CENTERS FOR DISEASE CONTROL

November 4, 1988/Vol. 37/No. 43

MMWR

MORBIDITY AND MORTALITY WEEKLY REPORT

Current Trends

Adult Immunization: Knowledge, Attitudes, and Practices – DeKalb and Fulton Counties, Georgia, 1988

Vaccine-preventable diseases are a major problem in adults (*1*). In particular, influenza and pneumococcal disease account for approximately 60,000 deaths each year among persons ≥65 years of age. Many of these deaths could be prevented through appropriate vaccination, but most adults are not immunized (*1*).

In July 1988, the DeKalb County Board of Health, Fulton County Health Department, Georgia Department of Human Resources, and CDC surveyed persons ≥65 years of age who lived in DeKalb and Fulton counties, Georgia. This survey assessed knowledge, attitudes, and practices regarding influenza and pneumococcal immunizations. Interviews were conducted by telephone or in person using the same questionnaire. In DeKalb and Fulton counties, respectively, 13 and 50 housing communities for older adults who lived independently were identified. Seven communities (five in DeKalb County and two in Fulton County) participated in the in-person interviews. For all the remaining communities in DeKalb County and half of those remaining in Fulton County, telephone numbers for interviews were selected from a reverse telephone directory. On a Wednesday evening, telephone calls were made to every other residence. The following day, interviewers conducted voluntary personal interviews of residents passing through lobbies of the housing in the seven previously identified communities.

The data were combined for this report because the same questionnaire was used for the telephone and in-person surveys in both counties, county-specific results were similar, and results from telephone and in-person interviews were similar.

A total of 867 interviews were completed—486 (26%) of 1851 telephone numbers called, 380 (26%) in-person interviews of the estimated 1452 residents, and one of unknown type. Because influenza and pneumococcal vaccines are recommended for all persons aged ≥65 years (*2–5*), this analysis is restricted to responses from the 716 (83%) residents who were in this age group and who identified their county of

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residence as DeKalb County (354 [49%]) or Fulton County (362 [51%]). Of these persons, 609 (85%) were female, 594 (83%) were white, and 122 (17%) were black. The median age was 78 years. For comparison, county-specific demographic data are shown in Table 1.

Six hundred forty-two (90%) of the respondents reported that they were aware of influenza vaccine. Of these, 355 (55%) reported receiving it within the past year. Fifty-nine percent of white respondents and 37% of black respondents reported receiving influenza vaccine in the past year (Table 2) (prevalence ratio [PR] = 1.6, 95% confidence interval [CI] 1.3, 2.0). No difference was found in vaccination status by sex.

Of factors that might be associated with influenza vaccination status, including race and gender, the most important was a recommendation for vaccination by a health-care provider. Seventy-five percent (447) of the 596 respondents who were aware of influenza vaccine and responded to the question reported that their health-care provider had recommended influenza vaccination. Seventy-five percent of persons to whom immunization had been recommended reported being vaccinated within the last year, compared with 7% of those who had not had a recommendation (Table 2) (PR = 11.2; 95% CI 8.1, 15.5). This association of recommendation and vaccination was present for both races.

Of the 642 respondents who were aware of the influenza vaccine, 466 (73%) reported negative attitudes toward it (i.e., that influenza vaccine itself causes illness, does not protect against influenza, or is unnecessary). Fifty percent of those with a negative attitude who responded to the question reported being vaccinated within the last year. Seventy percent of respondents with positive attitudes reported being vaccinated (PR = 0.7, 95% CI 0.6, 0.8). Of respondents with negative attitudes whose health-care provider had or had not recommended vaccination, 70% and 7%, respectively, had been vaccinated (Table 2) (PR = 10.8, 95% CI 7.3, 16.0). Of respondents with positive attitudes whose health-care provider had or had not recommended immunization, 87% and 8%, respectively, had been vaccinated (PR = 11.3, 95% CI 6.3, 20.3).

TABLE 1. County-specific sample and reference population* demographics for persons ≥65 years of age — DeKalb and Fulton counties, Georgia, July 1988

	DeKalb County population		Fulton County population	
Characteristic	Sample (%) (n=354)	Reference (%)	Sample (%) (n=362)	Reference (%)
Race				
White	92.6	84.6	73.2	64.7
Black	7.4	15.4	26.8	35.3
Sex				
Female	89.0	63.7	81.9	65.3
Male	11.0	36.3	18.1	34.7
Age (yrs)				
65–79	52.0	80.7	59.1	80.5
>79	48.0	19.3	40.9	19.5

*Estimated 1987 population of DeKalb and Fulton counties. Source: Georgia Vital Statistics Report, 1987 (in press), Office of Vital Records and Health Statistics, Georgia Center for Health Statistics, Division of Public Health, Georgia Department of Human Resources.

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Three hundred eighty-one (53%) of respondents were aware of a vaccine to prevent pneumococcal disease, and 146 (38%) of these reported having received it. There was no association between race or gender and pneumococcal vaccination status.

The most important factor associated with pneumococcal vaccination status, as with influenza vaccination status, was vaccine recommendation by a health-care provider. Of persons who were aware of the pneumococcal vaccine and responded to the question, 169 (53%) reported that the vaccine had been recommended to them by a health-care provider. Seventy-six percent of the 169 persons were vaccinated, compared with 6% of persons who did not report receiving a recommendation (Table 2) (PR = 12.5, 95% CI 8.4, 18.6). The association of vaccination and recommendation was present for both races.

One hundred thirty-seven (36%) of the 381 respondents who were aware of the pneumococcal vaccine reported negative attitudes toward it (i.e., that the vaccine would not prevent pneumonia or that the vaccine would make them sick). Thirty-three percent of respondents with negative attitudes who answered the question and 44% of those with positive attitudes reported being vaccinated (PR = 0.8, 95% CI 0.6, 1.0). Respondents with negative attitudes who reported that the vaccine was recommended by a health-care provider were more likely to report being vaccinated (64%) than were those who did not report receiving a recommendation (5%) (PR = 12.5,

TABLE 2. Influenza and pneumococcal immunization status, by sex, race, health-care provider recommendation, and attitude of resident* — DeKalb and Fulton counties, Georgia, July 1988

Characteristic	Influenza vaccine			Pneumococcal vaccine		
	No. aware of vaccine	Vaccinated		No. aware of vaccine	Vaccinated	
		No.	(%)		No.	(%)
Sex						
Male	89	56	(63)	42	19	(45)
Female	545	297	(55)	321	126	(39)
Unknown	3	2	(67)	2	1	(50)
Race						
White	536	317	(59)	323	134	(42)
Black	92	34	(37)	37	11	(30)
Provider recommendation						
Yes	447	335	(75)	169	129	(76)
No	149	10	(7)	147	9	(6)
Negative attitude: provider recommendation						
Yes	316	221	(70)	63	40	(63)
No	123	8	(7)	59	3	(5)
Positive attitude: provider recommendation						
Yes	131	114	(87)	106	89	(84)
No	26	2	(8)	88	6	(7)

*Based on responses of 637 persons ≥65 years of age who were aware of the influenza vaccine and reported their vaccination status and 365 who were aware of the pneumococcal vaccine and reported their vaccination status. Numbers vary because of missing values.

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95% CI 5.9, 26.6). Eighty-four percent of persons with positive attitudes who received vaccination recommendations from health-care providers reported being vaccinated, compared with 7% of those with positive attitudes who did not receive a recommendation (Table 2) (PR = 12.3, 95% CI 7.7, 19.6).

