

MNWR

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MORBIDITY AND MORTALITY WEEKLY REPORT

Emerging Infectious Diseases

Update: Coccidioidomycosis — California, 1991–1993

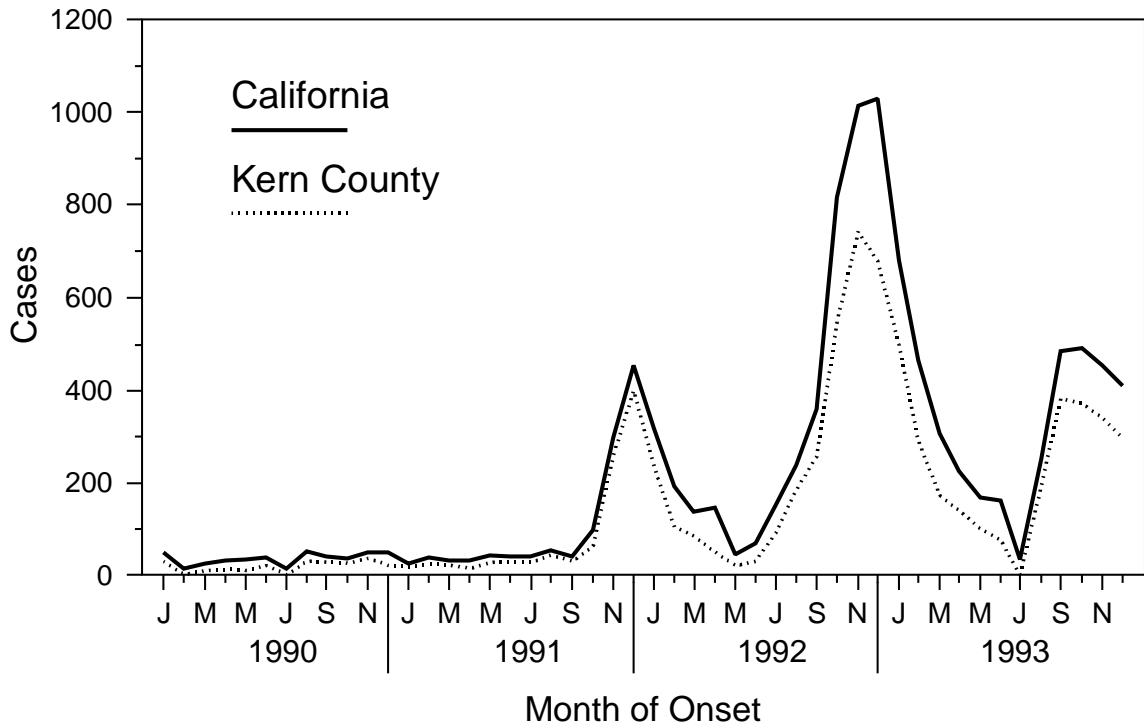
Coccidioidomycosis is an infection caused by the fungus *Coccidioides immitis*, which resides in the soil in some areas of Arizona, California, Nevada, New Mexico, Texas, and Utah. Infection can occur when airborne, infective arthroconidia are inhaled. Symptomatic coccidioidomycosis, which occurs in approximately 40% of all infections, has a wide clinical spectrum, including mild influenza-like illness, severe pneumonia, and disseminated disease. Beginning in 1991, the number of cases of coccidioidomycosis reported annually to the California Department of Health Services (CDHS) increased dramatically (1) (Figure 1). This report summarizes the occurrence of coccidioidomycosis in California during 1991–1993.

In 1991, 1200 cases of coccidioidomycosis were reported to CDHS, compared with an annual average of 428 reported cases during 1981–1990. The number of reported cases continued to increase during 1992 (4516 cases) but declined during 1993 (4137 cases). During 1991–1993, most (70%) cases in California were reported from Kern County in the San Joaquin Valley, where the incidence of coccidioidomycosis is high; in contrast, during 1981–1990, Kern County accounted for 52% of all cases. Coccidioidomycosis surveillance data are reported to CDHS by the counties as weekly case counts only.

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Editorial Note: The public health impact of coccidioidomycosis in California during 1991–1993 was substantial. For example, based on a review of medical records in Kern County alone, coccidioidomycosis accounted for approximately \$45 million in direct costs of hospitalization and outpatient care during that period (J. Caldwell, Pharm.D., Kern Medical Center, personal communication, 1994).

Factors potentially associated with the ongoing outbreak of coccidioidomycosis in California include weather conditions (e.g., protracted drought followed by heavy

*Coccidioidomycosis — Continued***FIGURE 1. Reported cases of coccidioidomycosis, by month of report — Kern County and California, 1990–1993**

rains) conducive to the growth and spread of *C. immitis*, activities that disturb the soil and facilitate airborne spread of the organism, and a large and increasing population of susceptible persons. These factors illustrate the association between environmental and demographic factors and the emergence of some infectious diseases (2,3).

During 1991–1993 and previously, the number of coccidioidomycosis cases probably has been underreported. In Kern County, unlike other counties in California, the local health department is the diagnostic laboratory for virtually all coccidioidomycosis serologic tests from suspected cases in the county and ensures that they are reported to CDHS. Although actual rates of coccidioidomycosis are probably higher in Kern County than in other California counties, the link between the diagnostic laboratory and case reporting in the county enhances coccidioidomycosis surveillance when compared with areas that rely primarily on health-care providers to report new cases.

At least two major barriers constrain the prevention of coccidioidomycosis. First, although measures to reduce exposure by minimizing dust in areas where coccidioidomycosis is endemic can lower incidence rates and may reduce severity of disease in persons who become infected, exposures to contaminated dust cannot be totally prevented (4). Second, although recovery from infection usually confers lasting protection against reinfection, suggesting a potential role for vaccination, efforts to develop a coccidioidomycosis vaccine for humans have been unsuccessful (5). Further efforts to develop vaccines can employ current genetic and biochemical methods.

In November 1993, CDHS and the Kern County Health Department convened a national meeting of experts to consider public health strategies for controlling and

Coccidioidomycosis — Continued

preventing coccidioidomycosis. Participants concluded that 1) surveillance is generally inadequate to assess the public health burden of coccidioidomycosis in the southwestern United States and that the approach used in Kern County (e.g., linking diagnostic testing to case reporting) enables more complete assessment of the public health impact of this disease; 2) despite a historical understanding of the epidemiology of coccidioidomycosis (4,6–8), efforts should be intensified to better characterize environmental, behavioral, and host risk factors for acquiring infection and developing disease; 3) although several serologic tests for the diagnosis of coccidioidomycosis (e.g., complement fixation and tube precipitin) are well characterized and perform well, the sensitivity, specificity, and reproducibility of enzyme immunoassay and other newer diagnostic tests need to be better defined (9); and 4) development of a vaccine may be the most effective strategy for preventing coccidioidomycosis.

