

Influenza Epidemics During 1951–56 With a Review of Trends

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DEATHS from influenza and pneumonia in the United States have decreased steadily since 1900 except during the great pandemic of 1918–19. The greatest decrease began about 1937, with the advent of the sulfa drugs and, a few years later, of penicillin and aureomycin. Deaths from influenza and pneumonia, however, still rank among the first 10 causes of death in the United States and were sixth in 1955 (1).

Because influenza and pneumonia are of such major importance as a cause of death and because of the explosive nature of influenza, these diseases continue to be of great concern. The Influenza Information Center at the National Office of Vital Statistics, part of the World Health Organization Influenza Study Program in the United States, receives reports on local outbreaks of influenza and on the predominating strain of the virus involved in these outbreaks (2).

The weekly reports of mortality from influenza and pneumonia received by the National Office of Vital Statistics from the health departments of 62 large cities are the basis of this review. Since pneumonia is so often the termination of fatal cases of influ-

enza, mortality from influenza can hardly be separated from mortality from pneumonia. This study reviews excess mortality from influenza and pneumonia from the summer of 1950 through the summer of 1956. Previous papers have reviewed excess mortality during epidemics of these diseases from 1918 to 1951 (3–8).

Mortality Trend, 1900–56

The trend of influenza and pneumonia mortality for the registration States from 1900 and for groups of cities from 1910 is shown in figure 1.

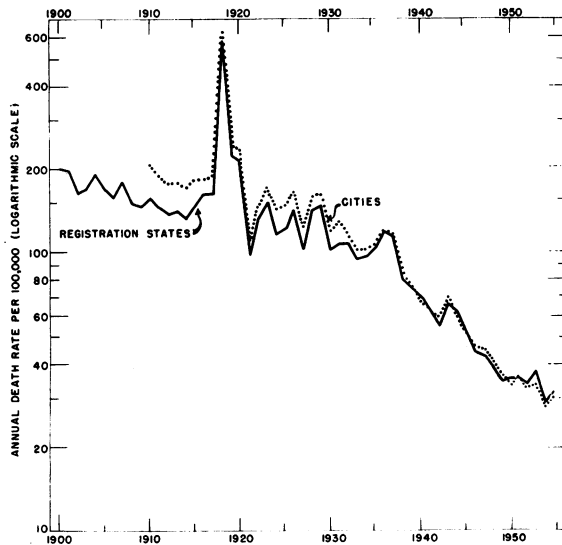
For the purpose of showing the trend line on a comparable basis for the whole series of years, mortality rates from 1949 through 1955 were corrected by the ratio of the fifth to the sixth revision of the International Lists (9). Since the trend is plotted on a logarithmic scale which shows the percentage rather than the actual change in the rates, the curve would remain the same except for a difference in its level.

The general downward trend in influenza and pneumonia mortality becomes more abrupt in 1937. This decline continues through 1954 but provisional data for 1955, based on the NOV 5 1955 10 percent sample, shows a small increase in influenza and pneumonia deaths.

The trend line for the cities parallels very closely the trend line for the registration States. The 62 cities in this study had a combined population in 1950 of 36,000,000. With the exception of four cities in the Mountain States, each city had a population of over 100,000. The

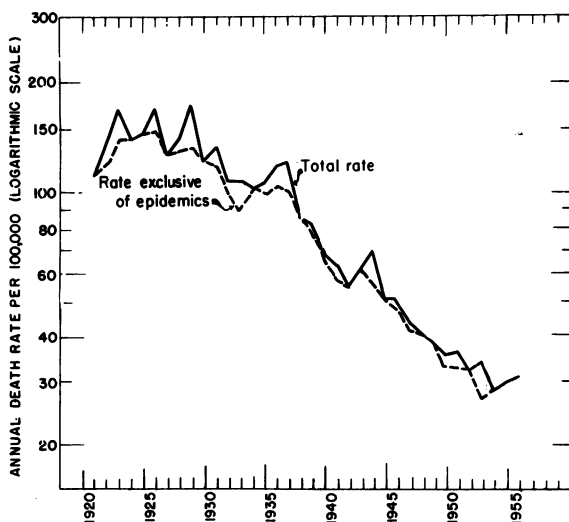
Dr. Collins is chief of the Morbidity and Health Statistics Branch, Division of Public Health Methods, Public Health Service, and Mrs. Lehmann is an assistant statistician in that branch. The National Office of Vital Statistics cooperated with the Division of Public Health Methods in this study, which includes a review of trends and epidemics of influenza and pneumonia in the years preceding 1951.

Figure 1. Trend of mortality from influenza and pneumonia in the registration States, 1900–55, and in groups of cities in the United States, 1910–55.



NOTE: Rates are for calendar years: 35 cities, 1910–19; 90 cities, 1920–42; 56 cities, 1943–50; 62 cities, 1951–55. Registration States rates for 1949–55 are plotted on the basis of the fifth revision of the International Lists (9).

Figure 2. Trend of mortality from influenza and pneumonia in groups of cities in the United States, including and excluding epidemic excess deaths, 1920–56.



