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Epidemiologic Notes and Reports

Nosocomial Transmission of Multidrug-Resistant Tuberculosis Among HIV-Infected Persons – Florida and New York, 1988–1991

During 1990 and 1991, outbreaks of multidrug-resistant tuberculosis (MDR-TB) in four hospitals (one in Miami [*1*] and three in New York City) were investigated by CDC in collaboration with the reporting hospitals and state and local health departments. This report summarizes preliminary findings of the investigations and recommendations for prevention and control of MDR-TB outbreaks.

Hospital A

From January 1988 through January 1990, 29 patients diagnosed with MDR-TB (case-patients) had *Mycobacterium tuberculosis* isolates resistant to at least isoniazid (INH) and rifampin (RIF) (*1*). For nine of these patients, isolates were also resistant to ethambutol (EMB). Of the 29 patients, 27 (93%) were known to be infected with human immunodeficiency virus (HIV); 23 had acquired immunodeficiency syndrome (AIDS)-defining conditions (*2*). Of the 29 total patients, 21 (72%) died a median of 7 weeks after diagnosis of MDR-TB.

The 29 case-patients were compared with 29 randomly selected HIV-infected patients with tuberculosis (TB) who had *M. tuberculosis* isolates susceptible to INH, RIF, and other drugs tested (controls). Before onset of TB, case-patients were more likely to have been patients in the hospital's HIV ward or outpatient HIV clinic at the same time as another case-patient with infectious pulmonary MDR-TB (14/29 vs. 1/29; odds ratio [OR] = 26.1; 95% confidence interval [CI] = 3.2–1143.0) (*1*).

From February 1990 through February 1991, 36 additional patients were diagnosed with *M. tuberculosis* resistant to at least INH and RIF; 30 of these cases were diagnosed during the first 6 months of that period and before, or within 2 months after, hospital A had implemented a substantial number of control measures (see box) with the assistance of the state and local health departments and CDC. Of the 36 additional patients, 35 were known to have HIV infection.

Multidrug-Resistant Tuberculosis — Continued

Summary of Recommendations for Preventing the Transmission of Tuberculosis in Health-Care Settings*

1. **Early identification and treatment of persons with active tuberculosis (TB)**
   - Maintain a high index of suspicion for TB to identify cases rapidly.
   - Promptly initiate effective multidrug anti-TB therapy based on clinical and drug-resistance surveillance data.
2. **Prevention of spread of infectious droplet nuclei by source control methods and by reduction of microbial contamination of indoor air**
   - Initiate acid-fast bacilli (AFB) isolation precautions immediately for all patients who are suspected or confirmed to have active TB and who may be infectious. AFB isolation precautions include use of a private room with negative pressure in relation to surrounding areas and a minimum of six air exchanges per hour. Air from the room should be exhausted directly to the outside. Use of ultraviolet lamps and/or high-efficiency particulate air filters to supplement ventilation may be considered.
   - Persons entering the AFB isolation room should use disposable particulate respirators that fit snugly around the face.
   - Continue AFB isolation precautions until there is clinical evidence of reduced infectiousness (i.e., cough has substantially decreased, and the number of organisms on sequential sputum smears is decreasing). If drug resistance is suspected or confirmed, continue AFB precautions until the sputum smear is negative for AFB.
   - Use special precautions during cough-inducing procedures.
3. **Surveillance for TB transmission**
   - Maintain surveillance for TB infection among health-care workers (HCWs) by routine, periodic tuberculin skin testing. Recommend appropriate preventive therapy for HCWs when indicated.
   - Maintain surveillance for TB cases among patients and HCWs.
   - Promptly initiate contact investigation procedures among HCWs, patients, and visitors exposed to an untreated, or ineffectively treated, infectious TB patient for whom appropriate AFB procedures are not in place. Recommend appropriate therapy or preventive therapy for contacts with disease or TB infection without current disease. Therapeutic regimens should be chosen based on the clinical history and local drug-resistance surveillance data.

*Adapted from reference 3.

Multidrug-Resistant Tuberculosis — Continued

Hospital B

From January 1989 through April 1990, 18 patients with AIDS diagnosed with MDR-TB had isolates resistant to at least INH and streptomycin (SM) (case-patients) (*4*). For 12 of these patients, isolates were also resistant to RIF and EMB. Sixteen (89%) of the patients died a median of 16 weeks after diagnosis of TB. For at least six patients, the cause of death appeared to be TB.

The 18 case-patients were compared with the 30 patients with AIDS who were diagnosed with TB during the same period and had *M. tuberculosis* isolates susceptible to one or both drugs (controls). In the 6 months before TB diagnosis, case-patients were more likely to have been hospitalized on the same ward at the same time as another case-patient with infectious pulmonary MDR-TB (13/18 vs. 2/30; OR = 36.4; 95% CI = 5.2–381.0). The estimated incubation period for TB in case-patients ranged from 30 to 105 days.

For 13 of 14 outbreak isolates analyzed, typing by restriction fragment length polymorphism (RFLP), an experimental method of DNA analysis for identifying genetic differences between *M. tuberculosis* strains (*5*), yielded identical DNA fingerprints. From May 1990 through January 1991, 17 additional patients (all infected with HIV) were diagnosed with *M. tuberculosis* resistant to at least INH and SM.

Hospital C

From September 1989 through March 1991, 17 patients diagnosed with MDR-TB had isolates resistant to at least INH, RIF, and SM (case-patients); for 10 case-patients, isolates were also resistant to EMB. Of the 16 patients who were known to be HIV-seropositive, 11 had AIDS-defining conditions. Of the 17 total patients, 14 (82%) died a median of 6 weeks after diagnosis of TB. For 10 case-patients, the cause of death appeared to be TB.

Case-patients were compared with the 69 patients with TB diagnosed during the same period with *M. tuberculosis* isolates susceptible to INH, RIF, SM, and other drugs tested (controls); 59 of the controls were known to be HIV-positive. Case-patients were more likely to have been hospitalized at hospital C at least 30 days before their first positive *M. tuberculosis* culture (when limited to case-patients and controls with HIV infection, 13/16 vs. 21/59; OR = 7.8; 95% CI = 1.8–46.4).

Since March 31, 1991, four additional patients have been diagnosed with *M. tuberculosis* resistant to at least INH, RIF, and SM; all four had HIV infection.

Hospital D

From January 1990 through March 1991, 23 patients diagnosed with MDR-TB had isolates resistant to at least INH and RIF (case-patients). For 13 of these patients, the isolates were resistant to other anti-TB drugs (four with resistance to INH, RIF, SM, and EMB). Of the 21 (91%) patients who were known to be HIV-seropositive, 20 had AIDS-defining conditions. Of the 23 total patients, 19 (83%) died a median of 4 weeks after diagnosis of TB. For 16 patients, the cause of death appeared to be TB.

The 23 case-patients were compared with 23 patients diagnosed with TB during the same period with *M. tuberculosis* isolates susceptible to INH, RIF, and other drugs tested (controls); 11 of the controls were known to be HIV-positive. Before onset of TB, case-patients were more likely to have been hospitalized at hospital D (when limited to case-patients and controls with HIV infection, 19/21 vs. 2/11; OR = 42.8; 95% CI = 4.0–576.5).

