosed in the medical student, the roommate's visitor and his family could not initially be found, despite intensive efforts at contact tracing. The roommate's visitor subsequently developed Ebola, visited multiple doctors and hospitals via 12 taxis, and transmitted Ebola to his mother, a cousin, another person, and a taxi driver.

Deliberate evasion of disease control interventions can hamper monitoring of contacts and identification of cases. In late July, on day 4 of contact monitoring, a female contact of an Ebola patient in Conakry stopped adhering to provisions of the 21-day period of close community monitoring. The contact left the community and traveled widely through several areas of the adjacent Forécariah prefecture by multiple motorcycle taxis. She visited a traditional healer and might have crossed into Sierra Leone before Ebola was diagnosed and she was isolated in an Ebola treatment unit on day 16. Contact identification for this patient was particularly challenging, because she provided inconsistent information.

Obscure transmission chains might reveal weaknesses in surveillance or hidden reservoirs of disease. In August 2015,

FIGURE 1. Reported number of confirmed Ebola virus disease cases, by World Health Organization reporting week — Guinea and Sierra Leone, February 2014–August 2015



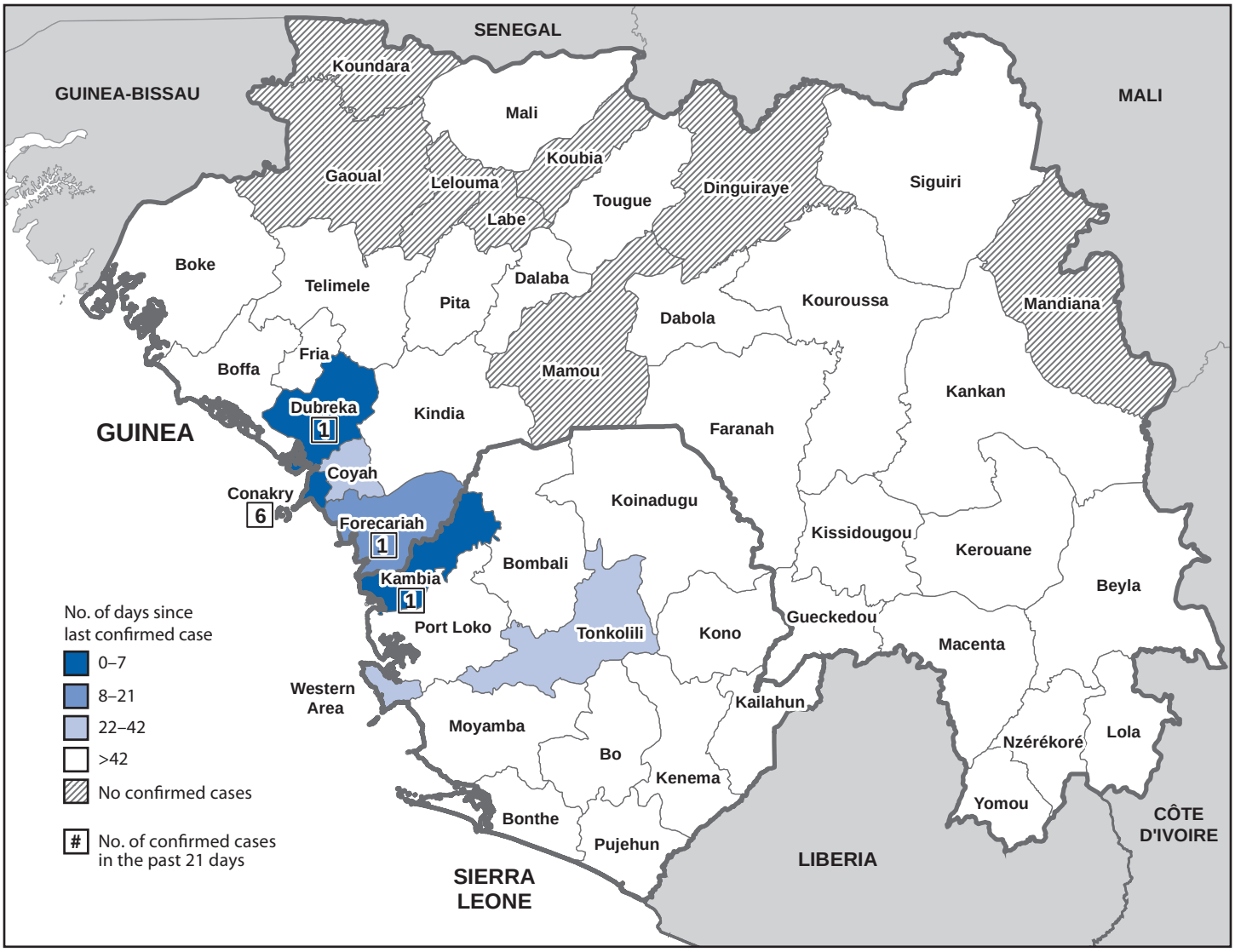
an Ebola case was diagnosed through routine postmortem swab surveillance in Forécariah prefecture. Although health officials initially thought this case resulted from contact with a recently deceased relative who was buried secretly, molecular sequencing demonstrated a likely chain of transmission from a different community.

