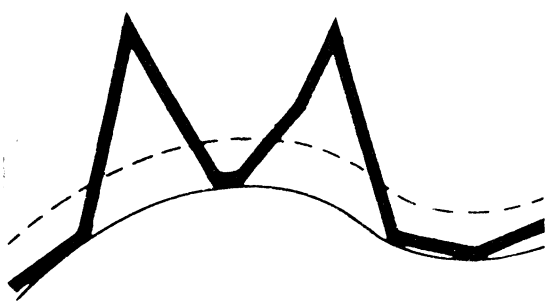
CDC

COMMUNICABLE DISEASE CENTER

REPORT NO. 81
JUNE 7, 1965

INFLUENZA - RESPIRATORY DISEASE SURVEILLANCE

TABLE OF CONTENTS



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. Much of the information is preliminary. It 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. Please address to: Chief, Influenza Surveillance Unit, Communicable Disease Center, Atlanta, Georgia 30333.

Communicable Disease Center	James L. Goddard, M.D., Chief
Epidemiology Branch	Alexander D. Langmuir, M.D., Chief
Statistics Section	Robert E. Serfling, Ph.D., Chief
Surveillance Section	Donald A. Henderson, M.D., Chief
Influenza Surveillance Unit	H. Bruce Dull, M.D., Chief William H. Stuart, M.D.
Respirovirus Unit, Laboratory Branch	Roslyn Q. Robinson, Ph.D., Chief

INTRODUCTION

During the past influenza season, pertinent summaries and epidemiological data were published regularly in the C.D.C. Morbidity and Mortality Weekly Reports. It was felt that the currentness and expanded distribution of information achieved in this manner outweighed the possibly more detailed coverage but retrospective character of standard Influenza Surveillance Summaries. The present report includes: 1) a review of the 1964-65 influenza experience in the United States; 2) an international summary; 3) laboratory discussion; and 4) a collection of pertinent special reports.

Interpretations and analysis in the present report are based on data received from official health and research agencies in States and Cities of the U.S. and material, largely that published by the World Health Organization and its sister organizations, dealing with international influenza surveillance. Where direct quotations or paraphrased reports have been printed, full credits are given; otherwise, data have been assimilated into discussion of broader topics without specific references.

New Name - The reader's attention is directed to an intended expansion of content in future Influenza Surveillance Summaries suggested by the more inclusive title first being published in this issue. As the epidemiology of multitudinous respiratory viruses becomes better documented, there is growing importance in fitting them into meaningful patterns for investigation and control. While these summaries cannot presume a major role in this regard, there will undoubtedly be times and reasons for comparative discussions and specific reports of general interest to our readers.

I. SUMMARY

Summer-Fall - 1964

Discrete outbreaks of confirmed influenza occurred in a few widely separate geographical regions from late summer through the fall:

1. Puerto Rico - a low level, but widespread epidemic of type A2 influenza developed in the late summer. Appearing first in the northern part of the Island, illness spread southward during the succeeding two months. (See Special Reports.)

2. Oregon - scattered cases of serologically confirmed type A influenza appeared from early fall in the heavily populated northwestern part of the State. Generalized spread was not observed, but low level disease persisted for some weeks.

3. Hawaii - awareness of type B influenza was noted on Oahu Island through abruptly increased daily school absenteeism up to 20 per cent which began late in September. The disease spread gradually to other Islands of the Hawaiian group during the next 6-8 weeks with absenteeism data suggesting that the younger age groups were most heavily affected.

4. Maine - a small number of students at the University of Maine developed characteristic influenza in early to mid-October. Serological evidence of type B infection was demonstrated in a number of the cases. No community spread could be documented.

Winter - 1964-65

Although in retrospect increased levels of febrile respiratory illness may have been suspected in some parts of the U.S. late in December 1964, it was not until middle January 1965 that sufficient evidence had been accumulated to suggest its identity as influenza. First observed in the North-east, particularly in Connecticut, Massachusetts, and New Jersey, the soon confirmed type A influenza appeared somewhat unpredictably elsewhere in the East with major skips of some heavily populated areas. From the eastern focus, it spread into the Midwest and South during the succeeding two months.

Once widely publicized by official publications and generally by the press, national awareness of influenza played a major role in support of surveillance activities. Weekly reports on the status of influenza outbreaks were submitted to C.D.C.'s Influenza Surveillance Unit by some 35 Health Departments following a request on February 8 to institute such a reporting scheme. These data and information received from other research, clinical, and university sources allow for a series of generalizations regarding the winter influenza season 1964-65:

1. The presence of influenza was identified clinically and epidemiologically in 37 States (74 per cent) and confirmed by laboratory means in all but one of the 37. Table 1 summarizes the 1964-65 influenza experience in the U.S.

Figure 1 attempts to quantitate the season's experience in those States reporting influenza. In order even to approach the difficult problem of making such judgements, several general catagories of extent were defined:

a. Widespread - influenza recognized by epidemiological or laboratory means in more than 50 per cent of a State's counties or occurring prominently in areas which comprise more than 50 per cent of the State population. No further quantitation of individual county involvement was attempted.

Figure 1

DISTRIBUTION OF REPORTED INFLUENZA AND INFLUENZA-LIKE ILLNESS
UNITED STATES - 1965 (WINTER)

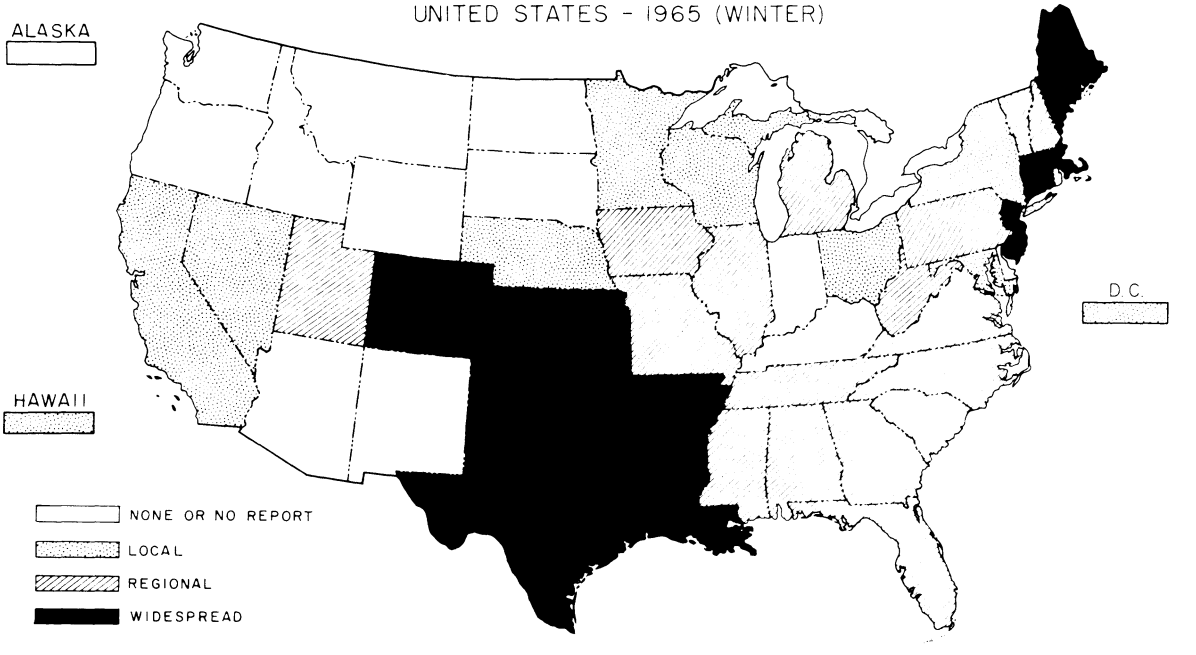


TABLE 1

UNITED STATES INFLUENZA SUMMARY - 1964-65*

DIVISION State	Geographical Distribution			First Recognized	Lab. Confirmation	
	Widespread	Regional	Local		Isolation	Serology
1964 (final half)						
Puerto Rico	X			August	A2	A
Hawaii	X			September	B	B
Maine			X	October	....	B
Oregon		X		"	....	A
1965 (through April)						
New England						
Connecticut	X			December	A2	A
Massachusetts	X			January	....	A
Maine	X			"	A2	A
Vermont		X		"	....	A
New Hampshire		X		"	....	A
Middle Atlantic						
New Jersey	X			January	A2	A
Pennsylvania		X		"	A2	A
New York			X	"	A2	A
East North Central						
Illinois		X		January	A2	A
Ohio			X	"	....	A
Michigan		X		"	A2	A
Wisconsin			X	February	....	A
West North Central						
Kansas	X			January	A2	A
Iowa		X		"	....	A
Missouri		X		"	A2	A
Nebraska			X	"	....	A
Minnesota			X	February	....	A
South Atlantic						
North Carolina		X		January	A2	A
West Virginia		X		"	....	A
Florida		X		February	A2	A
Maryland			X	"	A2,B	A,B
Georgia		X		"	A2	A
Dist. Columbia			X	"	A2	A
Virginia		X		March	....	A
South Carolina		X		"	....	....
East South Central						
Tennessee		X		January	A2	A,B
Mississippi		X		"	....	A,B
Alabama		X		February	....	A,B
West South Central						
Arkansas	X			January	....	A(?)
Louisiana	X			February	A2	A,B
Texas	X			"	....	A
Oklahoma	X			"	A2,B	A,B
Mountain						
Colorado	X			January	A2,B	A,B
Utah		X		February	A2	A
Nevada			X	"	....	A
Pacific						
Hawaii			X	January	....	A(?).B
California			X	February	[illegible]	A,B

*Information from Health Departments, Research Institutions, and University Centers
....Information not available or tests not done

b. Regional - influenza recognized in fewer than 50 per cent of a State's counties but with evidence of discrete outbreaks involving one or a cluster of adjacent counties.

c. Local - influenza recognized in only a limited number of small, well defined population units: institutional, isolated community, educational, or military groups.

It is apparent in Figure 1 that influenza was most widespread in parts of the eastern half of the country, much of the Far West being completely spared. There were noted, however, very prominent "skips" even in the pattern seen in the East. Careful search for influenza in these and other such sections of the U.S. led to minimal or no confirmation. In essentially adjacent areas, cases could easily be found. (See Divisional Notes)

2. Although demonstrated widely in some geographical areas, influenza was not felt to have had a generally substantial effect. Even in the most heavily involved regions, the year was often described as "mild."

3. The lack of uniformity in influenza's spread was repeatedly demonstrated. Within some States, the impact of influenza in producing up to 30-40 per cent school absenteeism and later community-wide illnesses was easily observed. In other regions of the same States, no influenza could be documented.

4. In many communities the initial and often most dramatic indices of influenza were school outbreaks where peak daily absenteeism of 25 or more per cent was common. Numerous communities in many of the more involved States closed selected schools temporarily because of high levels of student and/or teacher absences. Increased industrial absenteeism, however, was infrequently observed, although in many geographical areas substantial numbers of adult cases followed those described in younger age groups.

5. Pneumonia-influenza excess mortality reported to C.D.C. by 122 cooperating U.S. Cities showed minor excursions above the "epidemic threshold" from late January through March (Figure 2). The cities contributing to the later increases were primarily those in areas where influenza was being demonstrated. Few cities showed more than moderate mortality increases individually but together gave evidence of the Division's involvement. An earlier 1965 increase in mortality was felt largely to represent delayed year-end mortality reports. (See Divisional Notes).

6. Strains of type A2 influenza virus were isolated in 19 States and serological confirmation of type A involvement only demonstrated in 16 others. The A2 isolates showed antigenic relationship to each other with general evidence of a continued variation from earlier strains. No major antigenic variant was characterized. Type B influenza viruses were recovered in 4 States and their presence identified by serological tests in 5 others. Figures 3 and 4 show the geographical distribution of laboratory confirmed types A and B influenza in the U.S.

One strain of type B influenza recovered from a discrete outbreak in Colorado has been characterized as a distinctive variant from earlier antigenic strain. No evidence has been collected implicating this strain in illnesses elsewhere. (See Laboratory Section.)

7. The scant epidemiological evidence analyzed to the present time is not adequate for making a definitive evaluation of influenza vaccine effectiveness. The limited information which has been accumulated however, suggests that the vaccine did provide protection. (See Special Reports.)

Figure 2.

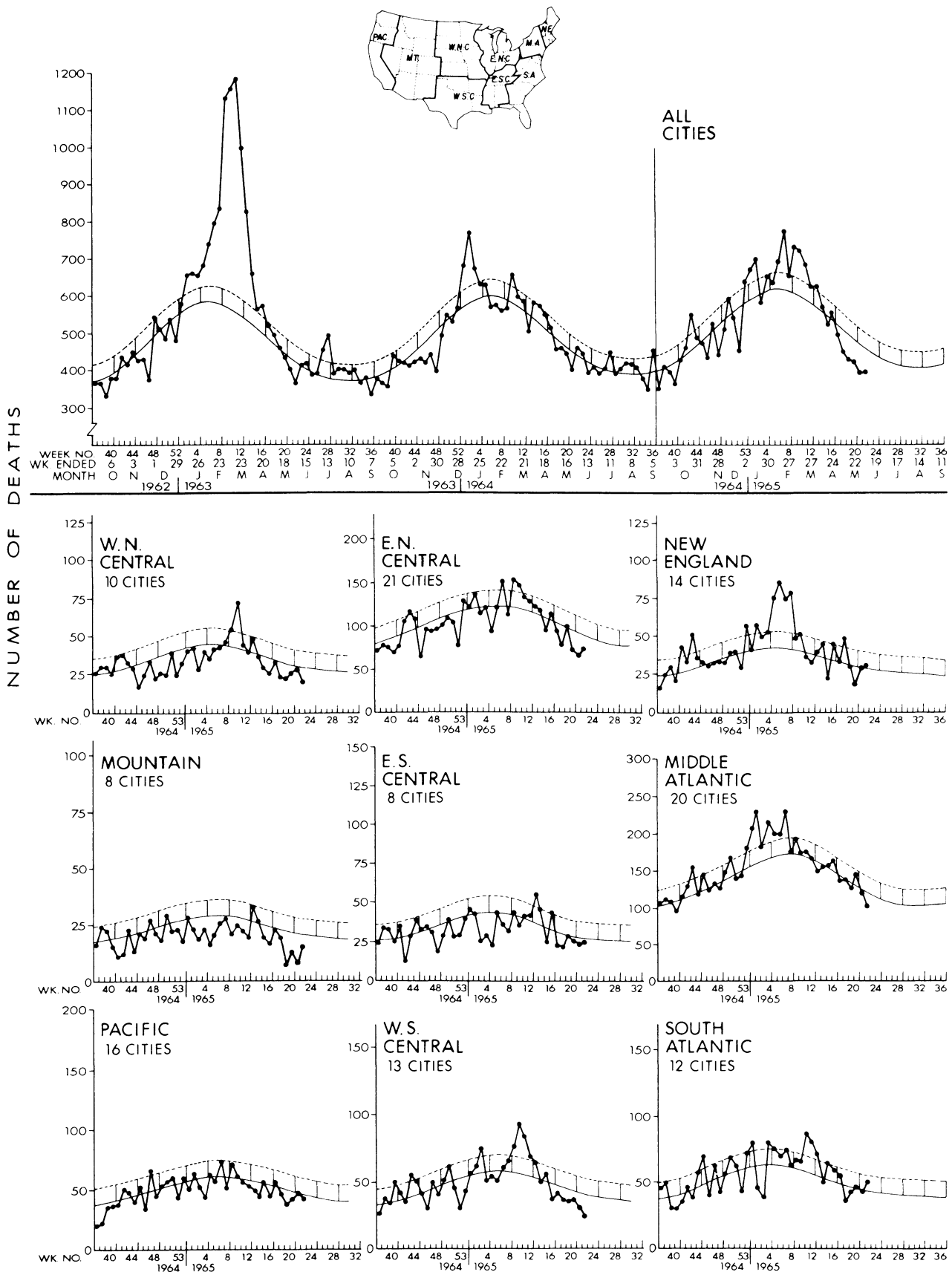

PNEUMONIA-INFLUENZA DEATHS IN 122 UNITED STATES CITIES
NUMBER OF DEATHS
PAC
MT
W.N.C
E.N.C
W.S.C
E.S.C
S.A
M.A
N.E
ALL CITIES
WEEK NO
WK. ENDED
MONTH
1962
1963
1964
1965
W. N. CENTRAL 10 CITIES
E.N. CENTRAL 21 CITIES
NEW ENGLAND 14 CITIES
MOUNTAIN 8 CITIES
E.S. CENTRAL 8 CITIES
MIDDLE ATLANTIC 20 CITIES
PACIFIC 16 CITIES
W.S. CENTRAL 13 CITIES
SOUTH ATLANTIC 12 CITIES
WK. NO.

Figure 3.

