

Mortality in the 1957-58 Influenza Epidemic

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OUTBREAKS of A-prime influenza had scarcely subsided in the United States and Europe late in the spring of 1957 when it was reported that an epidemic of influenza had broken out in Hong Kong about the first part of April. Confirmation that a new strain of type A influenza virus, now referred to as the "Asian" strain, was causing the disease was obtained by the third week of May. The disease was reported to be mild and to have a low mortality, although reports from Manila indicated that the number of deaths from all causes was higher than usual in that city.

Introduction of the new strain of virus into the United States from the Far East probably took place by the last of May 1957, and the first outbreak identified as due to "Asian" influenza began early in June in Newport, R. I. During the summer, the disease in the United States was characterized by a series of localized epidemics, some of them interrelated, in closed groups of teen-age children and young adults. Undoubtedly, dispersal of members of some affected groups to various parts of the country served to seed the population extensively before the end of the summer. During this period, deaths attributed to influenza were few, and the mortality rate from influenza and pneumonia was not higher than expected.

One communitywide epidemic of influenza occurred in Louisiana late in August. In September, when schools in most parts of the coun-

try opened, explosive epidemics began first in high schools and colleges and immediately thereafter in elementary school populations and in preschool children. Incidence in adults was not excessively high. The peak of the epidemic was reached in the third week of October, after which incidence declined throughout November and December. During January, February, and March, the occurrence of influenza was characterized by numerous localized outbreaks, principally in school and other institutional populations.

During the height of the epidemic in October, respiratory disease rates as estimated by the U. S. National Health Survey were about 111 per 1,000 persons per week in the age group 5 to 19 years, 28 per 1,000 under 5 years, 16 per 1,000 in the group aged 20 to 64 years, and about 9 per 1,000 in persons 65 years of age and over.

Data from two sources show the effect of the influenza epidemic on mortality: the numbers of deaths credited to influenza and pneumonia in 108 large cities, reported weekly to the National Office of Vital Statistics, Public Health Service; and the Current Mortality Sample, consisting of a 10 percent sample of all death certificates filed in State departments of health, copies of which are sent each month to the National Office of Vital Statistics (1, 2). These data are provisional; final figures will be available in early 1959.

Influenza and Pneumonia Deaths in 108 Cities

Influenza and pneumonia deaths reported each week from September 1 to March 29 are shown in figure 1 with the 3-year median fig-

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ures for 1954-56. These data show that mortality rose well above expected figures and reached a peak early in November, receding in December and early January 1958 to a level which remained above normal expectancy in December and early January. Another rise in mortality began about the middle of January; it reached a peak about the first of March.

There was a remarkable similarity in the trends of mortality from influenza and pneumonia in the 108 cities of the United States and the 160 large towns of England and Wales as reported in the Weekly Influenza Statement issued by the British Ministry of Health (fig. 1). In both countries, there were two peaks of mortality, but the early peak in the United States was reached 4 weeks later than in Great Britain. If the data are plotted so

that the early peaks in each country are superimposed, the similarities are even more striking. Each group, for example, reached a peak in 6 weeks and declined for a similar period of time. Mortality, however, continued to rise for a longer period during the second rise in the United States.

A total of 14,470 deaths from bronchitis was also reported in England and Wales from the first of September 1957 to March 8, 1958. Whether these correspond to any of the bronchopneumonia deaths reported in the United States or some other entity is not known. There were many more such deaths in England and Wales during the second rise of mortality than from influenza and pneumonia.

The estimated numbers of new cases of upper respiratory illness reported by the U. S. Na-

Figure 1. Numbers of deaths from influenza and pneumonia reported weekly in 108 large cities in the United States and 160 large towns in England and Wales, with the median for the period 1954 through 1956.