Delayed consideration of Ebola as a cause of illness or death and delayed isolation of persons with illness that meets the suspected Ebola case definition can lead to transmission and sometimes reintroduction of the virus into areas where transmission was previously interrupted. In late July, a man traveled from Freetown to Tonkolili District in Sierra Leone for a religious event. He sought care at two facilities, where he potentially exposed many health care workers and ultimately died. Ebola was confirmed by postmortem swab, ending the district's 150-day period without an Ebola case.

Discussion

Active case ascertainment, investigation, and daily interaction with all known contacts, combined with community engagement, safe burials, robust laboratory support (including genetic sequencing), and social mobilization are all tools for controlling Ebola in West Africa. In Guinea, social anthropologists have been engaged to create locally appropriate interventions, enhance adherence, and overcome barriers to effective disease control. Ebola transmission in Guinea and Sierra Leone has slowed, and the number of patients has fallen to record low levels, suggesting that containment is achievable. If all contacts of an Ebola patient are identified and monitored, then the population at risk can be defined, and new cases can be rapidly diagnosed and isolated; the number of contacts to be monitored is reduced by rapid isolation of the patient,

FIGURE 2. Number of days since last confirmed case of Ebola virus disease and number of confirmed cases in the past 21 days — Guinea and Sierra Leone, August 7–30, 2015



before transmission occurs. Thus, the proportion of new cases that arises among monitored contacts is a key indication of program effectiveness.

Ensuring that contacts of patients with Ebola are monitored for a full 21 days after their last exposure is among the most important aspects of effective Ebola control. Over time, in both Guinea and Sierra Leone, emphasis has shifted from efforts to enforce cooperation toward efforts to support identified contacts to ensure that they are able and willing to cooperate with monitoring. In April, Sierra Leone implemented voluntary quarantine for contacts in a housing facility with nutritional and social support, in lieu of home quarantine. In June, Guinea began to implement a strategy termed "cerclage," triggered by 1) an Ebola case, 2) a death with a positive postmortem swab, or 3) identification of two or more probable cases in populations of ≤300 persons. Cerclage incorporates movement restrictions based upon risk classifications of individual community members; ensures provision of health care services, food, and other commodities; and is supported by awareness and educational campaigns. Local police assist with coordination, and although monitored contacts are asked not to leave the general area, they are permitted to move within the area, for example, to tend crops. Symptomatic patients with suspected Ebola are sent to the nearest Ebola treatment unit for isolation and testing as needed.

In June, 2015, Sierra Leone began two parallel 21-day campaigns to apply maximum resources to Port Loko and Kambia, and to Western Urban and Rural districts to identify, contain, and stop the spread of Ebola. Components included enhanced community engagement activities, checkpoints with

What is already known on this topic?

