

VII.

Report on an investigation of the incidence and effects of Influenza among the Population of Warrington (Lancs.).

By

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General Course of the Epidemic.—The epidemic occurred in three distinct waves.

The first stage commenced in Warrington about the end of June, 1918, and although the whole town was more or less affected simultaneously, probably in the early stages the Orford District was attacked most severely. The only apparent reason that can be assigned for this is the greater congestion of property in this area compared with the rest of the town.

The worst period of this first stage was reached about the middle of July, and the number of cases then diminished until the second week in August.

A second stage involving the whole town commenced about the third week of October, and continued up to the end of December.

The third stage began about the middle of February and lasted to the end of April. Again the whole town was involved.

The death-rate was heavy, and some particulars are given on pages 554 and 555.

Method of Inquiry.—The notification of mortality figures of influenza alone are not of great service. It is, of course, quite as important to have full particulars of those who do not contract the disease during an epidemic as of those who do. In order, therefore, to obtain such information, a house to house inquiry was instituted. It was not possible to visit all the houses in the town, but a fair sample was taken. Altogether 41 streets were chosen in various districts, including residential and industrial quarters, better class and lower class homes, some in open areas, others in congested areas, but quite irrespective of any known incidence of influenza in the neighbourhood. In each street at least half-a-dozen consecutive houses were selected haphazard, and full inquiries made into the medical history of each one of the inmates in these houses.

In the 41 streets, investigations were made in 353 houses regarding 1,626 inmates living therein.

The number of deaths from influenza found to have occurred during the epidemic in these houses was 9 out of the 1,626 persons.

The population of "Warrington in October, 1918 (estimated from the Ration Books issued from the Food Control Office), was 68,677.

If, then, the deaths from influenza were spread throughout the population in the ratio found among the portion visited, there would have been 379 deaths in all, or a mortality rate of 5.5 per 1,000 population. The actual number of deaths that occurred as shown on the Death Returns was 391, giving a mortality rate of 5.6 per 1,000. So far as the death rate is concerned, therefore, the sample of the population investigated was apparently fairly representative of the whole.

It is hoped that the figures obtained in this inquiry, though small in some instances, will be found useful for comparison with results found in other areas.

Females :—

Under 1 year, 2.0 per cent.	-	-	-	-	-	-	-	-	-	-	-	765
„ 2 years, 1.7 „	-	-	-	-	-	-	-	-	-	-	-	666
„ 3 „	-	-	-	-	-	-	-	-	-	-	-	753
„ 4 „ } 6.3 „	-	-	-	-	-	-	-	-	-	-	-	796
„ 5 „ }	-	-	-	-	-	-	-	-	-	-	-	865
„ 6 „ }	-	-	-	-	-	-	-	-	-	-	-	870
„ 7 „ }	-	-	-	-	-	-	-	-	-	-	-	790
„ 8 „ } 10.8 „	-	-	-	-	-	-	-	-	-	-	-	780
„ 9 „ }	-	-	-	-	-	-	-	-	-	-	-	862
„ 10 „ }	-	-	-	-	-	-	-	-	-	-	-	839
„ 11 „ }	-	-	-	-	-	-	-	-	-	-	-	852
„ 12 „ }	-	-	-	-	-	-	-	-	-	-	-	855
„ 13 „ } 10.7 „	-	-	-	-	-	-	-	-	-	-	-	785
„ 14 „ }	-	-	-	-	-	-	-	-	-	-	-	815
„ 15 „ }	-	-	-	-	-	-	-	-	-	-	-	762
„ 16 „	-	-	-	-	-	-	-	-	-	-	-	821
„ 17 „	-	-	-	-	-	-	-	-	-	-	-	731
„ 18 „	-	-	-	-	-	-	-	-	-	-	-	699
18 years and over	-	-	-	-	-	-	-	-	-	-	-	23,810
												<u>38,116</u>
												<u>68,677</u>

Total (Males and Females)

On contrasting the proportion of persons in the various age periods of the population investigated with the total proportion in the population as shown by the Ration Cards, we find the following :—

TABLE IV.

	Under 1.	2.	5.	10.	15.	25.	35.	45.	55.	65.	Over 75.
<i>Males :—</i>											
Percentage of population investigated.	2.4	2.8	7.6	15.0	12.9						59.3
Percentage of total population.	2.4	2.2	8.08	13.2	13.2						60.92
<i>Females :—</i>											
Percentage of population investigated.	2.13	2.02	8.7	12.1	11.7						63.35
Percentage of total population.	2.0	1.7	6.3	10.8	10.7						68.5

(11) *Incidence of Influenza among the Population investigated.*

Out of this population of 1,626 the number of persons in which a history of an attack of influenza (occurring between June 1918 and the beginning of April 1919) could be traced was 369, or 22.6 per cent.

