CDC
CENTERS FOR DISEASE CONTROL AND PREVENTION

June 12, 1998 / Vol. 47 / No. 22

MMWR™

MORBIDITY AND MORTALITY WEEKLY REPORT

Hantavirus Pulmonary Syndrome — Colorado and New Mexico, 1998

Hantavirus pulmonary syndrome (HPS) is a severe cardiopulmonary illness resulting in death in approximately 45% of cases. The most frequently recognized etiologic agent of HPS in North America, Sin Nombre virus (SNV), is transmitted to humans from its primary rodent reservoir, *Peromyscus maniculatus* (deer mouse), by direct contact with infected rodents, rodent droppings, or nests or through inhalation of aerosolized virus particles from mouse urine and feces. Sporadic cases occur throughout the United States and Canada, but the potential for spread from rodents to humans in 1998 probably has increased because of increased rodent population densities in some regions of the country. This report describes three cases of HPS that occurred in the southwestern United States with onsets of illness during April 15–28, 1998, and recommends methods to avoid exposure to rodents inside and around human dwellings.

Patient 1

On April 15, a 17-year-old man in Teller County, Colorado, developed fever (103.1 F [39.5 C]), headache, myalgia, and lower back pain. By April 17, he was somnolent and complained of a nonproductive cough and progressive shortness of breath. On medical examination he was hypotensive and dyspneic and was admitted to a hospital in respiratory distress. Bilateral infiltrates consistent with pulmonary edema were observed on his chest radiograph. Complete blood count (CBC) showed decreased platelets (32,000/mm^3 [normal: 150,000/mm^3–450,000/mm^3]); a white blood cell count (WBC) of 19,600/mm^3 (normal: 3200/mm^3–9800/mm^3), and a hematocrit (Hct) of 65% (normal: 39%–49%). He was intubated within 3 hours of admission, and serous fluid subsequently poured out of the endotracheal tube. The patient suffered a cardiac arrest on April 18 and could not be revived. Serologic studies conducted at the Colorado Department of Public Health and Environment's virology laboratory were positive for anti-SNV IgM antibodies (*1*).

The patient lived with his family on a sheep ranch with open pastures surrounded by Ponderosa pine forest. The patient spent a large amount of time in a converted garage used as a studio where he often slept on a rodent-infested couch. Evidence of rodent infestation was observed in the numerous buildings, barns, and unused vehicles on the property.

Patient 2

On April 25, a 23-year-old man residing in San Juan County, New Mexico, sought care at a local emergency department (ED) for midsternal chest pain, difficulty breathing, sore throat, generalized aches and pains, nausea, vomiting, and fever of 5 days' duration. Examination revealed an oral temperature of 101.7 F (38.7 C) and an injected oropharynx. A CBC showed decreased platelets (111,000/ mm^3); WBC of 4200/mm^3; and Hct of 44.7%. A chest radiograph was normal. Bronchitis was diagnosed, and the patient was discharged. On April 27, the patient sought care at a different ED for sore throat, chest pain, nausea, and vomiting. He reported increasing abdominal pain with cramping and diarrhea. He appeared dehydrated, and his temperature was 100.8 F (38.2 C). The chest was clear to auscultation. Platelets were measured at 51,000/mm^3; WBC, 8100/mm^3; and liver enzymes were mildly elevated. Hepatitis was suspected. The patient was administered intravenous fluids and an antiemetic before being discharged. On April 28, he returned complaining of blurry vision, dizziness when standing, increased diarrhea, and bilateral thigh cramping and pain. Clinical evaluation at that time revealed acute respiratory distress with decreased platelets (14,000/mm^3) and increased Hct (58.9%). HPS was tentatively diagnosed. The patient's status declined rapidly and he died shortly after arriving at a regional medical facility. The diagnosis of acute SNV infection was confirmed using a strip immunoblot assay performed at the University of New Mexico (*2*).

Examination of the homesite revealed approximately 10 unused vehicles on which the patient worked frequently; all had evidence of rodent infestation. The patient slept on the floor of a mobile home in which droppings were found beneath the kitchen sink. The patient worked for a construction company and, according to his family, did jobs that included crawling under mobile homes to dig holes and pour pilings. Coworkers did not report any obvious exposures to rodents or rodent-infested areas.

Patient 3

On April 29, a 29-year-old woman residing in McKinley County, New Mexico, reported fever, myalgia, decreased appetite, headache, vomiting, back pain, and chills, and a seasonal, allergy-related cough. When examined at a local ED, her temperature was 101.5 F (38.6 C). A viral infection was diagnosed, and she was sent home. On May 1, she went to a different facility with worsening symptoms, including ear pain, nausea, and a dry cough that had worsened. A CBC showed thrombocytopenia, and she was transferred to the first facility's ED. Blood tests revealed a platelet count of 66,000/mm^3; WBC, 4700/mm^3; and Hct, 47.0% (normal: 33%–43%). HPS was tentatively diagnosed, and the patient was immediately transferred to a regional medical facility. Chest radiographs were clear on the evening of admission and the following morning, but by the evening of May 2 her cough had continued to worsen and bilateral infiltrates were observed on her radiograph. On May 3, peak lactate was 5.5 mmol/L (normal: 0.5–2.0 mmol/L), and the cardiac index was 1.9. The patient improved with dobutamine and supplemental oxygen and was discharged in stable condition on May 9. A strip immunoblot assay was positive on a serum sample taken approximately 24 hours before the appearance of pulmonary infiltrates (*2*).

The patient lived with her parents on a ranch. Rodents were seen occasionally outside of the house, and a mouse carcass was found in the house 2 weeks before the patient's onset of illness. An on-site investigation revealed rodent droppings in several closets in the house, including the patient's.

Rodent Monitoring

Since 1994, rodent populations have been continuously monitored at selected sites in Arizona, Colorado, and New Mexico. Estimated rodent population densities have increased at most trapping sites 10–20-fold from March 1997 to March 1998 (T. Yates, Ph.D., University of New Mexico, personal communication, 1998).

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Editorial Note: In addition to the three persons described in this report, a total of 183 confirmed cases of HPS from 29 states have been reported to CDC. More cases have occurred among males (61%) than among females, and the mean age of case-patients is 37 years (range: 11–69 years). HPS cases have occurred more often in rural areas that are associated with hantavirus-carrying rodents (CDC, unpublished data). Of all cases, 75% occurred among whites and 20% among American Indians; of these, 11% were of Hispanic ethnicity.

The distribution of the rodent hosts of the four different hantaviruses known to cause HPS in North America includes all the contiguous United States (*3,4*). In 1997, particularly in parts of the southwest, El Niño has been associated with increased winter rainfall, improving rodent food supplies and resulting in higher densities of rodents. Prolonged El Niño events preceded the first known HPS epidemic in 1993.

The most common early symptoms of HPS include fever; myalgia, particularly in large muscle groups of the lower back; nausea; vomiting; and diarrhea. However, distinguishing signs of HPS include fever and myalgia associated with thrombocytopenia, presence of immunoblasts, and hemoconcentration (*5*). HPS should be suspected in patients with these signs and symptoms, especially those who live in rural or semirural areas or who have had an identifiable rodent exposure. No specific antiviral therapy is available to treat HPS, although a double-blind, placebo-controlled trial is under way to evaluate the potential efficacy of ribavirin.* In a preliminary open label trial, no difference in case-fatality was identified. Early recognition of hantavirus infection and case management with careful hemodynamic monitoring, early use of inotropes, avoidance of overhydration, and supportive therapy may increase survival.

Although the specific site of exposure is unknown for the three persons described in this report, all lived on premises with substantial peridomestic rodent infestations. Limiting exposure to rodents and their excreta is the most effective means of decreasing the risk for HPS. Measures to decrease such exposures in and around a home or

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*Additional information on the trials is available from Dr. Greg Mertz, University of New Mexico School of Medicine, telephone (505) 272-5666, or Lanette Sherill, University of Alabama at Birmingham, telephone (205) 934-3411.

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workplace include eliminating food sources available to rodents in structures used by humans, limiting possible nesting sites, sealing holes and other possible entrances for rodents, and using “snaptraps” and rodenticides (*6*). Other methods include using a 10% bleach solution to disinfect dead rodents and wearing rubber gloves before handling trapped or dead rodents; gloves and traps should be disinfected after use. Before entering areas that have potential rodent infestations, doors and windows should be opened to ventilate the enclosure. Persons entering these areas should avoid stirring up or breathing potentially contaminated dust. Dusty or dirty areas or articles should be moistened with a 10% bleach solution or other disinfectant solution before being cleaned—brooms or vacuum cleaners should not be used to clean rodent-infested areas. Decreasing the number of rodents inside and around human dwellings remains the most effective means to prevent peridomestic hantavirus infection.

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Deaths Associated with Occupational Diving — Alaska, 1990–1997

During 1989–1997, the Occupational Safety and Health Administration (OSHA) recorded 116 occupational diving fatalities in the United States (OSHA, unpublished data, 1998).* During 1990–1997, nine persons in Alaska died in work-related diving incidents (four were investigated by OSHA); only one had training beyond a recreational diving certificate, and three lacked any certification. In response to concerns about adequate training of occupational divers in Alaska and recent public inquiry, CDC’s National Institute for Occupational Safety and Health (NIOSH) reviewed the nine occupational diving fatalities in Alaska.† This report describes three of these incidents, summarizes the results of the review, and provides recommendations to improve the safety of commercial diving.

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*This includes all diver deaths that had an employer/employee relationship, regardless of training level or dive-relatedness, except those involved in search and rescue, training, and government work. Self-employed divers are not subject to OSHA regulations and are not included.