Multidrug-Resistant Tuberculosis — Continued

be completed rapidly, and results should be reported promptly to the health-care provider and the health department, even if confirmatory tests are planned. The use of radiometric culture and RFLP techniques may facilitate rapid detection of drug-resistant *M. tuberculosis* strains and should be used when appropriate. Hospitals and health departments should periodically examine MDR-TB incidence and resistance patterns to detect outbreaks and to provide a basis for drug regimens for patients with suspected MDR-TB.

Until rapid methods for determining *M. tuberculosis* drug susceptibility are routinely available, however, suspicion of drug resistance based on clinical and epidemiologic grounds is the only means available for early detection of MDR-TB and prevention of outbreaks by effective treatment. Persons at high risk for developing MDR-TB include 1) immunocompromised persons and others who have recently been exposed to infectious MDR-TB and 2) persons who have been previously treated for TB but who failed to take medications as prescribed or were prescribed an inadequate or ineffective treatment regimen.

No data are available from controlled trials regarding the treatment of patients with TB resistant to INH and RIF. However, pending drug-susceptibility test results, patients likely to have MDR-TB should be treated promptly with regimens containing INH, RIF, and pyrazinamide (since these drugs may be effective) *plus* at least two other drugs to which the *M. tuberculosis* strain is likely to be susceptible (based on surveillance of local drug-resistance patterns). Expert consultation, often available through the state or local health department, may be advisable—especially if clinical specimens are AFB-smear– and/or culture-positive and the patient fails to respond to treatment. Treatment should be modified accordingly when drug-susceptibility results are available.

All hospital personnel, including volunteers, who may be exposed to patients with suspected or known TB should be educated about the medical consequences of becoming infected with MDR-TB and should follow appropriate precautions for minimizing such exposure (*3*). Their education should include information about the risk for life-threatening clinical TB in persons with immunocompromising conditions, including HIV infection. HCWs and other persons exposed to patients with potentially infectious TB for whom appropriate AFB isolation precautions are not in place should be promptly evaluated to determine whether treatment for TB or preventive therapy for tuberculous infection is indicated (*3*). HCWs who are diagnosed with active pulmonary or laryngeal TB should have temporary work restriction (*3*). Preventive therapy recommendations for persons exposed to or infected with multidrug-resistant strains of *M. tuberculosis* will depend on drug-susceptibility patterns. CDC, in consultation with additional experts, is developing guidelines for clinicians managing such patients.

It is unknown whether vaccination with BCG (bacille Calmette-Guérin) vaccines licensed for use in the United States will protect HCWs against TB (*9*). Furthermore, BCG vaccination is contraindicated for persons with HIV infection. The Immunization Practices Advisory Committee and the Advisory Council for Elimination of Tuberculosis are being consulted to determine if recommendations on BCG vaccination for HCWs should be modified in view of these MDR-TB outbreaks.

All TB cases identified in hospitals should be reported promptly to the appropriate health departments to facilitate community contact identification procedures. Outbreaks of MDR-TB should be promptly investigated and reported through state and

Multidrug-Resistant Tuberculosis — Continued

territorial health departments to the Division of Tuberculosis Elimination, National Center for Prevention Services, CDC; telephone (404) 639-2519. Health departments can usually provide additional services to prevent development or spread of MDR-TB, including directly supervised administration of TB medications in the patient's home or other settings; arrangements for temporary housing for TB patients who may be infectious and who are homeless; initiation of legal quarantine procedures for infectious TB patients, when needed; medical and nursing case management; expert consultation; and educational materials on TB.

References

1. CDC. Nosocomial transmission of multidrug-resistant tuberculosis to health-care workers and HIV-infected patients in an urban hospital—Florida. MMWR 1990;39:718–22.
2. CDC. Revision of the CDC surveillance case definition for acquired immunodeficiency syndrome. MMWR 1987;36(no. 1S).
3. CDC. Guidelines for preventing the transmission of tuberculosis in health-care settings, with special focus on HIV-related issues. MMWR 1990;39(no. RR-17).
4. Edlin BR, Tokars JI, Grieco MH, et al. A nosocomial outbreak of isoniazid- and streptomycin-resistant tuberculosis (TB) among AIDS patients at a New York City hospital [Abstract]. VII International Conference on AIDS, Florence, Italy, June 16–21, 1991;1:224.
5. Cave DM, Eisenach KD, McDermott PF, Bates JH, Crawford JT. IS6110: Conservation of sequence in the *Mycobacterium tuberculosis* complex and its utilization in DNA fingerprinting. Mol Cell Probes 1991;5:73–80.
6. Selwyn PA, Hartel D, Lewis VA, et al. A prospective study of the risk of tuberculosis among intravenous HIV-infected patients. N Engl J Med 1989;320:545–50.
7. Di Perri G, Cruciani M, Danzi MC, et al. Nosocomial epidemic of active tuberculosis among HIV-infected patients. Lancet 1989;23/30:1502–4.
8. Barnes PF, Bloch AB, Davidson PT, et al. Tuberculosis in patients with human immunodeficiency virus infection. N Engl J Med 1991;324:1644–50.
9. ACIP/Advisory Committee for Elimination of Tuberculosis. Use of BCG vaccines in the control of tuberculosis: a joint statement by the ACIP and the Advisory Committee for Elimination of Tuberculosis. MMWR 1988;37:663–4,669–75.

Current Trends

Opportunistic Non-Hodgkin's Lymphomas Among Severely Immunocompromised HIV-Infected Patients Surviving for Prolonged Periods on Antiretroviral Therapy — United States

Since 1982, high-grade B-cell non-Hodgkin's lymphomas (NHLs) have been reported among persons with human immunodeficiency virus (HIV) infection (*1*); in 1985, CDC revised the surveillance case definition for acquired immunodeficiency syndrome (AIDS) to include certain high-grade NHLs. Recent surveillance findings indicate that NHLs occur among approximately 3% of all adults with AIDS reported to CDC. This report characterizes the occurrence of NHLs in a cohort of persons with AIDS or severe HIV infection who have received long-term zidovudine (AZT)-based therapy.

In 1985, the National Cancer Institute (NCI) began to follow a cohort of patients with AIDS or symptomatic HIV infection (oral thrush or weight loss). These patients, who participated in three separate clinical trials of AZT-based therapy, were among the first to receive antiretroviral drugs (*2*). A total of 55 patients were enrolled (10 are still alive); through May 1991, some of these patients had been followed for up to 4¼ years.

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Multidrug-Resistant Tuberculosis — Continued

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Until rapid methods for determining *M. tuberculosis* drug susceptibility are routinely available, however, suspicion of drug resistance based on clinical and epidemiologic grounds is the only means available for early detection of MDR-TB and prevention of outbreaks by effective treatment. Persons at high risk for developing MDR-TB include 1) immunocompromised persons and others who have recently been exposed to infectious MDR-TB and 2) persons who have been previously treated for TB but who failed to take medications as prescribed or were prescribed an inadequate or ineffective treatment regimen.