The 2014–2015 Ebola virus disease (Ebola) epidemic has been the largest on record, with 17,401 cases and 6,482 deaths reported in Sierra Leone and Guinea alone, from January 2014 through August 30, 2015. A multinational group including Ministries of Health, CDC, the World Health Organization, and other partners has been working to reduce transmission and eradicate the outbreak in the three heavily affected West African countries.

What is added by this report?

Active transmission continues in Guinea and Sierra Leone, although reported cases are at their lowest point in a year. This report provides case reports illustrating the challenges in identifying remaining cases and preventing ongoing transmission, and describes current strategies and resources needed for disease eradication and vigilance for new cases.

What are the implications for public health practice?

Challenges remain to ending transmission of Ebola in West Africa. Ongoing vigilance will be required in affected countries to assure contact monitoring and prevent reintroduction from importation or disease reservoirs. When the outbreak ends, heightened surveillance and rapid response capacity will continue to be required.

hand washing and temperature screening, improved referral practices at high-risk health care facilities, and delivery of health care services and support packages to quarantined households.

Because the symptoms of Ebola are similar to those of diseases more common in West Africa such as malaria and typhoid fever, it is essential that health care providers have a high index of suspicion for Ebola and identify cases rapidly in health care settings. This is simplified when new cases arise from among contacts. But because patients with Ebola might not seek health care or might not receive a diagnosis, complete case ascertainment also requires monitoring of deaths. Safe burials are mandated for deaths in Guinea and Sierra Leone; however, this requirement is difficult to enforce, and traditional practice frequently leads to secret burials or unsafe manipulation of the body before safe-burial teams arrive (*4*). In Guinea, a plan to pilot newly available rapid diagnostic tests for decedents could permit routine burial practices for those testing negative, thus reducing reluctance to report community deaths.

On April 1, 2015, WHO and partners began an Ebola ring vaccination trial in Guinea to evaluate the efficacy of a recombinant, replication-competent vesicular stomatitis virus-based vaccine expressing a surface glycoprotein of Ebola virus (rVSV-ZEBOV) (*5*). Preliminary results suggest that the vaccine is safe and efficacious (*6*). The trial is expanding into Sierra Leone.

Epidemiologic milestones are recognized at 21 days (the maximum Ebola incubation period) and 42 days (twice the maximum incubation period) without known transmission within a given geographic area. However, achieving these milestones does not assure the end of the Ebola outbreak; WHO recommends an additional 90 days of heightened surveillance, given the risk for missed transmission chains, new introductions, possible sexual or reproductive transmission, or possible new emergence from an animal reservoir (*7*). CDC and its partners are investigating how long viable Ebola virus persists in semen. Ebola virus has been isolated from semen at 82 days and viral RNA detected at 101 days after symptom onset (*8*); sexual transmission is a possible source of infection in the weeks and months after recovery (*9*).

Current control strategies in Sierra Leone and Guinea have markedly reduced transmission, but ongoing enhanced surveillance and rapid response capability are needed, both to recognize ongoing transmission or reintroduction from persistent reservoirs and to respond to resurgent disease in the future.

