CENTERS FOR DISEASE CONTROL

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Current Trends

Update: Tuberculosis Elimination – United States

In April 1989, CDC's Advisory Committee for the Elimination of Tuberculosis (ACET) published *A Strategic Plan for the Elimination of Tuberculosis in the United States* (*1*). This plan established the goal of tuberculosis (TB) elimination (i.e., a case rate of 0.1 per 100,000 persons) by the year 2010, with an interim goal of a case rate of 3.5 per 100,000 population by the year 2000.

CDC, in collaboration with state and local health departments, uses three sources to monitor progress toward these goals: 1) an individual-case surveillance system, 2) TB mortality data from CDC's National Center for Health Statistics (NCHS), and 3) program performance data collected on cases, contact follow-up, bacteriologic conversion of sputum, continuity of drug therapy, completion of therapy, and preventive therapy. This report updates TB elimination efforts based on the most recent data from these three sources.

Case Surveillance

In 1988, the last year for which individual-case data are available, 22,436 TB cases (9.1 per 100,000 U.S. population) were reported, a 0.4% decrease from the 22,517 cases reported in 1987. If the 6.7% average annual decline between 1981 and 1984 had continued through 1988, an estimated 14,768 fewer cases would have been expected during 1985–1988 (Figure 1).

When compared with 1985, the number of reported TB cases in the 25–44-year age group in 1988 increased by 961 cases; however, in other age groups, cases declined (Table 1). In all age groups, reported cases increased among non-Hispanic blacks and Hispanics but decreased among non-Hispanic whites, Asians/Pacific Islanders, and American Indians/Alaskan Natives (Table 1). In the 25–44-year age group, cases among non-Hispanic blacks increased by 22.6% (from 2898 in 1985 to 3552 in 1988);

Tuberculosis Elimination — Continued

Hispanics, by 34.5% (from 1153 to 1551); and non-Hispanic whites, by 2.3% (from 1520 to 1555). Increases in cases occurred among both males and females. In 1988, TB case rates for racial/ethnic minorities were approximately fourfold to ninefold higher than for non-Hispanic whites (Table 1).

NCHS Data

Final TB mortality data from NCHS for 1987 indicate that 1755 persons died from TB in the United States—a 1.5% decrease from the 1782 deaths reported in 1986.

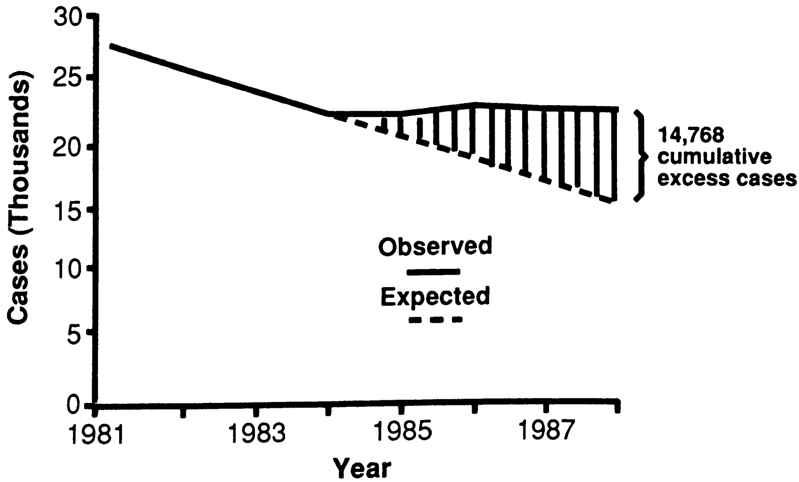
Program Performance Data

Case register and contact follow-up reports contained information on approximately 75% of cases reported during 1988. As of December 31, 1988, 76% of the patients receiving two or more TB drugs were current with their chemotherapy regimen. Up-to-date bacteriologic information was available for 57% of patients; for 84% of these patients, contacts were identified, and 93% of these were examined. Of contacts who were examined, 23% were infected. Preventive therapy was prescribed for 89% of infected contacts <15 years of age and for 59% of those ≥ 15 years of age. Approximately 1% of the contacts examined had clinically apparent TB.

Data on the bacteriologic conversion of sputum were known for 17,868 (79%) of the 22,517 cases reported during 1987. Sixty-one percent of patients with positive sputum were known to have become negative (bacteriologic conversion) within 3 months after starting chemotherapy; 20% remained positive beyond the third month of chemotherapy; and 7% died within 3 months of being reported. No information was available on the remaining patients.

Data on drug therapy were known for 14,072 (63%) of the cases reported during 1987. Medication was taken continuously during the first 6 months of therapy by 86% of patients. Six percent interrupted their therapy; 2% stopped taking their medication; and 9% died within the first 6 months of treatment. Approximately 75% of patients for whom reports were available completed therapy within 12 months: 9%, within 6 months; 27%, within 7–9 months; and 39%, within 10–12 months. Approximately 11% of patients died within 1 year of diagnosis.

FIGURE 1. Observed and expected tuberculosis cases — United States, 1981–1988



Tuberculosis Elimination — Continued

More than 95,000 persons with tuberculous infection at risk for clinical disease were reported to have begun preventive therapy during 1987; 66% completed 6 continuous months of treatment. Contacts of TB patients had a 72% completion rate. Recent converters and other infected persons had completion rates of 70% and 64%, respectively.

Reported by: State and local health departments. Div of Tuberculosis Control, Center for Prevention Svcs, CDC.

Editorial Note: The number of newly reported TB patients meeting the CDC case definition (*2*) represents >90% of patients under treatment supervision by state and local health departments (CDC, unpublished data), and this percentage has remained stable since 1984. However, the public health burden of TB is only partially reflected by the number of new cases reported annually. In 1987, this burden included the more than 115,000 persons under treatment for TB (>20,000 new patients plus >95,000 high-risk persons who began preventive therapy). In addition, 1755 persons died from this curable disease.

The trends for race/ethnicity primarily reflect the increasing occurrence of TB in persons infected with human immunodeficiency virus (HIV) (*3*). Because the HIV-infection status of TB patients is not collected on the TB case report form, the precise

TABLE 1. Number, rate, and change in number of cases for reported persons with tuberculosis, by sex, age group, and race/ethnicity — United States, 1985 and 1988

Characteristic	1985 No.	1988 No.	1988 Rate*	Change (1985 to 1988) No.	Change (1985 to 1988) (%)
Sex					
Male	14,496	14,680	12.3	+184	+1.3
Female	7,704	7,755	6.2	+51	+0.7
Unknown	1	1	—	0	0
Age (yrs)					
0–4	789	687	3.7	–102	–12.9
5–14	472	447	1.3	–25	–5.3
15–24	1,672	1,616	4.3	–56	–3.3
25–44	6,758	7,719	9.8	+961	+14.2
45–64	6,138	5,861	12.7	–277	–4.5
≥65	6,356	6,092	20.1	–264	–4.2
Unknown	16	14	—	–2	–12.5
Race/Ethnicity					
White, non-Hispanic	8,453	7,720	4.1	–733	–8.7
Black, non-Hispanic	7,592	8,280	28.3	+688	+9.1
Hispanic	3,092	3,637	18.3	+545	+17.6
Asian/Pacific Islander	2,530	2,371	36.3	–159	–6.3
American Indian/ Alaskan Native	397	308	18.1	–89	–22.4
Other[†]/Unknown	137	120	—	–17	–12.4
Total	**22,201**	**22,436**	**9.1**	**+235**	**+1.1**

*Per 100,000 population.
[†]Includes blacks and whites of unknown ethnicity.