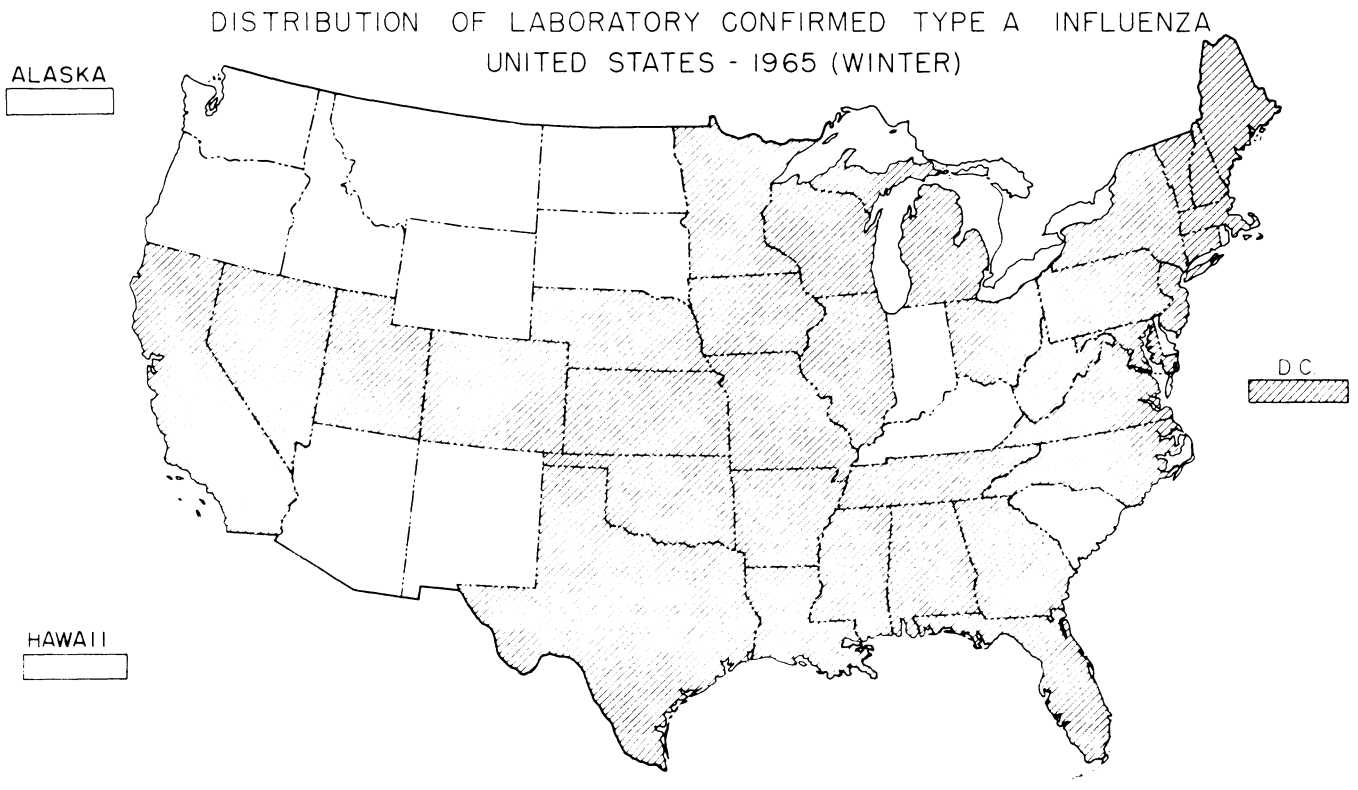
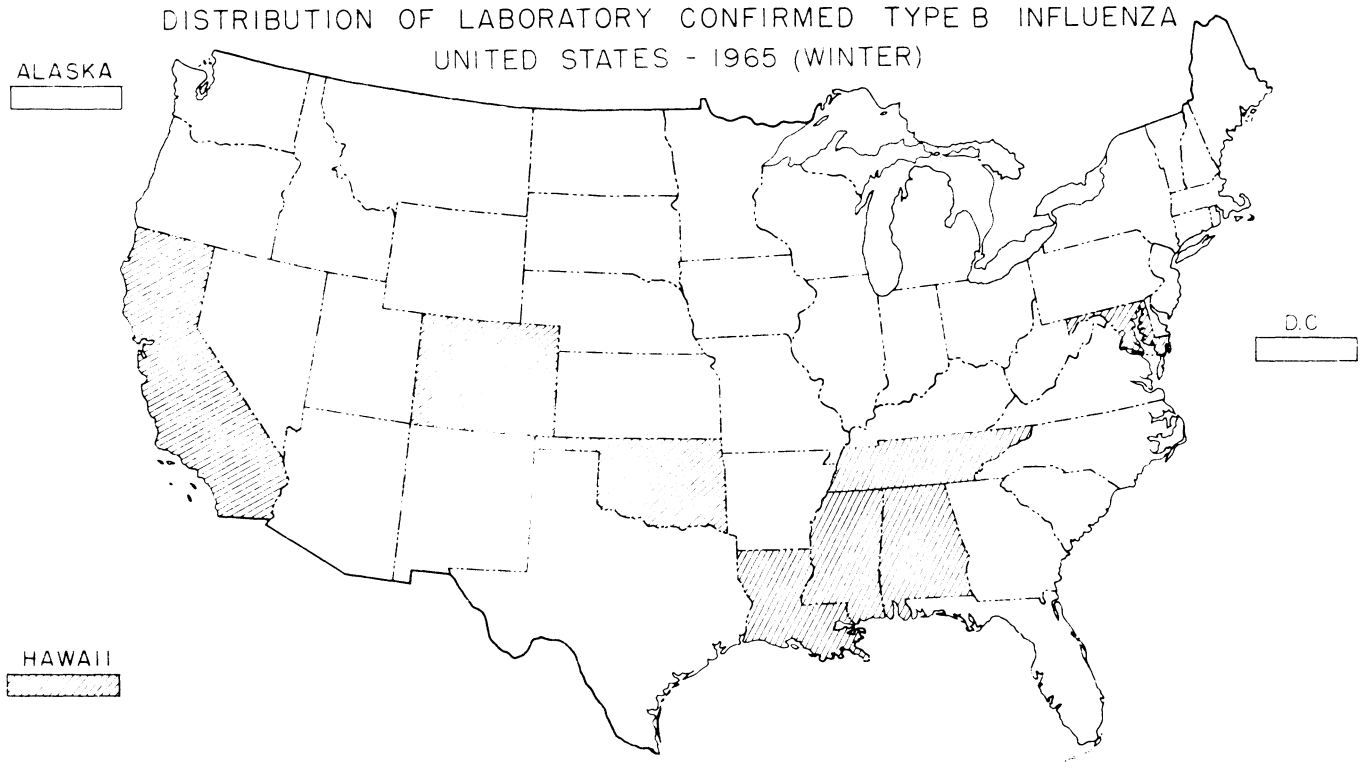
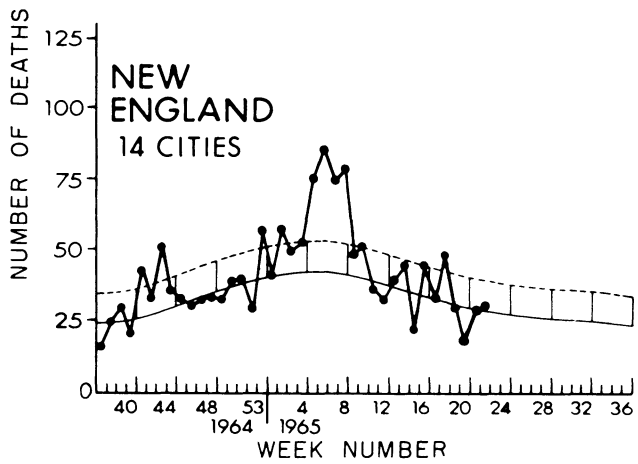


Figure 4.





New England

The New England Division (Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Rhode Island) generally experienced widespread but low-level influenza and moderate excess in pneumonia-influenza mortality.

In retrospect, the outbreaks appear to have begun first in Connecticut during December 1964 with subsequent spread there affecting most areas of the State. Laboratory confirmation of type A infections was repeatedly demonstrated.

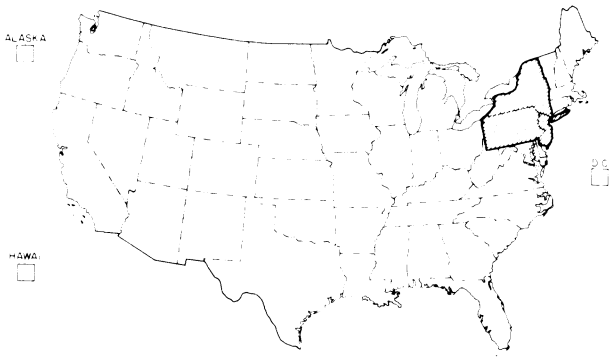
Massachusetts recognized the occurrence of influenza in early January when abruptly increased absenteeism led to temporary school closings in communities west of Boston. Although eventually widespread the outbreak was not felt to have been of major intensity. Type A infections were readily confirmed by serological means.

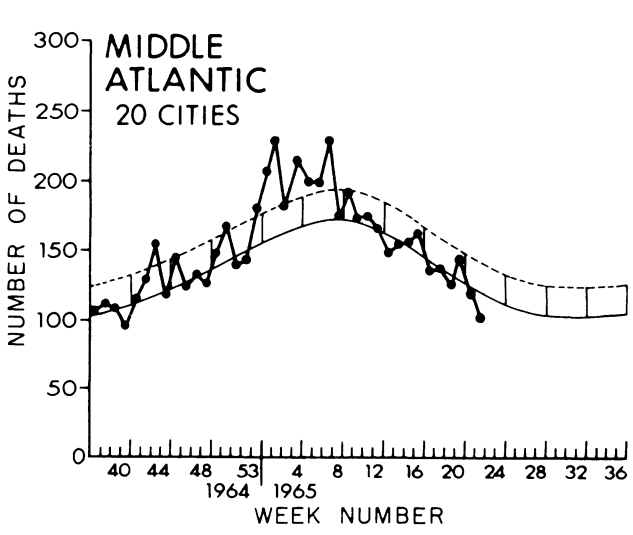
In Vermont, influenza-like illness occurred from mid-January through most of the following month. Serological confirmations of type A infections were obtained in Addison, Windsor, and Windham Counties where increased school absenteeism was observed. Only scattered influenza-like illnesses were observed in other parts of the State.

At approximately the same time, cases of influenza, later confirmed serologically as type A, were reported from several areas in southern New Hampshire. Keene, Manchester, and Concord appeared to be the most involved regions in the State; although no major elevation in school absenteeism or substantial involvement of the adult population were described.

Influenza was first recognized in Maine when dramatic increases in school absenteeism up to 50 per cent occurred in early January in Aroostok County. In February and as part of the appearance of influenza elsewhere in the State, the University of Maine experienced an outbreak of type A influenza which affected approximately 10 per cent of students. It is of particular interest to recall that this same university had experienced a limited outbreak of type B influenza four months before.

In spite of careful surveillance and an active search for influenza in Rhode Island, its notable absence there is one of the intriguing but unexplained features of 1965 influenza experience.





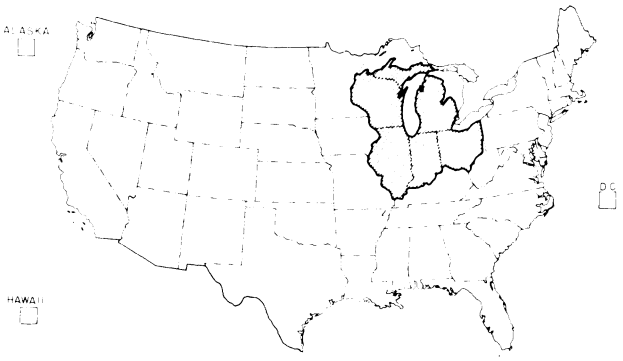
Middle Atlantic

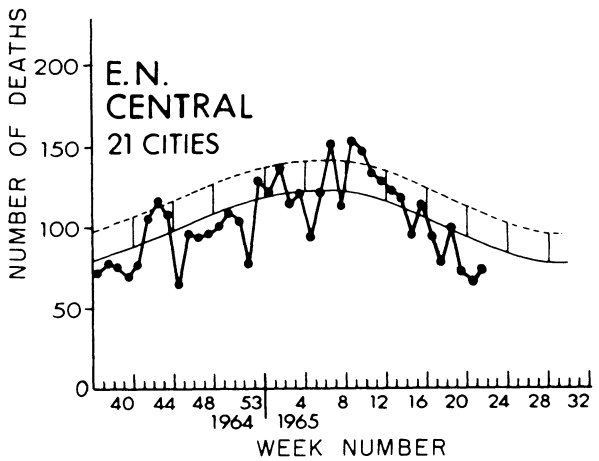
Influenza in the Middle Atlantic Division (New Jersey, New York, Pennsylvania) was recognized in early January. Slightly elevated pneumonia-influenza mortality in the Division developed in January and February, largely the result of New Jersey's experience and the more regional outbreaks in Pennsylvania.

New Jersey reported a moderately widespread epidemic. Virus isolations and serological confirmation of type A influenza were reported from virtually every major region of the State. Physician surveys on two occasions in January confirmed the scattered occurrence of acute febrile respiratory disease. It was, however, characteristic to observe that in spite of geographically widespread illness, uniform involvement of the entire population in any given area did not occur. Deaths due to influenza and pneumonia during the major epidemic period from the beginning of January to mid-February increased by some 50 per cent compared to a similar period in 1964. The epidemic appeared to focus in the central part of the State - Somerset, Middlesex, and Monmouth Counties.

The Allegheny County, Pennsylvania outbreak observed in mid-January first appeared to involve primarily younger age groups. Daily school absenteeism in several affected parts of the County was 20 per cent or more. The observed illnesses were uniformly mild although clinically characteristic of influenza. Type A2 virus isolations and serological confirmation of type A infection were obtained repeatedly by local health authorities in typical cases. Adult populations were not involved initially, but several school-family surveys demonstrated fairly uniform involvement of the entire population. Although scattered influenza-like illnesses were reported in other parts of Pennsylvania, influenza was not confirmed elsewhere.

Type A2 virus isolations made in Albany and Columbia Counties, New York in mid-January were not associated with recognized outbreaks. Influenza-like illness observed in Erie County (Buffalo) about the same time lacked laboratory confirmation. The illness there was described as showing rather uniform involvement of the population. Routine serological sampling carried out by New York State and New York City Health Departments failed to demonstrate evidence of influenza corroborating the epidemiological impressions of both groups.





East North Central

Generally, a very limited amount of influenza was observed in States comprising the East North Central Division (Illinois, Michigan, Wisconsin, Indiana, and Ohio). Excess pneumonia-influenza mortality was barely above the epidemic threshold for several weeks during late February and March with only Detroit recognized as contributing significantly.

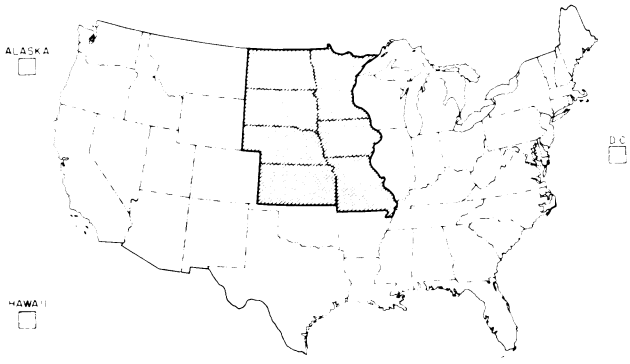
In Illinois type A2 influenza viruses were isolated from clinic patients and several students at the University of Chicago and at Northwestern University. The isolations were associated with sporadic cases and no outbreaks were recognized. Elsewhere in the State, minor amounts of influenza-like illness were described during the months of February and March.

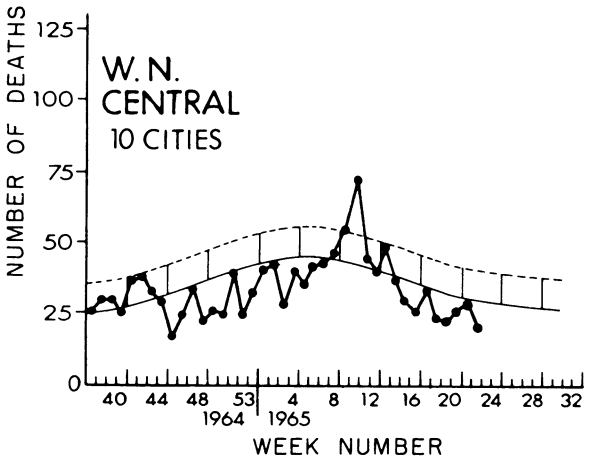
In Michigan, although epidemic influenza did not occur, regional outbreaks were seen in Ann Arbor, Grand Rapids, Lansing, and Detroit. Type A2 influenza viruses were demonstrated in specimens from students at the University of Michigan. Although influenza was not confirmed in the Detroit area, a general increase of influenza-like illnesses was observed there during late January and February; and as noted, mortality excess was noted thereafter.

Serological confirmations of type A influenza were made in Ohio from late January to early March. In no instance were these reports described as being associated with widespread or even local outbreaks. State-wide reports of influenza remained within expected limits during the season. In mid-February an outbreak of influenza-like illness caused somewhat elevated absenteeism in the Toledo area but there was no laboratory documentation of the outbreak's etiology.

