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*Epidemiologic Notes and Reports*

## Inadequate Immune Response Among Public Safety Workers Receiving Intradermal Vaccination Against Hepatitis B — United States, 1990–1991

The Immunization Practices Advisory Committee (ACIP) recommends that hepatitis B vaccine be administered by the intramuscular (IM) route (*1*). However, since November 1990, public safety departments have reported to CDC at least four instances of poor immune response among public safety workers vaccinated against hepatitis B by the intradermal (ID) route of administration.

**Report 1.** In December 1990, the fire and police departments in Tuscaloosa, Alabama, contracted with a private company to have hepatitis B vaccine administered to all employees. The cost of vaccination was $100 per employee; this fee included three doses of vaccine and postvaccination testing but did not include the costs of phlebotomy or additional doses of vaccine. All employees were vaccinated with 0.1 mL (1/10 the ACIP-recommended IM dose) of recombinant hepatitis B vaccine by the ID route at months 0, 1, and 6; postvaccination serum samples were obtained 4–6 weeks after the third dose had been administered.

A total of 226 employees were vaccinated; of these, 213 (94%) were men. Forty-nine (22%) were aged 23–29 years; 98 (43%), 30–39 years; and 79 (35%), ≥40 years. The contractor reported that, of the 226 employees, 108 (48%) had adequate serologic responses* to the three-dose series. The contractor also reported that vaccinees <40 years of age were more likely to have responded adequately than those ≥40 years of age (56% vs. 34%; $p<0.01$; chi-square test). The contractor offered to administer two additional doses by the ID route to nonresponders for $70 per person, thereby increasing the potential cost of vaccination for all employees to an average of $137 per vaccinee.

*For the private contractors used in reports 1–4, the specific laboratory testing methods and the definition of adequate antibody response are not known.

*Intradermal Hepatitis B Vaccination — Continued*

**Report 2.** During 1989, a public safety department in Fairhaven, Massachusetts, contracted with a private company to have public employees (including fire, police, and visiting nurse personnel) vaccinated with recombinant hepatitis B vaccine. The department reported that of 62 employees who were vaccinated, 30 (48%) adequately responded to three 0.1-mL doses administered by the ID route. Of the 32 nonresponders, 31 (97%) developed protective levels of antibody to hepatitis B surface antigen (anti-HBs) after vaccination with an additional 1.0-mL dose by the IM route. The average cost per employee for the vaccine program was $130, including the IM dose for nonresponders and postvaccination testing.

**Report 3.** In April 1989, a fire department in Quincy, Illinois, contracted with a private company to have recombinant hepatitis B vaccine administered to employees by the ID route using three 0.1-mL doses. The average age of the 59 vaccinated employees was 40 years; all were male. The contractor reported that 14 (24%) developed protective levels of anti-HBs. Nonresponders were vaccinated with one additional dose by the ID route; if adequate antibody titers did not develop, an additional dose by the same route was administered. Of the 45 employees who were vaccinated with either one or two additional doses, 41 (91%) developed protective levels of anti-HBs. The remaining four nonresponders were vaccinated with a second three-dose series by the ID route; postvaccination test results are pending. The second series cost an additional $105 for each of the four nonresponders; the overall average cost for the vaccination program was $132 per employee.

**Report 4.** In 1988, the Santa Barbara, California, fire department contracted with a private company to have hepatitis B vaccine administered to employees. The contractor vaccinated 44 of the 87 male and all nine female employees (average age of vaccinees: 33 years) with three 0.1-mL doses of recombinant hepatitis B vaccine by the ID route. Postvaccination testing indicated that 21 (40%) employees developed protective levels of anti-HBs. Because of the low response rate after ID vaccination, the remaining 43 male employees (average age: 33 years) were vaccinated by the IM route; after three vaccine doses, protective levels developed in 41 (95%) persons.

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**Editorial Note:** Infection with hepatitis B virus is an occupational risk for persons who have direct contact with blood or body fluids (*2*). CDC has recommended that health-care workers who have contact with blood or body fluids use universal precautions and that workers with occupational exposure to blood be vaccinated with hepatitis B vaccine (*3*). Regulations regarding these recommendations have been proposed by the Occupational Safety and Health Administration (*4*).

Some organizations have attempted to decrease the cost of employee hepatitis B vaccination by administering 1/10 the recommended IM vaccine dose by the ID route; however, hepatitis B vaccine is not licensed by the FDA for ID administration. In addition, ACIP recommends that hepatitis B vaccine be administered by the ID route only when a research protocol is used that includes informed consent from vaccinees and postvaccination antibody testing to detect nonresponders, who would then be eligible for revaccination (*1*).

*Intradermal Hepatitis B Vaccination — Continued*

In general, plasma-derived hepatitis B vaccine has induced seroconversion in similar proportions of vaccinees when vaccine has been administered by the IM and ID routes (*5*). However, immune responses to recombinant vaccine have not been equivalent after IM and ID vaccination. At least four studies have directly compared the immunogenicity of 1.0-mL doses of recombinant vaccine administered by the IM route to 0.1-mL doses administered by the ID route; in three of these, a greater proportion of vaccinees were protected after three IM doses (94%–97%) than after three ID doses (55%–78%) (*6–8*). In one study, the immune response was equivalent in both the IM and ID groups (*9*); however, the gender composition of these groups differed.

Age- and sex-specific variations in immune response may partially account for the poor immune responses to ID vaccination programs described in this report. In previous studies of recombinant vaccine, a smaller proportion of men (64%–71%) than women (87%–92%) responded to ID vaccination (*6,10*); in addition, both IM and ID vaccination routes induce better immune responses in younger vaccinees (*10*). Because of the generally poor immune response to ID vaccination and the demographic composition of public safety workers (e.g., some groups may consist predominantly of men, many of whom may be >40 years of age), ID vaccination for public safety workers is not recommended. In comparison, the findings from Santa Barbara indicate that the recommended IM route of administration can induce excellent levels of protection against hepatitis B infection among public safety workers. In addition, the suitability of this approach was demonstrated by a program in Phoenix, Arizona, when in 1988 the Phoenix fire department vaccinated 820 male and 30 female employees with hepatitis B vaccine by the IM route (average age of vaccinees: 32 years). Of the 850 vaccinated persons, 803 (94%) developed protective levels of anti-HBs at a cost of $140 per employee, including postvaccination testing.

Because ID administration of hepatitis B vaccine induces a poor immune response, especially in older men, any potential savings in costs resulting from ID administration of 1/10 the recommended vaccine dose will likely be negated by the costs of required postvaccination testing and additional vaccination of nonresponders. Assuming a full retail cost of $130 for three 1.0-mL doses of vaccine and a $10 cost for administration, the cost of IM vaccination is approximately $140 per vaccinee. Postvaccination antibody testing, which can add to the cost, should be considered for health-care workers at risk for percutaneous or permucosal exposure (*1*), although such testing may not be needed for others at lower occupational risk for hepatitis B.

ACIP has not recommended the ID administration of hepatitis B vaccine, and FDA has not licensed hepatitis B vaccine for ID administration. Moreover, ID vaccination programs offered by private contractors do not offer substantial cost savings over IM vaccination and may fail to induce immunity in a substantial proportion of vaccinees. For these reasons, vaccination programs should not use the ID route of administration.

*References*

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*Intradermal Hepatitis B Vaccination — Continued*

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## *Current Trends*

### Childhood Cancers — New Jersey, 1979–1985

In New Jersey, cancers among children aged 0–14 years account for fewer than 1% of all cancers diagnosed annually; however, childhood cancers account for the greatest number of years of potential life lost from cancer. This report summarizes a study by the New Jersey State Department of Health (NJSDH) that determined the incidence and death rates for the most frequent cancers among children aged 0–14 years in New Jersey during 1979–1985; these rates are compared with those for the United States for a comparable period.

