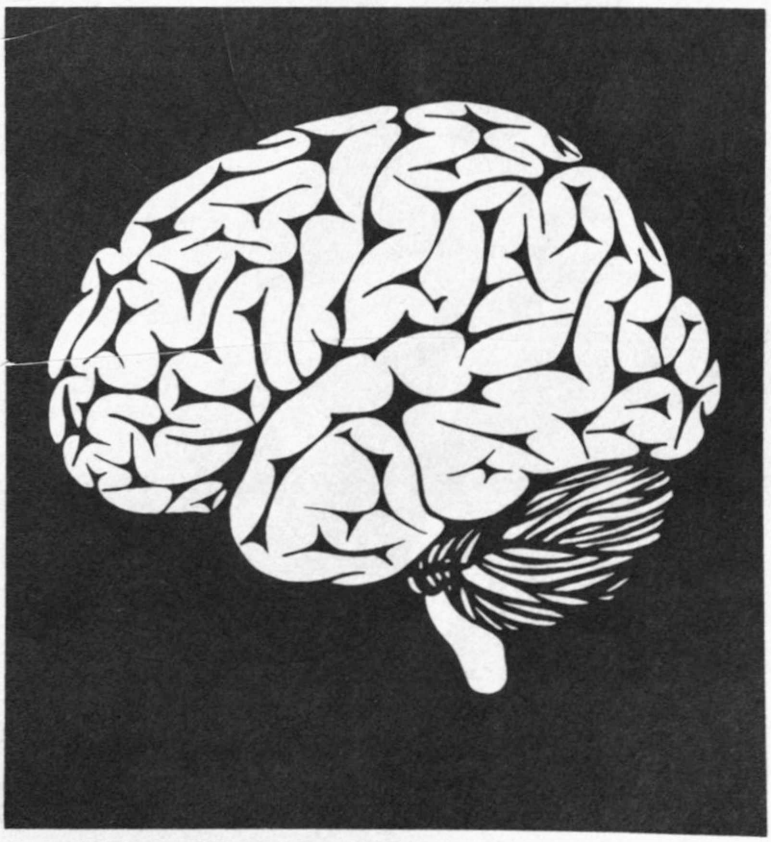
ANNUAL SUMMARY 1976
Issued December 1978

CENTER FOR DISEASE CONTROL

ENCEPHALITIS

SURVEILLANCE



U.S. DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE • Public Health Service

PREFACE

Summarized in this report is information received from state health departments, university investigators, virology laboratories, and other pertinent sources, domestic and foreign. This summary is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Send them to:

Center for Disease Control
Attention: Neurotropic Diseases
Viral Diseases Division
Bureau of Epidemiology
Atlanta, Georgia 30333

SUGGESTED CITATION
Center for Disease Control: Encephalitis Surveillance
Annual Summary 1976, Issued December 1978

I. SUMMARY

In 1976 a total of 1,830 cases of encephalitis, resulting in 245 deaths, were reported to the Center for Disease Control. The 1976 total is only 42% of the 4,308 cases (including those that occurred in an epidemic of St. Louis encephalitis [SLE]) reported for 1975. Nevertheless, the 1976 total is 8% higher than the average for the 5 years preceding 1975. Of the 9 geographic divisions in the United States, the East South Central reported the most cases and the highest attack rate. Cases were reported to have occurred in all states except Maine, Montana, New Mexico, Nevada, Vermont, and Wyoming. In 1976, as in each year except 1975, the majority of cases (61%) were of indeterminate etiology. Most of the other cases (23%) were of arboviral etiology. Of the cases with known etiology, most (61%) were associated with arboviral infection, primarily SLE. The next largest group of cases with known etiology were associated with childhood infections (25%), including mumps (71 cases), chickenpox (59), measles (44), and rubella (2). Another major component of cases with determined etiology was associated with herpes simplex infection (10%). The other cases of determined etiology, accounting for less than 3% of the total, were associated with respiratory infection (11), infectious mononucleosis (4), herpes zoster (3), cytomegalovirus (2), and Rocky Mountain spotted fever (1).

II. METHODS AND DEFINITIONS

This summary was compiled from data submitted to CDC from all state health departments. Only cases clinically classified as having an encephalitic component (i.e., encephalitis, meningo-encephalitis) were included, regardless of etiology. For each of these cases, information was requested on patient's age, sex, and county of residence, the date of onset and outcome of the illness, pertinent laboratory results, and etiologic evaluation when available. In general, cases were classified according to the degree of etiologic information available. Cases considered to be laboratory-confirmed were associated either with the isolation of a virus from an appropriate site--usually the central nervous system (CNS)--or with diagnostic serologic results usually involving at least a 4-fold difference in titer between acute- and convalescent-phase paired sera. Presumptive cases included those with enterovirus isolates from non-central nervous system sites without supporting serologic evidence, and cases with serologic evidence not meeting the criteria for a confirmed case. Except for presumptive arboviral infections which were tabulated with other cases of documented arboviral etiology, all presumptive cases were included in the indeterminate category. Similarly, cases with documented evidence for more than 1 etiology (complex) and those cases with either inconclusive or no evidence for a specific etiology were included in the indeterminate category. The physician's clinical diagnosis was accepted as documented evidence for specific etiologies where clinical diagnosis was feasible--for example, childhood exanthems or herpes zoster.

III. EPIDEMIOLOGY AND MORBIDITY TRENDS

In 1976 there were 706 cases, resulting in 54 deaths, with sufficient evidence to document a specific infectious etiology (Table 1). The majority of these cases (61%) involved arboviral encephalitis: 90% of the arboviral cases and all of the 15 associated deaths involved infection with SLE. Encephalitis cases following childhood infections accounted for 176 cases, nearly a quarter (25%) of those with determined etiology, and a similar proportion of fatalities (26%). Encephalitis cases following measles (44) were more numerous than they had been since 1971, reflecting widespread outbreaks of measles infection. Encephalitis cases associated with herpes simplex infection (69) included 22 fatalities (41% of those associated with encephalitis of determinate etiology). Cases associated with enteric, respiratory, and other viral agents accounted for less than 5% of all cases with determined etiology.

PREFACE

Summarized in this report is information received from state health departments, university investigators, virology laboratories, and other pertinent sources, domestic and foreign. This summary is intended primarily for the use of those with responsibility for disease control activities. Anyone desiring to quote this report should contact the original investigator for confirmation and interpretation.

Contributions to the Surveillance Report are most welcome. Send them to:

Center for Disease Control
Attention: Neurotropic Diseases
Viral Diseases Division
Bureau of Epidemiology
Atlanta, Georgia 30333

SUGGESTED CITATION
Center for Disease Control: Encephalitis Surveillance
Annual Summary 1976, Issued December 1978

Center for Disease Control.....William H. Foege, M.D., Director

Bureau of Epidemiology.....Philip S. Brachman, M.D., Director
Michael B. Gregg, M.D., Deputy Director

Viral Diseases Division.....John A. Bryan, M.D., Director

Enteric and Neurotropic
Viral Diseases Branch.....Lawrence B. Schonberger, M.D., Chief
Karl D. Kappus, Ph.D.

Statistical Services and Evaluation Branch.....Dennis J. Bregman, M.S., Chief
Robert C. Holman, Statistician
Anita Garner
Annabelle Alter

Editorial and Graphic Services.....Frances H. Porcher, M.A., Chief
Norma W. Strawn, Writer-Editor

Collaborators:

Bureau of Laboratories.....Roslyn Q. Robinson, Ph.D., Director

Virology Division.....Walter R. Dowdle, Ph.D., Director
Roy W. Chamberlain, Sc.D., Deputy Director

Enteric Virology Branch.....Milford H. Hatch, Sc.D., Chief

Vector-Borne Diseases Division.....Thomas P. Monath, M.D., Director

I. SUMMARY

In 1976 a total of 1,830 cases of encephalitis, resulting in 245 deaths, were reported to the Center for Disease Control. The 1976 total is only 42% of the 4,308 cases (including those that occurred in an epidemic of St. Louis encephalitis [SLE]) reported for 1975. Nevertheless, the 1976 total is 8% higher than the average for the 5 years preceding 1975. Of the 9 geographic divisions in the United States, the East South Central reported the most cases and the highest attack rate. Cases were reported to have occurred in all states except Maine, Montana, New Mexico, Nevada, Vermont, and Wyoming. In 1976, as in each year except 1975, the majority of cases (61%) were of indeterminate etiology. Most of the other cases (23%) were of arboviral etiology. Of the cases with known etiology, most (61%) were associated with arboviral infection, primarily SLE. The next largest group of cases with known etiology were associated with childhood infections (25%), including mumps (71 cases), chickenpox (59), measles (44), and rubella (2). Another major component of cases with determined etiology was associated with herpes simplex infection (10%). The other cases of determined etiology, accounting for less than 3% of the total, were associated with respiratory infection (11), infectious mononucleosis (4), herpes zoster (3), cytomegalovirus (2), and Rocky Mountain spotted fever (1).