Tuberculosis Elimination — Continued

impact of HIV infection on TB morbidity trends in the United States cannot be determined. Nevertheless, HIV infection is an important risk factor for developing clinically apparent TB among persons already infected with the tubercle bacillus (*4*). Accordingly, CDC recommends that all HIV-infected persons be screened for TB and latent tuberculous infection and, if infected, offered curative or preventive therapy (*5*). Similarly, persons with TB and known tuberculin-positive persons should be evaluated for HIV infection so that appropriate counseling and treatment can be undertaken (*5*).

Approximately 1% of the estimated 10 million persons in the United States who are infected with the tubercle bacillus (CDC, unpublished data) were identified and treated in 1988. Identification and treatment of all 10 million infected persons is not necessary to substantially reduce the burden of TB. Instead, ACET has emphasized focusing on high-risk populations (*1*). The proportion of infected persons represented in high-risk groups is unknown. However, the percentage of infected persons who are screened and treated for TB annually must increase substantially beyond 1% if TB is to be eliminated by the year 2010. These patients must also be carefully monitored for compliance and adverse drug reactions (*6*).

Use of program performance reports allows state and local health departments to measure their progress toward TB elimination. The reports indicate that noncompliance with prescribed therapy is the greatest remaining obstacle to elimination (*7*). Ideally, 90% of patients should complete therapy within 12 months. Program and research strategies that may be effective in addressing noncompliance include the use of outreach workers to administer and directly observe therapy and provide incentives to enhance compliance (*8*); education programs for health professionals; studies of compliance predictors and enhancers; and research targeted toward reducing the duration of therapy and number of drug doses required. Careful monitoring of all patients for compliance and the more widespread use of compliance-enhancing strategies is essential for eliminating TB.

References

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Update: Influenza — United States, 1989–90

CDC's influenza monitoring systems indicate that the level of influenza activity for the 1989–90 season (October 1–April 30) in the United States is declining. This report summarizes data for October 1989 through February 1990, and includes weekly reports from 63 World Health Organization (WHO) Collaborating Laboratories, 150 sentinel physicians, the 55 state and territorial health departments, and the 121 Cities Pneumonia and Influenza Mortality Reporting System (*1,2*).

WHO Collaborating Laboratories

In September 1989, the first influenza virus isolated in the United States this season (an A/Shanghai/11/87-like [H3N2] virus) was isolated from a Wisconsin student who became ill within 48 hours of returning from West Africa (*3*). Additional viruses were not isolated until the week ending November 18, when A/Shanghai/11/87-like (H3N2) viruses were reported from Arizona, Hawaii, Montana, and Washington. From the weeks ending November 25 through December 16, the total number of specimens submitted for influenza testing and the number positive increased from 562 and two (0.4%) to 1081 and 63 (5.8%). From January 13 to February 3, the largest number of specimens (mean: 2021 per week) were submitted for influenza testing, and the largest number of influenza viruses were isolated (mean: 467 [23%]). Submission of viral culture specimens began to decline the week ending February 10.

As of February 24, WHO Collaborating Laboratories reported the isolation of 2785 influenza viruses; 2777 (99.7%) were type A and eight (0.3%) were type B. Of the influenza A isolates that were subtyped, 99% were influenza A(H3N2); 17 influenza A(H1N1) isolates were reported. Domestic isolates that were antigenically characterized were similar to the components of the 1989–90 influenza vaccine (*4*).

Influenza Sentinel Physicians

From October 1 through November 18, an average of 3% of patient visits to 150 sentinel physicians were for influenza-like illness; from November 19 through December 16, the average was 4.2%. For the week ending December 23, the percentage increased to 6.4% and reached a season high of 8.9% the week ending December 30. The percentage stabilized at approximately 8% through January, then decreased to 6.5% during February.

State and Territorial Health Departments

For the week ending December 2, Montana's state health department became the first to report sustained regional* influenza activity and 2 weeks later was the first to report widespread influenza activity. During the week ending January 27, 38 states reported widespread or regional activity. By February 24, only two states reported widespread activity, although the number reporting regional activity (19) remained comparable to that in early January.

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*Levels of activity are: 1) *sporadic*—sporadically occurring influenza-like illness or culture-confirmed influenza, with no outbreaks detected; 2) *regional*—outbreaks of influenza-like illness or culture-confirmed influenza in counties having a combined population of <50% of the state's total population; 3) *widespread*—outbreaks of influenza-like illness or culture-confirmed influenza in counties having a combined population of ≥50% of the state's total population.

Influenza Update — Continued

121 Cities

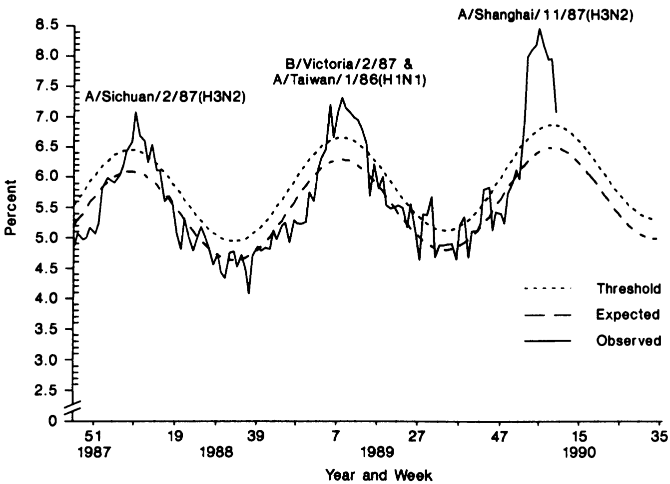
During the week ending January 6, the proportion of deaths attributable to pneumonia and influenza (P&I) first exceeded the epidemic threshold (Figure 1). The P&I ratio peaked during the week ending February 3 but remained above the epidemic threshold through March 3.

Reported by: State and territorial health department epidemiologists and state public health laboratory directors. WHO Collaborating Laboratories. Sentinel Physicians Influenza Surveillance System of the American Academy of Family Practice. Div of Surveillance and Epidemiologic Studies, Epidemiology Program Office; Epidemiology Activity, Biometrics Activity, Influenza Br, Div of Viral and Rickettsial Diseases, Center for Infectious Diseases, CDC.

Editorial Note: The predominance of influenza A(H3N2) during the 1989–90 epidemic exceeds that for recent influenza seasons in the United States. The only comparable season during the past decade was 1984–85, when influenza A(H3N2) isolates accounted for 97.3% of total subtyped influenza isolates. The number of isolates, the percentage of patients with influenza-like illness seen by sentinel physicians, and the activity levels reported by state and territorial health departments have not indicated exceptionally high levels of influenza morbidity during the 1989–90 season; however, the P&I ratio reflects the excess mortality in the elderly historically attributable to influenza A(H3N2).