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References

1. Baize S, Pannetier D, Oestereich L, et al. Emergence of Zaire Ebola virus disease in Guinea. N Engl J Med 2014;371:1418–25.
2. Dixon MG, Schafer IJ. Ebola viral disease outbreak—West Africa, 2014. MMWR Morb Mortal Wkly Rep 2014;63:548–51.
3. Kennedy M. The Guardian. WHO declares Ebola outbreak an international public health emergency. August 8, 2014. Available at http://www.theguardian.com/society/2014/aug/08/who-ebola-outbreak-international-public-health-emergency.
4. Dhillon RS, Kelly JD. Community trust and the Ebola endgame. N Engl J Med 2015;373:787–9.
5. Ebola ça Suffit Ring Vaccination Trial Consortium. The ring vaccination trial: a novel cluster randomised controlled trial design to evaluate vaccine efficacy and effectiveness during outbreaks, with special reference to Ebola. BMJ 2015;351:h3740.
6. Henao-Restrepo AM, Longini IM, Egger M, et al. Efficacy and effectiveness of an rVSV-vectored vaccine expressing Ebola surface glycoprotein: interim results from the Guinea ring vaccination cluster-randomised trial. Lancet 2015;386:857–66.
7. World Health Organization. Emergencies preparedness, response. Criteria for declaring the end of the Ebola outbreak in Guinea, Liberia or Sierra Leone. Available at http://www.who.int/csr/disease/ebola/declaration-ebola-end/en/.
8. Rodriguez LL, De Roo A, Guimard Y, et al. Persistence and genetic stability of Ebola virus during the outbreak in Kikwit, Democratic Republic of the Congo, 1995. J Infect Dis 1999;179(Suppl 1):S170–6.
9. Christie A, Davies-Wayne GJ, Cordier-Lasalle T, et al. Possible sexual transmission of Ebola virus—Liberia, 2015. MMWR Morb Mortal Wkly Rep 2015;64:479–81.

Notes from the Field

Pneumonia Associated with an Influenza A H3 Outbreak at a Skilled Nursing Facility — Florida, 2014

John G. Jordan, MD[1,2]; Scott Pritchard, MPH[2]; Garik Nicholson, MPH[3]; Tiffany Winston, MPH[2]; Megan Gumke, MPH[2]; Heather Rubino, PhD[2]; Sharon Watkins, PhD[2]; Lea A. Heberlein-Larson, MPH[4]; Anna Likos, MD[2]

In December 2014, the Florida Department of Health, Bureau of Epidemiology, was notified that 18 of 95 (19%) residents at a skilled nursing facility had radiographic evidence of pneumonia and were being treated with antibiotics. Two residents were hospitalized, one of whom died. A second resident died at the facility. The Florida Department of Health conducted an outbreak investigation to ascertain all cases through active case finding, identify the etiology, provide infection control guidance, and recommend treatment or prophylaxis, if indicated.

An outbreak-associated case was defined as the onset of fever or respiratory illness in a nursing facility resident or staff member from November 29–December 29, 2014. Overall, 50 persons, including 44 (46%) residents and six (8%) of 75 staff members met the case definition. The earliest reported onset date was November 29; 68% of cases occurred during December 12–18 (Figure). Antibiotics were prescribed to 36 (72%) patients. Nine (20%) ill residents were hospitalized. Two additional resident deaths occurred on December 21 and December 22, for a total of four, increasing the fatality rate to 9% among residents meeting the case definition (n = 44).

The mean age of affected residents was 81 years (range = 31–98 years); 57% were female. The most frequently reported signs and symptoms among all patients included congestion (72%), cough (60%), and fever (38%). The ill residents' rooms were distributed throughout the facility, with no apparent clustering.

Oropharyngeal swab samples were collected from 13 (30%) ill residents for respiratory viral testing by polymerase chain reaction at the Florida Department of Health Bureau of Public Health Laboratories. Ten specimens tested positive for influenza A H3, and three tested positive for respiratory syncytial virus. Among three specimens selected by the laboratory for atypical bacterial pathogens testing (*Chlamydia pneumoniae*, *Legionella pneumophila*, and *Mycoplasma pneumoniae*), all were negative. Urine antigen tests for *L. pneumophila* conducted at a commercial laboratory for 18 residents were all negative. Resident characteristics were analyzed for their association with illness including age, sex, race, room location, tobacco use, pneumococcal vaccination status, underlying chronic diseases, and obesity; no statistically significant association was found.

