certain lessons have been learned from this and other norovirus outbreaks. Early surveillance and identification of outbreaks of acute gastroenteritis with rapid detection of the causative agent are essential to implement timely, focused, and effective interventions. In particular, vigilance to hand-washing techniques; accessibility to soap and water within medical facilities, eating and food-preparation areas, lavatories, and showers; and containment and disinfection of soiled areas and bedding can all help decrease the spread of norovirus. These needs warrant special attention in planning and managing a disaster relief facility (*8,9*). When feasible, isolation of patients who are actively vomiting or continue to have diarrhea can be instituted, but care should be taken not to further distress traumatized evacuees.

Norovirus should be suspected when outbreaks of acute gastroenteritis occur in a crowded setting, on the basis of its epidemiologic features (i.e., rapid spread and secondary transmission) and clinical presentation (e.g., high prevalence of vomiting). Persons with norovirus gastroenteritis should be treated promptly with rehydration, and measures to prevent secondary transmission (e.g., promoting proper hand-washing techniques and cleaning and disinfecting soiled surfaces) should be taken immediately; however, these measures give no absolute assurance against further spread of norovirus (*5,10*). The outbreak described in this report was identified early and managed aggressively. However, rapid, sensitive laboratory assays are still needed to detect norovirus and to provide a better understanding of the most effective intervention strategies in crowded evacuee environments.

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Surveillance for Illness and Injury After Hurricane Katrina — New Orleans, Louisiana, September 8–25, 2005

Hurricane Katrina struck the Gulf Coast on August 29, 2005, resulting in extensive structural damage and severe flooding from breached levees in and around New Orleans, Louisiana. The public health infrastructure of the Louisiana Department of Health and Hospitals (LDHH) was damaged extensively, limiting surveillance for illnesses, injuries, and toxic exposures. On September 9, 2005, LDHH, CDC, and functioning emergency treatment resources (i.e., hospitals, disaster medical assistance teams, and military aid stations) established an active surveillance system to detect outbreaks of disease and characterize post-hurricane injuries and illnesses. As of September 25, the system had monitored 7,508 reports of health-related events* at participating facilities. Trends observed in the data prompted investigations of respiratory and rash illnesses, but no major outbreaks of disease or hazardous environmental exposures were detected.These data also were used to identify post-hurricane injury patterns and to guide prevention messages to residents and relief workers. A natural disaster of the magnitude of Hurricane Katrina requires a sustained response and a detailed plan for return to pre-hurricane surveillance activities.

The target population for the surveillance system was persons living or working in four parishes in and around New Orleans (Jefferson, Orleans, Plaquemines, and St. Bernard). On September 9, active surveillance was initiated in three hospitals and five nonhospital facilities that were providing acute care in these four parishes. Two additional hospitals and six additional nonhospital facilities in neighboring parishes that were treating workers and residents from the affected area also were enrolled in the surveillance system. As of September 25, four hospitals and 10 nonhospital facilities were participating in the surveillance system.

The facilities used a standardized reporting form that gathered individual level data on demographics, symptoms, clinical impressions (e.g., dehydration, acute respiratory infection [ARI], or diarrhea) and mechanism of injury (e.g., motor vehicle crash, laceration, fall, bite, or sting). In most facilities, health-care providers completed the form; in facilities with high volume, team members were assigned to assist with data abstraction from current medical records. Abstractors and clinicians were asked to identify all events as injury, illness, injury and illness, medication refill, or follow-up visit.

* Defined as a reported clinical impression for illness or mechanism of injury for injuries, toxic exposures, or carbon monoxide poisonings.

All data were gathered and entered into a computer database manually and analyzed daily. Illness and injury trends or individual cases of selected illness (e.g., bloody diarrhea or ARI) were communicated to city and state health authorities and investigated by health teams when appropriate.

Data were gathered prospectively starting September 9, 2005. Retrospective data have been collected when available, with a goal of complete enumeration from August 27, 2005, forward. Percentage estimates for each illness or injury were calculated by dividing the number of persons with a specific condition by all persons with an illness or injury, respectively. For 146 (1.9%) persons, both an illness and injury were recorded.