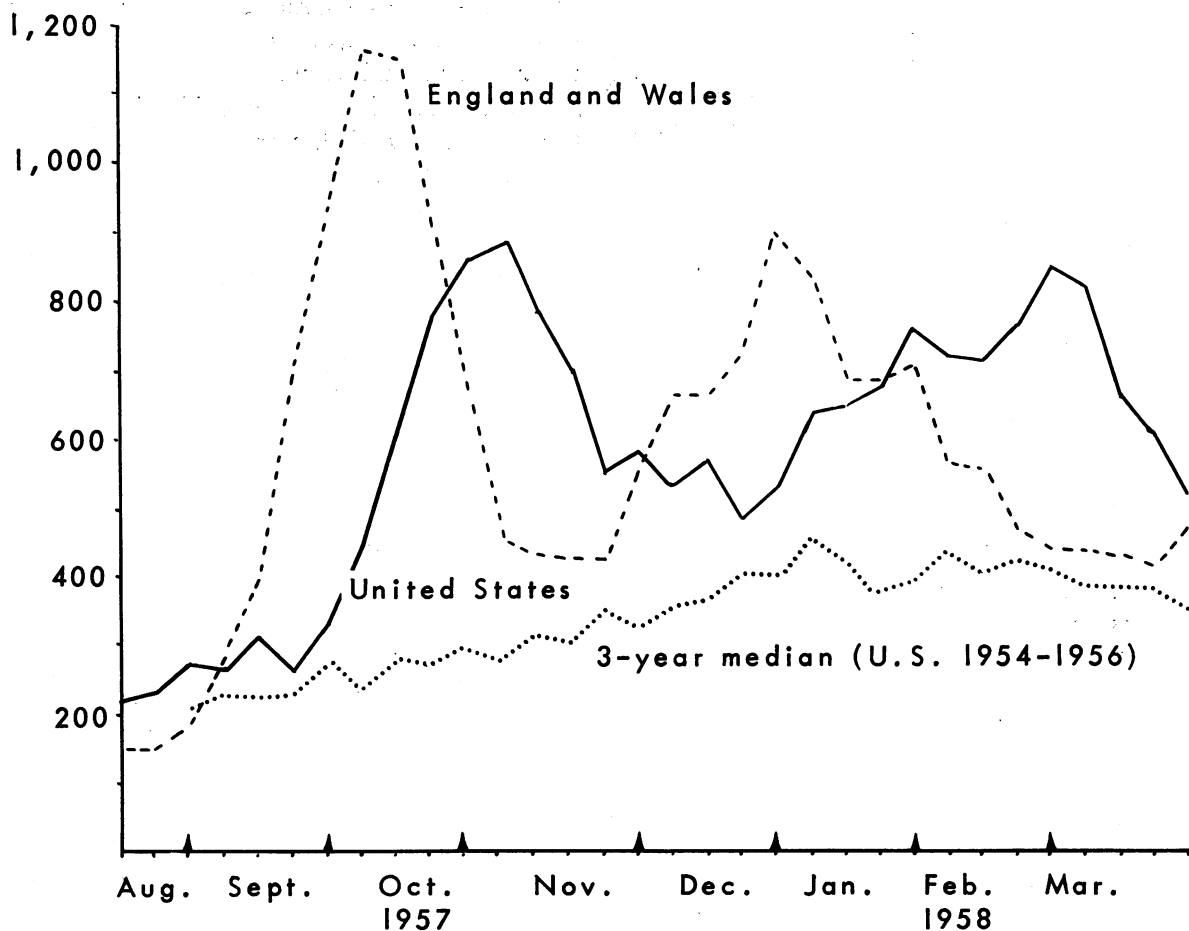