Incidence data were obtained from the New Jersey State Cancer Registry. The childhood cancer incidence data analyzed included the most frequent cancers among children reported to the NJSDH from hospitals, laboratories, and private practitioners, and cases identified through review of New Jersey death certificates. The mortality data were extracted from the state's vital statistics mortality data tapes. Incidence and death rates were age-adjusted to the 1970 U.S. population. National estimated incidence rates were obtained from the Surveillance, Epidemiology, and End Results (SEER) Program of the National Cancer Institute*; death rates were based on national data and were age-adjusted to the 1970 U.S. population (*1*).

From 1979 through 1985, incidence rates of childhood cancers remained relatively stable in New Jersey, while death rates decreased steadily (Figure 1). Although incidence rates for total childhood cancer in New Jersey were higher than the national rates, death rates for New Jersey were virtually identical to U.S. rates.

During the 7-year period, cancer was diagnosed annually in an average of 240 children in New Jersey, most (83%) of whom were white. Each year, an average of 64 children died from cancers—leukemia (31% of deaths), brain and central nervous system cancers (20%), lymphomas (11%), renal cancer (6%), bone and joint cancer (4%), eye and orbit cancer (3%), and all other cancers (24%). This distribution is

*The SEER Program comprises cases from nine population-based cancer registries throughout the United States.

*Childhood Cancers — Continued*

similar to that for cases observed in the SEER Program, which identified an average of 7800 cases of childhood cancers yearly. During the 7-year period, death rates from lymphomas decreased among children in the United States and in New Jersey.

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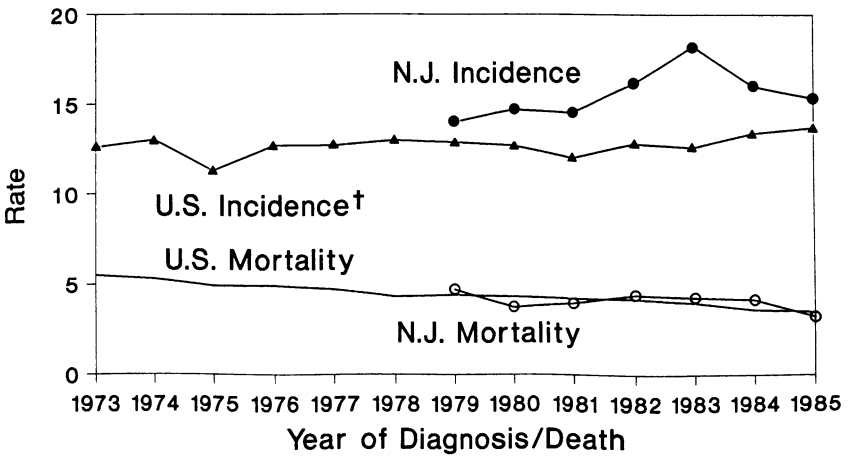
**Editorial Note:** Although the overall incidence of cancer is low among children, cancer is the major cause of deaths attributed to disease in children in the United States (*2*). During 1950–1985, the incidence rate of childhood cancers increased by 32%, while the death rate decreased 56% (*1*)—primarily because of advances in treatment of many forms of childhood cancers. In 1991, an estimated 7800 new cases of childhood cancers will occur in the United States, and approximately 1500 children will die from cancers (*2*).

New Jersey accounts for approximately 3.7% of the estimated 7800 childhood cancers that occur annually in the United States. Although the incidence rate of childhood cancers in New Jersey was higher than that of the United States, similarities in death rates suggest that health-care providers and programs in New Jersey have been successful in aggressively screening, identifying, and treating childhood cancers.

The NJSDH shares cancer registry data and collaborates with other institutions in the state to address childhood cancers and other diseases. For example, the New Jersey Pediatric Hematology Oncology Network has collaborated with the NJSDH to develop a statewide neonatal hemoglobinopathy screening program (*3*). Five institutions have been designated as regional treatment centers to confirm initial screening diagnosis, educate parents about the diseases, and provide comprehensive treatment for sickle cell disease and other hemoglobinopathies. In addition, the state, local, professional, and community pediatric networks have assisted in clarifying the

*(Continued on page 579)*

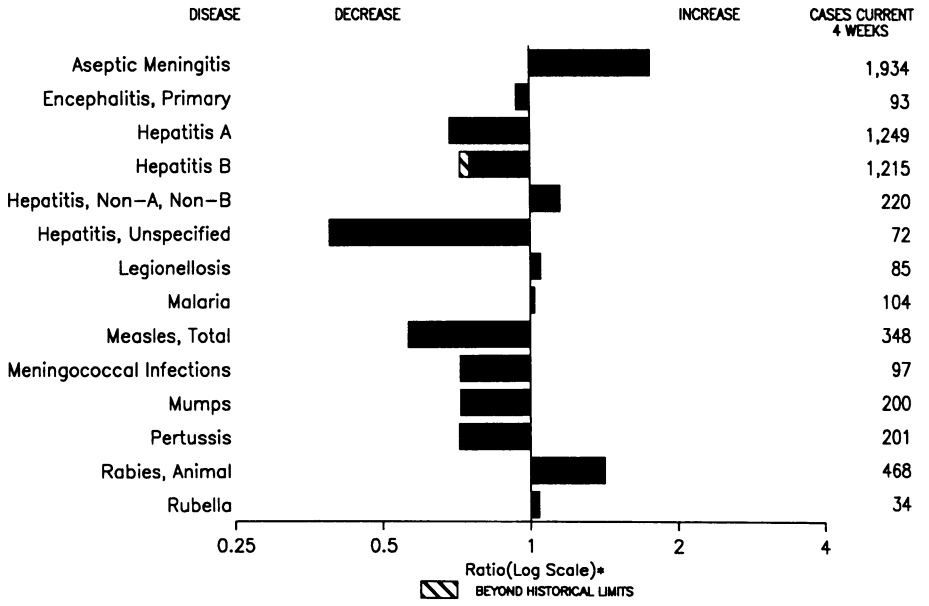
**FIGURE 1. Annual age-adjusted incidence and death rates* of childhood cancers — New Jersey, 1979–1985, and United States, 1973–1985**




*Per 100,000 population.

†Surveillance, Epidemiology, and End Results Program of the National Cancer Institute.

**FIGURE I. Notifiable disease reports, comparison of 4-week totals ending August 17, 1991, with historical data — United States**




*Ratio of current 4-week total to the 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 August 17, 1991 (33rd Week)**

| | Cum. 1991 | | Cum. 1991 |
|---|---|---|---|
| AIDS | 27,882 | Measles: imported | 148 |
| Anthrax | - | indigenous | 7,809 |
| Botulism: Foodborne | 11 | Plague | 1 |
| Infant | 39 | Poliomyelitis, Paralytic* | - |
| Other | 4 | Psittacosis | 56 |
| Brucellosis | 45 | Rabies, human | - |
| Cholera | 15 | Syphilis, primary & secondary | 25,582 |
| Congenital rubella syndrome | 13 | Syphilis, congenital, age < 1 year | 12 |
| Diphtheria | 2 | Tetanus | 26 |
| Encephalitis, post-infectious | 57 | Toxic shock syndrome | 193 |
| Gonorrhea | 366,131 | Trichinosis | 55 |
| *Haemophilus influenzae* (invasive disease) | 2,023 | Tuberculosis | 13,927 |
| Hansen Disease | 96 | Tularemia | 101 |
| Leptospirosis | 38 | Typhoid fever | 239 |
| Lyme Disease | 4,759 | Typhus fever, tickborne (RMSF) | 356 |

*Three suspected cases of poliomyelitis have been reported in 1991; none of the 8 suspected cases in 1990 have been confirmed to date. Five of the 13 suspected cases in 1989 were confirmed and all were vaccine associated.