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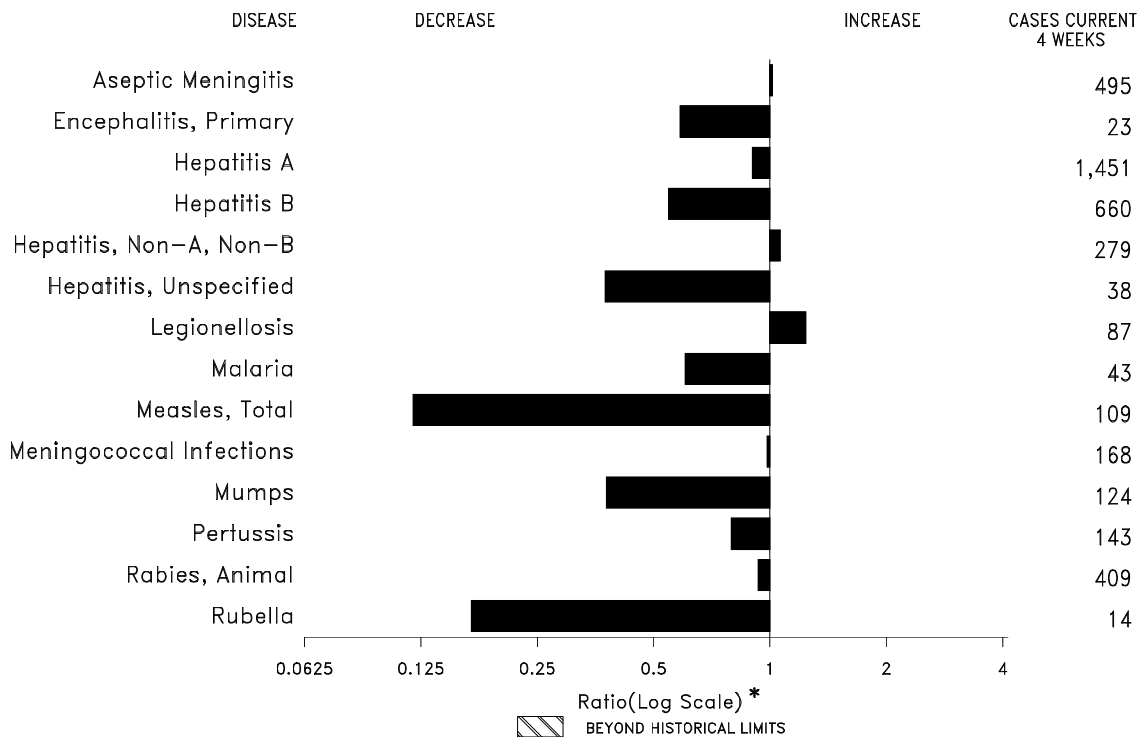
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*Effectiveness in Disease and Injury Prevention***Head Injuries Associated with Motorcycle Use —
Wisconsin, 1991**

From 1989 through 1991, a total of 9913 persons in the United States died as a result of crashes while operating or riding motorcycles (1). Although use of motorcycle helmets is an effective means for preventing crash-related fatal injuries (2), 25 states and the District of Columbia have not yet enacted laws requiring the universal use of motorcycle helmets (1). This report describes a study by the University of Wisconsin and the Wisconsin Department of Transportation in which linked police reports and hospital discharge records for 1991 were used to assess the risk for head injury for motorcyclists in motor-vehicle crashes, the initial inpatient hospital charges for motorcyclists with head injuries resulting from crashes, and the reduction in injuries and fatalities associated with universal helmet use.

(Continued on page 429)

FIGURE I. Notifiable disease reports, comparison of 4-week totals ending June 11, 1994, 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 — cases of specified notifiable diseases, United States, cumulative, week ending June 11, 1994 (23rd Week)

| | Cum. 1994 | | Cum. 1994 |
|---|-----------|---------------------------------------|-----------|
| AIDS* | 32,466 | Measles: imported | 131 |
| Anthrax | - | indigenous | 486 |
| Botulism: Foodborne | 24 | Plague | 2 |
| Infant | 30 | Poliomyelitis, Paralytic [§] | - |
| Other | 7 | Psittacosis | 16 |
| Brucellosis | 32 | Rabies, human | - |
| Cholera | 9 | Syphilis, primary & secondary | 9,286 |
| Congenital rubella syndrome | 3 | Syphilis, congenital, age < 1 year | - |
| Diphtheria | - | Tetanus | 17 |
| Encephalitis, post-infectious | 46 | Toxic shock syndrome | 98 |
| Gonorrhea | 158,307 | Trichinosis | 24 |
| <i>Haemophilus influenzae</i> (invasive disease) [†] | 556 | Tuberculosis | 8,915 |
| Hansen Disease | 49 | Tularemia | 13 |
| Leptospirosis | 12 | Typhoid fever | 155 |
| Lyme Disease | 1,519 | Typhus fever, tickborne (RMSF) | 84 |

*Updated monthly; last update May 24, 1994.

[†]Of 513 cases of known age, 149 (29%) were reported among children less than 5 years of age.

[§]No cases of suspected poliomyelitis have been reported in 1994; 3 cases of suspected poliomyelitis have been reported in 1993; 4 of the 5 suspected cases with onset in 1992 were confirmed; the confirmed cases were vaccine associated.

TABLE II. Cases of selected notifiable diseases, United States, weeks ending June 11, 1994, and June 12, 1993 (23rd Week)