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Editorial Note: As many as 20,000 influenza-associated deaths occur during typical influenza epidemics, and approximately 40,000 deaths associated with pneumococcal infections occur each year. Many of the deaths are in persons at high risk for serious complications from these illnesses, particularly persons aged ≥65 years (*1*). Although safe, effective, and inexpensive vaccines are available for these diseases, only about 22% of persons ≥65 years of age receive influenza vaccine annually; only 10% have ever received pneumococcal vaccine (*1*). Limited data have suggested that lack of awareness of the availability and benefits of safe, effective vaccines and unfounded concerns about adverse reactions among both physicians and patients contribute to low levels of adult immunization (*1*). Many of the DeKalb County and Fulton County residents interviewed were unaware of the availability of vaccines against influenza (10%) and pneumococcal disease (47%), and many expressed negative attitudes toward the safety and effectiveness of these vaccines. Other factors influencing vaccinations in this group need to be identified.

These data have several important limitations. The survey addressed a limited segment of the population at high risk for complications from influenza and pneumococcal infections in metropolitan Atlanta. Persons <65 years of age with high-risk conditions such as cardiopulmonary disease, those who do not live in residential centers, and those living in chronic-care facilities were not included. Of persons who were surveyed, 85% were women, a disproportionately high percentage compared with the percentages of women ≥65 years of age living in DeKalb (64%) and Fulton (65%) counties. The racial distributions of respondents from both DeKalb and Fulton counties also differed from that of the reference populations (Table 1). Selection bias may have been introduced into this survey because residential centers voluntarily participated in the survey, and randomization was not possible. In addition, the analysis is potentially complicated by the lack of information on the number of respondents seen by health-care providers. Those not seen by providers are unlikely to have received vaccination recommendations. Also, responses concerning immunization status were not verified. However, in previous surveys on the use of influenza vaccine, respondents correctly recalled receiving a "flu shot" within the previous year (CDC, unpublished data, 1988).

Despite these limitations, findings in this survey were similar to others (*1*) in demonstrating that recommendations for vaccination from health-care providers markedly influenced the decision to be vaccinated, even among those with negative attitudes toward immunization. Health-care providers can promote adult immunization by increasing awareness of vaccine availability, safety, and effectiveness and by recommending and offering vaccines to all adults, whenever indicated. Providers often miss opportunities to immunize adults during routine contacts in offices, clinics, and hospitals (*1*); such opportunities can be used to review the immunization status of adult patients and, when indicated, provide influenza and pneumococcal vaccines

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as well as other appropriate vaccines (diphtheria and tetanus toxoids, measles-mumps-rubella, and hepatitis B vaccines) (*2,3*). Many persons are candidates for both influenza and pneumococcal vaccines, and these vaccines can be given simultaneously (*4,5*). Education of health-care providers should therefore emphasize increasing awareness of not only vaccine recommendations but also the provider's role in promoting adult immunization.

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Epidemiologic Notes and Reports

Human Infection with Swine Influenza Virus — Wisconsin

An influenza virus isolated from a 32-year-old Wisconsin woman who had been exposed to pigs has been identified as a swine influenza virus. On September 13, 1988, when the woman was in her 36th week of pregnancy, she was admitted to a community hospital with a 1-week history of fever to 102 F (38.9 C); headache, myalgias, 3 days of nonproductive cough, and 1 day of progressive shortness of breath. The patient had radiologic evidence of pneumonitis with bilateral lower lobe consolidation and was treated with broad-spectrum antibiotics. On September 14, she was transferred to a tertiary-care hospital for ventilatory assistance and management of late-stage pregnancy. Specimens for bacterial, viral, and fungal cultures and serologic testing were obtained, and antibiotic therapy was continued. Because of mechanical difficulty in ventilating the patient, labor was induced, and on September 17 she gave birth to a healthy 2990-g infant. Despite intensive support, her respiratory failure persisted, and she died September 21.

The patient's clinical course and findings of postmortem examinations were consistent with primary viral pneumonia. All cultures for bacteria and fungi were negative. Influenza virus was isolated postmortem from a sputum specimen obtained on September 14 and was identified by monoclonal antibody as type A virus. When further tested by hemagglutination inhibition (HI) tests at CDC, the virus was unreactive with antisera to strains currently prevalent in the world but reacted with antisera to influenza A(H1N1) viruses related to swine influenza. A paired serum specimen showed a fourfold or greater rise in HI antibody against swine influenza virus. Results of preliminary HI tests performed at the University of Wisconsin with monoclonal antibodies to the hemagglutinin of swine influenza virus indicate that the isolate resembles viruses isolated during the summer from pigs in Wisconsin. Further laboratory studies of the recent Wisconsin isolate are being undertaken to confirm its similarity to enzootic strains.

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On September 3, 4 days before the onset of illness, the woman had attended a county fair and had visited the display area of a pig barn. Veterinarians working at the fair stated that influenza-like illness had occurred among pigs at the fair.

Preliminary investigations have detected no outbreaks of influenza-like illness in the surrounding communities. Further investigation is under way to determine whether the swine influenza virus may have infected others with known exposure to pigs at the fair or from the ill woman to persons with whom she had close contact.

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Editorial Note: Influenza A viruses circulate naturally in many nonhuman hosts including swine, horses, and numerous avian species (*1*). Such viruses are theoretically reservoirs from which strains capable of infecting humans may evolve; however, the genetic composition of most animal influenza viruses appears to biologically restrict the range of hosts and prevent the viruses from crossing the species barrier. In some cases, however, this barrier appears to have been circumvented. For example, "Hong Kong flu" emerged in 1968 by probable genetic reassortment between the previously circulating human strains of "Asian flu" and an animal virus that donated the gene for the new virus hemagglutinin (*2*).

Unlike the 1968 event, the case in Wisconsin probably represents direct transmission of influenza virus from a pig to a human host. Virus isolation on other occasions has proven that viruses genetically similar to those found in swine in the United States have caused human infections. The first proven case was in 1974 and involved a child with Hodgkin's disease who had known contact with pigs (*3*). Since then, other laboratory-confirmed cases have occurred in persons who either resided on farms or visited locations where contact with pigs was possible (*4*). Infections also have occurred without demonstrated exposure to swine, including the 1976 cluster of cases in Fort Dix, New Jersey, which showed limited person-to-person transmission (*5*), and possibly a case in a child in Las Vegas (*6*). In these situations, initial undocumented transmission of influenza virus from swine to humans is likely to have occurred, and the infected person probably initiated limited chains of person-to-person transmission (possibly with subclinical infections), which eventually led to the laboratory-diagnosed cases. In addition to the recent Wisconsin case, other human infections with swine influenza viruses have been fatal (*4*). The fatalities have occurred in human hosts who were immunosuppressed or otherwise compromised by stressful occupational or medical conditions. However, continuous transmission of swine influenza virus in humans has not occurred.

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Swine Influenza — Continued

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Recommendations of the Immunization Practices Advisory Committee (ACIP)

Use of BCG Vaccines in the Control of Tuberculosis: A Joint Statement by the ACIP and the Advisory Committee for Elimination of Tuberculosis

Since 1979, when the last Immunization Practices Advisory Committee (ACIP) statement on vaccination with Bacillus of Calmette and Guérin (BCG) was published, additional data have been published on the epidemiology of tuberculosis (TB) in the United States and on the efficacy of childhood BCG vaccines. As a result, ACIP and the Advisory Committee for Elimination of Tuberculosis have issued the following educational update on BCG vaccines.*[†]

Immunization with BCG vaccine lowers the risk of serious complications of primary TB in children (*1–4*). However, BCG vaccination should be considered only for children with negative tuberculin skin tests who fall into the following categories: 1) those who cannot be placed on isoniazid preventive therapy but who have continuous exposure to persons with active disease; 2) those with continuous exposure to patients with organisms resistant to isoniazid and rifampin; or 3) those belonging to groups with exceptionally high annual rates of new infection (i.e., >1% per year).