In keeping with the general character of influenza in the East North Central Division, Wisconsin reported only a localized, mild outbreak of confirmed type A infection in the Milwaukee area beginning in late February. The Milwaukee Health Department first became aware of the presence of influenza through a routine survey of upper respiratory illnesses carried out among families of Health Department employees. Subsequently, other cases in the community were confirmed, although the illness did not spread extensively and primarily involved the younger age groups.

Indiana did not demonstrate the presence of influenza during the 1965 season according to State reports.





West North Central

Of States in the West North Central Division (Kansas, Iowa, Missouri, Minnesota, Nebraska, North Dakota, and South Dakota), only Missouri and Kansas reported substantial amounts of influenza. Pneumonia-influenza mortality was noted to be above the "epidemic threshold" for only two weeks in early March.

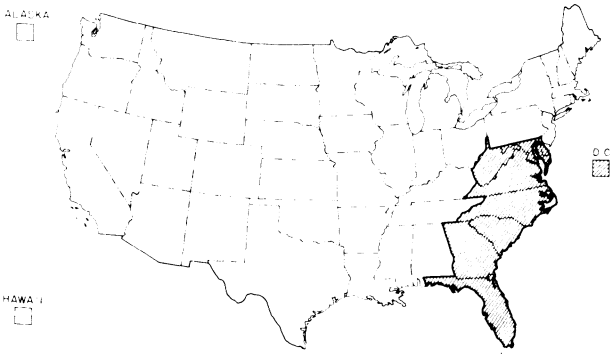
Influenza in Missouri was first documented in Princeton, Mercer County, when in late January school absenteeism increased rapidly to over 25 per cent, causing closure. (See Special Reports.) The illness caused by type A2 viruses first involved younger age groups and then spread to the adult population. Subsequent to this initial outbreak, many other areas of the State reported similar illnesses. Although Missouri's influenza was relatively widespread it was not generally considered to have been of major intensity.

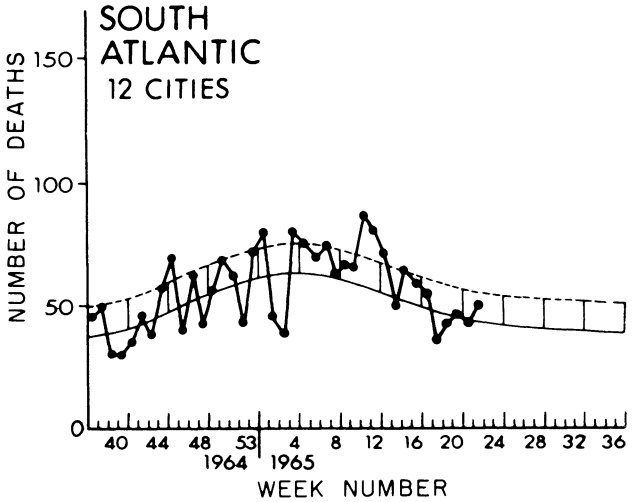
Kansas reported widespread but low level influenza-like illnesses through the winter. Type A infection was confirmed serologically from Lyons and Clyde Counties.

Serologically confirmed type A influenza was recognized during early January in Jefferson County, Iowa. The illness occurred primarily in the City of Fairfield where many students attending the local college returned from Christmas Holiday vacations at their homes in the East. Although the Iowa outbreak appeared to begin with the college students, it soon involved the community as well. Other evidence of influenza was observed in Wayne and Decatur Counties, located directly across the state line from Mercer County, Missouri.

Minnesota did not experience outbreaks of influenza during the 1965 season but was aware of scattered influenza-like illnesses. Type A infection was documented serologically in several isolated cases.

In Omaha, Nebraska, increased febrile respiratory disease was noted in school children beginning in late January. Absenteeism of some 10 per cent, approximately twice that normally experienced, was seen in some areas. Multiple etiologies for the illnesses were demonstrated - type A2 influenza, parainfluenza, and streptococcal disease. Survey of physicians in the Omaha area documented only sporadic occurrence of similar illnesses; a single type A2 strain was obtained from an adult. There was no evidence of disease elsewhere in Nebraska.





South Atlantic

Slightly excess pneumonia-influenza mortality occurred in the South Atlantic Division (Maryland, Washington, D. C., West Virginia, Virginia, North Carolina, South Carolina, Georgia, Florida) during three weeks from mid-March. Influenza of epidemic proportions was not, however, observed in any of the States.

From sporadic cases of respiratory disease in Washington, D. C., several strains of type A2 influenza virus were isolated in late February. Involvement of the general population was not observed.

Recovery of strains of types A2 and B influenza virus was made from cases in Maryland during the winter. No associated outbreaks were reported.

Scattered influenza-like illness was noted in Virginia from early March. Serological confirmation of type A influenza was obtained from industrial workers in Augusta County.

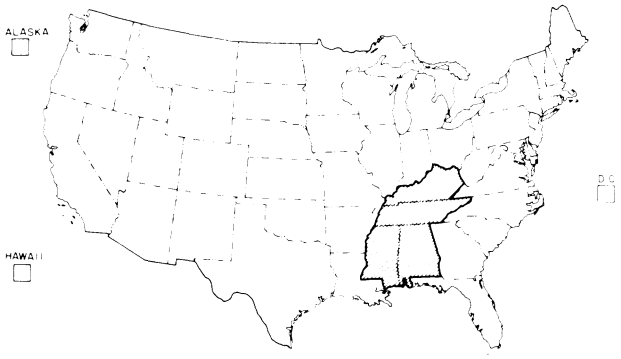
Reported influenza-like illnesses in West Virginia increased in January, and continued at an elevated level into April. Serological evidence of type A influenza was obtained from Marian, Kanawha, and Mercer Counties where the disease was reportedly most prevalent. Surveillance of school absenteeism did not suggest widespread impact of the disease.

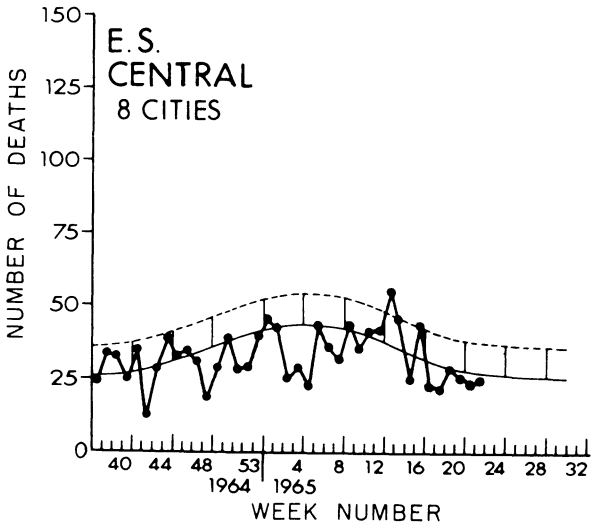
In North Carolina, influenza was first recognized in rural Graham County during mid-January. (See Special Reports.) Strains of type A2 virus were isolated from cases there (an area reported to have been heavily involved during the Type A epidemic in 1962-63). A general increase in the amount of respiratory illness was recognized in many parts of the State. Much of it, however, was not entirely typical of influenza

Influenza-like illness, minor in extent, was noted in South Carolina during March. There was no report of laboratory confirmation.

Influenza confirmed by isolation of strains of type A2 virus was observed in the Atlanta, Georgia Metropolitan area during late February and March. Moderately increased school absenteeism was reported. Although similar illnesses were observed in other parts of the State, they were of limited extent and were not confirmed by laboratory tests.

Influenza A2 was recognized in Florida by laboratory study of limited numbers of cases, but clearly defined outbreaks were not observed.





East South Central

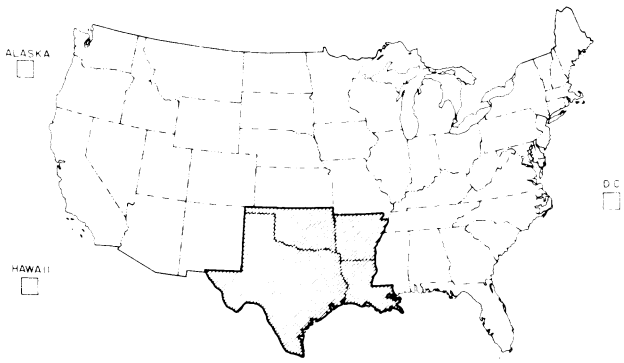
The occurrence of influenza within the East South Central Division (Kentucky, Tennessee, Mississippi, and Alabama) varied considerably in character and extent but was generally low level. Reported influenza and pneumonia mortality was elevated above the "epidemic threshold" for only a single week, therefore questionably related to the impact of influenza.

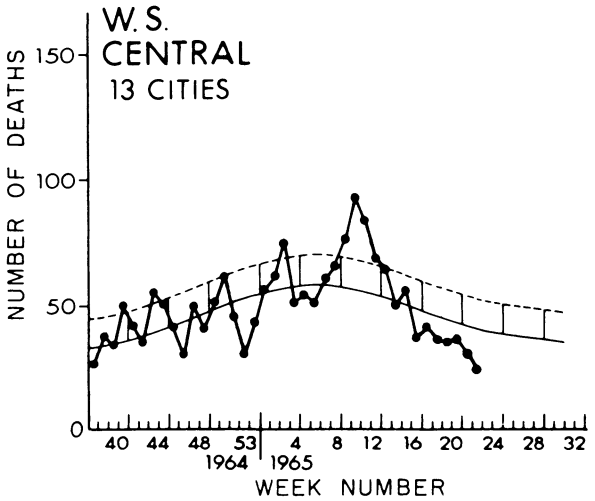
Although in retrospect the amount of febrile respiratory disease appears to have increased in Mississippi during late December, the first clear evidence of influenza activity was not observed until late January with the sudden occurrence of influenza-like illness in Rankin County. The first evidence of the outbreak was elevated school absenteeism in the range of 15 to 20 per cent. The illness spread rapidly from the younger age groups to the adult population. Subsequently, scattered spread of influenza involved other parts of the State where similar outbreaks developed. By mid-March reporting of influenza-like illness had returned to normal. Type A influenza infection was confirmed serologically in several areas in Mississippi.

Rural Lake County, situated in the northwest corner of the State, was Tennessee's first area to develop influenza. (See Special Reports) The epidemic there began during the week ending January 30 and reached its peak some two weeks later. Similar to the experience in Graham County, North Carolina, Lake County had also been involved with influenza during the 1962-63 epidemic. In 1965 the elementary school children were the first and most prominently involved. The illness soon spread to the adult population. Subsequent to the Graham County experience, spread was observed to neighboring counties and during the remainder of February and March, other regional outbreaks of influenza occurred in Tennessee. Strains of type A2 influenza virus were recovered from Lake County and serological confirmations of type A infection made widely.

Alabama reported scattered outbreaks of influenza-like illness in February, its most widespread involvement being Mobile County. Type A influenza was confirmed serologically in Clark County where elevated school absenteeism and recognition of major involvement of the younger age groups were observed. Type B infection was demonstrated serologically in a presumably isolated case occurring in February.

Kentucky did not report outbreaks of influenza during the 1965 season.





West South Central

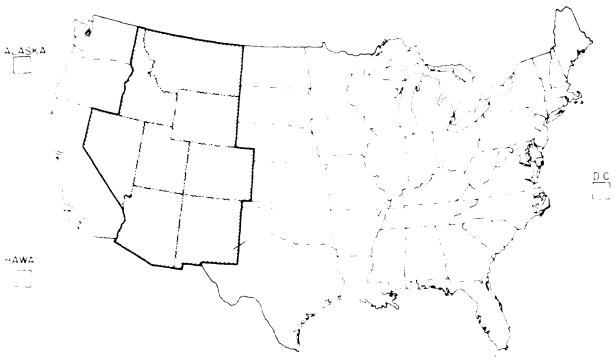
The occurrence of influenza was characterized by widespread but low-level involvement in all four states of the Division (Arkansas, Louisiana, Texas, Oklahoma). It did not uniformly involve all populations in given geographic areas, and excess influenza and pneumonia mortality increased only modestly above expected levels from the 9th through the 12th week of 1965.

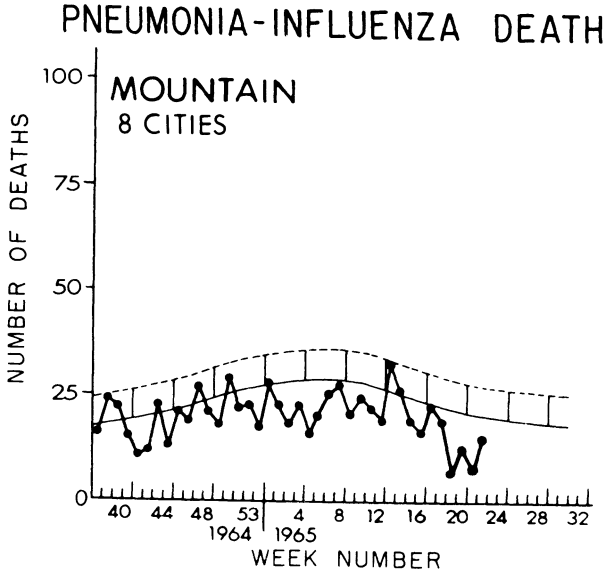
In Oklahoma, influenza began in mid-February with the major involvement being observed in Oklahoma City, Norman, and to a lesser degree in Tulsa. Scattered outbreaks were reported to have occurred throughout the entire State with isolation of type A2 strains and confirmation of additional type A infections. One type B influenza virus was isolated from Kaye County but was not associated with a discrete outbreak.

Influenza in Texas was described generally as widespread but low level and scattered. Although reports of individual county involvement increased greatly in number during February and early March, clearly epidemic proportions were never felt to have been reached. Influenza virus isolations were not reported from Texas, but many serologic confirmations of influenza infection were obtained: approximately 90 per cent type A and 10 per cent type B.

Arkansas experienced a moderately brisk outbreak of influenza-like illness beginning in late January and continuing into March. Involvement of the State was uniform with associated increases in school absenteeism, hospital admissions, and diagnoses of pneumonia. The illnesses were described as being characteristic of influenza. A presumptive serological confirmation of type A influenza was reported.

An exception to the rather low intensity involvement in the three other States of this Division was the Louisiana experience where the widespread epidemic of 1965 was considered to be as severe as that which occurred in 1962-63. The northern counties were much more heavily involved than those in the southern part of the State. Many schools were closed when large numbers of students and teachers were affected simultaneously. Strains of type A2 influenza virus were isolated from cases in the New Orleans area.





Mountain States

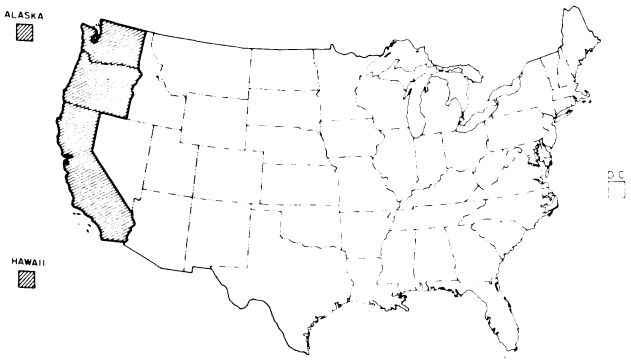
Of the eight Mountain States (Montana, Idaho, Nevada, Utah, Colorado, Wyoming, Arizona and New Mexico), only three (Colorado, Utah, and Nevada) had recognizable influenza during the 1965 season. There was no accompanying increase in pneumonia-influenza mortality.

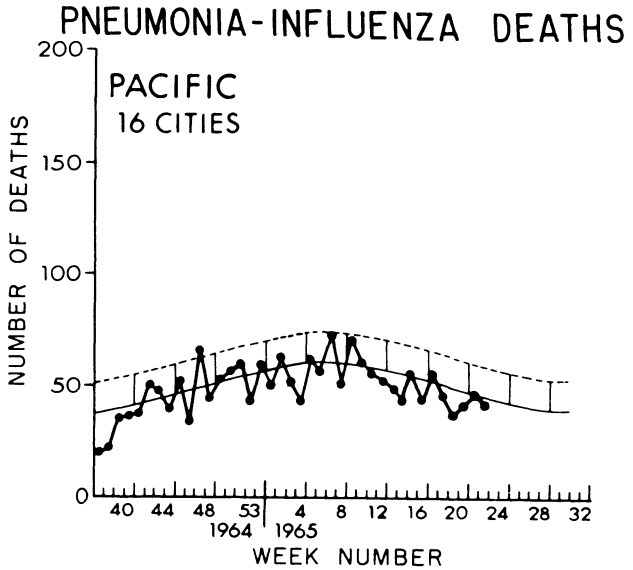
Influenza was recognized first in Colorado during the last week in January and continued into March. Review of influenza in Colorado demonstrated the presence of influenza-like illnesses in many counties based on a surveillance system of individual county reports. Investigation of an outbreak of influenza in a Jefferson County Junior High School suggested the simultaneous presence of influenza types A and B and para-influenza type 3 in the population at risk. (See Special Reports.) The precise degree of involvement of each of these agents could not be determined. A family questionnaire survey demonstrated fairly uniform attack rates in the general population with highest rates in the 10-24 year age group.