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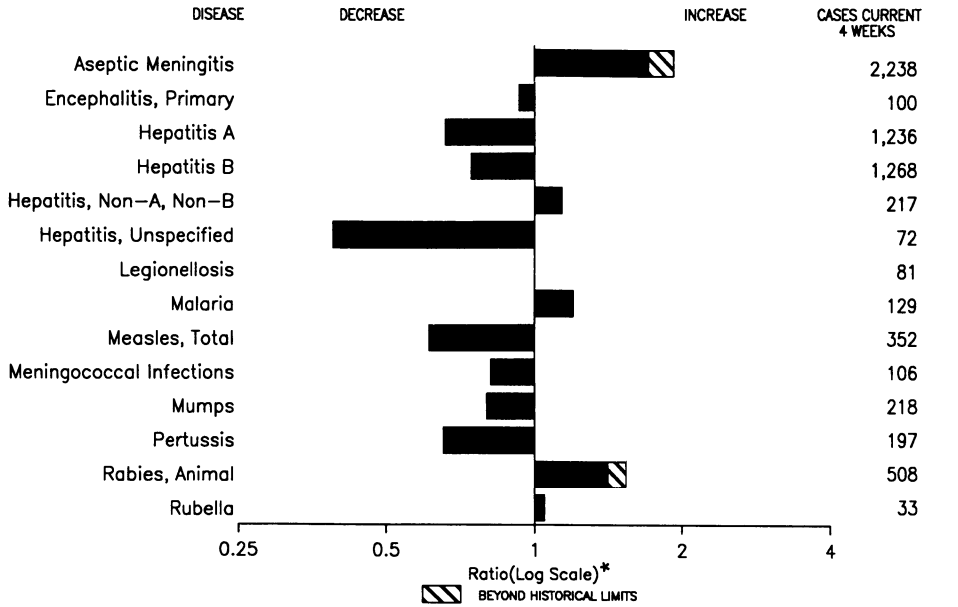
FIGURE I. Notifiable disease reports, comparison of 4-week totals ending August 24, 1991, with historical data — United States



*Ratio of current 4-week total to mean of 15 4-week totals (from previous, comparable, and subsequent 4-week periods for the past 5 years). The point where the hatched area begins is based on the mean and two standard deviations of these 4-week totals.

TABLE I. Summary — cases of specified notifiable diseases, United States, cumulative, week ending August 24, 1991 (34th Week)

	Cum. 1991		Cum. 1991
AIDS	28,656	Measles: imported	153
Anthrax	-	indigenous	7,883
Botulism: Foodborne	12	Plague	1
Infant	40	Poliomyelitis, Paralytic*	-
Other	4	Psittacosis	57
Brucellosis	45	Rabies, human	1
Cholera	16	Syphilis, primary & secondary	26,520
Congenital rubella syndrome	13	Syphilis, congenital, age < 1 year	12
Diphtheria	2	Tetanus	28
Encephalitis, post-infectious	58	Toxic shock syndrome	202
Gonorrhea	377,921	Trichinosis	56
Haemophilus influenzae (invasive disease)	2,059	Tuberculosis	14,350
Hansen Disease	99	Tularemia	109
Leptospirosis	38	Typhoid fever	248
Lyme Disease	4,979	Typhus fever, tickborne (RMSF)	378

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

TABLE II. Cases of selected notifiable diseases, United States, weeks ending August 24, 1991, and August 25, 1990 (34th Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea		Hepatitis (Viral), by type				Legionellosis	Lyme Disease
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1990	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991
UNITED STATES	28,656	7,190	530	58	377,921	441,838	15,490	10,886	1,911	853	735	4,979
NEW ENGLAND	1,036	721	21	1	9,048	12,074	384	573	53	24	47	995
Maine	38	39	3	-	113	141	16	15	2	-	2	-
N.H.	31	80	3	-	154	144	24	19	5	-	3	27
Vt.	15	175	3	-	38	38	20	12	6	-	2	4
Mass.	590	187	10	1	3,651	4,951	183	397	28	21	37	94
R.I.	63	233	-	-	741	755	69	19	10	3	3	103
Conn.	299	7	2	-	4,351	6,045	72	111	2	-	-	767
MID. ATLANTIC	7,966	1,077	40	11	45,251	59,245	1,464	961	193	15	205	2,941
Upstate N.Y.	941	519	17	7	8,310	8,972	594	368	116	9	70	1,910
N.Y. City	4,679	182	1	-	16,548	25,394	494	145	5	-	24	-
N.J.	1,592	-	-	-	7,840	9,780	177	228	42	-	23	532
Pa.	754	376	22	4	12,553	15,099	199	220	30	6	88	499
E.N. CENTRAL	1,922	1,353	156	7	70,020	83,080	1,979	1,287	307	40	153	145
Ohio	403	511	59	2	21,366	24,973	272	284	133	16	77	84
Ind.	182	114	12	1	7,314	7,240	280	159	1	1	13	7
Ill.	853	215	44	4	21,988	26,236	812	174	41	3	15	5
Mich.	370	472	37	-	15,296	18,781	219	410	84	20	33	49
Wis.	114	41	4	-	4,056	5,850	396	260	48	-	15	-
W.N. CENTRAL	764	388	35	7	18,748	22,470	1,573	468	203	18	35	169
Minn.	141	64	18	-	1,898	2,759	258	49	11	2	5	52
Iowa	80	83	-	4	1,253	1,638	39	32	8	3	10	12
Mo.	437	174	9	3	11,514	13,420	425	307	179	8	11	98
N. Dak.	4	2	2	-	30	93	32	4	2	1	1	-
S. Dak.	1	7	3	-	227	150	578	6	1	-	3	-
Nebr.	38	19	2	-	1,268	1,166	174	27	1	-	5	-
Kans.	63	39	1	-	2,558	3,244	67	43	1	4	-	7
S. ATLANTIC	6,926	1,384	104	24	115,518	126,096	1,118	2,275	264	177	120	365
Del.	53	37	2	-	1,753	2,017	7	32	4	2	2	37
Md.	702	130	18	1	11,724	14,033	199	273	47	13	24	138
D.C.	461	45	1	-	6,263	8,657	53	112	1	1	5	-
Va.	484	214	28	3	11,255	11,758	117	142	23	124	7	77
W. Va.	46	21	9	-	801	800	16	38	2	8	-	22
N.C.	351	181	24	-	23,349	20,003	115	346	92	-	14	52
S.C.	212	30	-	-	9,372	9,996	30	491	16	3	24	6
Ga.	1,027	201	7	2	27,703	27,857	141	345	35	-	13	21
Fla.	3,590	525	15	18	23,298	30,975	440	496	44	26	31	12
E.S. CENTRAL	684	503	24	-	36,884	38,212	154	905	247	3	39	78
Ky.	123	105	6	-	3,902	4,383	23	123	5	2	15	30
Tenn.	217	166	13	-	12,947	11,354	96	671	223	-	10	36
Ala.	197	204	5	-	10,715	13,335	29	102	15	1	13	12
Miss.	147	28	-	-	9,320	9,140	6	9	4	-	1	-
W.S. CENTRAL	2,809	925	58	1	41,563	48,059	2,185	1,467	83	170	29	51
Ark.	129	50	19	-	5,277	5,743	207	70	2	5	7	16
La.	494	85	10	-	9,765	8,888	88	205	6	5	5	1
Okla.	112	2	3	-	4,491	4,178	184	154	34	12	8	26
Tex.	2,074	788	26	1	22,030	29,250	1,706	1,038	41	148	9	8
MOUNTAIN	803	134	13	2	7,899	9,168	2,459	665	99	101	55	11
Mont.	22	9	1	-	70	116	64	49	4	5	2	-
Idaho	17	-	-	-	95	90	64	52	1	-	3	1
Wyo.	11	-	-	-	64	117	90	6	-	-	-	8
Colo.	304	46	3	1	2,149	2,424	384	97	41	17	12	-
N. Mex.	65	13	-	-	703	820	634	150	9	28	2	-
Ariz.	148	35	9	1	2,991	3,592	779	121	14	40	21	-
Utah	76	12	-	-	206	277	198	53	11	11	4	-
Nev.	160	19	-	-	1,621	1,732	246	137	19	-	11	2
PACIFIC	5,746	705	79	5	32,990	43,434	4,174	2,285	462	305	52	224
Wash.	352	-	6	1	2,873	3,843	395	292	101	17	2	1
Oreg.	168	-	-	-	1,298	1,683	262	214	83	8	2	-
Calif.	5,098	643	71	4	27,761	36,658	3,408	1,723	261	279	46	223
Alaska	15	28	2	-	544	799	85	24	13	1	-	-
Hawaii	113	34	-	-	514	451	24	32	4	-	2	-
Guam	2	-	-	-	-	188	-	-	-	-	-	-
P.R.	1,029	175	2	2	399	460	69	316	139	40	-	-
V.I.	13	-	-	-	269	279	1	9	-	-	-	-
Amer. Samoa	-	-	-	-	-	61	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	-	148	-	-	-	-	-	-