BCG vaccination is no longer recommended for health-care workers or other adults at high risk for acquiring TB infection. In addition, BCG should not be given to persons who are immunocompromised, including those with human immunodeficiency virus (HIV) infection.

INTRODUCTION

Transmission and Pathogenesis of TB

TB is a bacterial disease caused by organisms of the *Mycobacterium tuberculosis* complex (i.e., *M. tuberculosis, M. bovis, M. africanum*). It is transmitted primarily by airborne droplets; infection occurs when susceptible persons inhale infectious droplets produced by the exhalations of persons with respiratory tract TB. The risk for infection is directly related to duration and intensity of exposure to air contaminated with these droplets. TB infection usually begins in the lungs and spreads to the hilar lymph nodes, then to the blood stream. Thus, disease can occur in any organ of the body. Most infected persons react to the purified protein derivative (PPD) tuberculin skin test, and 5%–40% will develop clinically apparent TB. Infection is more likely to

*Official name: BCG Vaccine.
[†]Replaces previous recommendation on BCG vaccines (*MMWR* 1979;28:241–4).

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progress to clinical disease in the presence of certain risk factors, including younger and older ages, male sex, infection within the past 2 years, leanness, and suppression of cell-mediated immunity.

TB can be presumptively diagnosed if acid-fast bacilli are found in sputum, body fluids, or tissue or if at least two of three other conditions are met: 1) symptoms are compatible with TB; 2) chest radiograph is abnormal or abnormalities are found on physical examination; or 3) reaction to the tuberculin skin test is positive. Definitive diagnosis requires isolation and identification of organisms of the *M. tuberculosis* complex from a clinical specimen. Diagnosis of extrapulmonary TB is more difficult because it requires tissue biopsies or body fluids (e.g., spinal fluid) that usually contain only a few organisms.

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TABLE I. Summary — cases of specified notifiable diseases, United States

Disease	43rd Week Ending			Cumulative, 43rd Week Ending		
	Oct. 29, 1988	Oct. 31, 1987	Median 1983-1987	Oct. 29, 1988	Oct. 31, 1987	Median 1983-1987
Acquired Immunodeficiency Syndrome (AIDS)	257	U*	103	25,162	15,839	6,519
Aseptic meningitis	153	238	307	5,400	9,607	8,853
Encephalitis: Primary (arthropod-borne & unspec)	8	17	38	643	1,091	1,081
Post-infectious	3	-	1	107	89	91
Gonorrhea: Civilian	13,338	15,782	18,575	572,291	641,444	734,675
Military	188	288	501	9,593	13,347	17,606
Hepatitis: Type A	500	527	569	20,896	20,365	18,642
Type B	372	462	543	18,439	20,965	21,298
Non A, Non B	31	54	73	2,084	2,485	2,949
Unspecified	107	77	88	1,860	2,594	4,188
Legionellosis	19	17	21	781	803	619
Leprosy	8	3	3	133	175	200
Malaria	12	29	19	815	772	794
Measles: Total†	16	22	22	2,435	3,487	2,583
Indigenous	9	21	21	2,185	3,071	2,155
Imported	7	1	3	250	416	299
Meningococcal infections	33	56	44	2,342	2,406	2,257
Mumps	86	124	64	3,867	11,111	2,743
Pertussis	130	62	62	2,322	2,110	2,110
Rubella (German measles)	-	2	5	183	316	578
Syphilis (Primary & Secondary): Civilian	797	825	695	33,329	29,399	23,083
Military	3	1	2	134	135	142
Toxic Shock syndrome	6	3	8	290	283	314
Tuberculosis	301	461	461	17,405	17,542	17,619
Tularemia	5	3	3	161	176	176
Typhoid Fever	6	3	5	315	276	301
Typhus fever, tick-borne (RMSF)	3	5	12	588	563	697
Rabies, animal	61	74	114	3,576	3,986	4,543