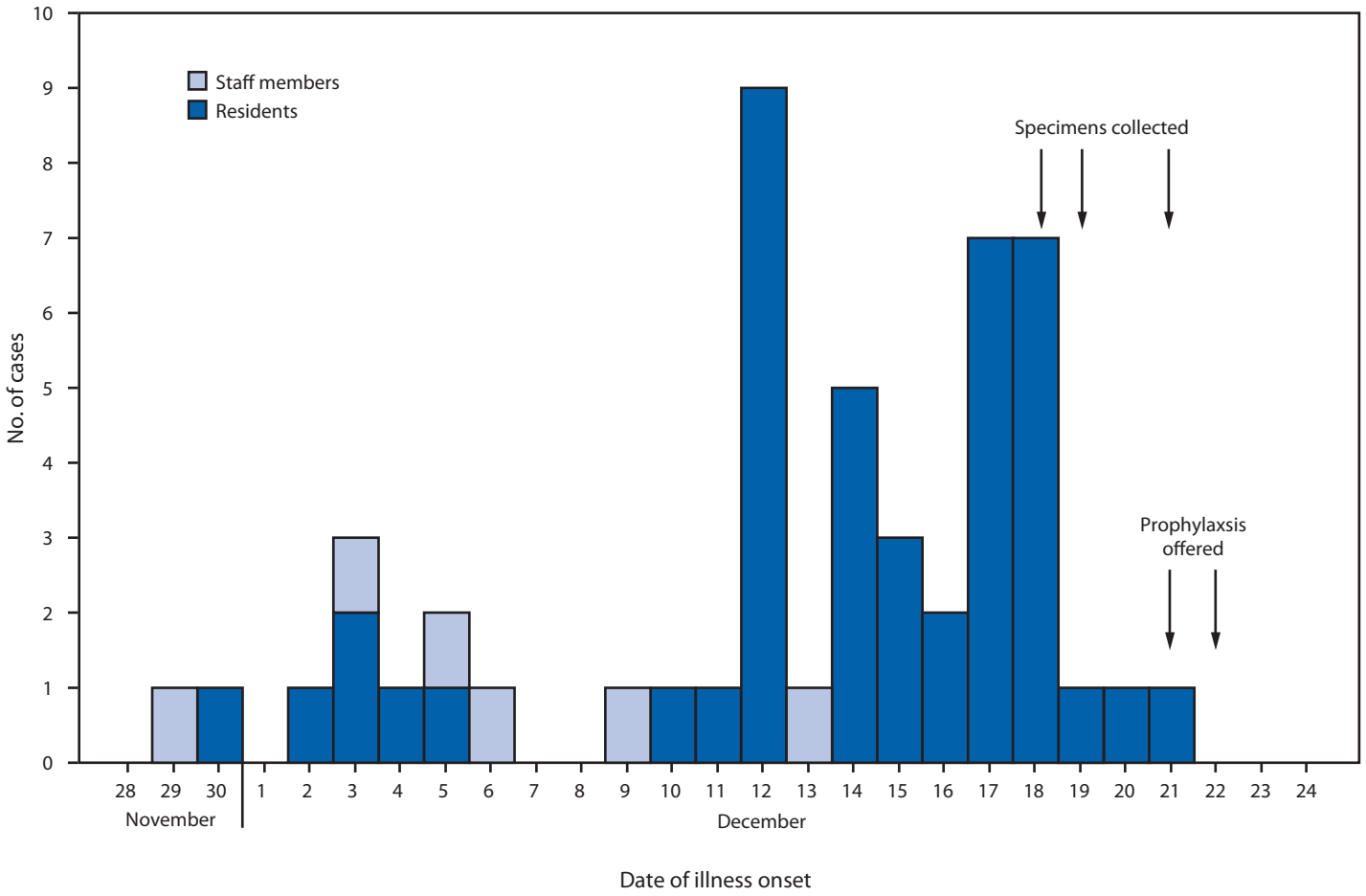
All asymptomatic residents and staff were considered to have been exposed, and courses of prophylactic oseltamivir were offered to exposed persons on December 21 and December 22. The facility cancelled group activities, initiated droplet precautions, and stopped accepting admissions. Additional measures included implementation of respiratory precautions for visitors and exclusion of ill staff from work until 24 hours after symptom resolution. No cases were identified after December 21.