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

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 24, 1991, and August 25, 1990 (34th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1991	1991	Cum. 1991	1991	Cum. 1991	Cum. 1990	Cum. 1991	1991	Cum. 1991	1991	Cum. 1991	Cum. 1990	1991	Cum. 1991	Cum. 1990
UNITED STATES	739	70	7,883	3	153	19,595	1,465	59	2,977	45	1,444	2,397	10	1,083	774
NEW ENGLAND	49	-	50	-	11	280	110	1	23	4	215	261	-	4	8
Maine	1	-	2	-	-	29	9	-	-	2	48	10	-	-	1
N.H.	2	-	-	-	-	8	12	-	3	-	17	36	-	1	1
Vt.	3	-	5	-	-	1	13	1	4	-	4	6	-	-	-
Mass.	24	-	23	-	9	24	60	-	1	-	127	192	-	2	2
R.I.	7	-	2	-	-	30	-	-	3	-	-	2	-	-	1
Conn.	12	-	18	-	2	188	16	-	12	2	19	15	-	1	3
MID. ATLANTIC	113	25	4,273	-	6	1,296	151	20	225	11	123	398	-	559	11
Upstate N.Y.	30	-	334	-	4	312	79	2	80	-	79	276	-	537	10
N.Y. City	44	25	1,675	-	-	316	9	-	-	-	-	-	-	-	-
N.J.	30	-	730	-	1	297	32	-	54	-	1	27	-	-	-
Pa.	9	-	1,534	-	1	371	31	18	91	11	43	95	-	22	1
E.N. CENTRAL	58	2	69	-	11	3,496	228	-	270	-	235	654	5	180	30
Ohio	13	-	1	-	2	537	77	-	60	-	85	118	-	147	1
Ind.	3	U	-	U	2	412	17	U	6	U	50	90	U	1	-
Ill.	23	-	25	-	-	1,323	66	-	104	-	44	245	-	6	18
Mich.	16	2	41	-	-	473	48	-	81	-	24	59	5	25	9
Wis.	3	-	2	-	7	751	20	-	19	-	32	142	-	1	2
W.N. CENTRAL	24	4	34	-	6	797	81	3	89	2	107	113	-	16	14
Minn.	7	4	9	-	5	321	17	3	16	1	42	21	-	6	9
Iowa	4	-	15	-	-	26	8	-	15	-	13	15	-	5	4
Mo.	6	-	-	-	1	97	29	-	26	1	36	61	-	5	-
N. Dak.	1	-	-	-	-	-	1	-	2	-	2	2	-	-	1
S. Dak.	1	-	-	-	-	23	2	-	1	-	3	1	-	-	-
Nebr.	1	-	1	-	-	106	6	-	5	-	5	4	-	-	-
Kans.	4	-	9	-	-	224	18	-	24	-	6	9	-	-	-
S. ATLANTIC	156	3	431	2	20	1,174	272	17	1,054	9	164	187	1	13	18
Del.	2	-	21	-	-	11	2	-	6	-	-	6	-	-	-
Md.	48	-	175	-	1	210	27	6	204	3	42	47	-	6	2
D.C.	9	-	-	-	-	22	10	-	21	-	-	14	-	1	1
Va.	29	-	24	1§	5	74	27	6	49	2	18	15	-	-	1
W. Va.	2	-	-	-	-	6	12	-	16	-	8	14	-	-	-
N.C.	11	-	36	-	3	30	50	3	217	1	23	40	-	2	-
S.C.	8	-	13	-	-	4	27	1	345	-	10	5	-	-	-
Ga.	16	-	10	1§	5	282	56	-	38	1	29	24	-	-	-
Fla.	31	3	152	-	6	535	61	1	158	2	34	22	1	4	14
E.S. CENTRAL	16	1	7	1	2	150	97	-	155	4	53	105	-	100	3
Ky.	2	-	1	-	1	32	35	-	-	-	-	-	-	-	-
Tenn.	9	1	6	1§	1	70	30	-	127	-	17	45	-	100	3
Ala.	5	-	-	-	-	22	31	-	8	4	36	54	-	-	-
Miss.	-	-	-	-	-	26	1	-	20	-	-	6	-	-	-
W.S. CENTRAL	48	-	148	-	14	4,062	110	7	324	-	42	83	-	5	66
Ark.	5	-	-	-	5	42	16	-	40	-	4	8	-	1	3
La.	12	-	-	-	-	10	23	1	22	-	11	19	-	-	-
Okla.	6	-	-	-	-	173	13	1	13	-	21	28	-	-	1
Tex.	25	-	148	-	9	3,837	58	5	249	-	6	28	-	4	62
MOUNTAIN	30	16	949	-	19	894	58	-	280	6	159	201	-	6	105
Mont.	1	-	-	-	-	1	9	-	-	-	2	26	-	-	13
Idaho	2	8	405	-	2	26	7	-	8	-	23	36	-	2	49
Wyo.	-	-	1	-	2	15	1	-	3	-	3	-	-	-	-
Colo.	8	-	1	-	5	133	11	-	118	-	69	76	-	-	4
N. Mex.	6	-	117	-	5	93	8	N	N	6	29	15	-	-	-
Ariz.	11	-	274	-	-	286	16	-	126	-	8	34	-	-	30
Utah	1	8	133	-	4	127	-	-	13	-	23	10	-	-	1
Nev.	1	-	18	-	1	213	6	-	12	-	2	4	-	4	8
PACIFIC	245	19	1,922	-	64	7,446	358	11	557	9	346	395	4	200	519
Wash.	17	-	46	-	15	254	46	2	152	1	83	100	-	8	-
Oreg.	5	-	41	-	29	212	45	N	N	-	48	44	-	2	9
Calif.	219	19	1,831	-	12	6,888	258	9	376	8	168	217	3	185	500
Alaska	-	-	-	-	3	80	7	-	10	-	12	4	-	1	-
Hawaii	4	-	4	-	5	12	2	-	19	-	35	30	1	4	10
Guam	-	U	-	U	-	1	-	U	-	U	-	-	U	-	-
P.R.	1	-	93	-	1	1,634	15	-	9	2	34	6	-	1	-
V.I.	2	-	-	-	2	23	-	-	8	-	-	-	-	-	-
Amer. Samoa	-	U	-	U	-	467	-	U	-	U	-	-	U	-	-
C.N.M.I.	-	U	-	U	-	-	-	U	-	U	-	4	U	-	-

