

AGE AND ASIAN INFLUENZA, 1957

BY

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The object of this investigation was to study the influence of age and related factors on susceptibility to influenza during the 1957 autumn epidemic. Certain other clinical and epidemiological observations that were made are also included in this report. The inquiry was conducted in a general practice in a post-war housing estate on the south-eastern outskirts of London; the doctor (J. W.) had just over 2,000 patients on his list, but those entering or leaving during the study, and a large group of about 200 gipsies, were excluded, leaving a total of 1,732 on whom the results are based.

Methods

From the middle of August, 1957, to the end of the year an attempt was made to record all acute respiratory illnesses in the 1,732 patients who were present during the whole of this period. The illnesses were divided clinically into those that probably were influenza and those that probably were not. Illnesses recorded were those for which the doctor was consulted and others of which he learned by inquiry. Ascertainment in families of four or more persons was probably fairly complete because these were included in a special study of secondary attack rates. Nearly all such families known to have a case of influenza were followed for at least two weeks and a record was made of acute respiratory illnesses before and after the first case seen; families without a known case were visited in December and inquiry was made. Information on smaller families was less complete; illnesses seen were noted and inquiries made about other members of the family then and at any subsequent opportunity. Although there must inevitably have been illnesses which were not recorded and some mistakes in clinical diagnosis, we believe that, for the epidemic period at least, a reasonable estimate of the incidence of influenza was obtained.

For the study of secondary attack rates, 104 families of four or more, in which a probable case of influenza occurred, were investigated in greater detail. So far as possible these were consecutive and unselected families, but some, where good co-operation was not anticipated, were excluded. The clinical features of all acute respiratory illnesses in these families were recorded in a standard manner. Acute and convalescent paired sera were obtained from 99 patients in 89 of the 104 families. Fifteen families were included but not tested, usually because the first subject seen was too young to bleed and there was no further illness in the family. It is possible that a slight bias towards high secondary attack rates in families tested serologically was thereby introduced.

The blood specimens were taken in vacuum tubes (Bayer) and posted to the laboratory, where serum was separated and completed pairs were examined for evidence of influenza-A infection by the complement-fixation test. Of the 99 pairs a fourfold or greater rise in titre was found in 61 and a twofold rise in a further 12; the 61 serologically confirmed cases were in 59 families.

Findings

Age and Sex Incidence

The epidemic lasted about eight weeks and reached its peak in all age groups in the week ending October 13. Most cases in the few weeks preceding the epidemic were in young adults. Attack rates by age and sex up to the end of November are given in Table I. Almost a third (31%) of

TABLE I.—Clinical Attack Rates by Age and Sex (Up to November 30)

Age in Years	Males		Females		Total	
	At Risk	Percentage Attacked	At Risk	Percentage Attacked	At Risk	Percentage Attacked
0-4 ..	115	36	92	25	207	31
5-14 ..	194	51	172	48	366	49
15-39 ..	323	25	352	28	675	27
40-59 ..	192	21	169	29	361	25
60 and over	55	15	68	10	123	12
All ages ..	879	31	853	30	1,732	31

the patients in the practice had influenza during this period, and, apart from a rather higher rate among males aged 0-4 years, there was little difference between the sexes. About half the schoolchildren were ill, a third of the pre-school children, a quarter of adults under 60, and about an eighth of the older persons. Between December 1, 1957, and January 5, 1958, there were a further 60 illnesses, including five who had been ill before; no specimens were taken from any of the five, so the cause of their illness is uncertain.

Effect of Schoolchildren

As the highest attack rates were among children aged 5 to 14 years, it seemed possible that families with children