†Data about diving fatalities were obtained from OSHA, the National Traumatic Occupational Fatalities database, and the Alaska Occupational Injury Surveillance System maintained by NIOSH, Division of Safety Research Alaska Field Station.

Occupational Diving — Continued

Case Reports

Case 1. In July 1996, a 24-year-old commercial fisherman with no diving certification used scuba gear while attempting to clear a fishing net wrapped around the propeller of a fishing vessel. He became entangled in the net and was unable to free himself. Other crew members were unable to assist because they had no diving gear. He was retrieved approximately 3 hours later, and no attempt was made to resuscitate him. The scuba tank still contained an adequate amount of air. The cause of death was drowning.

Case 2. In October 1996, a 32-year-old certified recreational diver with minimal experience was harvesting sea cucumbers using surface-supplied air in approximately 40 feet of water. After approximately 1 hour, the tender[§] lost sight of the diver's air bubbles. The diver did not respond to a recall signal, and the tender pulled him to the surface. His air regulator was not in his mouth, and cardiopulmonary resuscitation (CPR) was unsuccessful. Inspection of the dive gear indicated it to be fully operational, with no obvious defects. The cause of death was drowning, but the specific cause of the incident was unknown.

Case 3. In September 1997, a 47-year-old experienced commercial diver who had made no dives during the previous 2–3 years used scuba gear while attaching a mooring line to a buoy anchor line. The equipment was not in good condition, and both the primary and alternate regulator were leaking and in need of repair. Shortly after he submerged, the tether line floated to the surface. After he was signaled without response, the team leader put on scuba gear, submerged, and found the diver on the sea floor with a weight belt on and both tether line and tank high-pressure hose severed. The diver was recovered, and CPR was unsuccessful. The investigation did not determine how the hose was severed, and the cause of death was listed as drowning. OSHA cited the employer for violations including inadequate training in using tools/equipment and in CPR, absence of a ready standby diver, diver not line tended, lack of a reserve tank, and rescue not conducted in a timely manner.

Summary of Cases

All nine of the diving fatalities in Alaska occurred in males aged 19–47 years (median: 25 years). Three were harvesting sea cucumbers, three were diving to clear tangled lines or nets from fishing boats, two were conducting vessel-related activities (i.e., hull inspection and anchor attachment), and one was a U.S. Navy diver undergoing training. Six divers were using scuba gear, and three were using surface-supplied air. Three deaths were attributed to equipment failure, two to entanglement in lines or nets, one to exhaustion of air supply, and three to unknown causes. None of the divers had an adequately prepared standby diver, the three divers using surface-supplied air and one scuba diver were line tended, one diver was accompanied, and one diver carried a reserve air supply.

Reported by: Div of Safety Research, National Institute for Occupational Safety and Health, CDC.

Editorial Note: Of the 116 occupational diving fatalities reported by OSHA for 1989–1997 (13 deaths per year), 49 (five per year) occurred among an estimated 3000 full-time commercial divers (OSHA, unpublished data, 1998). The average of five deaths per year corresponds to a rate of 180 deaths per 100,000 employed divers per year,

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[§] A person who remains aboard the dive boat and supports the diver underwater—for example, operating the air compressor, maintaining lines, or monitoring for signs of diver distress or danger.

Occupational Diving — Continued

which is 40 times the national average death rate for all workers. This group, which accounts for most of the commercial dive time underwater, includes divers involved in construction, maintenance, and inspection of vessels and structures such as oil rigs, bridges, and dams. The remaining 67 deaths occurred among workers who were not full-time divers; these include seafood harvest divers, search and rescue divers, scientific divers, dive instructors, and nonmilitary federal agency divers. NIOSH's National Traumatic Occupational Fatalities database reported 56 occupational diving deaths for 1989–1994 (11 deaths per year) (CDC, unpublished data, 1998); causes of deaths listed most often for divers included drowning (73% of cases), asphyxia (14%), and embolism (7%). Other causes included trauma, hypothermia, and late medical complications, but hypothermia and air embolus may be underestimated because of difficulties in diagnosing these conditions.

During the 1990s, dive fisheries have expanded in response to increasing demands for sea urchins, sea cucumbers, geoduck clams, abalone, and other products harvested by diving. In Alaska, the number of permits for dive fisheries has increased 950%, from <59 in 1987 to approximately 628 in 1995 (*1*). Many permit holders make only one or two trips yearly (*1*), and no evidence of experience or training is required to obtain a permit. In addition to dive harvesting, Alaskan divers often assist in untangling lines and nets from boat propellers. These divers are often sport divers who solicit such work, but also may be crew members with little or no training in the use of dive equipment.

Drowning was listed as the official cause of death for all the cases in this report. Although the circumstances of the incidents are known in most of the cases, specific causes could not be determined for three cases. Lack of experience and possibly panic were mentioned as contributing factors in several cases. Lack of a reserve air supply contributed to the one death from exhaustion of air supply and perhaps others.

The findings in this report illustrate a pattern of fatal incidents associated with inadequately trained divers; only one diver with commercial dive training has died in Alaska since the 1960s (G. Cleary, Alaska Divers and Pile Drivers Union, personal communication, 1998). No commercial or fishery-related dive training is available in Alaska. In 1994, CDC reported six fatalities among commercial divers in Maine during 1992–1993 and identified insufficient training as an important contributing factor in the incidents (*2*). The fatal diving incidents in Maine resulted in legislation in 1993 to require specific training of sea harvest divers before they are licensed (*2*). The 3-day course covers first aid/CPR, operations management, emergency procedures for tenders and divers, and advanced dive tables[¶] and physiology. From 1994 (when this legislation was implemented) to 1997, only two dive fishery-associated fatalities in Maine were reported (*1*). Similar training requirements for dive-fishing permits should be considered in all states that have this industry; recreational diving certification is not sufficient training for commercial diving activities.

Divers performing work-related diving activities should understand and follow standard diving precautions (i.e., those recommended by OSHA and the U.S. Coast Guard [*3,4*]), including 1) developing familiarity with equipment and safety procedures, 2) avoiding diving without a "buddy" or being line tended, 3) avoiding diving without an available backup diver, and 4) carrying reserve air supplies. Equipping vessels with shrouded propellers (to reduce net entanglement), propeller clearing ports,

¶Dive tables are used to determine the maximum safe time and depth limits for divers to avoid developing decompression sickness from accumulation of excess nitrogen in the body.

Occupational Diving — Continued

or line cutters on the propeller shaft would reduce the need for divers to untangle nets and lines.

Additional information about diving is available from the Association of Dive Contractors, telephone (281) 893-8388; the Alaska Marine Safety Education Association, telephone (907) 747-3287; e-mail amsea@ptialaska.net; or from the World-Wide Web site http://www.ilo.org/public/english/90travai/sechyg/idhind01.htm.

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Community Exposure to Toluene Diisocyanate from a Polyurethane Foam Manufacturing Plant — North Carolina, 1997

In August 1996, residents of a community in Randolph County, North Carolina, contacted the Agency for Toxic Substances and Disease Registry (ATSDR) because of health concerns about possible exposure to chemical emissions from a polyurethane manufacturing plant. ATSDR and the North Carolina Department of Environment, Health, and Natural Resources (NCDEHNR) conducted ambient air monitoring to characterize air contamination near the plant. ATSDR and Randolph County health officials also conducted biologic monitoring to determine whether residents were being exposed to toluene diisocyanate (TDI) emitted from the plant. This report summarizes the results of these investigations, which indicate that residents were being exposed to TDI in ambient air surrounding the plant.

The facility produced polyurethane foam by reacting a polyether resin with TDI and water. Emissions from the manufacturing process were directed to exhaust stacks, which vented them to ambient air. Foam production occurred in batches, resulting in episodic releases of emissions. The facility had produced polyurethane foam for approximately 20 years; during the previous 5 years, foam was produced by a quick-cure process that used greater amounts of TDI.

Since January 1996, NCDEHNR conducted investigations of the facility including air sampling, interviews with residents, risk assessment of ambient air and emissions data, and reviews of medical records. Using a direct monitoring filter-tape instrument, ATSDR detected TDI in ambient air in a residential area near the facility. Concentrations of TDI as high as 29 parts per billion (ppb) were detected at a monitoring station approximately 100 feet outside the facility's fence line. The presence of TDI was confirmed by an alternative method in which diisocyanates were captured on glycerol-impregnated filters, chemically derivatized, and analyzed using high performance

Toluene Diisocyanate Exposure — Continued

liquid chromatography. Air monitoring conducted by ATSDR and NCDEHNR also detected methylene chloride and other volatile organic compounds in ambient air. These findings prompted ATSDR to issue a public health advisory on October 20, 1997.

To determine whether residents were being exposed to TDI emissions from the plant, ATSDR, in cooperation with the Randolph County Health Department (RCHD), initiated a biologic exposure investigation. RCHD mailed flyers to residents to inform them of the investigation. Persons who lived within ¼ mile of the facility were particularly encouraged to participate. Blood samples were collected from 113 residents and were sent to the University of Cincinnati Diagnostic Allergy Laboratory for analysis. The blood serum specimens were analyzed by an enzyme-linked immunosorbent assay (ELISA) for Immunoglobulin G (IgG) and Immunoglobulin E (IgE) antibodies to TDI, hexamethylene diisocyanate, and diphenylmethane diisocyanate. Samples were classified as positive if they exceeded three standard deviations above the mean value of seven negative control samples and a serum albumin blank.