II. METHODS AND DEFINITIONS

This summary was compiled from data submitted to CDC from all state health departments. Only cases clinically classified as having an encephalitic component (i.e., encephalitis, meningo-encephalitis) were included, regardless of etiology. For each of these cases, information was requested on patient's age, sex, and county of residence, the date of onset and outcome of the illness, pertinent laboratory results, and etiologic evaluation when available. In general, cases were classified according to the degree of etiologic information available. Cases considered to be laboratory-confirmed were associated either with the isolation of a virus from an appropriate site--usually the central nervous system (CNS)--or with diagnostic serologic results usually involving at least a 4-fold difference in titer between acute- and convalescent-phase paired sera. Presumptive cases included those with enterovirus isolates from non-central nervous system sites without supporting serologic evidence, and cases with serologic evidence not meeting the criteria for a confirmed case. Except for presumptive arboviral infections which were tabulated with other cases of documented arboviral etiology, all presumptive cases were included in the indeterminate category. Similarly, cases with documented evidence for more than 1 etiology (complex) and those cases with either inconclusive or no evidence for a specific etiology were included in the indeterminate category. The physician's clinical diagnosis was accepted as documented evidence for specific etiologies where clinical diagnosis was feasible--for example, childhood exanthems or herpes zoster.

III. EPIDEMIOLOGY AND MORBIDITY TRENDS

In 1976 there were 706 cases, resulting in 54 deaths, with sufficient evidence to document a specific infectious etiology (Table 1). The majority of these cases (61%) involved arboviral encephalitis: 90% of the arboviral cases and all of the 15 associated deaths involved infection with SLE. Encephalitis cases following childhood infections accounted for 176 cases, nearly a quarter (25%) of those with determined etiology, and a similar proportion of fatalities (26%). Encephalitis cases following measles (44) were more numerous than they had been since 1971, reflecting widespread outbreaks of measles infection. Encephalitis cases associated with herpes simplex infection (69) included 22 fatalities (41% of those associated with encephalitis of determinate etiology). Cases associated with enteric, respiratory, and other viral agents accounted for less than 5% of all cases with determined etiology.

Table 1
Cases of Encephalitis and Deaths, by Etiology, United States, 1976

Category and Etiology	Cases		Deaths		Death/Case Ratio (%)
	Number	% of Total	Number	% of Total	
Arboviral	427	23.3	15	6.1	3.5
Western equine	1		0		
St. Louis	379		15		
California	47		0		
Enteroviral	13	0.7	1	0.4	7.7
Associated with Childhood Infections	176	9.6	14	5.7	8.0
Measles	44		6		
Mumps	71		2		
Chickenpox	59		6		
Rubella	2		0		
Associated with Respiratory Illness	11	0.6	1	0.4	9.1
Adenovirus	4		0		
M. pneumoniae	1		0		
Respiratory syncytial virus	1		1		
Influenza A	5		0		
Associated with other Known Etiologies	79	4.3	23	9.4	29.1
Cytomegalovirus	2		0		
Herpes simplex	69		22		
Herpes zoster	3		1		
Infectious mononucleosis	4		0		
Rocky Mountain spotted fever	1		0		
Indeterminate	1,124	61.4	191	78	17.0
Complex	0		0		
Inconclusive	51		0		
Unknown etiology	1,073		191		
Total	1,830	100	245	100	13.4

There were 1,124 cases included in the indeterminate category: 1,073 with no indication of evidence for a specific etiology, and 51 with inconclusive evidence (36 with an enterovirus or a herpes virus demonstrated from an anatomical site not in the CNS, and 15 with presumptive serologic evidence of infection by some virus).

The number of arboviral cases reported for 1976 declined greatly from the extraordinary total for 1975. Nevertheless, 1976 was also a year of epidemic arboviral encephalitis activity, as shown in Table 2. The total of 427 cases of arboviral encephalitis in 1976 is the highest total reported since 1966, with the exception of 1975. In contrast, the number of cases associated with enteroviral infection (13) is the same as reported in 1973, the lowest total in the 11-year period that enteroviral cases have been identified. Cases associated with childhood infections continued the secular decline that began in 1966.

Table 2
Cases of Encephalitis, By Year and Etiologic Group, 1960-1976

Year	Total	Etiologic Group				
		Arboviral	Enteroviral	Associated with CI*	Other Known	Indeterminate
1960	2,533	45	–	1,094	79	1,335
1961	2,140	70	–	753	111	1,206
1962	2,410	270	–	771	83	1,286
1963	2,362	76	–	994	200	1,092
1964	3,587	582	–	1,397	188	1,420
1965	2,703	297	–	924	57	1,425
1966	3,102	438	37	963	172	1,492
1967	2,368	83	26	995	46	1,218
1968	2,283	130	66	502	75	1,510
1969	1,917	108	31	304	56	1,418
1970	1,950	110	52	370	58	1,360
1971	1,891	148	45	439	80	1,179
1972	1,302	70	30	243	61	898
1973	1,970	91	13	354	62	1,450
1974	1,382	108	48	218	50	958
1975	4,308	2,113	136	237	113	1,709
1976	1,830	427	13	176	90	1,124

*CI – Childhood infections: measles, mumps, chickenpox, rubella

The pattern of seasonal activity for 1976 (Figure 1) is similar to that of other years characterized by epidemic arboviral activity, such as 1964, 1965, and 1966. The monthly distribution of cases for each etiologic group is also similar to patterns of previous years (Figure 2). Arboviral and enteroviral activity occurred predominantly in the summer and early fall; August was the month of peak activity for cases of arboviral and enteroviral encephalitis and those of indeterminate etiology. Childhood infections-associated cases occurred more frequently from March through June. The monthly occurrence of cases in the indeterminate category suggests a composite of the seasonal distribution of cases associated with documented etiologies. The late summer peak of cases with unknown etiology may reflect undiagnosed arboviral or enteroviral cases.

Encephalitis cases for 1976 are tabulated by state and etiologic group in Table 3; fatal cases are tabulated in Table 4. Almost two-thirds of all cases were reported from 8 states: Mississippi (286), California (203), Illinois (148), Texas (135), Ohio (122), Indiana (109), Alabama (103), and Pennsylvania (96). The incidence of encephalitis is displayed by state in Figure 3. The geographic division with the highest rate was East South Central. The yearly rate for this division (33.9 cases per 1 million population) was 3 times higher than that for any other division. This elevated rate reflects SLE outbreaks in Mississippi and Alabama. The 3 states with the highest individual rates were Mississippi (121.5 cases per 1 million population), Alaska (39.3 cases per 1 million population), and Alabama (28.1 cases per 1 million population). Variations in attack rates from state to state are greatly influenced by epidemic patterns; however, dissimilar rates may also reflect dissimilar reporting practices and emphases on epidemiologic and laboratory investigations.