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1988		Cum. 1988
Anthrax	-	Leptospirosis (Ga. 1, Hawaii 3)	39
Botulism: Foodborne (Alaska 2)	21	Plague	14
Infant (Ark. 1)	29	Poliomyelitis, Paralytic (Wash. 1)	1
Other	3	Psittacosis (Ohio 1, Calif. 1)	76
Brucellosis (Md. 1, Fla. 1)	55	Rabies, human	-
Cholera	4	Tetanus	44
Congenital rubella syndrome (Ala. 1)	4	Trichinosis	38
Congenital syphilis, ages < 1 year	302		
Diphtheria	-		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.
†Five of the 16 reported cases for this week were imported from a foreign country or can be directly traceable to a known internationally imported case within two generations.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending October 29, 1988 and October 31, 1987 (43rd Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	25,162	5,400	643	107	572,291	641,444	20,896	18,439	2,084	1,860	781	133
NEW ENGLAND	1,052	338	24	4	18,053	19,721	702	981	105	74	46	15
Maine	26	17	2	-	339	581	17	47	4	1	4	-
N.H.	32	38	1	3	217	335	40	64	7	4	4	-
Vt.	10	23	7	-	102	186	13	33	6	4	3	-
Mass.	584	144	8	1	6,127	6,920	335	611	71	50	32	14
R.I.	67	70	-	-	1,671	1,790	77	71	10	-	3	1
Conn.	333	46	6	-	9,597	9,909	220	155	7	15	-	-
MID. ATLANTIC	8,462	596	51	4	89,914	99,963	1,547	2,659	158	260	189	8
Upstate N.Y.	1,084	321	32	1	13,125	14,876	639	639	61	19	74	-
N.Y. City	4,641	116	8	3	37,414	51,777	296	1,111	15	192	38	7
N.J.	2,019	61	11	-	12,948	13,872	331	620	56	35	40	1
Pa.	718	98	-	-	26,427	19,438	281	289	26	14	37	-
E.N. CENTRAL	1,785	895	162	12	95,804	98,067	1,374	1,960	185	98	178	4
Ohio	411	321	55	3	21,918	21,934	286	446	30	17	69	-
Ind.	80	89	18	-	7,321	7,485	142	286	19	20	20	-
Ill.	828	86	32	9	28,275	29,161	400	421	63	22	-	3
Mich.	374	357	42	-	30,898	30,898	341	582	50	36	54	-
Wis.	92	42	15	-	7,392	8,589	205	225	23	3	35	1
W.N. CENTRAL	606	218	47	11	24,421	26,068	1,173	844	91	30	65	1
Minn.	134	29	11	3	3,294	3,934	87	112	18	3	3	-
Iowa	35	33	9	3	1,830	2,513	42	76	13	2	16	-
Mo.	312	88	1	-	13,957	13,865	703	497	41	16	17	-
N. Dak.	4	1	4	-	144	246	6	10	3	5	1	-
S. Dak.	5	16	5	2	427	518	15	4	2	-	14	-
Nebr.	33	11	10	2	1,340	1,644	46	40	2	-	5	-
Kans.	83	40	7	1	3,429	3,348	274	105	12	4	9	1
S. ATLANTIC	4,328	1,162	98	40	162,257	168,456	1,979	3,812	319	289	119	1
Del.	60	38	3	-	2,550	2,846	38	120	7	4	13	-
Md.	453	171	8	3	16,943	19,311	251	585	37	24	17	1
D.C.	398	17	1	1	12,105	11,300	16	38	3	1	1	-
Va.	314	150	32	4	11,891	12,467	328	270	66	196	10	-
W. Va.	16	34	22	-	1,137	1,211	13	62	4	3	-	-
N.C.	229	135	21	-	22,676	24,694	269	679	75	-	31	-
S.C.	151	20	-	1	12,857	13,315	38	445	11	5	20	-
Ga.	573	134	1	2	30,750	30,087	516	538	12	6	17	-
Fla.	2,134	463	10	29	51,348	53,225	510	1,075	104	50	10	-
E.S. CENTRAL	638	351	58	8	46,295	48,643	670	1,174	155	12	43	2
Ky.	81	127	19	1	4,664	4,908	451	241	55	2	18	-
Tenn.	293	41	15	-	15,962	17,015	145	540	38	-	8	-
Ala.	173	153	24	2	14,017	15,444	48	301	52	9	13	2
Miss.	91	30	-	5	11,652	11,276	26	92	10	1	4	-
W.S. CENTRAL	2,149	664	72	3	61,825	72,831	2,516	1,672	182	451	19	28
Ark.	72	14	5	-	6,115	8,136	290	91	4	17	4	-
La.	302	103	21	1	12,129	12,512	124	301	24	13	6	1
Okla.	100	62	4	-	5,881	7,887	432	148	40	24	9	-
Tex.	1,675	485	42	2	37,700	44,296	1,670	1,132	114	397	-	27
MOUNTAIN	743	199	25	3	12,232	16,824	2,798	1,361	219	150	41	1
Mont.	11	4	-	-	360	472	36	46	10	4	2	-
Idaho	9	1	-	-	287	602	120	89	6	4	-	-
Wyo.	6	2	-	-	174	370	5	12	3	-	3	-
Colo.	282	67	3	-	2,657	3,800	184	169	63	67	8	1
N. Mex.	36	21	2	1	1,225	1,857	468	202	18	1	4	-
Ariz.	232	64	11	1	4,447	5,675	1,524	542	64	49	16	-
Utah	54	24	4	1	450	518	261	106	36	18	3	-
Nev.	113	16	5	-	2,632	3,530	200	195	19	7	5	-
PACIFIC	5,399	977	106	22	61,490	90,871	8,137	3,976	670	496	81	73
Wash.	342	-	7	4	5,752	7,477	1,847	696	164	59	17	4
Oreg.	143	-	-	-	2,689	3,391	1,139	489	71	21	1	1
Calif.	4,807	863	94	18	51,627	77,874	4,674	2,698	425	405	60	56
Alaska	16	23	3	-	897	1,420	468	48	6	6	-	1
Hawaii	91	91	2	-	525	709	9	45	4	5	3	11
Guam	1	-	-	-	122	170	9	13	-	2	1	5
P.R.	1,158	66	4	1	1,085	1,661	47	232	40	37	-	3
V.I.	32	-	-	-	353	235	1	6	2	-	-	-
Amer. Samoa	-	-	-	-	65	70	3	2	-	5	-	2
C.N.M.I.	-	-	-	-	39	-	1	3	-	4	-	1

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

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending October 29, 1988 and October 31, 1987 (43rd Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	1988	Cum. 1988	Cum. 1987
UNITED STATES	815	9	2,185	7	250	3,487	2,342	86	3,867	130	2,322	2,110	-	183	316
NEW ENGLAND	62	1	83	1	51	279	199	3	118	7	159	148	-	9	1
Maine	3	-	7	-	-	3	8	-	-	2	13	28	-	-	1
N.H.	3	-	67	-	44	162	23	3	106	1	47	37	-	5	-
Vt.	4	-	-	-	-	26	14	-	5	1	4	4	-	-	-
Mass.	31	1	2	-	2	64	89	-	7	3	60	50	-	3	-
R.I.	6	-	-	-	-	2	21	-	-	-	15	3	-	1	-
Conn.	15	-	7	1§	5	22	44	-	-	-	20	26	-	-	-
MID. ATLANTIC	144	1	810	-	48	582	243	2	323	3	172	238	-	14	11
Upstate N.Y.	36	-	19	-	18	40	112	-	95	-	100	137	-	2	9
N.Y. City	75	-	45	-	5	463	58	-	101	-	5	8	-	7	1
N.J.	11	-	217	-	11	39	63	-	44	-	8	15	-	3	1
Pa.	22	1	529	-	14	40	10	2	83	3	59	78	-	2	-
E.N. CENTRAL	42	1	139	-	48	361	326	13	781	4	235	243	-	30	37
Ohio	10	-	2	-	23	5	116	-	113	-	49	68	-	1	-
Ind.	3	-	57	-	-	-	26	-	71	1	73	16	-	-	-
Ill.	2	1	56	-	16	181	68	-	285	3	45	16	-	25	26
Mich.	23	-	24	-	5	29	77	12	202	-	34	46	-	4	9
Wis.	4	-	-	-	4	146	39	1	110	-	34	97	-	-	2
W.N. CENTRAL	17	-	11	-	2	230	86	7	133	7	121	129	-	2	2
Minn.	5	-	10	-	1	39	19	-	-	-	49	13	-	-	-
Iowa	2	-	-	-	-	-	-	-	33	7	29	55	-	-	1
Mo.	6	-	1	-	1	189	31	1	34	-	20	31	-	-	-
N. Dak.	-	-	-	-	-	1	-	-	-	-	11	12	-	-	-
S. Dak.	-	-	-	-	-	-	4	-	1	-	5	3	-	-	-
Nebr.	1	-	-	-	-	-	12	-	11	-	-	1	-	-	-
Kans.	3	-	-	-	-	1	20	6	54	-	7	14	-	2	1
S. ATLANTIC	107	-	374	1	20	159	408	35	641	6	223	291	-	17	18
Del.	1	-	-	-	-	32	2	-	-	-	7	5	-	-	2
Md.	16	-	11	-	3	7	49	23	129	1	37	17	-	1	3
D.C.	12	-	-	-	-	1	8	6	249	-	1	-	-	-	1
Va.	18	-	198	-	2	1	47	5	134	-	21	49	-	11	1
W. Va.	2	-	6	-	-	-	7	-	15	-	8	39	-	-	-
N.C.	13	-	-	1§	5	5	63	1	50	1	62	117	-	-	1
S.C.	10	-	-	-	-	2	35	-	5	-	1	-	-	-	-
Ga.	5	-	-	-	-	9	62	-	28	-	35	23	-	2	2
Fla.	30	-	159	-	10	102	135	-	31	4	51	41	-	3	8
E.S. CENTRAL	15	-	56	-	-	6	221	-	434	4	96	42	-	2	3
Ky.	-	-	35	-	-	-	49	-	208	-	12	2	-	-	2
Tenn.	-	-	1	-	-	-	123	-	209	-	29	12	-	2	1
Ala.	10	-	-	-	-	4	35	-	14	4	52	22	-	-	-
Miss.	5	-	20	-	-	2	14	N	N	-	3	6	-	-	-
W.S. CENTRAL	70	-	14	-	3	448	159	13	754	30	198	260	-	11	11
Ark.	4	-	-	-	1	-	20	-	99	-	22	12	-	4	2
La.	10	-	-	-	-	-	46	9	281	-	17	48	-	-	-
Okla.	10	-	8	-	-	4	18	-	196	-	61	149	-	1	5
Tex.	46	-	6	-	2	444	75	4	178	30	98	51	-	6	4
MOUNTAIN	39	-	117	5	32	495	67	6	187	39	677	175	-	6	24
Mont.	5	-	5	5†	30	128	2	-	2	-	2	6	-	-	8
Idaho	2	-	-	-	1	-	8	-	3	4	310	56	-	-	1
Wyo.	-	-	-	-	-	2	-	-	3	-	2	5	-	-	1
Colo.	14	-	112	-	1	9	17	1	31	9	29	59	-	2	-
N. Mex.	2	-	-	-	-	317	11	N	N	-	46	11	-	-	-
Ariz.	10	-	-	-	-	35	18	5	127	25	261	30	-	-	4
Utah	4	-	-	-	-	1	9	-	7	1	26	8	-	3	10
Nev.	2	-	-	-	-	3	2	-	14	-	1	-	-	1	-
PACIFIC	319	6	581	-	46	927	633	7	496	30	441	584	-	92	209
Wash.	19	-	7	-	-	44	57	1	49	-	105	86	-	-	2
Oreg.	12	-	6	-	2	91	36	N	N	1	45	70	-	-	2
Calif.	275	6	564	-	36	787	517	5	407	29	236	207	-	64	133
Alaska	3	-	1	-	-	1	6	1	13	-	7	6	-	-	2
Hawaii	10	-	3	-	8	4	17	-	16	-	48	215	-	28	70
Guam	-	-	-	-	1	2	-	-	2	-	-	-	-	1	1
P.R.	2	-	190	-	-	755	8	-	9	-	15	16	-	3	3
V.I.	-	-	-	-	-	-	-	-	31	-	-	-	-	-	1
Amer. Samoa	-	-	-	-	-	1	2	-	3	-	-	-	-	-	-
C.N.M.I.	1	-	-	-	-	-	1	-	2	-	-	-	-	-	-

