

VIII.

Analysis of an Influenza Census at Newcastle-upon-Tyne,

By

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Owing to the exceptional prevalence of influenza in Newcastle and the country generally during the past nine months, it was felt that an investigation into the local conditions influencing the Newcastle outbreaks might prove useful, and an "Influenza Census" was therefore begun. This consisted in a house-to-house enquiry in two areas at either end of the city. The areas selected were known to have had a definite influenza prevalence, especially during the January-March (1919) outbreak. Streets in these areas were picked out so as to include flat, tenement, and self-contained households, but apart from this no selection was made.

Nine hundred and seventy households (the majority being flats) containing 4,461 occupants, were investigated and the following results were obtained.

General incidence on Population.—890 cases occurred during the summer, autumn, and winter epidemics (June, July, August; October, November, December; January, February, March), giving an attack rate of 200 per 1,000 population. On these figures there must have been, approximately, 50,000 to 56,000 cases in Newcastle alone during the three epidemic periods. The incidence varied in the three outbreaks, being 62 per 1,000 population in summer, 52 per 1,000 population in autumn, and 86 per 1,000 population in winter; the average attack rate per 1,000 being, therefore, about 67. (The average attack rate for the last three years in Newcastle of enteric fever, scarlet fever, and diphtheria were 0·21, 3·0, and 0·9 per 1,000 population, respectively.)

Mortality Figures.—During the three epidemic periods the case mortality rate was 4·3 per cent., being 2·2 per cent, in the summer, 3·4 per cent, in the autumn, and 6 per cent, in the winter outbreaks. The case mortality rates over the three outbreaks for the different age periods are:—

	Per cent.
Under 1 year	38·4
Between 1 and 5	17·1
" 5 and 15	2·6
" 15 and 25	3·5
" 25 and 45	1·5

At ages over 45 years, the case mortality rate was 2·3 per cent. Of the total deaths, 53 per cent, were in children below the age of five years.

Age incidence in Infected Households only.—Taking the three outbreaks as a whole, the greatest number of cases occurred in the 25-45 age period and the next greatest in the 5-15 age period.

A noteworthy change in the age incidence occurred between the summer and winter epidemics as is shown in Table III. of Dr. Hutchinson's addendum. This was apparently general throughout the country and was not confined to Newcastle alone.

Sex incidence in Infected Households only.—Of 890 cases, 41 per cent, were males and 59 per cent, females. The higher incidence in females occurred exclusively between the ages of 15-45, in which period the proportion of females to males attacked was as 2:1; below the age of 15 the proportions were reversed, being as 6:7. Whether the excess of female cases over males at the higher-age periods is *entirely* due to the abnormally low proportion of males of those ages at the time is not clear.

Occupation.—A large proportion (70 per cent.) of the female cases between the ages of 15 and 45 were engaged in "home duties," and the majority appeared to have become infected from the nursing of other

patients ; many, however, were either first cases in a household and infected others, or were the only cases in the households affected. Apart from this occupation appears to play no part in the incidence.

Incubation Period.—The incubation period, calculated on the period elapsing between the date of onset of the first case in a household and the dates of onset of subsequent immediate contacts, varied from one to six days, in the great majority of cases being within three days.

Period of Infectivity.—No data were obtained bearing on this point owing to the difficulty of excluding other sources of infection.

Period of Immunity.—*Second Attacks.*—Of the 890 cases, 39 or 3 • 7 per cent, developed second attacks at the end of six months, 19 developed second attacks at the end of three months, and 2 were attacked in each of the three epidemics. A few cases also were stated to have had two attacks in two successive months. Reliable information could not be obtained as to the influence of the severity of the first attack on the period of immunity.

A certain degree of immunity therefore appears to be conferred by an attack of influenza, varying in different individuals and becoming noticeably less after six months.

Influence of Overcrowding.—(*Tables A. and B.*)—The evidence as to the influence of overcrowding appears to be inconclusive; the tables would appear to show that there is actually more chance of contracting infection by living in a house with less than one person per room than there is by living in a house with four or more persons per room. The inference would seem to be that overcrowding *qua* overcrowding is not the prime factor in the spread of infection.