TABLE V.

Age Incidence of Persons who contracted Influenza.

Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
—	4	20	49	48	34	27	64	74	37	7	4	1	369
Percentage of total persons in each age group -	10·2	14·9	22·3	24	20	27·8	28·07	29·9	26·9	10·1	9·3	20	22·6

The age and sex incidence of persons who contracted influenza during the period under survey is given in Table Y., and of those who did not contract the disease in Table VII.

TABLE VI.

Age and Sex Incidence of Persons who contracted Influenza.

—	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females -	-	2	8	17	23	17	22	42	46	19	6	2	-	204
Percentage	-	11·1	10·2	15·7	21·9	18·08	30·9	31·1	34·07	31·1	13·6	9·08	-	22·9
Males - -	-	2	12	32	25	17	5	22	28	18	1	2	1	165
Percentage	-	9·5	21·4	28·8	26·3	22·3	19·2	23·6	25	23·3	4·0	9·5	20	22·4

TABLE VII.

Age and Sex Incidence of those who did not take Disease.

—	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females -	19	16	70	91	82	77	49	93	89	42	38	20	-	686
Percentage	100	88·8	89·7	84·2	78·0	81·9	68·9	67·6	65·8	68·8	86·3	90·9	-	-
Males - -	18	19	44	79	70	59	21	71	84	59	24	19	4	571
Percentage	100	90·4	78·5	71·1	73·6	77·2	80·7	76·2	75·0	76·5	96·0	90·8	80·0	-

The total number of those who did not contract influenza was 1,257, or 77·3 per cent., whereas 369, or 22·7 per cent., were attacked. If this, therefore, is a true indication of the incidence of the disease throughout the general population, it is evident that in all probability much less than

25 per cent, of the population suffered in the whole epidemic, as it is unlikely that any genuine cases were missed in the inquiry, although cases would certainly be included that were not true cases of influenza.

Further than this, the proportion of persons affected in each separate wave was apparently much less than the majority of people thought at the time, for it works out at 7.5 per cent, of the population in the summer, 8.2 per cent, in the autumn, and 7.9 per cent, in the winter wave (see Table VIII.).

From the foregoing tables it is apparent that among the population investigated—

- (1) No cases of illness in children under 1 year were ascribed to influenza.
- (2) The greatest proportion of cases occurred in persons between 35 and 45 years of age (29.9 per cent, of total persons at these ages), but the incidence between the ages of 20 and 55 years (varying from 26.9 per cent, to 29.9 per cent, of persons at these age periods) was almost as high.
- (3) Between the ages of 1 and 2, 55 and 75, the incidence was low, varying from 9.3 to 10.1 per cent.
- (4) The incidence between 10 and 15 years (24 per cent.) was higher than in any age period excepting those between 20 and 25, 25 and 35, 35 and 45, and 45 and 55.
- (5) The incidence among the total male population investigated (22.4 per cent.) was very little less than that among the female (22.9 per cent.), but varied considerably at the different age periods.
- (6) The largest proportion of cases occurred in females between 35 and 45 years of age (34.07 per cent, compared with 25 per cent, in males). The highest incidence among males was between the ages of 5 and 10 and 10 and 15 (28.8 per cent, and 26.3 per cent, respectively, compared with 15.7 per cent, and 21.9 per cent, in females).
- (7) In females in the age groups 1 to 2, 20 to 25, 25 to 35, 35 to 45, 45 to 55, and 55 to 65, the proportion of cases was higher than the average for both sexes combined.
- (8) In males in the age groups 2 to 5, 5 to 10, 15 to 20, 65 to 75, the incidence was heavier than the average for both sexes combined.
- (9) Females were least susceptible to the infection at the extremes of life from birth to 10 years and after 55. Males between 20 and 25 years of age appear less liable to contract influenza than at any other period between 2 and 65 years.

2. *Age and Sex Incidence in the several Waves.*—The next tables show the age incidence in the three waves of the epidemic.

TABLE VIII.

Age Incidence.

SUMMER.

Age Group.	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over.	Total.
No. of cases	-	1	2	18	14	13	12	22	20	15	3	2	-	122
Percentage of persons in the Age-group investigated	-	2.5	1.4	8.2	7.0	7.6	12.3	9.6	8.09	10.8	4.3	4.6	-	7.5

AUTUMN.

