



MORBIDITY AND MORTALITY WEEKLY REPORT

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%), \geq 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 \geq 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.

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August 23, 1991 / Vol. 40 / No. 33

- 569 Inadequate Immune Response Among Public Safety Workers Receiving Intradermal Vaccination Against Hepatitis B – United States, 1990–1991
- 572 Childhood Cancers New Jersey, 1979–1985
- 579 Comparative Mortality of Two College Groups, 1945–1983

^{*}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 non-responders, 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 $\frac{1}{10}$ 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.

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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.

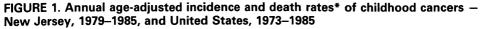
Reported by: ME Petrone, MD, DM Harlan, MS, HC Lewis, MPH, T Abe, MSW, Div of Epidemiology and Communicable Disease Control, Cancer Registry and Data Applications Programs, WE Parkin, DVM, K Spitalny, MD, State Epidemiologist, New Jersey State Dept of Health.

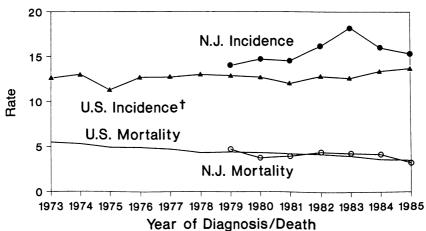
Editorial Note: Although the overall incidence of cancer is low among children, cancer is the major cause of deaths attributed to disease in children in the United States (2). During 1950–1985, the incidence rate of childhood cancers increased by 32%, while the death rate decreased 56% (1)-primarily 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)





^{*}Per 100,000 population.

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

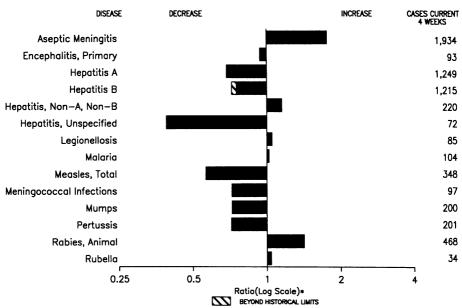


FIGURE I. Notifiable disease reports, comparison of 4-week totals ending August 17, 1991, with historical data - United States

*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	27,002	indigenous	7,809
Botulism: Foodborne	11	Plague	7,009
Infant	39	Poliomyelitis, Paralytic*	· · ·
Other	4	Psittacosis	56
Brucellosis	45	Rabies, human	90
Cholera	15		0.000
Congenital rubella syndrome		Syphilis, primary & secondary	25,582
	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
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*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. •