| Reporting Area | AIDS* | Aseptic Meningitis | Encephalitis | | Gonorrhea | | Hepatitis (Viral), by type | | | | Legionellosis | Lyme Disease |
|----------------|--------|--------------------|--------------|-----------------|-----------|-----------|----------------------------|-----------|-----------|-------------|---------------|--------------|
| | | | Primary | Post-infectious | | | A | B | NA,NB | Unspecified | | |
| | | | Cum. 1994 | Cum. 1994 | Cum. 1994 | Cum. 1994 | Cum. 1994 | Cum. 1993 | Cum. 1994 | Cum. 1994 | | |
| UNITED STATES | 32,466 | 2,310 | 227 | 46 | 158,307 | 168,996 | 8,788 | 4,885 | 1,875 | 188 | 625 | 1,519 |
| NEW ENGLAND | 1,245 | 78 | 7 | 3 | 3,473 | 3,140 | 139 | 179 | 63 | 15 | 18 | 209 |
| Maine | 46 | 7 | 1 | - | 44 | 38 | 12 | 8 | - | - | - | 8 |
| N.H. | 28 | 7 | - | 2 | - | 25 | 5 | 15 | 6 | - | - | - |
| Vt. | 19 | 5 | - | - | 8 | 13 | 1 | - | - | - | - | 1 |
| Mass. | 638 | 28 | 4 | - | 1,270 | 1,266 | 63 | 132 | 46 | 14 | 12 | 71 |
| R.I. | 104 | 31 | 2 | 1 | 200 | 165 | 13 | 3 | 11 | 1 | 6 | 24 |
| Conn. | 410 | - | - | - | 1,951 | 1,633 | 45 | 21 | - | - | - | 105 |
| MID. ATLANTIC | 9,386 | 175 | 20 | 6 | 17,535 | 19,406 | 486 | 460 | 220 | 3 | 74 | 926 |
| Upstate N.Y. | 856 | 96 | 11 | 1 | 3,743 | 3,789 | 234 | 173 | 108 | 1 | 22 | 655 |
| N.Y. City | 5,924 | 9 | 1 | - | 6,289 | 6,056 | 56 | 39 | - | - | - | 2 |
| N.J. | 1,728 | - | - | - | 2,187 | 2,368 | 135 | 157 | 93 | - | 11 | 115 |
| Pa. | 878 | 70 | 8 | 5 | 5,316 | 7,193 | 61 | 91 | 19 | 2 | 41 | 154 |
| E.N. CENTRAL | 2,663 | 357 | 62 | 10 | 30,772 | 33,533 | 795 | 498 | 142 | 2 | 181 | 24 |
| Ohio | 479 | 92 | 18 | 1 | 10,065 | 8,850 | 286 | 86 | 12 | - | 81 | 18 |
| Ind. | 333 | 65 | 2 | - | 3,573 | 3,545 | 144 | 87 | 4 | - | 53 | 3 |
| Ill. | 1,310 | 56 | 22 | 3 | 7,560 | 11,747 | 184 | 85 | 25 | 1 | 5 | 2 |
| Mich. | 409 | 139 | 19 | 6 | 6,854 | 6,631 | 114 | 153 | 101 | 1 | 34 | 1 |
| Wis. | 132 | 5 | 1 | - | 2,720 | 2,760 | 67 | 87 | - | - | 8 | - |
| W.N. CENTRAL | 736 | 142 | 8 | 1 | 8,330 | 9,094 | 432 | 280 | 83 | 4 | 68 | 36 |
| Minn. | 198 | 13 | 1 | - | 1,463 | 1,088 | 83 | 28 | 6 | - | - | 7 |
| Iowa | 30 | 43 | - | - | 614 | 773 | 26 | 16 | 7 | 3 | 21 | 1 |
| Mo. | 315 | 46 | - | - | 4,541 | 4,964 | 182 | 207 | 57 | 1 | 33 | 17 |
| N. Dak. | 18 | 1 | 2 | - | 14 | 23 | 1 | - | - | - | 3 | - |
| S. Dak. | 9 | - | 1 | - | 85 | 90 | 15 | - | - | - | - | - |
| Nebr. | 41 | 5 | 3 | 1 | - | 476 | 65 | 12 | 4 | - | 9 | 8 |
| Kans. | 125 | 34 | 1 | - | 1,613 | 1,680 | 60 | 17 | 9 | - | 2 | 3 |
| S. ATLANTIC | 7,007 | 524 | 36 | 18 | 44,599 | 45,823 | 561 | 1,167 | 364 | 15 | 167 | 234 |
| Del. | 97 | 7 | - | - | 784 | 588 | 8 | 12 | 23 | - | 1 | 52 |
| Md. | 541 | 71 | 8 | 2 | 8,398 | 7,195 | 76 | 152 | 18 | 5 | 42 | 64 |
| D.C. | 595 | 15 | - | - | 3,187 | 2,301 | 10 | 16 | - | - | 4 | 1 |
| Va. | 517 | 73 | 12 | 5 | 5,466 | 5,110 | 59 | 54 | 17 | 2 | 4 | 22 |
| W. Va. | 10 | 8 | - | - | 313 | 257 | 4 | 10 | 15 | - | 1 | 7 |
| N.C. | 556 | 62 | 15 | - | 10,884 | 10,623 | 47 | 129 | 27 | - | 10 | 27 |
| S.C. | 554 | 13 | - | - | 5,312 | 4,429 | 12 | 17 | 3 | - | 9 | 3 |
| Ga. | 872 | 24 | 1 | - | - | 4,660 | 23 | 444 | 152 | - | 69 | 53 |
| Fla. | 3,265 | 251 | - | 11 | 10,255 | 10,660 | 322 | 333 | 109 | 8 | 27 | 5 |
| E.S. CENTRAL | 834 | 160 | 20 | 1 | 19,176 | 17,693 | 202 | 500 | 346 | 1 | 28 | 17 |
| Ky. | 147 | 54 | 8 | 1 | 1,973 | 1,973 | 85 | 44 | 12 | - | 4 | 10 |
| Tenn. | 235 | 25 | 8 | - | 5,733 | 4,787 | 65 | 420 | 326 | 1 | 14 | 6 |
| Ala. | 245 | 62 | 4 | - | 6,986 | 6,451 | 34 | 36 | 8 | - | 7 | 1 |
| Miss. | 207 | 19 | - | - | 4,484 | 4,482 | 18 | - | - | - | 3 | - |
| W.S. CENTRAL | 3,242 | 241 | 15 | 1 | 18,040 | 18,570 | 1,311 | 561 | 185 | 46 | 14 | 36 |
| Ark. | 97 | 10 | - | - | 2,906 | 2,554 | 22 | 10 | 3 | - | 4 | 1 |
| La. | 474 | 11 | 2 | - | 5,292 | 5,030 | 66 | 78 | 52 | 1 | - | - |
| Okla. | 111 | - | - | - | 496 | 1,645 | 112 | 136 | 102 | 1 | 8 | 19 |
| Tex. | 2,560 | 220 | 13 | 1 | 9,346 | 9,341 | 1,111 | 337 | 28 | 44 | 2 | 16 |
| MOUNTAIN | 1,052 | 72 | 4 | - | 3,703 | 4,978 | 1,768 | 239 | 192 | 16 | 38 | 4 |
| Mont. | 13 | - | - | - | 38 | 22 | 13 | 11 | 4 | - | 14 | - |
| Idaho | 24 | 3 | - | - | 34 | 83 | 149 | 42 | 46 | 1 | - | 1 |
| Wyo. | 11 | - | - | - | 36 | 40 | 11 | 9 | 63 | - | 2 | - |
| Colo. | 420 | 19 | 1 | - | 1,154 | 1,608 | 151 | 15 | 15 | 4 | 5 | - |
| N. Mex. | 69 | 6 | - | - | 456 | 426 | 525 | 96 | 33 | 6 | 1 | 3 |
| Ariz. | 284 | 28 | - | - | 1,234 | 1,775 | 608 | 20 | 7 | 3 | 1 | - |
| Utah | 60 | 4 | - | - | 139 | 153 | 196 | 21 | 15 | - | 3 | - |
| Nev. | 171 | 12 | 3 | - | 612 | 871 | 115 | 25 | 9 | 2 | 12 | - |
| PACIFIC | 6,301 | 561 | 55 | 6 | 12,679 | 16,759 | 3,094 | 1,001 | 280 | 86 | 37 | 33 |
| Wash. | 401 | - | - | - | 1,302 | 1,721 | 167 | 33 | 32 | 1 | 5 | - |
| Oreg. | 269 | - | - | - | 354 | 611 | 166 | 22 | 5 | 1 | - | - |
| Calif. | 5,519 | 485 | 54 | 5 | 10,346 | 13,984 | 2,641 | 918 | 238 | 82 | 29 | 33 |
| Alaska | 19 | 12 | 1 | - | 363 | 208 | 90 | 7 | - | - | - | - |
| Hawaii | 93 | 64 | - | 1 | 314 | 235 | 30 | 21 | 5 | 2 | 3 | - |
| Guam | 1 | 6 | - | - | 65 | 49 | 10 | - | - | 4 | 2 | - |
| P.R. | 903 | 15 | - | 1 | 205 | 229 | 34 | 134 | 57 | 3 | - | - |
| V.I. | 12 | - | - | - | 11 | 51 | - | 1 | - | - | - | - |
| Amer. Samoa | - | - | - | - | 15 | 12 | 4 | - | - | - | - | - |
| C.N.M.I. | - | - | - | - | 22 | 40 | 3 | - | - | - | - | - |

N: Not notifiable

U: Unavailable

C.N.M.I.: Commonwealth of Northern Mariana Islands

*Updated monthly; last update May 24, 1994.