Fig. 1 REPORTED CASES OF ENCEPHALITIS, BY MONTH OF ONSET, UNITED STATES, 1963-1976

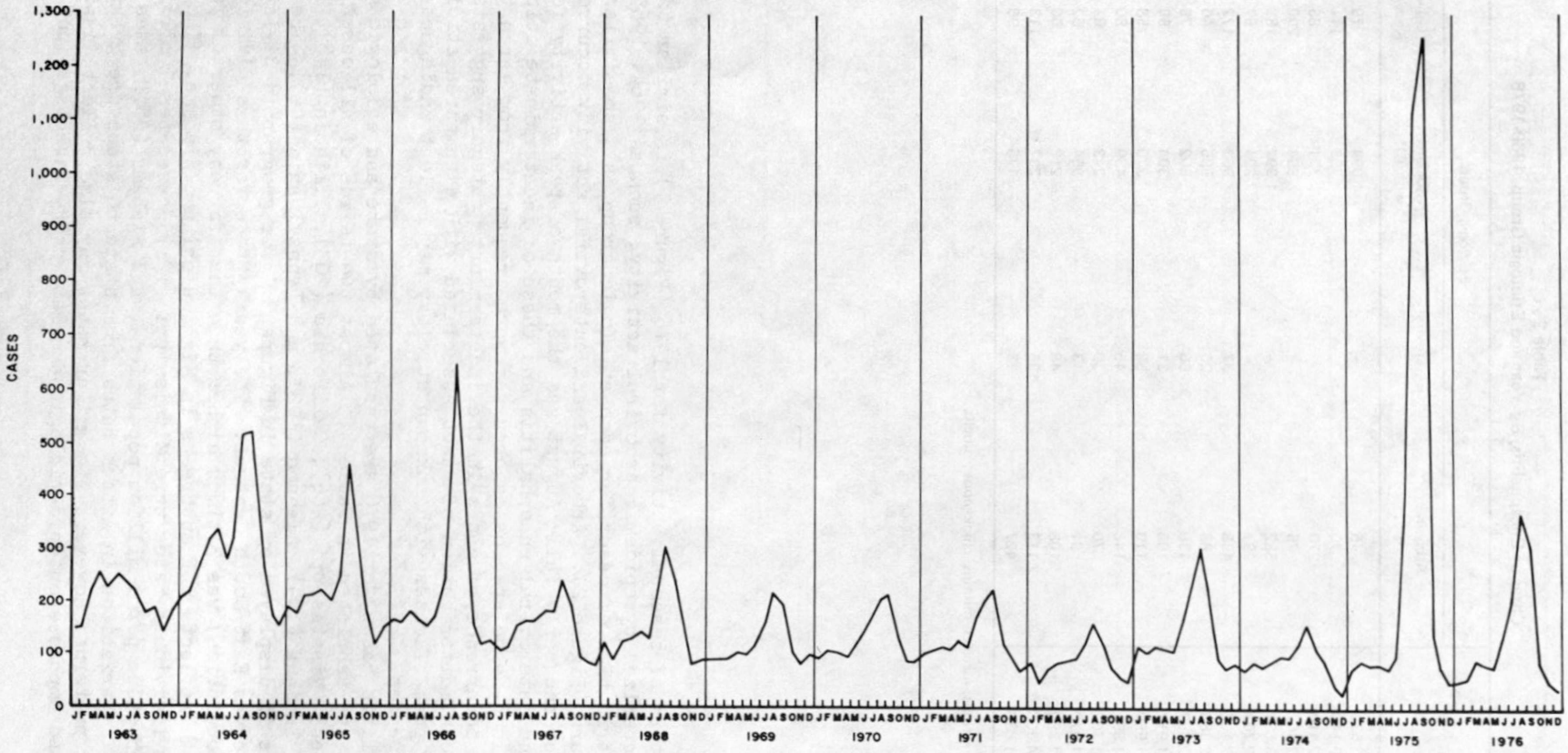


Fig. 2 REPORTED CASES OF ENCEPHALITIS, BY MONTH OF ONSET AND ETIOLOGIC GROUP, UNITED STATES, 1976

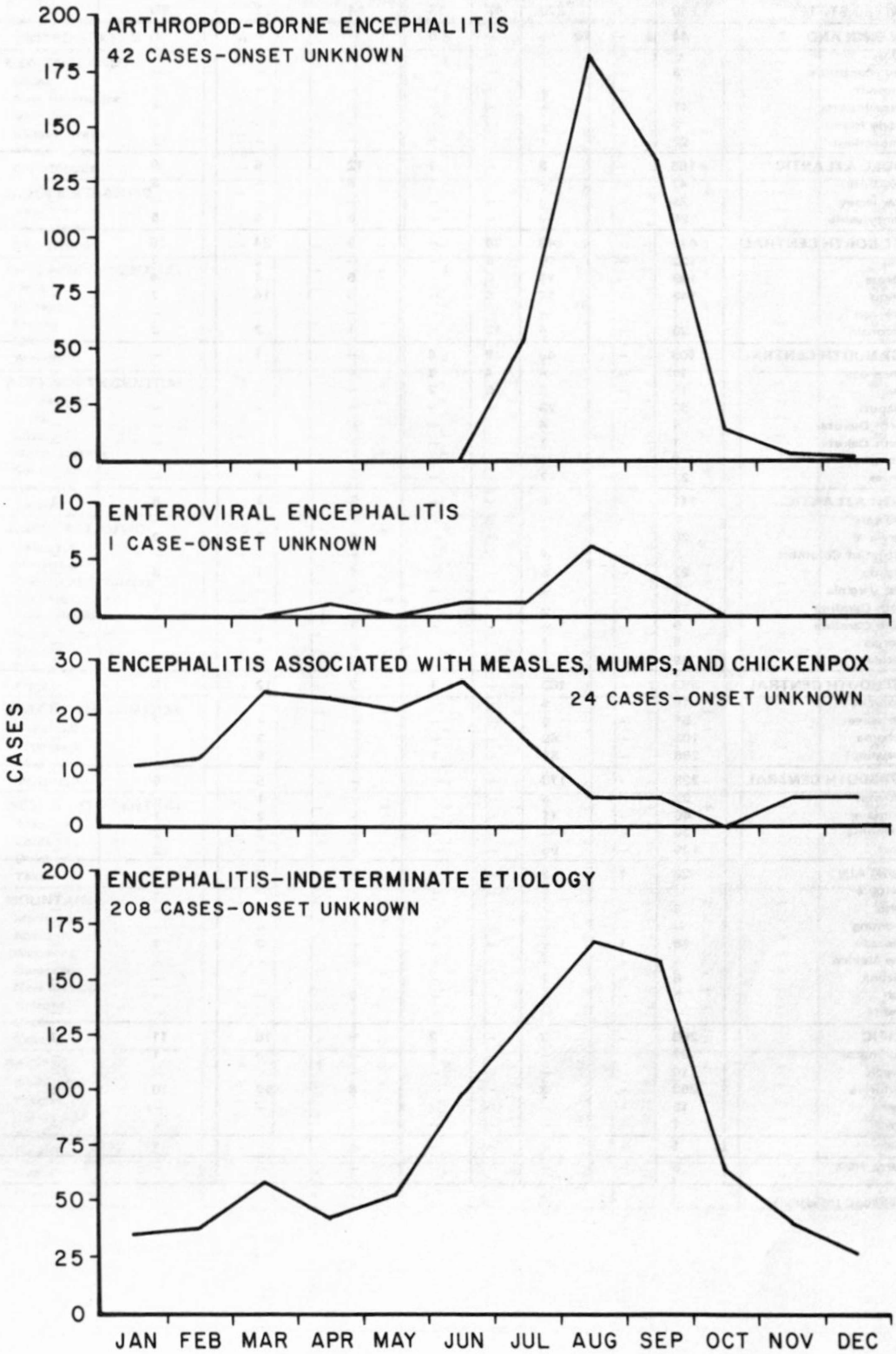


TABLE 3
REPORTED CASES OF ENCEPHALITIS, BY STATE AND ETIOLOGY, 1976

STATE	Area Total	Arthropod-borne			Entero-viral	Associated with CI*			
		WEE	SLE	CE		Measles	Mumps	Chickenpox	Rubella
UNITED STATES	**1,830**	**1**	**379**	**47**	**13**	**44**	**71**	**59**	**2**
NEW ENGLAND	**44**	–	–	–	**5**	–	–	**6**	–
Maine	–	–	–	–	–	–	–	–	–
New Hampshire	3	–	–	–	–	–	–	–	–
Vermont	–	–	–	–	–	–	–	–	–
Massachusetts	17	–	–	–	–	–	–	4	–
Rhode Island	2	–	–	–	–	–	–	–	–
Connecticut	22	–	–	–	5	–	–	2	–
MIDDLE ATLANTIC	**166**	–	**3**	–	**1**	**12**	**6**	**8**	–
New York	47	–	–	–	1	6	–	3	–
New Jersey	23	–	3	–	–	–	–	–	–
Pennsylvania	96	–	–	–	–	6	6	5	–
EAST NORTH CENTRAL	**411**	–	**43**	**38**	–	**9**	**24**	**16**	–
Ohio	122	–	10	18	–	–	2	2	–
Indiana	109	–	19	2	–	5	4	4	–
Illinois	148	–	14	6	–	3	16	7	–
Michigan	4	–	–	–	–	–	–	–	–
Wisconsin	28	–	–	12	–	1	2	3	–
WEST NORTH CENTRAL	**109**	–	**46**	**9**	**4**	–	**1**	–	–
Minnesota	11	–	4	4	2	–	–	–	–
Iowa	15	–	2	5	2	–	–	–	–
Missouri	53	–	23	–	–	–	–	–	–
North Dakota	4	–	4	–	–	–	–	–	–
South Dakota	1	–	1	–	–	–	–	–	–
Nebraska	3	–	–	–	–	–	–	–	–
Kansas	22	–	12	–	–	–	1	–	–
SOUTH ATLANTIC	**111**	–	**6**	–	–	**5**	**4**	**6**	**1**
Delaware	7	–	–	–	–	–	–	–	–
Maryland	26	–	–	–	–	1	2	2	–
District of Columbia	2	–	–	–	–	–	–	–	–
Virginia	27	–	5	–	–	1	1	3	–
West Virginia	1	–	–	–	–	–	–	–	–
North Carolina	15	–	–	–	–	–	–	1	–
South Carolina	9	–	–	–	–	1	–	–	–
Georgia	5	–	1	–	–	–	1	–	–
Florida	19	–	–	–	–	2	–	–	1
EAST SOUTH CENTRAL	**463**	–	**163**	–	**1**	**2**	**12**	**5**	–
Kentucky	19	–	5	–	–	2	–	1	–
Tennessee	55	–	8	–	–	–	4	2	–
Alabama	103	–	69	–	–	–	3	1	–
Mississippi	286	–	81	–	1	–	5	1	–
WEST SOUTH CENTRAL	**228**	–	**113**	–	–	–	**5**	**5**	–
Arkansas	22	–	6	–	–	–	1	–	–
Louisiana	45	–	11	–	–	–	2	1	–
Oklahoma	26	–	–	–	–	–	2	2	–
Texas	135	–	96	–	–	–	–	2	–
MOUNTAIN	**26**	**1**	**2**	–	–	**8**	**3**	**1**	–
Montana	–	–	–	–	–	–	–	–	–
Idaho	3	–	–	–	–	3	–	–	–
Wyoming	–	–	–	–	–	–	–	–	–
Colorado	10	1	–	–	–	–	3	1	–
New Mexico	–	–	–	–	–	–	–	–	–
Arizona	8	–	2	–	–	–	–	–	–
Utah	5	–	–	–	–	5	–	–	–
Nevada	–	–	–	–	–	–	–	–	–
PACIFIC	**266**	–	**3**	–	**2**	**8**	**16**	**11**	**1**
Washington	37	–	–	–	2	–	3	1	–
Oregon	10	–	–	–	–	–	–	–	–
California	203	–	3	–	–	8	13	10	1