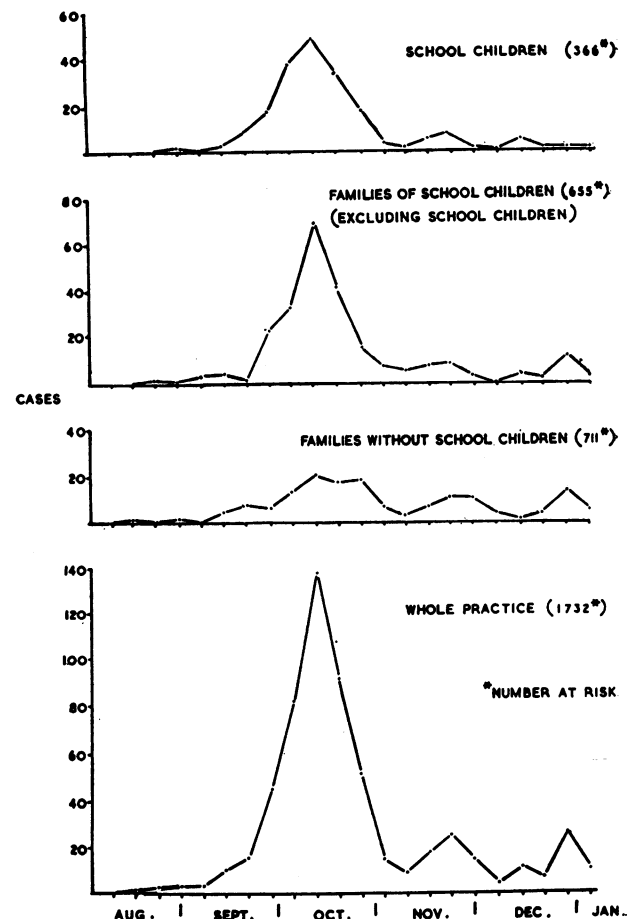


FIG. 1.—Weekly incidence of influenza in a Kent practice.

of this age might have suffered more from influenza than those without. That this was so is shown in Fig. 1, which shows that the epidemic was almost confined to schoolchildren and their families. Of the 529 persons who were recorded as having had influenza, 399 (75%) were children aged 5 to 14 or members of families with a child of this age.

TABLE II.—*Influenza Attack Rates in Families With and Without Schoolchildren (Up to November 30)*

Age Group	With Schoolchildren		Without Schoolchildren	
	No.	Attacked	No.	Attacked
0-4 years	104	34%	103	29%
15-39	357	34%	318	18%
40-59	181	32%	180	17%
60 and over	13	31%	110	10%
Total	655	33%	711	18%

In families that included a school child the attack rate was about 33% in all other age groups (Table II). In families without a school child, only children under 5 had an attack rate approaching this level; the rates among the adults were much lower.

Secondary Attack Rates

There were 59 families in which at least one case of influenza was confirmed by serological tests and a further 45 families similarly studied in which no confirmation was obtained. Secondary attack rates—that is, attack rates among the remainder of the family after exclusion of the first case—were calculated in an attempt to find out whether there was any relation between age and susceptibility under the conditions of home exposure. A family outbreak (or episode) in this calculation was defined as a group of influenzal illnesses, no two consecutive cases being separated by more than seven days. In 86% of episodes all cases occurred within seven days of onset of the first case. Persons with influenza more than seven days prior to the beginning of an episode were excluded from those at risk.

It may be seen in Table III that the secondary attack rates for all age groups under 40 years were similar, but over this age they fell away. Rates based on 59 episodes in families with a serologically confirmed case did not differ greatly from those based on all 104 families (105 episodes).

TABLE III.—*Secondary Attack Rates in 104 Families with 4 or More Persons*

Age (Years)	All Episodes		Serologically Positive Episodes	
	No. Exposed	Percentage Attacked	No. Exposed	Percentage Attacked
0-5	59	60	37	57
5-10	63	57	38	63
10-15	41	54	26	61
15-20	28	54	20	55
20-30	39	44	26	58
30-40	82	48	33	64
40-50	56	37	33	36
50+	21	19	16	13
All ages	389	49	229	53

TABLE IV.—*Order of Onset of Illness in Relation to Age (105 Family Outbreaks)*

Age Group	No. Illnesses	1st	2nd	3rd or More
0-4 years	40	13%	52%	35%
5-14	121	52%	29%	19%
15-39	102	30%	34%	35%
40+	40	37%	15%	48%

The lower rates in persons of 40 and over could be explained either by lower susceptibility or by less exposure to infection. The primary cases in family episodes were most frequently in schoolchildren aged 5-14 years and least frequently in children under 5 (Table IV). The subsequent order of becoming ill also varied with age, those of 40 or

more seldom being infected next but most often being third or later. This suggests that older persons may have been less exposed to infection from the younger ones, who introduced it to the family, than were infants and young adults.

In an attempt to overcome the difficulty of unequal exposure the records of all families in the practice without a child aged 5-14 were searched for episodes in which the first case was in a husband or wife. There were 83 such families, and in 14 (17%) the spouse also developed influenza within seven days. Of 59 spouses aged 20-49 years, 9 (15%) were attacked, compared with 5 (21%) out of 24 aged 50 or more.