NOTE: Rates are for years ending in mid-August, that is, 32d week of the calendar year. For data prior to 1943 see tables 1 and 3 of reference 8.

weekly death reports from the group of cities show about the same increase in mortality from influenza and pneumonia in 1955 as the 10 percent NOVS sample for the United States.

The trend of annual death rates from influenza and pneumonia for these same cities for the years ending in mid-August 1920–56 is shown in figure 2. The solid line shows the total rates and the dotted line shows the rates exclusive of excess deaths during influenza epidemics. For the winter of 1953–54, mortality rates are the lowest of any year for which influenza and pneumonia deaths have been recorded since the establishment of the registration area. Mortality rates for the years 1954–55 and 1955–56 seem to have followed a small upward course (table 1).

Table 1. Annual mortality from influenza and pneumonia in cities of the United States¹

Year ending in mid-August (32d week)	Annual death rate per 100,000	
	Including epidemic excess deaths	Excluding epidemic excess deaths
1943 ² -----	62.2	62.2
1944-----	70.4	56.0
1945-----	51.4	51.4
1946-----	51.2	47.5
1947-----	44.4	41.9
1948-----	41.4	41.4
1949-----	38.9	38.9
1950-----	35.6	32.9
1951-----	35.8	32.9
1952-----	32.8	32.8
1953-----	34.2	27.3
1954-----	28.8	28.8
1955-----	30.2	30.2
1956-----	31.3	31.3

¹ 56 cities, 1943–50; 62 cities, 1951–56.

² For years prior to 1943, see tables 1 and 3 of reference 8.

The trend of annual mortality rates for influenza and pneumonia by geographic area from mid-August 1935 to mid-August 1956 is shown in figure 3. As figure 1 shows for the combined group of cities, these are the years of the most dramatic decline in these rates. The 1943 epidemic is evident in all geographic sections. The mortality rates in 1950–51 and again in 1952–53 show the highest peaks for the Mountain area. Except in New England

and on the Pacific coast, the 1953 rise in the mortality rates for influenza and pneumonia (shown in figures 1 and 2 for the United States and for the groups of cities respectively) is evident in each geographic section. In the winter of 1955-56, these rates increased in all geographic sections except the Middle Atlantic (table 2).

Excess Mortality

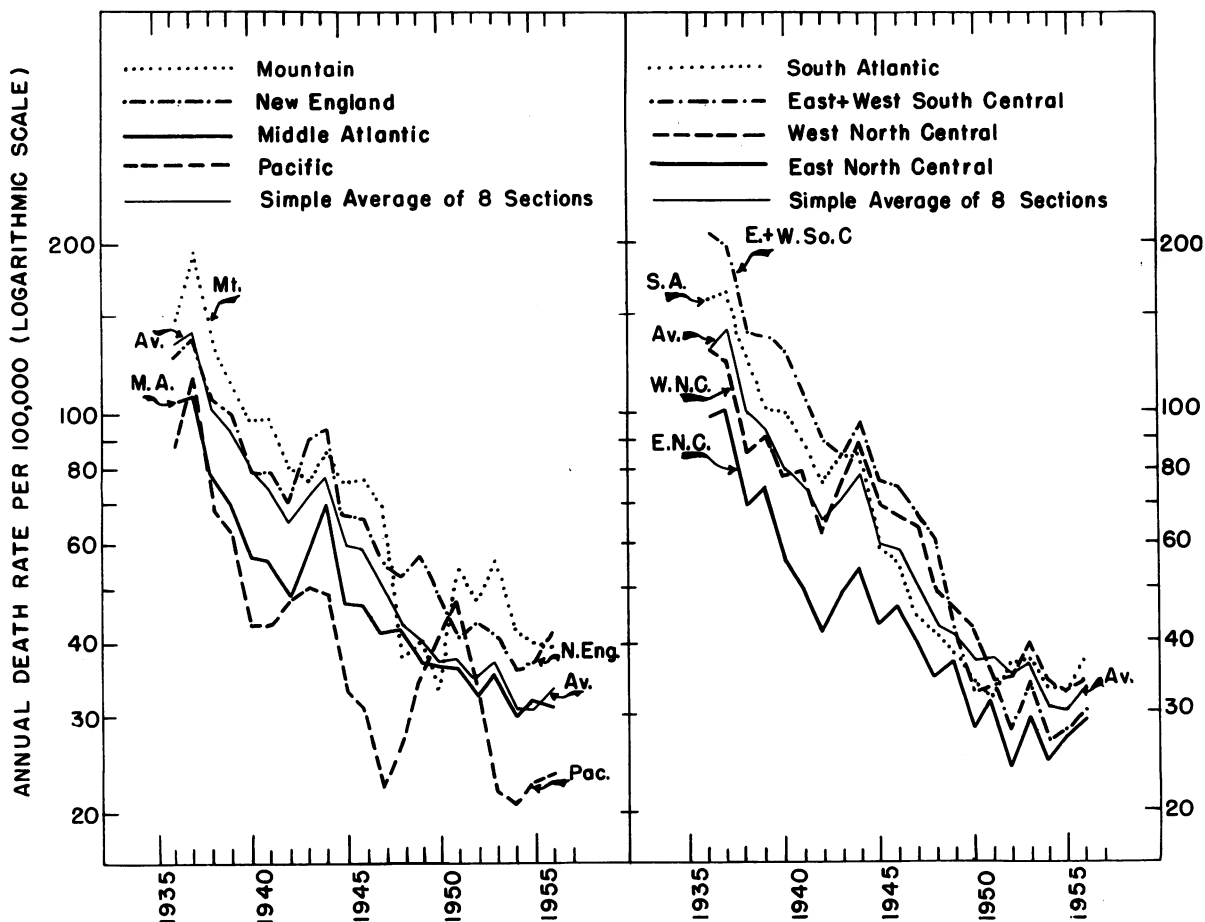
Weekly excess mortality has been used as the measure of size of outbreaks of influenza in previous studies of this series. The method of computing the normal seasonal curve has been described in detail in a preceding paper (3). For the years 1950-56 a seasonal expectancy for deaths from influenza and pneumonia was