# TABLE II. Cases of selected notifiable diseases, United States, weeks ending August 17, 1991, and August 18, 1990 (33rd Week)

| Reporting Area | AIDS | Aseptic Menin-gitis | Encephalitis | | Gonorrhea | | Hepatitis (Viral), by type | | | | Legionel-losis | Lyme Disease |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Primary | Post-in-fectious | | | A | B | NA,NB | Unspeci-fied | | |
| | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1990 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 |
| UNITED STATES | 27,882 | 6,268 | 495 | 57 | 366,131 | 428,738 | 15,096 | 10,438 | 1,859 | 815 | 715 | 4,759 |
| NEW ENGLAND | 1,007 | 623 | 20 | 1 | 8,801 | 11,593 | 368 | 559 | 52 | 23 | 47 | 981 |
| Maine | 38 | 25 | 3 | - | 113 | 136 | 16 | 15 | 2 | - | 2 | - |
| N.H. | 27 | 62 | 3 | - | 154 | 139 | 23 | 17 | 5 | - | 3 | 25 |
| Vt. | 15 | 167 | 3 | - | 37 | 35 | 20 | 6 | 5 | - | 2 | 4 |
| Mass. | 589 | 158 | 9 | 1 | 3,544 | 4,729 | 182 | 391 | 28 | 20 | 37 | 92 |
| R.I. | 39 | 204 | - | - | 731 | 710 | 68 | 19 | 10 | 3 | 3 | 103 |
| Conn. | 299 | 7 | 2 | - | 4,222 | 5,844 | 59 | 111 | 2 | - | - | 757 |
| MID. ATLANTIC | 7,865 | 837 | 37 | 11 | 43,224 | 58,227 | 1,392 | 913 | 183 | 15 | 197 | 2,802 |
| Upstate N.Y. | 940 | 423 | 17 | 7 | 8,139 | 8,661 | 586 | 365 | 113 | 9 | 70 | 1,804 |
| N.Y. City | 4,680 | 127 | - | - | 15,441 | 25,160 | 436 | 115 | 5 | - | 20 | - |
| N.J. | 1,491 | - | - | - | 7,456 | 9,657 | 176 | 221 | 37 | - | 21 | 528 |
| Pa. | 754 | 287 | 20 | 4 | 12,188 | 14,749 | 194 | 212 | 28 | 6 | 86 | 470 |
| E.N. CENTRAL | 1,848 | 1,118 | 144 | 7 | 67,170 | 81,057 | 1,951 | 1,216 | 302 | 39 | 148 | 139 |
| Ohio | 366 | 432 | 57 | 2 | 20,885 | 24,270 | 264 | 277 | 133 | 16 | 75 | 81 |
| Ind. | 182 | 114 | 12 | 1 | 7,314 | 6,936 | 280 | 159 | 1 | 1 | 13 | 7 |
| Ill. | 849 | 200 | 39 | 4 | 20,008 | 25,995 | 812 | 173 | 41 | 3 | 15 | 5 |
| Mich. | 337 | 345 | 33 | - | 14,989 | 18,200 | 207 | 362 | 79 | 19 | 31 | 46 |
| Wis. | 114 | 27 | 3 | - | 3,974 | 5,656 | 388 | 245 | 48 | - | 14 | - |
| W.N. CENTRAL | 747 | 358 | 29 | 7 | 18,172 | 22,030 | 1,541 | 451 | 198 | 18 | 32 | 146 |
| Minn. | 141 | 48 | 16 | - | 1,835 | 2,678 | 250 | 48 | 12 | 2 | 5 | 30 |
| Iowa | 66 | 78 | - | 4 | 1,253 | 1,599 | 38 | 32 | 8 | 3 | 9 | 12 |
| Mo. | 437 | 172 | 9 | 3 | 11,124 | 13,166 | 421 | 297 | 173 | 8 | 11 | 98 |
| N. Dak. | 4 | 2 | 1 | - | 30 | 87 | 32 | 4 | 2 | 1 | 1 | - |
| S. Dak. | 1 | 5 | 2 | - | 221 | 144 | 569 | 4 | 1 | - | 3 | - |
| Nebr. | 38 | 18 | - | - | 1,151 | 1,113 | 167 | 24 | 1 | - | 3 | - |
| Kans. | 60 | 35 | 1 | - | 2,558 | 3,243 | 64 | 42 | 1 | 4 | - | 6 |
| S. ATLANTIC | 6,727 | 1,221 | 97 | 23 | 112,390 | 122,032 | 1,092 | 2,170 | 261 | 162 | 121 | 343 |
| Del. | 53 | 36 | 2 | - | 1,681 | 1,943 | 7 | 31 | 4 | 2 | 2 | 35 |
| Md. | 626 | 111 | 16 | 1 | 11,357 | 13,462 | 194 | 265 | 47 | 13 | 25 | 125 |
| D.C. | 454 | 40 | 1 | - | 6,092 | 8,370 | 53 | 101 | 1 | 1 | 5 | - |
| Va. | 484 | 161 | 25 | 3 | 10,807 | 11,470 | 110 | 124 | 22 | 110 | 7 | 76 |
| W. Va. | 39 | 17 | 9 | - | 771 | 777 | 16 | 37 | 2 | 7 | - | 21 |
| N.C. | 319 | 137 | 23 | - | 22,827 | 19,310 | 113 | 333 | 92 | - | 14 | 50 |
| S.C. | 210 | 30 | - | - | 9,048 | 9,664 | 28 | 464 | 16 | 3 | 24 | 6 |
| Ga. | 953 | 186 | 7 | 2 | 26,994 | 27,040 | 137 | 333 | 33 | - | 13 | 18 |
| Fla. | 3,589 | 503 | 14 | 17 | 22,813 | 29,996 | 434 | 482 | 44 | 26 | 31 | 12 |
| E.S. CENTRAL | 642 | 466 | 24 | - | 35,842 | 35,950 | 150 | 872 | 236 | 3 | 39 | 77 |
| Ky. | 107 | 97 | 6 | - | 3,798 | 4,224 | 22 | 119 | 5 | 2 | 15 | 29 |
| Tenn. | 217 | 142 | 13 | - | 12,579 | 10,973 | 94 | 646 | 212 | - | 10 | 36 |
| Ala. | 197 | 199 | 5 | - | 10,449 | 11,963 | 28 | 98 | 15 | 1 | 13 | 12 |
| Miss. | 121 | 28 | - | - | 9,016 | 8,790 | 6 | 9 | 4 | - | 1 | - |
| W.S. CENTRAL | 2,587 | 866 | 57 | 1 | 40,955 | 46,623 | 2,133 | 1,397 | 77 | 163 | 28 | 51 |
| Ark. | 113 | 48 | 19 | - | 5,175 | 5,563 | 206 | 70 | 2 | 5 | 7 | 16 |
| La. | 482 | 85 | 10 | - | 9,765 | 8,563 | 86 | 202 | 6 | 5 | 5 | 1 |
| Okla. | 112 | 2 | 3 | - | 4,349 | 4,012 | 183 | 148 | 33 | 12 | 7 | 26 |
| Tex. | 1,880 | 731 | 25 | 1 | 21,666 | 28,485 | 1,658 | 977 | 36 | 141 | 9 | 8 |
| MOUNTAIN | 778 | 119 | 12 | 2 | 7,706 | 8,894 | 2,413 | 650 | 98 | 100 | 53 | 10 |
| Mont. | 21 | 8 | 1 | - | 68 | 113 | 63 | 49 | 4 | 5 | 2 | - |
| Idaho | 12 | - | - | - | 93 | 87 | 64 | 51 | 1 | - | 3 | - |
| Wyo. | 11 | - | - | - | 61 | 116 | 90 | 6 | - | - | - | 8 |
| Colo. | 304 | 38 | 3 | 1 | 2,149 | 2,341 | 379 | 94 | 40 | 17 | 11 | - |
| N. Mex. | 59 | 13 | - | - | 703 | 802 | 616 | 143 | 9 | 27 | 2 | - |
| Ariz. | 148 | 33 | 8 | 1 | 2,908 | 3,481 | 769 | 120 | 14 | 40 | 20 | - |
| Utah | 76 | 12 | - | - | 206 | 269 | 198 | 53 | 11 | 11 | 4 | - |
| Nev. | 147 | 15 | - | - | 1,518 | 1,685 | 234 | 134 | 19 | - | 11 | 2 |
| PACIFIC | 5,681 | 660 | 75 | 5 | 31,871 | 42,332 | 4,056 | 2,210 | 452 | 292 | 50 | 210 |
| Wash. | 352 | - | 6 | 1 | 2,773 | 3,746 | 391 | 286 | 100 | 17 | 2 | 1 |
| Oreg. | 166 | - | - | - | 1,298 | 1,651 | 252 | 209 | 79 | 8 | 2 | - |
| Calif. | 5,036 | 601 | 67 | 4 | 26,785 | 35,726 | 3,306 | 1,659 | 256 | 266 | 44 | 209 |
| Alaska | 15 | 25 | 2 | - | 513 | 774 | 84 | 24 | 13 | 1 | - | - |
| Hawaii | 112 | 34 | - | - | 502 | 435 | 23 | 32 | 4 | - | 2 | - |
| Guam | 2 | - | - | - | - | 178 | - | - | - | - | - | - |
| P.R. | 1,029 | 173 | 2 | 2 | 390 | 460 | 69 | 310 | 138 | 39 | - | - |
| V.I. | 12 | - | - | - | 265 | 268 | 1 | 8 | - | - | - | - |
| Amer. Samoa | - | - | - | - | - | 53 | - | - | - | - | - | - |
| C.N.M.I. | - | - | - | - | - | 148 | - | - | - | - | - | - |