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

TABLE II. (Cont'd.) Cases of selected notifiable diseases, United States, weeks ending August 24, 1991, and August 25, 1990 (34th Week)

Reporting Area	Syphilis (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1991	Cum. 1990	Cum. 1991	Cum. 1991	Cum. 1990	Cum. 1991	Cum. 1991	Cum. 1991	Cum. 1991
UNITED STATES	26,520	31,865	202	14,350	14,960	109	248	378	4,080
NEW ENGLAND	680	1,156	10	379	340	1	27	5	41
Maine	-	5	4	30	-	-	1	-	-
N.H.	12	44	1	5	3	-	1	-	1
Vt.	1	1	-	4	7	-	-	-	-
Mass.	314	447	5	179	185	1	24	4	-
R.I.	37	12	-	43	43	-	-	-	-
Conn.	316	647	-	118	102	-	1	1	40
MID. ATLANTIC	4,264	6,356	32	3,304	3,553	1	47	9	1,344
Upstate N.Y.	103	571	15	233	281	1	9	6	484
N.Y. City	2,148	2,966	1	2,055	2,231	-	25	-	-
N.J.	876	1,039	-	582	579	-	10	2	620
Pa.	1,137	1,780	16	434	462	-	3	1	240
E.N. CENTRAL	3,161	2,176	39	1,453	1,412	5	15	29	102
Ohio	442	362	19	205	240	-	2	18	14
Ind.	94	55	-	119	124	-	-	7	7
Ill.	1,519	866	12	787	724	3	4	3	22
Mich.	776	645	8	276	267	2	8	1	23
Wis.	330	248	-	66	57	-	1	-	36
W.N. CENTRAL	469	335	32	338	366	39	4	27	600
Minn.	47	61	7	66	66	1	2	-	219
Iowa	40	42	6	50	40	-	-	1	111
Mo.	335	171	10	143	174	32	-	16	14
N. Dak.	-	1	-	5	16	-	-	-	69
S. Dak.	1	1	1	26	9	4	-	1	140
Nebr.	11	9	1	13	15	-	2	4	11
Kans.	35	50	7	35	46	2	-	5	36
S. ATLANTIC	8,102	10,344	17	2,761	2,797	4	47	166	980
Del.	104	123	1	18	29	-	-	-	107
Md.	643	759	1	258	211	-	8	20	373
D.C.	506	690	1	126	98	-	2	-	8
Va.	588	593	3	227	246	-	8	9	177
W. Va.	21	11	-	45	49	-	1	4	42
N.C.	1,279	1,181	7	369	360	1	2	85	11
S.C.	1,026	664	1	266	311	1	3	28	70
Ga.	2,004	2,648	-	544	468	1	5	19	168
Fla.	1,931	3,675	3	908	1,025	1	18	1	24
E.S. CENTRAL	2,991	2,846	9	1,030	1,081	13	2	71	117
Ky.	61	60	4	230	266	4	2	19	33
Tenn.	1,023	1,168	5	323	277	8	-	38	29
Ala.	1,086	866	-	258	336	1	-	14	55
Miss.	821	752	-	219	202	-	-	-	-
W.S. CENTRAL	4,755	5,274	14	1,720	1,864	30	16	62	449
Ark.	478	360	3	149	229	20	-	11	26
La.	1,612	1,631	-	159	216	-	3	-	4
Okla.	128	165	4	112	125	10	-	51	130
Tex.	2,537	3,118	7	1,300	1,294	-	13	-	289
MOUNTAIN	378	572	25	395	324	11	6	7	139
Mont.	6	-	-	6	22	7	-	5	27
Idaho	3	6	-	4	8	-	-	-	1
Wyo.	6	1	-	3	4	1	-	-	61
Colo.	55	38	5	33	13	2	1	2	12
N. Mex.	21	29	6	54	74	-	-	-	3
Ariz.	246	405	4	219	146	1	4	-	26
Utah	5	8	10	30	18	-	-	-	5
Nev.	36	85	-	46	39	-	1	-	4
PACIFIC	1,720	2,806	24	2,970	3,223	5	84	2	308
Wash.	111	267	3	190	181	2	4	1	1
Oreg.	51	94	-	69	87	2	3	1	4
Calif.	1,550	2,418	21	2,545	2,806	1	74	-	299
Alaska	4	12	-	35	35	-	-	-	3
Hawaii	4	15	-	131	114	-	3	-	1
Guam	-	2	-	-	33	-	-	-	-
P.R.	306	204	-	157	66	-	9	-	48
V.I.	77	6	-	2	4	-	-	-	-
Amer. Samoa	-	-	-	-	11	-	-	-	-
C.N.M.I.	-	3	-	-	40	-	-	-	-