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

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending October 29, 1988 and October 31, 1987 (43rd Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	33,329	29,399	290	17,405	17,542	161	315	588	3,576
NEW ENGLAND	964	506	21	458	537	4	33	12	15
Maine	12	1	4	22	22	-	-	-	1
N.H.	6	3	4	8	18	-	-	-	5
Vt.	3	2	2	4	10	-	1	-	-
Mass.	353	238	9	266	300	3	20	7	-
R.I.	30	10	-	36	51	-	5	2	-
Conn.	560	252	2	122	136	1	7	3	9
MID. ATLANTIC	8,101	5,544	45	3,463	3,105	-	64	18	394
Upstate N.Y.	481	221	21	464	421	-	12	11	41
N.Y. City	5,690	4,110	6	1,888	1,481	-	39	6	-
N.J.	811	590	3	532	564	-	11	-	13
Pa.	1,119	623	15	579	639	-	2	1	340
E.N. CENTRAL	929	764	43	1,931	1,938	1	29	51	134
Ohio	87	90	29	363	357	-	7	39	5
Ind.	47	52	1	195	192	-	2	2	28
Ill.	425	401	1	833	856	-	14	7	29
Mich.	344	169	12	452	448	1	4	2	34
Wis.	26	52	-	88	85	-	2	1	38
W.N. CENTRAL	196	154	36	443	501	73	4	89	403
Minn.	17	15	5	75	98	3	2	2	116
Iowa	18	25	6	47	35	-	-	-	13
Mo.	127	72	8	217	271	45	2	53	20
N. Dak.	1	1	3	15	9	1	-	-	93
S. Dak.	-	11	4	31	23	16	-	7	112
Nebr.	27	10	4	12	23	2	-	1	17
Kans.	6	20	6	46	42	6	-	26	32
S. ATLANTIC	11,777	10,033	18	3,708	3,748	5	33	192	1,217
Del.	91	63	1	34	36	2	-	1	50
Md.	593	521	3	364	334	-	1	22	277
D.C.	578	326	-	168	135	-	1	-	8
Va.	363	267	-	333	371	2	12	16	308
W. Va.	35	10	-	65	85	-	1	2	87
N.C.	674	583	8	388	423	-	1	103	8
S.C.	613	633	3	404	390	-	-	22	106
Ga.	2,123	1,406	-	606	657	1	4	23	243
Fla.	6,707	6,224	3	1,346	1,317	-	13	3	130
E.S. CENTRAL	1,668	1,609	22	1,453	1,568	11	3	82	258
Ky.	56	19	9	313	347	5	1	28	106
Tenn.	735	639	10	435	468	5	-	37	69
Ala.	477	418	3	438	466	-	1	10	78
Miss.	400	533	-	267	287	1	1	7	5
W.S. CENTRAL	3,629	3,655	28	2,213	2,061	48	8	128	467
Ark.	204	214	2	253	250	30	-	24	72
La.	703	678	-	268	235	-	4	2	10
Okla.	128	150	9	206	194	15	-	87	30
Tex.	2,594	2,613	17	1,486	1,382	3	4	15	355
MOUNTAIN	723	596	35	463	531	11	8	11	330
Mont.	3	9	-	19	11	-	1	6	181
Idaho	3	5	5	19	28	-	-	1	11
Wyo.	1	3	-	5	2	2	-	3	37
Colo.	85	101	3	57	133	5	3	1	28
N. Mex.	46	50	2	87	81	2	1	-	11
Ariz.	139	264	16	206	223	1	3	-	37
Utah	14	22	9	18	24	1	-	-	9
Nev.	432	142	-	52	29	-	-	-	16
PACIFIC	5,342	6,538	42	3,273	3,553	8	133	5	358
Wash.	178	129	6	192	204	1	12	1	-
Oreg.	256	258	1	128	100	1	7	1	-
Calif.	4,867	6,135	34	2,782	3,035	4	111	3	348
Alaska	14	4	-	39	52	2	-	-	10
Hawaii	27	12	1	132	162	-	3	-	-
Guam	3	2	-	21	26	-	-	-	-
P.R.	576	774	-	194	265	-	5	-	62
V.I.	1	9	-	6	2	-	-	-	-
Amer. Samoa	-	-	-	3	8	-	1	-	-
C.N.M.I.	1	-	-	17	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending October 29, 1988 (43rd Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	700	475	115	58	25	27	48
Boston, Mass.	198	121	37	23	4	13	24
Bridgeport, Conn.	54	38	7	5	3	1	-
Cambridge, Mass.§	23	20	3	-	-	-	3
Fall River, Mass.	35	29	5	-	1	-	2
Hartford, Conn.	52	32	9	4	2	5	1
Lowell, Mass.	30	25	2	1	2	-	2
Lynn, Mass.	18	13	4	1	-	-	-
New Bedford, Mass.	29	22	6	1	-	-	-
New Haven, Conn.	69	42	7	11	4	5	4
Providence, R.I.	44	31	10	2	-	1	-
Somerville, Mass.	6	5	-	1	-	-	1
Springfield, Mass.	44	30	10	1	2	1	4
Waterbury, Conn.	36	27	4	2	2	1	5
Worcester, Mass.	62	40	11	6	5	-	2
MID. ATLANTIC	2,883	1,909	541	305	63	65	148
Albany, N.Y.	43	29	9	3	1	1	-
Allentown, Pa.	15	13	1	1	-	-	1
Buffalo, N.Y.	101	68	22	7	1	3	7
Camden, N.J.	25	12	8	3	2	-	1
Elizabeth, N.J.	23	16	6	1	-	-	-
Erie, Pa.†	34	30	3	-	-	1	2
Jersey City, N.J.	48	32	8	6	2	-	3
N.Y. City, N.Y.	1,613	1,043	308	192	38	32	72
Newark, N.J.	68	28	17	14	4	5	2
Paterson, N.J.	32	17	6	6	-	3	3
Philadelphia, Pa.	397	266	73	35	10	13	20
Pittsburgh, Pa.†	84	42	22	16	1	3	2
Reading, Pa.	37	26	9	1	-	1	4
Rochester, N.Y.	116	91	19	3	2	1	14
Schenectady, N.Y.	24	20	1	2	1	-	2
Scranton, Pa.†	34	28	5	1	-	-	1
Syracuse, N.Y.	96	76	13	5	-	2	9
Trenton, N.J.	42	26	8	8	-	-	1
Utica, N.Y.	25	22	1	1	1	-	1
Yonkers, N.Y.	26	24	2	-	-	-	3
E.N. CENTRAL	2,286	1,486	511	160	55	74	98
Akron, Ohio	55	39	11	2	2	1	-
Canton, Ohio	15	11	3	1	-	-	1
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	136	87	37	9	1	2	10
Cleveland, Ohio	153	97	40	6	7	3	4
Columbus, Ohio	176	105	46	11	4	10	1
Dayton, Ohio	113	79	18	9	3	4	5
Detroit, Mich.	252	136	66	31	11	8	9
Evansville, Ind.	61	42	13	4	1	1	5
Fort Wayne, Ind.	58	31	18	5	2	2	5
Gary, Ind.	14	6	6	1	1	-	2
Grand Rapids, Mich.	51	32	12	2	1	4	1
Indianapolis, Ind.	175	109	43	11	6	6	5
Madison, Wis.	19	13	5	-	1	-	2
Milwaukee, Wis.	132	106	18	3	1	4	5
Peoria, Ill.	50	34	10	4	-	2	3
Rockford, Ill.	45	36	3	2	1	3	4
South Bend, Ind.	41	32	6	3	-	-	9
Toledo, Ohio	116	86	19	8	2	1	11
Youngstown, Ohio	60	43	12	3	1	1	-
W.N. CENTRAL	854	610	167	45	15	17	45
Des Moines, Iowa	97	63	22	10	1	1	2
Duluth, Minn.	41	36	4	1	-	-	3
Kansas City, Kans.	39	23	11	3	2	-	3
Kansas City, Mo.	121	81	30	8	1	1	5
Lincoln, Nebr.	40	32	4	2	1	1	3
Minneapolis, Minn.	162	125	25	10	2	-	12
Omaha, Nebr.	89	64	19	1	1	4	6
St. Louis, Mo.	138	93	25	7	5	8	7
St. Paul, Minn.	56	39	13	2	1	1	1
Wichita, Kans.§	71	54	14	1	1	1	3