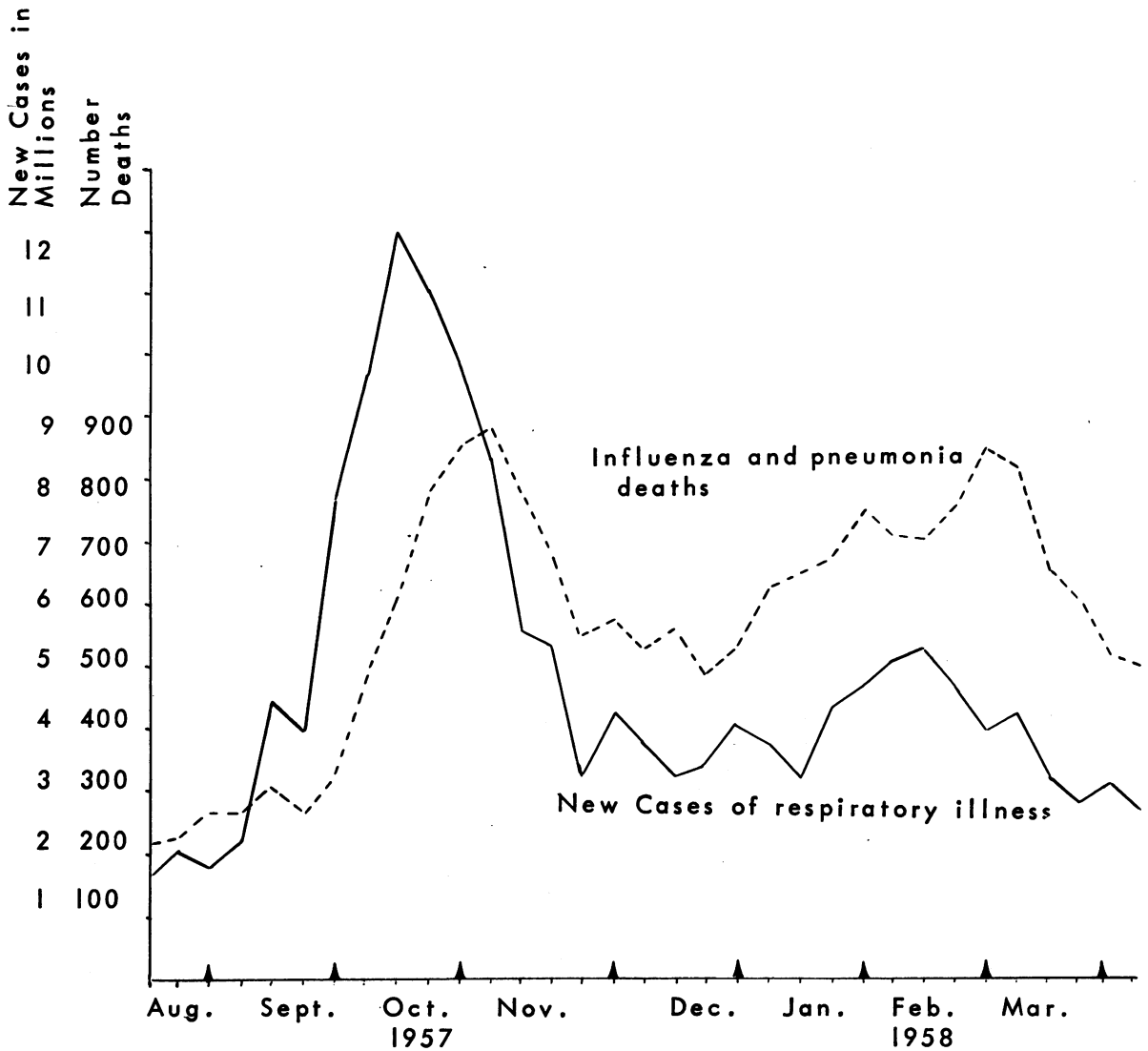