Type A2 influenza virus strains were isolated from several county-wide outbreaks in Utah during March. It is of interest that the major areas of involvement in Utah - Uintah, Graham, and San Juan Counties - have geographical continuity with regions in Colorado showing influenza-like disease.

One case of serologically confirmed Type A influenza was reported from Nevada during the 1965 season but there was no reported evidence of associated outbreaks.

The Mountain States, with the exception of Colorado and a limited area in Utah were free of epidemic influenza during the 1965 season.





Pacific

In the Pacific Division (California, Oregon, Washington, Alaska, and Hawaii), only isolated experiences with influenza were recognized coincident with that occurring elsewhere in the U.S. Excess pneumonia-influenza mortality was not evident at any time during the 1964-65 season.

A few sporadic cases of respiratory illness in California studied serologically in February showed evidence of type A or type B influenza infection but none represented part of a recognized outbreak. Strains of type B virus were recovered from a cluster of cases occurring in a hospital for retarded children in the southern part of the State in April. Laboratory characterization of the strains is underway. Although not attributable to a California focus, a mid-March outbreak of type A influenza aboard the Golden Bear, merchant marine training ship returning to the State from the Orient, involved 55 per cent of the crew. Details are given in Special Reports.

In view of the fall 1964 experience with type B influenza virus in Hawaii, it is of particular interest to note a mid-January outbreak of serologically confirmed type B influenza in a high school on Kauai Island (an island of the Hawaiian group west of Oahu where the fall outbreak was most pronounced). Absentee data from the school of some 900 students showed the span of the outbreak to be January 11 through January 28 with a peak absenteeism of 17 per cent on January 18 and 19. No information on spread into the community is reported. Later in January a small amount of influenza-like illness was observed on Lanai Island but laboratory confirmation of its etiology is not available.

III. INTERNATIONAL SUMMARY

Influenza was recognized in Europe at about the same time early in 1965 that it was reported in the United States. In subsequent weeks the general epidemiological patterns which developed were remarkably similar in the two areas. The major points of comparison can be summarized as follows:

1. Outbreaks were first observed in early to mid-January with additional regions reporting influenza during the succeeding two months. Most of the apparent disease had diminished markedly by late March, and in April no entirely new foci were recognized.

2. Initial outbreaks were commonly observed in schools, military establishments or other confined populations. Children were usually affected earlier than adults.

3. Spread through the general population was variable, even within limited geographical regions; and uniform spread was an almost unusual occurrence. In many countries there were only scattered, sporadic outbreaks without clearly discernable relationships to each other.

4. Clinical illnesses were generally classified as mild.

5. Virus isolations and serological identifications showed type A influenza to be most generally prominent, although type B outbreaks were also demonstrated in 6 of the 14 European countries (43%) reporting laboratory confirmed influenza. No country observed only type B infections, and often both type A & B appeared in some geographical contiguity. Recent isolates being characterized by the W.H.O. Influenza Centers generally show continued variation from earlier strains and are discussed in more detail in the Laboratory Section.

Elsewhere in the world, only a few additional countries have identified influenza outbreaks. Clearly the most prominent occurrences outside the United States in the winter of 1965 were those observed in Europe.

Table 2 based on published data through April 1965 is a chronological summary of international influenza from the beginning of the year and amplifies the previously drawn comparisons between the experience in the U.S. and Europe. The Table's estimates of geograpical distribution of influenza are necessarily interpretations based on available information and cannot be expected to be comprehensive in all cases. Data utilized in Table 2 and in the following brief summaries from individual countries have been obtained from the 1965 issues of Weekly Epidemiological Records (W.H.O., Geneva), Weekly Epidemiological Report (P.A.S.B., Washington, D.C.), and the Epidemiological Bulletin (Ottawa, Canada).

EUROPE

U.S.S.R. - Influenza in Leningrad and Moscow developed early in January, reached its peak later in the month and had begun to decline in early February. The extent of the Leningrad experience was comparable to that in 1957, and Moscow's outbreak was also considered to have been extensive. Children and adults were affected, the children first. No official comment on the protective value of the Russian live-virus influenza vaccines has been received although it is reported that some four million individuals had been vaccinated in anticipation of an outbreak.

Elsewhere in the U.S.S.R. during January, influenza was recognized in most of the northern Russian cities, Kiev, the Ukraine, and Novosibirsk in Siberia. In February it spread south into the Caucasus, into Central Asian U.S.S.R., and appeared

TABLE 2

INTERNATIONAL INFLUENZA SUMMARY - 1965 (WINTER)*

Country	Geographical Distribution			First Recognized	Lab. Confirmation	
	Widespread	Regional	Local		Isolation	Serology
Europe						
U.S.S.R.	X			January	A2	A
East Germany			X	"	A2	A
France	X			"	A2, B	A, B
Romania			X	"	....	A
Sweden	X			February	A2	A, B
Finland		X		"	A2, B	A, B
Norway	X			"	....	A
Poland		X		"	(?)	A
Hungary			X	"	A2	A
Netherlands			X	"	A2, B	A, B
Austria			X	"	....	....
Denmark		X		"	....	A, B, C
United Kingdom			X	"	A2, B	A, B
Switzerland	X			"	A2	A
Fed. Rep. of Germany			X	March	....	A
Bulgaria			X	"	....	A
Other Areas						
Japan			X	January	A2	A
Canada			X	February	A2	A
Venezuela			X	March	....	A
Brazil			X	April	A2	A

* Information from "Epidemiological Notes" appearing in 1965 Weekly Epidemiological Records (W.H.O., Geneva); Morbidity and Mortality Weekly Reports (C.D.C., Atlanta); Epidemiological Bulletins (Ottawa, Canada); and Weekly Epidemiological Reports (P.A.S.B., Washington, D.C.)

.... Information not available

in a few limited outbreaks along the Trans-Siberian Railroad. By early March most of the reported epidemics had essentially ceased.

Numerous strains of type A2 influenza virus were isolated in Leningrad, Moscow, and other parts of the U.S.S.R.

East Germany - Scattered outbreaks were recognized from early January, primarily in the North near the Baltic Coast. They reportedly diminished during the next four weeks after which no additional reports were published. Type A2 influenza virus was isolated.

France - In late January, Paris and other regions in East, West, and Central France reported serologically confirmed types A influenza. Type B was demonstrated in the northeastern part of the country at about the same time.

While no large outbreaks were recorded, mild influenza became widespread in February and March often involving confined populations in schools, nursing homes, and hospitals. Infections shown to be caused by both types A and B were often demonstrated in the same geographical areas. The number of outbreaks had declined by early April.

Isolation of types A2 and B influenza virus were made in several distinct parts of France.

Romania - Scattered, focal outbreaks of type A influenza, often recognized in closed populations, developed from late January. School children were primarily affected in a limited number of small outbreaks, one reported in the community of Moldavia, 24 February - 10 March.

Serological confirmation of type A infection and possibly type A2 virus isolation are recorded.

Netherlands - Sporadic cases of influenza among the military were recognized in early February and continued through most of March. Infections due both to types A and B virus were repeatedly reported from military establishments.

Midway in the Netherlands' experience, type A2 virus was recovered from a case on board a Swedish ship docked in Rotterdam. No additional details are available to link this occurrence with either the Swedish or Netherlands' outbreak.

Minor spread to the civilian population was apparent by early March. A moderate outbreak occurred in the town of Den Helder in the North from which strains of type A2 virus were isolated.

Of interest is the isolation of type B influenza virus from a fatal case of pneumonia occurring in the Netherlands.

Sweden - Beginning in early February, cases of influenza were reported from military units in Stockholm and from a boarding school in North Sweden. During the following few weeks, clinical influenza was observed to be spreading along the northern coast - Norrbotten, Västerbotten, and Västernorrland. It had by then also appeared in some of the southern districts. In certain army units, 10 per cent of the men reported influenza-like illnesses. Generally the clinical disease was mild.

By late March numerous serological confirmations of type A influenza and isolation of an A2 strain had been recorded. The major focus of disease was then observed in southern regions as North Sweden's outbreaks diminished. Weekly case reports increased in numbers from January's seasonal levels to some 13,000 in the week ended March 21 and declined thereafter.

Of interest is Sweden's summary of serological identification regarding the etiology of respiratory illnesses during the outbreaks. Type A influenza was documented in approximately 300 cases, type B in some instances, and adenovirus infection in others.

Norway - Beginning in early February, serologically confirmed type A influenza was reported in South Norway where a moderate number of cases of mild clinical disease were observed during the next weeks. Primary foci included Trondheim, Bergen and various smaller towns along the West Coast. In Oslo, influenza was not recognized until March when it appeared in moderate amount. No official reports have been published since middle March.

Finland - Military units in South and East Finland with a 10 - 20 per cent attack rate of influenza were investigated during the first week in February. Serological identification of type A infection was promptly made. and within several weeks the disease was recognized in the civilian populations. In Helsinki, school and industrial absenteeism increased substantially in middle February as influenza appeared there.

In succeeding weeks the outbreaks spread northward, and those in South Finland declined. It is estimated that by late April when evidence of the epidemic had nearly disappeared, some 25 per cent of the Helsinki population had been affected as had nearly 35 per cent of personnel in military units.

Numerous strains of type A2 influenza virus were recovered as was one strain of type B. Serological evidence of type A infection were widespread, although late in the epidemic, various parts of Finland reported type B confirmations. Adenovirus type 3 was also held accountable for some of the illnesses observed during the outbreak.

Hungary - Outbreaks of influenza-like disease in Southern Hungary were reported in middle February. No additional data have been published.

Poland - Sporadic cases of clinical influenza, primarily seen among school children, were reported from the Warsaw area early in February. During subsequent weeks, cases appeared among the adult population there and in the Province of Gdansk. Sporadic cases occurred in the Province of Koszalin and Szczecin. Peak numbers of cases were reported early in March from Warsaw and Gdansk where serological evidence of type A infections was demonstrated.

Denmark - A small outbreak of type B influenza occurred in a Jutland military establishment in middle February. Copenhagen reported cases confirmed serologically as type A influenza later in the month and also noted small numbers of type C and adenovirus infections. The illness spread variably outside Copenhagen, and modest numbers of cases developed elsewhere. The Jutland focus of type B influenza did not appear to spread outside the military unit.

By middle April, influenza had generally declined. Of interest in summary were serological evidence of a majority of type A influenza illnesses, some type B and C, adenovirus infections, and a large number of febrile respiratory diseases occurring in the outbreaks which could not be diagnosed as any of these entities.

United Kingdom - Sporadic cases of influenza, many in school populations, observed from late February in the southern half of England yielded some six strains of type B virus. At approximately the same time, type A2 strains were recovered in boy's boarding schools in Cambridge where some 20- 40 per cent of students were involved in the outbreaks.

In March, localized occurrences of influenza were observed in the Southeastern Region of England and in the greater London area. Additional strains of type A2 virus were isolated. No general spread of the disease was described.

Switzerland - From late February moderate amounts of influenza-like disease were reported widely in Switzerland. Official records show a seasonal maximum of more than 4600 reported cases during the week ended 27 March and evidence of clinical cases in all but two of the Swiss Cantons. Isolation of type A2 virus in Basel and serological confirmation of type A infections in Bern, Neuchâtel, and Geneva gives additional evidence of widespread activity.

Bulgaria - Minor outbreaks of influenza classified as being due to type A2 were reported in March from Kazanlik, Stara Zagora Department and from Isperihova, Pazardzhik Department. No additional details have been received.

Federal Republic of Germany - Early in March a few minor outbreaks of serologically confirmed type A influenza occurred in the Hannover area. A small outbreak in lower Saxony shortly thereafter involved some 30 soldiers in 2 military units, again shown to be Type A infection. Evidence of spread to Hamburg and the north-eastern part of the Republic developed by middle March. One month later occurrence of influenza-like disease had returned to normal levels.

Austria - Influenza-like illnesses were reported in moderate numbers in late February but no laboratory confirmation or epidemiological follow-up has been published.

ASIA

Japan - Sporadic outbreaks of influenza were reported in January from the Tokyo region where isolation of a type A2 strain was made. Additional details are not available.

SOUTH AMERICA

Venezuela - In the last half of March serologically confirmed type A influenza was reported from Caracas but no comment on extent is as yet recorded.

Brazil - A report from the State of Guanabara in early April described cases of clinical influenza from which strains of type A2 were recovered. Other details of the outbreak are not yet known.

NORTH AMERICA

Canada - In middle February two foci of influenza-like disease were reported from Nova Scotia - North Sydney, Cape Breton Island and the Windsor area - where some hundreds of cases developed in subsequent weeks. Later in February, Chester, N. S. reported similar clinical illnesses, many noted to be complicated by secondary bacterial infection. Type A2 influenza virus was isolated.

In late February influenza-like disease was recognized in St. John's, Newfoundland and in the areas of Avondale, Corner Brook, and Brookfield. Substantial increases in school and industrial absenteeism were associated with the St. John's outbreal/

At the same time in the Province of Quebec many regional schools were closed because of epidemics of influenza-like illness. Type A influenza was confirmed in laboratory studies of sera collected in Quebec and in the Province of Ontario. Isolation of type A2 virus was made from cases in the Ottawa area.

A high incidence of influenza-like illnesses was observed in Winnipeg, Manitoba in the late winter. Of interest is the description of an outbreak of respiratory disease attributed to respiratory syncytial virus occurring in the same geographical region.

IV. LABORATORY REPORT

Roslyn Q. Robinson, Ph.D.
Chief, Respirovirus Unit and
International Influenza Center
for the Americas
Virology Section, Laboratory Branch

Type A and type B influenza viruses have been isolated in the United States and abroad during the past influenza season and have been of considerable interest from the laboratory viewpoint because of their antigenic variation from earlier strains, and because of difficulties encountered in their isolation and use in serologic procedures.

Type A viruses: All type A viruses isolated during the past several months have been clearly of the A2 sub-type. In general, isolations have been made with considerable difficulty both in embryonated eggs and in rhesus monkey kidney tissue cultures. At this Center both isolation systems have been employed simultaneously, and rhesus monkey kidney tissue cultures have been somewhat superior to embryonated eggs in terms of numbers of viruses recovered. However, in most instances, viruses which were recovered in embryonated eggs were not recovered in tissue culture, and viruses isolated in tissue culture were not isolated in eggs. Therefore, no sound conclusion can be drawn regarding the relative efficacy of the two systems.

In both isolation procedures, viruses which have been recovered have had hemagglutinin titers of 1:2 - 1:8 with few exceptions, even after repeated passage. Viruses isolated in monkey kidney tissue culture, and subsequently transferred in embryonated eggs, have shown the same low hemagglutinin titers. After the eighth to tenth passage in eggs, titers have been increased to 1:32 - 1:64, although this has not been a uniform observation for all viruses isolated. Reduction in egg incubation temperature, increased incubation time, dilution of inocula, and sonic oscillation of inocula have been ineffective in increasing infectivity titers. However, sonic oscillation of harvested egg fluid or monkey kidney tissue cultures has increased hemagglutinin titers approximately four-fold. Because of these problems, detailed antigenic characterization of strains has been difficult. However, isolates have been readily identified as type A viruses by complement fixation tests, even though hemagglutin titers have been as low as 1:2.

Antigenic comparison of selected strains, with A2 viruses isolated in earlier years, is presented in Table 1. While all recently isolated viruses have not been uniform in their reactivity with available antisera, it is quite clear that there is a continuing antigenic shift away from the prototype virus isolated in 1957. Of particular interest is the relatively good reactivity of most viruses isolated in 1965, with antiserum prepared with the A2/Taiwan/1/64 virus. Notable exceptions are the A2/Moscow/1019/65 and A2/New Jersey/3/65 viruses, although it is not clear at this time whether these strains are antigenically more different or whether they react poorly with antibody. The A2/Taiwan/1/64 virus has been selected for inclusion in vaccines to be used during the 1965-66 influenza season.

Type B viruses: Type B influenza viruses recovered in 1964 and 1965 have been different among themselves as well as different from viruses isolated in earlier years. No problems have been encountered in the propagation of these viruses in either embryonated eggs or in rhesus monkey kidney tissue cultures. However, strains isolated in Singapore, New Guinea and Colorado have been extremely sensitive to nonspecific inhibitors in sera which could not be removed by the usual procedures using heat, trypsin and potassium periodate, either singly or in combination. This property has never been reported for type B influenza viruses isolated since 1940. In this laboratory RDE was found to reduce, but not completely destroy inhibitors to which the newer viruses were sensitive. In another laboratory (Dr. F. M. Davenport and Miss Elva Minuse at the University of Michigan), RDE was found satisfactory when used in greater concentration than routinely employed.