U: Unavailable

TABLE III. Deaths in 121 U.S. cities,* week ending August 24, 1991 (34th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	587	425	86	43	20	13	27
Boston, Mass.	175	115	28	19	7	6	13
Bridgeport, Conn.	63	40	10	9	3	1	1
Cambridge, Mass.	13	13	-	-	-	-	1
Fall River, Mass.	26	24	2	-	-	-	-
Hartford, Conn.	39	26	7	1	4	1	-
Lowell, Mass.	14	9	3	1	1	-	-
Lynn, Mass.	13	9	4	-	-	-	-
New Bedford, Mass.	23	18	4	1	-	-	2
New Haven, Conn.	27	15	6	3	1	2	2
Providence, R.I.	43	37	5	-	1	-	2
Somerville, Mass.	26	24	2	-	-	-	-
Springfield, Mass.	28	22	3	2	-	1	4
Waterbury, Conn.	24	15	6	2	-	1	2
Worcester, Mass.	73	58	6	5	3	1	-
MID. ATLANTIC	2,637	1,687	512	311	70	56	142
Albany, N.Y.	40	32	2	2	1	3	2
Allentown, Pa.	21	16	3	2	-	-	1
Buffalo, N.Y.	108	79	15	7	3	4	4
Camden, N.J.	32	20	7	3	2	-	-
Elizabeth, N.J.	38	24	12	2	-	-	1
Erie, Pa.†	33	27	6	-	-	-	-
Jersey City, N.J.	72	44	8	15	-	5	1
New York City, N.Y.	1,546	932	319	213	47	35	89
Newark, N.J.§	U	U	U	U	U	U	U
Paterson, N.J.	23	14	4	4	-	1	-
Philadelphia, Pa.	291	188	71	22	6	4	14
Pittsburgh, Pa.†	58	37	15	3	2	1	7
Reading, Pa.	42	30	4	8	-	-	5
Rochester, N.Y.	134	96	17	14	6	1	9
Schenectady, N.Y.	33	21	7	2	1	2	1
Scranton, Pa.†	33	26	6	-	1	-	2
Syracuse, N.Y.	82	64	9	9	-	-	1
Trenton, N.J.	38	27	4	5	1	-	4
Utica, N.Y.	13	10	3	-	-	-	1
Yonkers, N.Y.§	U	U	U	U	U	U	U
E.N. CENTRAL	2,100	1,233	428	228	154	57	103
Akron, Ohio	60	46	9	5	-	-	-
Canton, Ohio	26	20	6	-	-	-	3
Chicago, Ill.	507	199	105	99	87	17	15
Cincinnati, Ohio	114	66	34	4	7	3	16
Cleveland, Ohio	135	81	25	12	5	12	4
Columbus, Ohio	156	94	32	18	6	6	3
Dayton, Ohio	133	88	30	10	4	1	8
Detroit, Mich.	216	120	50	31	11	4	7
Evansville, Ind.	44	32	6	2	2	2	3
Fort Wayne, Ind.	55	41	6	5	1	2	3
Gary, Ind.	16	9	5	-	2	-	-
Grand Rapids, Mich.	65	50	6	2	3	4	13
Indianapolis, Ind.	152	112	29	5	6	-	-
Madison, Wis.	29	17	8	3	1	-	2
Milwaukee, Wis.	112	83	19	5	4	1	9
Peoria, Ill.	38	28	5	2	1	2	4
Rockford, Ill.	53	27	12	10	3	1	3
South Bend, Ind.	43	34	7	1	1	-	2
Toledo, Ohio	86	42	21	12	9	2	7
Youngstown, Ohio	60	44	13	2	1	-	1
W.N. CENTRAL	772	539	125	53	24	31	36
Des Moines, Iowa	53	36	9	-	5	3	2
Duluth, Minn.	30	22	4	1	2	1	1
Kansas City, Kans.	30	18	7	2	-	3	1
Kansas City, Mo.	83	61	14	5	-	3	2
Lincoln, Nebr.	33	21	5	6	1	-	2
Minneapolis, Minn.	263	175	49	26	5	8	14
Omaha, Nebr.	72	48	11	5	4	4	4
St. Louis, Mo.	106	76	15	3	5	7	2
St. Paul, Minn.	52	45	3	3	1	-	5
Wichita, Kans.	50	37	8	2	1	2	3
S. ATLANTIC	1,107	653	241	116	38	49	51
Atlanta, Ga.§	U	U	U	U	U	U	U
Baltimore, Md.	158	96	37	16	6	3	13
Charlotte, N.C.	94	54	23	10	2	5	4
Jacksonville, Fla.	127	85	24	10	3	5	8
Miami, Fla.	123	64	40	15	2	2	-
Norfolk, Va.	55	34	8	7	1	5	-
Richmond, Va.	75	46	12	10	6	1	3
Savannah, Ga.	39	22	11	3	2	1	6
St. Petersburg, Fla.	55	39	7	2	2	5	-
Tampa, Fla.	135	98	28	6	1	2	14
Washington, D.C.	234	105	51	36	13	19	3
Wilmington, Del.	12	10	-	1	-	1	-
E.S. CENTRAL	773	509	145	74	28	17	39
Birmingham, Ala.	106	65	17	17	2	5	8
Chattanooga, Tenn.	48	36	7	3	2	-	1
Knoxville, Tenn.	77	60	15	2	-	-	7
Louisville, Ky.	92	58	18	7	6	3	4
Memphis, Tenn.	190	118	43	24	4	1	8
Mobile, Ala.	78	51	11	9	7	-	-
Montgomery, Ala.	53	39	9	4	-	1	2
Nashville, Tenn.	129	82	25	8	7	7	9
W.S. CENTRAL	1,499	870	340	174	78	37	69
Austin, Tex.	57	31	15	6	4	1	2
Baton Rouge, La.	45	29	9	4	3	-	-
Corpus Christi, Tex.	49	34	9	3	1	2	1
Dallas, Tex.	215	118	62	27	6	2	-
El Paso, Tex.	76	47	15	7	3	4	3
Ft. Worth, Tex.	105	61	12	18	7	7	2
Houston, Tex.	418	209	117	62	20	10	38
Little Rock, Ark.	76	46	19	3	7	1	4
New Orleans, La.	93	44	23	13	12	1	-
San Antonio, Tex.	178	118	31	20	6	3	6
Shreveport, La.	63	48	6	1	4	4	5
Tulsa, Okla.	124	85	22	10	5	2	8
MOUNTAIN	650	414	136	43	35	22	32
Albuquerque, N.M.	88	53	20	6	4	5	8
Colo. Springs, Colo.	37	22	8	2	4	1	3
Denver, Colo.	84	59	13	5	3	4	1
Las Vegas, Nev.	97	59	24	7	6	1	2
Ogden, Utah	33	23	4	2	3	1	4
Phoenix, Ariz.	142	92	31	7	8	4	5
Pueblo, Colo.	23	16	5	2	-	-	-
Salt Lake City, Utah	34	18	8	2	4	2	1
Tucson, Ariz.	112	72	23	10	3	4	8
PACIFIC	1,730	1,111	319	181	68	48	82
Berkeley, Calif.	23	17	4	2	-	-	2
Fresno, Calif.	74	50	13	5	4	2	1
Glendale, Calif.	20	14	2	4	-	-	2
Honolulu, Hawaii	112	78	20	5	2	7	5
Long Beach, Calif.	62	37	15	3	5	2	4
Los Angeles, Calif.	430	261	81	56	19	10	12
Oakland, Calif.§	U	U	U	U	U	U	U
Pasadena, Calif.	31	25	4	2	-	-	2
Portland, Oreg.	104	69	12	13	9	1	-
Sacramento, Calif.	162	96	39	14	4	9	6
San Diego, Calif.	151	92	29	23	6	1	16
San Francisco, Calif.	146	90	27	20	3	6	3
San Jose, Calif.	135	95	17	18	4	1	14
Seattle, Wash.	144	91	31	8	11	3	3
Spokane, Wash.	50	36	9	3	-	2	7
Tacoma, Wash.	86	60	16	5	1	4	5
TOTAL	11,855††	7,441	2,332	1,223	515	330	581

*Mortality data in this table are voluntarily reported from 121 cities in the United States, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Report for this week is unavailable (U).