Influenza A H3N2 was the predominant influenza virus strain circulating in the United States during the 2014–15 influenza season, and the majority of H3N2 viruses tested have drifted from the H3N2 vaccine strain (*1*). Three of the 10 swabs that tested positive for influenza A H3 were forwarded to CDC for further analysis; two of these samples were the nondrifted strain (A/Texas/50/2012-LIKE (H3N2) GP). Among the 44 ill residents, 19 (43%) had documentation of receipt of influenza vaccination during the 2014–15 influenza season, including two patients who were hospitalized (one of whom died). Among 51 unaffected residents, 33 (65%) had documentation of receipt of influenza vaccination.

As of January 24, 2015, widespread influenza activity and 76 reported influenza-like illness outbreaks had occurred in Florida (*2*), including this severe outbreak that resulted in a 46% attack rate and four deaths. The 2014–15 influenza season was moderately severe overall, especially in older adults, and reduced vaccine effectiveness was widely reported (*3*). Neither influenza testing nor prescription of antiviral medications occurred during the initial cluster, which was followed by extensive secondary transmission. Preventing transmission of influenza viruses within long-term care facilities requires a multifaceted approach that includes yearly vaccination of all residents and health care workers (*4*); prompt testing when any resident has signs and symptoms* that could be due to influenza; standard and droplet precautions for residents with suspected or confirmed influenza; empirical antiviral treatment of all residents with confirmed or suspected influenza, regardless of vaccination status; and antiviral chemoprophylaxis for residents as soon as an outbreak is identified.

* Includes fever or feverishness with cough, chills, headache, myalgias, sore throat, or runny nose. Elderly patients might have atypical clinical signs and symptoms.

FIGURE. Number of cases of outbreak-associated fever or respiratory illness in nursing home residents and staff members, by date of illness onset — Florida, November–December, 2014



Acknowledgment

Florida Department of Health, Bureau of Public Health Laboratories.

[1]Epidemic Intelligence Service, CDC; [2]Florida Department of Health, Division of Disease Control and Health Protection; [3]Florida Department of Health in Pasco County; [4]Florida Department of Health, Bureau of Public Health Laboratories in Tampa.

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References

1. Appiah GD, Blanton L, D'Mello T, et al. Influenza activity—United States, 2014–15 season and composition of the 2015–16 influenza vaccine. MMWR Morb Mortal Wkly Rep 2015;64:583–90.
2. Florida Department of Health. Florida flu review, 2014–15 season, week 3: January 18–24, 2015. Tallahassee, FL: Florida Department of Health; 2015. Available at http://www.floridahealth.gov/diseases-and-conditions/influenza/_documents/2014-15/2015_w3_flu_review.pdf.
3. Flannery B, Clippard J, Zimmerman RK, et al. Early estimates of seasonal influenza vaccine effectiveness—United States, January 2015. MMWR Morb Mortal Wkly Rep 2015;64:10–5.
4. Grohskopf LA, Shay DK, Shimabukuro TT, et al. Prevention and control of seasonal influenza with vaccines: recommendations of the Advisory Committee on Immunization Practices—United States, 2013–2014. MMWR Recomm Rep 2013;62(No. RR-07):1–43.

Announcement

National Cholesterol Education Month — September 2015

September 2015 is National Cholesterol Education Month. High blood cholesterol is a major risk factor for heart disease and stroke, the first and fifth leading causes of death in the United States. High cholesterol is asymptomatic; therefore, blood cholesterol screening is the only way to know one's risk.