Alaska	15	–	–	–	–	–	–	–	–
Hawaii	1	–	–	–	–	–	–	–	–
Guam	1	–	–	–	–	–	–	1	–
Puerto Rico	5	–	–	–	–	–	–	–	–

*Childhood Infections

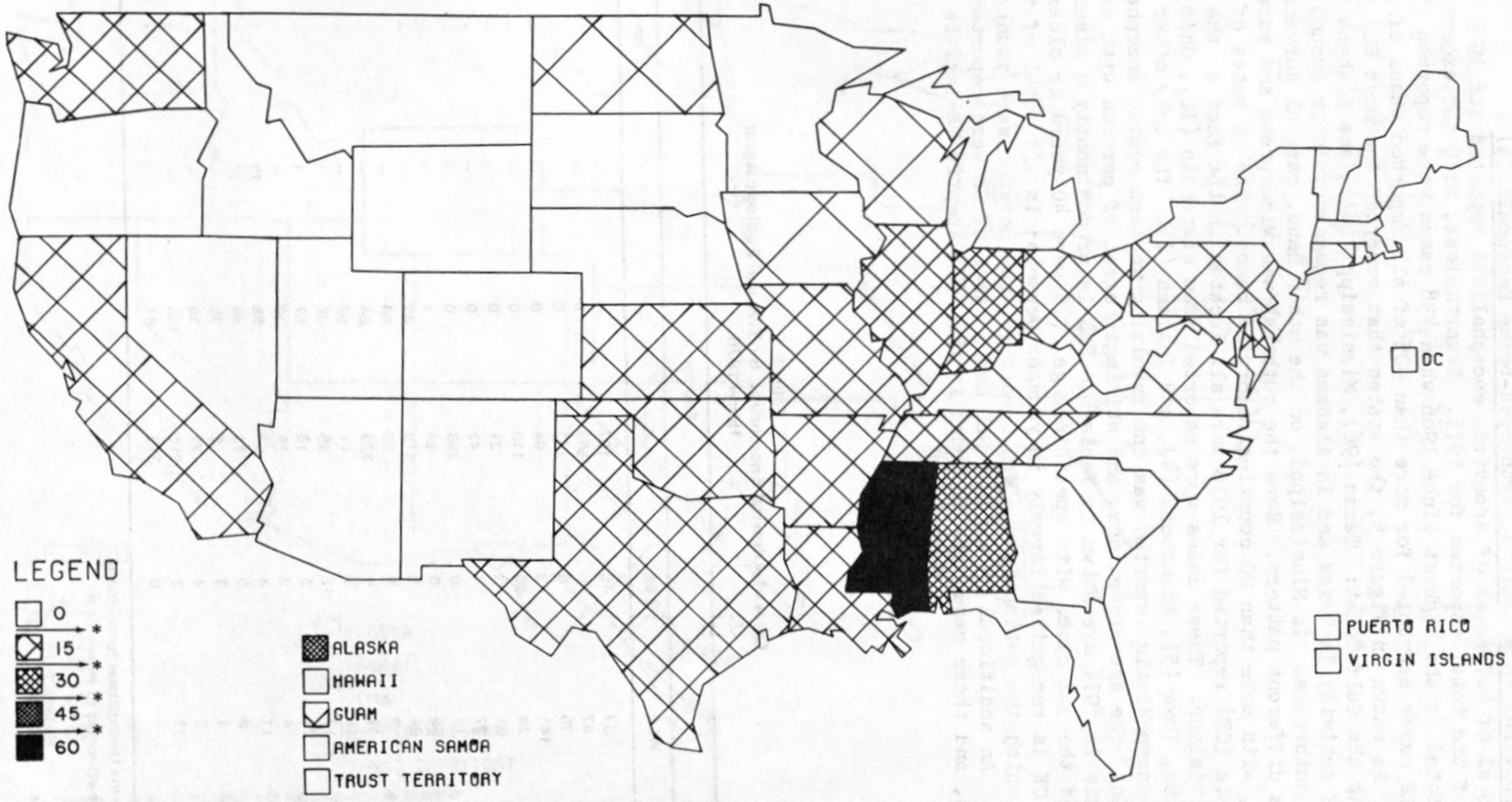
TABLE 3—Continued
REPORTED CASES OF ENCEPHALITIS BY STATE AND ETIOLOGY, 1976

STATE	Associated with Respiratory Infection				Other Known Etiologies					Indeterminate
	Adenovirus	M. pneumo.	RSV	Influenza A	CMV	Herpes simplex	Herpes zoster	Infect Mono.	RMSF	
UNITED STATES	**4**	**1**	**1**	**5**	**2**	**69**	**3**	**4**	**1**	**1,124**
NEW ENGLAND	–	–	–	1	–	2	–	–	–	30
Maine	–	–	–	–	–	–	–	–	–	–
New Hampshire	–	–	–	1	–	–	–	–	–	2
Vermont	–	–	–	–	–	–	–	–	–	–
Massachusetts	–	–	–	–	–	–	–	–	–	13
Rhode Island	–	–	–	–	–	–	–	–	–	2
Connecticut	–	–	–	–	–	2	–	–	–	13
MIDDLE ATLANTIC	–	–	–	–	–	7	1	1	–	127
New York	–	–	–	–	–	3	–	–	–	34
New Jersey	–	–	–	–	–	1	1	–	–	18
Pennsylvania	–	–	–	–	–	3	–	1	–	75
EAST NORTH CENTRAL	–	–	–	1	1	12	–	3	–	264
Ohio	–	–	–	–	–	1	–	–	–	89
Indiana	–	–	–	–	1	10	–	2	–	62
Illinois	–	–	–	–	–	–	–	1	–	101
Michigan	–	–	–	–	–	–	–	–	–	4
Wisconsin	–	–	–	1	–	1	–	–	–	8
WEST NORTH CENTRAL	1	–	1	–	1	1	–	–	–	45
Minnesota	–	–	–	–	–	–	–	–	–	1
Iowa	1	–	–	–	1	–	–	–	–	4
Missouri	–	–	–	–	–	–	–	–	–	30
North Dakota	–	–	–	–	–	–	–	–	–	–
South Dakota	–	–	–	–	–	–	–	–	–	–
Nebraska	–	–	–	–	–	–	–	–	–	3
Kansas	–	–	1	–	–	1	–	–	–	7
SOUTH ATLANTIC	3	–	–	1	–	15	2	–	1	67
Delaware	–	–	–	–	–	2	–	–	–	5
Maryland	–	–	–	–	–	1	–	–	–	20
District of Columbia	–	–	–	–	–	–	1	–	–	1
Virginia	–	–	–	–	–	–	–	–	–	17
West Virginia	–	–	–	–	–	–	–	–	–	1
North Carolina	3	–	–	–	–	1	–	–	–	10
South Carolina	–	–	–	–	–	–	–	–	–	8
Georgia	–	–	–	–	–	2	–	–	1	–
Florida	–	–	–	1	–	9	1	–	–	5
EAST SOUTH CENTRAL	–	–	–	–	–	–	–	–	–	280
Kentucky	–	–	–	–	–	–	–	–	–	11
Tennessee	–	–	–	–	–	–	–	–	–	41
Alabama	–	–	–	–	–	–	–	–	–	30
Mississippi	–	–	–	–	–	–	–	–	–	198
WEST SOUTH CENTRAL	–	–	–	–	–	–	–	–	–	105
Arkansas	–	–	–	–	–	–	–	–	–	15
Louisiana	–	–	–	–	–	–	–	–	–	31
Oklahoma	–	–	–	–	–	–	–	–	–	22
Texas	–	–	–	–	–	–	–	–	–	37
MOUNTAIN	–	–	–	–	–	1	–	–	–	10
Montana	–	–	–	–	–	–	–	–	–	–
Idaho	–	–	–	–	–	–	–	–	–	–
Wyoming	–	–	–	–	–	–	–	–	–	–
Colorado	–	–	–	–	–	1	–	–	–	4
New Mexico	–	–	–	–	–	–	–	–	–	–
Arizona	–	–	–	–	–	–	–	–	–	6
Utah	–	–	–	–	–	–	–	–	–	–
Nevada	–	–	–	–	–	–	–	–	–	–
PACIFIC	–	1	–	2	–	31	–	–	–	191
Washington	–	–	–	–	–	–	–	–	–	31
Oregon	–	–	–	–	–	–	–	–	–	10
California	–	1	–	2	–	31	–	–	–	134
Alaska	–	–	–	–	–	–	–	–	–	15
Hawaii	–	–	–	–	–	–	–	–	–	1
Guam	–	–	–	–	–	–	–	–	–	–
Puerto Rico	–	–	–	–	–	–	–	–	–	5