based on a 5-year moving average of rates for the group of 62 cities for corresponding weeks of the 5 years ending in August 1955.

The seasonal expectancy was computed as follows: The moving averages of the 5-year means of rates were plotted on a large-scale chart and definite epidemic items were replaced by values interpolated by inspection. Adjustment for change in level of the actual rates was made at quarterly intervals by relating the average of these actual nonepidemic rates for each quarter of each year to the corresponding quarter of the normal seasonal curve to obtain a ratio of the actual to the expected rate.

Between these quarterly ratios (centering in the middle of each quarter) interviewing weeks were obtained by a straight line interpolation.

Figure 3. Trend of mortality from influenza and pneumonia in cities in each of eight geographic sections of the United States, 1935-56.



NOTE: For data prior to 1943, see table 3 of reference 8.

The ratio for a given week of each year was applied to the rate for the corresponding week in the normal seasonal curve to obtain a seasonal expectancy for each week of each year. This quarterly adjustment, while rough, gives a fairly good approximation to the normal seasonal expectancy of influenza in each of the years in this study and a basis from which to derive the weekly deviations around this normal

expectancy. This same process was repeated for each of the geographic sections.

These data are shown in figure 4 for the group of 62 cities in the study. Since 1950 there have been two epidemics of influenza, a small one early in 1951 and a larger one in 1952-53. The 1952-53 outbreak is the largest since the epidemic of 1943-44 but only about half the size of that outbreak in terms of total

Table 2. Annual total mortality per 100,000 from influenza and pneumonia in 62 cities of eight geographic sections of the United States, 1951-56

Year ending in mid-August (32d week)	All cities	New England	Middle Atlantic	East North Central	West North Central	South Atlantic	East and West South Central	Mountain	Pacific
1951 ¹	35.8	40.9	35.3	31.1	34.7	32.4	34.3	54.0	45.8
1952.....	32.8	43.8	32.6	24.4	34.8	36.5	27.8	47.5	33.6
1953.....	34.2	42.2	35.4	30.4	40.1	37.3	33.8	55.5	22.4
1954.....	28.8	36.3	30.3	24.7	34.4	33.5	26.8	41.5	21.0
1955.....	30.2	37.5	32.0	27.4	33.0	32.7	27.7	40.1	22.9
1956.....	31.3	41.9	31.2	29.1	34.5	37.4	30.2	40.7	23.9

¹ For years prior to 1951, see table 4 of reference 3.

Table 3. Summary of period covered by epidemics and of the excess¹ mortality from influenza and pneumonia in epidemics in groups of cities² in the United States, 1951-56

Date of epidemic and geographic section	Total excess mortality during whole epidemic per 100,000 population	Date of middle (Wednesday) of peak week	Actual excess per 100,000 for peak week	Total number of weeks included	Approximate dates of epidemic	
					Beginning	End
<i>Early 1951³</i>						
All cities.....	3.8	Mar. 14	0.64	10	Feb. 11	Apr. 21
New England.....	6.5	Feb. 28	2.09	8	Feb. 11	Apr. 7
Middle Atlantic.....	5.0	Feb. 28	1.15	9	Feb. 11	Apr. 14
East North Central.....	3.1	Mar. 21	.65	11	Mar. 4	May 19
South Atlantic.....	4.8	Apr. 11	.58	16	Dec. 31	Apr. 21
East and West South Central.....	5.3	Feb. 14	.87	11	Feb. 4	Apr. 21
Mountain.....	5.0	Oct. 25	1.56	8	Oct. 8	Dec. 2
Pacific.....	6.0	Mar. 14	1.05	12	Feb. 11	May 5
<i>Early 1953</i>						
All cities.....	6.9	Feb. 11	.94	13	Dec. 28	Mar. 28
New England.....	4.5	Feb. 18	.76	11	Jan. 4	Mar. 21
Middle Atlantic.....	3.9	Feb. 11	.70	13	Dec. 28	Mar. 28
East North Central.....	3.4	Feb. 11	.65	11	Dec. 28	Mar. 14
West North Central.....	10.9	Jan. 28	2.48	12	Dec. 28	Mar. 21
South Atlantic.....	6.8	Feb. 25	1.38	11	Dec. 28	Mar. 14
East and West South Central.....	9.8	Jan. 28	1.99	13	Dec. 28	Mar. 28
Mountain.....	13.0	Jan. 28	2.52	14	Dec. 14	Mar. 21
Pacific.....	3.5	Mar. 11	.56	15	Dec. 28	Apr. 11

¹ For methods of computation see appendix to reference 3.