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending June 11, 1994, and June 12, 1993 (23rd Week)

| Reporting Area | Malaria | Measles (Rubeola) | | | | | Men- gococcal infections | Mumps | | Pertussis | | | Rubella | | |
|----------------|---------|-------------------|--------------|----------------|--------------|--------------|--------------------------------|-------|--------------|-----------|--------------|--------------|---------|--------------|--------------|
| | | Indigenous | | Imported* | | Total | | 1994 | Cum. 1994 | 1994 | Cum. 1994 | Cum. 1993 | 1994 | Cum. 1994 | Cum. 1993 |
| | | 1994 | Cum. 1994 | 1994 | Cum. 1994 | Cum. 1993 | | | | | | | | | |
| UNITED STATES | 371 | 26 | 486 | 1 | 131 | 175 | 1,402 | 24 | 647 | 45 | 1,303 | 1,326 | 6 | 163 | 98 |
| NEW ENGLAND | 28 | - | 10 | - | 10 | 55 | 71 | - | 11 | - | 142 | 279 | 3 | 109 | 1 |
| Maine | 1 | - | 1 | - | 3 | - | 12 | - | 3 | - | 2 | 8 | - | - | 1 |
| N.H. | 3 | - | 1 | - | - | - | 6 | - | 4 | - | 38 | 70 | - | - | - |
| Vt. | 1 | - | - | - | 1 | 31 | 2 | - | - | - | 27 | 44 | - | - | - |
| Mass. | 11 | - | 1 | - | 4 | 15 | 28 | - | - | - | 61 | 135 | 3 | 108 | - |
| R.I. | 4 | - | 4 | - | 2 | 1 | - | - | 1 | - | 3 | 3 | - | 1 | - |
| Conn. | 8 | - | 3 | - | - | 8 | 23 | - | 3 | - | 11 | 19 | - | - | - |
| MID. ATLANTIC | 45 | 3 | 114 | 1 | 13 | 12 | 121 | 3 | 54 | 8 | 281 | 185 | - | 8 | 27 |
| Upstate N.Y. | 16 | 1 | 14 | - | - | 1 | 44 | 1 | 14 | 3 | 103 | 71 | - | 8 | 4 |
| N.Y. City | 6 | 2 | 8 | 1 [†] | 2 | 3 | 8 | - | - | 5 | 59 | 7 | - | - | 15 |
| N.J. | 16 | - | 88 | - | 9 | 8 | 33 | - | 4 | - | 6 | 36 | - | - | 7 |
| Pa. | 7 | - | 4 | - | 2 | - | 36 | 2 | 36 | - | 113 | 71 | - | - | 1 |
| E.N. CENTRAL | 40 | 8 | 40 | - | 40 | 9 | 204 | 5 | 109 | 7 | 191 | 288 | - | 8 | 2 |
| Ohio | 7 | - | 6 | - | - | 3 | 53 | 4 | 31 | 5 | 71 | 90 | - | - | 1 |
| Ind. | 10 | - | - | - | 1 | - | 37 | - | 6 | 1 | 35 | 24 | - | - | - |
| Ill. | 11 | 4 | 15 | - | 38 | 6 | 71 | - | 42 | - | 45 | 61 | - | 3 | - |
| Mich. | 11 | 4 | 16 | - | 1 | - | 25 | 1 | 27 | 1 | 22 | 16 | - | 5 | - |
| Wis. | 1 | - | 3 | - | - | - | 18 | - | 3 | - | 18 | 97 | - | - | 1 |
| W.N. CENTRAL | 18 | - | 109 | - | 41 | 3 | 102 | 2 | 32 | 1 | 58 | 84 | - | - | 1 |
| Minn. | 5 | - | - | - | - | - | 8 | - | 4 | - | 27 | 39 | - | - | - |
| Iowa | 4 | - | - | - | - | - | 12 | 1 | 9 | 1 | 6 | 1 | - | - | - |
| Mo. | 7 | - | 108 | - | 40 | 1 | 49 | - | 15 | - | 14 | 24 | - | - | 1 |
| N. Dak. | - | - | - | - | - | - | - | 1 | 2 | - | 2 | 3 | - | - | - |
| S. Dak. | - | - | - | - | - | - | 6 | - | - | - | - | 1 | - | - | - |
| Nebr. | 1 | - | - | - | 1 | - | 8 | - | 2 | - | 3 | 5 | - | - | - |
| Kans. | 1 | - | 1 | - | - | 2 | 19 | - | - | - | 6 | 11 | - | - | - |
| S. ATLANTIC | 82 | - | 7 | - | 2 | 22 | 249 | 2 | 100 | 2 | 156 | 117 | 2 | 7 | 7 |
| Del. | 3 | - | - | - | - | - | - | - | - | - | - | 1 | - | - | 2 |
| Md. | 36 | - | 1 | - | 1 | 4 | 16 | - | 23 | - | 51 | 35 | - | - | 1 |
| D.C. | 7 | - | - | - | - | - | 2 | - | - | - | 3 | 1 | - | - | - |
| Va. | 9 | - | 1 | - | 1 | 1 | 38 | - | 24 | - | 15 | 11 | - | - | - |
| W. Va. | - | - | - | - | - | - | 9 | - | 3 | - | 2 | 3 | - | - | - |
| N.C. | 2 | - | - | - | - | - | 37 | - | 26 | - | 44 | 21 | - | - | - |
| S.C. | 2 | - | - | - | - | - | 11 | - | 6 | 1 | 10 | 5 | - | - | - |
| Ga. | 11 | - | 2 | - | - | - | 56 | - | 7 | - | 11 | 11 | - | - | - |
| Fla. | 12 | - | 3 | - | - | 17 | 80 | 2 | 11 | 1 | 20 | 29 | 2 | 7 | 4 |
| E.S. CENTRAL | 11 | - | 28 | - | - | 1 | 93 | 2 | 13 | 6 | 82 | 58 | - | - | - |
| Ky. | 3 | - | - | - | - | - | 24 | - | - | - | 52 | 9 | - | - | - |
| Tenn. | 5 | - | 28 | - | - | - | 22 | 2 | 6 | 3 | 16 | 29 | - | - | - |
| Ala. | 2 | - | - | - | - | 1 | 41 | - | 1 | 3 | 13 | 15 | - | - | - |
| Miss. | 1 | - | - | - | - | - | 6 | - | 6 | - | 1 | 5 | - | - | - |
| W.S. CENTRAL | 14 | - | 7 | - | 5 | 1 | 182 | 2 | 151 | 2 | 40 | 31 | - | 7 | 12 |
| Ark. | - | - | - | - | 1 | - | 27 | - | - | 2 | 8 | 2 | - | - | - |
| La. | 2 | - | - | - | 1 | 1 | 23 | - | 15 | - | 5 | 5 | - | - | 1 |
| Okla. | 2 | - | - | - | - | - | 18 | - | 21 | - | 20 | 11 | - | 4 | 1 |
| Tex. | 10 | - | 7 | - | 3 | - | 114 | 2 | 115 | - | 7 | 13 | - | 3 | 10 |
| MOUNTAIN | 15 | 12 | 130 | - | 12 | 2 | 97 | 1 | 44 | 8 | 85 | 93 | - | 4 | 5 |
| Mont. | - | - | - | - | - | - | 2 | - | - | - | 3 | - | - | - | - |
| Idaho | 2 | - | - | - | - | - | 13 | 1 | 5 | - | 24 | 12 | - | 1 | 1 |
| Wyo. | - | - | - | - | - | - | 5 | - | 1 | - | - | 1 | - | - | - |
| Colo. | 5 | 1 | 13 | - | 1 | 2 | 12 | - | 1 | - | 18 | 43 | - | - | - |
| N. Mex. | 2 | - | - | - | - | - | 11 | N | N | 1 | 9 | 19 | - | - | - |
| Ariz. | 1 | - | - | - | - | - | 38 | - | 24 | 7 | 20 | 11 | - | - | 1 |
| Utah | 4 | 11 | 117 | - | - | - | 12 | - | 6 | - | 9 | 7 | - | 2 | 2 |
| Nev. | 1 | - | - | - | 11 | - | 4 | - | 6 | - | 2 | - | - | 1 | 1 |
| PACIFIC | 118 | 3 | 41 | - | 8 | 70 | 283 | 7 | 133 | 11 | 268 | 191 | 1 | 20 | 43 |
| Wash. | 4 | - | - | - | - | - | 20 | 1 | 4 | 1 | 13 | 19 | - | - | - |
| Oreg. | 7 | - | - | - | - | - | 46 | N | N | - | 22 | 2 | - | - | 1 |
| Calif. | 97 | 3 | 41 | - | 6 | 55 | 210 | 6 | 119 | 9 | 227 | 160 | - | 17 | 22 |
| Alaska | - | - | - | - | - | - | 2 | - | 2 | - | - | 3 | - | 1 | 1 |
| Hawaii | 10 | - | - | - | 2 | 15 | 5 | - | 8 | 1 | 6 | 7 | 1 | 2 | 19 |
| Guam | - | U | 211 | U | - | 2 | - | U | 3 | U | - | - | U | 1 | - |
| P.R. | 2 | - | 13 | - | - | 256 | 6 | - | 2 | - | 1 | 1 | - | - | - |
| V.I. | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| Amer. Samoa | - | - | - | - | - | 1 | - | - | 1 | - | 1 | 2 | - | - | - |
| C.N.M.I. | 1 | U | 26 | U | - | 1 | - | U | 1 | U | - | - | U | - | - |