Age Group.	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over.	Total.
No. of cases	-	1	12	16	17	9	7	24	38	5	1	1	1	134
Percentage of persons in the age-group investigated.	-	2.5	8.9	7.3	8.5	5.2	7.2	10.8	15.3	3.6	1.4	2.3	20	8.2

"WINTER.

No. of cases	-	2	6	15	16	12	8	25	24	17	3	1	-	129
Percentage of persons in the age-group investigated.	-	5.1	4.4	6.8	8	7.05	8.2	10.9	9.7	12.3	4.3	2.3	-	7.9

Apparently the greatest proportion of cases occurred in a different age group in each wave, and each time the incidence was more severe among older people than in the previous wave. In the Summer, persons aged 20—25 years (12.3 per cent.); in the Autumn, 35—45 years (15.3 per cent.); and in the Winter wave, 45—55 years (12.3 per cent.) were most affected.

The distribution according to sex is shown as follows:—

TABLE IX.

Table giving Age and Sex Incidence in the several Waves, with Percentage affected of Persons in the Age Group investigated.

SUMMER.

June, July, August, 1918.

	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over.	Total.
Females	-	-	1	6	7	5	10	15	13	8	2	1	-	68
Percentage	-	-	1.2	5.5	6.6	5.3	14.0	11.1	9.6	13.1	4.5	4.5	-	-
Males	-	1	1	12	7	8	2	7	7	7	1	1	-	54
Percentage	-	4.7	1.7	10.8	7.3	10.5	7.6	7.5	6.2	9.0	4.0	4.7	-	7.5

AUTUMN.

September, October, November, December, 1918.

Females	-	1	6	6	7	6	6	14	21	3	1	1	-	72
Percentage	-	5.5	7.6	5.5	6.6	6.39	8.45	10.3	15.5	4.9	2.27	4.5	-	-
Males	-	-	6	10	12	3	1	10	17	2	-	-	1	62
Percentage	-	-	10.7	9.0	12.6	3.94	3.8	10.7	15.1	2.5	-	-	20.0	8.2

WINTER.

January, February, March, 1919.

Females	-	1	1	5	9	6	6	15	16	8	3	-	-	70
Percentage	-	5.5	1.2	4.6	8.5	6.3	8.4	11.1	11.8	13.1	6.8	-	-	-
Males	-	1	5	10	7	6	2	10	8	9	-	1	-	59
Percentage	-	4.7	8.9	9.0	7.3	7.8	7.6	10.7	7.1	11.6	-	4.7	-	7.9

In the summer wave the high incidence in the 20 to 25 years group was mainly due to the excessive number of females affected, whereas in the Autumn wave both sexes in the group (35-45) with the largest incidence appeared to suffer equally. In the groups 45 to 55 in the Winter wave again the proportion of females was larger than that of males.

Children and persons over 55 years of age in all three waves escaped comparatively lightly, although in the Autumn wave the incidence among children of 2-5 years was six times and in the Winter wave was three times as heavy as it was in the Summer wave.

3. *Occupational Incidence.*—The occupations of those affected is shown as follows :—

TABLE X.

Incidence of Occupation.

	Number of Persons visited.	Number affected.	Percentage affected.
Housewife	395	116	29.3
Scholar	360	82	22.7
Ironworker	159	40	25.1
Child under school age	218	19	8.7
Wireworker	72	14	19.4
Rubberworker	21	10	47.6
Shop assistant	22	8	36.6
Railwaymen	35	7	20.0
Clerk	21	7	33.3
Soap maker	39	7	17.9
Cotton operative	49	5	10.2
Tannery and leather worker	30	5	16.6
No occupation	56	5	8.9

	Number of Persons visited.	Number affected.	Percentage affected.
Joiner and building work - - -	12	4	33·3
Aluminium worker - - -	9	4	44·4
Hotel and Cafe Waitress - - -	5	3	60·0
Carter - - -	9	2	22·2
Engineer - - -	6	2	33·3
Confectioner - - -	4	2	50·0
Chemical worker - - -	8	2	25·0
Tramway worker - - -	3	2	66·6
Fustian cutter - - -	3	2	66·6
Filecutter - - -	2	2	100·0
Milliner and dressmaker - - -	5	2	40·0
All other occupations in which only one person contracted influenza.	83	17	20·4

Children under school age and persons of no occupation evidently suffered less proportionately than other persons.