TABLE 4
REPORTED ENCEPHALITIS DEATHS, BY STATE AND ETIOLOGY, 1976

STATE	Area Total	Arbo-viral	Entero-viral	Associated with Childhood Infections			RSV	Herpes simplex	Herpes zoster	Indeter-minate
				Measles	Mumps	Chicken-pox				
UNITED STATES	**245**	**15**	**1**	**6**	**2**	**6**	**1**	**22**	**1**	**191**
NEW ENGLAND	**7**	–	–	–	–	–	–	**1**	–	**6**
Maine	–	–	–	–	–	–	–	–	–	–
New Hampshire	1	–	–	–	–	–	–	–	–	1
Vermont	–	–	–	–	–	–	–	–	–	–
Massachusetts	3	–	–	–	–	–	–	–	–	3
Rhode Island	2	–	–	–	–	–	–	–	–	2
Connecticut	1	–	–	–	–	–	–	1	–	–
MIDDLE ATLANTIC	**9**	–	–	–	–	–	–	**3**	–	**6**
New York	5	–	–	–	–	–	–	2	–	3
New Jersey	1	–	–	–	–	–	–	–	–	1
Pennsylvania	3	–	–	–	–	–	–	1	–	2
EAST NORTH CENTRAL	**55**	**1**	–	–	–	**2**	–	**3**	–	**49**
Ohio	7	–	–	–	–	–	–	1	–	6
Indiana	23	1	–	–	–	–	–	1	–	21
Illinois	23	–	–	–	–	2	–	–	–	21
Michigan	–	–	–	–	–	–	–	–	–	–
Wisconsin	2	–	–	–	–	–	–	1	–	1
WEST NORTH CENTRAL	**14**	–	**1**	–	–	–	**1**	–	–	**12**
Minnesota	–	–	–	–	–	–	–	–	–	–
Iowa	1	–	1	–	–	–	–	–	–	–
Missouri	8	–	–	–	–	–	–	–	–	8
North Dakota	–	–	–	–	–	–	–	–	–	–
South Dakota	–	–	–	–	–	–	–	–	–	–
Nebraska	–	–	–	–	–	–	–	–	–	–
Kansas	5	–	–	–	–	–	1	–	–	4
SOUTH ATLANTIC	**30**	–	–	**1**	–	**1**	–	**3**	**1**	**24**
Delaware	2	–	–	–	–	–	–	2	–	–
Maryland	8	–	–	–	–	–	–	–	–	8
District of Columbia	1	–	–	–	–	–	–	–	1	–
Virginia	13	–	–	–	–	1	–	–	–	12
West Virginia	–	–	–	–	–	–	–	–	–	–
North Carolina	5	–	–	–	–	–	–	1	–	4
South Carolina	–	–	–	–	–	–	–	–	–	–
Georgia	–	–	–	–	–	–	–	–	–	–
Florida	1	–	–	1	–	–	–	–	–	–
EAST SOUTH CENTRAL	**37**	**11**	–	–	–	–	–	–	–	**26**
Kentucky	–	–	–	–	–	–	–	–	–	–
Tennessee	12	–	–	–	–	–	–	–	–	12
Alabama	6	5	–	–	–	–	–	–	–	1
Mississippi	19	6	–	–	–	–	–	–	–	13
WEST SOUTH CENTRAL	**28**	**3**	–	–	–	**1**	–	–	–	**24**
Arkansas	6	1	–	–	–	–	–	–	–	5
Louisiana	16	1	–	–	–	–	–	–	–	15
Oklahoma	2	–	–	–	–	–	–	–	–	2
Texas	4	1	–	–	–	1	–	–	–	2
MOUNTAIN	**2**	–	–	–	–	–	–	–	–	**2**
Montana	–	–	–	–	–	–	–	–	–	–
Idaho	–	–	–	–	–	–	–	–	–	–
Wyoming	–	–	–	–	–	–	–	–	–	–
Colorado	2	–	–	–	–	–	–	–	–	2
New Mexico	–	–	–	–	–	–	–	–	–	–
Arizona	–	–	–	–	–	–	–	–	–	–
Utah	–	–	–	–	–	–	–	–	–	–
Nevada	–	–	–	–	–	–	–	–	–	–
PACIFIC	**63**	–	–	**5**	**2**	**2**	–	**12**	–	**42**
Washington	7	–	–	–	–	–	–	–	–	7
Oregon	–	–	–	–	–	–	–	–	–	–
California	53	–	–	5	2	2	–	12	–	32
Alaska	3	–	–	–	–	–	–	–	–	3
Hawaii	–	–	–	–	–	–	–	–	–	–
Guam	–	–	–	–	–	–	–	–	–	–
Puerto Rico	–	–	–	–	–	–	–	–	–	–

Fig. 3 CASES OF ENCEPHALITIS PER 1,000,000 POPULATION, UNITED STATES, 1976



* INTERMEDIATE VALUES IN THE DENSITY OF THE CROSSHATCHING REPRESENT RATES THAT FALL BETWEEN THE EXACT ONES LISTED HERE.

A. Arboviral Encephalitis (Arthropod-borne Encephalitis)

The total of 427 cases of arboviral encephalitis reported for 1976 (Figure 4) is only 20% of the total reported for 1975. Nevertheless, with the exception of 1975, the 1976 total is the highest since 1966 when 428 cases were reported (Table 5). The 386 SLE cases accounted for more than 90% of all reported cases of arboviral etiology. As shown in Figure 5, the states that reported the most SLE cases were 3 bordering the Gulf Coast: Texas (96), Mississippi (81), and Alabama (69). Most of the SLE activity in Texas and in Alabama was recognized in or around several localized outbreaks. In Mississippi, on the other hand, careful surveillance revealed a different pattern. Here the outbreak was widespread and rural in character, with more than 20 counties recording cases. The 40 cases of California encephalitis (CE) reported for 1976 were all located in the East or the West North Central divisions. These cases were reported from Wisconsin (12), Ohio (11), Illinois (6), Iowa (5), Minnesota (4), and Indiana (2). The only other case of arboviral encephalitis reported was one involving western equine encephalitis (WEE) in Colorado. The age group, sex, and etiologic agent of persons with arboviral encephalitis in 1976 are shown in Table 6. SLE is predominantly a disease of older persons; of the 362 cases with specified age, 72% were 40 years or older. In contrast, CE is recognized largely in younger persons; in all but 1 of the 45 cases for which the patient's age was specified, the persons were younger than 15 years old. An additional 3 cases of SLE and 3 cases of CE were reported as aseptic meningitis, and these cases are included in the 1976 Aseptic Meningitis Surveillance Report.