*For measles only, imported cases include both out-of-state and international importations.

N: Not notifiable

U: Unavailable

[†] International

[§] Out-of-state

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending June 11, 1994, and June 12, 1993 (23rd Week)

| Reporting Area | Syphilis (Primary & Secondary) | | Toxic-Shock Syndrome | Tuberculosis | | Tula- remia | Typhoid Fever | Typhus Fever (Tick-borne) (RMSF) | Rabies, Animal |
|----------------|-----------------------------------|--------------|-------------------------|--------------|--------------|----------------|------------------|--|-------------------|
| | Cum. 1994 | Cum. 1993 | Cum. 1994 | Cum. 1994 | Cum. 1993 | Cum. 1994 | Cum. 1994 | Cum. 1994 | Cum. 1994 |
| UNITED STATES | 9,286 | 12,007 | 98 | 8,915 | 9,007 | 13 | 155 | 84 | 2,617 |
| NEW ENGLAND | 97 | 179 | 1 | 174 | 175 | - | 13 | 5 | 811 |
| Maine | 4 | 2 | - | - | 7 | - | - | - | - |
| N.H. | - | 18 | - | 7 | 7 | - | - | - | 91 |
| Vt. | - | - | - | 2 | 3 | - | - | - | 64 |
| Mass. | 37 | 83 | 1 | 85 | 93 | - | 9 | 5 | 314 |
| R.I. | 9 | 6 | - | 18 | 30 | - | 1 | - | 5 |
| Conn. | 47 | 70 | - | 62 | 35 | - | 3 | - | 337 |
| MID. ATLANTIC | 593 | 1,214 | 17 | 1,622 | 1,918 | - | 39 | - | 295 |
| Upstate N.Y. | 75 | 102 | 8 | 112 | 273 | - | 6 | - | 79 |
| N.Y. City | 288 | 628 | - | 1,064 | 1,168 | - | 23 | - | - |
| N.J. | 86 | 167 | - | 306 | 187 | - | 10 | - | 139 |
| Pa. | 144 | 317 | 9 | 140 | 290 | - | - | - | 77 |
| E.N. CENTRAL | 1,194 | 1,998 | 20 | 868 | 934 | 1 | 29 | 14 | 17 |
| Ohio | 491 | 523 | 8 | 128 | 130 | - | 2 | 9 | - |
| Ind. | 106 | 174 | 2 | 73 | 99 | - | 2 | 1 | 3 |
| Ill. | 323 | 801 | 4 | 438 | 484 | - | 16 | 2 | 3 |
| Mich. | 144 | 290 | 6 | 205 | 187 | 1 | 3 | 2 | 5 |
| Wis. | 130 | 210 | - | 24 | 34 | - | 6 | - | 6 |
| W.N. CENTRAL | 529 | 778 | 15 | 219 | 199 | 6 | - | 5 | 83 |
| Minn. | 22 | 38 | 1 | 46 | 28 | - | - | - | 8 |
| Iowa | 21 | 35 | 6 | 15 | 17 | - | - | 1 | 35 |
| Mo. | 456 | 619 | 4 | 110 | 106 | 5 | - | - | 9 |
| N. Dak. | - | 2 | - | 2 | 4 | - | - | - | 3 |
| S. Dak. | - | - | - | 9 | 9 | - | - | 3 | 11 |
| Nebr. | - | 10 | 2 | 9 | 8 | - | - | 1 | - |
| Kans. | 30 | 74 | 2 | 28 | 27 | 1 | - | - | 17 |
| S. ATLANTIC | 2,600 | 3,148 | 6 | 1,762 | 1,951 | - | 23 | 38 | 840 |
| Del. | 13 | 61 | - | - | 17 | - | 1 | - | 16 |
| Md. | 99 | 172 | - | 141 | 163 | - | 4 | - | 279 |
| D.C. | 109 | 172 | - | 47 | 80 | - | 1 | - | 2 |
| Va. | 306 | 290 | 1 | 157 | 217 | - | 3 | 2 | 170 |
| W. Va. | 8 | 2 | - | 39 | 39 | - | - | - | 33 |
| N.C. | 783 | 860 | 1 | 212 | 196 | - | - | 11 | 84 |
| S.C. | 308 | 491 | - | 185 | 177 | - | - | 1 | 80 |
| Ga. | 589 | 560 | - | 394 | 340 | - | 1 | 22 | 168 |
| Fla. | 385 | 540 | 4 | 587 | 722 | - | 13 | 2 | 8 |
| E.S. CENTRAL | 1,658 | 1,527 | 2 | 559 | 601 | - | 1 | 5 | 87 |
| Ky. | 100 | 137 | 1 | 143 | 154 | - | 1 | - | 3 |
| Tenn. | 424 | 374 | 1 | 157 | 144 | - | - | 3 | 34 |
| Ala. | 319 | 363 | - | 191 | 196 | - | - | 1 | 50 |
| Miss. | 815 | 653 | - | 68 | 107 | - | - | 1 | - |
| W.S. CENTRAL | 2,150 | 2,353 | - | 1,014 | 723 | 2 | 8 | 13 | 331 |
| Ark. | 231 | 290 | - | 111 | 79 | 2 | - | 2 | 14 |
| La. | 831 | 1,072 | - | 14 | - | - | 3 | - | 41 |
| Okla. | 15 | 160 | - | 107 | 77 | - | 1 | 9 | 18 |
| Tex. | 1,073 | 831 | - | 782 | 567 | - | 4 | 2 | 258 |
| MOUNTAIN | 137 | 106 | 4 | 186 | 213 | 3 | 6 | 4 | 36 |
| Mont. | 1 | 1 | - | 9 | 5 | 1 | - | 2 | - |
| Idaho | 5 | - | 1 | 6 | 6 | - | - | - | - |
| Wyo. | - | 3 | - | 3 | 1 | - | - | 1 | 9 |
| Colo. | 70 | 31 | 1 | 1 | 29 | - | 2 | 1 | - |
| N. Mex. | 6 | 17 | - | 27 | 18 | 1 | - | - | 2 |
| Ariz. | 27 | 42 | - | 100 | 100 | - | 1 | - | 23 |
| Utah | 5 | 2 | 2 | - | 11 | 1 | 1 | - | - |
| Nev. | 23 | 10 | - | 40 | 43 | - | 2 | - | 2 |
| PACIFIC | 328 | 704 | 33 | 2,511 | 2,293 | 1 | 36 | - | 117 |
| Wash. | 22 | 25 | - | 117 | 114 | - | 3 | - | - |
| Oreg. | 17 | 28 | - | 54 | 41 | 1 | - | - | - |
| Calif. | 285 | 647 | 30 | 2,188 | 1,986 | - | 32 | - | 88 |
| Alaska | 3 | 2 | - | 30 | 25 | - | - | - | 29 |
| Hawaii | 1 | 2 | 3 | 122 | 127 | - | 1 | - | - |
| Guam | 3 | 1 | - | 18 | 25 | - | 1 | - | - |
| P.R. | 134 | 252 | - | 33 | 82 | - | - | - | 38 |
| V.I. | 22 | 24 | - | - | 2 | - | - | - | - |
| Amer. Samoa | 1 | - | - | 3 | 1 | - | 1 | - | - |
| C.N.M.I. | 1 | 2 | - | 16 | 16 | - | 1 | - | - |