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	<u> </u>	Aseptic	Encer	halitis			Г н	onstitie ()	Viral), by	type	r		
Descention Arres	AIDS	Menin-	Primary	Post-in-	Gone	orrhea	A	в	NA,NB	Unspeci-	nspeci- Legionel-	Lyme Disease	
Reporting Area	Cum. 1991	gitis Cum. 1991	Cum. 1991	fectious Cum. 1991	Cum. 1991	Cum. 1990	Cum. 1991	Cum. 1991	Cum. 1991	fied 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. Vt.	27 15	62 167	3 3		154 37	139 35	23 20	17 6	5 5	:	3 2	25 4	
Mass.	589	158	9	1	3,544	4,729	182	391	28	20	37	92	
R.I. Conn.	39 299	204 7	2	-	731 4,222	710 5,844	68 59	19 111	10 2	3	3	103 757	
MID. ATLANTIC	7,865	837	37	11	43,224	58,227	1,392	913	183	15	197	2,802	
Upstate N.Y. N.Y. City	940 4.680	423 127	17	7	8,139 15,441	8,661	586	365	113	9	70	1,804	
N.J.	1,491		-	-	7,456	25,160 9,657	436 176	115 221	5 37		20 21	528	
Pa.	754	287	20	4	12,188	14,749	194	212	28	6	86	470	
E.N. CENTRAL Ohio	1,848 366	1,118 432	144 57	7 2	67,170 20,885	81,057 24,270	1,951 264	1,216 277	302 133	39	148	139	
Ind.	182	114	12	1	7,314	6,936	280	159	133	16 1	75 13	81 7	
III.	849	200	39	4	20,008	25,995	812	173	41	3	15	5	
Mich. Wis.	337 114	345 27	33 3	-	14,989 3,974	18,200 5,656	207 388	362 245	79 48	19	31 14	46	
W.N. CENTRAL	747	358	29	7	18,172	22,030	1,541	451	198	18	32	146	
Minn. Iowa	141 66	48 78	16	4	1,835 1,253	2,678 1,599	250 38	48	12	2	5	30	
Mo.	437	172	9	3	11,124	13,166	421	32 297	8 173	3 8	9 11	12 98	
N. Dak.	4	2	1	-	30	87	32	4	2	ĩ	1	-	
S. Dak. Nebr.	1 38	5 18	2	-	221 1,151	144 1,113	569 167	4 24	1	-	3	-	
Kans.	60	35	1	-	2,558	3,243	64	42	i	4	-	6	
S. ATLANTIC	6,727	1,221	97	23	112,390	122,032	1,092	2,170	261	162	121	343	
Del. Md.	53 626	36 111	2 16	1	1,681 11,357	1,943 13,462	7 194	31 265	4 47	2	2	35	
D.C.	454	40	1	-	6,092	8,370	53	101	4/	13 1	25 5	125	
Va. W. Va.	484 39	161 17	25 9	3	10,807	11,470	110	124	22	110	7	76	
N.C.	319	137	23	-	771 22,827	777 19,310	16 113	37 333	2 92	7	14	21 50	
S.C.	210	30	- 7	:	9,048	9,664	28	464	16	3	24	6	
Ga. Fla.	953 3,589	186 503	14	2 17	26,994 22,813	27,040 29,996	137 434	333 482	33 44	26	13 31	18 12	
E.S. CENTRAL	642	466	24	-	35,842	35,950	150	872	236	3	39	77	
Ку.	107 217	97	6	-	3,798	4,224	22	119	5	2	15	29	
Tenn. Ala.	197	142 199	13 5	-	12,579 10,449	10,973 11,963	94 28	646 98	212 15	1	10	36	
Miss.	121	28	-	-	9,016	8,790	20	9	4	-	13 1	12	
W.S. CENTRAL	2,587	866	57	1	40,955	46,623	2,133	1,397	77	163	28	51	
Ark. La.	113 482	48 85	19 10	-	5,175 9,765	5,563 8,563	206 86	70 202	2 6	5 5	7	16	
Okla.	112	2	3	-	4,349	4,012	183	148	33	12	5 7	1 26	
Tex.	1,880	731	25	1	21,666	28,485	1,658	977	36	141	9	8	
MOUNTAIN Mont.	778 21	119 8	12 1	2	7,706 68	8,894 113	2,413 63	650 49	98 4	100	53 2	10	
Idaho	12	-	-	-	93	87	64	49 51	4	5	2	-	
Wyo. Colo.	11 304	- 38	3	- 1	61 2,149	116	90	6	-	-	-	8	
N. Mex.	59	13	-	-	703	2,341 802	379 616	94 143	40 9	17 27	11 2	-	
Ariz. Utah	148 76	33	8	1	2,908	3,481	769	120	14	40	20		
Nev.	147	12 15	-		206 1,518	269 1,685	198 234	53 134	11 19	11	4 11	-	
PACIFIC	5,681	660	75	5	31,871	42,332	4,056	2,210	452	292	50	2 210	
Wash. Oreg.	352 166	-	6	1	2,773	3,746	391	286	100	17	2	210	
Calif.	5,036	601	67	4	1,298 26,785	1,651 35,726	252 3,306	209 1,659	79 256	8	2	-	
Alaska Hawaii	15	25	2	-	513	774	84	24	256 13	266 1	44	209	
	112	34	-	-	502	435	23	32	4	-	2	-	
Guam P.R.	2 1,029	173	2	2	- 390	178 460	- 69	- 310	138	-	-	-	
V.I. Amor Samoa	12	•	-	-	265	268	1	310	130	39		-	
Amer. Samoa C.N.M.I.	-	-	-	-	-	53	-	-	-	-		-	
	-	•	-	-	-	148	-	•	-	-	•	•	