In the 1988–89 season, predominant influenza A activity in the winter was superseded by influenza B during March and April. Although a similar trend has not been observed so far in 1989–90, this pattern demonstrates the importance of continued monitoring of influenza activity, including culturing of patients with

FIGURE 1. Pneumonia and influenza (P&I) deaths as a percentage of total deaths* — United States, October 1988–March 3, 1990



*Reported to CDC from 121 U.S. cities. P&I deaths include all deaths for which pneumonia is listed on the death certificate as a primary or underlying cause or for which influenza is listed on the death certificate. The predominant strains are shown above the peak of mortality for each season. The epidemic guideline (threshold) for each season is 1.645 standard deviations above the expected baseline estimated using a periodic regression model applied to observed percentages since 1983. This baseline was estimated using a robust regression procedure.

Influenza Update — Continued

suspected influenza, throughout the influenza season to guide prophylaxis and treatment decisions (*4*).

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Perspectives in Disease Prevention and Health Promotion

Influenza Vaccination Coverage Levels in Selected Sites — United States, 1989

In 1988, the Congressionally mandated Influenza Vaccine Demonstration Project awarded demonstration grant funds for the 1988–89 and 1989–90 influenza seasons to nine geographic areas, including states and counties. Goals of this project were to determine 1) the cost-effectiveness of Medicare coverage of influenza vaccination and 2) whether Medicare reimbursement and other measures to enhance vaccine delivery result in increased influenza vaccination levels among Medicare Part B beneficiaries (i.e., persons aged ≥65 years or persons of any age with a disability or who have end-stage renal disease). Each area includes an intervention site, where influenza vaccine is a benefit provided to these beneficiaries, and a comparison site, where the benefit is not provided. Intervention sites were chosen based on their ability to support promotional intervention efforts to increase vaccine coverage, and comparison sites were chosen on the basis of similar demographic and health service utilization characteristics. Annual surveys in the nine areas will assess changes in influenza vaccine coverage.

This report summarizes preliminary results of the first survey, conducted from May through July, 1989.* Because vaccine distribution was limited during the project's first year, the data reported here are considered baseline.

A telephone survey was conducted using the September 1988 update of the Medicare statistical data file to select a stratified probability sample of noninstitutionalized Medicare Part B beneficiaries from each demonstration site. The age-sex-race distribution of the sample at each intervention site was replicated for its comparison site. Telephone numbers were available for approximately 65% of selected beneficiaries. Respondents were asked about vaccination status for the 1987–88 and 1988–89 influenza seasons, source of influenza vaccination, presence of an underlying medical condition, and factors influencing influenza vaccination status (e.g., concern about side effects). Data from this survey are self-reported.

For each of the intervention and comparison sites, at least 940 respondents were surveyed. The 17,643 respondents represented a 60% completion rate. The overall influenza vaccination coverage estimate for noninstitutionalized Medicare beneficiaries for the 1987–88 influenza season was 41% (95% confidence interval [CI]=39.9–41.3), and for 1988–89, 43% (95% CI=42.7–44.1) (Table 1, page 165).

*A second survey will be conducted in the summer of 1990. The project is expected to continue for 1991 and 1992.

Influenza Vaccination — Continued

Coverage in intervention sites tended to be slightly higher than coverage in comparison sites.

The lowest reported vaccination level was among persons aged ≤65 years with a disability or who had end-stage renal disease (30% [377/1259]). In comparison, among persons aged 65–75 years and >75 years, coverage was 42% (4352/10,310) and 48% (2931/6074), respectively. Vaccination levels for males (44%) and females (43%) were similar; the level for races other than white (31%) was substantially lower than for whites (44%). Among persons with and without an underlying medical condition, vaccination levels were 48% and 39%, respectively.

Of 7660 persons vaccinated, 62% reported receiving vaccine from a private physician. Among the 9983 (57%) persons not vaccinated, at least 91% were candidates for vaccination based on recommendations of the Immunization Practices Advisory Committee (ACIP) (*1*). The most commonly (54%) cited reason for not being

(Continued on page 165)

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

Disease	10th Week Ending			Cumulative, 10th Week Ending		
	Mar. 10, 1990	Mar. 11, 1989	Median 1985-1989	Mar. 10, 1990	Mar. 11, 1989	Median 1985-1989
Acquired Immunodeficiency Syndrome (AIDS)	992	U*	325	8,215	5,756	3,844
Aseptic meningitis	81	102	92	811	827	827
Encephalitis: Primary (arthropod-borne & unspec)	8	9	13	112	109	148
Post-infectious	1	-	1	21	17	13
Gonorrhea: Civilian	12,320	13,944	13,944	127,986	130,456	156,070
Military	86	109	358	1,960	2,004	2,998
Hepatitis: Type A	499	793	495	5,063	6,558	4,572
Type B	361	439	519	3,443	3,837	4,448
Non A, Non B	20	58	74	343	468	554
Unspecified	32	57	57	320	501	631
Legionellosis	17	16	13	204	177	139
Leprosy	2	-	7	23	25	42
Malaria	22	16	16	186	193	129
Measles: Total†	330	285	71	2,624	1,198	446
Indigenous	325	279	57	2,355	1,146	367
Imported	5	6	9	269	53	52
Meningococcal infections	64	82	83	598	648	648
Mumps	104	130	130	1,007	1,081	987
Pertussis	31	40	40	494	381	381
Rubella (German measles)	11	2	8	89	47	47
Syphilis (Primary & Secondary): Civilian	777	854	627	8,987	7,646	6,543
Military	7	12	5	53	63	46
Toxic Shock syndrome	8	4	5	72	57	55
Tuberculosis	358	420	420	3,371	3,317	3,343
Tularemia	1	1	1	8	10	16
Typhoid Fever	6	11	7	64	71	45
Typhus fever, tick-borne (RMSF)	-	1	1	15	18	10
Rabies, animal	58	76	76	539	741	741

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1990		Cum. 1990
Anthrax	-	Leptospirosis (Hawaii 1)	6
Botulism: Foodborne	1	Plague	-
Infant (Pa. 1)	7	Poliomyelitis, Paralytic,§	-
Other	1	Psittacosis (Mich. 1, Tenn. 2)	33
Brucellosis (Kans. 1)	9	Rabies, human	-
Cholera	-	Tetanus (Ga. 1)	10
Congenital rubella syndrome	-	Trichinosis (Nev. 1)	10
Congenital syphilis, ages < 1 year	-		
Diphtheria	1		

*Because AIDS cases are not received weekly from all reporting areas, comparison of weekly figures may be misleading.
†Three of the 330 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.
§One case of suspected poliomyelitis has been reported in 1990; none of 13 suspected cases in 1989 have been confirmed to date. Nine of 14 suspected cases in 1988 were confirmed and all were vaccine-associated.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending March 10, 1990 and March 11, 1989 (10th Week)