It is interesting to note the incidence among women who worked entirely at home compared with those who worked away from home :—

	Number of Women.	Number of Cases of Influenza.	Per- centage.
Total women in population investigated between ages of 15 and 45 years.	435	132	30·3
Number of these women who worked at home.	281	90	32·0
Number of these women who worked away from home.	154	42	27·2

The percentage of cases was higher among those who worked at home than among the other class, but the difference is not so striking as one might have expected, considering the fact that the housewife in many instances was in contact continuously for many days with severe cases of the disease.

4. *Incidence on Person nursing the Disease.*—Among the cases investigated it was found that in 284 cases the nursing was done by a member of the same household.

In 56 instances (19·7 per cent.) the nurse developed the disease, whilst in 228 cases (80·3 per cent.) influenza was not contracted.

5. *Sleeping Room Infection.*—The total number of persons found to have occupied a bedroom with a patient suffering from influenza was 235. Of these 70 or 29·8 per cent, contracted influenza, and 165, or 70·2 per cent., were not infected.

6. *Multiple Attacks.*—The following figures have a bearing on the question of immunity:

		Per cent.	} Of population investigated.
Number of males attacked -	54 or 7·3	}	
„ females attacked -	68 or 7·6		
Number of males who escaped -	681 or 92·5	}	
„ females who escaped -	823 or 92·4		

AUTUMN WAVE.

	Per cent.	
Number of males attacked -	62 or 8·4	} Of population investigated.
„ females attacked -	72 or 8·08	
Number attacked of males who had suffered in Summer -	2 or 3·6	
Number attacked of females who had suffered in Summer -	4 or 5·8	
Number attacked of males who had escaped in Summer -	60 or 8·8	
Number attacked of females who had escaped in Summer -	68 or 8·2	

WINTER WAVE.

Number of males attacked -	59 or 8·01	} Of population investigated.
„ females attacked -	70 or 7·8	
Number attacked of those who escaped both previous waves :—		
Males -	51 or 6·9 per cent.	
Females -	68 or 7·9	
Number attacked of those who escaped Summer but attacked Autumn :—		
Males -	5	
Females -	0	
Number attacked of those who escaped Autumn but attacked Summer :—		
Males -	1	
Females -	2	
Number attacked of those who were attacked both Summer and Autumn :—		
Males -	2	
Females -	—	

"With regard to the immunising effect of a previous attack it would appear as though females are less liable than males to a second attack.

In the Winter wave 119 persons (51 males, 68 females) contracted influenza who escaped the previous two waves.

In addition, eight males were attacked; one of these had had the disease in the Summer wave, five in the Autumn wave, and two had been attacked before in both waves.

Only two females, however, had previously had the disease among those attacked in the Winter wave, and these had had it during the Summer wave.

7. *House Incidence.*—As might be expected it was found that the incidence of disease was highest in the most overcrowded houses :—

- | | |
|---|---|
| (i) Houses with one or more Persons per Room. | (ii) Houses with less than one Person per Room. |
|---|---|

There were 251 houses occupied by 1,358 persons. The number of persons affected was 327 = 24 · 07 per cent.	There were 102 houses occupied by 268 persons. The number of persons affected was 42 = 15·6 per cent.
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The virulence of the epidemic appeared to increase in each wave, and whereas 11·6 per cent, of the houses were invaded in the first wave, 15 per cent, were invaded in the last wave.

More than half the houses escaped without having a case of infection in any of the waves.

Number of Houses invaded Summer only.	Number of Houses invaded Autumn only.	Number of Houses invaded Winter only.	Number of Houses escaped all three Waves.	Number of Houses invaded all three Waves.	Number of Houses invaded Summer and Autumn.	Number of Houses invaded Summer and Winter.	Number of Houses invaded Autumn and Winter.
41	44	54	183	6	8	7	10
Per cent. 11·6	Per cent. 12·4	Per cent. 15·2	Per cent. 51·8	Per cent. 1·7	Per cent. 2·03	Per cent. 1·9	Per cent. 2·8

Multiple Cases.—The number of houses visited was 353.
Of these houses—

	Per cent.
The number without a case was 183	51
" " with 1 case was 71	20
" " " 2 cases was 46	13
" " " 3 " " 18	5·1
" " " 4 " " 18	5·1
" " " 5 " " 10	2·8
" " " 6 " " 4	1·1
" " " 7 " " 2	0·56
" " " 8 " " 1	0·02

8. *Incubation Period.*—Out of 385 cases inquired into, the shortest incubation period recorded was 12 hours, and the longest given was six days. The average was two days, and is probably shorter than this.

9. *Medical Attendance.*—The proportion of cases receiving medical attention was high. Out of 385 instances a doctor was in attendance on 323, or 83·8 per cent.