Table 5
Cases of Arboviral Encephalitis, By Year and Etiologic Agent
1955–1976

Year	Etiology						Total
	WEE	EEE	SLE	CE	VEE	Pow	
1955	37	15	107	0	–	–	159
1956	47	15	563	0	–	–	625
1957	35	5	147	0	–	–	187
1958	141	2	94	0	–	–	237
1959	14	36	118	0	–	–	168
1960	21	3	21	0	–	–	45
1961	27	1	42	0	–	–	70
1962	17	0	253	0	–	–	270
1963	56	0	19	1	–	–	76
1964	64	5	470	42	–	–	582**
1965	172	8	58	59	–	–	297
1966	47	4	323	64	–	–	438
1967	18	1	11	53	–	–	83
1968	17	12	35	66	1	–	131
1969	21	3	16	67	1	–	108
1970	4	2	15	89	–	–	110
1971	11	4	57	58	19	1	150
1972	8	0	13	46	2*	1	70
1973	4	7	5	75	–	–	91
1974	2	4	72	30	–	–	108
1975	133	3	1,815	160	–	2	2,113
1976	1	0	379	47	–	–	427

*Imported into the United States from Mexico
**Includes 1 case attributed to tensaw virus

Fig. 4 CASES OF ARBOVIRAL ENCEPHALITIS PER 1,000,000 POPULATION, UNITED STATES, 1976

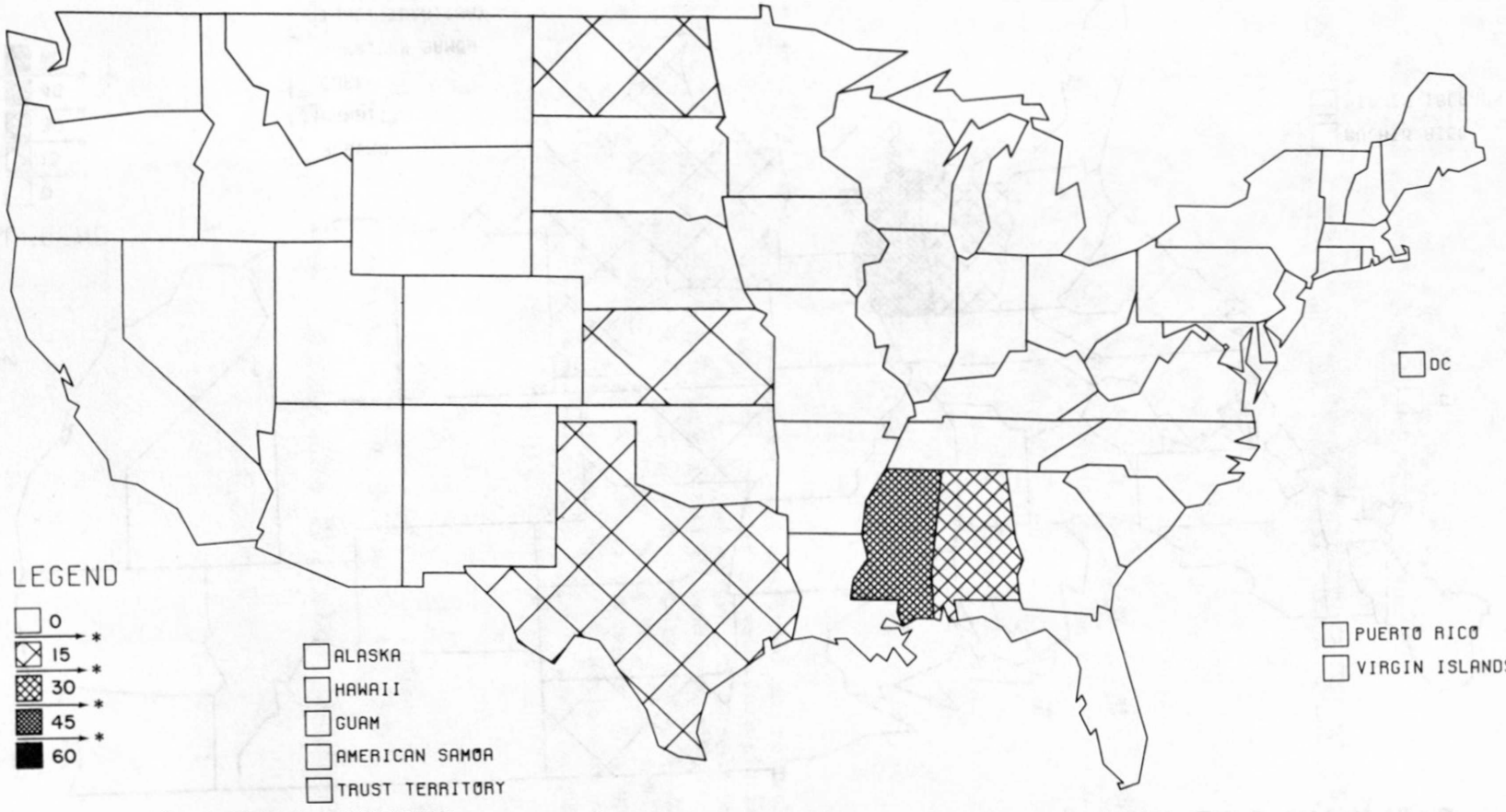
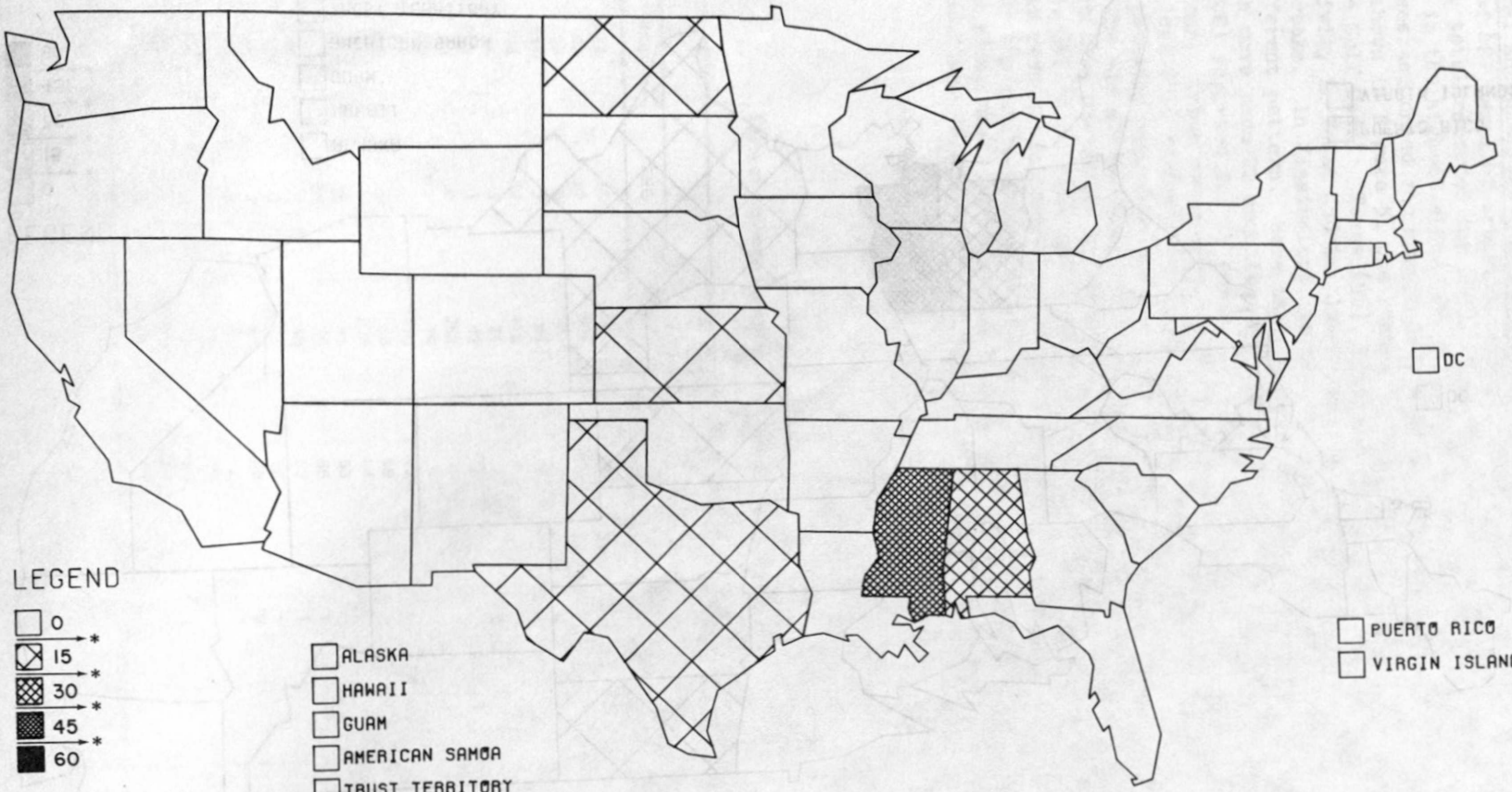


Fig. 5 CASES OF ST. LOUIS ENCEPHALITIS PER 1,000,000 POPULATION, UNITED STATES, 1976



*INTERMEDIATE VALUES IN THE DENSITY OF THE CROSSHATCHING REPRESENT RATES THAT FALL BETWEEN THE EXACT ONES LISTED HERE.