Of the 113 participants who were tested, 10 (9%) had antibodies to one or more of the diisocyanates, nine had IgG antibodies to TDI, and one had IgE antibodies to TDI. Four participants had antibodies that reacted with more than one diisocyanate.

Persons with positive antibody tests were interviewed to identify possible sources of exposure to diisocyanates. One of the 10 persons with a positive test reported having occupational exposure to TDI or other diisocyanates. In addition, two persons reported using polyurethane varnishes, a possible source of diisocyanates, in their homes. None of the other seven persons reported exposure to known sources of diisocyanates. The presence of TDI antibodies in these persons could have resulted from exposure to TDI in residential ambient air near the facility.

Some residents who lived near the facility reported health effects that they attributed to emissions from the plant. Therefore, persons with positive tests for diisocyanate antibodies and persons with symptoms of respiratory disease were encouraged to seek additional clinical evaluation. NCDEHNR arranged for residents to receive further clinical evaluation by Duke University Medical Center.

Because of public health concerns about the public health impact of chemical emissions from the plant, the state health director issued an Order to Abate a Public Health Nuisance on September 3, 1997. Polyurethane foam production at the plant has not resumed since the order was issued.

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Editorial Note: Occupational exposure to TDI and other diisocyanates can cause irritation of the eyes, upper and lower respiratory tract, and skin. In some workers, exposure to TDI results in sensitization, defined as hyperresponsiveness to TDI at concentrations substantially below those that affect most persons. Approximately 5%–10% of workers exposed to diisocyanates develop occupational asthma (*1*). The exposure level of TDI that causes sensitization is not well characterized, but can occur at levels below the Occupational Safety and Health Administration short-term exposure level of 20 ppb (*2*).

From 10% to 30% of symptomatic workers develop IgE antibodies to diisocyanates (*1*). In a study of workers exposed to diisocyanates in the workplace, IgE antibodies to

Toluene Diisocyanate Exposure — Continued

diisocyanates were detected in 13.6% of symptomatic workers and in 8.4% of all workers (*3*). Symptomatic workers experienced bronchial asthma, chronic bronchitis, rhinitis, or conjunctivitis. In a representative subgroup of this same population, IgG antibodies were more prevalent, being detected in 24% of symptomatic workers and 17% of asymptomatic workers. Antibodies have not been detected in workers in the absence of diisocyanate exposure (*4,5*).

Several participants in this investigation had positive antibody reactions to more than one diisocyanate. Such cross-reactivity of diisocyanate antibodies has been observed (*3,5*). In one study, approximately 60% of positive serum cross-reacted with one or more diisocyanates (*3*).

In the investigation described in this report, antibodies to TDI were used as a biomarker of exposure because they can be detected even in the absence of recent exposure. As demonstrated by this investigation, air and biologic monitoring can be useful in assessing human exposure to diisocyanates in the environment.

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Outbreak of *Vibrio parahaemolyticus* Infections Associated with Eating Raw Oysters — Pacific Northwest, 1997

During July–August 1997, the largest reported outbreak in North America of culture-confirmed *Vibrio parahaemolyticus* infections occurred. Illness in 209 persons was associated with eating raw oysters harvested from California, Oregon, and Washington in the United States and from British Columbia (BC) in Canada; one person died. This report summarizes the investigations of the outbreak, which suggest that elevated water temperatures may have contributed to increased cases of illness and highlights the need for enhanced surveillance for human infections.

British Columbia

During July 1–19, the BC Provincial Laboratory received isolates of *V. parahaemolyticus* from nine patients, more than twice the expected number for July. Because of the high number of isolates identified, the BC Center for Disease Control (BCCDC) conducted interviews with the eight patients who could be contacted; seven had eaten raw oysters during the 24 hours before illness onset, and one had eaten crabs. On July 30, the BC Ministry of Health (BCMOH) issued a public health alert advising that molluscan shellfish (e.g., oysters, clams, mussels, and scallops) should not be eaten raw or undercooked. On July 31, the Vancouver/Richmond Health Board banned the sale of raw molluscan shellfish in restaurants in the cities of Vancouver and Richmond, BC. These actions were followed by a rapid decline in the number of new cases. On August 19, the Federal Department of Fisheries and Oceans (DFO) closed all BC coastal waters to the harvesting of oysters.

The BCMOH continued to interview BC residents with culture-confirmed *V. parahaemolyticus* infections; information was obtained from 42 of the 51 persons with illness reported during July 1–September 26. Of the 42, a total of 39 (93%) had eaten molluscan shellfish and 35 (83%) had eaten raw or undercooked oysters during the 4 days before onset of illness; 28 had eaten oysters purchased at restaurants or other food establishments in BC; and seven had eaten oysters they had harvested. Oysters eaten by ill persons were traced by BCCDC, the Canadian Food Inspection Agency (CFIA), and BCMOH to harvesting areas along the BC coast. Samples of oysters harvested from these areas contained multiple *V. parahaemolyticus* serotypes at <200 colony-forming units (CFU) per gram of oyster tissue. No additional outbreak-related illnesses were reported in BC residents after DFO closed the coastal waters to the harvesting of oysters. The closure remained in effect until September 12, after which no additional cases were reported.

Washington

On July 18, on the basis of reports of illness received from local health departments and from ill persons, the Washington Department of Health (WDOH) issued an advisory that persons eat only thoroughly cooked oysters. On August 14, after additional cases had been reported, the WDOH advised commercial harvesters to refrigerate oysters within 4 hours after harvesting, and on August 20, advised the public to thoroughly cook molluscan shellfish from both commercial and noncommercial sources. On August 23, the U.S. Food and Drug Administration (FDA) also issued a statement regarding proper procedures for cooking oysters (*1*).

WDOH interviewed 54 of the 56 persons who had culture-confirmed *V. parahaemolyticus* during May 26–September 9. Of the 54, a total of 48 (89%) had eaten molluscan shellfish before becoming ill; 42 (88%) reported eating oysters. Product traceback by the WDOH's Shellfish Program determined that 35 case-patients had eaten molluscan shellfish harvested in Washington. On August 20, members of the Pacific Coast Oyster Growers Association voluntarily halted shipments of shell oysters from Washington, and on August 28, WDOH closed oyster beds in major shellfish harvesting areas. The oyster beds were reopened on September 15, and no additional illnesses were reported.

Oregon

On August 21, the Oregon Health Division (OHD) requested that local county health departments and microbiology laboratories provide immediate notification of illnesses associated with or isolations of *V. parahaemolyticus*. The request was prompted by an increased number of *V. parahaemolyticus* cases detected by the Foodborne Disease Active Surveillance Network (FoodNet) (a collaboration between CDC, the U.S. Department of Agriculture, FDA, and seven states for surveillance of foodborne diseases and related epidemiologic studies) and simultaneous reports from BC and Washington of a *V. parahaemolyticus* outbreak associated with eating raw or undercooked shellfish.

OHD interviewed the 13 persons reported with culture-confirmed *V. parahaemolyticus* infections with onsets during July 19–September 27. Twelve had eaten molluscan shellfish; 10 (77%) had eaten raw oysters. Traceback of the oysters that had been eaten indicated they had been harvested in waters near BC (four cases), Washington (four), Oregon (one), and California (one). On August 26, the implicated oyster harvest bed in Oregon was closed by the Oregon Department of Agriculture; only oysters to be cooked could be harvested. On August 28, OHD, in conjunction with the Food Safety Division of the Oregon Department of Agriculture, issued a press release warning persons not to eat raw molluscan shellfish harvested along the Pacific Northwest coast.

After closure of the implicated oyster harvest bed in Oregon, no additional cases associated with eating raw oysters harvested from Oregon waters were reported. The sale of oysters to be eaten raw was reestablished on September 30.

California

During May–July, the City and County of San Francisco Department of Public Health reported 11 culture-confirmed *V. parahaemolyticus* infections to the California Department of Health Services (CDHS). On the basis of these cases, on August 18, San Francisco health officials issued a health advisory recommending that persons not eat raw shellfish and advising restaurants not to serve raw oysters, clams, or mussels. On August 19, CDHS issued a warning about eating raw oysters, clams, and mussels harvested off the coasts of BC and Washington. CDHS interviewed each of the 83 persons reported with culture-confirmed *V. parahaemolyticus* infections with onset during June 9–December 9. Of the 83, a total of 68 (82%) reported eating oysters during the week before onset of illness. Although 59 persons ate oysters identified through traceback as having been harvested off the coast of Washington and BC, nine persons with culture-confirmed illness ate oysters harvested from Tomales Bay, California (40 miles north of San Francisco).