Reporting Area	AIDS	Aseptic Menin-gitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionel-losis	Leprosy
			Primary	Post-in-fectious			A	B	NA,NB	Unspeci-fied		
	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1989	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990
UNITED STATES	8,215	811	112	21	127,986	130,456	5,063	3,443	343	320	204	23
NEW ENGLAND	328	47	5	-	3,970	3,689	104	209	9	20	9	-
Maine	15	1	-	-	49	57	1	12	2	1	1	-
N.H.	25	1	-	-	36	48	3	9	-	1	-	-
Vt.	3	4	-	-	14	17	1	10	2	-	3	-
Mass.	163	17	1	-	1,499	1,562	72	143	5	17	3	-
R.I.	10	17	-	-	198	304	13	13	-	1	2	-
Conn.	112	7	4	-	2,174	1,701	14	22	-	-	-	-
MID. ATLANTIC	2,922	155	5	-	15,388	22,120	767	500	47	28	58	8
Upstate N.Y.	305	63	4	-	2,541	3,059	208	139	7	6	24	1
N.Y. City	1,794	19	1	-	8,188	9,950	80	162	8	12	8	4
N.J.	553	-	-	-	2,489	2,818	65	51	13	-	7	2
Pa.	270	73	-	-	2,170	6,293	414	148	19	10	19	1
E.N. CENTRAL	506	141	20	5	25,833	22,940	324	512	20	29	61	-
Ohio	133	44	4	2	7,889	5,915	49	111	6	2	23	-
Ind.	53	27	2	2	2,555	1,420	41	173	3	9	16	-
Ill.	193	17	7	1	8,015	7,206	102	30	3	10	-	-
Mich.	85	48	7	-	6,267	6,428	97	130	7	8	14	-
Wis.	42	5	-	-	1,107	1,971	35	68	1	-	8	-
W.N. CENTRAL	203	33	8	1	7,221	5,305	264	143	15	7	10	-
Minn.	32	2	4	1	841	556	33	11	3	-	-	-
Iowa	8	2	1	-	548	454	70	19	1	1	1	-
Mo.	124	16	-	-	4,112	3,196	120	100	5	4	8	-
N. Dak.	-	-	-	-	24	26	2	-	-	1	-	-
S. Dak.	1	1	1	-	43	48	9	1	1	-	-	-
Nebr.	16	8	2	-	306	307	18	8	2	-	-	-
Kans.	22	4	-	-	1,347	718	12	4	3	1	1	-
S. ATLANTIC	1,563	174	36	4	36,240	35,166	571	672	57	43	24	1
Del.	19	4	1	-	464	518	28	20	2	1	1	-
Md.	191	42	4	-	4,218	3,263	283	107	8	3	8	1
D.C.	49	1	-	-	745	2,292	6	5	3	-	-	-
Va.	218	39	13	-	3,602	3,151	31	34	6	31	2	-
W. Va.	12	2	3	-	249	285	5	24	1	-	-	-
N.C.	155	19	9	-	6,018	5,295	109	205	28	-	6	-
S.C.	74	3	-	-	3,249	3,300	12	133	4	5	4	-
Ga.	235	9	3	1	8,591	6,693	39	63	1	2	3	-
Fla.	610	55	3	3	9,104	10,369	58	81	4	1	-	-
E.S. CENTRAL	149	56	7	-	10,540	10,467	69	276	25	2	17	-
Ky.	30	15	1	-	1,147	949	19	75	11	2	3	-
Tenn.	29	7	4	-	3,210	3,475	21	154	9	-	7	-
Ala.	34	28	2	-	3,804	3,195	29	47	5	-	7	-
Miss.	56	6	-	-	2,379	2,848	-	-	-	-	-	-
W.S. CENTRAL	798	29	3	2	11,850	13,982	393	186	21	27	11	6
Ark.	31	1	-	-	1,731	1,434	103	14	1	2	1	-
La.	145	6	2	-	2,375	2,861	16	46	-	1	2	-
Okla.	41	6	-	2	1,151	1,299	106	33	5	2	8	-
Tex.	581	16	1	-	6,593	8,388	168	93	15	22	-	6
MOUNTAIN	197	35	3	-	2,637	2,586	835	261	28	33	12	-
Mont.	3	1	-	-	24	44	21	20	2	1	-	-
Idaho	6	-	-	-	18	42	12	18	5	-	-	-
Wyo.	-	1	1	-	30	28	15	5	-	-	-	-
Colo.	64	12	-	-	678	488	64	43	8	14	1	-
N. Mex.	12	3	-	-	206	265	80	24	-	-	-	-
Ariz.	68	9	2	-	1,172	986	526	80	11	11	7	-
Utah	22	4	-	-	84	100	43	13	1	2	-	-
Nev.	22	5	-	-	425	633	74	58	1	5	4	-
PACIFIC	1,549	141	25	9	14,307	14,201	1,736	684	121	131	2	8
Wash.	130	-	1	1	1,226	1,258	297	105	24	7	-	1
Oreg.	64	-	-	-	503	535	202	76	8	5	-	-
Calif.	1,320	128	23	7	12,287	12,116	1,161	476	86	118	2	4
Alaska	9	2	-	-	228	203	42	13	3	-	-	-
Hawaii	26	11	1	1	63	89	34	14	-	1	-	3
Guam	1	-	-	-	27	31	2	1	-	4	-	-
P.R.	349	23	4	-	264	198	25	20	-	18	-	-
V.I.	3	-	-	-	99	111	-	2	-	-	-	-
Amer. Samoa	-	-	-	-	16	11	3	-	-	-	-	2
C.N.M.I.	-	-	-	-	31	19	2	1	-	-	-	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 March 10, 1990 and March 11, 1989 (10th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1990	1990	Cum. 1990	1990	Cum. 1990	Cum. 1989	Cum. 1990	1990	Cum. 1990	1990	Cum. 1990	Cum. 1989	1990	Cum. 1990	Cum. 1989
UNITED STATES	186	325	2,355	5	269	1,198	598	104	1,007	31	494	381	11	89	47
NEW ENGLAND	23	6	35	1	10	36	37	2	12	7	76	12	-	1	1
Maine	-	-	-	-	-	-	4	-	-	-	1	4	-	-	-
N.H.	2	-	-	-	7	-	-	-	4	1	7	5	-	-	-
Vt.	3	-	-	1§	1	1	4	-	1	-	2	1	-	-	1
Mass.	12	-	-	-	-	7	20	-	4	6	61	-	-	-	-
R.I.	2	6	14	-	2	16	-	2	3	-	-	2	-	1	-
Conn.	4	-	21	-	-	12	9	-	-	-	5	-	-	-	-
MID. ATLANTIC	40	30	209	-	70	96	92	6	62	3	142	33	1	2	2
Upstate N.Y.	7	3	112	-	60	9	31	4	24	1	117	12	-	1	1
N.Y. City	17	3	14	-	4	19	8	-	-	-	-	-	-	-	1
N.J.	4	-	-	-	-	59	16	-	14	-	6	17	-	-	-
Pa.	12	24	83	-	6	9	37	2	24	2	19	4	1	1	-
E.N. CENTRAL	10	57	954	-	116	87	79	1	93	2	100	46	-	5	4
Ohio	3	-	139	-	-	45	27	-	29	-	30	1	-	-	-
Ind.	-	-	48	-	-	-	10	-	5	-	31	3	-	-	-
Ill.	2	-	361	-	-	41	20	-	17	-	11	18	-	5	3
Mich.	3	57	122	-	116	-	14	1	28	2	16	4	-	-	-
Wis.	2	-	284	-	-	1	8	-	14	-	12	20	-	-	1
W.N. CENTRAL	2	-	75	-	1	210	25	3	39	-	5	14	-	-	1
Minn.	-	-	27	-	1	-	5	-	-	-	-	-	-	-	-
Iowa	-	-	21	-	-	-	1	1	6	-	1	6	-	-	-
Mo.	2	-	27	-	-	205	10	2	18	-	1	7	-	-	1
N. Dak.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
S. Dak.	-	-	-	-	-	-	2	-	-	-	1	-	-	-	-
Nebr.	-	-	-	-	-	-	3	-	1	-	1	-	-	-	-
Kans.	-	-	-	-	-	5	4	-	14	-	1	1	-	-	-
S. ATLANTIC	45	15	154	-	32	88	114	49	358	4	50	26	3	6	-
Del.	1	-	1	-	-	-	1	-	-	-	1	-	-	-	-
Md.	10	2	11	-	11	5	12	31	198	-	18	2	-	-	-
D.C.	4	-	-	-	1	2	2	-	4	-	1	-	-	-	-
Va.	10	4	9	-	2	-	16	-	9	-	4	3	-	-	-
W. Va.	1	6	6	-	-	-	4	5	28	-	5	1	-	-	-
N.C.	4	-	3	-	-	81	20	1	27	-	6	10	-	-	-
S.C.	-	1	1	-	-	-	7	-	10	3	3	-	-	-	-
Ga.	5	-	1	-	-	-	23	5	25	1	8	4	-	-	-
Fla.	10	2	122	-	18	-	29	7	57	-	4	6	3	6	-
E.S. CENTRAL	3	3	21	-	-	2	28	2	30	1	16	20	-	-	-
Ky.	-	-	-	-	-	1	11	-	-	-	-	-	-	-	-
Tenn.	2	3	16	-	-	-	10	2	12	1	5	11	-	-	-
Ala.	1	-	-	-	-	1	7	-	3	-	11	6	-	-	-
Miss.	-	-	5	-	-	-	-	-	15	-	-	3	-	-	-
W.S. CENTRAL	2	58	141	2	9	438	43	26	211	3	9	4	-	-	5
Ark.	-	-	-	-	-	-	3	13	52	-	-	1	-	-	-
La.	-	-	-	-	-	1	9	5	43	-	1	-	-	-	-
Okla.	2	35	38	-	-	15	7	-	63	3	8	3	-	-	-
Tex.	-	23	103	2†	9	422	24	8	53	-	-	-	-	-	5
MOUNTAIN	4	26	68	1	13	16	12	1	61	4	50	169	-	-	1
Mont.	-	-	-	-	-	13	4	-	-	-	-	-	-	-	-
Idaho	2	-	-	-	-	1	-	-	31	-	2	10	-	-	-
Wyo.	-	-	-	-	-	-	-	-	2	-	-	-	-	-	-
Colo.	-	4	6	-	2	1	4	1	6	3	37	14	-	-	-
N. Mex.	-	12	16	-	-	-	-	N	N	-	-	2	-	-	-
Ariz.	2	10	37	-	8	1	2	-	19	-	6	137	-	-	-
Utah	-	-	-	-	-	-	-	-	2	-	2	5	-	-	-
Nev.	-	-	9	1§	3	-	2	-	1	1	3	1	-	-	1
PACIFIC	57	130	698	1	18	225	168	14	141	7	46	57	7	75	33
Wash.	2	-	-	-	10	1	18	5	15	4	12	8	-	-	-
Oreg.	2	-	-	-	-	-	19	N	N	-	3	1	-	-	-
Calif.	52	129	679	1†	7	220	127	8	124	2	27	46	7	71	28
Alaska	-	1	18	-	-	-	4	-	-	-	-	-	-	-	-
Hawaii	1	-	1	-	1	4	-	1	2	1	4	2	-	4	5
Guam	1	U	-	U	-	-	-	U	-	U	-	1	U	-	-
P.R.	-	8	44	-	-	110	4	-	3	4	4	2	-	-	2
V.I.	-	-	-	-	-	-	-	1	2	-	-	-	-	-	-
Amer. Samoa	-	U	-	U	-	-	-	U	-	U	-	-	U	-	-
C.N.M.I.	-	U	-	U	-	-	-	U	2	U	-	-	U	-	-