The U.S. Preventive Services Task Force recommends regular cholesterol screening for men aged ≥35 years, women aged ≥45 years, and men aged 20–35 years and women aged 20–45 years who are at an increased risk for coronary heart disease (*1*). The American Academy of Pediatrics recommends that all children have their cholesterol levels measured at ages 9–11 years and again at ages 17–21 years (*2*).

Lowering high cholesterol or maintaining a healthy cholesterol level can reduce the risk for heart attack or stroke. Health behaviors such as engaging in physical activity, maintaining a healthy weight, following a heart-healthy diet, and using medication can all contribute to the maintenance of a healthy cholesterol level and decreased risk for heart attack or stroke. Educational materials and additional information are available at http://www.cdc.gov/cholesterol.

References

1. US Preventive Services Task Force. Final recommendation statement. Lipid disorders in adults (cholesterol, dyslipidemia): screening, June 2008. Available at http://www.uspreventiveservicestaskforce.org/Page/Document/RecommendationStatementFinal/lipid-disorders-in-adults-cholesterol-dyslipidemia-screening#consider.
2. American Academy of Pediatrics. Physicians recommend all children, ages 9–11, be screened for cholesterol. Available at https://www.aap.org/en-us/about-the-aap/aap-press-room/pages/Physicians-Recommend-all-Children,-Ages-9-11,-Be-Screened-for-Cholesterol.aspx.

Notice to Readers

The Effect of Falsified *Clostridium difficile* Infections Surveillance Data on Results Reported in *MMWR*

In 2012, *MMWR* published the report, "Vital Signs: Preventing *Clostridium difficile* Infections," which examined *Clostridium difficile* infection (CDI) surveillance data. This report contained several errors pertaining to Emerging Infections Program (EIP) data. These errors occurred as a result of scientific misconduct by a former employee of the Oregon Health Authority. The Public Health Service Office of Research Integrity has determined that the former employee falsified or fabricated data for 56 Oregon EIP CDI case report forms (https://ori.hhs.gov/content/case-summary-asherin-ryan).

The authors re-analyzed the EIP data to determine if the removal of all Oregon CDI cases (57 total cases) from the 10,342 cases included in the original publication altered the previously reported results. It did not. Re-analysis confirms the conclusions in the original report. Data in the original report from sources other than the Oregon Health Authority (i.e., from other EIP sites, the National Healthcare Safety Network, and Illinois, Massachusetts, and New York CDI prevention programs) were not involved in the research misconduct.

Errata for the 2012 report have been published in this issue of *MMWR*.

Errata

Vol. 61, No. 9

In the report, "Vital Signs: Preventing *Clostridium difficile* Infections," published in 2012, several errors occurred in the text and in a figure title and alternate text. A Notice to Readers about this report has been published in this issue of *MMWR*.

On page 157, the second sentence of the first paragraph of the "Methods" section should read, "CDC's Emerging Infections Program conducted active, population-based surveillance for CDIs from eight diverse geographic areas in 2010 (*5*); data from seven of these areas were included in the analysis."

On page 158, the first paragraph of the "Results" section should read, "The Emerging Infections Program population under surveillance in seven sites included persons in the catchment areas of **110** acute-care hospitals and **309** nursing homes. A total of **10,285** CDIs were identified; 44% of patients were aged <65 years. CDIs were classified by inpatient or outpatient status at time of stool collection and type/location of exposures (Figure 1). Overall, 94% of all CDIs were related to various precedent and concurrent health-care exposures; of these, 75% had their onset outside of hospitals. In addition, some cases occurred in patients who were exposed to multiple settings. For example, **21%** of hospital-onset CDIs occurred in recent (i.e., <12 weeks) residents of a nursing home, and **68%** of nursing home–onset CDI cases occurred in patients recently discharged from an acute-care hospital."