U: Unavailable

**TABLE III. Deaths in 121 U.S. cities,* week ending
June 11, 1994 (23rd Week)**

| Reporting Area | All Causes, By Age (Years) | | | | | | P&I [†] Total | Reporting Area | All Causes, By Age (Years) | | | | | | P&I [†] Total |
|---------------------|----------------------------|-------|-------|-------|------|----|---------------------------|-----------------------|----------------------------|-------|-------|-------|------|-----|---------------------------|
| | All Ages | ≥65 | 45-64 | 25-44 | 1-24 | <1 | | | All Ages | ≥65 | 45-64 | 25-44 | 1-24 | <1 | |
| NEW ENGLAND | 584 | 398 | 98 | 61 | 16 | 11 | 38 | S. ATLANTIC | 1,350 | 844 | 261 | 167 | 53 | 24 | 71 |
| Boston, Mass. | 163 | 97 | 36 | 19 | 8 | 3 | 17 | Atlanta, Ga. | 143 | 73 | 35 | 30 | 3 | 2 | 4 |
| Bridgeport, Conn. | 42 | 33 | 4 | 2 | 1 | 2 | 4 | Baltimore, Md. | 229 | 134 | 49 | 36 | 9 | 1 | 19 |
| Cambridge, Mass. | 25 | 21 | 2 | 2 | - | - | - | Charlotte, N.C. | 107 | 64 | 27 | 5 | 10 | 1 | 9 |
| Fall River, Mass. | 33 | 27 | 3 | 2 | 1 | - | - | Jacksonville, Fla. | 145 | 97 | 25 | 14 | 6 | 3 | 5 |
| Hartford, Conn. | 52 | 24 | 11 | 13 | 2 | 2 | 2 | Miami, Fla. | 131 | 76 | 23 | 25 | 5 | 2 | - |
| Lowell, Mass. | 18 | 14 | 2 | 1 | 1 | - | 2 | Norfolk, Va. | 66 | 43 | 12 | 4 | 4 | 3 | 4 |
| Lynn, Mass. | 11 | 7 | 3 | 1 | - | - | - | Richmond, Va. | 107 | 71 | 14 | 13 | 7 | 2 | 5 |
| New Bedford, Mass. | 25 | 21 | 2 | 2 | - | - | - | Savannah, Ga. | 53 | 39 | 9 | 3 | 1 | 1 | 3 |
| New Haven, Conn. | 46 | 29 | 10 | 3 | 2 | 2 | - | St. Petersburg, Fla. | 71 | 48 | 17 | 2 | 2 | 2 | 4 |
| Providence, R.I. | 38 | 28 | 6 | 4 | - | - | 4 | Tampa, Fla. | 174 | 121 | 30 | 18 | 2 | 2 | 14 |
| Somerville, Mass. | 6 | 5 | - | 1 | - | - | - | Washington, D.C. | 115 | 72 | 20 | 15 | 4 | 4 | 4 |
| Springfield, Mass. | 41 | 26 | 7 | 7 | - | 1 | 2 | Wilmington, Del. | 9 | 6 | - | 2 | - | 1 | - |
| Waterbury, Conn. | 26 | 21 | 4 | 1 | - | - | 2 | E.S. CENTRAL | 774 | 509 | 167 | 56 | 29 | 13 | 42 |
| Worcester, Mass. | 58 | 45 | 8 | 3 | 1 | 1 | 5 | Birmingham, Ala. | 115 | 71 | 26 | 7 | 7 | 4 | 1 |
| MID. ATLANTIC | 2,678 | 1,758 | 530 | 279 | 56 | 55 | 122 | Chattanooga, Tenn. | 77 | 64 | 7 | 5 | 1 | - | 3 |
| Albany, N.Y. | 52 | 36 | 9 | 5 | - | 2 | 2 | Knoxville, Tenn. | 65 | 36 | 17 | 7 | 3 | 2 | 6 |
| Allentown, Pa. | 21 | 17 | 2 | 2 | - | - | - | Lexington, Ky. | 44 | 25 | 12 | 2 | 4 | 1 | 2 |
| Buffalo, N.Y. | 100 | 73 | 16 | 5 | 4 | 2 | 2 | Memphis, Tenn. | 167 | 113 | 40 | 9 | 4 | 1 | 17 |
| Camden, N.J. | 31 | 14 | 6 | 5 | 5 | 1 | 1 | Mobile, Ala. | 85 | 63 | 8 | 8 | 3 | 3 | 8 |
| Elizabeth, N.J. | 19 | 13 | 6 | - | - | - | - | Montgomery, Ala. | 53 | 25 | 21 | 6 | 1 | - | - |
| Erie, Pa.§ | 40 | 28 | 10 | 1 | 1 | - | 7 | Nashville, Tenn. | 168 | 112 | 36 | 12 | 6 | 2 | 5 |
| Jersey City, N.J. | 33 | 19 | 7 | 7 | - | - | - | W.S. CENTRAL | 1,432 | 881 | 307 | 150 | 57 | 37 | 93 |
| New York City, N.Y. | 1,289 | 796 | 270 | 170 | 26 | 27 | 40 | Austin, Tex. | 76 | 50 | 12 | 14 | - | - | 5 |
| Newark, N.J. | 66 | 32 | 17 | 9 | 3 | 5 | 4 | Baton Rouge, La. | 68 | 47 | 9 | 6 | 3 | 3 | 4 |
| Paterson, N.J. | 29 | 9 | 7 | 10 | 2 | 1 | - | Corpus Christi, Tex. | 71 | 42 | 19 | 8 | 2 | - | 4 |
| Philadelphia, Pa. | 596 | 428 | 105 | 44 | 11 | 8 | 41 | Dallas, Tex. | 187 | 100 | 44 | 26 | 10 | 7 | 3 |
| Pittsburgh, Pa.§ | 55 | 41 | 12 | 2 | - | - | 2 | El Paso, Tex. | 66 | 40 | 15 | 5 | 5 | 1 | 4 |
| Reading, Pa. | 15 | 10 | 2 | 3 | - | - | 1 | Ft. Worth, Tex. | 115 | 71 | 23 | 13 | 6 | 2 | 10 |
| Rochester, N.Y. | 124 | 93 | 20 | 5 | - | 6 | 11 | Houston, Tex. | 369 | 212 | 82 | 49 | 14 | 12 | 28 |
| Schenectady, N.Y. | 20 | 14 | 4 | 2 | - | - | 3 | Little Rock, Ark. | 85 | 59 | 18 | 4 | 2 | 2 | 3 |
| Scranton, Pa.§ | 37 | 31 | 6 | - | - | - | 2 | New Orleans, La. | U | U | U | U | U | U | U |
| Syracuse, N.Y. | 104 | 68 | 24 | 7 | 3 | 2 | 5 | San Antonio, Tex. | 219 | 146 | 50 | 15 | 5 | 3 | 16 |
| Trenton, N.J. | 24 | 19 | 3 | 1 | - | 1 | 1 | Shreveport, La. | 34 | 23 | 6 | 2 | 2 | 1 | 6 |
| Utica, N.Y. | 23 | 17 | 4 | 1 | 1 | - | - | Tulsa, Okla. | 142 | 91 | 29 | 8 | 8 | 6 | 10 |
| Yonkers, N.Y. | U | U | U | U | U | U | U | MOUNTAIN | 936 | 614 | 183 | 87 | 29 | 21 | 70 |
| E.N. CENTRAL | 2,389 | 1,462 | 438 | 279 | 131 | 79 | 142 | Albuquerque, N.M. | 84 | 55 | 15 | 11 | 2 | 1 | 2 |
| Akron, Ohio | 43 | 31 | 6 | 4 | 1 | 1 | 2 | Colo. Springs, Colo. | 51 | 29 | 12 | 8 | 1 | 1 | 7 |
| Canton, Ohio | 31 | 24 | 3 | 3 | - | 1 | 2 | Denver, Colo. | 98 | 62 | 20 | 9 | 3 | 4 | 5 |