*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 March 10, 1990 and March 11, 1989 (10th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1990	Cum. 1989	Cum. 1990	Cum. 1990	Cum. 1989	Cum. 1990	Cum. 1990	Cum. 1990	Cum. 1990
UNITED STATES	8,987	7,646	72	3,371	3,317	8	64	15	539
NEW ENGLAND	363	302	3	66	71	-	2	-	-
Maine	3	-	-	-	1	-	-	-	-
N.H.	26	-	-	1	4	-	-	-	-
Vt.	-	-	-	2	1	-	-	-	-
Mass.	125	103	2	26	29	-	1	-	-
R.I.	1	9	-	15	14	-	-	-	-
Conn.	208	190	1	22	22	-	1	-	-
MID. ATLANTIC	1,508	1,500	9	863	731	1	17	2	149
Upstate N.Y.	102	133	4	17	66	-	7	-	3
N.Y. City	1,032	565	2	602	484	-	2	-	-
N.J.	325	270	-	115	79	1	7	2	49
Pa.	49	532	3	129	102	-	1	-	97
E.N. CENTRAL	552	299	22	381	379	-	9	1	9
Ohio	94	21	8	48	69	-	3	-	-
Ind.	6	11	2	17	26	-	-	-	-
Ill.	227	145	-	176	163	-	3	-	4
Mich.	161	111	12	121	107	-	3	1	-
Wis.	64	11	-	19	14	-	-	-	5
W.N. CENTRAL	62	68	8	83	86	4	-	2	57
Minn.	20	6	-	17	22	-	-	-	31
Iowa	6	11	1	7	12	-	-	-	-
Mo.	30	32	4	35	25	3	-	2	1
N. Dak.	1	1	-	3	4	-	-	-	5
S. Dak.	-	-	-	4	6	-	-	-	13
Nebr.	2	10	2	7	5	1	-	-	-
Kans.	3	8	1	10	12	-	-	-	7
S. ATLANTIC	3,471	2,863	2	571	688	2	5	4	169
Del.	43	34	-	6	5	-	-	-	2
Md.	240	155	-	62	56	-	3	-	59
D.C.	692	171	-	14	40	-	-	-	-
Va.	119	115	-	40	66	-	-	-	35
W. Va.	2	3	-	9	17	-	-	-	3
N.C.	332	165	1	73	62	1	-	3	2
S.C.	180	141	-	92	77	1	-	1	17
Ga.	773	623	-	86	75	-	1	-	45
Fla.	1,090	1,456	1	189	290	-	1	-	6
E.S. CENTRAL	671	463	5	222	265	-	-	1	21
Ky.	16	12	-	77	68	-	-	-	7
Tenn.	217	151	3	44	56	-	-	1	-
Ala.	223	182	2	73	99	-	-	-	14
Miss.	215	118	-	28	42	-	-	-	-
W.S. CENTRAL	1,320	1,017	3	402	340	-	2	4	70
Ark.	93	88	-	47	42	-	-	-	4
La.	410	212	-	43	50	-	-	-	-
Okla.	42	14	3	35	19	-	-	4	15
Tex.	775	703	-	277	229	-	2	-	51
MOUNTAIN	166	155	7	69	94	1	5	-	16
Mont.	-	-	-	4	4	-	-	-	6
Idaho	4	-	1	1	3	-	-	-	-
Wyo.	-	-	1	-	-	-	-	-	8
Colo.	11	8	2	-	-	-	-	-	-
N. Mex.	11	4	2	19	14	1	-	-	1
Ariz.	111	40	1	30	47	-	3	-	-
Utah	1	5	-	-	12	-	-	-	-
Nev.	28	98	-	15	14	-	2	-	1
PACIFIC	874	979	13	714	663	-	24	1	48
Wash.	45	64	1	54	36	-	-	-	-
Oreg.	20	50	-	17	22	-	-	-	-
Calif.	803	859	11	611	567	-	23	1	36
Alaska	2	2	-	10	8	-	-	-	12
Hawaii	4	4	1	22	30	-	1	-	-
Guam	-	3	-	8	9	-	-	-	-
P.R.	218	83	-	29	37	-	-	-	5
V.I.	-	1	-	1	1	-	-	-	-
Amer. Samoa	-	-	-	3	-	-	-	-	-
C.N.M.I.	-	1	-	6	1	-	4	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending March 10, 1990 (10th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	677	477	117	40	23	20	76
Boston, Mass.	187	120	38	11	11	7	24
Bridgeport, Conn.	47	36	5	4	2	-	1
Cambridge, Mass.	23	21	1	1	-	-	5
Fall River, Mass.	30	24	3	2	-	1	2
Hartford, Conn.	61	42	12	4	2	1	10
Lowell, Mass.	30	20	7	-	-	3	3
Lynn, Mass.	15	11	2	2	-	-	1
New Bedford, Mass.	34	29	5	-	-	-	1
New Haven, Conn.	55	33	13	5	2	2	9
Providence, R.I.	44	33	4	6	-	1	3
Somerville, Mass.	10	9	1	-	-	-	3
Springfield, Mass.	45	30	8	1	2	4	7
Waterbury, Conn.	34	22	6	3	3	-	3
Worcester, Mass.	62	47	12	1	1	1	4
MID. ATLANTIC	2,988	1,961	586	297	68	76	196
Albany, N.Y.	43	32	7	3	-	1	3
Allentown, Pa.	17	13	3	1	-	-	-
Buffalo, N.Y.	142	94	23	18	2	5	6
Camden, N.J.	51	25	11	6	3	6	-
Elizabeth, N.J.	37	31	4	1	-	1	8
Erie, Pa.†	36	29	4	2	-	1	2
Jersey City, N.J.	94	62	12	11	2	7	2
N.Y. City, N.Y.	1,575	977	344	190	34	30	91
Newark, N.J.	86	51	17	13	5	-	12
Paterson, N.J.	35	17	8	3	4	3	2
Philadelphia, Pa.	399	285	79	19	9	7	32
Pittsburgh, Pa.†	77	55	11	6	1	4	3
Reading, Pa.	39	30	6	2	1	-	3
Rochester, N.Y.	119	84	19	10	4	2	17
Schenectady, N.Y.	20	14	3	-	2	1	-
Scranton, Pa.†	34	28	1	2	-	3	2
Syracuse, N.Y.	78	54	16	6	-	2	7
Trenton, N.J.	42	30	7	2	1	2	3
Utica, N.Y.	33	26	5	1	-	1	-
Yonkers, N.Y.	31	24	6	1	-	-	3
E.N. CENTRAL	2,462	1,602	513	195	68	84	159
Akron, Ohio	76	52	13	3	6	2	3
Canton, Ohio	43	31	7	4	1	-	5
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	139	95	28	10	-	6	18
Cleveland, Ohio	152	97	36	9	4	6	1
Columbus, Ohio	198	124	43	20	5	6	16
Dayton, Ohio	122	75	32	12	3	-	16
Detroit, Mich.	257	150	56	30	11	10	7
Evansville, Ind.	35	21	13	1	-	-	3
Fort Wayne, Ind.	76	53	16	3	2	2	2
Gary, Ind.	21	8	4	6	2	1	1
Grand Rapids, Mich.	97	68	16	2	4	7	14
Indianapolis, Ind.	187	106	41	20	11	9	7
Madison, Wis.	28	19	3	3	3	-	3
Milwaukee, Wis.	147	107	28	9	1	2	10
Peoria, Ill.	44	23	14	4	-	3	5
Rockford, Ill.	46	38	3	2	-	3	7
South Bend, Ind.	78	56	13	5	1	3	5
Toledo, Ohio	102	78	14	5	4	1	10
Youngstown, Ohio	50	39	8	2	-	1	10
W.N. CENTRAL	966	680	163	70	15	38	59
Des Moines, Iowa	97	78	12	5	-	2	6
Duluth, Minn.	31	25	5	1	-	-	3
Kansas City, Kans.	53	30	8	8	2	5	-
Kansas City, Mo.	123	92	18	8	1	4	13
Lincoln, Nebr.	35	23	10	2	-	-	8
Minneapolis, Minn.	261	175	50	20	6	10	22
Omaha, Nebr.	73	56	11	4	1	1	4
St. Louis, Mo.	155	106	30	9	3	7	-
St. Paul, Minn.	72	50	10	6	1	5	1
Wichita, Kans.	66	45	9	7	1	4	2