During September 8–25, 2005, a total of 7,508 events were recorded; 4,169 (55.6%) were illnesses, and 2,018 (26.9%) were injuries (Tables 1 and 2). Another 1,321 (17.5%) were nonacute health-related events, not classified as either illnesses or injuries (e.g., medication refills, wound checks, or cast removals). Of the 6,167 illnesses and injuries where disposition status was known, five persons died, and 552 (9%) were admitted to hospitals. Among those injured, 42 had intentional injuries (i.e., self-inflicted or violent), seven of those (16.7%) were victims of assault, and one (2.4%) was admitted to a health-care facility. A total of 1,037 (13.8%) events were recorded for relief workers (e.g., paid military, paid civilian, self-employed, or volunteer), and 2,567 (34.2%) events were recorded for residents (i.e., persons not identified as relief workers). For 3,904 (52.0%) persons, relief worker status or resident status was unknown. Relief workers were significantly more likely than residents aged ≥18 years to be treated in a nonhospital facility (odds ratio [OR] = 5.8, 95% confidence interval [CI] = 5.0–6.8).

The proportion of ill patients evaluated for ARI increased over time, during September 8–25, when data were analyzed from all facilities (Figure). Among the 505 with ARI, 371 (73.5%) had cough, 62 (12.3%) had shortness of breath, and

TABLE 1. Number and percentage of persons with selected illnesses after Hurricane Katrina, by residency status — New Orleans, Louisiana area, September 8–25, 2005

Selected illnesses	Relief workers		Residents		Unknown		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Infectious-disease–related								
Skin or wound infection	101	(19.1)	192	(12.8)	347	(16.2)	**640**	**(15.4)**
Acute respiratory infection	119	(22.5)	158	(10.5)	228	(10.6)	**505**	**(12.1)**
Diarrhea	11	(2.1)	52	(3.5)	83	(3.9)	**146**	**(3.5)**
Other infectious disease	36	(6.8)	109	(7.3)	143	(6.7)	**288**	**(6.9)**
Noninfectious-disease–related								
Rash	67	(12.7)	87	(5.8)	146	(6.8)	**300**	**(7.2)**
Heat-related	34	(6.4)	80	(5.3)	93	(4.3)	**207**	**(5.0)**
Nondiarrhea gastrointestinal	23	(4.4)	77	(5.1)	108	(5.0)	**208**	**(5.0)**
Renal*	8	(1.5)	44	(2.9)	35	(1.6)	**87**	**(2.1)**
Other classifiable illness†	22	(4.2)	52	(3.5)	88	(4.1)	**162**	**(3.9)**
Other illnesses	107	(20.3)	649	(43.3)	870	(40.6)	**1,626**	**(39.0)**
Total	**528**	**(100.0)**	**1,500**	**(100.0)**	**2,141**	**(100.0)**	**4,169**	**(100.0)**

* Includes kidney stones and renal failure (i.e., chronic and acute).
† Includes diabetes, cardiovascular conditions, obstetric/gynecologic conditions, and dental problems.

TABLE 2. Number and percentage of persons with selected injuries and exposures after Hurricane Katrina, by residency status — New Orleans, Louisiana area, September 8–25, 2005

Selected injuries and exposures	Relief workers		Residents		Unknown		Total	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
Injuries								
Falls	46	(13.6)	196	(27.4)	222	(23.0)	**464**	**(23.0)**
Bites/Stings	67	(19.8)	92	(12.8)	152	(15.8)	**311**	**(15.4)**
Motor vehicle crash	16	(4.7)	65	(9.1)	64	(6.6)	**145**	**(7.2)**
Intentional injury	4	(1.2)	20	(2.8)	18	(1.9)	**42**	**(2.1)**
Other unintentional injuries*	117	(34.6)	237	(33.1)	362	(37.6)	**716**	**(35.5)**
Undetermined etiology	72	(21.3)	99	(13.8)	128	(13.3)	**299**	**(14.8)**
Toxic exposure/Poisoning								
Carbon monoxide poisoning	5	(1.5)	3	(0.4)	6	(0.6)	**14**	**(0.7)**
Other toxic exposure	11	(3.3)	4	(0.6)	12	(1.2)	**27**	**(1.3)**
Total	**338**	**(100.0)**	**716**	**(100.0)**	**964**	**(100.0)**	**2,018**	**(100.0)**

* Includes cuts, blunt trauma, burns, and environmental exposures.