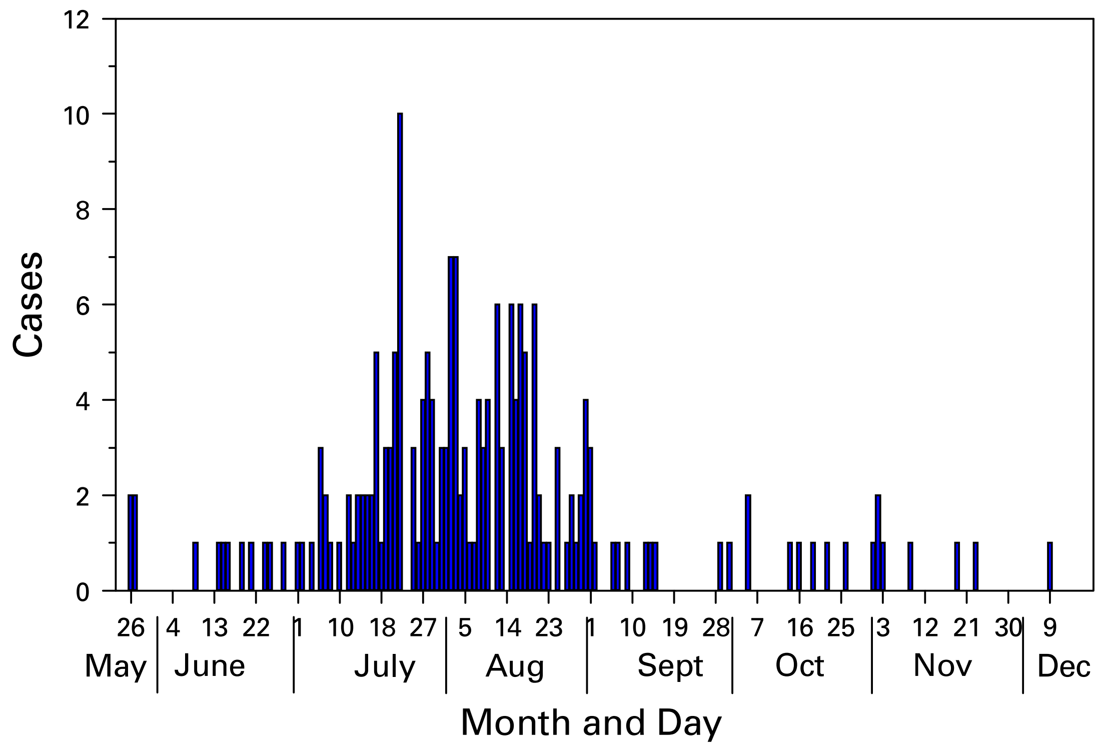
Summary Findings

During July 20–August 24, culture-confirmed cases of *V. parahaemolyticus* infections associated with eating shellfish harvested from Washington or BC also were reported to the state health departments of Utah (three), Alaska (one), Maryland (one), and Hawaii (one). A total of 209 culture-confirmed *V. parahaemolyticus* infections were reported throughout North America during this outbreak. Dates of illness onset ranged from May 26 through December 9 (median: August 8) (Figure 1). *V. parahaemolyticus* isolates from ill persons included many different serotypes, some of which matched serotypes found in oysters. The median age of patients was 39 years (range: 12–85 years); 141 (67%) were male. Clinical histories were available for 196 persons with culture-confirmed infection: 194 (99%) reported diarrhea; 172 (88%), abdominal cramps; 101 (52%), nausea; 77 (39%), vomiting; 64 (33%), fever; and 24 (12%), bloody diarrhea. Of 137 persons providing information on underlying illnesses, 17 (12%) reported an underlying illness. Two patients were hospitalized; one with *V. parahaemolyticus* isolated from her bloodstream died.

Mean Pacific coastal sea surface temperatures recorded by the U.S. Navy ranged from 54 F–66 F (12 C–19 C) during May 13–September 9, 1997 (B. McKenzie, U.S. Navy, personal communication, 1998). These temperatures were 2 F–9 F (1 C–5 C) above temperatures from the same period in 1996.

Vibrio parahaemolyticus — *Continued*

FIGURE 1. Culture-confirmed *Vibrio parahaemolyticus* cases associated with oysters harvested in the Pacific Northwest, by date of illness onset — North America, 1997*



*N=209.

Oysters from implicated harvest sites contained *V. parahaemolyticus*, but the number of organisms per gram was often <200 CFU. The highest levels were >11,000 CFU in samples tested by CFIA.

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Editorial Note: The last large outbreak of *V. parahaemolyticus* infections reported in North America occurred in 1982 and resulted in 10 culture-confirmed cases. Although *V. parahaemolyticus* outbreaks are rare, sporadic cases are not infrequent. Most infections are associated with ingestion of raw or undercooked shellfish harvested from both the Gulf of Mexico and the Pacific Ocean.

V. parahaemolyticus is a gram-negative bacterium that naturally inhabits U.S. and Canadian coastal waters and is found in higher concentrations during the summer (*2,3*). The outbreak described in this report may have been associated with elevated water temperatures. Because *V. parahaemolyticus* concentrations in oysters and shellfish increase with warmer temperatures, enhanced surveillance at the beginning of summer may lead to earlier recognition and appropriate public health action. Water temperature monitoring may help determine when oyster beds should be closed to harvesting to prevent further outbreaks (*4*).

Epidemiologic and microbiologic studies conducted during this outbreak primarily implicated eating raw oysters. On the basis of studies suggesting that the infectious dose of *V. parahaemolyticus* might be ≥100,000 CFU (*5*), the United States and Canada allow the sale of oysters if there are <10,000 CFU of *V. parahaemolyticus* per gram of oyster. However, adherence to these guidelines did not prevent this outbreak. Closure of implicated shellfish beds by health officials was useful; in Canada, additional human illness rapidly declined following a federally mandated suspension of harvesting of shellfish from BC waters in September. In the United States, shellfish-associated infections continued to occur into December.

The mean incubation period for *V. parahaemolyticus* is 15 hours (range: 4–96 hours). In immunocompetent persons, *V. parahaemolyticus* causes a mild to moderate gastroenteritis with a mean duration of illness of 3 days. Infection can cause serious illness in persons with underlying disease (e.g., persons who use alcohol excessively or have diabetes, pre-existing liver disease, iron overload states, compromised immune systems, or gastrointestinal problems) (*2,6*). During this outbreak, most ill persons had no underlying illness. To reduce the risk for *V. parahaemolyticus* and other shellfish-associated infections, persons should avoid eating raw or undercooked shellfish. If persons who eat raw or undercooked shellfish develop gastroenteritis within 4 days of ingestion, they should consult a health-care provider and request a stool culture. Only three states (California, Florida, and Louisiana) require visible posting of alerts regarding the risks associated with eating raw oysters at point of retail sale (*2,7,8*). Although assessment of these regulatory educational strategies have indicated compliance is variable (*7*), other states might consider posting such alerts.

V. parahaemolyticus is not a reportable disease in all states. During this outbreak, public health officials in Washington and California and in BC promptly became aware of the outbreak through routine reporting; in Oregon, although *V. parahaemolyticus* is not reportable, the outbreak was detected through an active surveillance program. All states should consider making *V. parahaemolyticus* and other vibrioses reportable; standard forms are available from CDC's Foodborne and Diarrheal Diseases Branch, Division of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, telephone (404) 639-2206; fax (404) 639-2205.

Vibrio parahaemolyticus — *Continued*

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Multistate Outbreak of *Salmonella* Serotype Agona Infections Linked to Toasted Oats Cereal — United States, April–May, 1998

During April–May 1998, a total of 11 states reported an increase in cases of *Salmonella* serotype Agona infections; as of June 8, a total of 209 cases have been reported and at least 47 persons have been hospitalized, representing an eightfold increase over the median number of cases reported in those states during 1993–1997. The states reporting increases were Illinois (49 cases), Indiana (30), Ohio (29), New York (24), Missouri (22), Pennsylvania (20), Michigan (15), Iowa (eight), Wisconsin (six), Kansas (four), and West Virginia (two). This report summarizes the outbreak investigation by local, state, and federal public health officials, which implicated Millville brand plain Toasted Oats cereal manufactured by Malt-O-Meal, Inc. as the cause of illness.

Among 162 patients in this outbreak for whom information was available, 85 (52%) were female. Most cases occurred in children and the elderly (47% in persons aged <10 years and 21% in persons aged >70 years). Most illnesses began in May.

Officials in the 11 state health departments, in collaboration with CDC, conducted a matched case-control study comparing persons with cases of *S.* Agona infection in April and May with well household members (controls); conditional linear logistic regression was used to examine the relation between consumption of cereal and illness. As of June 8, information from 55 households has been analyzed; 46 (84%) of these 55 households shopped at an Aldi supermarket. During the 3 days before onset of illness, 31 (66%) of 47 patients and 32 (36%) of 89 household controls consumed Millville brand plain Toasted Oats cereal purchased at an Aldi supermarket (matched odds ratio=22; p=0.003). This association remained significant when controlled for age (p<0.05). When average daily consumption of Millville brand plain Toasted Oats cereal purchased from an Aldi supermarket was categorized into three groups (no consumption, ≤1 cup, and >1 cup), a significant dose response relation was found (p=0.003).

Culture of an open box of Millville brand plain Toasted Oats cereal obtained from the home of a case-patient yielded *Salmonella* Agona at CDC. The pulsed-field gel electrophoresis (PFGE) pattern of this isolate was indistinguishable from the predominant PFGE pattern among outbreak-associated clinical isolates. The Food and Drug Administration (FDA) isolated *Salmonella* Agona from two separate composite samples from unopened boxes. Clinical isolates were susceptible to all antimicrobial agents tested (i.e., ampicillin, trimethoprim-sulfamethoxazole, and ciprofloxacin).

The Minnesota Department of Health, the Minnesota Department of Agriculture, FDA, and CDC are collaborating in the investigation of the Malt-O-Meal, Inc. plant that manufactured the implicated cereal to determine the source of contamination. At this plant on the same production line, multiple brands of plain Toasted Oats are manufactured at different times. Malt-O-Meal has issued a voluntary recall of all plain Toasted Oats cereal produced on the same production line. Investigation is ongoing to determine whether other plain Toasted Oats cereal brands produced by the same company were contaminated. Cases of *Salmonella* Agona infection occurring during the same time have now been reported in California (11), Washington (nine), New Jersey (five), Tennessee (three), Oklahoma (three), Idaho (two), Maryland (two), Minnesota (two), Nebraska (one), and Connecticut (one). These cases are being investigated to determine possible links to this outbreak. CDC recommends that consumers not eat plain Toasted Oats cereal produced by Malt-O-Meal until further investigation has identified the scope, magnitude, and cause of the contamination. Questions about plain Toasted Oats cereals manufactured by Malt-O-Meal should be directed to the company, telephone (800) 590-1810.