² For names of cities see appendix tables in reference 3. The 6 cities added to the Mountain section were Albuquerque, Colorado Springs, Ogden, Phoenix, Pueblo, and Tucson.

³ For years prior to 1951 see table 5 of reference 3.

NOTE: Geographic sections omitted from the table had no excess mortality from influenza and pneumonia during the particular epidemic.

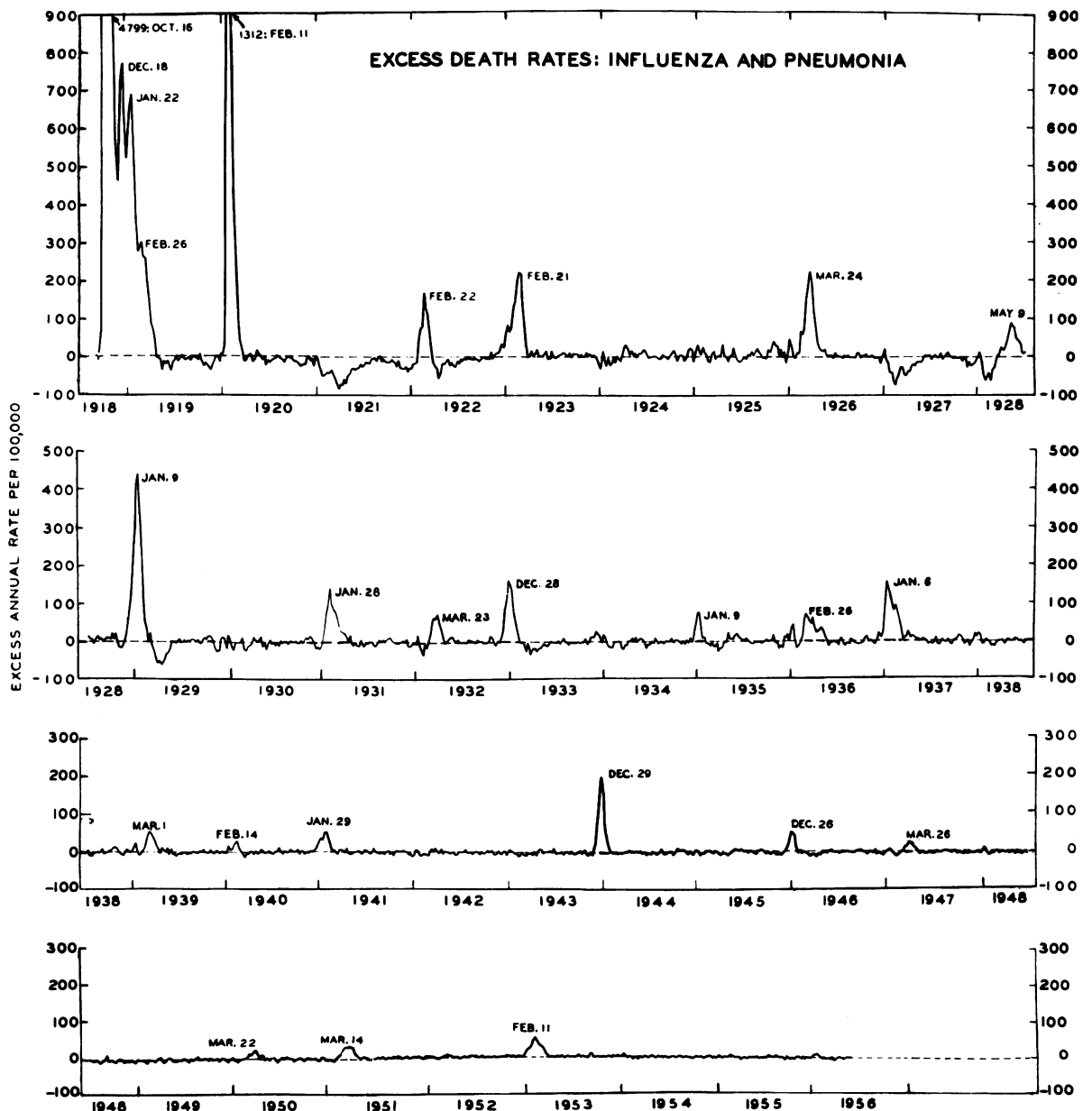
excess mortality. The total excess mortality for the whole of an epidemic is obtained by reducing the sum of the rates for the weeks involved from an annual to an actual basis.