60 (11.2%) had fever. A total of 23 (4.6%) persons with ARI were admitted to a hospital. When separate analyses were performed by type of facility (i.e., hospital versus nonhospital), the increase in ARI cases over time was only observed in nonhospital facilities. Investigation determined that this trend was driven by one facility that identified multiple ARI cases among members of a National Guard battalion.

Rash illnesses increased over time in all facilities. Relief workers were significantly more likely than residents to be seen for a rash (OR = 1.7, CI = 1.4–2.1). Investigations determined that these rashes were noninfectious; they were classified as prickly heat, arthropod bites, and the abrasive effects of wet clothing and moist skin (*3*).

Motor vehicle crashes accounted for 145 (7.2%) of the injuries; motor vehicle crashes accounted for a smaller proportion of injuries among relief workers (5.0%) than among residents (9.2%) (OR = 0.55, CI = 0.32–0.95). As of September 25, the surveillance system had detected 14 cases of carbon monoxide (CO) poisoning; 27 persons were exposed to other toxic substances (e.g., diesel fuel, contaminated water, or cleaning agents).

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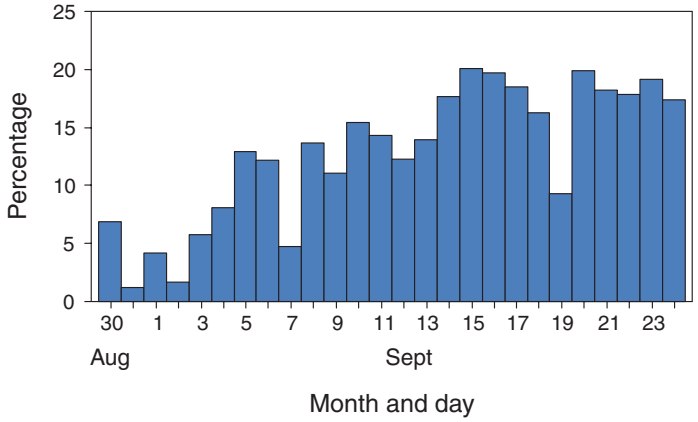
FIGURE. Proportion of acute respiratory infections among reported illnesses after Hurricane Katrina — New Orleans, Louisiana area, August 30–September 24, 2005



Editorial Note: The loss of public health infrastructure from Hurricane Katrina necessitated rapid mobilization of resources in Louisiana to restore essential services and disease surveillance. In collaboration with LDHH, CDC established active surveillance in multiple settings, including evacuation centers, coroner offices, and hospital-based emergency departments to identify outbreaks, injuries, and environmental concerns and to initiate interventions before reinstitution of routine surveillance. Collection of individual-level data provided detailed contextual information (e.g., location or circumstances) regarding health-related events. No major outbreak of disease was reported in the greater New Orleans area. Although outbreaks of epidemic-prone diseases such as cholera have happened after extensive flooding in developing countries (*4*), the United States has low or no endemic potential for epidemics of cholera or measles (*5*).

The surveillance system did identify an increase in ARI over time. This finding prompted an investigation into possible etiologies, including environmental exposure. Examination of individual data determined that the cluster was the result of transmission within close quarters of one battalion of the National Guard (*6*). Investigation also indicated that the rash illnesses were noninfectious. Injury data (e.g., proportion of motor vehicle crashes, falls, bites, and CO poisonings) were used to guide prevention messages (e.g., flyers distributed at health-care facilities and at checkpoints for residents returning to hurricane-affected areas).