Table 6
Cases of Arboviral Encephalitis,
By Etiologic Agent, Sex, and Age Group, 1976

Agent & Sex	Age Group											
	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+	Unk	Total
WEE													
Male				1									1
Female													0
Total				1									1
SLE													
Male		5	3	8	12	18	10	21	24	31	44	5	181
Female		3	3	6	6	13	12	20	31	36	51	9	190
Unknown			1		2	1		1				3	8
Total		8	7	14	20	32	22	42	55	67	95	17	379
CE													
Male		5	17	6						1		2	31
Female			12	3									15
Unknown		1											1
Total		6	29	9						1		2	47

B. Enteroviral Encephalitis

Only 13 cases of encephalitis were associated with confirmed enteroviral infection, i.e., an enterovirus was isolated from some CNS location or was serologically confirmed by a diagnostic rise in appropriately collected acute- and convalescent-phase paired sera (Table 7). In addition, there were 36 cases associated with an isolated enterovirus from throat or stool specimens without accompanying serologic confirmation. These cases were tabulated as encephalitis of indeterminate etiology. Confirmed enterovirus cases were reported by 6 states and involved echovirus 4, 6, and 9, and coxsackievirus A9, B2, and B3. Too few cases were reported to produce an accurate pattern of cases by sex and age (Table 8). Nevertheless, as in previous years, most cases (12 of 13 in 1976) were in persons less than 40 years old.

Table 7
Cases of Encephalitis Associated with a Confirmed
Enteroviral Infection, by Virus Type and State, 1976

Virus Type	Connecticut	New York	Minnesota	Iowa	Mississippi	Washington	Total
Coxsackie							
A9			2	1	1		4
B2		1					1
B3	1					1	2
Echovirus							
4	3						3
6				1			1
9	1					1	2
Total	5	1	2	2	1	2	13

Table 8
Cases of Enteroviral Encephalitis, By Sex and Age Group, 1976

Sex	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+	Unk	Total
Male	1	2	2		1		1	1					8
Female			1	1	1	2							5
Total	1	2	3	1	2	2	1	1					13

C. Encephalitis Associated with Childhood Infections

The total of 176 cases of encephalitis associated with childhood infections for 1976 was the lowest annual total in the United States records. The secular decline of cases associated with childhood infections has followed the decline in the national incidence of measles, mumps, and rubella infections that began when effective vaccination against these diseases became common throughout the United States (Tables 9 and 10).

There were 71 encephalitis cases associated with mumps infection, accounting for 40% of all the childhood infections-associated cases. Only 2 deaths occurred following the mumps encephalitis cases. There is no vaccine approved to prevent chickenpox infection, and the number of chickenpox-associated encephalitis cases has not declined to the extent that the number of encephalitis cases associated with the other childhood exanthems has declined. Of the 59 cases of encephalitis following chickenpox infection, 6 were fatal. The 44 cases of encephalitis following measles infection presented a marked increase from the much lower totals reported for the previous 4 years. The increase in cases following measles was directly associated with widespread outbreaks of measles in many parts of the United States. There were only 2 cases of encephalitis associated with rubella infection, reflecting the declining number of rubella cases and the continuation of the consistently low rates of encephalitic involvement.

Encephalitis cases caused by childhood infections occurred primarily in the younger age groups (Table 11). Of those cases for which age-specific data are available, most occurred in persons younger than 20 years old: 99% of the cases associated with mumps, 95% of chickenpox cases, and 87% of measles cases. Although mumps-associated encephalitis occurred more than twice as frequently in males as in females, the sex distribution was nearly equal for cases associated with measles and chickenpox.

Table 9
Encephalitis Cases and Deaths Associated with Childhood Infections, By Year and Type of Infection, United States 1963-1976

Year	Measles			Mumps			Chickenpox			Rubella		
	No. of Cases	No. of Deaths	Death/Case Ratio (%)	No. of Cases	No. of Deaths	Death/Case Ratio (%)	No. of Cases	No. of Deaths	Death/Case Ratio (%)	No. of Cases	No. of Deaths	Death/Case Ratio (%)
1963	239	30	12.6	671	6	0.9	84	21	25.0	–	–	–
1964	300	46	15.3	932	18	1.9	106	32	30.2	–	–	–
1965	171	21	12.3	634	4	0.6	112	29	25.9	–	–	–
1966	219	29	13.2	628	10	1.6	106	29	27.4	–	–	–
1967	62	6	9.7	849	8	0.9	77	24	31.2	–	–	–
1968	19	1	5.3	408	2	0.5	69	17	24.6	–	–	–
1969	35	5	14.3	218	5	2.3	48	12	25.0	–	–	–
1970	27	2	7.4	288	5	1.7	46	15	32.6	–	–	–
1971	69	10	14.5	310	5	1.6	54	13	24.1	–	–	–
1972	26	6	23.1	163	0	0	52	18	34.6	–	–	–
1973	37	8	21.6	214	3	1.4	102	14	13.7	–	–	–
1974	14	2	14.3	149	2	1.3	54	10	18.5	–	–	–
1975	17	5	29.4	166	4	2.4	54	12	22.2	–	–	–
1976	44	6	13.6	71	2	2.8	59	6	10.2	2	0	0
Total	1,279	177	13.8	5,701	74	1.3	1,023	252	24.6	2	0	0

Table 10
Cases of Childhood Infections and Number of Cases Associated with Encephalitis, By Year and Type of Infection, United States, 1960-1976

Year	Measles			Mumps			Rubella			Chickenpox		
	No. of Cases	No. of Cases Assoc. with Encephalitis	Rate Per 100,000 Cases	No. of Cases	No. of Cases Assoc. with Encephalitis	Rate Per 100,000 Cases	No. of Cases	No. of Cases Assoc. with Encephalitis	Rate Per 100,000 Cases	No. of Cases	No. of Cases Assoc. with Encephalitis	Rate Per 100,000 Cases
1960	441,703	299	67.7	*	700	–	*	0	–	*	0	–
1961	423,919	276	65.1	*	400	–	*	0	–	*	0	–
1962	481,530	337	70.0	*	385	–	*	0	–	*	0	–
1963	385,156	239	62.1	*	671	–	*	0	–	*	0	–
1964	458,083	300	65.5	*	932	–	*	59	–	*	0	–
1965	261,904	171	65.3	*	634	–	*	7	–	*	0	–
1966	204,136	219	107.3	*	628	–	46,975	10	21.3	*	0	–
1967	67,705	62	98.9	*	849	–	46,888	7	14.9	*	0	–
1968	22,231	19	84.0	152,209	408	268.0	49,371	6	12.2	*	0	–
1969	25,826	35	135.5	90,918	218	239.8	57,686	3	5.2	*	0	–
1970	47,251	27	57.0	104,953	288	274.4	56,552	7	12.4	*	0	–
1971	75,290	69	91.6	124,939	310	248.1	45,086	3	6.7	*	0	–
1972	32,275	26	83.4	74,215	163	219.6	25,507	2	7.8	164,114	52	31.7
1973	26,690	37	138.6	69,612	214	307.4	27,804	1	3.6	182,927	102	55.8
1974	22,094	14	63.4	59,128	149	252.0	11,917	1	8.4	141,495	54	38.2
1975	24,374	17	69.7	59,647	166	278.3	16,652	0	0.0	154,248	54	35.0
1976	41,126	44	107.0	38,492	71	184.5	12,491	2	16.0	183,990	59	32.1

*National reporting of mumps began in 1968, rubella in 1966, and chickenpox in 1972.