TABLE 1

Comparison of A2 Influenza Viruses by Hemagglutination-Inhibition Test

	Antisera				
Antigens	A2/Japan/305/57	A2/Japan/170/62	A2/Nederlands/65/63	A2/Puerto Rico/1/64	A2/Taiwan/1/64
A2/Japan/305/57	160	160	80	80	20
A2/Japan/170/62	80	320	320	80	20
A2/Nederlands/65/63	160	320	320	160	80
A2/Puerto Rico/1/64	40	160	320	160	40
A2/Taiwan/1/64	40	80	160	160	160
A2/Moscow/1019/65	80	160	80	40	20
A2/Leningrad/29/65	160	320	640	640	320
A2/Connecticut/1/65	40	160	320	160	80
A2/Albany/1/65	40	160	160	160	80
A2/Pittsburg/1/65	80	80	320	80	80
A2/New Jersey/4/65	20	80	160	80	80
A2/New Jersey/3/65	<10	80	80	80	10

Treatment of sera with carbon dioxide (World Health Organization Technical Report Series, 170: 40, 1959) has been found to be completely satisfactory for removal of inhibitors and did not reduce specific antibody titers measurable with nonsensitive strains. In this technique 0.1 ml of serum is heated at 56° C for 30 minutes. This is followed by addition of 0.8 ml of distilled water, mixing, and adding a small pellet of dry ice. This forms a precipitate which is centrifuged out and 0.1 ml of 8.5 per cent NaCL is added. This is a 1:10 dilution from which subsequent dilutions are made for performance of the standard hemagglutination inhibition test.

Results of hemagglutination inhibition tests using CO_2 treatment of antisera are contained in Table 2. Of the antigens used, the B/Singapore/3/64, B/New Guinea/1/65 and B/Colorado/2/65 viruses were sensitive to inhibitors in sera removable only with CO_2. However, CO_2 treatment was satisfactory for removal of inhibitors to which the B/Lee/40, B/Great Lakes/1739/54 and B/Maryland/1/59 viruses are sensitive, and which are normally removed by heat or trypsin treatment.

TABLE 2

Comparison of Type B Influenza Viruses by Hemagglutination-Inhibition Test

	Antisera					
Antigens	B/Lee/40	B/GL/1739/54	B/Maryland/1/59	B/Singapore/3/64	B/New Guinea/1/65	B/Colorado/2/65
B/Lee/40	320	40	20	20	10	40
B/Great Lakes/1739/54	10	80	10	10	10	10
B/Maryland/1/59	10	20	80	80	80	40
B/Singapore/3/64	20	20	320	640	640	80
B/New Guinea/1/65	10	80	40	80	160	40
B/Colorado/2/65	<10	20	20	80	80	640

While the 1964-65 viruses all share the property of extreme sensitivity to inhibitors, they are not antigenically identical to each other. It is clear that the virus isolated in New Guinea is more nearly like the B/Maryland/1/59 virus. Because of the extreme antibody avidity of the B/Singapore/3/65 virus, its position in the antigen spectrum of type B viruses is not clear. The B/Colorado/2/65 virus is antigenically distinct from viruses isolated earlier. Although not shown in this table, B/Colorado/2/65 is not similar to the B/Taiwan/2/62 virus. This latter virus was also shown to be antigenically distinct from all other type B strains. (See CDC Influenza Surveillance Report No. 75, March 8, 1963). Thus far, there has been no evidence of spread of either the B/Taiwan/2/62 or B/Colorado/2/65 viruses from their geographic areas of isolation. However, serologic evidence of type B virus infections in the U. S. during the past influenza season was recorded but isolation attempts either were unsuccessful or antigenic characterization of isolates is incomplete.

V. SPECIAL REPORTS

1. Epidemic Investigations

Puerto Rico

During mid-August, 1964 cases of influenza-like illness were reported in various areas of Puerto Rico, the majority of cases noted in the San Juan area.

During the following two months, epidemiological and laboratory investigations were carried out jointly by the Puerto Rico Department of Health and the Communicable Disease Center. Strains of type A2 influenza virus were isolated from throat washings obtained from clinical cases. Significant antibody titer rises to type A influenza were found in the sera of those cases as well as others studied. The following report summarizes the various parts of the investigations:

Pneumonia and Influenza Deaths

The number of deaths from pneumonia and influenza for 1962, 1963 and 1964 are presented in Figure 1. Through August, 1964, the trend for 1964 was similar to the proceding two years; however, in September and October, the number of deaths due to pneumonia and influenza increased sharply. In Figure 2, deaths attributed to pneumonia are shown for all age groups and for persons over 65 years of age. An increase is noted in September and October among persons over age 65 and a decline thereafter.

Clinic Visits and School Absenteeism

Although there was an increase in deaths attributed to pneumonia and influenza during September and October, no corresponding increases were apparent in outpatient clinic visits or school absenteeism.

Visits to the military outpatient clinics in metropolitan San Juan are shown in Table 1. The proportion of outpatients seen with acute respiratory disease increased in August, September and October but did not exceed that during January and February.

TABLE 1

Military Outpatient Visits
San Juan, Puerto Rico - 1964

Month	Total Visits	Acute Respiratory Involvement	Per cent with Acute Respiratory Involvement
January	6749	430	6.4
February	7069	543	7.7
March	7489	439	5.9
April	6780	303	4.5
May	6088	216	3.5
June	6914	396	5.7
July	8091	477	5.9
August	8542	611	7.2
September	6209	404	6.5
October	6979	518	7.4

In Ponce, the second largest city on the Island, daily visits to the outpatient clinic at the Tricoche Hospital there were recorded from mid-April through early December. No significant upward trend in the average number of clinic visits occurred during the autumn months.

School absenteeism in the municipality of Ponce was reported on the same day each week from September 8 through December 8. The proportion of students absent on these days is presented in Table 2. There is no indication of any one week when influenza affected the children in this study group.

FIGURE 1.

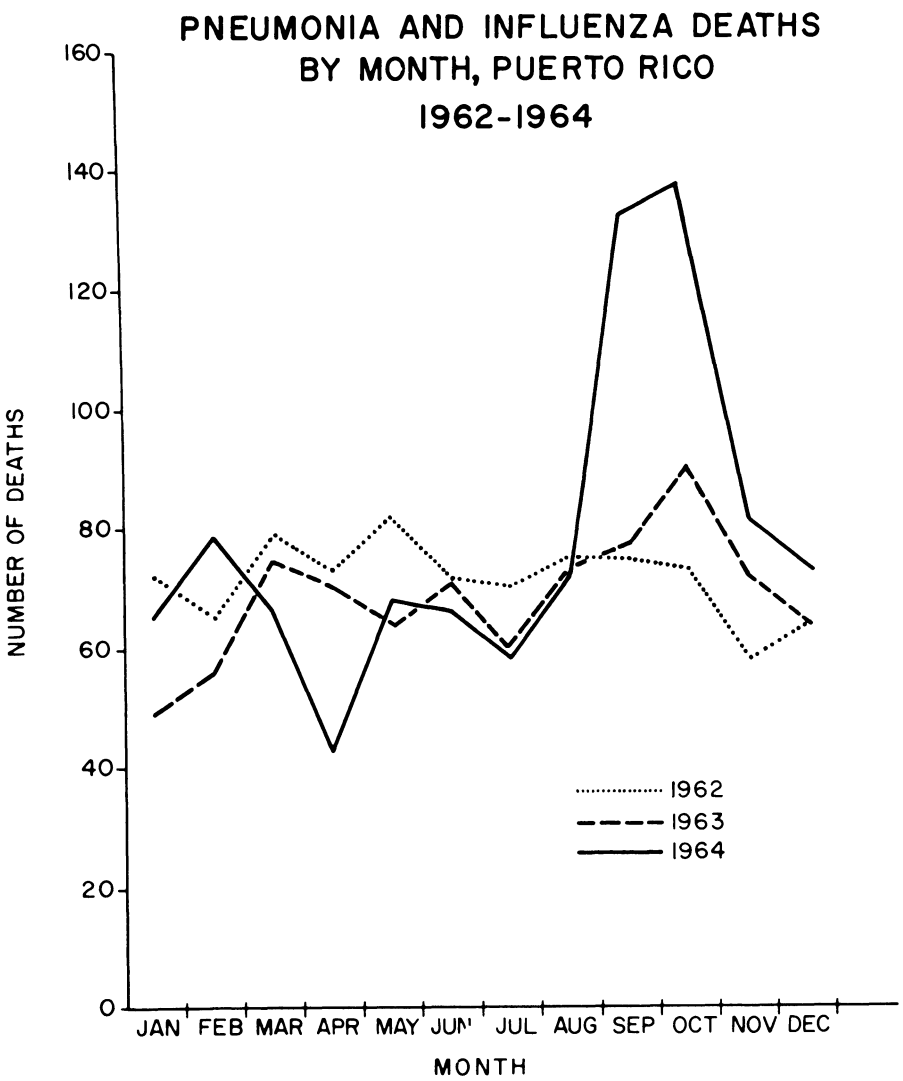
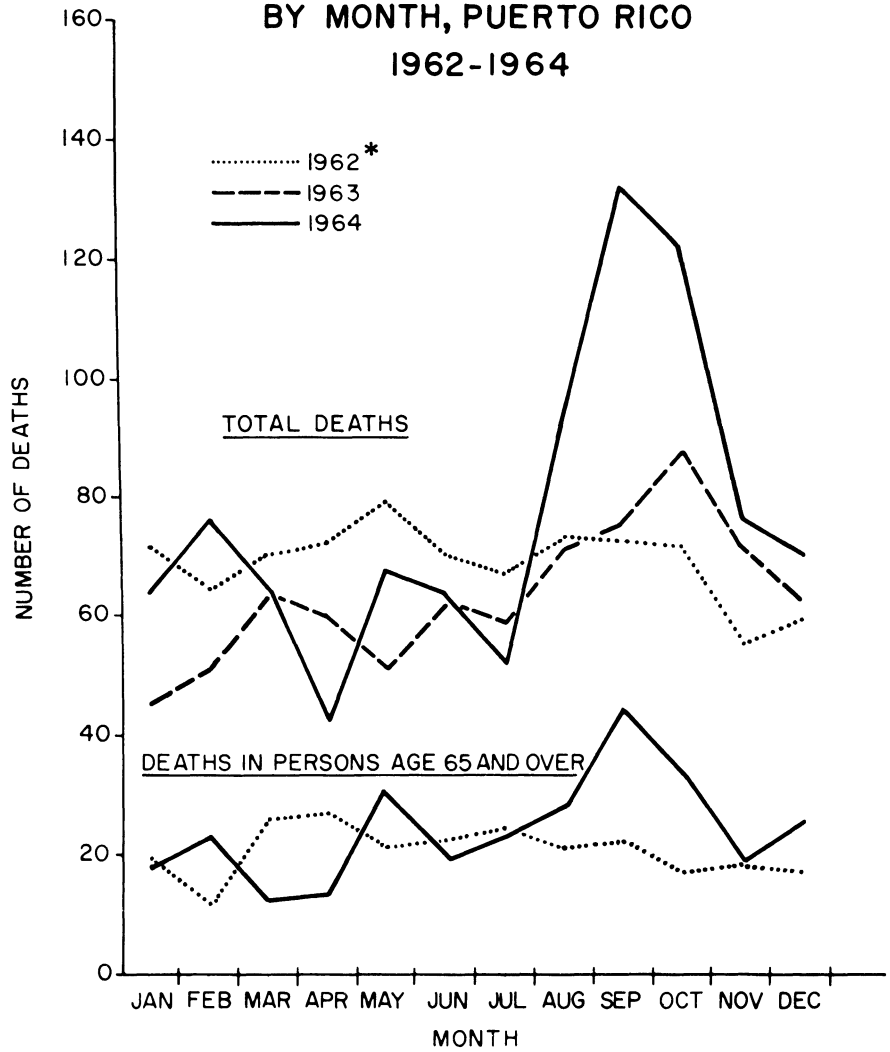


FIGURE 2.



*Data Not Available for Persons 65 and over

TABLE 2

School Absenteeism

Ponce, Puerto Rico, 1964

Date	Per cent Absent	Date	Per cent Absent
September	6.2	October 27	6.8
September 15	6.0	November 3	7.0
September 22	7.1	November 10	7.7
September 29	7.3	November 17	7.0
October 6	5.0	November 24	6.8
October 13	3.9	December 1	7.4
October 20	4.4	December 8	6.7

Survey of Influenza-Like Illness

A survey of influenza-like illness was carried out among employees of the Puerto Rico Department of Health in San Juan. The survey was designed to be comparable to that of the Baltimore Fire Department family influenza survey conducted during an epidemic in early 1963. (See Influenza Surveillance Report No. 77, June 14, 1963). Employees were given a questionnaire and requested to record all influenza-like illness in their families between June 1 and October 15, 1964.

The forms were completed by 535 health department employees and included information on a total of 2242 persons. There were 843 cases of influenza-like illness reported during the 4-1/2 month period, an attack rate of 37.7 per 100, a surprisingly high rate considering the absence of other indicators of widespread respiratory illness. The age-specific attack rates were remarkably uniform with slightly higher rates noted in the under 10 and the over 60 years age groups. (These rates are approximately double those found in Baltimore in 1963.)

Attack rates by age and sex, presented in Table 3, show the rates among males and females to be similar for all age groups.

TABLE 3

Influenza-like Illness by Age and Sex
Puerto Rico Health Department Families
June 1 - October 15, 1964

Age Group	Population			Number of Cases			Attack Rate (per 100)		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
0-4	79	78	157	38	34	72	48.1	43.6	45.9
5-9	104	86	190	53	47	100	51.0	54.7	52.6
10-14	109	88	197	36	34	70	33.0	38.6	35.5
15-19	113	156	269	40	52	92	35.4	33.3	34.2
20-29	175	264	439	58	94	152	33.1	35.6	34.6
30-39	126	166	292	36	64	100	28.6	38.6	34.2
40-49	116	179	295	44	61	105	37.9	34.1	35.6
50-59	94	118	212	26	50	76	27.7	42.4	35.8
60+	77	100	177	32	41	73	41.6	41.0	41.2
Unk.	5	9	14	0	3	3	-	-	-
Total	998	1244	2242	363	480	843	36.4	38.6	37.6

The great majority of health department families surveyed lived in the San Juan metropolitan area. Attack rates were slightly lower for those living outside the metropolitan area.

The relationship between family attack rates and family size is shown in Table 4. There was a gradual increase in attack rates from about 31 per cent for families of 1, 2 and 3 individuals to about 33 per cent for families of greater than 10 persons.

TABLE 4

Attack Rates for Influenza-Like Illness
According to Family Size

No. of Persons in Family	No. of Families	No. of Persons	No. Cases	Attack Rate (%)	Attack Rate (%) Groups of 3 Family Sizes
1	37	37	11	29.7	30.7
2	78	156	45	28.9	30.7
3	104	312	99	31.7	
4	103	412	158	38.4	
5	91	455	177	39.0	38.2
6	55	330	122	37.0	
7	31	217	88	40.9	
8	16	128	60	46.9	42.6
9	11	99	41	41.4	
10	6	60	29	48.3	
11	2	22	5	22.7	43.8
14	1	14	8	57.1	
	535	2242	843	37.7	

In summary, the impact of a widespread but low level epidemic of type A2 influenza occurring from late summer 1964 in Puerto Rico was most apparent in reports of pneumonia and influenza mortality. Although a sample survey suggested the presence of considerable respiratory disease, other indices of epidemic influenza could not easily be demonstrated.

(Reported by Dr. Rafael Timothee, Director, Preventive Medical Services; Dr. Luis Visot, Epidemiologist, Southern District, Ponce; and a team from C.D.C. working with the Puerto Rico Department of Public Health.)

Lake County, Tennessee

Lake County (population 9,572 in 1960) is situated in the far northwestern corner of Tennessee, bordered on the north by Fulton County, Kentucky, and on the west by New Madrid and Pensicot County, Missouri. There is little travel to and from the latter area, however, as the only access across the Mississippi River from Lake County is by ferry. Tiptonville (population 2,068) and Ridgely (population 1,464) are the only two towns of significant size in the county, and are situated eight miles apart in the central region. Gin-milling, cotton and soybean farming are the major income sources. Reelfoot Lake (it supposedly got its name via a Chickasaw Indian Chief's son who walked with a reeling motion due to a club foot!) is a popular duck hunting and fishing attraction, although the seasons are not active at the time of the influenza epidemic.

Lake County was hard hit by the 1963 A2 epidemic, in fact this was the last time that county schools were closed because of illness. Only two physicians are actively practicing in the County at present - one in Ridgely and the other in Tiptonville. There is no hospital in the County. Patients are usually sent either to Parkview in Dyersburg, Dyer County (110 beds) or Obion General in Union City, Obion County (129 beds.)

The 1965 outbreak first appeared during the week of January 24-30, reached a peak between February 5 and 9, started a rapid decline during the week of February 14-20, and had completely subsided early in the following week. The first cases were noted in and around Ridgely. There was apparently a 4-5 day delay before the illness reached Tiptonville, and cases began appearing in the sparsely-populated, outlying sections of the County during the second and third weeks of the outbreak.

The elementary school children were both the first and most severely involved. Both physicians reported a "fair number" of cases in infant children and individuals over 65 years. Multiple cases in family units were common, and it appeared that at least one adult member was usually involved along with the children.

A rise in absenteeism began in each of the six white schools in the county during the latter part of the week of January 31-February 6. This was most marked in the elementary schools in Tiptonville, Ridgely, and Phillippy (population 100), a small community near the Kentucky line. Grades 7 and 8 are included in a consolidated junior high school in Ridgely and grades 9-12 in a consolidated high school in Tiptonville. The overall absentee rate in the white schools reached 21 per cent on February 8, forcing closure on February 9 and 10. They reconvened on February 11 but closed again on the following day when absenteeism was still running 25-50 per cent in the elementary schools and 18 per cent in the high school. A sharp decline in number absent began on February 15.