Figure 2. Estimated numbers of new cases of respiratory illnesses¹ and numbers of deaths from influenza and pneumonia, in 108 large cities, by week.



¹ U. S. National Health Survey estimates.

tional Health Survey and the numbers of deaths from influenza and pneumonia reported in 108 cities are shown in figure 2. As would be expected, morbidity rates from respiratory disease began to rise about 3 weeks before there was any apparent rise in mortality from influenza and pneumonia in the large cities. The peak in morbidity was also reached about 3 weeks prior to that for mortality. However, the second rise in mortality was not preceded by any rise in incidence of cases of respiratory disease. As a matter of fact, no rise in incidence was apparent until about 4 weeks after

the beginning of the secondary rise in mortality, and that increase in incidence was moderate.

During the fall of 1957, deaths from influenza and pneumonia were above expected levels in the cities of all regions, but the excess was less pronounced in the West South Central, Mountain, and Pacific groups of cities. Such geographic variations have been common in previous epidemics. The second rise in mortality during January, February, and March 1958 was greater in the East North Central and West South Central cities. It was smaller in the West North Central and South Atlantic,

and was absent in the Mountain and Pacific cities. In two areas, the East and West South Central, the numbers of deaths from influenza and pneumonia in January and February 1958 equaled or exceeded those reported in October and November 1957. There were equally wide variations from city to city within most of the geographic divisions, that is, some cities reported more than the number of expected deaths from influenza and pneumonia in the fall, some during the winter, and others had significant increases in both the fall and the winter.