Reported by: State and local health depts. Office of Regulatory Affairs, and Center for Food Safety and Applied Nutrition, Food and Drug Administration. Foodborne and Diarrheal Diseases Br, Div of Bacterial and Mycotic Diseases, National Center for Infectious Diseases, CDC.

Editorial Note: *Salmonella* Agona is one of approximately 2000 *Salmonella* serotypes that can cause illness in humans. An estimated 2–4 million cases of salmonellosis occur in the United States each year, resulting in ≥500 deaths (*1*). Approximately 40,000 of these infections are culture confirmed, serotyped, and reported to CDC by state health departments (*1*). *Salmonella* infections usually resolve in 5–7 days and do not require antibiotic treatment. Persons with severe diarrhea may require rehydration with intravenous fluids. Antibiotics are required when infection spreads from the intestinal tract. *Salmonella* Agona is an uncommon serotype of *Salmonella*, accounting for approximately 1.5% of human isolates reported to the Public Health Laboratory Information System (PHLIS) (*2*). Like most other *Salmonella* serotypes, *Salmonella* Agona is found in a variety of animal reservoirs including poultry, cattle, pigs, and animal feed. The first reported U.S. outbreak of *Salmonella* Agona infections was traced to animal feed made with contaminated imported fishmeal in 1972 (*3*); other outbreaks have been attributed to dried milk (*4*) and to a commercial peanut-flavored snack (*5*). This outbreak represents the first time a commercial cereal product has been implicated in a *Salmonella* outbreak, although an infant cereal product was implicated in an outbreak of *Salmonella senftenberg* in the United Kingdom (*6*). *Salmonella* spp. are relatively resistant to desiccation and can survive for long periods in dry environments such as cereal (*7*).

Timely communication among the states and CDC about unexplained local increases in *Salmonella* Agona infections, and the relative rarity of this serotype, led to

Salmonella — *Continued*

the identification of this multistate outbreak. Electronic national laboratory-based reporting of *Salmonella* infections facilitated prompt recognition of the extent of the outbreak. Cooperative investigations among federal, state, and local agencies, coordination by CDC, electronic reporting through PHLIS, and the rapid identification of related isolates using PulseNet (the national network of public health laboratories that perform DNA "fingerprinting" on foodborne bacteria) are critical components in the recognition and investigation of multistate foodborne outbreaks.

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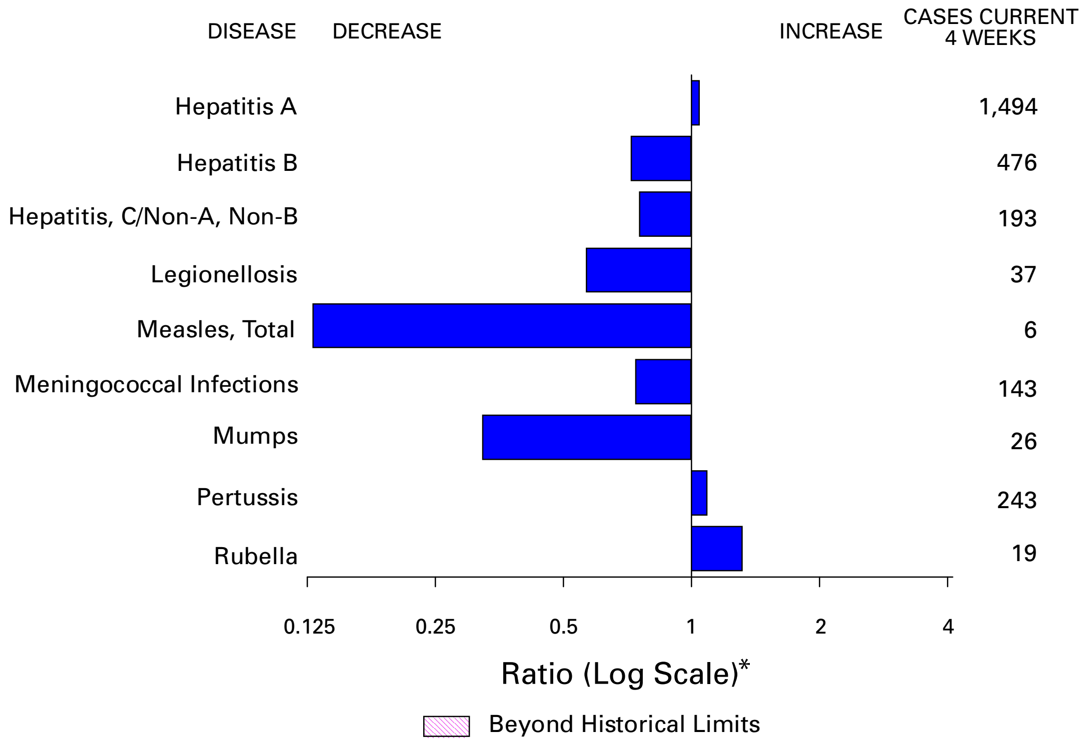
FIGURE I. Selected notifiable disease reports, comparison of provisional 4-week totals ending June 6, 1998, with historical data — United States



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

TABLE I. Summary — provisional cases of selected notifiable diseases, United States, cumulative, week ending June 6, 1998 (22nd Week)

	Cum. 1998		Cum. 1998
Anthrax	-	Plague	-
Brucellosis	11	Poliomyelitis, paralytic¶	-
Cholera	3	Psittacosis	19
Congenital rubella syndrome	2	Rabies, human	-
Cryptosporidiosis*	721	Rocky Mountain spotted fever (RMSF)	44
Diphtheria	1	Streptococcal disease, invasive Group A	976
Encephalitis: California*	-	Streptococcal toxic-shock syndrome*	31
eastern equine*	-	Syphilis, congenital**	101
St. Louis*	-	Tetanus	10
western equine*	-	Toxic-shock syndrome	57
Hansen Disease	46	Trichinosis	5
Hantavirus pulmonary syndrome*†	2	Typhoid fever	116
Hemolytic uremic syndrome, post-diarrheal*	12	Yellow fever	-
HIV infection, pediatric*§	106		

-:no reported cases
*Not notifiable in all states.
† Updated weekly from reports to the Division of Viral and Rickettsial Diseases, National Center for Infectious Diseases (NCID).
§ Updated monthly to the Division of HIV/AIDS Prevention–Surveillance and Epidemiology, National Center for HIV, STD, and TB Prevention (NCHSTP), last update May 24, 1998.
¶ One suspected case of polio with onset in 1998 has also been reported to date.
**Updated from reports to the Division of STD Prevention, NCHSTP.

TABLE II. Provisional cases of selected notifiable diseases, United States, weeks ending June 6, 1998, and May 31, 1997 (22nd Week)