10. *Effect of Attendance at Places of Entertainment.*—In the following table those persons who are given as attending places of entertainment are those only who visited such places regularly at frequent intervals, and in those cases in which the person contracted influenza the period elapsing between the date of last visit and the date of onset of disease did not exceed a week or 10 days :—

(a) Total number of persons visited	1,626
(b) Number of these who frequented places of entertainment	227
(c) No of persons who contracted influenza among those who frequented places of entertainment	49 or 21·5 per cent.
(d) Number of persons who did not frequent places of entertainment	1,399
(e) Number of persons who contracted influenza among those who did not frequent places of entertainment	320 or 22·8 per cent.

From the above there does not appear to be much difference in the incidence of influenza among the two classes, and if anything, the proportion of persons attacked is slightly heavier among those who did not visit places of amusement.

This incidence, however, varied in the three waves, and is shown as follows:—

	Summer Wave.	Autumn Wave.	Winter Wave.
Total persons visited	1,626	1,626	1,626
Number of these who had influenza.	122 or 7·5 per cent.	134 or 8·2 per cent.	129 or 7·9 per cent.
Number who attended places of amusement.	227	227	227
Number of these who had influenza.	8 or 3·4 per cent.	20 or 8·8 per cent.	21 or 9·2 per cent.
Number who did not attend places of amusement.	1,399	1,399	1,399
Number of these who had influenza.	114 or 8·1 per cent.	114 or 8·1 per cent.	108 or 7·7 per cent.

The proportion of those affected who did not attend places of entertainment was fairly constant throughout the three waves (varying only from 8·1 per cent, in the summer to 7·7 per cent, in the winter), whereas amongst those who attended such places the incidence rose from 3·4 per cent, in the summer to 9·2 per cent, in the winter.

There is a possibility that the predisposing effect of a chill due to waiting in queues before the performance may have had something to do with this higher incidence in winter, because, if anything, ventilation of the halls was better then, as special regulations were in force.

11. *Effect of Influenza on Pregnant and Lying-in Women.*—From the cases reported from time to time by doctors and midwives in the district, it appeared that influenza was specially deleterious to pregnant women and women in childbirth. An attempt was made to collect some information on this subject.

In addition to the usual card filled in by the health visitors at the time of their visits under the Notification of Births Act, or in connection with visits under the Midwives Act, a special card was drawn up, divided into two parts, one part of which had to be completed in every instance according to whether the mother *had had* or *had not had* influenza during pregnancy. This card was in use for a period of four months from the 1st December 1918 to 31st March 1919, and during this time inquiries were made in the 475 notifications received.

There was a history of the mother having suffered from influenza during pregnancy in 187, or 39·3 per cent, of the cases.

The incidence of influenza among women of child-bearing age (from 15 to 45 years) found in the general inquiry (see page 546) was 30·3 per cent, of the cases.

According to these figures it is evident that the pregnant woman was more liable to the disease than the average woman at the same age. It is probable, too, that many cases of pregnancy that terminated in early abortion would not come to our notice, so that the incidence of influenza among pregnant women was probably higher than the percentage shown. On the other hand, it is quite possible that there might be more exaggeration of the numbers than among the general population owing to

a tendency to ascribe many of the ailments of pregnancy to influenza, especially if there happened to be a genuine case in the house.

Total cases inquired into, 471.

	Women who had Influenza during Pregnancy, 187.		Women who did not have Influenza during Pregnancy, 284.	
	No.	Per Cent.	No.	Per Cent.
Normal confinements - - - -	137	73·2	223	78·52
Abnormal confinements, including all forceps confinements.	50	26·8	61	21·48
Deaths of mothers - - - -	8	4·2	—	—

Summary of Abnormal Cases of Labour.

	Total Women who had Influenza, 187.		Total Women who did not have Influenza, 284.	
	No.	Per Cent.	No.	Per Cent.
Ordinary forceps cases without complications.	15	8·01	33	11·6
Other abnormality, viz :	35	19	28	9·85
Miscarriage and abortion - - -	7	3·74	9	3·17
Premature births - - - -	12	6·42	8	2·83
Still births, premature - - - -	9	4·81	3	1·05
" full time - - - -	2	1·07	7	2·46
Postpartum hæmorrhage - - -	3	1·60	1	·35
Phlegmasia alba dolens - - -	1	0·53	Nil	Nil
Retained placenta and collapse -	1	0·53	Nil	Nil

Effect on Child.