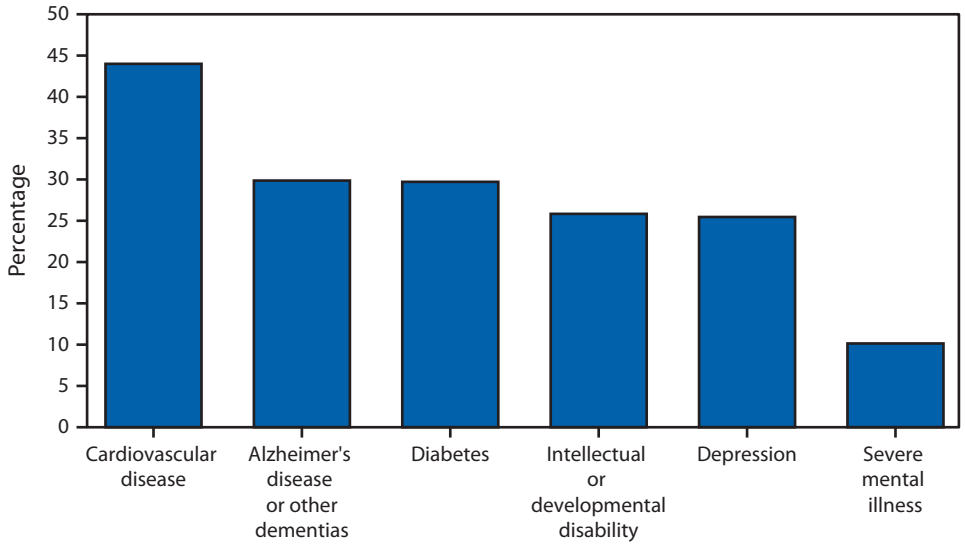
On page 159, the title for Figure 1 should read, "Percentage of *Clostridium difficile* infection (CDI) cases **(N = 10,285)**, by inpatient or outpatient status at time of stool collection and type/location of exposures* — United States, Emerging Infections Program, 2010."

The alternate text for Figure 1, which is posted online, should read, "The figure above shows the percentage of *Clostridium difficile* infection (CDI) cases **(N = 10,285)**, by inpatient or outpatient status at time of stool collection and type/location of exposures, in the United States during 2010, based on data from the Emerging Infections Program. Data from seven sites are shown. The population under surveillance included persons in the catchment areas of **110** acute-care hospitals and **309** nursing homes. A total of **10,285** CDIs were identified. CDIs were classified by inpatient or outpatient status at time of stool collection and type/location of exposures. Overall, 94% of all CDIs were related to various antecedent and concurrent health-care exposures; of these, 75% had their onset outside of hospitals. In addition, some cases occurred in patients who were exposed to multiple settings. For example, **21%** of hospital-onset CDIs occurred in recent (i.e., <12 weeks) residents of a nursing home, and **68%** of nursing home-onset CDI cases occurred in patients recently discharged from an acute-care hospital."

QuickStats

FROM THE NATIONAL CENTER FOR HEALTH STATISTICS

Percentage of Adult Day Services Center Participants,* by Selected Diagnoses† — National Study of Long-Term Care Providers, United States, 2014



* The denominator used to calculate these percentages is 282,200, which is the estimated number of enrolled adult day services center participants in the United States on any given day in 2014. Because diagnoses are not mutually exclusive, percentages add up to more than 100 percent.

† Participating administrators of adult day services centers were asked, "Of the participants enrolled at this center, about how many have been diagnosed with: a. Alzheimer's disease or other dementias, b. Intellectual or developmental disability, c. Severe mental illness, d. Depression, e. Cardiovascular disease (e.g., heart disease, stroke, high blood pressure), f. Diabetes?"

Of the six diagnoses tracked in 2014, cardiovascular disease (44%) was the most common diagnosis among adult day services center participants, and severe mental illness (10%) was the least common diagnosis. About 30% of adult day services center participants had a diagnosis of Alzheimer's disease or other dementias, 30% had diabetes, approximately 25% had intellectual or developmental disability, and 25% had depression.

Source: National Study of Long-Term Care Providers, 2014. Available at http://www.cdc.gov/nchs/nsltcp.htm.

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