The findings in this report are subject to at least three limitations. First, because of limited resources and heavy patient volume, the enumeration of illnesses and injuries among residents and relief workers in the New Orleans area after Hurricane Katrina is incomplete. Second, misclassification of illnesses or injuries on the standardized form by participating facilities was possible. Finally, prehurricane baseline data were not available to assess the magnitude of any increase in illnesses and injuries.

Written protocols were established and training was provided for each team deployed to ensure continuity of the surveillance system. Goals for the surveillance system, inclusion and exclusion criteria for reporting facilities, protocols for facility recruitment, data analysis methodology, and thresholds to initiate outbreak investigations all require documentation and review by stakeholders.

The evacuation of New Orleans associated with Hurricane Katrina created unforeseen complications in establishing and maintaining the surveillance system. Manual data collection and entry on this scale required substantial personnel resources and increased institutional support as residents returned to the four parishes. When providing surveillance support after a disaster of this magnitude, authorities should be prepared to

devote resources to the collection and reporting of data, implement automated data entry (e.g., scannable forms and electronic transmission of medical records) at the earliest opportunity, and reinstitute prehurricane surveillance once the capacity of the state health department has been reestablished.

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West Nile Virus Infections in Organ Transplant Recipients — New York and Pennsylvania, August–September, 2005

On October 5, this report was posted as an MMWR Early Release *on the* MMWR *website* (http://www.cdc.gov/mmwr).

In September 2005, West Nile virus (WNV) infection was confirmed in three of four recipients of organs transplanted from a common donor. Two recipients subsequently had neuroinvasive disease, one recipient had asymptomatic WNV infection, and a fourth recipient apparently was not infected. This report summarizes the ongoing investigation. Clinicians should be aware of the potential for transplant-associated transmission of infectious disease.

Organ Donor

The organ donor, a New York City resident, was hospitalized on August 23 after a traumatic head injury and underwent emergency evacuation of an epidural hematoma, during which he received one unit of packed red blood cells (PRBCs). He was declared brain dead on August 26. Liver and associated vessels, one lung, and both kidneys were recovered. On August 28, the liver and kidneys were transplanted into three recipients at two transplant centers in New York City, the lung was transplanted into a recipient at a transplant center in Pittsburgh, and the vessels were discarded.

After unexplained neurologic illness occurred in two organ recipients, an investigation was initiated. Investigators determined that the donor had lived near an area where mosquitoes positive for WNV were collected on August 16, 2005. The donor's wife reported that he had spent time outdoors and felt febrile before sustaining the fatal head injury. Serum and plasma collected from the donor on August 27 were retrieved. The samples tested positive for WNV immunoglobulin M antibodies (IgM) and IgG by enzyme immunoassay but negative for WNV RNA by polymerase chain reaction (PCR). Immunohistochemical analyses of liver, gallbladder, kidney, and epidural hematoma were negative for WNV antigens. The PRBC unit received by the organ donor was donated on July 30 and was negative for WNV RNA by minipool nucleic acid-amplification test (mpNAT). A repeat donation on September 22 was WNV mpNAT and IgM negative.

Liver Recipient

The liver recipient had end-stage liver disease caused by hepatitis C virus infection. She initially did well after the transplantation. She required multiple transfusions of blood products, all of which were WNV RNA negative by mpNAT. On post-transplant day 13, she had a fever and altered mental status. On day 18, she experienced respiratory distress requiring endotracheal intubation. A lumbar puncture revealed mild lymphocytic pleocytosis (8 cells/mm^3) and elevated protein (81 mg/dL). She became comatose and developed acute flaccid paralysis consistent with WNV encephalitis.

Serum and cerebrospinal fluid (CSF) specimens collected on day 23 were positive for WNV IgM, and CSF contained WNV RNA. That day, the patient began treatment with four doses of intravenous Omr-IgG-am^{TM} (Omrix Biopharmaceuticals, Tel Aviv, Israel, supplied by the National Institutes of Health [NIH]), an immune globulin with high antibody titers against WNV under an investigational new drug (IND) compassionate-use protocol; however, the patient had no subsequent clinical improvement and remains in a coma.

Lung Recipient

The lung recipient had end-stage lung disease caused by pulmonary fibrosis. The initial post-transplant course was