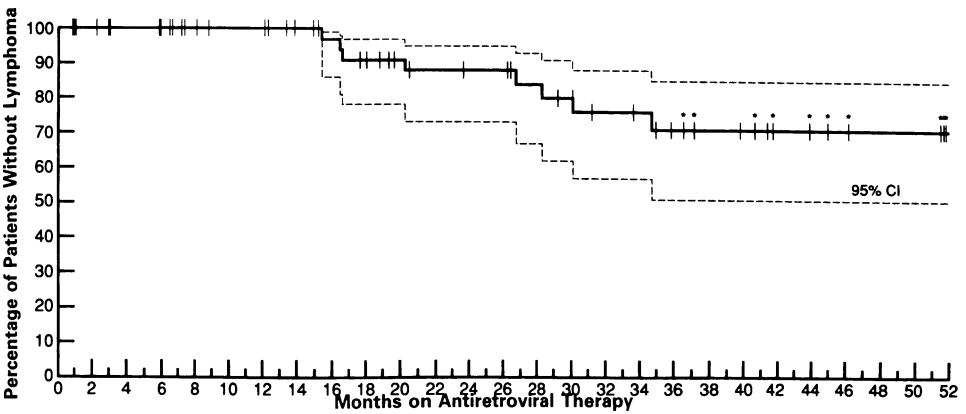
Non-Hodgkin's Lymphomas — Continued

Through May 1991, NHLs had occurred in eight of the patients. NHL was diagnosed a median of 23.6 months (range: 15.4–34.8 months) after initiation of antiretroviral therapy and a median of 21.8 months (range: 2.7–76.6 months) after the diagnosis of AIDS. Based on the method of Kaplan and Meier, the estimated probability of developing NHL within 24 months of initiating antiretroviral therapy (updated from a previous estimate [*2*]) is 12% (95% confidence interval [CI] = 5%–27%), increasing to 29% (95% CI = 15%–49%) after 36 months (Figure 1). Among this patient cohort, the incidence rate of developing an NHL is 0.077 per patient-year of follow-up.

The median CD4 cell count for the 55 patients at initiation of antiretroviral therapy was 71 cells/mm^3 (range: 0–953 cells/mm^3). The risk for NHL varied inversely with the CD4 cell count—patients with >50 CD4 cells/mm^3 had no lymphomas during 56.8 patient-years of observation, whereas those with <50 CD4 cells/mm^3 had eight lymphomas during 45.8 patient-years ($p<0.002$ by the test for difference in Poisson rates [*3*]). Among patients who survived for 18 months with a count of<50 CD4 cells/mm^3, the risk for NHL was 28% (95% CI = 13%–50%). The eight patients who developed NHLs had a median of six CD4 cells/mm^3 (range: 4–30 cells/mm^3) at the time of NHL diagnosis.

The NHLs among patients in this cohort were typical of those previously associated with HIV infection (*4*). All NHLs occurred in extranodal sites; for five patients, NHLs occurred in the central nervous system (CNS). Of these five, two occurred in patients with cerebral toxoplasmosis, and one was diagnosed at autopsy and involved only the leptomeninges. Seven patients presented with B-cell tumors, and one, a null-cell tumor (this patient subsequently developed a second lymphoma of B-cell origin). On histologic examination, four consisted of small noncleaved cell (includes diffuse undifferentiated, Burkitt's, and non-Burkitt's), and four, large-cell immunoblastic lymphomas. Response to treatment was generally poor, with a

FIGURE 1. Development of non-Hodgkin's lymphoma among a cohort of 55 patients on antiretroviral therapy, through May 1991*



*Eight patients (represented by the breaks in the curve) have developed non-Hodgkin's lymphoma (NHL). Each of the 47 tick marks represents a patient without NHL, and the asterisks represent the 10 patients alive at last follow-up. Of the 15 patients who were alive at the time of a previous estimate (*2*), none have since developed NHL.

Non-Hodgkin's Lymphomas — Continued

median survival of 1.8 months (range: 0.6–3.2 months) for patients with primary CNS involvement and 7 months (range: 0.5–18.0 months) for those with primary visceral involvement.

Reported by: National Cancer Institute, National Institutes of Health. Office of the Deputy Director (HIV), CDC.

Editorial Note: HIV-associated NHLs are typically aggressive, B-cell lymphomas occurring in extranodal sites, particularly the CNS (*4*). Although NHLs occur in approximately 3% of adults with AIDS reported to CDC, this proportion represents predominately AIDS-defining illnesses rather than NHLs that develop in patients with previously diagnosed AIDS. The findings in this report suggest that the incidence of HIV-associated NHL may be higher than previously estimated, particularly among patients with <50 CD4 cells/mm^3 who survive for prolonged periods. These findings are based on follow-up of a small, highly selected patient sample studied at a research hospital. Although no patient had lymphoma at entry into the studies, the patients were followed on an oncology/AIDS service where the clinical level of suspicion for tumors was especially high. In particular, the diagnoses of NHL in three of the patients may not have been made in certain other settings; for example, two cases were diagnosed by brain biopsy in patients with advanced AIDS and preexisting cerebral toxoplasmosis.

A review of the records of 1030 patients with advanced HIV infection receiving AZT therapy during a 2-year period (*5*) identified 24 NHLs, yielding an estimated risk for NHL of 3.2%, a lower 2-year incidence than that in the NCI cohort. This lower incidence may have reflected the patients' better clinical status (median entry CD4 count of 104 cells/mm^3) or differences in the length and intensity of follow-up. In a necropsy study of HIV-related deaths, NHLs were diagnosed in 20 (20%) of 101 HIV-related deaths (*6*); in eight (40%) patients, this condition was not suspected antemortem.

NCI's Surveillance, Epidemiology, and End Results (SEER) Program has documented a 56.9% increase in the incidence of NHL in the general population from 1973 through 1988. Although this trend reflects an increase in NHL among never-married men aged 20–49 years beginning in 1983 (Figure 2), there also appears to be an underlying longer-term increase. Based on the SEER database (which includes both AIDS-defining NHLs and NHLs associated with previously diagnosed AIDS), estimates of future AIDS incidence, and the findings in this report, the prevalence of patients with HIV-associated NHL in the United States in 1992 may range from 2900 to 9800 (*7*). Nearly 80% of these cases may occur among patients with a prior diagnosis of AIDS.