Mortality in the Nation

When mortality rates from influenza and pneumonia in the 1957-58 epidemic are compared with those for certain other recent epidemics, it is found that the death rates in 1957-58 were not excessively high, as shown in figure 3. The peak in the 1953 epidemic was reached in February when the mortality rate from influenza and pneumonia was 75.9 per 100,000 population, and in 1951 the peak was reached in March with a rate of 59.8. The peak in 1957-58 was reached in November when the rate was 66.6 or about midway between 1951 and 1953. In 1943, the peak month was

February when the death rate from influenza and pneumonia was 94 per 100,000 population. However, the period of increased mortality extended over a longer period of time in 1957-58—about 6 months, compared with the usual 3 to 4 months.

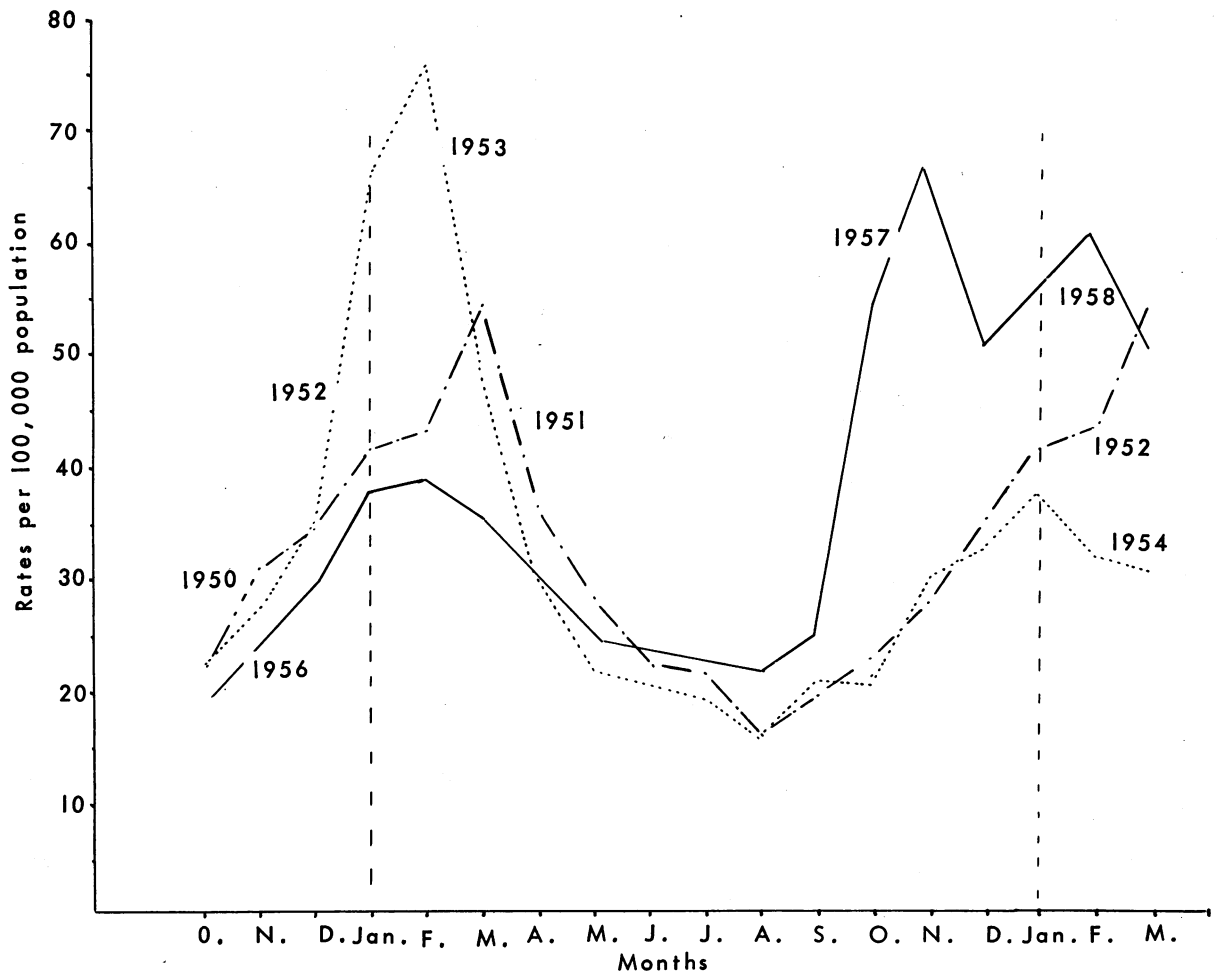
Excess Mortality

The number of deaths above that expected during a nonepidemic period, or the excess mortality, has been used by Collins to measure the effects of epidemics of influenza (3, 4). He has used this method since approximately 1930 to measure the size of epidemics and has shown that 21 separate ones have occurred since 1918-19. By using data from selected cities, Collins showed that excess mortality from influenza and pneumonia in these cities amounted to 99.3 per 100,000 population in 1920, 44.4 in 1928-29, 18.4 in 1936-37, 14.4 in 1943, 3.8 in 1951, and 6.9 in 1953. He also demonstrated that during influenza epidemics there had been an excess in mortality from causes other than influenza and pneumonia. This excess was mainly from cardiovascular diseases. Since 1918 when about 95 percent of the excess mortality was credited to influenza and pneumonia, there has been a gradual decrease in the proportion of

Table 1. Estimated number of deaths by cause for each month from September 1957 through March 1958 compared with estimates for that month in 1956-57

Month and year	All causes	Cardio-vascular diseases	Influenza and pneumonia	All other causes
September.....	{1957 123, 370 1956 118, 280	64, 680 62, 060	3, 430 2, 610	55, 260 53, 610
October.....	{1957 150, 390 1956 131, 610	78, 800 69, 330	7, 860 3, 430	63, 730 58, 850
November.....	{1957 145, 170 1956 129, 070	75, 560 70, 130	9, 280 3, 990	60, 330 54, 950
December.....	{1957 152, 060 1956 138, 520	81, 690 74, 360	7, 400 4, 760	62, 970 59, 400
January.....	{1958 153, 190 1957 146, 380	84, 960 81, 240	7, 680 5, 410	60, 550 59, 730
February.....	{1958 143, 030 1957 127, 600	80, 750 69, 340	7, 850 5, 010	54, 430 53, 250
March.....	{1958 144, 800 1957 142, 510	78, 450 77, 920	7, 210 5, 210	59, 140 59, 380

Figure 3. Estimated death rates from influenza and pneumonia, by month, 1951, 1953, and 1957.



the excess credited to this cause. In recent years, only about a quarter of the excess mortality resulting from influenza epidemics has been attributed to influenza and pneumonia.

In measuring the effects of the 1957-58 epidemic, excess mortality for the country as a whole was obtained by subtracting from the number of deaths during the period September 1957 to March 1958, those reported during the comparable period in the previous year. The 1956-57 period was considered normal because there was little influenza and the numbers of deaths reported were not greatly different from the 3-year (1954-56) mean and median numbers.

Since increases in mortality during influenza epidemics of the past decade or two have not been solely caused by influenza and pneumonia,

data showing excess mortality from other causes are included. The estimated numbers for these categories are shown in table 1 by months from September 1957 through March 1958, and, for comparison, the estimated numbers for the previous year are given as well. The differences between the data for the two periods are shown in table 2. In the same table, these differences or excesses are also expressed as the excess number of deaths per 100,000 population for each month. They should not be confused with mortality rates for the various categories.