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
S. ATLANTIC	1,358	806	297	150	54	50	65
Atlanta, Ga.	157	87	39	25	5	1	6
Baltimore, Md.	329	195	72	35	14	13	12
Charlotte, N.C.	70	43	21	4	-	2	5
Jacksonville, Fla.	69	45	13	7	1	3	1
Miami, Fla.	165	80	40	23	13	9	1
Norfolk, Va.	70	47	10	3	4	6	5
Richmond, Va.	71	47	15	5	3	1	12
Savannah, Ga.	63	42	13	4	1	3	9
St. Petersburg, Fla.	74	64	6	1	1	2	8
Tampa, Fla.	63	34	13	9	5	1	4
Washington, D.C.	201	102	52	32	7	8	1
Wilmington, Del.	26	20	3	2	-	1	1
E.S. CENTRAL	820	535	187	56	23	19	45
Birmingham, Ala.	134	82	41	5	3	3	3
Chattanooga, Tenn.	71	43	19	8	-	1	3
Knoxville, Tenn.	96	66	17	11	2	-	10
Louisville, Ky.	74	53	16	2	2	1	4
Memphis, Tenn.	208	134	47	15	6	6	14
Mobile, Ala.	53	30	9	8	3	3	6
Montgomery, Ala.	56	38	13	3	1	1	-
Nashville, Tenn.	128	89	25	4	6	4	5
W.S. CENTRAL	1,786	1,082	392	187	69	56	61
Austin, Tex.	86	51	21	10	2	2	4
Baton Rouge, La.	46	31	10	3	2	-	4
Corpus Christi, Tex.§	48	37	10	1	-	-	1
Dallas, Tex.	178	101	38	20	8	11	5
El Paso, Tex.	71	49	7	6	5	4	3
Fort Worth, Tex	105	68	16	8	8	5	3
Houston, Tex.§	733	435	169	89	24	16	18
Little Rock, Ark.	66	41	16	4	1	4	5
New Orleans, La.	132	79	30	14	7	2	-
San Antonio, Tex.	192	115	40	21	8	8	10
Shreveport, La.	26	10	12	4	-	-	1
Tulsa, Okla.	103	65	23	7	4	4	7
MOUNTAIN	657	409	120	60	22	46	36
Albuquerque, N. Mex.	80	48	17	9	3	3	4
Colo. Springs, Colo.	39	27	5	5	2	-	5
Denver, Colo.	101	56	16	11	-	18	2
Las Vegas, Nev.	113	77	21	9	4	2	5
Ogden, Utah	20	16	4	-	-	-	2
Phoenix, Ariz.	131	75	23	15	8	10	6
Pueblo, Colo.	22	16	4	1	-	1	2
Salt Lake City, Utah	46	28	6	2	3	7	1
Tucson, Ariz.	105	66	24	8	2	5	9
PACIFIC	1,792	1,211	278	201	55	40	111
Berkeley, Calif.	14	9	4	1	-	-	-
Fresno, Calif.	75	52	10	7	3	1	6
Glendale, Calif.	26	21	3	2	-	-	-
Honolulu, Hawaii	68	46	17	1	1	3	7
Long Beach, Calif.	84	55	15	10	-	4	16
Los Angeles Calif.	498	365	36	68	23	3	23
Oakland, Calif.	74	47	11	8	3	5	2
Pasadena, Calif.	28	19	5	2	-	2	4
Portland, Oreg.	139	109	16	8	3	3	9
Sacramento, Calif.	166	99	35	20	6	6	11
San Diego, Calif.	122	76	29	9	3	3	12
San Francisco, Calif.	150	87	24	34	2	3	3
San Jose, Calif.	162	105	33	16	4	4	9
Seattle, Wash.	105	68	24	8	4	1	1
Spokane, Wash.	41	31	7	-	2	1	6
Tacoma, Wash.	40	22	9	7	1	1	2
TOTAL	13,136††	8,523	2,608	1,222	381	394	657

*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.

§Data not available. Figures are estimates based on average of past available 4 weeks.

ACIP — Continued

Epidemiology of TB in the United States

TB in the United States has declined approximately 6% per year since nationwide reporting began in 1953. However, in 1986, the morbidity rate for TB increased slightly to 9.4/100,000, a rate 82% lower than that for 1953 but 1.1% higher than the 1985 rate. A total of 22,768 cases were reported (*5*), and approximately 80% were pulmonary disease.

Untreated TB is fatal in up to 50% of cases. However, chemotherapy has helped reduce the case-mortality rate 94% since 1953. In 1984, the most recent year for which final mortality data are available, 1729 deaths were attributed to TB, representing a mortality rate of 0.7/100,000 population.