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of the Northern Mariana Islands

## TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 17, 1991, and August 18, 1990 (33rd Week)

| Reporting Area | Malaria | Measles (Rubeola) | | | | | Menin-gococcal Infections | Mumps | | Pertussis | | | Rubella | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Indigenous | | Imported* | | Total | | | | | | | | | |
| | Cum. 1991 | 1991 | Cum. 1991 | 1991 | Cum. 1991 | Cum. 1990 | Cum. 1991 | 1991 | Cum. 1991 | 1991 | Cum. 1991 | Cum. 1990 | 1991 | Cum. 1991 | Cum. 1990 |
| UNITED STATES | 681 | 70 | 7,809 | 5 | 148 | 18,854 | 1,431 | 46 | 2,912 | 58 | 1,382 | 2,278 | 1 | 1,072 | 768 |
| NEW ENGLAND | 46 | - | 50 | - | 11 | 280 | 105 | 1 | 22 | 6 | 211 | 252 | - | 4 | 8 |
| Maine | 1 | - | 2 | - | - | 29 | 8 | - | - | - | 46 | 10 | - | - | 1 |
| N.H. | 2 | - | - | - | - | 8 | 12 | - | 3 | - | 17 | 31 | - | 1 | 1 |
| Vt. | 2 | - | 5 | - | - | 1 | 12 | 1 | 3 | 1 | 4 | 6 | - | - | - |
| Mass. | 22 | - | 23 | - | 9 | 24 | 57 | - | 1 | 4 | 127 | 188 | - | 2 | 2 |
| R.I. | 7 | - | 2 | - | - | 30 | - | - | 3 | - | - | 2 | - | - | 1 |
| Conn. | 12 | - | 18 | - | 2 | 188 | 16 | - | 12 | 1 | 17 | 15 | - | 1 | 3 |
| MID. ATLANTIC | 98 | 25 | 4,239 | - | 6 | 1,278 | 145 | - | 205 | 1 | 112 | 351 | - | 559 | 5 |
| Upstate N.Y. | 28 | - | 325 | - | 4 | 311 | 78 | - | 78 | 1 | 79 | 268 | - | 537 | 4 |
| N.Y. City | 35 | 25 | 1,650 | - | - | 306 | 8 | - | - | - | - | - | - | - | - |
| N.J. | 26 | - | 730 | - | 1 | 290 | 30 | - | 54 | - | 1 | 26 | - | - | - |
| Pa. | 9 | - | 1,534 | - | 1 | 371 | 29 | - | 73 | - | 32 | 57 | - | 22 | 1 |
| E.N. CENTRAL | 57 | - | 67 | - | 11 | 3,490 | 224 | - | 264 | 3 | 228 | 627 | - | 174 | 30 |
| Ohio | 13 | - | 1 | - | 2 | 537 | 76 | - | 60 | 3 | 85 | 118 | - | 147 | 1 |
| Ind. | 3 | - | - | - | 2 | 411 | 17 | - | 6 | - | 50 | 83 | - | 1 | - |
| Ill. | 23 | - | 25 | - | - | 1,319 | 66 | - | 103 | - | 41 | 236 | - | 5 | 18 |
| Mich. | 16 | U | 39 | U | - | 473 | 46 | U | 79 | U | 23 | 55 | U | 20 | 9 |
| Wis. | 2 | - | 2 | - | 7 | 750 | 19 | - | 16 | - | 29 | 135 | - | 1 | 2 |
| W.N. CENTRAL | 21 | - | 30 | - | 5 | 797 | 80 | - | 86 | 2 | 102 | 108 | - | 16 | 14 |
| Minn. | 6 | - | 5 | - | 5 | 321 | 17 | - | 13 | - | 41 | 21 | - | 6 | 9 |
| Iowa | 4 | - | 15 | - | - | 26 | 8 | - | 15 | 1 | 13 | 15 | - | 5 | 4 |
| Mo. | 6 | - | - | - | - | 97 | 29 | - | 26 | 1 | 32 | 59 | - | 5 | - |
| N. Dak. | 1 | - | - | - | - | - | 1 | - | 2 | - | 2 | 2 | - | - | 1 |
| S. Dak. | - | - | - | - | - | 23 | 2 | - | 1 | - | 3 | 1 | - | - | - |
| Nebr. | - | - | 1 | - | - | 106 | 6 | - | 5 | - | 5 | 3 | - | - | - |
| Kans. | 4 | - | 9 | - | - | 224 | 17 | - | 24 | - | 6 | 7 | - | - | - |
| S. ATLANTIC | 144 | 5 | 428 | 1 | 18 | 1,073 | 264 | 6 | 1,038 | 10 | 155 | 183 | - | 12 | 18 |
| Del. | 2 | - | 21 | - | - | 11 | 2 | - | 6 | - | - | 6 | - | - | - |
| Md. | 41 | - | 175 | 1† | 1 | 210 | 29 | 3 | 199 | 5 | 39 | 47 | - | 6 | 2 |
| D.C. | 9 | - | - | - | - | 22 | 7 | - | 21 | - | - | 14 | - | 1 | 1 |
| Va. | 25 | - | 24 | - | 4 | 72 | 26 | - | 43 | - | 16 | 15 | - | - | 1 |
| W. Va. | 2 | - | - | - | - | 6 | 12 | - | 16 | - | 8 | 14 | - | - | - |
| N.C. | 11 | - | 36 | - | 3 | 30 | 49 | - | 214 | - | 22 | 40 | - | 2 | - |
| S.C. | 8 | 1 | 13 | - | - | 4 | 27 | 1 | 344 | 1 | 10 | 5 | - | - | - |
| Ga. | 16 | - | 10 | - | 4 | 184 | 54 | 2 | 38 | 4 | 28 | 24 | - | - | - |
| Fla. | 30 | 4 | 149 | - | 6 | 534 | 58 | - | 157 | - | 32 | 18 | - | 3 | 14 |
| E.S. CENTRAL | 13 | - | 6 | - | 1 | 150 | 95 | - | 155 | 2 | 49 | 105 | - | 100 | 3 |
| Ky. | 2 | - | 1 | - | 1 | 32 | 35 | - | - | - | - | - | - | - | - |
| Tenn. | 7 | - | 5 | - | - | 70 | 28 | - | 127 | - | 17 | 45 | - | 100 | 3 |
| Ala. | 4 | - | - | - | - | 22 | 31 | - | 8 | 2 | 32 | 54 | - | - | - |
| Miss. | - | - | - | - | - | 26 | 1 | - | 20 | - | - | 6 | - | - | - |
| W.S. CENTRAL | 45 | 3 | 148 | - | 14 | 4,009 | 108 | 22 | 317 | 2 | 42 | 76 | - | 5 | 66 |
| Ark. | 5 | - | - | - | 5 | 42 | 16 | 1 | 40 | - | 4 | 3 | - | 1 | 3 |
| La. | 9 | - | - | - | - | 10 | 23 | - | 21 | 1 | 11 | 19 | - | - | - |
| Okla. | 6 | - | - | - | - | 173 | 13 | - | 12 | 1 | 21 | 26 | - | - | 1 |
| Tex. | 25 | 3 | 148 | - | 9 | 3,784 | 56 | 21 | 244 | - | 6 | 28 | - | 4 | 62 |
| MOUNTAIN | 27 | 3 | 933 | 2 | 19 | 844 | 57 | 6 | 280 | 11 | 153 | 199 | - | 6 | 105 |
| Mont. | 1 | - | - | - | - | 1 | 9 | - | - | - | 2 | 26 | - | - | 13 |
| Idaho | 2 | 3 | 397 | - | 2 | 26 | 7 | - | 8 | 2 | 23 | 36 | - | 2 | 49 |
| Wyo. | - | - | 1 | - | 2 | 15 | 1 | - | 3 | - | 3 | - | - | - | - |
| Colo. | 8 | - | 1 | 1† | 5 | 133 | 11 | 4 | 118 | 3 | 69 | 75 | - | - | 4 |
| N. Mex. | 6 | - | 117 | - | 5 | 93 | 8 | N | N | 1 | 23 | 14 | - | - | - |
| Ariz. | 8 | - | 274 | - | - | 286 | 15 | 2 | 126 | - | 8 | 34 | - | - | 30 |
| Utah | 1 | - | 125 | - | 4 | 78 | - | - | 13 | 5 | 23 | 10 | - | - | 1 |
| Nev. | 1 | - | 18 | 1§ | 1 | 212 | 6 | - | 12 | - | 2 | 4 | - | 4 | 8 |
| PACIFIC | 230 | 34 | 1,908 | 2 | 63 | 6,933 | 353 | 11 | 545 | 21 | 330 | 377 | 1 | 196 | 519 |
| Wash. | 17 | - | 46 | - | 15 | 254 | 44 | 9 | 150 | 1 | 82 | 87 | - | 8 | - |
| Oreg. | 5 | - | 41 | - | 29 | 212 | 45 | N | N | 6 | 48 | 41 | - | 2 | 9 |
| Calif. | 204 | 34 | 1,817 | 1† | 12 | 6,375 | 255 | 2 | 366 | 12 | 153 | 215 | 1 | 182 | 500 |
| Alaska | - | - | - | - | 3 | 80 | 7 | - | 10 | - | 12 | 4 | - | 1 | - |
| Hawaii | 4 | - | 4 | 1† | 4 | 12 | 2 | - | 19 | 2 | 35 | 30 | - | 3 | 10 |
| Guam | - | U | - | U | - | 1 | - | U | - | U | - | - | U | - | - |
| P.R. | 1 | 2 | 93 | - | 1 | 1,444 | 15 | - | 9 | - | 32 | 6 | - | 1 | - |
| V.I. | 2 | U | - | U | 2 | 23 | - | U | 8 | U | - | - | U | - | - |
| Amer. Samoa | - | U | - | U | - | 377 | - | U | - | U | - | - | U | - | - |
| C.N.M.I. | - | U | - | U | - | - | - | U | - | U | - | 4 | U | - | - |