Reporting Area	AIDS		Chlamydia		*Escherichia coli* O157:H7		Gonorrhea		Hepatitis C/NA,NB	
					NETSS†	PHLIS§				
	Cum. 1998*	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1998	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997
UNITED STATES	20,034	25,974	212,087	190,686	453	255	124,729	115,161	1,637	1,246
NEW ENGLAND	640	897	7,952	7,327	56	42	2,074	2,455	19	29
Maine	13	25	394	395	1	-	19	24	-	-
N.H.	21	14	385	326	10	11	37	55	-	-
Vt.	10	18	163	171	-	-	13	24	-	1
Mass.	275	416	3,567	3,016	26	20	856	926	18	25
R.I.	58	70	1,058	884	3	1	156	207	1	3
Conn.	263	354	2,385	2,535	16	10	993	1,219	-	-
MID. ATLANTIC	5,695	8,265	26,790	24,051	41	10	14,944	14,716	167	149
Upstate N.Y.	710	1,336	N	N	33	-	2,489	2,639	130	115
N.Y. City	3,153	4,136	14,435	12,814	2	5	6,131	5,650	-	-
N.J.	993	1,783	4,148	4,361	6	4	2,531	3,064	-	-
Pa.	839	1,010	8,207	6,876	N	1	3,793	3,363	37	34
E.N. CENTRAL	1,518	1,809	36,559	31,064	77	45	24,661	18,459	205	287
Ohio	281	394	10,507	9,421	23	6	6,277	5,775	6	7
Ind.	293	328	3,092	3,475	10	19	1,977	2,398	3	7
Ill.	610	602	10,265	5,499	25	-	8,111	2,686	7	46
Mich.	252	394	9,364	8,144	19	7	6,989	5,720	189	211
Wis.	82	91	3,331	4,525	N	13	1,307	1,880	-	16
W.N. CENTRAL	351	520	12,809	13,167	54	31	6,278	5,818	103	31
Minn.	56	83	1,830	2,760	23	17	650	961	-	2
Iowa	20	66	1,815	1,908	6	-	560	485	12	14
Mo.	176	254	4,904	4,891	8	12	3,645	3,159	87	4
N. Dak.	4	4	290	359	1	1	29	24	-	2
S. Dak.	9	2	711	501	1	-	119	52	-	-
Nebr.	36	48	976	834	6	-	340	299	2	2
Kans.	50	63	2,283	1,914	9	1	935	838	2	7
S. ATLANTIC	5,037	6,477	44,961	36,298	35	14	36,488	34,742	76	88
Del.	57	111	1,074	612	-	1	576	457	-	-
Md.	571	742	3,510	2,982	10	4	3,874	4,906	5	1
D.C.	413	469	N	N	1	-	1,507	1,725	-	-
Va.	368	552	3,980	4,738	N	7	2,561	3,343	3	8
W. Va.	47	38	1,211	1,306	N	-	335	412	3	7
N.C.	335	363	9,520	6,995	9	2	7,980	6,753	11	25
S.C.	318	295	7,817	5,174	1	-	5,085	4,625	1	19
Ga.	608	856	10,221	3,982	2	-	8,554	5,263	8	-
Fla.	2,320	3,051	7,628	10,509	11	-	6,016	7,258	45	28
E.S. CENTRAL	788	807	14,566	13,788	33	11	13,748	13,912	61	149
Ky.	101	112	2,596	2,754	9	-	1,419	1,768	10	7
Tenn.	272	354	5,322	5,131	19	10	4,473	4,273	48	89
Ala.	233	196	3,917	3,339	5	-	5,083	4,691	3	5
Miss.	182	145	2,731	2,564	U	1	2,773	3,180	U	48
W.S. CENTRAL	2,473	2,590	28,703	21,344	27	5	16,641	14,366	463	142
Ark.	81	96	1,239	1,144	1	1	1,114	1,859	1	5
La.	415	493	4,991	3,346	-	1	4,230	3,131	6	82
Okla.	134	138	4,368	3,113	3	3	2,371	1,954	5	4
Tex.	1,843	1,863	18,105	13,741	23	-	8,926	7,422	451	51
MOUNTAIN	725	751	7,501	11,187	41	33	2,743	3,042	197	156
Mont.	13	18	515	430	2	-	22	17	4	7
Idaho	14	22	800	616	4	-	72	45	80	21
Wyo.	2	13	287	223	-	-	15	25	30	56
Colo.	127	194	-	1,993	11	8	971	773	13	19
N. Mex.	111	66	1,614	1,634	9	6	292	372	40	28
Ariz.	286	188	3,315	4,354	N	7	1,213	1,370	1	16
Utah	57	60	717	685	11	7	66	88	16	3
Nev.	115	190	253	1,252	4	5	92	352	13	6
PACIFIC	2,807	3,858	32,246	32,460	89	64	7,152	7,651	346	215
Wash.	203	287	4,648	3,836	20	22	784	816	10	11
Oreg.	88	144	2,361	1,982	25	21	327	305	2	2
Calif.	2,463	3,377	23,603	25,373	43	18	5,733	6,147	280	129
Alaska	12	22	811	576	1	-	143	181	1	-
Hawaii	41	28	823	693	N	3	165	202	53	73
Guam	-	2	8	193	N	-	2	27	-	-
P.R.	834	760	U	U	-	U	176	260	-	53
V.I.	17	35	N	N	N	U	U	U	U	U
Amer. Samoa	-	-	U	U	N	U	U	U	U	U
C.N.M.I.	-	1	N	N	N	U	7	16	-	2

N: Not notifiable U: Unavailable -: no reported cases C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly to the Division of HIV/AIDS Prevention–Surveillance and Epidemiology, National Center for HIV, STD, and TB Prevention, last update May 24, 1998.

†National Electronic Telecommunications System for Surveillance.

§Public Health Laboratory Information System.

TABLE II. (Cont'd.) Provisional cases of selected notifiable diseases, United States, weeks ending June 6, 1998, and May 31, 1997 (22nd Week)

Reporting Area	Legionellosis		Lyme Disease		Malaria		Syphilis (Primary & Secondary)		Tuberculosis		Rabies, Animal
	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998*	Cum. 1997	Cum. 1998
UNITED STATES	420	352	1,773	1,385	433	568	2,781	3,610	3,064	6,983	2,834
NEW ENGLAND	22	24	457	282	17	23	32	68	119	169	555
Maine	1	1	1	3	1	1	1	-	U	15	84
N.H.	2	4	11	7	3	2	1	-	2	6	33
Vt.	1	3	3	3	-	2	2	-	-	3	30
Mass.	8	8	106	35	11	16	21	37	96	83	178
R.I.	4	4	31	37	2	2	-	-	21	13	33
Conn.	6	4	305	197	-	-	7	31	U	49	197
MID. ATLANTIC	93	59	1,045	853	114	163	93	179	231	1,248	586
Upstate N.Y.	26	13	557	108	30	25	12	19	U	176	390
N.Y. City	15	2	3	66	53	94	22	33	U	649	U
N.J.	4	8	124	234	17	32	18	83	231	254	83
Pa.	48	36	361	445	14	12	41	44	U	169	113
E.N. CENTRAL	132	136	32	26	38	60	390	320	220	749	37
Ohio	60	62	31	11	2	6	70	102	5	132	30
Ind.	18	21	1	9	2	5	66	70	U	64	-
Ill.	14	5	-	2	15	28	144	35	215	402	2
Mich.	26	31	-	4	18	16	89	45	U	103	4
Wis.	14	17	U	U	1	5	21	68	U	48	1
W.N. CENTRAL	28	26	15	14	22	15	65	72	98	197	294
Minn.	3	1	4	9	8	5	3	13	U	49	54
Iowa	2	7	9	-	2	6	-	3	U	20	62
Mo.	11	2	-	4	9	2	49	37	69	83	17
N. Dak.	-	2	-	-	1	-	-	-	U	4	52
S. Dak.	-	1	-	-	-	-	1	-	9	4	54
Nebr.	9	10	-	1	-	1	4	1	5	4	2
Kans.	3	3	2	-	2	1	8	18	15	33	53
S. ATLANTIC	52	45	152	127	110	99	1,197	1,455	546	1,267	927
Del.	7	5	2	26	1	2	15	11	-	14	17
Md.	10	10	104	80	37	35	281	402	116	120	236
D.C.	3	2	4	5	7	6	34	54	48	36	-
Va.	4	9	11	-	17	24	74	116	89	140	280
W. Va.	N	N	4	-	-	-	2	3	21	22	39
N.C.	6	6	5	7	8	6	336	303	162	149	136
S.C.	5	2	1	1	3	7	139	178	110	104	66
Ga.	-	-	2	1	14	12	219	261	U	243	61
Fla.	16	11	19	7	23	7	97	127	U	439	92
E.S. CENTRAL	16	14	21	30	11	14	455	798	158	513	119
Ky.	11	2	5	4	1	3	50	65	U	72	17
Tenn.	4	5	8	10	7	4	242	332	U	184	70
Ala.	1	2	8	2	3	4	102	206	158	171	32
Miss.	U	5	U	14	U	3	61	195	U	86	U
W.S. CENTRAL	11	5	5	8	11	7	329	488	41	1,038	74
Ark.	-	-	2	2	-	1	48	65	41	80	1
La.	-	1	-	1	4	4	115	174	-	80	-
Okla.	6	1	-	1	2	2	22	51	U	78	73
Tex.	5	3	3	4	5	-	144	198	U	800	-
MOUNTAIN	27	24	1	4	23	32	83	77	154	221	63
Mont.	1	1	-	-	-	2	-	-	12	7	21
Idaho	-	2	-	-	3	-	-	-	4	5	-
Wyo.	1	1	-	1	-	1	-	-	2	2	36
Colo.	5	5	-	1	7	16	5	2	U	42	1
N. Mex.	2	1	-	-	8	4	12	4	25	9	-
Ariz.	4	7	-	1	4	4	61	62	83	101	5
Utah	13	4	-	-	1	1	3	3	28	10	-
Nev.	1	3	1	1	-	4	2	6	U	45	-
PACIFIC	39	19	45	41	87	155	137	153	1,497	1,581	179
Wash.	4	4	1	1	7	8	9	6	-	121	-
Oreg.	-	-	5	8	9	10	2	3	U	59	-
Calif.	35	14	39	32	70	133	126	142	1,415	1,279	163
Alaska	-	-	-	-	-	2	-	1	17	39	16
Hawaii	-	1	-	-	1	2	-	1	65	83	-
Guam	-	-	-	-	-	-	-	3	-	13	-
P.R.	-	-	-	-	-	3	108	94	46	88	25
V.I.	U	U	U	U	U	U	U	U	U	U	U
Amer. Samoa	U	U	U	U	U	U	U	U	U	U	U
C.N.M.I.	-	-	-	-	-	-	1	5	8	-	-

N: Not notifiable U: Unavailable -: no reported cases

*Additional information about areas displaying "U" for cumulative 1998 Tuberculosis cases can be found in Notice to Readers, *MMWR* Vol. 47, No. 2, p. 39.