	Mother suffered from Influenza during Pregnancy (187 = 39·3 per Cent.).		Mother did not suffer from Influenza during Pregnancy (284 = 60·4 per Cent.).	
	No.	Per Cent.	No.	Per Cent.
Healthy full-time babies - - - -	137	73·26	232	81·69
Poor or fair babies - - - -	21	11·23	25	8·80
Dead or immature - - - -	29	15·51	27	9·50

Further contrasting the maternal death-rate and infantile death-rate due to the causes prematurity and still-birth for the past five years with the period under review, we find there is a markedly increased death-rate under these headings during the influenza epidemic.

	Total known Confinements, &c.	Maternal Deaths.		Infantile Deaths due to			
				Prematurity.		Still Births.	
		No.	Per Cent.	No.	Per Cent.	No.	Per Cent.
1913 - -	221	4	·18	35	1·58	87	3·84
1914 - -	2,271	6	·26	42	1·85	72	3·17
1915 - -	1,980	5	·25	29	1·46	2	1·61
1916 - -	1,850	4	·22	26	1·40	23	1·24
1917 - -	1,576	3	·19	20	1·27	23	1·45
Four months Dec. 1918 to Mar. 1919. }	471	8	1·7	20	4·29	21	4·46

Table showing Months of Pregnancy in which Mothers had attack of Influenza which was followed by Abnormal Confinement.

	1st.	2nd.	3rd.	4th.	5th.	6th.	7th.	8th.	9th.
Still Births (premature) - -	-	1	-	-	2	2	4	-	-
„ (full time) - -	-	-	-	-	-	-	-	2	-
Premature Births - -	3	1	-	-	1	2	4	1	-
Abortion or Miscarriage - -	1	2	1	-	2	1	-	-	-
Postpartum hæmorrhage - -	1	1	-	1	-	-	-	-	-
Phlegmasia alba dolens - -	-	-	-	-	-	-	-	1	-
Partially retained placenta and collapse - -	-	-	-	-	-	-	-	-	1
TOTAL - - -	5	5	1	1	5	5	8	4	1

Effect of an Attack of Influenza occurring at time of Confinement is shown in table.

	Total No. of Cases.	No. of normal Confinements.	No. in which Child was premature.	No. of Deaths of Mothers.
Cases in which influenza occurred at the time of confinement.	16	4 (25 per cent.).	12 (75 per cent.).	8 (50 per cent.)
Cases in women who did not have influenza at time of confinement.	455	364 (71·1 per cent.).	36 (7·9 per cent.).	-
Cases in women who did not have influenza at all.	284	223 (78·5 per cent.).	20 (7 per cent.).	-
Cases in women who had influenza during pregnancy and not at time of confinement.	187	141 (73·7 per cent.).	28 (14·6 per cent.).	-

There is no doubt that an attack of influenza occurring towards the end of pregnancy is a very serious matter, both for mother and child.

Out of 16 cases of the disease at this period there were no less than eight deaths of mothers.

Effect of Influenza on Pregnant Women treated in an Institution.

From figures kindly supplied to me by Dr Hodgkinson, Medical Superintendent, Union Infirmary, Warrington, I am able to draw up the following table of cases dealt with in that institution during the six months ending 31st March, 1919:—

	No. of Women.	No. of Deaths.
Total number of known pregnant women admitted suffering from influenza.	6	2 = (33·3 per cent.).
Total number of women aged 16 years to 45 years admitted suffering from influenza.	41	14 = (34·1 per cent.).

The risk to life of the pregnant women suffering from influenza when nursed in an institution does not appear, according to this, to be any greater than it is for all women of similar ages.

II.—Deaths from Influenza.

The total deaths from influenza in 1918 was 272, giving a death-rate of 3·9 per 1,000 of the population.

During the period of the epidemic, from June 1918 to April 1919, the number of deaths certified as due to influenza was 391, distributed as follows:—