Previous Medical History.—Enquiry was made into the previous medical history of occupants of both affected and non-affected households, with a view to ascertaining whether previously existing disease such as tuberculosis, septic diseases, &c., had any influence either in predisposing to or protecting from attack, but no conclusion could be come to from the information obtained.

Complications.—13 per cent, of all cases developed complications of the respiratory system, of which 64 per cent, were pneumonia.

Of 53 second attacks, 14 were complicated similarly, (or 26 per cent, of cases) 71 per cent, of which were pneumonia.

The incidence of respiratory complications (pneumonia and bronchitis) was nearly four times as high in the winter outbreak as in the summer one, and twice as high in the autumn as in summer (5 • 4 per cent., 11 per cent, and 19 • 6 per cent, of cases respectively).

The higher incidence of complications in second attacks may thus be partly explained inasmuch as the great majority of second attacks occurred in the winter outbreak. Overcrowding appears to have no influence on the incidence of complications.

Incidence and infectivity of Pneumonia.

Seventy-five cases developed pneumonia, 4 • 3 per cent, of cases in summer, 7 • 6 per cent, of cases in autumn, and 11 • 6 per cent, of cases in winter. As previously stated, overcrowding appears to exert no influence on the incidence of pneumonia.

In all except three instances, only one case of pneumonia occurred in any one household, although there were other cases of influenza actually ill at the time. Of the exceptions, in each of two households three cases appeared to develop simultaneously, *all* the influenza cases being affected—in the other household, a second case of pneumonia followed a first at an interval of 3 days. In no case were any special measures taken to protect one case from infection by another, as far as could be ascertained.

The spread of pneumonia from one case to another would, therefore, appear to be uncommon.

TABLE A.

Whole Period)	Less than 1 Person per Room.			1-2 Persons per Room.			2-3 Persons per Room.			3-4 Persons per Room.			4 and more Persons per Room.												
	Households.	Affected.		Households.	Affected.		Households.	Affected.		Households.	Affected.		Households.	Affected.		Households.	Occupants.	Not affected.							
		Occupants.	Cases.		Occupants.	Cases.		Occupants.	Cases.		Occupants.	Cases.		Occupants.	Cases.				Occupants.	Cases.					
	36	104	49 (47.1 per cent.)	65	150	166	665	270 (40.6 per cent.)	222	804	142	777	322 (41.4 per cent.)	150	752	77	482	192 (40 per cent.)	61	369	22	161	60 (37.2 per cent.)	29	197

TABLE B.

Households containing	Total Number of Households investigated.	Number of Households affected in whole Epidemic Period.	Number of Households not affected throughout.	Proportion of affected Households to Total.	Total Number of Cases.	Average Number of Cases per affected Household.	Actual Number of Cases to immediate Contacts.	Percentage number of Cases to immediate Contacts in affected Households.
Less than 1 person per room	101	36	65	1 in 2.8	49	1.36	1 in 2.12	47
1-2 persons per room	388	166	222	1 in 2.3	270	1.63	1 in 2.42	40.6
2-3 persons per room	292	142	150	1 in 2	322	2.27	1 in 2.41	41.4
3-4 persons per room	138	77	61	1 in 1.8	192	2.50	1 in 2.52	40
4 and more persons per room	51	22	29	1 in 2.3	60	2.72	1 in 2.68	37
Total	970	443	527		893			

TABLE C.

Incidence of Complications.

	Less than 1 per Room.		1--2 per Room.		2--3 per Room.		3--4 per Room.		4 and more per Room.		Totals.		Summer.	Autumn.	Winter.
	Pneumonia.	Bronchitis.	Pneumonia.	Bronchitis.	Pneumonia.	Bronchitis.	Pneumonia.	Bronchitis.	Pneumonia.	Bronchitis.	Pneumonia.	Bronchitis.			
Single attacks	2	4	13	10	26	15	17	8	7	1	65	38	15 (5.4 per cent.).	26 (11.0 per cent.).	76 (19.6 per cent.).
Second attacks	2	—	1	1	5	—	1	2	1	1	10	4	}	}	}
	4	4	14	11	31	15	18	10	8	2	75	42			
Totals	8		25		46		28		10		117		—	—	—
Percentage to cases	16.3 per cent.		9.2 per cent.		14.3 per cent.		14.6 per cent.		16.6 per cent.		13.1 per cent.		3.4 per cent.	11 per cent.	19.6 per cent.