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

N: Not notifiable

U: Unavailable

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

576

	Malaria			iles (Ru			Menin- gococcal	mps Pertussis			Rubella				
Reporting Area	Cum.		enous Cum.		rted* Cum.	Total Cum.	Infections Cum.		Cum.		Cum.	Cum.		Cum.	Cum
	1991	1991	1991	1991	1991	1990	1991	1991	1991	1991	1991	1990	1991	1991	199
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	ε
Maine N.H.	1 2	-	2			29 8	8 12	-	- 3	•	46 17	10 31	2	1	
/t.	2	-	5	-	-	1	12	1	3	1	4	6	-		
Mass.	22	-	23	-	9	24	57	-	1	4	127	188	-	2	2
R.I. Conn.	7 12	:	2 18	-	2	30 188	16	-	3 12	1	17	2	-	-	1
				-				-		•		15	-	1	3
VID. ATLANTIC Jpstate N.Y.	98 28	25	4,239 325	-	6 4	1,278 311	145 78	-	205 78	1	112 79	351 268	-	559 537	5
N.Y. City	35	25	1,650	-	-	306	8	-				200		- 537	4
ł.J.	26	-	730	-	1	290	30	-	54	-	1	26	-	-	
°a.	9	•	1,534	-	1	371	29	-	73	-	32	57	-	22	1
.N. CENTRAL	57	-	67	-	11	3,490	224	-	264	3	228	627	-	174	30
Dhio nd.	13 3	-	1	-	2 2	537 411	76 17	-	60 6	3	85	118	-	147	1
na. II.	23	-	25	-	2	1,319	66	-	103		50 41	83 236		1	18
Mich.	16	υ	39	U	-	473	46	U	79	U	23	55	U	20	
Vis.	2	•	2	•	7	750	19	-	16	-	29	135	-	1	
V.N. CENTRAL	21	-	30	-	5	797	80	-	86	2	102	108	-	16	14
/linn.	6 4	-	5	-	5	321	17	-	13	-	41	21	-	6	ę
owa Ao.	4 6	-	15	-	-	26 97	8 29	-	15 26	1	13 32	15 59	-	5	4
N. Dak.	1	-	-	-	-		1	-	20	-	2	2	:	5	1
5. Dak.	-	-	-	-	-	23	2	-	1	-	3	1	-		
lebr.	Ā	-	1	-	-	106	6	-	5	-	5	3	-	-	
ans.	-	-	9	•	-	224	17	-	24	-	6	7	-	-	
. ATLANTIC	144	5	428	1	18	1,073	264	6	1,038	10	155	183	-	12	18
)el. /Id.	2 41	-	21 175	1†	1	11 210	2 29	3	6 199	5	39	6 47	-	6	2
.C.	9	-	-	-	-	22	7	-	21	-	- 35	14	-	1	1
/a.	25	-	24	-	4	72	26	-	43	-	16	15	-		1
V. Va. √.C.	2 11	-	36	-	3	6 30	12 49	-	16 214	-		14	-	:	
5.C.	8	1	13	-		4	27	1	344	1	22 10	40 5	-	2	
Sa.	16	•	10	-	4	184	54	2	38	4	28	24	-		
la.	30	4	149	-	6	534	58	-	157	-	32	18	-	3	14
S. CENTRAL	13	-	6	-	1	150	95	-	155	2	49	105		100	3
(y. Tenn.	27	-	1 5	:	1	32 70	35	-		-	-	-	-	-	
Ala.	4				-	22	28 31	-	127 8	2	17	45	-	100	3
Miss.	-	-	-	-	-	26	1	-	20	-	32	54 6	-		
V.S. CENTRAL	45	3	148	-	14	4,009	108	22	317	2	42	76		-	
Ark.	5	-	-	-	5	42	16	1	40	-	42	3	-	5 1	66
.a. Okla.	9 6	-	-		:	10	23	-	21	1	11	19	-		``
ex.	25	3	148	-	9	173 3,784	13 56	21	12 244	1	21	26	-	-	
OUNTAIN	27	3	933	2	19					-	6	28	-	4	62
Aont.	1	-		-	19	844 1	57 9	6	280	11	153	199	-	6	105
daho	2	3	397	-	2	26	7	-	8	2	2 23	26 36	-	2	1:
Vyo.	-	-	1	-	2	15	1	-	3	-	- 3		-	2	49
Colo. I. Mex.	8 6	:	1 117	1†	5 5	133	11	4	118	3	69	75	-	-	
Ariz.	8	-	274	-	- 5	93 286	8 15	N 2	N 126	1	23 8	14	-	-	
Jtah	1	-	125	-	4	78		-	13	5	23	34 10	:	-	30
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ACIFIC	230	34	1,908	2	63	6,933	353	11	545	21	330	377	1	196	519
Vash.	17	-	46 41	-	15	254	44	9	150	1	82	87	-	8	513
eg. alif.	5 204	34	1,817	1†	29 12	212 6,375	45 255	N 2	N 266	6	48	41	-	2	9
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TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 17, 1991, and August 18, 1990 (33rd Week)