The high mortality rates for all causes of death for the United States in January and

February of 1953 reflect the high mortality from influenza and pneumonia (2).

Table 3 gives a summary of the total excess mortality from these causes during epidemics in 1951-56, the date of the middle of the peak week, and the approximate length of each epi-

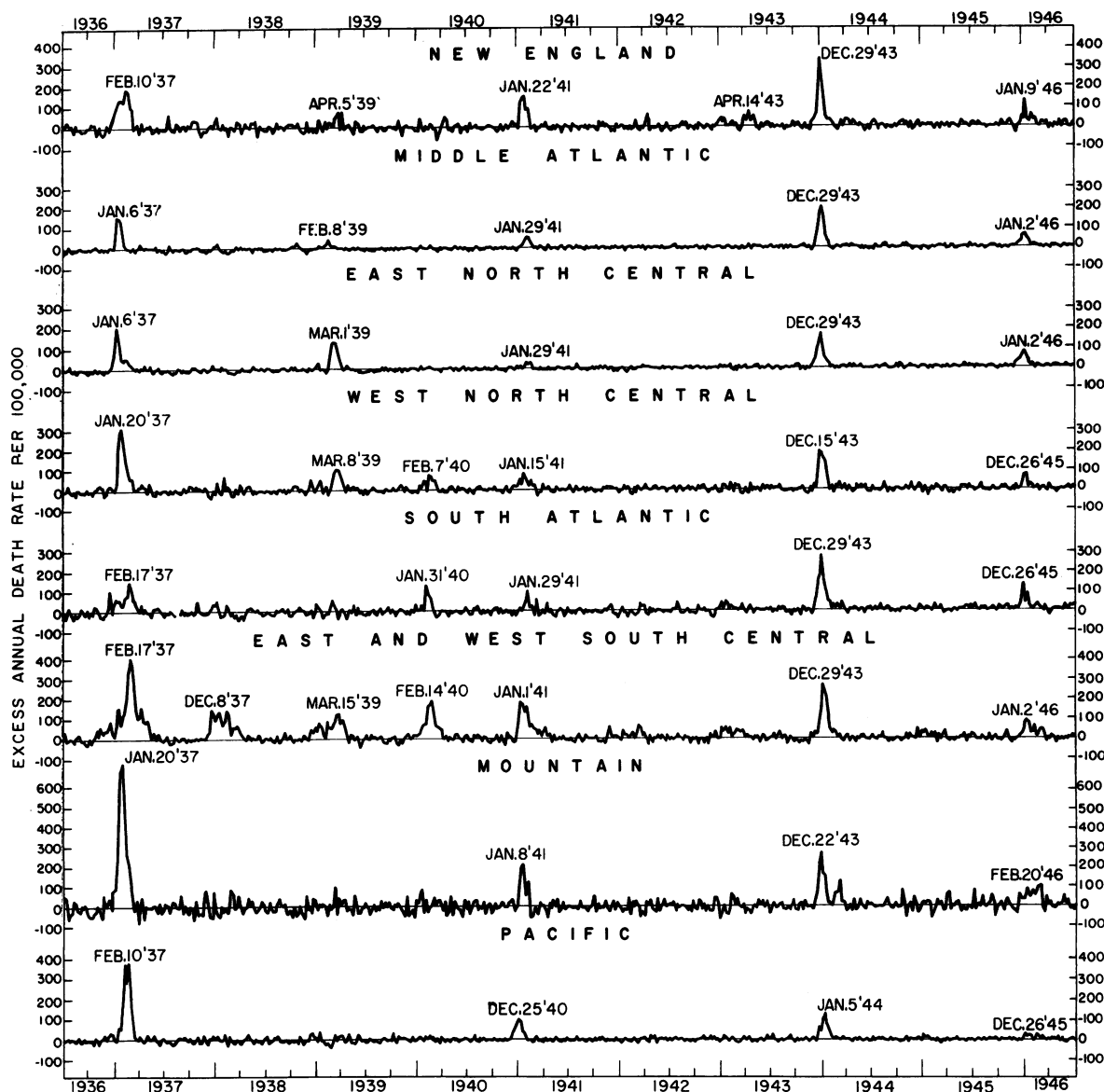
Figure 4. Weekly excess mortality (annual basis) from influenza and pneumonia in groups of cities in the United States, September 1918 to August 1956.



NOTE: Dates on charts are middle (Wednesday) of peak weeks. In 1920-29, excess rates are deviations from the smoothed median rate for corresponding weeks for the period 1921-27; in 1930 and later years, they

are deviations from average rates for corresponding weeks of years exclusive of or without serious epidemics, with adjustment for downward trend in non-epidemic rates.

Figure 5. Weekly excess mortality (annual basis) from influenza and



demie for the combined group of cities and for each geographic section where epidemics have occurred.