Percentage Complications to Second Attacks :—26 per cent. (14 complicated cases in 53).
No. of Second Attacks : 53.

Incidence of Concurrent Diseases, e.g., E.C.S.M., Poliomyelitis.—Enquiry was made as to above, in view of the statements which have appeared in the Medical Journals recently describing organisms obtained from filtrates of material from cases of E.C.S.M., poliomyelitis, typhus, measles, &c, which were apparently morphologically identical.

No evidence of any increase of these diseases concurrently with the influenza outbreaks was noted.

Use of Preventatives.—Numerous drugs and quack remedies, disinfectants, &c, were used but without any apparent effect.

Addendum by Dr. J. R. Hutchinson to Dr. Clegg's Analysis of the Newcastle-upon-Tyne Influenza Figures.

970 households were investigated: of these, 439 houses were invaded. The number of persons attacked was 828; 60 of these had more than one attack; the aggregate number of attacks was 890.

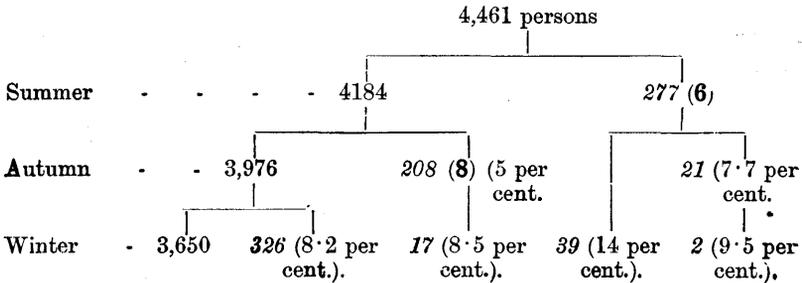
768 had one attack (17·2 per cent, of population investigated).
 58 „ two attacks (1 · 3 „ „ „ „).
 2 „ three „ (0 · 04 „ „ „ „ „ „).

Occupational Incidence.—Of the 828 persons attacked :—
 34 per cent, were children of or below school age.
 39 per cent, were women engaged in household duties.
 5 per cent, were labourers.
 4 per cent, were ironworkers.
 3 per cent, were shopkeepers.
 2 per cent, were clerks.

The remainder comprised cobblers, teachers, carpenters, horsemen, railway employees, dressmakers, barmaids, painters, bricklayers, tailors, barbers, coachbuilders, tramway workers, miners, weavers, papermakers, motormen, firemen, &c, &c.

Information as to nursing is not available.

Immunity.—The table below summarises the data on this point.



Figures in heavy type = deaths.
 Figures in italics = attacks.

TABLE I.
Age and Sex Incidence of Cases.

	Under One Year.	1-2.	2-5.	5-10.	10-15.	15-20.	20-25.	25-35.	35-45.	45-55.	55-65.	65-75.	75 and over.	Totals.
Males -	5	8	42	56	48	32	12	45	43	32	12	6	--	341
Females	8	12	28	49	40	44	52	98	78	51	19	5	3	487
Total	13	20	70	105	88	76	64	143	121	83	31	11	3	828

41 per cent. were males and 59 per cent. females.

TABLE II.

Mortality Incidence.

	Under One Year.	1-2.	2-5.	5-10.	10-15.	15-20.	20-25.	25-35.	35-45.	45-55.	55-65.	65-75.	75 and over.	Totals.
Summer:—														
Males	1	1	2	—	—	—	—	—	—	—	—	—	—	4
Females	1	—	—	1	—	—	—	—	—	—	—	—	—	2
Autumn:—														
Males	1	—	1	—	—	1	—	—	—	—	—	—	—	3
Females	—	2	2	—	—	—	—	—	1	—	—	—	—	5
Winter:—														
Males	2	—	2	1	—	2	—	1	—	—	—	—	—	9
Females	—	1	3	—	3	1	1	2	—	2	—	1	—	13
Totals	5	4	10	2	3	4	1	3	1	2	—	1	—	36
Case mortality	38.4 per cent.	20 per cent.	14.3 per cent.	2.6 per cent.	3.5 per cent.	1.5 per cent.	1.7 per cent.	7.1 per cent.	4.3 per cent.					