Very few cases were observed among the non-white population in the county, and there has been no significant change in absenteeism in the three non-white schools to date. (Approximately one-fifth of the population is non-white.)

No significant change in work days lost during the outbreak occurred in the two textile plants in the area.

Characteristically, the illness began with a sore throat, slight fever, headache, and myalgia followed by profound malaise, increase in fever, chills, and dry hacking cough. Temperatures of 103-104° F were recorded most frequently in infants and preschool children. Approximately 5 per cent of patients reported gastrointestinal involvement, usually nausea and vomiting. Diarrhea was particularly rare. In approximately 10 per cent, the headache was rather severe and was the most annoying initial symptom. There was no neurological or cutaneous component. The illness usually lasted 3-4 days, though in numerous cases, a non-productive cough persisted for 7-10 days. Secondary pneumonia was infrequent and was confined to infants, small children, and rarely adults over 65. Hospitalization was required for only a small number of patients in this category. No death was attributable to the illness.

Specimens collected from patients in Lake County yielded strains of type A2 influenza virus, and acute-convalescent serum pairs confirmed the later occurrence of type A influenza in other nearby counties.

(Reported by Dr. Cecil B. Tucker, Epidemiologist, and by an EIS officer assigned to the Tennessee Department of Public Health.)

Graham County, North Carolina

About mid-January a slight upsurge in the incidence of respiratory infections had been noted by the three practicing physicians in Robbinsville, the county seat and major population center of Graham County. However, it was not until approximately February 14 or 15 that a major increase in the number of cases with influenza-like disease was appreciated. Also at that time the clinical characteristics of the illness became more constant. Most patients complained of fever, sore throat, prostration, harsh cough and severe muscular aches and pains. Considerable chest pain was experienced by some individuals. Although many adults were affected, it appeared that the disease was occurring predominantly among children. Absenteeism in the schools increased daily during the third week in February. On Monday, February 22, approximately 25 per cent of the school enrollment was absent. In addition, many of the pupils present in the school were obviously ill. A number of teachers were affected, and it was decided at that time to close the County schools for the remainder of the week. The two industries in Graham County reported a minimal, but definite, increase in absenteeism due to "influenza."

On February 23, visits were made to the three private physicians, the school superintendent, and officials of the local health department - several of them were becoming symptomatic at the time of the visit. (Some controversy existed as to whether the local basketball tournament scheduled for that night should be allowed to take place.) The health departments of the surrounding counties were contacted and in only one, Cherokee County, was any excessive school absenteeism because of respiratory disease occurring. No obvious reason for rural Graham County to be the site of an influenza outbreak was apparent.

With the assistance of the local physicians and the public health nurse, six individuals who appeared to be in the early stages of clinically typical influenza were selected for more careful study and collection of specimens for laboratory testing. Specimens of convalescent serum from the same six individuals were collected some 7-10 days later. By this time the schools had reopened and the absenteeism rate had declined significantly. Five of the six specimens of paired sera showed a fourfold or more rise in complement-fixing and hemagglutination-inhibiting antibodies to type A influenza. Isolation of type A2 virus was later accomplished.

In summary rural Graham County was the site of a rather well-localized epidemic of type A influenza in early 1965. Perusal of surveillance reports for previous years reveals that Graham County, although apparently spared during the type A outbreak of 1956-57, was hard-hit by that in 1962-63.

(Reported by Dr. Martin P. Hines, Director, Division of Epidemiology, and by an E.I.S. officer assigned to the North Carolina State Board of Health.)

Allegheny County, Pennsylvania

In mid-January the Allegheny County Health Department became aware of an outbreak of febrile respiratory disease among school children in the eastern part of the County. One school's absenteeism peaked at 22 per cent and showed approximately ten days of an excess rate. The illness described by the school nurse, and also observed at a boys' boarding school where approximately 20 of 55 boys were ill, was the sudden onset of fever to 102° F, aches and pains, headache, sore throat and cough. The clinical and epidemiological patterns were suggestive of epidemic influenza, and surveillance of schools was intensified. Throat swabs were collected from children becoming ill in school and the boys' boarding school was visited to obtain acute and convalescent blood specimens.

One of the first schools affected was a high school of 625 students in a community of lower-middle class working people. The school had administered commercial polyvalent influenza vaccine (1964 formulation) to the football team in August and September-October. A questionnaire survey was done in this school one week after absenteeism returned to normal to determine attack rates for students and their families.

The questionnaire was filled out in classes on February 1 by all the students in the high school. It briefly described the influenza syndrome and asked if the student had had a similar illness requiring absence from school during January. In addition, they were questioned regarding their immunization status and about similar diseases in family members. The ages of the students sampled ranged from thirteen to eighteen. All attended the senior high school and lived in the same municipality (population 8,418 - 1960 census). The school nurse provided information on the immunization status of the 43-man football team. In addition, absence records were checked for all those who said they were ill and absent.

Results of Questionnaire

The questionnaire confirmed the impression that essentially only the football team was immunized. Nineteen other students claimed to have had "flu shots." Of them, 15 had been ill; several indicated that their "flu shot" was penicillin. Because of the questionable vaccination histories and the small number involved it was elected to disregard all claims of immunization except for the team members.

Fifty-seven per cent of all students indicated they had been absent with an influenza-like illness in January. There was significant illness in the families simultaneously with attack rates between 300 and 400/1000 in all age groups (Table 1). It is recognized that this is only a rough estimate since the children were asked to recall family illnesses for the preceding month. Illustrative of this fact is the observation that 16/34 sibling pairs gave contradictory information about their parents' illnesses.

TABLE 1

Attack Rates for Students at the High School and Their Families

	Ill	Well	Attack Rate/1000
High School Students (only)	273	228	570
Age Group			
0-5	49	63	438
6-19	192	407	326
20-39	123	184	400
40 and over	251	433	370
Relationship			
Mothers	202	245	452
Fathers	127	240	348
Sibling and other	286	602	325

The experience of the football team was quite different from the rest of the school. (Table 2) Six boys on the team refused immunization and two received only one injection. These eight constitute the "not immunized" group for purposes of analysis.

TABLE 2

	Ill	Well	Total	Percent Ill
Immunized	5	30	35	14.3
Not Immunized	5	3	8	62.5
Total	10	33		

The unimmunized atheletes had a slightly higher attack rate than the general population, but the difference is not statistically significant. Using the attack rate for the whole school (excluding the football team) for comparison, the vaccine appeared to be 75 per cent effective in prevention of clinical influenza.

No serological work or cultures were done at this school since the outbreak was over when it first came to the attention of the Health Department. However, the students at Boys Town in whom paired sera confirmed type A influenza had a clinically identical illness and some nine strains of a type A2 influenza virus were isolated in neighboring communities.

(Reported by Dr. Edwin M. Brown, Chief, Disease Control and by an EIS officer assigned in the Allegheny County Health Department, Pittsburgh, Pennsylvania.)

Jefferson County, Colorado

On Thursday, January 28th, a high rate of absenteeism due to an outbreak of respiratory disease in a junior high school of Jefferson County, Colorado, was first reported. On the same day a check was made with other health departments in the Denver Metropolitan area to determine whether there had been similar increases in school absenteeism elsewhere. While none was found at that time, by February 1st the absentee rates in two grade schools, two junior high schools and two senior high schools picked at random in Jefferson County ranged from 12 to 21 per cent, approximately two to three times the expected levels. One of the schools, a junior high school with an absentee rate of 21 per cent, was selected for detailed investigation:

The junior high school located in an upper middle class neighborhood is composed of seventh, eighth, and ninth grade students numbering approximately 1,100. The school began to notice an increased absentee rate on January 25 with nearly 200 absences noted each day during that week. On February 3, the number of absentees increased to 235, 21 per cent of the enrollment, when less than 10 per cent was expected. The prevalent illness was basically respiratory and relatively mild; the children were out of school only two or three days but did have persistent coughs on return to class.

Eight students were interviewed in the first 24 to 48 hours of their illnesses in order to characterize the clinical syndrome. There was wide variation in symptoms in contrast to a rather uniform set often found in influenza outbreaks among children. The most consistent symptom was weakness or dizziness and sore throat of a mild nature was reported by six of the eight. Only one complained of chills, and one of fever - two findings which are expected with influenza. Four had headache, four had nausea, four had myalgia, and three had cough. The impressive thing about the illness was that no two cases looked alike, no child appeared very ill, and only four were actually in bed at the time they were seen.

On March 22 a questionnaire survey was undertaken in order to document the extent of the outbreak and give evidence of family spread. Forms were distributed to the students in the junior high school which were to be filled out by the family. Questions to be answered included:

1. A list of family members, noting age and sex

2. Whether or not each individual family member had had flu since January 1, 1965

3. The onset date

4. Whether of not each individual family member had had flu vaccine in the winter of 1964-65

Of 1,100 questionnaires distributed to the students at the school, 390 were returned giving information on 1,800 family members. Of the total number, 803 (45 per cent) reported having had a "flu-like" illness in 1965 and 636 of this latter group (79 per cent) supplied approximate onset dates.

The epidemic appeared to begin in early January, peak at the end of that month, and decline by mid-March.

Table 1 shows age specific attack rates. The overall rate in the school families was 44.5 per cent. The highest attack rates were found in the 10-24 age group (54-55 per cent); the next highest in the 1-9 year age group (42-44 per cent); and the lowest rates in the 25-64 age group (30-33 per cent). There were not significant numbers in less than one year or greater than 65 groups to allow adequate analysis.

TABLE 1

Age Specific Attack Rates

Age	Total	No. With Flu	Attack Rate (per cent)
1	9	3	33
1 - 4	52	23	44.2
5 - 9	184	79	42.6
10 - 14	598	323	54
15 - 24	253	140	55.2
25 - 34	52	16	30.7
35 - 44	397	132	33.2
45 - 64	162	52	32
65+	5	2	40
Unknown	88	29	-
Total	1800	803	44.5%

Based on questionnaire data, influenza vaccine appeared to offer no protection. Of the 1,800 persons on whom data were available, only 138 had received vaccine during the winter of 1964-65. In this group, 65 reported a "flu-like" illness, an attack rate of 47 per cent. Of the 1,662 remaining who had no flu shots, 738 had a similar illness, a rate of 44.3 per cent.

Strains of type B influenza virus were isolated in tissue culture from children in the schools. Characterization showed them to be unique variants from older strains

(See Laboratory Section). Additional serological confirmations of type B infection were made. Although no other viruses were isolated from the outbreak, serological studies on a sample of students showed that at least one type A influenza infection had occurred and that in another case parainfluenza type 3 virus had been involved.

(Reported by Dr. C.S. Mollohan, Chief, Section of Epidemiology, and by an EIS officer assigned to the Colorado State Department of Public Health.)

Princeton, Missouri

The community of Princeton, Missouri, was the first area in the State where influenza was clearly identified in 1965. The following summary report describes the investigations carried out jointly by the Missouri Division of Health and C.D.C.'s Kansas City Field Station:

Geography and Population

Princeton is an agricultural community located in north-central Missouri with a population of 1,443 (1960 census). The area is served by a consolidated school which consists of three separate buildings: one building for the primary grades (grades 1 through 5), one for the junior high school (grades 6 through 8), and one for the high school. There is also a county nursing home in the community which cares for approximately 40 elderly patients.

Investigation and Description of the Epidemic

A sharp increase in absenteeism in the schools beginning on January 25 was the first suggestive evidence of an outbreak. The absentee data are briefly outlined in Table 1.

TABLE 1

Absenteeism in Princeton, Missouri Schools - January, 1965

School	Number of pupils	Average rate (%) (January 7-21)	Peak rate (%) (January 27)
Primary	281	4.3	25.2
Junior high	191	4.3	23.0
High school	222	3.1	19.8
Total	694	3.9	22.9

There are 694 pupils in the school system. The average absentee rates between January 7 and January 21 were 4.3 per cent in the primary and junior high schools and 3.1 per cent in the high school. A peak absenteeism occurred on January 27 with an overall rate of 22.9 per cent. An abrupt increase in absenteeism was noted in all grades on January 25. The schools were closed on January 26 because of heavy snowfall, and reopened the following day at which time the absentee rate reached its peak. Schools were then closed for the remainder of that week and reopened on February 1. The three age groups represented all showed a similar absentee curve; the only exception was a slightly slower decline to pre-epidemic levels in the primary school.

Discussion with the authorities of the county nursing home revealed the following: The present census was 20 females and 17 males; the majority was over 70 years of age. A total of 15 employees worked in the home. Of the female patients, 16 became ill with an influenza-like illness, and 15 of the males were also ill with a similar syndrome. Four deaths had occurred since February 1, but only one was

attributed to influenza. Virtually all the employees gave a history of influenza-like illness during the past month. The nursing home outbreak was said to have begun in mid-January, and the onset of the last illness occurred on February 11. There is no history of any influenza vaccine having been given to any of the patients in the past.

A telephone survey of the community was undertaken on February 18. One hundred thirty-seven persons (approximately a 9 per cent sample of the total population) were included, and inquiry was made regarding the presence or absence of illness during the previous month. In addition, an attempt was made to ascertain the status of illness vaccination in the community. Of the 137 persons sampled, 27 (19.7 per cent) gave a history of an influenza-like illness in the preceding month. An additional 25 (18.2 per cent) gave a history of illness compatible with mild upper respiratory illness (URI). The age-specific attack rates of acute respiratory illness on the basis of this survey are shown in Table 2. High attack rates are evident in all age groups.

TABLE 2

Telephone Survey. Age Specific Attack Rates - URI and Influenza-like Illnesses (January 14--February 18, 1965)

Age Group	Total Number	Flu-like Illnesses	URI	Flu-like, Attack Rate (%)	URI + Flu-like, Attack Rate (%)
0-4	7	2	1	28.5	42.8
5-14	19	3	6	15.7	47.3
15-34	17	3	4	17.6	41.1
35-39	42	8	5	19.0	30.9
59	52	11	9	21.1	38.4
Total	137	27	25	19.7	37.9

Adults with school-age children in the home had an attack rate only slighly higher than that of those without children (Table 3).

TABLE 3

Incidence of Influenza-like and URI's in Adults With and Without Children in the Home

Families	Total Number	Flu-like Illnesses	UR URI	Flu-like, Attack Rate (%)	URI + Flu-like, Attack Rate (%)
With children	32	8	6	25.0	43.7
Without children	72	13	12	18.0	34.7

Of the survey population, 28 (20.4 per cent) gave a history of influenza vaccination within the preceding two and one-half years. The majority of these had received injections during the fall of 1964. It is of interest that of the 27 cases of influenza-like illness recorded in the telephone survey, only 2 (7.4 per cent) gave a history of URI, 6 (24.0 per cent) had a history of prior vaccination with influenza vaccine. The attack rates for influenza-like illness and URI's among vaccinated and unvaccinated persons are presented in Table 4. Although the numbers are small, there was suggestive evidence that influenza vaccine had conferred some protection.

TABLE 4

Relationship of Influenza Vaccination History to Illness History

Vaccination Status	Total Number	Flu-like Illnesses	URI	Flu-like, Attack Rate (%)	URI + Flu-like, Attack Rate (%)
Vaccinated	28	2	6	7	28
Unvaccinated	109	25	19	23	40

Clinical specimens collected in Princeton yielded strains of type A2 influenza virus, and paired sera confirmed the widespread distribution of the infection.

Summary

An outbreak of influenza A2 occurred in Princeton, Missouri, during January and February 1965. The epidemic peak appeared between January 25 and 27, as evidenced by sharp increases in school absenteeism and physician calls during that period. Data from the telephone survey suggest that prior immunization with polyvalent vaccine was probably protective to some extent. The high incidence of influenza-like illness (with one death) which occurred in the nursing home confirms the severity of influenza in this age group.

(Reported by Dr. E. A. Belden, Communicable Disease Consultant, Missouri Division of Health, and the C.D.C. Kansas City Field Station.)

DeKalb County, Georgia

From late January through early March 1965, a moderate outbreak of influenza was obserbed in DeKalb County, Georgia, one of five counties making up the Atlanta greater Metropolitan area. Attention was first called to the presence of influenza by rising school absenteeism reportedly caused by acute febrile respiratory disease. The identification of type A influenza in the County was confirmed by isolations of A2 strains and numerous serological conversions. Epidemiological studies in a small children's home and one of the County School System were carried out further to characterize the extent.

In the Children's Home a continuing serological study of all acute respiratory disesases occurring at the home had been underway during the past winter. The presence of type A influenza was observed from February 10 to March 8 with an overall attack rate of 20 per cent (24/119) uniformly distributed among a population where ages ranged from 5-18 years. Of these 24 laboratory confirmed influenza cases, 79 per cent (19/24) were afebrile.