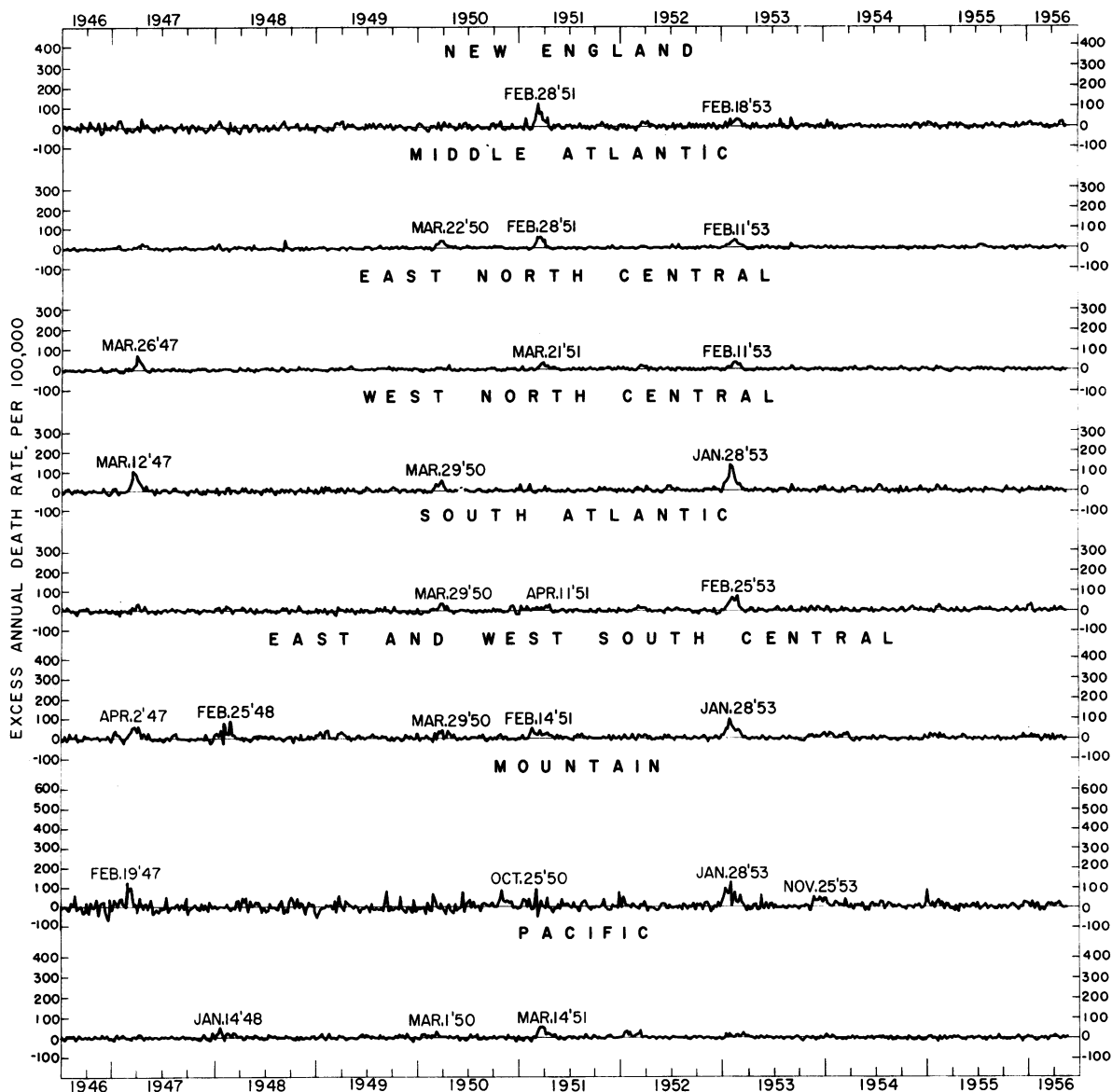
Excess Mortality in Geographic Sections

The weekly excess mortality from influenza and pneumonia, plotted for each of eight geographic sections from mid-August 1936 through mid-August 1956, is shown in figure 5. The United States census geographic sections are used in this study except that the East South Central and West South Central sec-

tions are combined. In 1950-51 there was no measurable excess of mortality from influenza and pneumonia in the West North Central section but moderate-sized epidemics are quite evident in all other sections.

In December 1952 some scattered outbreaks of influenza were reported to the Influenza Information Center and the National Office of Vital Statistics. By January 1953 these outbreaks had become quite widespread over the East and West South Central, the West North Central, and the Mountain sections, and in most of the States of the South Atlantic section

pneumonia in groups of cities in each geographic section, 1936-56.



(10, 11). These four sections had the highest total excess mortality from influenza and pneumonia (fig. 5 and table 3). The epidemic of 1952-53 in the West North Central section, with a total excess mortality of 10.9 per 100,000 population, was the most severe of any outbreak in that region since 1943, although the mortality was only slightly higher than in the epidemic of 1947. The rates of excess deaths from these causes in 1953 in New England and the Middle Atlantic States were slightly lower than in 1951 and about the same in the East North Central section. The Pa-

cific section had a total excess mortality from influenza and pneumonia in 1951 of 6.0 per 100,000 but was affected very little in 1953.