The excess mortality for the country as a whole as well as numbers of influenza and pneumonia deaths for the cities occurred in two phases or "waves." The first rose and fell with the explosive epidemic in September, Oc-

Table 2. Excess number of deaths by cause from September 1957 through March 1958 as compared with comparable periods in 1956-57

Month	All causes		Cardiovascular diseases		Influenza and pneumonia		All other causes	
	Number	Rate ¹	Number	Rate ¹	Number	Rate ¹	Number	Rate ¹
September.....	5,090	2.9	2,620	1.5	820	0.5	1,650	1.0
October.....	18,780	10.9	9,470	5.5	4,430	2.6	4,880	2.8
November.....	16,100	9.3	5,430	3.2	5,290	3.0	5,380	3.1
December.....	13,540	7.8	7,330	4.2	2,640	1.5	3,570	2.1
January.....	6,810	3.9	3,720	2.2	2,270	1.3	820	.5
February.....	15,430	8.9	11,410	6.6	2,840	1.6	1,180	.7
March.....	2,290	1.3	530	.3	2,000	1.2	-240	-.1

¹ Excess number per 100,000 population.

tober, and November 1957, and the second occurred in January, February, and March 1958 during a period of localized outbreaks, mainly in schools and institutional populations.

The greatest excess mortality from all causes occurred in October 1957, when incidence of respiratory illness was at its height. This was due mainly to the fact that deaths from cardiovascular diseases were excessively high. On the other hand, the greatest excess in influenza and pneumonia deaths occurred in November, coinciding with the peak in numbers of deaths from this cause reported by the 108 large cities. During this same period, excess deaths from causes other than cardiovascular diseases and influenza and pneumonia were highest.

Mortality during the second phase, during January, February, and March 1958, rose to a high level principally in the category of cardiovascular diseases. In February, the excess

number for this disease category was 22 percent above the excess for the preceding October, while excess deaths from influenza were well below those reported in November. Deaths from all other causes were also well below the level reached in November.

While excess mortality from all causes during the last 4 months of 1957 amounted to 53,510 deaths, the effect on the general death rate of the United States was not striking. The provisional crude rate for 1957 was 9.6 based on the 10 percent sample of deaths as compared with 9.4 in 1956, or an increase of 2.1 percent. If the excess number of deaths during the last 4 months of the year were subtracted from the estimated total for 1957, the rate would have been about 9.3 per 1,000 which would have been lower than that for the previous year.

Table 3. Estimated death rates for influenza and pneumonia, by age group, for the period August through December in 1957 and in 1956

	All ages	Under 1 year	1-24 years	25-44 years	45-64 years	65 and over
<i>1957</i>						
August.....	21.6	161.5	3.3	4.3	15.0	140.5
September.....	24.6	179.5	5.9	4.2	17.2	155.1
October.....	53.3	274.1	16.8	19.4	49.7	294.1
November.....	66.6	321.0	13.7	18.2	63.3	404.6
December.....	50.2	377.6	12.3	11.6	43.3	290.0
<i>1956</i>						
August.....	19.8	97.0	4.0	2.5	16.0	141.8
September.....	19.2	130.3	3.6	3.1	15.1	125.3
October.....	23.8	217.3	5.1	3.0	14.9	153.5
November.....	29.2	250.6	4.4	6.8	16.1	189.7
December.....	33.8	340.1	8.2	5.1	22.1	190.1

Table 4. Excess mortality by age, September 1957 through March 1958

Age (years)	September-December 1957		January-March 1958		Total excess per 100,000 population
	Excess number	Excess per 100,000 population	Excess number	Excess per 100,000 population	
Under 1.....	1, 670	44. 0	490	12. 9	56. 9
1-14.....	2, 270	4. 7	650	1. 4	6. 1
15-24.....	490	2. 2	150	. 7	2. 9
25-34.....	1, 410	5. 9	-430	-1. 8	4. 1
35-44.....	1, 416	6. 2	420	1. 8	8. 0
45-54.....	3, 240	16. 4	2, 410	12. 2	28. 6
55-64.....	7, 500	50. 2	3, 760	25. 1	75. 3
65-74.....	15, 220	156. 5	6, 890	70. 7	227. 2
75 and over.....	20, 310	405. 2	10, 010	199. 7	604. 9

Age Distribution of Deaths

The age distribution of deaths from influenza and pneumonia is available for the last 5 months of 1957. These have been compared with those for a similar period of 1956 (see table 3). These data show that, while all age groups experienced some increase in mortality rates, the highest rate per 100,000 population was in the very young age group under 1 year and in persons 65 years of age and over. There was a greater percentage increase in the rates in the age groups from 1 to 64 years, but this was not sufficient to change the contour of the curve of influenza and pneumonia mortality seen in recent epidemics.