The school centered survey was done in an elementary high school where peak absenteeism of 18 and 12 per cent respectively were recorded during February. A questionnaire requesting the following information was distributed to each school family during the second week of March:

1. List all family members and persons living in the house, by age and sex

2. Indicate those members who had influenza during February or March 1965 prior to this survey

3. Influenza vaccine study

4. Order of illness in the family

The questionnaire, which included a clinical description of influenza in the introductory letter, was to be completed by the parents and returned to the school. The questions asked were designed to provide information about (1) age-specific attack rates, (2) influenza vaccine efficacy, and (3) the mode of introduction into the family unit.

Results

Of the initial population sample, 80 percent of the families returned the questionnaires. The overall attack rate of the respondents (3575 persons) was 21.2 percent. The population distribution and attack rates by age are shown in Table 1.

TABLE 1

Influenza-like Illnesses
Age Specific Attack Rates

Age (Years)	Yes	Total Population	Attack Rate (Per Cent)
0-4	11	93	11.8
5-9	59	275	21.4
10-14	127	560	22.6
15-19	199	836	23.8
20-29	23	144	15.9
30-39	49	284	17.2
40-49	151	724	20.8
50-59	73	328	22.2
60 and over	18	100	18.0

Although age specific attack rates were relatively uniform, there was some slight preponderance in school age children. Attack rates calculated by increasing family size, attempting to show relative risk of disease, were again surprisingly constant. Although not invariable, the first case in the family units occurred predominately in school age children (5-19 years) and secondarily in the older groups.

The attack rate in some 8 per cent of the population receiving influenza vaccine in 1964-65 was not significantly different from that in the unvaccinated although histories of illness and vaccination could not be confirmed. This survey was not supported by laboratory investigation although type A influenza was repeatedly confirmed in DeKalb County during the period of reported illnesses in the school.

(Reported by Dr. Marion Dressler, M.D., Assistant Director of Public Health, DeKalb and Rockdale Counties and EIS officers assigned in the Epidemiology and Laboratory Branches of the C.D.C.)

The Golden Bear, California

Background

The California Maritime Academy, situated on San Pablo Bay in Vallejo, is administered by the State Department of Education. It is one of several state governed institutions scattered over the country serving to train individuals for maritime and merchant marine careers. The Academy is organized on a quasi-military foundation, and the years of study are equivalent to the first, second, and third years of the usual college undergraduate course. The midshipmen whose ages range from eighteen to twenty-four, are drawn from all areas of the State, and are offered two courses of study, nautical science and marine engineering. A Bachelor of Science degree is awarded at the completion of the three year program. The curriculum includes an annual training cruise of two to three months duration aboard the Golden Bear, a converted naval attack-transport. All those enrolled in the Academy participate in the cruise.

Medical care for the contingent of midshipmen is provided on as needed basis by the U. S. Public Health Service Hospital and Clinics in San Francisco. At the Academy, care for minor complaints is supplied by the pharmacist mate on the installation. The institution does not employ a full-time physician, but does contract one to supply medical care during the annual cruise. There is no routine program for immunization of midshipmen at the time of their admission into the Academy, and the only immunizations routinely administered during the three year course are those recommendations and requirements for international travel specific for the cruise itinerary. For the 1965 cruise, influenza vaccine was not given.

The Cruise

The 1965 cruise departed Vallejo, California, for several Pacific ports of call on January 9 with 267 individuals on board. All those on board were male. A breakdown by classification is cited below:

Dock, Engineering, and Miscellaneous Officers and Men	31
Stewards Department	23
Midshipmen 1st Class	68
Midshipmen 2nd Class	55
Midshipmen 3rd Class	90
Total	267

In general fashion, those on board were segregated into three groups. These included (1) midshipmen, (2) stewards department, and (3) officers and crew. Dining and sleeping facilities for the three groups are separate and distinct. The midshipmen are quartered in large multiple bunk areas located in the forward portion of the ship with upwards of fifty men to an area. Stewards and officers and men are quartered under less crowded circumstances with one to four individuals per cabin. Dining facilities are separate, but food is prepared and dispensed by individuals and equipment common to all.

Midshipmen are divided into sections which is the basic unit of work, quartering, standing watches and leave. Sections are comprised of twenty to thirty-five men and include representatives of all three classes.

The itinerary for the cruise is noted below:

	Arrive	Sail
Vallejo, California		1/9
Honolulu, Hawaii	1/17	1/21

(continued)

	Arrive	Sail
Manila, P. I.	2/10*	2/14*
Hong Kong, C.C.	2/17*	2/23*
Yokohama, Japan	3/1*	3/7*
Honolulu, Hawaii	3/19	3/20
Vallejo, California	3/28	

*Asterisk denotes time one day ahead of Pacific Standard Time due to transit of the International Date Line. This notation will be continued below.

Prior to arrival at Yokohama on March 1*, major medical problems were not encountered, and no significant episodes of respiratory disease were observed. Shortly after departure from Yokohama, several individuals began to note the onset of an acute upper respiratory illness and six days after sailing three individuals were admitted to sick bay with febrile respiratory disease. Within two days, by March 15*, a total twenty-six had been admitted. The typical complaints and progression of illness included nasal congestion, sore throat, general malaise and weakness, headache with retroorbital localization, feverishness, chills, generalized muscular aches and cough with retrosternal pain. Physical examination indicated that most of those admitted to sick bay appeared acutely ill with temperatures ranging from 102° to 104° F. Moderate inflammation of the conjunctivae and mucosal surfaces of the nose and throat was present. Chest examination was significant in that breath sounds were coarse and terminal respiratory coarse crackles and rhonchi were heard.

By the time of March 16 a total of forty-two had been admitted to sick bay. The problem of crowding in the sick bay became so acute that it was necessary to convert one section of the midshipmen's quarters into a sick bay. Therapy consisted of antibiotics, including penicillin and tetracycline, and supportive measures including antipyretics, oral fluids, cough suppressants, and expectorants. The supply of antibiotics was soon depleted and a request for assistance was radioed to the U. S. Coast Guard Station at Hawaii. On March 18 an air drop of medical supplies was made to the Golden Bear.

On March 20, the Golden Bear put into Honolulu (this was not on the original itinerary) to remove one midshipman to Tripler Army Hospital for evaluation of an episode of hematemesis during his respiratory illness. Evaluation at Tripler did not reveal a source of bleeding, and at the time of his admission the chest X-ray examination and white blood cell count were normal. While in port, the Golden Bear was visited by representatives of the PHS Quarantine Station and the Hawaii State Department of Public Health. Throat swabs were obtained for laboratory examination.

By the time of return to Vallejo on March 28, a total of sixty-four had been admitted to sick bay. However, all members of the ship's company were able to depart for leave. The midshipmen returned to the Academy on April 12.

Epidemiology

To define more precisely the nature of the outbreak, a questionnaire was distributed to all those on board and available at the Academy. The following tabulation illustrates the results regarding illness experience. The attack rate for those on board responding to the questionnaire (87 per cent of those on board) was 55 per cent. Further breakdown of the population into deck and engineering crew and analysis of the midshipmen population by the various sections did not demonstrate any significant difference in attack rate. The disease was uniformly widespread throughout the population and affected approximately 50-60 per cent of those at risk.

	Ill	Not Ill	No Response	Total	Per cent Respondents Ill
Deck, Engineering, and Miscellaneous Officers and Men	13	12	6	31	52
Stewards Department	9	5	9	23	64
Midshipmen 1st Class	38	26	4	68	59
Midshipmen 2nd Class	26	24	5	55	52
Midshipmen 3rd Class	42	38	10	90	53
Total	128	105	34	267	55

The epidemic curve is demonstrated on Figure 1. This is based upon reported date of onset and illustrates quite well a rapid increase in the numbers becoming ill with a more gradual decline after March 15. Interestingly, although illness first occurred prior to departure of the Golden Bear from Yokohama on March 7*, the first admissions to sick bay (Figure 2) did not occur until March 13, six days after departure from Japan. It can be seen that several dated their onset prior to or shortly after leaving Yokohama, but several days elapsed before admissions occurred. This delay may represent (1) error in defining precisely the date of onset complicated by the extra day, (2) a reluctance upon the part of those ill to seek medical care while in port and/or on liberty, or (3) an indication that in the earlier stages of the outbreak, the disease was indeed less severe. This latter idea could not be supported by demonstrating any difference in symptomatology between those with illness early and late in the course of the outbreak. Comparison of Figures 1 and 2 illustrates this lag between onset and time of admission.

The time of onsets of the disease in the various populations and midshipmen sections was studied to determine if any particular group was affected at an earlier or later date. No indication of different periods of onset could be found.

The frequency of symptoms is listed below:

		Per cent
1.	Cough	80
2.	Nasal symptoms	75
3.	Sore throat	64
4.	Headache	53
5.	Weakness	50
6.	Loss of appetite	35
7.	Weight loss	35
8.	Muscle aches	32
9.	Chills	29
10.	Hoarseness	24

The three symptoms cited as being the most bothersome included cough (30 per cent), sore throat (24 per cent), and weakness and increased fatiguability (15 per cent).

An attempt was made to obtain information regarding previous immunization with influenza vaccine. Seventeen, or 13 per cent of those ill indicated that they had received influenza vaccine at some time in the past. However, only two received the vaccine since 1964. All others had received the material between 1957 and 1963. Of those not ill, sixteen, or 15 per cent had received immunization, and four indicated they had received it in 1964. The remainder were scattered from 1957 to 1963, with the

Figure 1.

CASES BY DATE OF ONSET

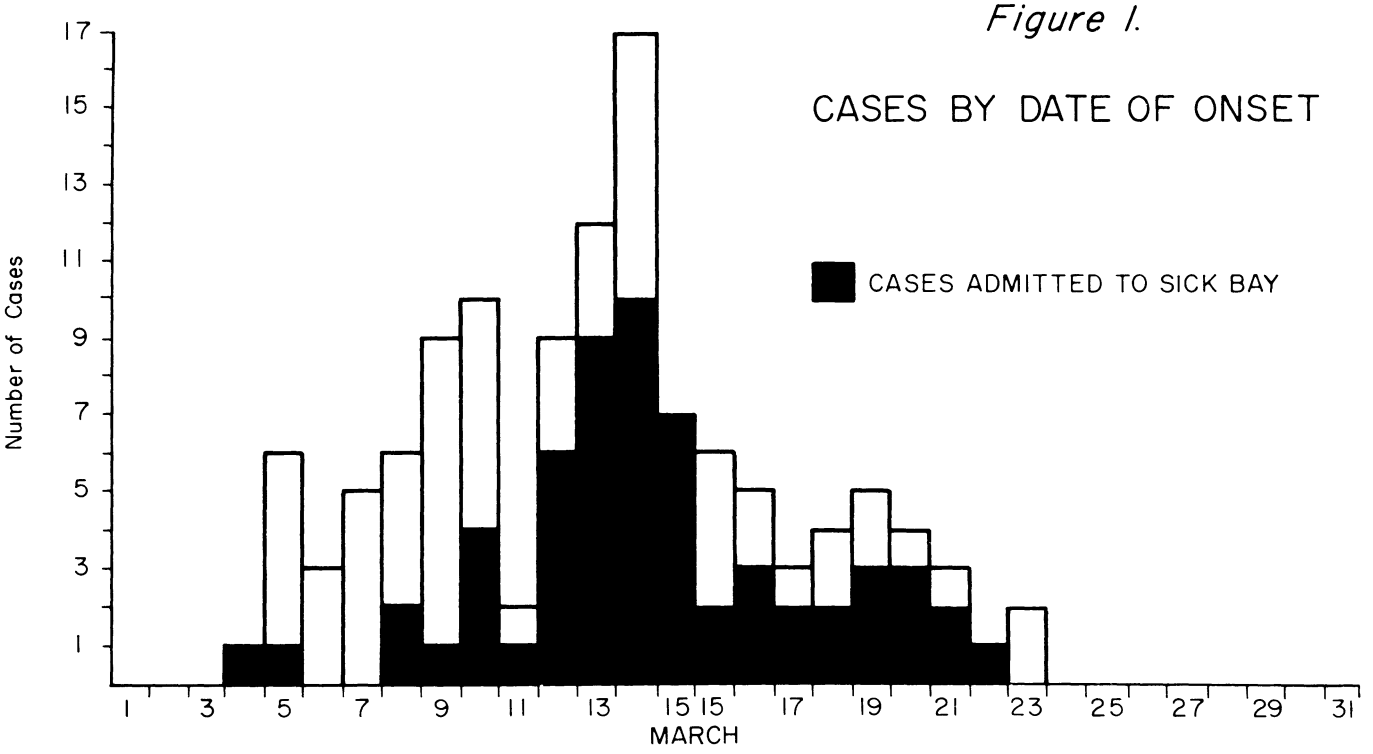
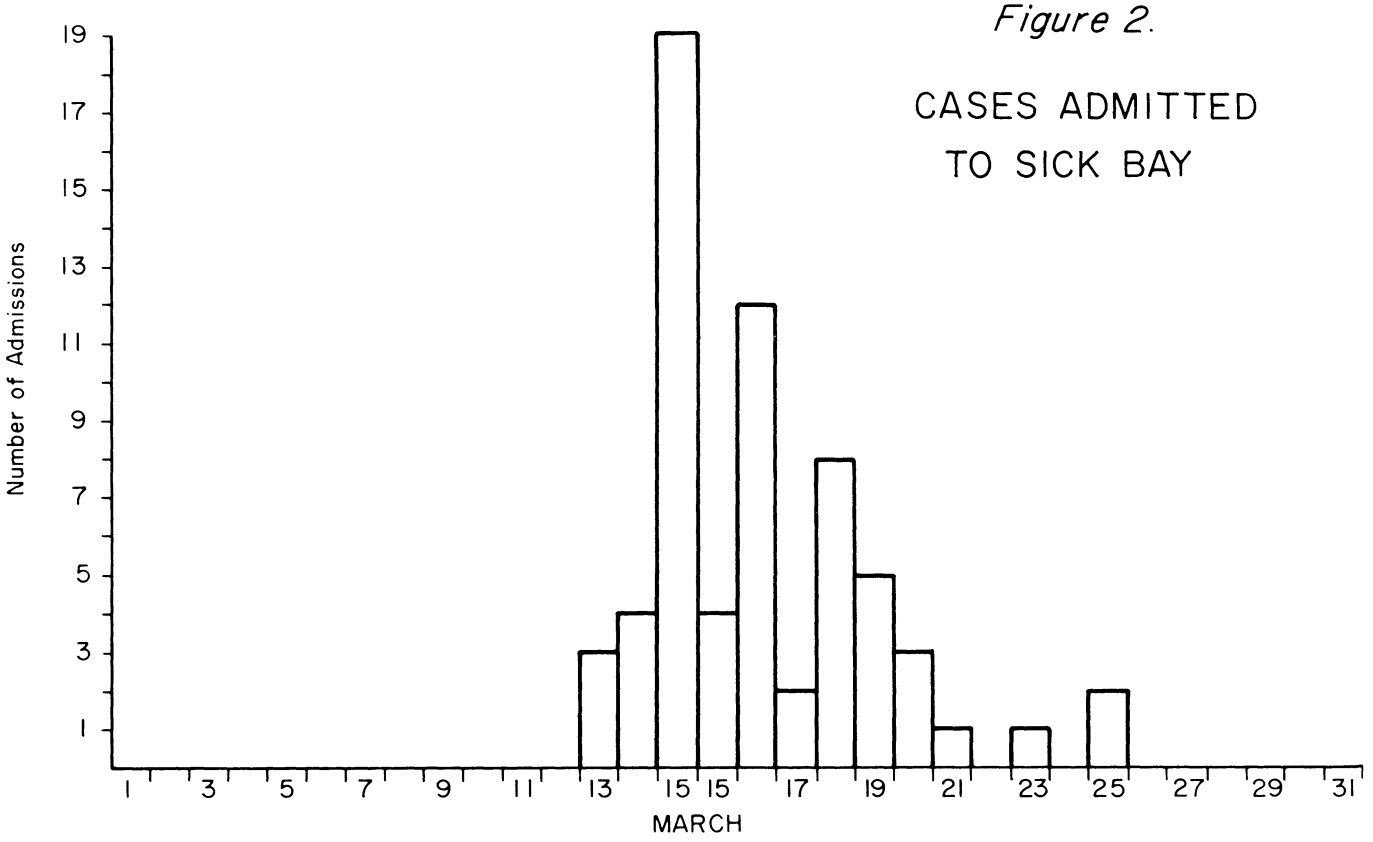


Figure 2.

CASES ADMITTED TO SICK BAY



majority receiving vaccine in 1961 and 1963. From the data available it was not possible to gain any information regarding effectiveness of influenza vaccine in preventing the disease.

Approximately 25 per cent of both groups described previous experience with influenza or "flu" within the previous eight years. Earlier disease did not appear to be a protective factor.

Laboratory

Acute and convalescent serum pairs were obtained from 43 individuals admitted to the sick bay. The acute specimens were taken one to seven days after admission and two to ten days after onset of symptoms. An additional thirteen pairs had been obtained from individuals not admitted to sick bay but eight of them described a respiratory illness in response to the questionnaire.

Complement fixation tests for influenza A, B, and adenoviruses showed significant antibody titer rises against the type A influenza influenza antigen in 12 of 33 pairs tested.

Virus isolation attempts from throat swab specimens collected at the time of landing in Hawaii have not yielded agents, likely related to the problems of adequate specimen storage.