*For measles only, imported cases includes both out-of-state and international importations. N: Not notifiable U: Unavailable ¹International ⁵Out-of-state

Reporting Area		hilis Secondary)	Toxic- shock Syndrome	ock Tuberculosis			Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies Anima
	Cum. Cum. 1991 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
Vlaine	-	5	4	27	-	•	1	-	-
N.H. /t.	12 1	44 1	1	5 4	3 7		1	-	1
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
Jpstate N.Y.	103	552	14	209	277	1	9	6	465
N.Y. City N.J.	2,042 857	2,882 1,013	1	1,984 559	2,231 575	-	21 10	1	-
Pa.	1,115	1,771	15	431	455		3	1	596 240
.N. CENTRAL	2,984	2,143	39	1,414	1,379	4	14	28	84
Dhio	400	345	19	201	236		2	17	11
nd.	94	53	-	119	120		-	7	7
II.	1,399	865	12	755	700	2	4	3	17
Vich. Vis.	770 321	642 238	8	273 66	267 56	2	7 1	1	17 32
W.N. CENTRAL	458	317	22						
WIND CENTRAL	458	54	32 7	329 62	362 65	37 1	2	27	571 198
owa	40	39	6	49	38	-	-	1	109
Mo.	325	164	10	143	174	31	-	16	11
N. Dak. S. Dak.	1	1		4	15	:	-	-	67
S. Dak. Nebr.	11	1 8	1	25 11	9 15	4	-	1 4	140
Kans.	35	50	ż	35	46	1	-	5	11 35
S. ATLANTIC	7,831	9,975	17	2,678	2,699	4	47	153	939
Del.	98	109	i	17	2,000			155	103
VId.	626	730	1	248	211	-	8	19	355
D.C. /a.	494 575	649 593	1 3	123 224	96 234	•	2		7
/a. N. Va.	20	11	3	224 44	234 48		8 1	6 4	175
N.C.	1,237	1,145	7	358	352	1	2	77	42 8
5.C.	980	640	1	256	301	1	3	28	66
Ga. Ha.	1,929 1,872	2,536 3,562	- 3	531	439	1	5	18	159
				877	989	1	18	1	24
S. CENTRAL	2,860 55	2,669 57	9 4	1,004	1,058	11	2	66	115
(y. Tenn.	997	1,063	4	219 323	258 277	4 6	2	19 35	33
Ala.	1,008	819	-	243	322	1	-	35 12	29 53
Viss.	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	442
.a.	1,612	1,588		155	201		3		20

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Bridgeport, Conn. 128 19 5 12 2 1 Buttimore M.d. 146 86 39 15 8 3 12 2 1 Fail River, Mass. 24 16 8 3 5 Charlotte, N.C. 69 11 56 2 9 2 1 5 Hardrot, Conn. 57 33 10 10 2 2 - 1 4 Jacksonville, Fia. 129 68 32 9 2 1 5 Hardrot, Conn. 57 33 10 10 2 2 - 1 Nordik, Va. 68 39 13 7 5 4 5 Norw Beford, Mass. 21 13 7 Nordik, Va. 68 39 13 7 5 4 5 Norw Beford, Mass. 21 14 4 2 - 1 - 1 Tampa, Fia. 130 86 22 11 8 2 - 4 Providence, Fia. 139 86 22 11 8 2 - 4 Providence, Fia. 139 88 - 2 4 1 5 1 5 2 Washington, Del. 23 0 3 S 10 12 40 39 16 21 6 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 5 10 12 13 6 17 5 13 7 4 41 5 28 43 68 102 Chattanooga, Tenn. 69 49 11 4 3 2 2 Albany, N.Y. 216 1374 415 283 43 68 102 Chattanooga, Tenn. 78 46 18 9 4 1 5 5 1 4 14 12 1 12 6 9 12 Chattanooga, Tenn. 138 9 12 2 1 11 4 2 1 12 6 9 12 Chattanooga, Tenn. 138 9 12 2 1 11 4 2 1 12 6 9 12 Chattanooga, Tenn. 138 9 12 2 1 11 4 2 1 1 2 1 4 4 1 10 10 10 7 5 17 7 1 5 4 10 Noble, Na. 133 7 123 8 11 1 2 1 4 4 1 Noble, N.Y. 100 75 17 7 1 5 2 11 4 10 Noble, Na. 133 7 12 8 24 11 2 1 4 4 1 Noble, N.Y. 100 75 17 7 5 2 11 4 10 Noble, Na. 133 9 12 20 1 10 2 10 10 2 7 1 2 1 4 10 Noble, N.Y. 100 75 17 7 5 2 11 4 10 Noble, Na. 133 9 12 20 1 10 2 1 1 4 2 1 10 Now York Chy, N.Y. 102 596 204 159 28 15 3 1 5 1 1 4 10 Noble, N.Y. 100 75 17 7 5 2 11 4 10 Noble, Na. 133 9 12 20 1 10 2 1 1 4 10 Noble, N.Y. 100 75 17 7 5 2 11 4 10 Noble, Na. 133 12 0 13 1 1 2 1 4 1 5 1 1 4 10 Noble, N.Y. 100 75 17 7 5 2 11 4 10 Noble, Na. 133 12 0 13 1 1 2 1 1 4 1 12 1 1 4 1 10 11 10 Now York Chy, N.Y. 102 596 204 159 2 14 13 1 5 1 10 Noble, Na. 100 Nov York Chy, N.Y. 102 596 204 159 2 1 1 4 10 Noble, Na. 100 Nov York Chy, N.Y. 102 596 204 159 2 1 1 4 1 2 1 14 1 5 1 1 1 4 10 110 Noble, Na. 100 Noble,														49		
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TABLE III. Deaths in 121 U.S. cities,* week ending August 17, 1991 (33rd Week)