| Chicago, Ill. | 527 | 222 | 96 | 97 | 75 | 37 | 49 | Las Vegas, Nev. | 205 | 137 | 43 | 17 | 7 | 1 | 7 |
| Cincinnati, Ohio | 113 | 74 | 29 | 8 | - | 2 | 10 | Ogden, Utah | 30 | 20 | 7 | 2 | 1 | - | 2 |
| Cleveland, Ohio | 146 | 91 | 32 | 18 | 2 | 3 | 5 | Phoenix, Ariz. | 216 | 142 | 37 | 25 | 5 | 7 | 24 |
| Columbus, Ohio | 197 | 122 | 31 | 27 | 9 | 8 | 7 | Pueblo, Colo. | 21 | 16 | 2 | - | 1 | 2 | 3 |
| Dayton, Ohio | 118 | 84 | 19 | 11 | 2 | 2 | 9 | Salt Lake City, Utah | 92 | 55 | 20 | 7 | 6 | 2 | 6 |
| Detroit, Mich. | 276 | 153 | 61 | 37 | 18 | 7 | 3 | Tucson, Ariz. | 139 | 98 | 27 | 8 | 3 | 3 | 14 |
| Evansville, Ind. | 51 | 36 | 10 | 4 | - | 1 | 4 | PACIFIC | 2,194 | 1,469 | 398 | 224 | 60 | 41 | 145 |
| Fort Wayne, Ind. | 65 | 46 | 13 | 3 | 3 | - | 3 | Berkeley, Calif. | 15 | 7 | 2 | 3 | 1 | 2 | - |
| Gary, Ind. | 33 | 21 | 8 | 3 | 1 | - | 1 | Fresno, Calif. | 109 | 72 | 22 | 9 | 4 | 2 | 12 |
| Grand Rapids, Mich. | 59 | 41 | 9 | 4 | 4 | 1 | 5 | Glendale, Calif. | 33 | 29 | 3 | 1 | - | - | 2 |
| Indianapolis, Ind. | 226 | 152 | 41 | 23 | 8 | 2 | 9 | Honolulu, Hawaii | 67 | 42 | 14 | 5 | 2 | 4 | 7 |
| Madison, Wis. | 48 | 31 | 9 | 7 | 1 | - | 1 | Long Beach, Calif. | 88 | 64 | 16 | 4 | 2 | 2 | 11 |
| Milwaukee, Wis. | 121 | 79 | 27 | 11 | 1 | 3 | 9 | Los Angeles, Calif. | 672 | 458 | 113 | 70 | 20 | 9 | 25 |
| Peoria, Ill. | 45 | 33 | 6 | 2 | 1 | 3 | 5 | Pasadena, Calif. | 34 | 22 | 8 | 2 | 2 | - | 3 |
| Rockford, Ill. | 59 | 44 | 8 | 4 | 2 | 1 | 4 | Portland, Ore. | 138 | 90 | 26 | 15 | 5 | 2 | 5 |
| South Bend, Ind. | 32 | 23 | 4 | 3 | 1 | 1 | 1 | Sacramento, Calif. | 182 | 131 | 30 | 16 | 3 | 2 | 15 |
| Toledo, Ohio | 118 | 98 | 12 | 5 | 2 | 1 | 9 | San Diego, Calif. | 148 | 85 | 40 | 15 | 5 | 3 | 15 |
| Youngstown, Ohio | 81 | 57 | 14 | 5 | - | 5 | 4 | San Francisco, Calif. | 150 | 92 | 31 | 25 | 2 | - | 17 |
| W.N. CENTRAL | 779 | 559 | 116 | 57 | 23 | 23 | 42 | San Jose, Calif. | 219 | 155 | 32 | 22 | 2 | 8 | 24 |
| Des Moines, Iowa | 58 | 45 | 8 | 4 | 1 | - | 4 | Santa Cruz, Calif. | 25 | 15 | 4 | 2 | 4 | - | 2 |
| Duluth, Minn. | 27 | 20 | 3 | 2 | 1 | 1 | 2 | Seattle, Wash. | 165 | 107 | 28 | 21 | 5 | 4 | 3 |
| Kansas City, Kans. | 33 | 22 | 6 | 3 | 1 | 1 | - | Spokane, Wash. | 54 | 42 | 7 | 3 | 1 | 1 | 1 |
| Kansas City, Mo. | 83 | 57 | 14 | 8 | 2 | 2 | 2 | Tacoma, Wash. | 95 | 58 | 22 | 11 | 2 | 2 | 3 |
| Lincoln, Nebr. | 38 | 34 | 1 | 2 | 1 | - | 4 | TOTAL | 13,116 [†] | 8,494 | 2,498 | 1,360 | 454 | 304 | 765 |
| Minneapolis, Minn. | 186 | 131 | 34 | 10 | 6 | 5 | 13 | | | | | | | | |
| Omaha, Nebr. | 82 | 60 | 10 | 7 | 2 | 3 | 3 | | | | | | | | |
| St. Louis, Mo. | 124 | 86 | 22 | 6 | 4 | 6 | 8 | | | | | | | | |
| St. Paul, Minn. | 58 | 40 | 10 | 5 | 2 | 1 | 3 | | | | | | | | |
| Wichita, Kans. | 90 | 64 | 8 | 10 | 3 | 4 | 3 | | | | | | | | |

*Mortality data in this table are voluntarily reported from 121 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 these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

[¶]Total includes unknown ages.

U: Unavailable.

Head Injuries — Continued

For this report, motorcyclists were defined as persons who were operating or riding as a passenger on a motorcycle. Wisconsin was one of seven states funded under the Crash Outcome Data Evaluation Systems project of the National Highway Traffic Safety Administration to generate linked statewide data systems. Because personal identifiers were not available, Police Accident Reports from the Wisconsin Department of Transportation and inpatient discharge records for acute-care hospitals from the state's Office of the Commissioner of Insurance were linked through a probabilistic method (which calculates the likelihood that a police report and a discharge record represent the same person) using date of the event—the crash or the hospital admission—and the motorcyclist's birth date, sex, and zip code of residence. Secondary linking variables were the county of the event, the health service area of the event, the injury, and whether the person was transported by ambulance from the crash. Uncertain matches were reviewed manually using additional corroborating information, such as *International Classification of Diseases, Ninth Revision, Clinical Modification* (ICD-9-CM) external cause of injury codes and consistency with known patterns of trauma referral and injury resulting from motor-vehicle crashes. Approximately 7% of the matches made by computer between police reports and hospital records were incorrect.