The pathogenesis of HIV-associated NHL is incompletely understood. However, multiple factors are believed to be involved (including polyclonal B-cell activation, IL-6 or other cytokine production, or coinfection with other viruses such as Epstein-Barr virus), which may increase the likelihood of molecular events such as t(8:14) or other translocations involving the *c-myc* gene locus. Immunosuppression induced by HIV appears to play a role similar to that in patients with primary immunodeficiency disorders such as the Wiskott-Aldrich syndrome (WAS) and severe combined immunodeficiency (*8*). In patients with WAS, improved supportive measures that prolong survival are believed to have increased the incidence of NHL (*9*). In this report, the prolonged survival of HIV-infected patients with ≤50 CD4 cells/mm^3 appeared to be a

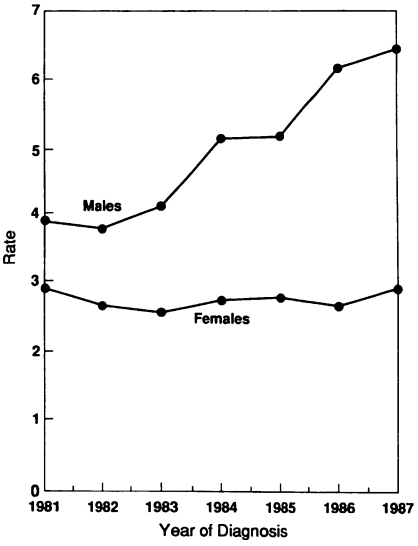
Non-Hodgkin's Lymphomas — Continued

major risk factor for NHL. These results support the value of CD4 cell counts as risk markers for HIV-associated complications.

Based on available data, the use of AZT is not considered to directly increase the risk for HIV-associated NHL. In this report, patients who developed lymphomas were all severely immunosuppressed, and the lymphomas were typical of those previously reported among HIV-infected patients not receiving antiretroviral therapy (*4*). In addition, in a placebo-controlled study of asymptomatic HIV-infected patients with >200 CD4 cells/mm^3, the use of AZT was not associated with an increased incidence of NHL (*10*).

Because the life expectancy of HIV-infected patients has been substantially prolonged by more effective treatment of HIV and associated complications, new clinical problems related to prolonged survival of persons with profound immunodeficiency have emerged. The emergence of HIV-associated NHL as described in this report requires continuing epidemiologic and clinical assessment. Therapies or strategies for preventing the development of severe immunosuppression, particularly sustaining CD4 cells at levels >50 cells/mm^3, may delay or even prevent the risk for NHL. Further studies of the risk for, or occurrence of, NHL in persons with HIV infection and on the use of CD4 cells as a risk marker for HIV-associated complications are in progress.

FIGURE 2. Incidence rate* of non-Hodgkin's lymphomas among persons aged 20–49 years, by sex and year of diagnosis — United States, 1981–1987



*Per 100,000 persons.
Source: Surveillance, Epidemiology, and End Results Program, National Cancer Institute.

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Non-Hodgkin's Lymphomas — Continued

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Effectiveness in Disease and Injury Prevention

Child Passenger Restraint Use and Motor-Vehicle–Related Fatalities Among Children — United States, 1982–1990

Although in recent years the increase in child safety seat use in the United States has saved lives of and prevented injuries to infants (children aged ≤1 year) and toddlers (children aged 1–4 years), the leading cause of death among U.S. children aged 1–4 years continues to be injuries to motor-vehicle occupants (*1*). These injuries account for the largest number of years of potential life lost before age 65 and the highest costs associated with pediatric injury (*2*). This report, based on data from the Fatal Accident Reporting System (FARS) (maintained by the National Highway Traffic Safety Administration), summarizes overall trends from 1982 through 1990 for motor-vehicle–related fatalities among children and lives saved by child passenger restraint use.

In the United States, in 1990, child safety seats were used for an estimated 83% of infants and 84% of toddlers, compared with 60% and 38%, respectively, in 1983 (Table 1) (*3*). Despite this level of use, 500–700 infants and toddlers died each year from 1983 through 1990 in traffic crashes (*4*). In 1990, FARS reported that 624 children <5 years of age were killed in motor-vehicle crashes, of whom 70% were not restrained. Compared with children in the general population, fatally injured children and survivors of fatal crashes (i.e., crashes in which at least one fatality occurred within 30 days of the crash) were substantially less likely to have been restrained by child safety seats (Table 1).

Use of child safety seats reduced the likelihood of fatal injury by an estimated 69% for infants and 47% for toddlers. Adult safety belts used for toddlers reduced the likelihood of fatal injury by 36% (*5–7*). Based on these estimates, from 1982 through 1990, the use of restraints (both child safety seats and adult safety belts) saved an estimated total of 1546 lives of young children in passenger-vehicle crashes.

Child Passenger Restraint Use — Continued

Reported by: TM Klein, MC Walz, National Center for Statistics and Analysis, Research and Development, National Highway Traffic Safety Administration, US Dept of Transportation. Unintentional Injuries Section, Epidemiology Br, Div of Injury Control, National Center for Environmental Health and Injury Control, CDC.

Editorial Note: From 1985 through 1989, the number of fatalities among passenger-vehicle occupants <5 years of age increased steadily. Most of the increase appeared to be related to increased on-the-road exposure of children rather than to decreased child restraint use, increased improper use, or child restraint deficiencies (*4*). In addition, young children involved in fatal crashes may not be representative of the general population: children who are not restrained may be at greater risk for involvement in a potentially fatal crash (*5*)—a problem also characteristic of the high-risk adult population (*8*).

In 1978, Tennessee became the first state to implement a law requiring restraint of children in motor vehicles. By 1985, all 50 states and the District of Columbia had such mandatory-use laws in effect (*9*). These laws vary by state, some requiring use only until the child's first birthday, others until age 5 years. Although most states require that children be protected by child safety seats until the third or fourth birthday, some exceptions are permitted (e.g., travel in vehicles other than a parent's). The average fine for persons who fail to use safety restraints for children is approximately $40 (range: $10–$500); however, this fine is usually waived on proof of safety seat acquisition. A recent assessment of child restraint laws indicates their immediate benefit is to reduce fatalities by 9% (*10*). Because laws contribute to an increased use of restraints for young children and an increased awareness of restraint use in general, the potential benefits (e.g., reduction in fatalities and injuries in motor-vehicle crashes) may increase over time.

Further reductions in child crash fatalities will require education and motivation of parents to use child safety seats and safety belts. In addition, high-risk groups (i.e.,

TABLE 1. Percentage of restrained infants and toddlers* in fatal crashes,† overall and by injury severity, and observed restraint use by infants and toddlers in the general population — United States, 1982–1990

Category	1982	1983	1984	1985	1986	1987	1988	1989	1990
Infants in fatal crashes§									
Surviving	25	36	47	57	52	55	67	68	68
Killed	11	17	22	28	29	28	37	31	35
Overall	19	29	39	47	45	45	57	55	57
Toddlers in fatal crashes§									
Surviving	11	21	30	37	43	48	48	48	52
Killed	9	13	19	23	26	31	26	29	28
Overall	11	19	28	34	39	45	43	44	47
Restraint use¶									
All infants	NA**	60	66	66	70	78	82	81	83
All toddlers	NA	38	44	53	72	80	83	81	84

* Infants = children <1 year of age; toddlers = children 1–4 years of age.
† Crashes in which at least one fatality occurred within 30 days of the crash.
§ Source: Fatal Accident Reporting System, US Department of Transportation, National Highway Traffic Safety Administration.
¶ Source: *Occupant Protection Trends in 19 Cities*, US Department of Transportation, National Highway Traffic Safety Administration (*3*).
** Not available.

Child Passenger Restraint Use — Continued

those most likely to be involved in crashes) must be identified and targeted for intervention to increase the use of child safety seats.

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