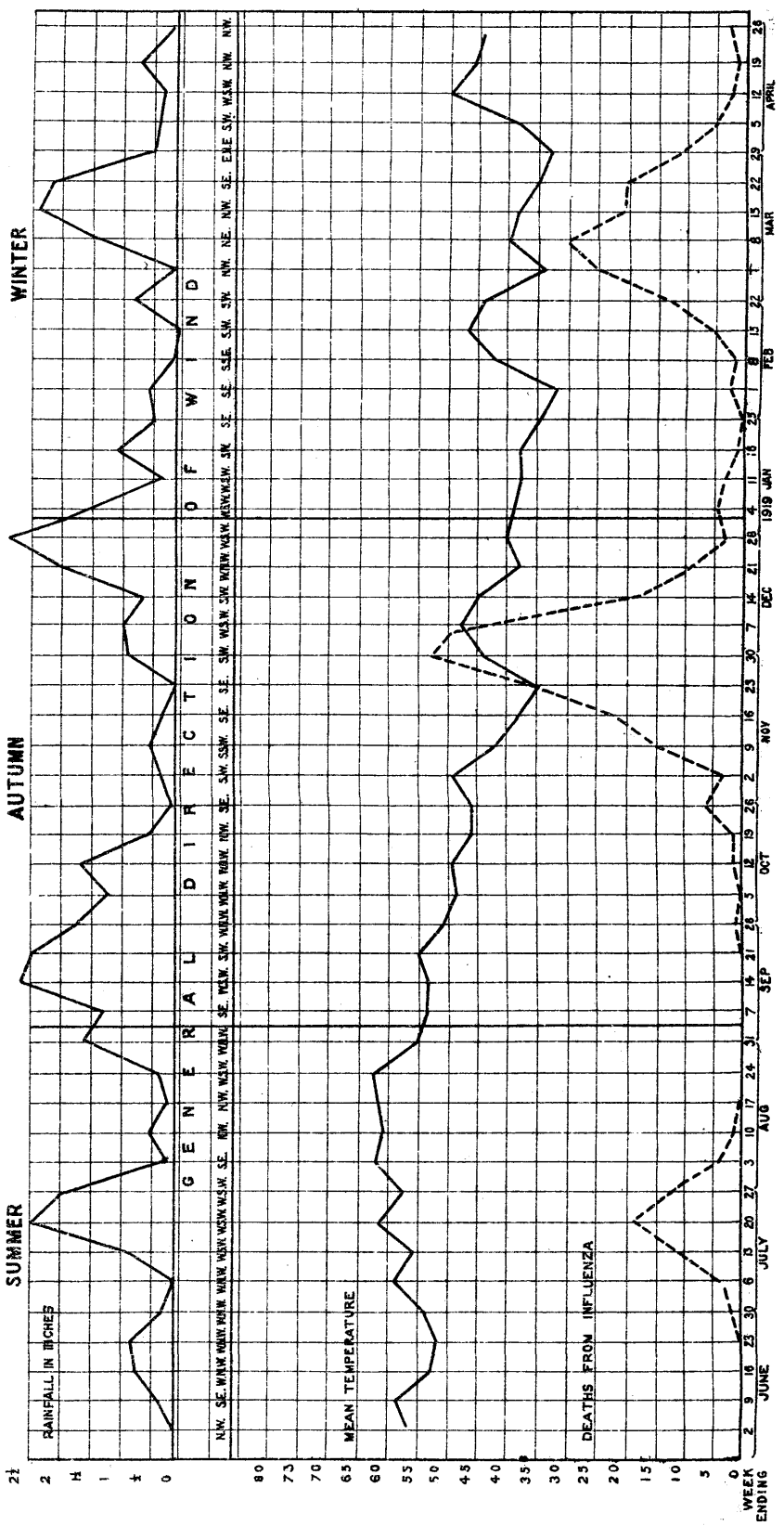
Summer wave	47
Autumn	203
Winter	141

The table on page 553 shows the number of deaths each week due to influenza and pneumonia. A chart is given showing the number of deaths at various times of the year and the meteorological conditions so far as rainfall, temperature, and prevailing winds are concerned.

The age and sex incidence of the persons who died is shown in the next table:—

	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females	4	7	17	15	11	13	18	45	33	17	25	10	8	223
Males	3	3	20	11	1	5	6	30	33	17	22	13	4	168
Percentage	7	10	37	26	12	18	24	75	66	34	47	23	12	391

WARRINGTON.



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Deaths from Influenza and Pneumonia each week during year 1918.

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No. of Week.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
MONTH.	January.				February.				March.					April.				May.				June.				
DATES.	5	12	19	26	2	9	16	23	2	9	16	23	30	6	13	20	27	4	11	18	25	1	8	15	22	29
Influenza - - -	-	1	1	1	1	-	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Pneumonia - - -	2	3	2	4	3	3	1	1	3	3	3	2	4	5	3	4	3	6	7	7	2	3	2	-	-	2

No. of Week.	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52
MONTH.	July.				August.					September.				October.				November.				December.				
DATES.	6	13	20	27	3	10	17	24	31	7	14	21	28	5	12	19	26	2	9	16	23	30	7	14	21	28
Influenza - - -	3	10	18	12	2	1	-	-	-	-	-	-	1	-	1	1	5	3	15	20	36	49	44	17	9	3
Pneumonia - - -	2	1	4	5	3	2	-	-	-	1	-	1	-	2	-	-	2	4	1	4	9	12	9	2	5	1

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Deaths from Influenza and Pneumonia during year 1919.