*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

**Pneumonia and influenza.

tBecause 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.

ttTotal 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).

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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.

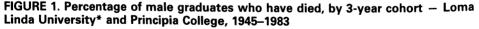
Mortality - Continued

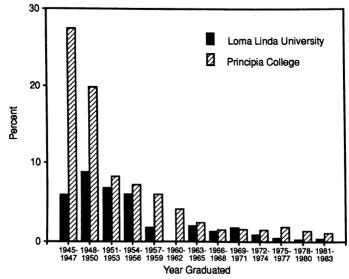
Sciences at LLU. Overall mortality was higher for PC graduates than for LLU graduates (for men, 40 per 1000 and 22 per 1000, respectively [p<0.001; Cochran-Mantel-Haenszel chi-square test], and for women, 27 per 1000 and 12 per 1000, respectively [p=0.001]) (Figures 1 and 2). Total mortality was higher 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





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

Vol. 40 / No. 33

MMWR

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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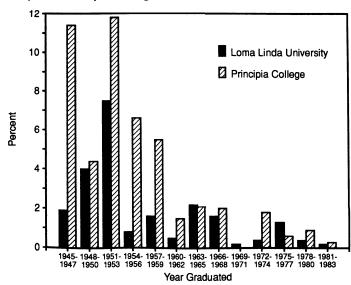
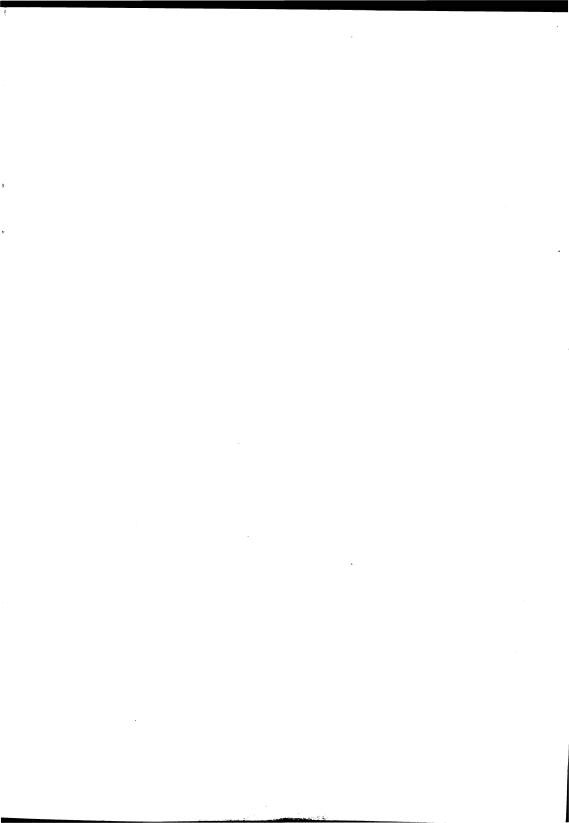


FIGURE 2. Percentage of female graduates who have died, by 3-year cohort – Loma Linda University and Principia College,* 1945–1983

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

Mortality - Continued

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