In the previous report (3), data for the Mountain section were available for only 2 large cities, but since 1950 weekly reports have been obtained from 6 additional cities. This adds about half a million population to the Mountain area and probably accounts for the fact that the deviations from the baseline are not as irregular as in previous years.

Although the yearly mortality rates for influenza and pneumonia for the geographic sec-

Table 4. Excess ¹ weekly death rates (annual basis) per 100,000 from influenza and pneumonia, 1951-56, 62 cities ²

Week of year	Smoothed mean	1951 ³	1952	1953	1954	1955	1956
1	37	+4	0	+18	+10	+5	+6
2	38	+5	+6	+23	+2	-1	+9
3	39	-1	0	+29	-1	-1	+4
4	38	+2	-1	+44	+1	-2	-3
5	38	-4	-3	+47	-2	-1	-1
6	38	+2	-3	+49	-5	+6	-2
7	38	+10	-2	+43	+2	+6	-1
8	39	+10	-6	+34	-5	+5	-6
9	39	+33	0	+32	-6	+2	-1
10	40	+27	+5	+19	+1	-2	-2
11	40	+33	+8	+8	-3	-2	-4
12	40	+25	+4	+3	-2	-4	-4
13	39	+28	+4	-1	+3	-5	+1
14	38	+14	+4	-1	0	-1	+4
15	37	+11	-5	-1	-1	0	+1
16	36	+3	0	-1	+4	-3	-2
17	34	-1	-4	+1	+3	-2	-1
18	31	+2	-3	+2	-3	-2	+3
19	29	+1	-4	0	-4	-1	+1
20	28	+4	+2	+6	0	-1	0
21	27	-2	0	-3	-2	+3	
22	26	-1	-1	+1	+2	-1	
23	26	-1	0	+1	+1	-1	
24	25	0	+1	-2	+4	-2	
25	25	-1	+2	-1	+2	0	
26	25	-1	0	-1	-4	0	
27	25	-4	+7	0	-2	+6	
28	25	+1	0	-5	+2	+5	
29	25	-2	+1	+3	+1	+3	
30	24	-4	+6	-3	+2	+2	
31	24	+3	+1	-2	+3	+6	
32	23	-2	-4	-4	+2	+4	
33	22	0	0	-4	0	-1	
34	22	-2	+1	-3	-2	+2	
35	22	-2	-3	+14	-2	-2	
36	23	+1	-1	+11	-1	-6	
37	23	+4	-3	-2	0	-2	
38	23	+2	0	-1	-4	-4	
39	24	-1	-4	0	0	-5	
40	25	-2	0	-2	+5	-4	
41	26	-1	-3	-2	-1	-4	
42	26	+1	-1	0	-1	+1	
43	27	-2	+1	-1	-1	+1	
44	28	-2	+3	-3	-4	+1	
45	29	+1	+3	-1	-1	-1	
46	30	+1	0	+2	0	+5	
47	31	+2	+6	0	+2	-5	
48	32	0	0	0	+2	+1	
49	33	+1	+4	+2	-4	-2	
50	34	-3	+3	+5	+1	-1	
51	35	-1	+1	0	-1	+1	
52	36	+3	-2	+2	+4	+6	
53			+9				

Quarterly factors for adjustment of means to current nonepidemic level

1st quarter (1st-13th weeks)	1. 223	1. 140	0. 773	0. 901	1. 009	1. 018
2d quarter (14th-26th weeks)	1. 150	1. 005	. 867	. 920	. 932	
3d quarter (27th-39th weeks)	1. 010	1. 013	. 985	. 922	1. 079	
4th quarter (40th-52d weeks)	1. 066	1. 014	. 958	. 986	1. 034	

¹ See footnote 1 to table 3. ² See footnote 2 to table 3. ³ For years prior to 1951 see appendix table A of reference 3.

tions go up slightly for the first half of 1956 (fig. 3), the method used to determine excess mortality does not indicate an epidemic in any of the sections.

The weekly deviations in rates for all 62 cities in the study and the quarterly factors for adjustment of the normal seasonal curve to nonepidemic levels, from which these weekly deviations are derived, are shown in table 4.

Summary

The general trend of mortality from influenza and pneumonia has been downward since 1900, except during the great influenza pandemic of 1918-19. In 1900, the death rate from influenza and pneumonia was about 200 per 100,000 but by 1935 it had declined to about 100 per 100,000.

Beginning about 1937 with the advent of the sulfa drugs and, a few years later, of penicillin and aureomycin, the downward trend of deaths from influenza and pneumonia became more abrupt. In 1955 the provisional death rate for the United States from these causes was 27.5, a decline from 1935 of roughly 75 percent. The trend lines for the registration States and for the groups of cities reporting to the National Office of Vital Statistics have been consistently parallel and since 1937 lie very close together.

The same downward trend for the registration States and for the groups of all cities combined is seen in each geographic section.