Table 11
Encephalitis Cases Associated with Childhood Infections*,
By Etiology, Sex, and Age Group, United States, 1976

Etiology and Sex	Age Group <1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+	Unk	Total
Measles													
Male		3	4	4	2	2						4	19
Female			5	7	2			1				2	17
Unknown			2	2	2	2							8
Total		3	11	13	6	4		1				6	44
Mumps													
Male		9	17	13								1	40
Female		1	10	4		1							16
Unknown			4	6	3							2	15
Total		10	31	23	3	1						3	71
Chickenpox													
Male		7	12	7		1	1					1	29
Female		5	11	3	1								20
Unknown	1	5	1	1	1						1		10
Total	1	17	24	11	2	1	1				1	1	59
Rubella													
Male													0
Female					1								1
Unknown					1								1
Total					2								2

*Measles, Mumps, Chickenpox, Rubella

D. Encephalitis with Other Documented Etiology

The other 79 cases of encephalitis with documented etiology are displayed by age group, sex, and etiologic agent in Table 12. Herpes simplex encephalitis accounted for 87% of these cases and 22 (96%) of the associated 23 fatalities, with a case-fatality ratio of 32%. Herpes simplex cases occurred in persons of all ages, but 10% of the cases with patient's age specified occurred in persons less than 1 year of age, and 17% occurred in persons 70 years or older. The herpes simplex cases were not associated with any recognized outbreaks or particular season. The other cases of encephalitis with a determined etiology involved influenza A (5 cases), adenoviruses (4), infectious mononucleosis (4), herpes zoster (3), cytomegalovirus (2), respiratory syncytial virus (1), Rocky Mountain spotted fever (1), and Mycoplasma pneumoniae (1).

Table 12
Cases of Encephalitis with Other Known Etiology
By Etiologic Agent, Sex, and Age Group, United States, 1976

Etiology	Sex	Age Group <1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+	Unk	Total
Adenovirus	Male													0
	Female	1	1	1				1						4
M. pneumoniae	Male													0
	Female													0
	Unknown									1				1
Respiratory syncytial virus	Male													0
	Female													0
	Unknown										1			1
Influenza A	Male												1	1
	Female							1	1					2
	Unknown			1	1									2
Cytomegalovirus	Male							1					1	2
	Female													0
H. simplex	Male			1		2	3	2	2	1	3		4	18
	Female		1		1	2	2	2	1		3	3	5	20
	Unknown	6	3			3	3	2	5	2		7		31
H. zoster	Male											1		1
	Female											2		2
Infectious mono.	Male					3	1							4
	Female													0
Rocky Mountain spotted fever	Male				1									1
	Female													0

E. Encephalitis of Indeterminate Etiology

The 1,124 cases of indeterminate etiology represent 61% of all encephalitis cases reported for 1976. Cases of unknown etiology have represented the majority of reported cases every year except for 1975, when arboviral cases were in the majority. Cases of indeterminate etiology and associated deaths are shown by age group and sex in Table 13. Cases were almost evenly divided between males and females and no single age group predominated. The fatality rate was higher for persons less than 1 year of age or 40 years of age or older; the highest rate (37%) involved persons older than 69 years. Although cases of indeterminate etiology occurred throughout 1976, the incidence peaked in late summer at about the same time that cases of arboviral and enteroviral etiology peaked.

Table 13
Encephalitis Cases and Deaths with Indeterminate Etiology
By Sex and Age Group, United States, 1976

	Age Group												
	<1	1-4	5-9	10-14	15-19	20-29	30-39	40-49	50-59	60-69	70+	Unk	Total
All Cases													
Male	20	38	67	54	41	52	46	41	37	38	39	20	493
Female	19	37	39	34	26	84	49	26	47	46	54	19	480
Unknown	9	16	14	11	10	30	15	5	14	7	5	15	151
Total	48	91	120	99	77	166	110	72	98	91	98	54	1124
Deaths													
Male	8	5	6	8		3	3	6	7	13	14	1	74
Female	2	4	3	1	2	10	6	8	13	13	18	5	85
Unknown	1	4		2	2	4	3	1	8	3	4		32
Total	11	13	9	11	4	17	12	15	28	29	36	6	191
Death Rate (%)	22.9	14.3	7.5	11.1	5.2	10.2	10.9	20.8	28.6	31.9	36.7	11.1	17.0

STATE EPIDEMIOLOGISTS AND STATE LABORATORY DIRECTORS

The State Epidemiologists are the key to all disease surveillance activities. They are responsible for collecting, interpreting, and transmitting data and epidemiologic information from their individual states. Their contributions to this report are gratefully acknowledged. In addition, valuable contributions are made by State Laboratory Directors; we are indebted to them for their valuable support.

STATE	STATE EPIDEMIOLOGIST	STATE LABORATORY DIRECTOR
Alabama	Frederick S Wolf, MD	James L Holston, Jr, DrPH
Alaska	Thad L Woodard, MD, Acting	Frank P Pauls, DrPH
Arizona	Alexander Kelter, MD	Jon M Counts, DrPH
Arkansas	Paul C White, Jr, MD	Robert T Howell, DrPH
California	James Chin, MD	John M Heslep, PhD
Colorado	Timm A Edell, MD, Acting	C D McGuire, PhD
Connecticut	John N Lewis, MD	John J Redys, BS
Delaware	Ernest S Tierkel, VMD	Mahadeo P Verma, PhD
District of Columbia	Martin E Levy, MD	Alston Shields, DrPH
Florida	R Michael Yeller, MD, Acting	Nathan J Schneider, PhD
Georgia	John E McCroan, PhD	Earl E Long, MS
Hawaii	Ned H Wiebenga, MD	Albert I Oda
Idaho	John A Mather, MD	D W Brock, DrPH
Illinois	Byron J Francis, MD	Hugh-Bert Ehrhard, DrPH
Indiana	Richard D Telle, MD	Josephine Van Fleet, MD
Iowa	Laverne A Wintermeyer, MD	W J Hausler, Jr, PhD
Kansas	Donald E Wilcox, MD	Roger H Carlson, PhD
Kentucky	Calixto Hernandez, MD	B F Brown, MD
Louisiana	Charles T Caraway, DVM	Henry Bradford, PhD
Maine	Stefan H Zineski, MD, Acting	Howard E Lind, PhD
Maryland	David L Sorley, MD, Acting	J Mehsen Joseph, PhD
Massachusetts	Nicholas J Fiumara, MD	George F Grady, MD
Michigan	Norman S Hayner, MD	George R Anderson DVM
Minnesota	Andrew G Dean, MD	C Dwayne Morse, DrPH
Mississippi	Durward L Blakey, MD	R H Andrews, MS
Missouri	H Denny Donnell, Jr, MD	Elmer Spurrier, DrPH
Montana	Martin D Skinner, MD	Michael R Skeels, PhD
Nebraska	Paul A Stoesz, MD	Henry McConnell, DrPH
Nevada	William M Edwards, MD	Paul Fugazzotto, PhD
New Hampshire	Vladas Kaupas, MD	Robert A Miliner, DrPH
New Jersey	Ronald Altman, MD	John J Nelson, MPH
New Mexico	Jonathan A Mann, MD	Aaron Bond, MPH
New York State	Peter Greenwald, MD, Acting	David Axelrod, MD
New York City	John S Marr, MD	Bernard Davidow, PhD
North Carolina	Martin P Hines, DVM	Mildred A Kerbaugh
North Dakota	Kenneth Mosser	C Patton Steele, BS
Ohio	Thomas J Halpin, MD	Charles C Croft, ScD
Oklahoma	Mark A Roberts, MPH, Acting	William R Schmieding, PhD
Oregon	John A Googins, MD	William Murphey, PhD
Pennsylvania	William E Parkin, DVM	Vern Pidcoe, DrPH
Puerto Rico	Henry Negron, MD	Jose L Villamil
Rhode Island	Gerald A Faich, MD	Raymond G Lundgren, PhD
South Carolina	Richard L Parker, DVM	Arthur F DiSalvo, MD
South Dakota	James D Corning, BA	A Richard Melton, DrPH
Tennessee	Robert H Hutcheson, Jr, MD	George Walter
Texas	Charles R Webb, Jr, MD	Charles Sweet, DrPh
Utah	Taira Fukushima, MD	Francis M Urry, PhD
Vermont	Richard L Vogt, MD, Acting	Dymitry Pomer, DVM
Virginia	Grayson B Miller, Jr, MD	Frank W Lambert, PhD
Washington	John W Taylor, MD, MPH	Jack Allard, PhD
West Virginia	William L Cooke, MD	John W Brough, DrPH
Wisconsin	Jeffrey P Davis, MD	S L Inhorn, MD
Wyoming	Herman S Parish, MD	Donald T Lee, DrPH