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
S. ATLANTIC	1,366	845	272	154	47	44	71
Atlanta, Ga.	158	90	34	21	3	10	8
Baltimore, Md.	236	148	56	19	4	9	10
Charlotte, N.C.	24	12	8	3	-	1	4
Jacksonville, Fla.	98	65	20	5	4	4	7
Miami, Fla.	125	79	23	15	6	2	1
Norfolk, Va.	65	40	10	9	2	4	2
Richmond, Va.	90	57	20	9	2	2	8
Savannah, Ga.	40	31	7	2	-	-	2
St. Petersburg, Fla.	73	67	4	2	-	-	4
Tampa, Fla.	96	61	19	11	1	-	5
Washington, D.C.	339	177	68	57	25	12	20
Wilmington, Del.	22	18	3	1	-	-	-
E.S. CENTRAL	734	491	147	50	25	21	64
Birmingham, Ala.	86	55	13	9	4	5	6
Chattanooga, Tenn.	39	26	7	1	2	3	-
Knoxville, Tenn.	95	68	21	5	-	1	15
Louisville, Ky.	95	58	24	7	5	1	6
Memphis, Tenn.	199	138	42	13	3	3	21
Mobile, Ala.	30	16	5	4	2	3	-
Montgomery, Ala.	55	36	10	3	2	4	6
Nashville, Tenn.	135	94	25	8	7	1	10
W.S. CENTRAL	1,830	1,129	391	190	69	51	84
Austin, Tex.	52	32	9	8	2	1	6
Baton Rouge, La.	54	28	11	7	5	3	3
Corpus Christi, Tex.	48	31	13	2	-	2	4
Dallas, Tex.	206	103	50	34	10	9	3
El Paso, Tex.	69	43	14	5	2	5	6
Fort Worth, Tex	119	72	24	6	8	9	4
Houston, Tex.§	734	436	169	89	24	16	18
Little Rock, Ark.	63	45	10	7	1	-	9
New Orleans, La.§	144	99	26	12	5	2	-
San Antonio, Tex.	184	117	41	15	8	3	10
Shreveport, La.	32	29	2	1	-	-	4
Tulsa, Okla.	125	94	22	4	4	1	17
MOUNTAIN	797	504	157	76	37	23	44
Albuquerque, N. Mex.	101	57	24	16	4	-	4
Colo. Springs, Colo.	48	27	10	7	1	3	6
Denver, Colo.	125	74	23	9	9	10	9
Las Vegas, Nev.	149	91	36	14	6	2	10
Ogden, Utah	26	22	2	2	-	-	1
Phoenix, Ariz.	173	109	33	19	11	1	7
Pueblo, Colo.	17	11	3	-	2	1	2
Salt Lake City, Utah	39	26	8	3	-	2	-
Tucson, Ariz.	119	87	18	6	4	4	5
PACIFIC	2,140	1,448	366	217	53	51	177
Berkeley, Calif.	27	18	5	4	-	-	4
Fresno, Calif.	91	67	11	6	2	5	11
Glendale, Calif.	24	18	3	3	-	-	3
Honolulu, Hawaii	76	48	17	8	2	1	7
Long Beach, Calif.	99	62	17	14	4	2	19
Los Angeles Calif.	605	388	95	86	21	11	33
Oakland, Calif.	85	61	10	6	2	6	5
Pasadena, Calif.	19	14	4	-	1	-	3
Portland, Oreg.	151	98	30	14	5	4	12
Sacramento, Calif.	178	136	30	7	3	2	27
San Diego, Calif.	155	100	25	18	4	7	14
San Francisco, Calif.	191	114	40	32	-	5	7
San Jose, Calif.	183	130	36	9	5	3	20
Seattle, Wash.	161	118	30	8	3	2	4
Spokane, Wash.	44	36	6	-	1	1	5
Tacoma, Wash.	51	40	7	2	-	2	3
TOTAL	13,960††	9,137	2,712	1,289	405	408	930