Prevalence of TB infection and disease varies for different segments of the population. Disease rates are twice as high in males as in females and increase sharply with age in both sexes and all races. Groups at high risk for TB include most racial/ethnic minorities, immigrants from countries with a high prevalence of TB, the homeless population, close contacts of persons with pulmonary TB, and persons with HIV infection. In 1986, 62% of all TB cases occurred in racial/ethnic minorities, and over 20% of all cases were in foreign-born persons (*5*). Although the prevalence of active TB in the homeless population is difficult to assess, surveillance of selected clinics and shelters showed infection rates between 1.6% and 6.8% (*6*). Based on 1985 data from U.S. health departments, 29% of close contacts of TB patients were infected at the time the patients were diagnosed (*7*). In addition, the estimated risk for active TB in persons with symptomatic HIV infection is 100–200 times greater than that of persons in the general population (*8*). Persons with asymptomatic HIV infection and *M. tuberculosis* infection may have an equally high risk for developing clinical disease.

In 1985, the 1261 cases of TB in children <15 years of age accounted for 5.7% of cases in all age groups. Eighty percent of these were among racial/ethnic minorities (*9*). One fourth (315) of all childhood cases were extrapulmonary; of these, 41 cases were meningeal, and 17 were miliary. Childhood cases of TB meningitis and miliary TB remained stable between 1981 and 1985, averaging 55 cases annually.

In the past, TB was regarded as an occupational hazard for health-care workers, who had higher rates of infection and disease than persons of the same age groups in the general population. Although these rates have decreased over time, persons who work with high-risk patients or in high-prevalence communities still may be at risk for new infection, defined as conversion from a negative to a positive tuberculin skin test (*10–18*). However, in recent studies, which found increased conversion rates among health-care personnel, rates were highest in health-care workers who did not have patient contact (*10,11*), suggesting that conversion resulted from community-acquired infection with *M. tuberculosis* or exposure to nontuberculous mycobacteria rather than from occupational exposure.

Control of TB

There are four general strategies for controlling TB:

1. The most important and universally applied strategy is the early identification and treatment of persons with infectious TB. This strategy not only cures the affected person but also renders the patient noncontagious within a few weeks. Thus, case-finding and treatment programs have both clinical and public health benefits (*19*).

ACIP — Continued

2. Identifying and treating persons with noncontagious TB (such as extrapulmonary disease, primary pulmonary disease in children, bacteriologically unconfirmed pulmonary disease, and tuberculous infection) can prevent infectious cases (*20*). Therapy to prevent progression of infection to clinical disease is particularly useful in countries, such as the United States, where the risk of new infection is low.
3. Use of ventilation and ultraviolet lights will decontaminate air containing infectious droplet nuclei. Because sites of potential transmission of tubercle bacilli are numerous and difficult to identify in advance, this strategy is used routinely only where the risk of transmission is known to be exceptionally high. Some of these areas include mycobacteriology laboratories, sputum induction cubicles, chest clinic waiting areas, and selected shelters for the homeless. To be effective, ventilation systems and ultraviolet lights must be properly maintained.
4. In the United States, BCG vaccination is recommended only for uninfected children who are at unavoidable risk of exposure to TB and for whom other methods of prevention and control have failed or are not feasible.

BCG VACCINES

BCG was derived from a strain of *M. bovis* attenuated through years of serial passage in culture by Calmette and Guérin at the Pasteur Institute in Lille, France. It was first administered to humans in 1921. Many BCG vaccines are available worldwide; all are derived from the original strain but vary in cultural characteristics and in ability to induce sensitization to tuberculin. BCG vaccines vary because of genetic changes in the bacterial strains and because of differences in techniques of production, in methods and routes of vaccine administration, and in characteristics of the populations and environments in which BCG vaccines have been studied.

Production standards for BCG vaccines, set by the Food and Drug Administration, specify that they be freeze-dried products containing live bacteria from a documented strain of BCG. The strain must demonstrate various specified characteristics of safety and potency in animals and induce tuberculin sensitivity in guinea pigs and humans. The vaccines currently available in the United States have been evaluated only for their ability to induce a delayed hypersensitivity state.

Vaccine Efficacy Studies

BCG vaccines vary substantially in efficacy. Different preparations of liquid BCG used in controlled community trials conducted before 1955 gave estimated efficacies ranging from –56% and 80% (*21*). In 1969, a large controlled trial was begun in Madras (Chingleput) in south India to estimate the efficacy of two strains of freeze-dried BCG vaccine at two different doses. After 15 years of follow-up, the risk of sputum-positive pulmonary TB in persons vaccinated with BCG was not lower than that in persons given placebo (*22*).

Although randomized controlled trials are the most reliable method for assessing vaccine efficacy, less precise estimates can be obtained more quickly and less expensively by observational studies (case-control, historical cohort, and cross-sectional studies) in areas where vaccination is performed at birth. Data from such studies show that the incidence of tuberculous meningitis and miliary TB is 52%–100% lower and that the incidence of pulmonary TB is 2%–80% lower in vaccinated children <15 years of age than in unvaccinated controls (*1–4,23,24*). However, because vaccination is not allocated randomly in observational studies, disproportionate exposure to TB may distort the estimates of vaccine efficacy.

ACIP – Continued

Side Effects and Adverse Reactions

BCG rarely causes serious complications. Side effects vary by vaccine strain; they also vary for the same strain over time. Side effects occur in 1%–10% of vaccinated persons and usually include severe or prolonged ulceration at the vaccination site, lymphadenitis, and lupus vulgaris. The risk of side effects is greater with more potent vaccines. Some vaccine strains have caused osteomyelitis in one case per million doses administered. Disseminated BCG infection and death have occurred in one to 10 cases per 10 million doses administered, although this problem is restricted almost exclusively to persons with impaired immunity.

Data on adverse reactions may pertain to the vaccines licensed in the United States. The reported frequency of complications has varied, depending in part on the intensity of the surveillance effort.

In persons with tuberculous infections, the response to BCG vaccine is accelerated. This accelerated response is generally characterized by the appearance of induration >5 mm in diameter within 24–48 hours after vaccination, formation of a pustule within 5–7 days, and scab formation and healing in 10–15 days (*25*). The normal response to BCG vaccine begins 2–3 weeks after vaccination. Scar formation and healing occur within 3 months.

Interpretation of Tuberculin Test Following BCG Vaccination

The size of tuberculin skin test reactions caused by BCG vaccination (i.e., postvaccination sensitivity) varies by strain and dose of vaccine, age and nutritional status at vaccination, number of years since vaccination, and frequency of tuberculin testing. Mean size of skin test reactions in BCG-vaccinated children range from 3 mm to 19 mm (*26–35*). The presence or size of postvaccination tuberculin skin test reactions does not reliably predict the degree of protection afforded by BCG (*36*).

After BCG vaccination, it is usually not possible to distinguish between a tuberculin skin test reaction caused by virulent mycobacterial infection or by vaccination itself (*37*). Therefore, TB should be included in the differential diagnosis of any TB-like illness, especially if the person has been recently exposed to a person with infectious TB or received BCG several years before being tuberculin tested (*38*).

General guidelines exist for interpreting tuberculin skin test reactions in BCG vaccine recipients. The probability that a skin test reaction results from exposure to *M. tuberculosis* increases 1) as the size of the reaction increases, 2) when the patient is a contact of a person with TB, especially if that person has infected others, 3) when there is a family history of TB or when the patient's country of origin has a high TB prevalence, and 4) as the length of time between vaccination and tuberculin testing increases (*38*). For example, a positive skin test (>10 mm) usually can be attributed to *M. tuberculosis* infection if the vaccinated person is in a group at high risk for TB or has known exposure to a person with infectious TB. However, in vaccinated persons who do not belong to groups at high risk for infection and have no known exposure, a positive skin test reaction probably does *not* indicate recent infection with *M. tuberculosis*.