*For measles only, imported cases includes 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 August 17, 1991, and August 18, 1990 (33rd Week)

| Reporting Area | Syphilis (Primary & Secondary) | | Toxic-shock Syndrome | Tuberculosis | | Tula-remia | Typhoid Fever | Typhus Fever (Tick-borne) (RMSF) | Rabies, Animal |
|---|---|---|---|---|---|---|---|---|---|
| | Cum. 1991 | Cum. 1990 | Cum. 1991 | Cum. 1991 | Cum. 1990 | Cum. 1991 | Cum. 1991 | Cum. 1991 | Cum. 1991 |
| UNITED STATES | 25,582 | 30,888 | 193 | 13,927 | 14,591 | 101 | 239 | 356 | 3,913 |
| NEW ENGLAND | 670 | 1,140 | 10 | 360 | 321 | 1 | 27 | 5 | 35 |
| Maine | - | 5 | 4 | 27 | - | - | 1 | - | - |
| N.H. | 12 | 44 | 1 | 5 | 3 | - | 1 | - | 1 |
| Vt. | 1 | 1 | - | 4 | 7 | - | - | - | - |
| Mass. | 309 | 440 | 5 | 179 | 172 | 1 | 24 | 4 | - |
| R.I. | 37 | 11 | - | 27 | 43 | - | - | - | - |
| Conn. | 311 | 639 | - | 118 | 96 | - | 1 | 1 | 34 |
| MID. ATLANTIC | 4,117 | 6,218 | 30 | 3,183 | 3,538 | 1 | 43 | 8 | 1,301 |
| Upstate N.Y. | 103 | 552 | 14 | 209 | 277 | 1 | 9 | 6 | 465 |
| N.Y. City | 2,042 | 2,882 | 1 | 1,984 | 2,231 | - | 21 | - | - |
| N.J. | 857 | 1,013 | - | 559 | 575 | - | 10 | 1 | 596 |
| Pa. | 1,115 | 1,771 | 15 | 431 | 455 | - | 3 | 1 | 240 |
| E.N. CENTRAL | 2,984 | 2,143 | 39 | 1,414 | 1,379 | 4 | 14 | 28 | 84 |
| Ohio | 400 | 345 | 19 | 201 | 236 | - | 2 | 17 | 11 |
| Ind. | 94 | 53 | - | 119 | 120 | - | - | 7 | 7 |
| Ill. | 1,399 | 865 | 12 | 755 | 700 | 2 | 4 | 3 | 17 |
| Mich. | 770 | 642 | 8 | 273 | 267 | 2 | 7 | 1 | 17 |
| Wis. | 321 | 238 | - | 66 | 56 | - | 1 | - | 32 |
| W.N. CENTRAL | 458 | 317 | 32 | 329 | 362 | 37 | 2 | 27 | 571 |
| Minn. | 46 | 54 | 7 | 62 | 65 | 1 | 2 | - | 198 |
| Iowa | 40 | 39 | 6 | 49 | 38 | - | - | 1 | 109 |
| Mo. | 325 | 164 | 10 | 143 | 174 | 31 | - | 16 | 11 |
| N. Dak. | - | 1 | - | 4 | 15 | - | - | - | 67 |
| S. Dak. | 1 | 1 | 1 | 25 | 9 | 4 | - | 1 | 140 |
| Nebr. | 11 | 8 | 1 | 11 | 15 | - | - | 4 | 11 |
| Kans. | 35 | 50 | 7 | 35 | 46 | 1 | - | 5 | 35 |
| S. ATLANTIC | 7,831 | 9,975 | 17 | 2,678 | 2,699 | 4 | 47 | 153 | 939 |
| Del. | 98 | 109 | 1 | 17 | 29 | - | - | - | 103 |
| Md. | 626 | 730 | 1 | 248 | 211 | - | 8 | 19 | 355 |
| D.C. | 494 | 649 | 1 | 123 | 96 | - | 2 | - | 7 |
| Va. | 575 | 593 | 3 | 224 | 234 | - | 8 | 6 | 175 |
| W. Va. | 20 | 11 | - | 44 | 48 | - | 1 | 4 | 42 |
| N.C. | 1,237 | 1,145 | 7 | 358 | 352 | 1 | 2 | 77 | 8 |
| S.C. | 980 | 640 | 1 | 256 | 301 | 1 | 3 | 28 | 66 |
| Ga. | 1,929 | 2,536 | - | 531 | 439 | 1 | 5 | 18 | 159 |
| Fla. | 1,872 | 3,562 | 3 | 877 | 989 | 1 | 18 | 1 | 24 |
| E.S. CENTRAL | 2,860 | 2,669 | 9 | 1,004 | 1,058 | 11 | 2 | 66 | 115 |
| Ky. | 55 | 57 | 4 | 219 | 258 | 4 | 2 | 19 | 33 |
| Tenn. | 997 | 1,063 | 5 | 323 | 277 | 6 | - | 35 | 29 |
| Ala. | 1,008 | 819 | - | 243 | 322 | 1 | - | 12 | 53 |
| Miss. | 800 | 730 | - | 219 | 201 | - | - | - | - |
| W.S. CENTRAL | 4,625 | 5,133 | 7 | 1,653 | 1,791 | 30 | 16 | 61 | 442 |
| Ark. | 386 | 360 | 3 | 145 | 223 | 20 | - | 11 | 26 |
| La. | 1,612 | 1,588 | - | 155 | 201 | - | 3 | - | 4 |
| Okla. | 111 | 150 | 4 | 112 | 124 | 10 | - | 50 | 127 |
| Tex. | 2,516 | 3,035 | - | 1,241 | 1,243 | - | 13 | - | 285 |
| MOUNTAIN | 357 | 564 | 25 | 377 | 324 | 9 | 6 | 6 | 132 |
| Mont. | 6 | - | - | 6 | 22 | 7 | - | 5 | 26 |
| Idaho | 3 | 6 | - | 4 | 8 | - | - | - | 1 |
| Wyo. | 6 | 1 | - | 3 | 4 | 1 | - | - | 59 |
| Colo. | 55 | 37 | 5 | 33 | 13 | 1 | 1 | 1 | 10 |
| N. Mex. | 21 | 29 | 6 | 48 | 74 | - | - | - | 2 |
| Ariz. | 225 | 400 | 4 | 207 | 146 | - | 4 | - | 25 |
| Utah | 5 | 6 | 10 | 30 | 18 | - | - | - | 5 |
| Nev. | 36 | 85 | - | 46 | 39 | - | 1 | - | 4 |
| PACIFIC | 1,680 | 2,729 | 24 | 2,929 | 3,119 | 4 | 82 | 2 | 294 |
| Wash. | 111 | 263 | 3 | 186 | 172 | 2 | 4 | 1 | 1 |
| Oreg. | 51 | 94 | - | 69 | 82 | 1 | 3 | 1 | 4 |
| Calif. | 1,510 | 2,345 | 21 | 2,511 | 2,718 | 1 | 72 | - | 285 |
| Alaska | 4 | 12 | - | 35 | 35 | - | - | - | 3 |
| Hawaii | 4 | 15 | - | 128 | 112 | - | 3 | - | 1 |
| Guam | - | 2 | - | - | 32 | - | - | - | - |
| P.R. | 298 | 204 | - | 141 | 66 | - | 9 | - | 41 |
| V.I. | 75 | 6 | - | 2 | 4 | - | - | - | - |
| Amer. Samoa | - | - | - | - | 11 | - | - | - | - |
| C.N.M.I. | - | 3 | - | - | 40 | - | - | - | - |