Based on ICD-9-CM diagnostic codes in the discharge record, head injuries were classified into three mutually exclusive categories: 1) brain injury, defined as any diagnosis of intracranial injury with or without skull fracture, intracranial hemorrhage following injury, or loss of consciousness for 1 hour or more; 2) skull fracture with no intracranial injury; and 3) concussion with only brief (less than 1 hour) or no loss of consciousness.

Of the 3184 motorcyclists involved in police-reported crashes in Wisconsin in 1991, 2015 (63.3%) were unhelmeted and 994 (31.2%) were helmeted at the time of the crash. Helmet use was unknown for 175 (5.5%), four of whom were fatally injured; of 32 who were hospitalized, 13 incurred head injuries. Of those motorcyclists for whom helmet status was known, 545 were hospitalized and 74 died, including 55 who were unhelmeted and 19 who were helmeted. Of the 545 hospitalized, 187 (34.3%) had sustained a head injury (Table 1). Overall, unhelmeted motorcyclists involved in police-reported crashes were more than twice as likely to be hospitalized for a head injury (153 [7.6%]) than were helmeted riders (34 [3.4%]). Brain injury occurred among 97 (4.8%) of those who were unhelmeted and 17 (1.7%) of those who were helmeted (rate ratio [RR]=2.9, 95% confidence interval [CI]=1.7–4.9); the rate for skull fracture among unhelmeted riders (0.9%) was 4.5 times (95% CI=1.0–19.2) that among helmeted riders (0.2%). The rate for concussions among unhelmeted motorcyclists involved in crashes (1.9%) was higher than that for helmeted riders (1.5%) (RR=1.3; 95% CI=0.7–2.3).

Total initial* inpatient hospital charges for the 97 unhelmeted motorcyclists with brain injuries was \$2,396,366—compared with \$333,619 for the 17 helmeted motorcyclists with brain injuries (Table 1). Average initial hospital charges for unhelmeted motorcyclists with brain injuries were \$24,705, compared with \$19,624 for helmeted motorcyclists with brain injuries.

*Initial hospital charges were used as a proxy for hospital costs, which are only a portion of direct medical costs. Initial hospital charges do not include physician fees, emergency department charges, or costs after discharge for subsequent hospitalizations, long-term care, and rehabilitation.

*Head Injuries — Continued***TABLE 1. Number and rate of head injury outcomes and hospital charges* for motorcyclists and rate ratios for unhelmeted versus helmeted crash-involved motorcycle riders† — Wisconsin, 1991**

| Injury | Unhelmeted motorcyclists (n=2015) | | | Helmeted motorcyclists (n=994) | | | Rate ratio | 95% CI [¶] |
|--|--------------------------------------|-------------------|---------------------|-----------------------------------|-------------------|---------------------|---------------|---------------------|
| | No. | Rate [§] | Hospital charges | No. | Rate [§] | Hospital charges | | |
| Brain injury | 97 | 4.8 | \$2,396,366 | 17 | 1.7 | \$333,619 | 2.9 | (1.7– 4.9) |
| Skull fracture without intra- cranial injury | 18 | 0.9 | \$ 222,707 | 2 | 0.2 | \$ 10,838 | 4.5 | (1.0–19.2) |
| Concussion | 38 | 1.9 | \$ 278,786 | 15 | 1.5 | \$ 60,037 | 1.3 | (0.7– 2.3) |
| Total | 153 | 7.6 | \$2,897,859 | 34 | 3.4 | \$404,494 | 2.2 | (1.6– 3.4) |

* Includes charges for initial hospitalization; does not include physician fees, emergency department charges, or medical costs after discharge.

† n=3184. Excludes 175 persons for whom helmet use was unknown.

§ Per 100 crash-involved motorcyclists.

¶ Confidence interval.

Although some crashes will be so severe that a motorcycle helmet will not prevent brain injury or death, the proportion of injuries that could have been prevented if a motorcycle helmet had been worn by all riders was estimated for each category of head injury and death (3). These estimates assume that if unhelmeted motorcyclists wore helmets and experienced a similar distribution of outcomes as helmeted motorcyclists, then universal helmet use by all motorcyclists in Wisconsin during 1991 potentially would have prevented 60 brain injuries, 13 skull fractures with no intracranial injury, and eight concussions. In addition, universal helmet use potentially would have prevented 14 (18.9%) deaths.

Reported by: TA Karlson, PhD, CA Quade, Center for Health Systems Research and Analysis, Univ of Wisconsin, Madison; Wisconsin Dept of Transportation. Div of Unintentional Injury Prevention, National Center for Injury Prevention and Control, CDC.

Editorial Note: Motorcycle helmets are designed to protect users against injury to the brain and other head injuries. The findings in this report indicate that the use of motorcycle helmets lowers the rate of head injury. Although helmet use is approximately 99% in states with universal requirements, use is substantially less in states with laws that apply only to subgroups of the population (4). For example, in Wisconsin, where the law applies only to riders aged <19 years, observed helmet use is 42% for all motorcycle riders (5).

The findings in this report are subject to at least four limitations. First, incorrectly matched police reports and hospital records diminish the measure of the protective effect of helmets. Second, some motorcycle crashes in Wisconsin may not have been reported to police—in particular, crashes occurring in areas adjacent to other states for which medical treatment may have been obtained in those states. Third, this study evaluated only hospitalized motorcycle riders; the differences in injury rates and health-care costs for unhelmeted riders compared with helmeted riders probably would have been greater if data from emergency departments and long-term-care facilities had been available and analyzed. Skull fractures and concussions are usually associated with complete recovery, but more severe injuries to the brain can result in lifelong disability (6). Fourth, this study did not control for injuries other than head

Head Injuries — Continued

injuries. In a Washington study that controlled for severity of injuries other than head injury, motorcycle helmets were effective in limiting the occurrence of head injury, the need for and duration of mechanical ventilation, the length of intensive-care stay, and the need for rehabilitation (7). Previous studies indicate that unhelmeted riders who are injured are more likely to be admitted to a hospital as an inpatient, be permanently impaired, and require ambulance service, neurosurgery, intensive care, rehabilitation, and long-term care (4).

Although the source of payment for hospitalization was not analyzed in this report, findings from previous reports indicate that public monies underwrite 25%–50% of the costs associated with motorcycle crashes (4). State-specific data on the costs for hospitalizations—initial, long-term, and public—for unhelmeted riders may assist state legislators in making informed decisions regarding the passage and retention of these laws.

This report illustrates how linked data can help provide information on the potential health-care costs associated with public policies intended to prevent motor-vehicle-related injuries. Linkage of existing data systems can assist in the characterization of motorcycle and other motor-vehicle-crash events, injury severity, and cost for non-fatal injuries. Probabilistic linkage allows large files to be linked rapidly, potentially providing information about persons involved in crashes and the severity of their injuries, the treatment they received, and charges for treatment; this information could be linked with data on the public costs of injuries associated with risk-taking behavior (e.g., drinking and driving), nonuse of safety belts and motorcycle helmets, and speeding. The Wisconsin Department of Transportation is using information from linked data about medical outcomes and the costs of crash-related injuries resulting from motorcycle and other motor-vehicle crashes to plan interventions and evaluate their impact.

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