Serial Intervals

As influenza is probably most infectious during the first few hours of illness serial intervals between dates of onset in family outbreaks may provide a measure of the incubation period. The distribution of serial intervals in the 104 families specially studied is illustrated in Fig. 2; there is a periodicity of about two days, which agrees well with previous estimates.

Clinical Features

There have been many descriptions of the symptomatology of influenza in this and in previous epidemics, but most of them have been based on the study of adults, and little attention has been given to variations associated with age. In the 59 family episodes in which at least one case was confirmed serologically there were 187 illnesses. An analysis of the clinical features in these illnesses is presented in Table V. The general clinical picture was similar to that

TABLE V.—*Clinical Features of Illnesses in Serologically Confirmed Family Outbreaks*

Age group: No. of Cases:	0-4 24	5-14 71	15-39 70	40+ 22	Total 187
	%	%	%	%	%
Onset:					
Gradual	50	48	61	55	54
Sudden	50	52	39	45	46
Symptoms:					
Cough	84	83	93	82	87
Headache	8	65	92	82	70
Sneezing	75	63	67	73	67
Nasal symptoms	62	62	71	59	65
Sore throat	17	56	73	55	57
Sweating	37	46	61	68	48
Shivers	8	41	59	59	46
Aches and pains	12	17	73	59	42
Malaise	33	7	17	18	15
Prostration	17	13	26	9	14
Drowsy	54	11	0	0	11
Delirium	4	21	3	5	10
Nose bleeds	17	8	9	0	9
Faint and giddy	0	4	10	14	7
Hoarseness	8	1	6	9	5
Vomiting	29	23	11	9	18
Abd. pain	0	10	9	0	7
Diarrhoea	8	4	1	0	3
Complications:					
Pneumonia	4	3	1	9	3
Otitis media	4	3	0	0	2
Most frequent initial symptoms					
Cough	Cough	Headache	Headache	Sore throat	Headache
Drowsy	Drowsy	Sore throat	Sore throat	Headache	Sore throat
Most troublesome symptoms					
Cough	Cough	Headache	Headache	Headache	Headache
Drowsy	Drowsy	Sore throat	Prostration	Cough	Cough
Days fever (median)	3	2	3	3	3
Days in bed (median)	2	3	3	3	3

usually found in influenza, the most prominent complaints being cough, headache, sneezing, nasal symptoms, sore throat, sweating, shivering, and aches and pains. The onset was described as sudden in about half the cases only—less than is usually stated.

Some of the age differences in symptomatology can probably be attributed to the young being less able to describe their troubles; thus it is not surprising that sore throat, headache, and aches and pains were infrequent in those under 5 years of age, whereas malaise was relatively prominent. Other differences, however, may be more real—for

example, the greater frequency of drowsiness, vomiting, diarrhoea, and nose bleeds in the young, or delirium in children of school age, and of aches and pains and faintness or giddiness in adult life. Six cases of pneumonia (3%) and three of otitis media (2%) were the only important complications, and there were no deaths. Two children developed fever and polyarthritis 4 and 12 days after the onset of illness; but haemolytic streptococci were isolated from one, and the sister of the other had otitis media, so it is uncertain whether these should be regarded as complications of influenza.

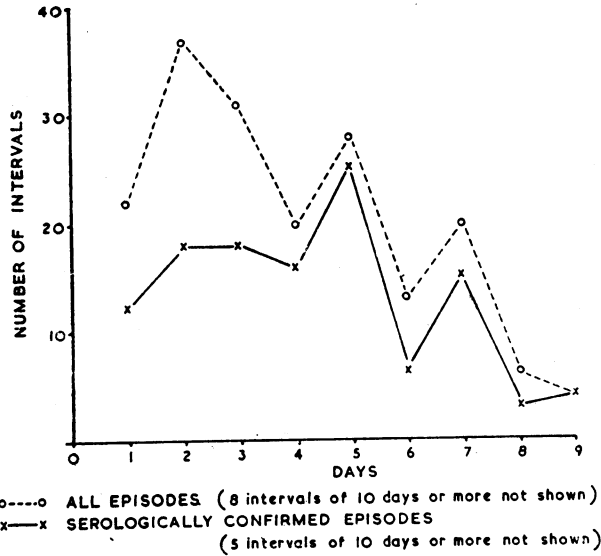


FIG. 2.—Distribution of serial intervals between first and subsequent cases in family episodes.