The numbers of deaths by age groups in excess of those for the previous year are shown for all causes in table 4. Two periods of time, corresponding to the two phases of the influenza epidemic, are shown. The excess is also expressed as the number of deaths per 100,000 population above that for the previous year. These data show that 80 percent of the excess deaths from September to December, inclusive, occurred among persons above the age of 54 years. From January to March, inclusive, the proportion was 85 percent for the same age group. The proportions of the excess which occurred in infants were 3 and 2 percent, respectively, for the two periods of time. These data point up the vulnerability of persons in the older age groups during the recent influenza epidemic. The excess mor-

tality in infants was relatively small and, in children and young adults, slight.

Discussion

The recent epidemic caused by the Asian strain of type A influenza virus appears to have been similar to the 1918-19 epidemic with respect to its seasonal occurrence. Both were characterized by localized outbreaks prior to the explosive type of infection early in the fall. Both were milder in the following winter months.

The recent epidemic differed from that of 1918-19 in that mortality this time was lower; most of the excess deaths were credited to cardiovascular disease, and deaths were relatively more common in older persons, in contrast with high mortality principally from influenza and pneumonia in young adults in 1918-19.

The epidemic of "Asian" influenza was similar in most respects to others caused by the A-prime strains during the past decade in which mortality was not excessively high; most of the excess deaths occurred in older persons; and a large proportion of excess deaths was credited to cardiovascular diseases. However, the 1957-58 epidemic differed in that the main or explosive part occurred early in the fall rather than in the winter, it was preceded by a series of localized outbreaks, and it was followed by a secondary rise in mortality with little evidence of widespread infection.

The very large excess in numbers of deaths

from all causes, and, especially from cardiovascular diseases, in January, February, and March 1958 is difficult to explain. There was no evidence of widespread occurrence of influenza at that time, and excess mortality from influenza and pneumonia was small compared with that of the previous October and November. The actual number of deaths from influenza and pneumonia was 2,000 less in February 1958, the peak month, than it was in November 1957 and the number which would be expected to occur was about 1,000 more in February than in November. Consequently, the excess was relatively small for this category. Persons in the older age groups, among whom most of the deaths occurred, may have had during this period respiratory infections that were difficult to recognize, possibly the reason why the majority of the deaths were credited to cardiovascular diseases. The suggestion also has been made that many of those who died in January and February had been weakened by attacks of influenza in the fall of 1957. Since a number of deaths during the epidemic in the fall were caused by staphylococcal pneumonia, the possibility that the increase in deaths in January, February, and March was due to this infection has also been proposed. Information from certain hospital centers and mortality data do not support this hypothesis. The reason for the increase in mortality during the last part of the winter remains unexplained.

The data presented in this report indicate

very clearly that the total impact of the 1957-58 influenza epidemic on mortality cannot be approximated if only deaths credited to influenza and pneumonia are taken into consideration. The data show that the increase in the number of deaths credited to cardiovascular diseases accounts for approximately one-half of the total excess mortality. This is not surprising, since most of the deaths occurred in older persons, many of whom would be expected to have some evidence of cardiovascular pathology.

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CDC Courses in Insect and Rodent Control

Refresher training in insect and rodent control will be offered at the Communicable Disease Center, Atlanta, Ga., during September 15, 1958, through June 1959, according to the following schedule:

Insect control. September 15-26.

Rodent control. September 29-October 10.

Mosquito control. November 2-7.

Biology and identification of arthropods of public health importance. January 12-23.

Epidemiology and control of vector-borne diseases. February 16-20.

Insect and rodent control. June 1-12.

There are no tuition or laboratory fees for the courses. Students will be accepted from State and local health departments, the Armed Forces, and other organizations concerned with insect or rodent control. Qualified students from other countries will be accepted and given opportunity to study vectors of important diseases.

Application forms may be obtained from the Chief, Training Branch, Communicable Disease Center, Public Health Service, 50 Seventh Street, NE., Atlanta 23, Ga.