TABLE III. Provisional cases of selected notifiable diseases preventable by vaccination, United States, weeks June 6, 1998, and May 31, 1997 (22nd Week)

Reporting Area	H. influenzae, invasive		Hepatitis (Viral), by type: A		Hepatitis (Viral), by type: B		Measles (Rubeola): Indigenous		Measles (Rubeola): Imported†		Measles (Rubeola): Total	
	Cum. 1998*	Cum. 1997	Cum. 1998	Cum. 1997	Cum. 1998	Cum. 1997	1998	Cum. 1998	1998	Cum. 1998	Cum. 1998	Cum. 1997
UNITED STATES	486	504	8,836	11,759	3,124	3,858	4	12	-	11	23	63
NEW ENGLAND	26	29	118	281	47	71	-	-	-	1	1	8
Maine	2	3	12	37	-	4	-	-	-	-	-	-
N.H.	1	4	6	16	7	5	-	-	-	-	-	-
Vt.	2	-	10	6	1	2	-	-	-	-	-	-
Mass.	19	19	30	139	15	32	-	-	-	1	1	8
R.I.	2	2	9	24	24	8	-	-	-	-	-	-
Conn.	-	1	51	59	-	20	-	-	-	-	-	-
MID. ATLANTIC	70	63	566	1,041	490	582	1	3	-	1	4	12
Upstate N.Y.	28	3	145	110	131	101	1	2	-	-	2	4
N.Y. City	11	21	140	469	123	237	U	-	U	-	-	5
N.J.	27	25	113	155	90	112	-	1	-	-	1	2
Pa.	4	14	168	307	146	132	-	-	-	1	1	1
E.N. CENTRAL	74	80	1,099	1,303	300	671	2	5	-	2	7	6
Ohio	32	40	144	179	28	41	-	-	-	-	-	-
Ind.	18	8	73	129	24	45	-	2	-	1	3	-
Ill.	23	23	169	322	52	126	-	-	-	-	-	5
Mich.	-	9	628	581	181	213	2	3	-	1	4	1
Wis.	1	-	85	92	15	246	-	-	-	-	-	-
W.N. CENTRAL	32	22	753	819	134	232	-	-	-	-	-	11
Minn.	17	14	28	69	11	18	-	-	-	-	-	2
Iowa	1	2	349	109	20	16	-	-	-	-	-	-
Mo.	9	3	303	461	80	175	-	-	-	-	-	1
N. Dak.	-	-	2	9	2	1	U	-	U	-	-	-
S. Dak.	-	2	8	12	1	-	-	-	-	-	-	8
Nebr.	-	1	14	23	6	8	-	-	-	-	-	-
Kans.	5	-	49	136	14	14	-	-	-	-	-	-
S. ATLANTIC	102	89	726	602	436	437	-	1	-	5	6	3
Del.	-	-	2	11	-	3	-	-	-	1	1	-
Md.	31	36	151	101	66	68	-	-	-	1	1	1
D.C.	-	-	25	13	6	20	-	-	-	-	-	1
Va.	12	6	119	74	45	51	-	-	-	2	2	-
W. Va.	4	3	1	6	3	6	-	-	-	-	-	-
N.C.	12	15	41	94	82	94	-	-	-	-	-	1
S.C.	3	3	15	56	1	42	-	-	-	-	-	-
Ga.	18	18	122	117	61	47	-	-	-	1	1	-
Fla.	22	8	250	130	172	106	-	1	-	-	1	-
E.S. CENTRAL	30	34	169	298	177	292	-	-	-	-	-	1
Ky.	4	4	10	35	21	16	-	-	-	-	-	-
Tenn.	19	20	115	176	128	185	-	-	-	-	-	-
Ala.	7	8	44	48	28	32	-	-	-	-	-	1
Miss.	U	2	U	39	U	59	U	U	U	U	U	-
W.S. CENTRAL	26	21	1,523	2,354	472	436	-	-	-	-	-	4
Ark.	-	1	27	115	25	31	-	-	-	-	-	-
La.	12	4	23	87	29	46	-	-	-	-	-	-
Okla.	12	14	244	715	32	15	-	-	-	-	-	-
Tex.	2	2	1,229	1,437	386	344	-	-	-	-	-	4
MOUNTAIN	63	51	1,458	1,758	350	380	-	-	-	-	-	7
Mont.	-	-	43	47	3	5	-	-	-	-	-	-
Idaho	-	1	107	73	17	14	-	-	-	-	-	-
Wyo.	-	1	21	18	2	12	-	-	-	-	-	-
Colo.	13	8	110	197	41	77	-	-	-	-	-	-
N. Mex.	4	3	78	132	138	131	-	-	-	-	-	-
Ariz.	36	14	939	825	98	81	-	-	-	-	-	5
Utah	4	3	99	308	30	38	-	-	-	-	-	-
Nev.	6	21	61	158	21	22	U	-	U	-	-	2
PACIFIC	63	115	2,424	3,303	718	757	1	3	-	2	5	11
Wash.	3	2	513	220	58	30	-	-	-	1	1	-
Oreg.	28	21	182	167	53	48	-	-	-	-	-	-
Calif.	26	88	1,695	2,833	596	663	1	3	-	1	4	8
Alaska	1	1	11	19	6	10	-	-	-	-	-	-
Hawaii	5	3	23	64	5	6	-	-	-	-	-	3
Guam	-	-	-	-	-	3	U	-	U	-	-	-
P.R.	2	-	19	162	220	609	-	-	-	-	-	-
V.I.	U	U	U	U	U	U	U	U	U	U	U	U
Amer. Samoa	U	U	U	U	U	U	U	U	U	U	U	U
C.N.M.I.	-	5	-	1	7	21	U	-	U	-	-	1

N: Not notifiable U: Unavailable -: no reported cases

*Of 117 cases among children aged <5 years, serotype was reported for 62 and of those, 28 were type b.

†For imported measles, cases include only those resulting from importation from other countries.

TABLE III. (Cont'd.) Provisional cases of selected notifiable diseases preventable by vaccination, United States, weeks ending June 6, 1998, and May 31, 1997 (22nd Week)

Reporting Area	Meningococcal Disease		Mumps			Pertussis			Rubella		
	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997	1998	Cum. 1998	Cum. 1997
UNITED STATES	1,293	1,751	9	203	298	70	1,638	2,237	9	223	51
NEW ENGLAND	66	110	-	-	7	9	284	494	-	32	-
Maine	4	10	-	-	-	-	5	6	-	-	-
N.H.	4	11	-	-	-	4	23	58	-	-	-
Vt.	1	2	-	-	-	1	25	161	-	-	-
Mass.	31	59	-	-	2	4	222	249	-	6	-
R.I.	3	7	-	-	4	-	3	12	-	-	-
Conn.	23	21	-	-	1	-	6	8	-	26	-
MID. ATLANTIC	132	178	-	10	33	2	180	184	7	105	13
Upstate N.Y.	33	43	-	3	5	2	114	62	7	101	2
N.Y. City	13	31	U	4	1	U	4	45	U	2	11
N.J.	36	33	-	-	5	-	5	11	-	2	-
Pa.	50	71	-	3	22	-	57	66	-	-	-
E.N. CENTRAL	188	255	3	36	35	10	165	212	-	-	3
Ohio	74	97	1	17	13	1	63	65	-	-	-
Ind.	25	31	1	3	4	2	47	22	-	-	-
Ill.	47	78	-	1	8	-	10	28	-	-	-
Mich.	22	24	1	15	9	7	28	28	-	-	-
Wis.	20	25	-	-	1	-	17	69	-	-	3
W.N. CENTRAL	105	127	-	19	8	7	139	124	-	3	-
Minn.	16	17	-	10	3	1	79	76	-	-	-
Iowa	15	25	-	5	4	5	34	7	-	-	-
Mo.	45	63	-	3	-	-	11	21	-	2	-
N. Dak.	-	1	U	1	-	U	-	2	U	-	-
S. Dak.	6	4	-	-	-	-	4	1	-	-	-
Nebr.	4	4	-	-	1	1	5	2	-	-	-
Kans.	19	13	-	-	-	-	6	15	-	1	-
S. ATLANTIC	227	296	-	30	35	1	110	181	1	5	12
Del.	1	4	-	-	-	-	1	-	-	-	-
Md.	21	31	-	-	1	-	20	71	-	-	-
D.C.	-	5	-	-	-	-	1	2	-	-	-
Va.	21	28	-	4	4	-	6	19	-	-	1
W. Va.	5	12	-	-	-	-	1	4	-	-	-
N.C.	31	54	-	7	7	-	42	40	-	3	10
S.C.	33	37	-	4	9	-	13	9	-	-	1
Ga.	46	54	-	1	5	-	2	6	-	-	-
Fla.	69	71	-	14	9	1	24	30	1	2	-
E.S. CENTRAL	96	125	-	-	18	1	45	39	-	-	-
Ky.	15	33	-	-	2	-	18	10	-	-	-
Tenn.	36	39	-	-	3	-	14	12	-	-	-
Ala.	45	36	-	-	6	1	13	12	-	-	-
Miss.	U	17	U	U	7	U	U	5	U	U	-
W.S. CENTRAL	134	159	-	29	34	15	111	61	1	60	3
Ark.	18	25	-	-	-	2	15	3	-	-	-
La.	25	30	-	2	7	-	-	7	-	-	-
Okla.	25	22	-	-	-	-	13	8	-	-	-
Tex.	66	82	-	27	27	13	83	43	1	60	3
MOUNTAIN	77	110	2	19	36	17	379	603	-	5	4
Mont.	2	8	-	-	-	-	1	6	-	-	-
Idaho	3	7	2	3	2	3	167	399	-	-	1
Wyo.	3	-	-	1	1	-	7	4	-	-	-
Colo.	17	31	-	3	3	4	58	141	-	-	-
N. Mex.	13	19	N	N	N	4	61	31	-	1	-
Ariz.	28	23	-	4	22	1	59	10	-	1	3
Utah	8	11	-	3	4	5	19	4	-	2	-
Nev.	3	11	U	5	4	U	7	8	U	1	-
PACIFIC	268	391	4	60	92	8	225	339	-	13	16
Wash.	34	49	-	5	11	7	130	159	-	9	3
Oreg.	49	82	N	N	N	1	14	23	-	-	-
Calif.	180	257	3	40	66	-	76	147	-	2	7
Alaska	1	1	-	2	5	-	-	2	-	-	-
Hawaii	4	2	1	13	10	-	5	8	-	2	6
Guam	-	1	U	-	1	U	-	-	U	-	-
P.R.	4	9	-	1	4	-	2	-	-	-	-
V.I.	U	U	U	U	U	U	U	U	U	U	U
Amer. Samoa	U	U	U	U	U	U	U	U	U	U	U
C.N.M.I.	-	-	U	-	4	U	-	-	U	-	-