*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.

Influenza Vaccination — Continued

vaccinated was that persons considered themselves healthy and not in need of vaccination. Additional reasons cited included: concern about side effects (30%), concern about illness associated with the vaccine (30%), and lack of a physician's recommendation for vaccination (15%).

Reported by: Div of Health Systems and Special Studies, Office of Research and Demonstrations, Health Care Financing Administration. Div of Immunization, Center for Prevention Svcs, CDC.

Editorial Note: The public health impact of epidemic influenza is dramatic: influenza accounted for ≥10,000 excess deaths during each of 19 epidemics that occurred in the United States from 1957 to 1986 (*1*). In three of these epidemics, more than 40,000 excess deaths occurred. However, because influenza vaccine is up to 75% effective in preventing complications and death from influenza among high-risk older persons residing in institutions (*2*), much of this health burden is preventable.

Influenza vaccine is recommended annually for persons with chronic cardiopulmonary disorders; residents of nursing homes and other chronic-care facilities; healthy adults ≥65 years of age; adults and children with metabolic diseases (including diabetes mellitus), renal dysfunction, hemoglobinopathies, or immunosuppression; children and teenagers receiving long-term aspirin therapy; health-care personnel caring for high-risk patients; and home-care and household contacts of high-risk persons. In addition, vaccination should be considered for persons with human immunodeficiency virus infection, travelers to countries where influenza is

TABLE 1. Baseline influenza vaccination coverage estimates for Medicare Part B beneficiaries who reported receiving vaccine — nine selected areas, 1988–89

Demonstration area	Intervention site (%)	Comparison site (%)
Arizona*	47.1	48.1
Massachusetts†	39.0	37.1
Michigan§	41.4	40.9
New York¶	54.5	50.1
North Carolina**	42.1	38.1
Ohio††	42.3	39.7
Oklahoma§§	43.1	40.5
Pennsylvania¶¶	45.5	42.5
Texas***	46.8	42.6
Total†††	**44.7**	**42.2**

*Intervention: Maricopa County. Comparison: Pima County.
†Intervention: Essex County. Comparison: Worcester County.
§Intervention: Calhoun, Ingham, Jackson, and Kalamazoo counties. Comparison: Kent, Muskegon, and Ottawa counties.
¶Intervention: Monroe County. Comparison: Onondaga County.
**Intervention: Alexander, Burke, Caldwell, Catawba, Cleveland, Durham, Edgecombe, Franklin, Gaston, Johnston, Lee, Lincoln, Mecklenberg, Nash, Orange, Union, Wake, and Wilson counties. Comparison: Davidson, Davie, Forsyth, Guilford, Randolph, Rockingham, Stokes, Surry, and Yadkin counties.
††Intervention: Stark and Summit counties. Comparison: Franklin County.
§§Intervention: all of Oklahoma. Comparison: all of Kansas.
¶¶Intervention: Allegheny County. Comparison: Lackawanna and Luzerne counties.
***Intervention: Bexar County. Comparison: Bell, Coryell, McLennan, Travis, and Williamson counties.
†††Overall influenza vaccination coverage for all areas was 43.4%.

Influenza Vaccination — Continued

likely to occur, persons providing essential community services, students or other persons in institutional settings (e.g., schools and colleges), and persons who wish to reduce their risk of acquiring influenza infection (*1,3,4*).

Findings from this survey suggest that influenza vaccination coverage among older persons may be higher than documented in previous surveys. For example, the most recent national coverage estimate (from the 1985 U.S. Immunization Survey) for persons aged ≥65 years was 23%. For 1987, the Behavioral Risk Factor Surveillance System estimated influenza vaccination coverage among persons aged ≥65 years to be 32% (*5*); state-specific estimates ranged from 24% to 41%. Finally, in 1987, the number of doses of trivalent influenza vaccine distributed was >24 million[†] (CDC, unpublished data), the highest number of doses distributed in any year since 1976.

The results of this study are based on nonrandomly selected sites and cannot be generalized to the entire U.S. population of noninstitutionalized persons ≥65 years of age for at least two reasons. First, vaccination status of nonrespondents and the 35% of Medicare Part B beneficiaries for whom telephone numbers were not available could not be determined and could result in bias of unknown direction and magnitude. Second, sites that offered to participate in the project as intervention sites may have been more likely to have ongoing active adult immunization programs (*6,7*). Thus, vaccination levels in the survey areas may be higher than in other areas.

Because the project was implemented late in the 1988–89 influenza season, adequate data are not yet available to conduct a cost-effectiveness evaluation. The demonstration sites will be monitored for the success of intervention efforts in increasing influenza immunization levels. At the completion of the project, if Medicare coverage is determined to be cost effective, influenza vaccine will become a covered benefit for all Medicare Part B beneficiaries.

The high proportion of vaccinees reporting a private physician as their source of vaccination and the substantial group reporting lack of a physician's recommendation as a reason for not being vaccinated underscore the influence of health-care providers in the decision to be vaccinated (*8,9*). Educational and promotional campaigns may help dispel concerns among patients regarding the benefits, safety, and efficacy of influenza vaccine. Health-care providers should use every opportunity to assess patients' immunization status and recommend influenza vaccine and all other vaccines (hepatitis B, measles, mumps, rubella, and pneumococcal vaccines, and diphtheria and tetanus toxoids) appropriate for adults (*1,3,4*).

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[†]Previous estimates of 27 million (*5*) were based on provisional data.

Influenza Vaccination — Continued

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Current Trends

Disk Diffusion Antimicrobial Susceptibility Testing of *Neisseria gonorrhoeae*

Antimicrobial resistance in *Neisseria gonorrhoeae* has developed to each of the agents that have been recommended for gonorrhea therapy (*1*). As a result, a well-standardized laboratory method to monitor the susceptibilities of gonococcal isolates has been recommended by the National Committee for Clinical Laboratory Standards (NCCLS). The NCCLS recently completed a multicenter study to standardize disk diffusion (and agar dilution) susceptibility tests for *N. gonorrhoeae* and to establish interpretive criteria and quality-control guidelines (*2*). The recommended test medium is GC base agar with a defined "XV-like" supplement. Control organisms are *N. gonorrhoeae* ATCC 49226 (CDC F-18), *N. gonorrhoeae* WHO V, and *Staphylococcus aureus* ATCC 25923.