Data on weekly mortality from influenza and pneumonia have been available for large cities in the United States since 1918. By the method used in this and previous studies to determine weekly excess mortality, there have been 21 epidemics since the 1918-19 pandemic. The most severe epidemics occurred in the decade 1920-29. The most widespread of these was early in 1920, with a total excess mortality of 99.3 per 100,000. Another severe epidemic occurred in the winter of 1928-29, with a total excess mortality of 44.4 per 100,000. In the next decade, the two most severe epidemics occurred in the winters of 1932-33 and 1936-37, with total excess mortality rates per 100,000 of 19.2 and 18.4, respectively. In the decade 1940-49, the only epidemic that compared in size with the epidemics of 1932-33 and 1936-37

was in the winter of 1943-44, when the total excess mortality from influenza and pneumonia was 14.4 per 100,000.

There have been two influenza epidemics since 1950. The first, in 1951, involved all geographic sections except the West North Central and had a total excess mortality of 3.8 per 100,000; the second, the most widespread since 1943-44, occurred in early 1953, with a total excess mortality rate of 6.9 per 100,000 for all cities combined.

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Tables 5-12, giving the weekly deviations in mortality rates for influenza and pneumonia for the years 1951-56, are on file with the Division of Public Health Methods, Public Health Service, and may be obtained upon request.

REFERENCES

- (1) Annual Summary for 1955—Part 2: Estimated numbers of deaths and death rates for selected causes: United States, 1955. *In* Monthly Vital Statistics Report, vol. 4, No. 13, May 28, 1956. Washington, D. C., U. S. National Office of Vital Statistics, 1956.
- (2) Provisional information on selected notifiable diseases in the United States for weeks ended Jan. 24, 1953, and Jan. 31, 1953. *In* Morbidity and Mortality Weekly Report, vol. 2, No. 4, Feb. 6, 1953; vol. 2, No. 5, Feb. 13, 1953. Washington, D. C., U. S. National Office of Vital Statistics, 1953.
- (3) Collins, S. D., and Lehmann, J.: Trends and epidemics of influenza and pneumonia, 1918-1951. *Pub. Health Rep.* 66: 1487-1516, Nov. 16, 1951.
- (4) Collins, S. D.: Influenza and pneumonia excess mortality at specific ages in the epidemic of 1943-44 with comparative data for preceding epidemics. *Pub. Health Rep.* 60: 821-835; 853-863, July 20, July 27, 1945.
- (5) Collins, S. D.: Influenza-pneumonia mortality in a group of about 95 cities in the United States, 1920-29. *Pub. Health Rep.* 45: 361-406, Feb. 21, 1930.
- (6) Collins, S. D., and Gover, M.: Influenza and pneumonia mortality in a group of about 95 cities in the United States during four minor epidemics, 1930-35; with a summary for 1920-35. *Pub. Health Rep.* 50: 1668-1689, Nov. 29, 1935.
- (7) Collins, S. D., Frost, W. H., Gover, M., and Sydenstricker, E.: Mortality from influenza

- and pneumonia in 50 large cities of the United States, 1910-29. Pub. Health Rep. 45: 2277-2328, Sept. 26, 1930.
- (8) Gover, M.: Influenza and pneumonia mortality in a group of 90 cities in the United States, August 1935-March 1943, with a summary for August 1920-March 1943. Pub. Health Rep. 58: 1033-1061, July 9, 1943.
- (9) World Health Organization: Manual of the international statistical classification of diseases, injuries, and causes of death. Sixth revision of the international list of diseases and causes of death, adopted 1948. I. Introduction. II. Alphabetical index. Geneva, World Health Organization, 1948, 1949.
- (10) Davis, D. J., and Dauer, C. C.: The occurrence of influenza in the United States, 1952-53. Pub. Health Rep. 68: 1141-1146, December 1953.
- (11) Davis, D. J.: Occurrence of influenza, July 1953 to June 1954. Pub. Health Rep. 69: 1150, December 1954.

Social Security Changes Affecting the Disabled

Recent amendments to the Social Security Act extend to persons severely disabled before January 1, 1955, a year's leeway in applying for a "freeze" of their social security records. The application deadline has been advanced from June 30, 1957, to June 30, 1958.

The amendments also provide that veterans with service-connected disabilities may receive full social security disability insurance benefits along with their full disability compensation from the Veterans Administration.

Under the social security disability "freeze" provision, the years during which a worker has no earnings because of his disability are not counted in figuring the benefits payable to him or his family in the future.

Until the enactment of the new amendments, disabled veterans receiving compensation from the Veterans Administration for service-connected disabilities had their social security disability insurance benefits reduced by the amount of their veterans compensation payment.

The first social security disability insurance benefits are payable to disabled workers aged 50 to 65 beginning with the month of July 1957.

The new amendments do not change the provision requiring that social security disability insurance benefits be reduced by the amount of any veterans pension for non-service-connected disability. This offset of benefits is also made where a disabled worker is receiving another type of Federal payment for disability or disability payments under a Federal or State workmen's compensation law.