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No. of Weeks.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
MONTH.	January.				February.				March.					April.			
DATES.	4	11	18	25	1	8	15	23	1	8	15	23	30	5	12	19	26
Influenza - - - -	3	3	1	-	2	2	5	12	24	30	20	20	11	5	2	1	2
Pneumonia - - - -	1	1	2	-	5	6	7	4	5	4	8	2	7	4	2	4	2

Influenza Death-Rate per 1,000 of the Population in the Age and Sex Groups obtained from the Statistics of Ration Cards.

—	Under 1.	2.	5.	10.	15.	All other Ages.
Males :—						
Rate per 1,000	4·0	4·3	8·0	2·6	·2	7·2
Females :—						
Rate per 1,000	5·2	10·5	7·0	3·6	2·7	6·4

The death-rate per 1,000 among the female population at any age-group appears to have been higher than among the males except in the case of children 2—5 (males 8 and females 7 per 1,000).

The following tables show the number of deaths that occurred in the various age-periods during the three waves :—

SUMMER.

—	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females -	1	-	-	3	-	-	2	3	6	4	3	1	-	23
Males -	-	-	3	-	-	-	2	4	8	4	2	1	-	24

AUTUMN.

—	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females -	-	3	8	7	10	9	13	28	18	7	12	5	3	123
Male -	1	-	10	7	1	4	2	11	16	8	11	5	4	80

WINTER.

—	Under 1.	2.	5.	10.	15.	20.	25.	35.	45.	55.	65.	75.	Over 75.	Total.
Females -	3	4	9	5	1	4	3	14	9	6	10	4	5	77
Males -	2	3	7	4	-	1	2	15	9	5	9	7	-	64

Population from Ration Cards :—

Females -	-	-	-	-	-	-	-	-	-	-	-	-	-	38,116
Males -	-	-	-	-	-	-	-	-	-	-	-	-	-	30,561

Total Female deaths, 223 = 5·8 per 1,000.

„ Male „ 168 = 5·4 „

A striking feature is the fact that there were few deaths among males of the age-periods 10-25 compared with the number of female deaths at the same ages.

From our investigation, however, the actual incidence of illness among males was higher than among females of those ages.

The total death-rate among females was slightly higher than among males (females, 5·8 per 1,000 ; males, 5·4 per 1,000).

In the *Summer wave* the deaths among females were very similar both in number and age-group affected to those occurring among males, but the death-rates worked out on the population estimated from the Ration Cards was : males, 7 per 1,000 ; females, 6 per 1,000.

In the *Autumn* there were 123 deaths of females compared with 80 of males, the excess among females being chiefly between the ages of 10-35 years. (The death-rate was 3 • 1 per 1,000 females and 2 • 6 per 1,000 males).

In the *Winter wave* the death-rate for males was 2 • 09, and for females 2 • 02 per 1,000.

Evidently the *Autumn wave* was more fatal to females than either the *Summer* or *Winter waves*.

Investigations elicited the following facts :—

(a) *Occupation of those who died during the epidemic.*—

	Per cent.
Housewife - - - - -	31
Persons engaged in factories - - - - -	17
Ironworkers - - - - -	15
Under school age - - - - -	14
School children - - - - -	10
Persons engaged in shops or public places - - - - -	8
Invalids, &c., of no occupation - - - - -	4
Soldier - - - - -	1

(b) *Places of Amusement.*—It was found that 11 per cent, regularly attended places of entertainment and had been there within one week of commencement of illness.

(c) *Infectivity of Fatal Cases.*—In houses in which a death occurred, 40 • 04 per cent, of the inmates contracted influenza, whereas in infected houses where no deaths occurred the proportion of cases was 38 • 4 per cent, of the inmates.

Deaths from other Diseases of the Respiratory Organs.

During the epidemic period of 10 months the following deaths from diseases of the respiratory organs occurred in addition to those from influenza:—

Pneumonia - - - - -	129
Bronchitis - - - - -	102
Empyema - - - - -	2
Acute pleuritis - - - - -	1
Asthma - - - - -	1
Total - - - - -	235

They are contrasted with the total deaths from these diseases during previous years :—

1913	1914	1915	1916	1917	1918
197	204	251	234	252	250

In conclusion, I am much indebted to Dr. J. JR. Hutchinson, of the Ministry of Health, for valuable advice, and to Mr. J. Stevens of our Health Department, who has given great assistance both in collecting and summarising the statistics.

October 1919.