Interpretive criteria based on expected treatment failure rates for single-agent therapy with penicillin, tetracycline, spectinomycin, or ceftriaxone have been selected (Table 1). Resistance to penicillin is defined as a zone diameter of ≤26 mm (10-U disk), corresponding to a minimum inhibitory concentration (MIC) of ≥2 μg/mL. Strains producing β-lactamase (penicillinase-producing *N. gonorrhoeae* [PPNG]) produce zone sizes of ≤19 mm. Resistance to tetracycline is defined as a zone diameter of ≤30 mm (30-μg disk), also corresponding to an MIC of ≥2 μg/mL. Strains producing zone

TABLE 1. Proposed criteria for interpreting susceptibilities of *Neisseria gonorrhoeae* to penicillin, tetracycline, spectinomycin, and ceftriaxone

		Proposed zone* and MIC correlate†							
		Susceptible		Moderately susceptible		Intermediate		Resistant	
Antimicrobial	Disk content	Zone	MIC	Zone	MIC	Zone	MIC	Zone	MIC
Penicillin§	10 U	≥47	≤0.06	27–46	0.12–1	–	–	≤26	≥2
Tetracycline§	30 μg	≥38	≤0.25	31–37	0.5–1	–	–	≤30	≥2
Spectinomycin	100 μg	≥18	≤32.0	–	–	15–17	64	≤14	≥128
Ceftriaxone	30 μg	≥35	≤0.25	–	–	–	–	–	–

*Expressed as zone diameter in mm.
†MIC = minimum inhibitory concentration. Correlate expressed as μg/mL.
§Penicillinase-producing *N. gonorrhoeae* and/or tetracycline-resistant *N. gonorrhoeae* produce zone sizes of ≤19 mm.

Neisseria gonorrhoeae – *Continued*

diameters of ≤19 mm may be presumptively identified as having high-level plasmid-mediated resistance to tetracycline (tetracycline-resistant *N. gonorrhoeae* [TRNG]); the corresponding MIC of these strains is ≥16 μg tetracycline/mL. Spectinomycin-resistant isolates produce zone sizes of ≤14 mm (MIC ≥128 μg spectinomycin/mL) with a 100-μg disk. Only a susceptible criterion for ceftriaxone has been established (30-μg disk) because of the absence of treatment failures in patients treated with ceftriaxone, 250 mg, IM.

Cure rates of ≤85% would be expected for patients infected with organisms resistant to an antimicrobial agent when treated with that agent alone. Cure rates of ≥95% would be expected for patients infected with susceptible organisms. Cure rates lower than those for infections caused by susceptible organisms may be expected for patients infected with moderately susceptible* organisms (*2*).

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Editorial Note: Antimicrobial resistance in *N. gonorrhoeae* has been due either to multiple chromosomal mutations or to R-factor plasmids. The development of resistance to tetracycline due to chromosomal mutations (*1*) prompted a CDC recommendation in 1985 that tetracycline not be used as single-drug therapy for gonococcal infection (*3*). The subsequent emergence of plasmid-mediated resistance to tetracycline (*4*) affirmed that recommendation. In addition, increasing prevalence of strains containing β-lactamase plasmids prompted the virtual abandonment of penicillins as single-dose therapies for gonorrhea in 1987 (*5*). Isolates with chromosomal resistance to alternative drugs such as spectinomycin have also been reported (*1*).

NCCLS criteria for interpreting disk diffusion susceptibility test results update previous CDC recommendations (*5*). Criteria for resistance to the four listed antimicrobial agents are only slightly different from those previously published by CDC (*5*). For penicillin and spectinomycin, the criteria for resistance have been modified from ≤25 mm to ≤26 mm and ≤15 mm to ≤14 mm, respectively. The criteria for distinguishing moderately susceptible from susceptible organisms have undergone the greatest changes. The criteria for interpreting MIC values (*5*; Table 1) were modified either because of changes in the procedure for determining MICs (penicillin) or reevaluation of treatment outcome data (tetracycline and spectinomycin).

This report does not alter the recommended methods for detecting PPNG; such strains may be identified easily by the detection of β-lactamase. Strains of *N. gonorrhoeae* that have chromosomally mediated resistance to antimicrobial agents or plasmid-mediated resistance to penicillin and/or tetracycline may be detected by measuring their susceptibilities by disk diffusion tests. Disk diffusion (or agar dilution) susceptibility tests alone can only identify TRNG isolates presumptively; TRNG can be confirmed only with genetic probes that specifically detect the TetM determinant.

Determining resistance is primarily a laboratory responsibility that affects both surveillance and patient care. The standardized test method and interpretive criteria permit comparison of results obtained in different health jurisdictions. Surveillance of

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*The term "intermediate," used previously by CDC, has been replaced by the term "moderately susceptible"; "intermediate" is now used only for spectinomycin susceptibilities of 15–17 mm (MIC of 64 μg/mL) for which clinical experience is insufficient.

susceptibilities based on carefully collected information permits the detection of emerging resistance that may necessitate revision of therapy recommendations.

Based on surveillance of gonococcal susceptibilities in 1988 and 1989, >20% of isolates were resistant to penicillin and/or tetracycline (CDC, unpublished data); thus, single-drug therapy with these agents would be expected to result in unacceptably low cure rates. The use of a β-lactam and tetracycline, in combination, may be expected to improve cure rates over those obtained with each agent individually. However, such dual β-lactam/tetracycline therapy may be inadequate to cure infections caused by strains with chromosomal resistance to multiple agents or plasmid-mediated resistance (PPNG and/or TRNG) (*5,6*). Thus, it may be more difficult to correlate zone sizes or MICs with clinical outcome when dual therapies are used.

State and local health departments are encouraged to determine antimicrobial susceptibilities of isolates from selected patients. Isolates should be tested from patients with disseminated gonococcal infection or neonatal disease and from persons thought to have failed initial therapy. In addition, laboratories are encouraged to systematically monitor local patterns and trends of antimicrobial susceptibilities of isolates from uncomplicated infections (e.g., a sample such as the first 20 isolates each month) (*7*).

Ideally, susceptibilities to penicillin, tetracycline, spectinomycin, and ceftriaxone should be determined. At a minimum, susceptibilities to the antigonococcal agents used locally should be determined. If ceftriaxone is the primary antigonococcal agent, susceptibilities to penicillin, as well as ceftriaxone, can be used as a marker for possible emerging ceftriaxone resistance. Although all gonococcal strains are susceptible to ceftriaxone, strains chromosomally resistant to penicillin have exhibited decreased relative susceptibility to ceftriaxone (*1*). Susceptibility testing to tetracycline may be included to detect TRNG.

The disk diffusion testing protocol and supplemental control organisms that define individual types of resistance are available to laboratories from the Technical Services Branch, Scientific Resources Program, Center for Infectious Diseases, CDC, Mailstop C21, Atlanta, GA 30333; telephone (404) 639-3354.

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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; telephone (404) 332-4555.

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