N: Not notifiable U: Unavailable -: no reported cases

TABLE IV. Deaths in 122 U.S. cities,* week ending June 6, 1998 (22nd Week)

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	>65	45-64	25-44	1-24	<1	
NEW ENGLAND	532	378	101	32	14	7	37
Boston, Mass.	140	93	31	8	3	5	11
Bridgeport, Conn.	33	23	6	3	1	-	2
Cambridge, Mass.	11	7	3	1	-	-	-
Fall River, Mass.	21	16	4	-	1	-	1
Hartford, Conn.	50	28	13	5	3	1	1
Lowell, Mass.	23	18	4	1	-	-	-
Lynn, Mass.	10	9	1	-	-	-	2
New Bedford, Mass.	27	22	2	3	-	-	2
New Haven, Conn.	50	38	8	2	2	-	4
Providence, R.I.	56	42	9	2	2	1	1
Somerville, Mass.	5	5	-	-	-	-	-
Springfield, Mass.	32	21	8	2	1	-	3
Waterbury, Conn.	23	18	3	2	-	-	4
Worcester, Mass.	51	38	9	3	1	-	6
MID. ATLANTIC	2,311	1,639	411	180	35	46	132
Albany, N.Y.	41	34	5	-	1	1	1
Allentown, Pa.	17	12	3	2	-	-	-
Buffalo, N.Y.	84	57	18	5	2	2	5
Camden, N.J.	48	33	5	5	3	2	3
Elizabeth, N.J.	12	7	2	1	1	1	-
Erie, Pa.	45	36	7	2	-	-	4
Jersey City, N.J.	35	23	5	6	-	1	3
New York City, N.Y.	1,145	814	210	87	18	16	54
Newark, N.J.	45	11	17	7	3	7	1
Paterson, N.J.	21	15	2	3	-	1	-
Philadelphia, Pa.	400	280	78	34	4	4	34
Pittsburgh, Pa.§	80	58	12	3	1	6	5
Reading, Pa.	32	26	2	4	-	-	4
Rochester, N.Y.	108	82	16	6	-	4	9
Schenectady, N.Y.	17	13	2	2	-	-	-
Scranton, Pa.	37	32	4	1	-	-	1
Syracuse, N.Y.	105	80	15	9	1	-	7
Trenton, N.J.	22	12	6	2	1	1	1
Utica, N.Y.	17	14	2	1	-	-	-
Yonkers, N.Y.	U	U	U	U	U	U	U
E.N. CENTRAL	2,044	1,415	350	153	55	69	119
Akron, Ohio	44	31	9	2	2	-	-
Canton, Ohio	35	30	1	2	2	-	3
Chicago, Ill.	379	218	78	43	13	26	22
Cincinnati, Ohio	77	48	17	5	2	5	7
Cleveland, Ohio	120	82	21	6	5	6	2
Columbus, Ohio	200	139	38	8	7	8	20
Dayton, Ohio	102	77	13	7	2	2	9
Detroit, Mich.	211	132	41	27	6	5	6
Evansville, Ind.	60	51	7	1	1	-	3
Fort Wayne, Ind.	70	49	13	2	5	1	2
Gary, Ind.	17	8	6	2	1	-	1
Grand Rapids, Mich.	64	53	4	2	2	3	5
Indianapolis, Ind.	213	149	40	14	4	6	-
Lansing, Mich.	38	30	4	3	1	-	7
Milwaukee, Wis.	111	81	18	8	1	3	7
Peoria, Ill.	44	35	4	3	-	2	5
Rockford, Ill.	51	37	6	5	1	2	5
South Bend, Ind.	54	45	5	4	-	-	6
Toledo, Ohio	84	65	13	6	-	-	6
Youngstown, Ohio	70	55	12	3	-	-	3
W.N. CENTRAL	898	623	172	51	26	22	46
Des Moines, Iowa	82	64	14	2	2	-	6
Duluth, Minn.	26	20	5	-	-	1	1
Kansas City, Kans.	31	18	6	4	2	1	-
Kansas City, Mo.	76	48	16	4	3	2	3
Lincoln, Nebr.	43	31	6	3	2	1	1
Minneapolis, Minn.	243	169	47	13	5	8	18
Omaha, Nebr.	87	62	19	1	4	1	7
St. Louis, Mo.	104	64	24	9	3	4	-
St. Paul, Minn.	111	86	20	2	1	2	7
Wichita, Kans.	95	61	15	13	4	2	3

Reporting Area	All Causes, By Age (Years)						P&I† Total
	All Ages	>65	45-64	25-44	1-24	<1	
S. ATLANTIC	1,100	728	216	102	35	19	53
Atlanta, Ga.	U	U	U	U	U	U	U
Baltimore, Md.	207	118	51	27	4	7	19
Charlotte, N.C.	92	63	16	8	1	4	6
Jacksonville, Fla.	167	112	37	8	7	3	3
Miami, Fla.	113	80	20	10	3	-	1
Norfolk, Va.	47	34	7	3	3	-	-
Richmond, Va.	63	42	11	8	2	-	3
Savannah, Ga.	54	33	9	5	3	4	1
St. Petersburg, Fla.	45	30	9	5	-	1	5
Tampa, Fla.	200	149	33	11	7	-	14
Washington, D.C.	92	51	23	13	5	-	1
Wilmington, Del.	20	16	-	4	-	-	-
E.S. CENTRAL	619	403	135	44	19	17	29
Birmingham, Ala.	149	89	40	10	6	3	9
Chattanooga, Tenn.	68	44	15	6	1	2	1
Knoxville, Tenn.	68	46	15	4	2	1	4
Lexington, Ky.	84	63	15	4	2	-	5
Memphis, Tenn.	U	U	U	U	U	U	U
Mobile, Ala.	61	37	13	5	3	3	-
Montgomery, Ala.	50	34	9	3	2	2	2
Nashville, Tenn.	139	90	28	12	3	6	8
W.S. CENTRAL	1,424	896	313	140	42	33	103
Austin, Tex.	83	46	24	7	3	3	3
Baton Rouge, La.	16	8	5	2	1	-	1
Corpus Christi, Tex.	64	44	14	6	-	-	7
Dallas, Tex.	215	140	39	28	4	4	8
El Paso, Tex.	68	50	12	2	3	1	7
Ft. Worth, Tex.	97	62	26	5	1	3	14
Houston, Tex.	413	250	96	41	17	9	32
Little Rock, Ark.	62	18	18	12	9	5	4
New Orleans, La.	103	65	27	8	2	1	-
San Antonio, Tex.	188	133	38	14	-	3	12
Shreveport, La.	U	U	U	U	U	U	U
Tulsa, Okla.	115	80	14	15	2	4	15
MOUNTAIN	1,005	663	197	93	34	18	85
Albuquerque, N.M.	124	79	20	20	4	1	6
Boise, Idaho	27	18	7	1	1	-	1
Colo. Springs, Colo.	50	37	6	3	3	1	2
Denver, Colo.	108	73	20	9	3	3	9
Las Vegas, Nev.	198	127	48	14	6	3	14
Ogden, Utah	22	15	5	1	1	-	2
Phoenix, Ariz.	203	122	43	24	8	6	23
Pueblo, Colo.	26	20	4	2	-	-	3
Salt Lake City, Utah	99	68	19	6	3	3	9
Tucson, Ariz.	148	104	25	13	5	1	16
PACIFIC	1,870	1,344	324	137	40	25	138
Berkeley, Calif.	16	10	3	1	1	1	-
Fresno, Calif.	79	56	13	8	2	-	7
Glendale, Calif.	36	29	2	4	-	1	2
Honolulu, Hawaii	70	52	12	4	2	-	3
Long Beach, Calif.	49	37	8	2	1	1	13
Los Angeles, Calif.	700	510	130	41	8	11	35
Pasadena, Calif.	25	17	3	2	2	1	2
Portland, Oreg.	U	U	U	U	U	U	U
Sacramento, Calif.	U	U	U	U	U	U	U
San Diego, Calif.	162	106	28	13	12	3	13
San Francisco, Calif.	150	96	28	20	5	1	19
San Jose, Calif.	213	145	48	17	1	2	20
Santa Cruz, Calif.	37	30	7	-	-	-	3
Seattle, Wash.	157	125	16	12	2	2	7
Spokane, Wash.	58	42	11	4	1	-	3
Tacoma, Wash.	118	89	15	9	3	2	11
TOTAL	11,803¶	8,089	2,219	932	300	256	742

U: Unavailable -: no reported cases

*Mortality data in this table are voluntarily reported from 122 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

†Pneumonia and influenza.

§Because of changes in reporting methods in this Pennsylvania city, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

¶Total includes unknown ages.

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The *Morbidity and Mortality Weekly Report (MMWR)* Series is prepared by the Centers for Disease Control and Prevention (CDC) and is available free of charge in electronic format and on a paid subscription basis for paper copy. To receive an electronic copy on Friday of each week, send an e-mail message to *listserv@listserv.cdc.gov*. The body content should read *SUBscribe mmwr-toc*. Electronic copy also is available from CDC's World-Wide Web server at *http://www.cdc.gov/* or from CDC's file transfer protocol server at *ftp.cdc.gov*. To subscribe for paper copy, contact Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402; telephone (202) 512-1800.

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