U: Unavailable

# TABLE III. Deaths in 121 U.S. cities,* week ending August 17, 1991 (33rd Week)

| Reporting Area | All Causes, By Age (Years) | | | | | | P&I** |
|---|---|---|---|---|---|---|---|
| | All Ages | ≥65 | 45-64 | 25-44 | 1-24 | <1 | Total |
| NEW ENGLAND | 547 | 369 | 103 | 42 | 17 | 16 | 25 |
| Boston, Mass. | 133 | 83 | 28 | 16 | 4 | 2 | 7 |
| Bridgeport, Conn. | 28 | 19 | 5 | 2 | - | 2 | 1 |
| Cambridge, Mass. | 24 | 16 | 8 | - | - | - | 3 |
| Fall River, Mass. | 27 | 20 | 4 | 2 | - | 1 | - |
| Hartford, Conn. | 57 | 33 | 10 | 10 | 2 | 2 | - |
| Lowell, Mass. | 22 | 19 | 3 | - | - | - | - |
| Lynn, Mass. | 16 | 15 | 1 | - | - | - | 1 |
| New Bedford, Mass. | 21 | 14 | 4 | 2 | 1 | - | - |
| New Haven, Conn. | 42 | 26 | 10 | 1 | 2 | 3 | 2 |
| Providence, R.I. | 37 | 29 | 6 | 2 | - | - | 1 |
| Somerville, Mass. | 9 | 8 | - | 1 | - | - | 2 |
| Springfield, Mass. | 52 | 32 | 9 | 2 | 6 | 3 | 2 |
| Waterbury, Conn. | 26 | 18 | 5 | 2 | 1 | - | - |
| Worcester, Mass. | 53 | 37 | 10 | 2 | 1 | 3 | 6 |
| MID. ATLANTIC | 2,163 | 1,374 | 415 | 263 | 43 | 68 | 103 |
| Albany, N.Y. | 56 | 34 | 11 | 5 | 1 | 5 | 4 |
| Allentown, Pa. | 23 | 14 | 7 | 2 | - | - | 4 |
| Buffalo, N.Y. | 100 | 75 | 17 | 7 | - | 1 | 4 |
| Camden, N.J. | 34 | 17 | 8 | 3 | 1 | 5 | 1 |
| Elizabeth, N.J. | 22 | 11 | 4 | 3 | - | 4 | 1 |
| Erie, Pa.† | 51 | 42 | 7 | 1 | 1 | - | 2 |
| Jersey City, N.J. | 53 | 35 | 8 | 6 | 1 | 3 | 3 |
| New York City, N.Y. | 1,002 | 596 | 204 | 159 | 28 | 15 | 36 |
| Newark, N.J. | 65 | 29 | 14 | 19 | - | 3 | 2 |
| Paterson, N.J. | 31 | 18 | 5 | 7 | - | 1 | 4 |
| Philadelphia, Pa. | 296 | 188 | 61 | 30 | 4 | 13 | 13 |
| Pittsburgh, Pa.† | 89 | 54 | 17 | 5 | 2 | 11 | 4 |
| Reading, Pa. | 35 | 29 | 6 | - | - | - | 4 |
| Rochester, N.Y. | 111 | 80 | 18 | 6 | 2 | 5 | 9 |
| Schenectady, N.Y. | 21 | 18 | 2 | - | 1 | - | 1 |
| Scranton, Pa.† | 25 | 20 | 4 | 1 | - | - | - |
| Syracuse, N.Y. | 79 | 62 | 12 | 2 | 2 | 1 | 3 |
| Trenton, N.J. | 28 | 21 | 4 | 3 | - | - | 6 |
| Utica, N.Y. | 17 | 13 | 3 | 1 | - | - | - |
| Yonkers, N.Y. | 25 | 18 | 3 | 3 | - | 1 | 2 |
| E.N. CENTRAL | 2,186 | 1,345 | 397 | 224 | 153 | 67 | 105 |
| Akron, Ohio | 71 | 55 | 10 | 3 | 2 | 1 | 4 |
| Canton, Ohio | 34 | 27 | 7 | - | - | - | 1 |
| Chicago, Ill. | 445 | 187 | 87 | 78 | 75 | 18 | 13 |
| Cincinnati, Ohio | 142 | 97 | 32 | 7 | 3 | 3 | 13 |
| Cleveland, Ohio | 145 | 82 | 31 | 17 | 8 | 7 | 2 |
| Columbus, Ohio | 199 | 135 | 36 | 14 | 8 | 6 | 4 |
| Dayton, Ohio | 107 | 80 | 17 | 8 | - | 2 | 8 |
| Detroit, Mich. | 228 | 118 | 47 | 37 | 17 | 9 | 3 |
| Evansville, Ind. | 40 | 28 | 8 | 3 | 1 | - | 4 |
| Fort Wayne, Ind. | 69 | 47 | 8 | 6 | 5 | 3 | 1 |
| Gary, Ind. | 18 | 10 | 3 | 2 | - | 3 | - |
| Grand Rapids, Mich. | 71 | 52 | 12 | - | 6 | 1 | 3 |
| Indianapolis, Ind. | 152 | 89 | 28 | 21 | 11 | 3 | 5 |
| Madison, Wis. | 46 | 30 | 7 | 3 | 2 | 4 | 6 |
| Milwaukee, Wis. | 125 | 85 | 23 | 9 | 5 | 3 | 17 |
| Peoria, Ill. | 46 | 34 | 5 | 2 | 3 | 2 | 3 |
| Rockford, Ill. | 53 | 39 | 8 | 5 | - | 1 | 5 |
| South Bend, Ind. | 46 | 31 | 10 | 1 | 3 | 1 | 3 |
| Toledo, Ohio | 90 | 70 | 13 | 5 | 2 | - | 8 |
| Youngstown, Ohio | 59 | 49 | 5 | 3 | 2 | - | 2 |
| W.N. CENTRAL | 632 | 421 | 125 | 47 | 18 | 21 | 28 |
| Des Moines, Iowa | 64 | 42 | 18 | 2 | - | 2 | 3 |
| Duluth, Minn. | 20 | 15 | 4 | - | - | 1 | 1 |
| Kansas City, Kans. | 24 | 12 | 7 | 2 | 1 | 2 | 1 |
| Kansas City, Mo. | 112 | 75 | 22 | 12 | 2 | 1 | 6 |
| Lincoln, Nebr.§ | U | U | U | U | U | U | U |
| Minneapolis, Minn. | 85 | 56 | 18 | 6 | 5 | - | 5 |
| Omaha, Nebr. | 90 | 58 | 17 | 7 | 4 | 4 | 2 |
| St. Louis, Mo. | 119 | 81 | 20 | 8 | 4 | 6 | 6 |
| St. Paul, Minn. | 72 | 54 | 9 | 4 | 1 | 4 | 4 |
| Wichita, Kans. | 46 | 28 | 10 | 6 | 1 | 1 | - |