Summary

Following arrival of the Golden Bear, training ship of the California Maritime Academy, in Yokohama, an outbreak of febrile respiratory disease eventually affecting 55 per cent of the population on board began. The first cases had onset prior to departure from Yokohama. Attack rates throughout several populations on board were uniform, and no group was spared. Sixty-four individuals were admitted to sick bay, and a medical drop from the Coast Guard was needed to refurbish dwindling medical supplies.

Laboratory data implicates type A influenza as the causative agent.

(Reported by Dr. Henry A. Renteln, Special Surveillance Section, Bureau of Communicable Diseases, and an EIS officer assigned to the California Department of Public Health.)

2. Animal Influenza

In the last decade at least seven "new" type A influenza viruses have been isolated from horses and members of the avian family. Although certain features of human and animal influenza epidemics have been well defined, the origins of virus strains responsible for influenza epidemics and epizootics are still unknown.

Satisfactory investigation of the total biology of a disease requires the close cooperation of specialists in a variety of medical disciplines. With this in mind, a Special Report on Animal Influenza* has been prepared at the Communicable Disease Center for immediate distribution. It is the purpose of this Zoonoses Surveillance Report provide medical investigators with an up-to-date concise review of the animal influenza complex. To do this, the available surveillance data on the subject have been combined with pertinent historical and experimental knowledge. The review section is followed by special reports from investigators currently involved in studies relating to the epidemiology of influenza.

This report may be obtained by requesting it from the Zoonoses Surveillance Unit, Surveillance Section, Epidemiology Branch, Communicable Disease Center, Atlanta, Georgia.

---

* Report No. 5, Special Report: Animal Influenza

3. Concepts of Excess Mortality

Robert E. Serfling, Ph.D.
Chief, Statistics Section
Epidemiology Branch, C.D.C.

Weekly deaths in 122 United States cities are presented in the accompanying figure. The reported numbers are shown as dots joined by line segments. The solid line for each mortality category is the expected number of deaths. The dashed line, 1.65 standard deviations above the expected number is the "epidemic threshold," a criterion for recognition of significant deviations in excess of the expected number. The vertical bars joining the curve of expected numbers with the epidemic threshold are in alignment with the divisions of the scale at the bottom of the chart which mark 4-week time periods. The vertical scale of each mortality curve is the same when measured in standard deviation units.

Previous charts were based on data for 108 cities but since the autumn of 1957 reports have been received from 14 additional cities. The present charts, constructed from data for the period 1959-63, include these cities. All of the 122 reporting cities are listed in Table 4, the format of which has been altered to provide a weekly record of deaths by each of the four categories. The table will be published each week, the chart periodically.

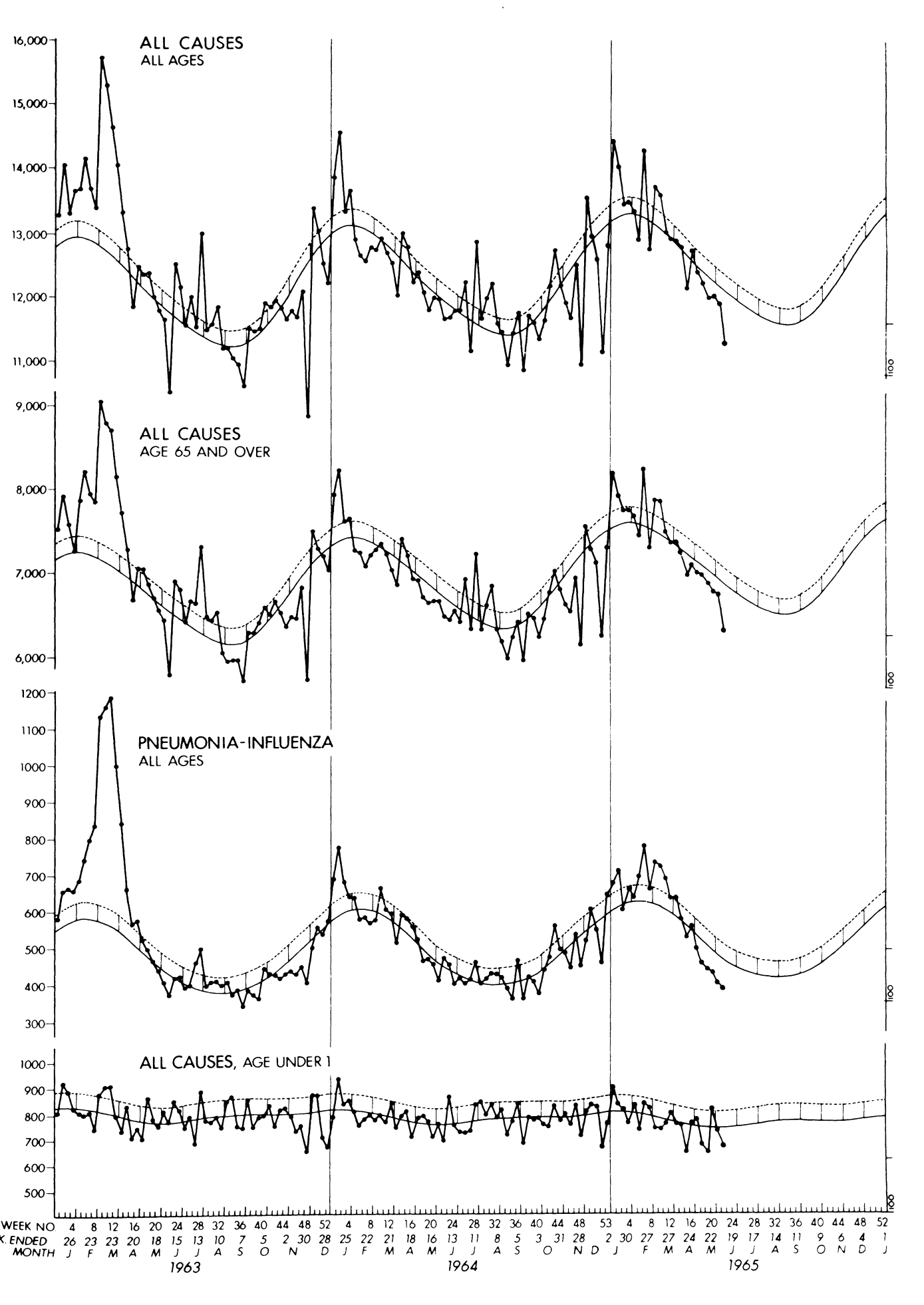
The Data - The deaths reported are those recorded each week in the Vital Statistics Offices of the 122 cities. They are by place of occurrence of death, thus including deaths of persons whose residence may be elsewhere and not including deaths of residents which occur in other vital statistics jurisdictions. The report is a count of death certificates filed; so that each week the deaths recorded include some which happened during the preceding week. The number of delayed certificates usually increases during holiday periods, causing a negative deviation during the holiday week, followed by a positive deviation when the delayed certificates are included in the report for the succeeding week.

The population of the central cities of the 122 reporting cities was 49,566,346 in 1960 but inclusion of the urban fringe population increases this total to 82,304,118. Since the central cities frequently include hospital facilities and nursing homes which provide services to surrounding areas, the principal population in which the reported deaths occur is in the range of 50-80 million persons. Because of this great range the charts show the number of deaths rather than the death rate. In order to compensate for secular change in number of deaths as a result of changes in population, hospital facilities and death rates, a linear secular trend component, described in Table 1 is included in the estimation of the expected number of deaths.

TABLE 1

EXCESS MORTALITY IN THE 122 CITIES DURING RECENT INFLUENZA EPIDEMICS

Epidemic Period (Weeks Ended)	Duration in Weeks	Influenza Type	Excess Mortality									
			Number of Excess Deaths					Percent of Expected Deaths				
			All Causes				Pneumonia-Influenza	All Causes				Pneumonia-Influenza
			All Ages	65 & Over	1-64	Under 1		All Ages	65 & Over	1-64	Under 1	
1957, Oct. 5–Dec. 28	13	A_2	12,426	7,469	5,030	-73	3,753	8.6	9.8	8.9	-0.6	77.7
1958, Jan. 4–May 3	18	A_2	14,330	10,911	3,486	-67	3,416	6.8	9.7	4.2	-0.4	41.5
1960, Jan. 2–Apr. 30	18	A_2	12,237	9,333	2,903	1	4,400	5.6	7.8	3.5	0.0	49.1
1962, Dec. 30–May 5	19	B	5,855	6,216	-312	-49	1,446	2.5	4.7	-0.3	-0.3	14.4
1963, Jan. 5–May 4	18	A_2	16,550	12,505	3,922	123	3,816	7.3	9.8	4.6	0.8	38.7


ALL CAUSES
ALL AGES
16,000
15,000
14,000
13,000
12,000
11,000
ALL CAUSES
AGE 65 AND OVER
9,000
8,000
7,000
6,000
PNEUMONIA-INFLUENZA
ALL AGES
1200
1100
1000
900
800
700
600
500
400
300
ALL CAUSES, AGE UNDER 1
1000
900
800
700
600
500
WEEK NO 4 8 12 16 20 24 28 32 36 40 44 48 52 4 8 12 16 20 24 28 32 36 40 44 48 53 4 8 12 16 20 24 28 32 36 40 44 48 52
K. ENDED 26 23 23 20 18 15 13 10 7 5 2 30 28 25 22 21 18 16 13 11 8 5 3 31 28 2 30 27 27 24 22 19 17 14 11 9 6 4 1
MONTH J F M A M J J A S O N D J F M A M J J A S O N D J F M A M J J A S O N D J
1963
1964
1965

Excess Mortality - During influenza epidemics marked excess pneumonia-influenza mortality extending over a period of several weeks is characteristic. This is evident on the chart for the period early in 1963. For a full account see Collins (1957) and Langmuir et al., (1964). Associated increases in deaths from all causes also may be observed. These are primarily deaths assigned to heart diseases and other chronic conditions. The relationship to influenza epidemics has been discussed by Eickhoff et al., (1961) and by Collins and Lehman (1953).

Excess mortality in the 122 cities during influenza epidemics since the pandemic of 1957-58 is given in Table 1. Influenza A2 first appeared in the United States in the summer of 1957. Excess mortality became noticeable in October, rose to a maximum during the week ending November 2nd and then decreased to near the expected numbers in late December. This was the first early autumn episode of this kind since the 1918 pandemic. In early 1958 excess mortality rose again, reaching a peak during the week ending March 1. This "second wave" appeared at the usual time of excess epidemic mortality. Outbreaks of influenza A2 accompanied by marked excess mortality occurred again in early 1960 and in early 1963. During these epidemics excess mortality was of the same order of magnitude as during the second wave of 1957-58.

Minor influenza type B epidemics were observed in 1952 and 1955 but the first major recurrence since 1944 took place in 1962. In this epidemic excess mortality recorded for both pneumonia-influenza and deaths from all causes was lower than in the type A2 epidemics of the 1958-63 period. Excess mortality among persons under 65 years of age was negligible.

Brief periods of excess mortality may be observed in summer months during severe heat waves. An account of two recent episodes in the East North Central States has been given by Schuman et al., (1964). One of these occurring in the 7th period of 1963, is reflected in the data for the 122 cities.

Martin and Bradley (1960) report increased mortality in London immediately following days of heavy fog and atmospheric pollution but it seems unlikely in this country that such occurrence would happen simultaneously in a sufficiently large number of cities to cause marked upward deviations in the combined reports of the 122 cities.

Construction of the Mortality Curves - The curves of expected mortality are of the form

$$\text{Expected Deaths} = \mu + rt + \sum_{i=1}^{2} A_i \cos (i\theta_t + \phi_i). \qquad (1)$$

In this equation is a linear trend coefficient, positive except in the curve for deaths under one year of age; the cosine function describes the seasonal variation. The procedures employed, using data for the period September 1959 through August 1963 differ from those previously described, (Serfling, 1964) by inclusion of a second cosine term. In the earlier studies, using data for the period 1954-1960, only a single cosine term was required. Least squares estimates of the parameters of equation (1) were obtained by an analytical inversion of the coefficient matrix of the normal equations, a modification of the method given in the paper cited.

As described in that paper the epidemic threshold (dashed line in the future was calculated from the differences between observed and expected values after exclusion of epidemic periods and other weeks with extreme deviations. It is placed at a distance (1.65 standard deviations above the expected level) such that the random occurrence of two successive deviations which exceed the epidemic threshold is unlikely. If the deviations were successive independent events the odds would be 9 to 1 against the occurrence of one or more runs of two such events in a series of 26 trials.

The "epidemic threshold" thus serves as a device for screening random fluctuations which may occur because of temporary variations in mortality, artifacts such as delayed reporting and other variations of a random character. In practice the stated odds are approximate since successive deviations are not independent but exhibit a small negative serial correlation. Use of this criterion for several years has indicated that the discrepancy between theory and practice is not serious.

References

Collins, S. D.: Long Term Trends in Illness and Medical Care. Public Health Monograph No. 48, U.S. Government Printing Office, Washington, D.C., 1957.

Collins, S. D., and Lehman, J.: Excess Deaths From Influenza and Pneumonia and From Important Chronic Diseases During Epidemic Periods, 1918-51. Public Health Monograph No. 10, U.S. Government Printing Office, Washington, D.C., 1953.

Eickhoff, T. C., Sherman, I. L., and Serfling, R. E. Observations on excess mortality associated with epidemic influenza. J.A.M.A. 176: 776-782 (1961).

Langmuir, A. D., Henderson, D. A., and Serfling, R. E.: The epidemiological basis for the control of influenza. Amer. J. Public Health 54: 563-571 (1964).

Martin, A. E., and Bradley, V. H.: Mortality, fog and atmospheric pollution. Monthly Bull. Minist. of Health (Lond.) 19: 56-72 (1960).

Schuman, S. H., Anderson, C. P., and Oliver J. T.: Epidemiology of successive heat waves in Michigan in 1962 and 1963. Public Health Rep. 189: 131-136 (1964).

Serfling, R. E.: Methods for the current statistical analysis of excess pneumonia-influenza deaths. Public Health Rep. 78: 494-506 (1963).

Key to all disease surveillance activities are those in each State who serve the function as State epidemiologists. Responsible for the collection, intrepretation and transmission of data and epidemiological information from their individual States, the State epidemiologists perform a most vital role. Their major contributions to the evolution of this report are gratefully acknowledged.

STATE	NAME
Alabama	Dr. W. H. Y. Smith
Alaska	
Arizona	Dr. Philip M. Hotchkiss
Arkansas	Dr. Wm. L. Bunch, Jr.
California	Dr. Philip K. Condit
Colorado	Dr. C. S. Mollohan
Connecticut	Dr. James C. Hart
Delaware	Dr. Floyd I. Hudson
D. C.	Dr. John R. Pate
Florida	Dr. E. Charlton Prather
Georgia	Dr. W. J. Murphy
Hawaii	Dr. W. F. Lyons
Idaho	Dr. John A. Mather
Illinois	Dr. Norman J. Rose
Indiana	Dr. A. L. Marshall, Jr.
Iowa	Dr. Ralph H. Heeren
Kansas	Dr. Don E. Wilcox
Kentucky	Dr. William McBeath
Louisiana	Dr. John M. Bruce
Maine	Dr. Dean Fisher
Maryland	Dr. John H. Janney
Massachusetts	Dr. Nicholas J. Fiumara
Michigan	Dr. George H. Agate
Minnesota	Dr. D. S. Fleming
Mississippi	Dr. Durward L. Blakey
Missouri	Dr. E. A. Belden
Montana	Dr. Mary E. Soules
Nebraska	Dr. E. A. Rogers
Nevada	Dr. B. A. Winne
New Hampshire	Dr. William Prince
New Jersey	Dr. W. J. Dougherty
New York State	Dr. Robert M. Albrecht
New York City	Dr. Harold T. Fuerst
New Mexico	Dr. H. G. Doran, Jr.
North Carolina	Dr. Jacob Koomen
North Dakota	Mr. Kenneth Mosser
Ohio	Dr. Calvin B. Spencer
Oklahoma	Dr. F. R. Hassler
Oregon	Dr. Grant Skinner
Pennsylvania	Dr. W. D. Schrack, Jr.
Puerto Rico	Dr. Rafael A. Timothee
Rhode Island	Dr. James E. Bowes
South Carolina	Dr. G. E. McDaniel
South Dakota	Dr. G. J. Van Heuvelen
Tennessee	Dr. C. B. Tucker
Texas	Dr. Van C. Tipton
Utah	Dr. Elton Newman
Vermont	Dr. Linus J. Leavens
Virginia	Dr. James B. Kenley
Washington	Dr. E. A. Ager
West Virginia	Dr. L. A. Dickerson
Wisconsin	Dr. Josef Preizler
Wyoming	Dr. Helen A. Moore

U. S. DEPARTMENT OF
HEALTH, EDUCATION, AND WELFARE
PUBLIC HEALTH SERVICE
Communicable Disease Center
Atlanta, Georgia 30333

Official Business

POSTAGE AND FEES PAID
U. S. DEPARTMENT OF H. E. W.

ROBT J M HORTON 1-4 7 22
46 6341 VISTA RIDGE LA
5 64 CINCINNATI, OHIO 45227