Discussion

Much of the value of the age-incidence figures shown in Table I depends on the extent to which they are representative of the country as a whole. From August 21 to the end of the year the number of new claims for National Insurance sickness benefit in Britain was about 2½m. more than the average for the same periods in the previous five years—that is, an increase equivalent to about 12½% of the insured population. We are indebted to the Ministry of Pensions and National Insurance for the information that the excess, compared with the previous year, of claims received by their nearest office (Sidcup) also amounted to about 12½% of the estimated population at risk. As no figure exists for the population normally served by a given insurance office this can be only a rough estimate, but it encourages the belief that the incidence figures are fairly representative of the national experience.

About a quarter of the adults of working age in this practice had an influenza-like illness, which is much greater than the National Insurance figure of 12½%. Sickness benefit can be paid only for incapacity lasting more than three days, whereas many illnesses, either because they were mild or at a week-end, caused lesser or no absence from work, which probably accounts for the difference. Sickness statistics for the past three years, kindly supplied by Morphy-Richards, Ltd., who have a large factory in the same area, showed that the proportion of their employees who were absent rose to 23% during the influenza epidemic: compared with a level of about 6% in previous years. The absence rate from influenza was therefore probably more than 17%, and so compatible with the practice figures. If the age-specific attack rates in this practice are applied to the population of England and Wales we may estimate that there were about 12m. cases of influenza—a similar figure to that put forward by Fry (1958). Unfortunately, both these estimates are based on practices in the same part of the country.

From the figures for secondary attack rates (Table III) we infer that the high incidence of influenza among school-

children in the general population was not due to any greater susceptibility to infection in this age group, but to other factors. Outbreaks among schoolchildren appeared to play a big part in the spread of Asian influenza in the country generally last autumn, and it is clear that, in this practice at least, the epidemic was almost confined to schoolchildren and their family contacts. The low attack rate among older people may well have been due to the fact that comparatively few have close contact with schoolchildren.

Though the proportion of schoolchildren who escaped infection with Asian virus was probably small, perhaps three-quarters of the adult population were still susceptible to Asian virus after the autumn epidemic. It is possible that infection smouldering on during the winter contributed to the relatively high mortality in the country during December and January (McDonald, 1958). But even when the winter was over most older persons must still have been susceptible to the Asian virus. It remains to be seen, however, whether any further epidemic is possible until the school population become susceptible once more, either as a result of waning immunity or of antigenic variation in the virus.

Summary

During the autumn epidemic 31% of the patients in a practice on the south-eastern outskirts of London had clinical influenza. About half the schoolchildren were ill, a third of pre-school children, a quarter of adults under 50, and an eighth of adults over 60. It seems probable from National Insurance statistics that the prevalence of influenza in this part of Kent was similar to that for the country as a whole; there may therefore have been about 12m. cases of influenza in England and Wales during the autumn epidemic.

Three-quarters of patients in the epidemic were children aged 5 to 14 years or members of families with a child of this age. In such families the proportion attacked was about 33% at all ages. The falling attack rate with age in the practice as a whole was entirely due to the experience of families without children of school age.

Secondary attack rates were calculated for a group of 104 families in which a case of influenza occurred. Serological confirmation of influenza virus A infection was obtained in at least one patient in 59 of the families. Secondary attack rates for all age groups up to the age of 40 years showed little variation, but above that age the rates fell away. The sequence of becoming ill in these family outbreaks suggested that the lower rates in older people were possibly due to less exposure to infection. Attack rates in husbands and wives supported this view.

The clinical features of illnesses in family outbreaks where at least one case was confirmed serologically varied with age: drowsiness, vomiting, diarrhoea, and nose bleeds were more prominent in the young; delirium in children of school age; and headache, aches and pains, and faintness and giddiness in adult life.

REFERENCES

- Fry, J. (1958). *Brit. med. J.*, **1**, 259.
McDonald, J. C. (1958). *Proc. roy. Soc. Med.* In press.

The annual report (1958-59) of the National Marriage Guidance Council (78, Duke Street, London, W.1) states that the past year has been one of steady expansion and new work. "It is unfortunate," continues the report, "that this has not been matched by a corresponding increase in Government grant." 197 candidates attended the sixteen selection conferences for marriage guidance counsellors, of whom 128 (65%) were accepted for this work.