| S. ATLANTIC | 1,301 | 754 | 283 | 159 | 49 | 53 | 58 |
| Atlanta, Ga. | 142 | 83 | 35 | 16 | 5 | 3 | 2 |
| Baltimore, Md. | 210 | 116 | 55 | 27 | 8 | 4 | 12 |
| Charlotte, N.C. | 69 | 41 | 16 | 9 | 1 | 2 | 2 |
| Jacksonville, Fla. | 129 | 85 | 32 | 9 | 2 | 1 | 5 |
| Miami, Fla. | 102 | 46 | 30 | 19 | 1 | 5 | 1 |
| Norfolk, Va. | 68 | 39 | 13 | 7 | 5 | 4 | 5 |
| Richmond, Va. | 85 | 53 | 19 | 8 | 3 | 2 | 4 |
| Savannah, Ga. | 49 | 27 | 12 | 8 | 2 | - | 4 |
| St. Petersburg, Fla. | 66 | 46 | 6 | 6 | 3 | 5 | - |
| Tampa, Fla. | 130 | 86 | 22 | 11 | 3 | 6 | 17 |
| Washington, D.C. | 228 | 112 | 40 | 39 | 16 | 21 | 6 |
| Wilmington, Del. | 23 | 20 | 3 | - | - | - | - |
| E.S. CENTRAL | 779 | 508 | 142 | 70 | 30 | 29 | 46 |
| Birmingham, Ala. | 113 | 70 | 23 | 8 | 6 | 6 | 2 |
| Chattanooga, Tenn. | 69 | 49 | 11 | 4 | 3 | 2 | 2 |
| Knoxville, Tenn. | 78 | 46 | 18 | 9 | 4 | 1 | 5 |
| Louisville, Ky. | 138 | 95 | 24 | 11 | 2 | 6 | 9 |
| Memphis, Tenn. | 156 | 103 | 27 | 14 | 5 | 7 | 14 |
| Mobile, Ala. | 65 | 41 | 10 | 10 | 2 | 2 | 2 |
| Montgomery, Ala. | 39 | 26 | 5 | 3 | 1 | 4 | 2 |
| Nashville, Tenn. | 121 | 78 | 24 | 11 | 7 | 1 | 10 |
| W.S. CENTRAL | 1,117 | 693 | 206 | 107 | 61 | 50 | 39 |
| Austin, Tex. | 53 | 35 | 11 | 5 | 1 | 1 | 4 |
| Baton Rouge, La. | 42 | 24 | 11 | 2 | 1 | 4 | - |
| Corpus Christi, Tex. | 35 | 28 | 5 | - | 1 | 1 | 1 |
| Dallas, Tex. | 199 | 110 | 45 | 23 | 16 | 5 | - |
| El Paso, Tex. | 58 | 42 | 6 | 5 | 1 | 4 | 1 |
| Ft. Worth, Tex. | 88 | 49 | 14 | 8 | 6 | 11 | 4 |
| Houston, Tex. | 124 | 74 | 18 | 13 | 13 | 6 | 6 |
| Little Rock, Ark. | 56 | 40 | 12 | 3 | 1 | - | 3 |
| New Orleans, La. | 78 | 38 | 16 | 6 | 3 | 15 | - |
| San Antonio, Tex. | 219 | 139 | 36 | 26 | 15 | 3 | 8 |
| Shreveport, La. | 67 | 54 | 8 | 3 | 2 | - | 6 |
| Tulsa, Okla. | 98 | 60 | 24 | 13 | 1 | - | 6 |
| MOUNTAIN | 629 | 372 | 139 | 67 | 31 | 20 | 33 |
| Albuquerque, N.M. | 75 | 52 | 12 | 7 | 3 | 1 | 4 |
| Colo. Springs, Colo. | 35 | 24 | 7 | 3 | - | 1 | 2 |
| Denver, Colo. | 97 | 57 | 20 | 15 | 1 | 4 | 6 |
| Las Vegas, Nev. | 134 | 71 | 41 | 14 | 5 | 3 | 5 |
| Ogden, Utah | 27 | 20 | 2 | 3 | 2 | - | 4 |
| Phoenix, Ariz. | 113 | 57 | 32 | 11 | 8 | 5 | 3 |
| Pueblo, Colo. | 21 | 13 | 3 | 1 | 2 | 2 | 2 |
| Salt Lake City, Utah | 41 | 24 | 4 | 5 | 7 | 1 | 3 |
| Tucson, Ariz. | 86 | 54 | 18 | 8 | 3 | 3 | 4 |
| PACIFIC | 1,829 | 1,153 | 343 | 174 | 95 | 56 | 92 |
| Berkeley, Calif. | 13 | 8 | 2 | - | - | 3 | 1 |
| Fresno, Calif. | 92 | 57 | 16 | 7 | 5 | 7 | 5 |
| Glendale, Calif. | 28 | 22 | 4 | 1 | 1 | - | - |
| Honolulu, Hawaii | 71 | 40 | 21 | 4 | 1 | 5 | 7 |
| Long Beach, Calif. | 70 | 47 | 9 | 6 | 5 | 3 | 3 |
| Los Angeles, Calif. | 519 | 288 | 120 | 56 | 38 | 10 | 16 |
| Oakland, Calif.§ | U | U | U | U | U | U | U |
| Pasadena, Calif. | 32 | 19 | 7 | 1 | 2 | 3 | - |
| Portland, Oreg. | 111 | 84 | 12 | 6 | 6 | 3 | 8 |
| Sacramento, Calif. | 175 | 112 | 28 | 20 | 10 | 5 | 12 |
| San Diego, Calif. | 188 | 112 | 36 | 24 | 9 | 7 | 19 |
| San Francisco, Calif. | 151 | 91 | 30 | 24 | 3 | 2 | 4 |
| San Jose, Calif. | 135 | 99 | 24 | 3 | 7 | 2 | 9 |
| Seattle, Wash. | 139 | 93 | 21 | 14 | 5 | 6 | - |
| Spokane, Wash. | 44 | 37 | 4 | 1 | 2 | - | 4 |
| Tacoma, Wash. | 61 | 44 | 9 | 7 | 1 | - | 4 |
| TOTAL | 11,183†† | 6,989 | 2,153 | 1,153 | 497 | 380 | 529 |

*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.

§Report for this week is unavailable (U).

*Childhood Cancers — Continued*

epidemiology of childhood cancers in New Jersey. Parents can assist in early detection of childhood cancers by ensuring that children are evaluated for problems such as unexplained fatigue or fever, frequent headaches, unusual masses or swelling, increased bruising, and unexplained weight loss (*2*).