GENERAL RECOMMENDATIONS

In the United States, the general population is at low risk for acquiring tuberculous infection. Furthermore, TB can be controlled successfully in most high-risk groups by modern methods of case detection, chemotherapy, and preventive therapy. In most population groups, prevention of TB is most reliably accomplished by periodic

ACIP — Continued

Mantoux testing with PPD tuberculin for high-risk children and adults and with administration of preventive therapy to those whose skin test reactions convert from negative to positive. Preventive chemotherapy should also be given to tuberculin-positive persons who are contacts of persons with infectious TB and to other high-risk tuberculin-positive persons (*39*). Therefore, a BCG vaccination policy for the entire population is not indicated. However, BCG vaccination may contribute to TB control in selected population groups. For example, it may benefit uninfected children who are at high risk for continuous or repeated exposure to infectious persons who remain undetected or untreated.

Recommended Vaccine Recipients

Exposed tuberculin skin-test–negative infants and children. BCG vaccination is strongly recommended for infants and children with negative tuberculin skin tests who 1) are at high risk of intimate and prolonged exposure to persistently untreated or ineffectively treated patients with infectious pulmonary TB, cannot be removed from the source of exposure, and cannot be placed on long-term preventive therapy, or 2) are continuously exposed to persons with TB who have bacilli resistant to isoniazid and rifampin.

Groups with an excessive rate of new infections. BCG vaccination is also recommended for tuberculin-negative infants and children in groups in which the rate of new infections exceeds 1% per year (*40*) and for whom the usual surveillance and treatment programs have been attempted but are not operationally feasible. These groups include persons without regular access to health care, those for whom usual health care is culturally or socially unacceptable, or groups who have demonstrated an inability to effectively use existing accessible care.

Discontinued Recommendation for Health-Care Workers

In the past, BCG vaccine was recommended for health-care workers, who as a group experienced high rates of new infection. However, BCG is *no longer recommended* for this group. Instead, health-care workers should be protected by adequate surveillance by periodic tuberculin skin testing (*41*) and isoniazid preventive therapy for all skin-test–positive health-care workers who are at high risk for developing disease. These persons include recent skin test converters and workers who are close contacts of TB patients or those who have medical conditions such as diabetes, renal failure, or immunosuppression associated with therapy or disease (*39*). In addition, hospital infection control measures, especially the prompt identification and implementation of precautions for patients with suspected TB, will help reduce the risk of TB transmission to health-care workers (*42*).

Vaccine Availability

Two BCG vaccine strains licensed in the United States are available. The Glaxo strain is available from Quad Pharmaceuticals, Inc., Indianapolis. The Tice strain is available from Bionetics Research, Inc., Chicago, or Antigen Supply House, Northridge, California.

Vaccine Dose and Administration

BCG should be reserved for persons whose skin test is negative to 5 tuberculin units of PPD tuberculin. The Glaxo strain is administered intradermally and the Tice strain percutaneously. Vaccination should be administered only by the route indicated in the package labeling and only in the suggested dose.

ACIP – Continued

Infants <30 days old should receive one half the usual dose. If the indications for vaccination persist, they should receive a full dose at 1 year of age.

Freeze-dried vaccine should be reconstituted, protected from exposure to light, refrigerated when not in use, and used within 8 hours.

Contraindications to Use

BCG should not be given to persons 1) whose immunologic responses are impaired because of congenital immunodeficiency, HIV infection, leukemia, lymphoma, or generalized malignancy or 2) whose immunologic responses have been suppressed by steroids, alkylating agents, antimetabolites, or radiation.

BCG vaccine should be administered with caution to persons in groups at high risk for HIV infection. An AIDS patient was reported to have developed disseminated *M. bovis* disease after vaccination with BCG (*43*). Three infants with symptomatic HIV infection were reported to have developed BCG adenitis after vaccination (*44*); however, disseminated BCG disease has not been reported in persons with asymptomatic HIV infection.

Theoretically, persons with asymptomatic HIV infection may be at greater risk for complications from BCG vaccine, but data are inconclusive regarding this elevated risk. The World Health Organization has recommended that in populations where the risk of tuberculosis is high, HIV-infected children who are asymptomatic should receive BCG vaccine at birth or as soon as possible thereafter. BCG vaccine should not be given to children with symptomatic HIV infection (*45*). In populations where the risk of TB is low, BCG vaccine should be withheld from persons known or suspected to be infected with HIV (*45*). The latter recommendation would apply to most populations in the United States for whom BCG might be considered.

Use in Pregnancy

Although harmful effects of BCG on the fetus have not been observed, women should avoid vaccination during pregnancy.

SURVEILLANCE

All suspected adverse reactions to BCG should be reported to the manufacturer and to the Office of Biologics Research, Center for Biologics Evaluation and Research, Food and Drug Administration, Bethesda, Maryland. These reactions occasionally occur >1 year after vaccination.

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Errata: Vol. 37, No. 37

p. 570 In Table 1 of the article "Update: Sudden Unexplained Death Syndrome Among Southeast Asian Refugees—United States," two errors in percents appear on the California line. The information for California should read:

State	Reported cases		SEA refugee population	
	No.	(%)	No.	(%)
California	36	(31)	335,400	(39)

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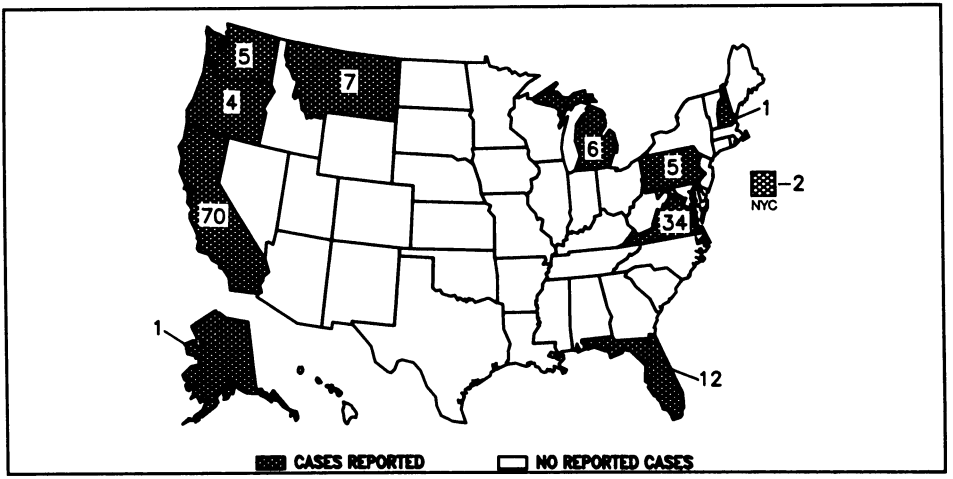
p. 655 In the article "Human Plague—United States, 1988," an error appears in the credits. The name of the first person listed for the New Mexico Dept of Health and Environment should read M Sewell, DrPH.

FIGURE I. Reported measles cases — United States, Weeks 39–42, 1988



The *Morbidity and Mortality Weekly Report* is prepared by the Centers for Disease Control, Atlanta, Georgia, and available on a paid subscription basis from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, (202) 783-3238.

The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

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HHS Publication No. (CDC) 89-8017