*References*

1. National Institutes of Health. 1987 Annual cancer statistics review. Bethesda, Maryland: US Department of Health and Human Services, Public Health Service, 1988; NIH publication no. 87-2789.
2. American Cancer Society. Cancer facts and figures—1991. Atlanta: American Cancer Society, 1991.
3. Donaldson MH. New Jersey pediatric hematology oncology. NJ Med 1990;87:927–30.

## Comparative Mortality of Two College Groups, 1945–1983

Patterns of morbidity and mortality vary substantially among some religious groups in the United States. These variations may be associated with a wide range of factors, including lifestyle, acceptance of prevention measures (e.g., vaccination), and risks for injury (*1–12*). This report summarizes a study of mortality in cohorts of graduates from two colleges whose students are from different religious backgrounds.

The populations in this study included graduates of Principia College (PC) (Elsah, Illinois), a liberal arts college for Christian Scientists, and Loma Linda University (LLU) (Loma Linda, California), a Seventh-day Adventist–affiliated university with a predominantly Seventh-day Adventist student population (A. Kutzner, Loma Linda University, personal communication, 1991). The doctrines of both religious groups require abstinence from alcohol consumption and smoking. Seventh-day Adventists are also required to abstain from consuming certain foods (e.g., pork and shellfish); in addition, the church recommends that its members use primarily a lacto-ovo-vegetarian diet that limits the consumption of meat, poultry, or fish to less than once per week. The groups also differ in that Christian Scientists reject medical healing in favor of spiritual healing alone (*13*), whereas Seventh-day Adventists accept both spiritual and medical healing (*14*).

This study compared mortality between the graduating classes of PC and LLU for 1945 (the first year for which data are available) through 1983.* Data for PC were obtained from alumni directories and quarterly updates that record deaths of graduates by year of graduation. The data for LLU were obtained from a search of the alumni database of the university's Alumni Office. PC graduates whose vital status was unknown were assumed to be alive. Mortality among LLU graduates whose vital status was unknown was assumed to be the same as that for graduates whose records existed. For each school, mortality was calculated for 3-year cohorts for 1945–1983 for men and women. The analysis assumed that the mean matriculation age for students at both institutions was the same.

During the 39-year period, a total of 2421 men and 2669 women graduated from PC, and 5010 men and 3788 women graduated from the College of Liberal Arts and

*Limitations in mortality data for any cohort later than 1983 precluded statistical analysis.

*Mortality – Continued*

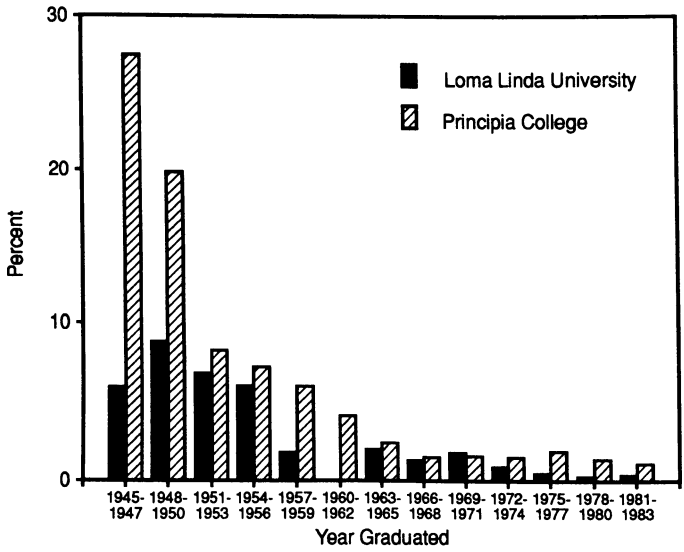
Sciences at LLU. Overall mortality was higher for PC graduates than for LLU graduates (for men, 40 per 1000 and 22 per 1000, respectively [$p<0.001$; Cochran-Mantel-Haenszel chi-square test], and for women, 27 per 1000 and 12 per 1000, respectively [$p=0.001$]) (Figures 1 and 2). Total mortality was higher among PC graduates in 22 (85%) of the 26 cohorts. However, for four of the cohorts, total mortality was higher among graduates of LLU (men: 1969–1971; women: 1963–1965, 1969–1971, and 1975–1977).

*Reported by: WF Simpson, PhD, Emporia State Univ, Emporia, Kansas. Div of Surveillance and Epidemiology, Epidemiology Program Office, CDC.*

**Editorial Note:** Previous reports have described differences in health status and disease patterns in religious groups in the United States. For example, prolonged outbreaks of measles, rubella, and poliomyelitis have been documented among the Amish (*1–3*) and Christian Scientists (*4,5*); in 1984, of all reported cases of measles classified as "nonpreventable," 89.2% occurred among persons exempt from vaccination laws for religious or philosophic reasons (*6*). Rates of congenital disorders are higher among the Amish (*7*), for whom injury related to horse-drawn buggies is also of concern (*8*). Perinatal and maternal mortality rates are higher for members of the Faith Assembly in Indiana who avoid prenatal and obstetric care than for other residents of the same state (*9*). Among Mormons, death rates are substantially lower for cancers, heart disease, and all causes combined compared with non-Mormons in Utah and whites in the United States (*10,11*). Finally, for male physician graduates of LLU, the age-adjusted death rate was 73% that of graduates of a nonreligiously affiliated medical school and 56% that of all white males in the United States (*12*).

The findings in this study indicated higher mortality among graduates of PC than among graduates of LLU's liberal arts college. Although these findings are consistent

**FIGURE 1. Percentage of male graduates who have died, by 3-year cohort – Loma Linda University* and Principia College, 1945–1983**




*No deaths have been recorded among Loma Linda students who graduated during 1960–1962.

*Mortality — Continued*

with a previous report (*15*), they may be subject to at least two biases. First, the assumption that PC graduates who were lost to follow-up were alive and that LLU graduates who were also lost to follow-up had the same risk for death as other graduates may have reduced the differences in mortality for the two groups. Second, because the dietary habits of Seventh-day Adventists are associated with lower risks for several chronic diseases, mortality related to chronic diseases was probably lower among LLU graduates than it would have been in other comparison populations.

For at least three potential reasons, religious affiliation may be related to health status: 1) persons with differing risk-factor profiles may seek membership in particular religious groups; 2) religions may prescribe or proscribe behavior associated with altered risk for disease (e.g., physical exercise, vaccination and other health-care practices, and prohibitions regarding smoking and diet); and 3) patterns of marriage may increase the risk for certain heritable disorders. Investigation of associations between religious affiliation and health status may assist in defining the etiology of different conditions and designing public health interventions appropriate to the health practices of specific groups.

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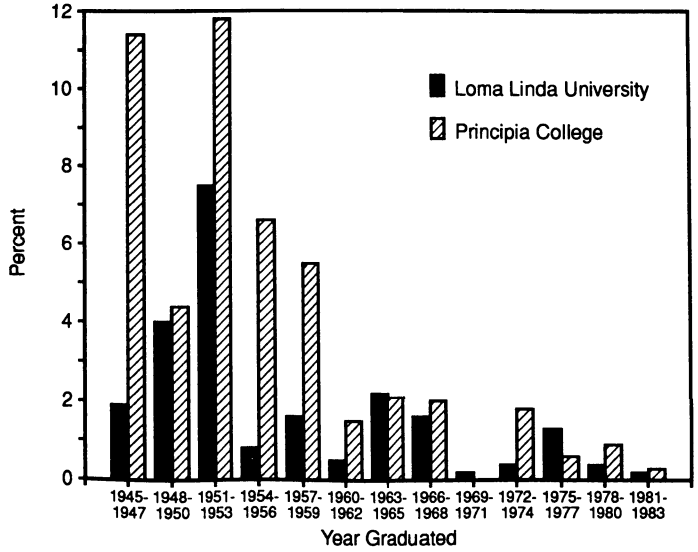
**FIGURE 2. Percentage of female graduates who have died, by 3-year cohort — Loma Linda University and Principia College,* 1945–1983**




*No deaths have been recorded among Principia students who graduated during 1969–1971.

*Mortality — Continued*

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