A FAMILY STUDY OF RESPIRATORY ILLNESS

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In recent years, many hitherto unknown viruses have been recovered from cases of respiratory illness; the present state of knowledge in this field has been surveyed by Andrewes (1959). The role of these viruses in the aetiology of the minor respiratory illnesses seen, or not seen, by the general practitioner in this country remains imperfectly known. A longitudinal survey of a small number of selected families was therefore carried out from January to July 1959. This survey is reported mainly from its interest as a pilot study in one method of investigating families in their homes.

Methods

Record cards of the type used by Hope-Simpson (figure 1) were distributed to the families, who completed them and returned them at three weekly intervals.

Sera were obtained at the beginning and at the end of the survey from as many of the participants as possible. These sera were tested against a range of respiratory virus antigens, either by complement-fixation (using the technique of Balducci *et al.*, 1956) or by haemagglutination-inhibition (using a modification of the World Health Organization's (1953) plastic plate method).

Results

Six families were studied; five of these lived in two suburbs of Sheffield and one family lived in a mining village some fifteen miles

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NAME JOHN JONES BORN 1—4—51 NO 1493
ADDRESS BROWN STREET DR SMITH
SHEFFIELD 2. DATE JAN. 1959

DATE JAN	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
SORE THROAT	–	–	–	1	2	2	3	2	2	–	–	–	–	–	–	–	–	–	–	–	–
COLD IN HEAD	–	1	2	2	2	3	4	3	3	–	–	–	–	–	–	–	–	–	–	–	–
COUGH	–	–	–	2	3	3	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
HEADACHE	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
ACHE IN BACK OR LIMBS	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
FEVERISH	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–

Severity Scale
- – Nil
- 1 Extremely Mild
- 2 Mild
- 3 Moderate
- 4 Severe

Please change this card on JAN. 22

Figure 1. Record card of respiratory illness as used in the present survey.

from Sheffield. All the families consisted of father, mother, and two children (in one case, three children). The parental ages ranged from 27 to 38 years and those of the children ranged from one year to 13 years. Four families were of social class II and two families were of social class III.

The incidence of respiratory illness

One hundred and eighteen illnesses, in 25 individuals, were recorded in which one or more of the three symptoms ‘ cold in head ’, ‘ cough ’ or ‘ sore throat ’ were present. Of these, four were noted on the record card as “ measles ” (two cases) and “ scarlet fever ” (two cases) and will not be considered further. The families were under observation for a total of 14.5 person/years, giving an average (probably valid, as the study embraced both winter and summer months) of 7.8 respiratory illnesses per person/year. The proportions of illness experienced by fathers, mothers, schoolchildren, and preschoolchildren is given in table I. The incidence of respiratory

TABLE I.

THE INCIDENCE OF RESPIRATORY ILLNESS IN FAMILIES

	Number at risk	*Number of respiratory illnesses*	*Respiratory illnesses per person per year*
Fathers	6	15	4.3
Mothers	6	27	7.8
Schoolchildren	10	61	10.5
Pre-school children	3	11	6.3
TOTAL	25	114	7.8

illness by months is given in figure 2 and by weeks in figure 3. The cumulative incidence of respiratory illness is given in figure 4. These figures show, as might be expected, a high level of morbidity during the winter months, falling to a low level as the summer approached.

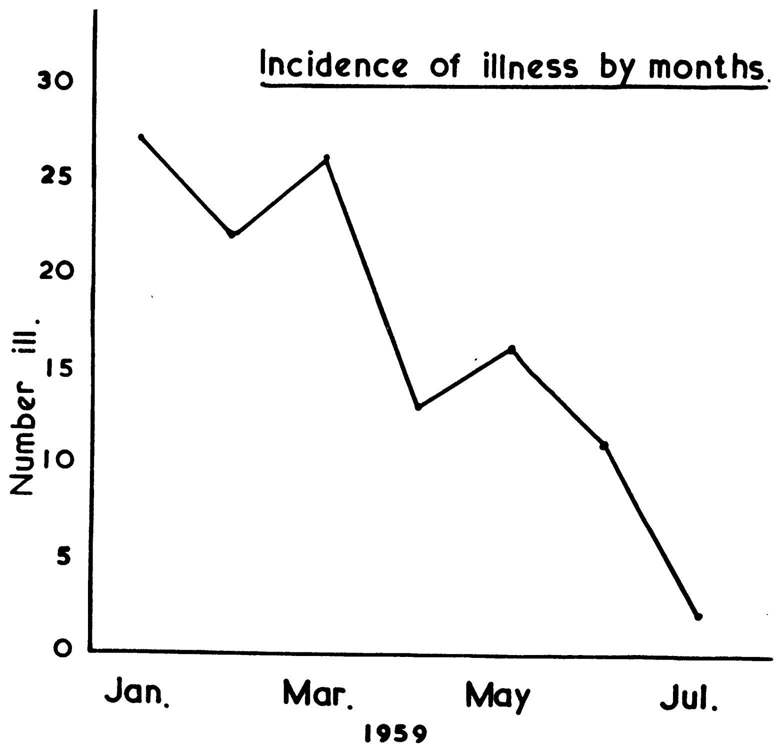

Figure 2. The incidence of respiratory illness by months.

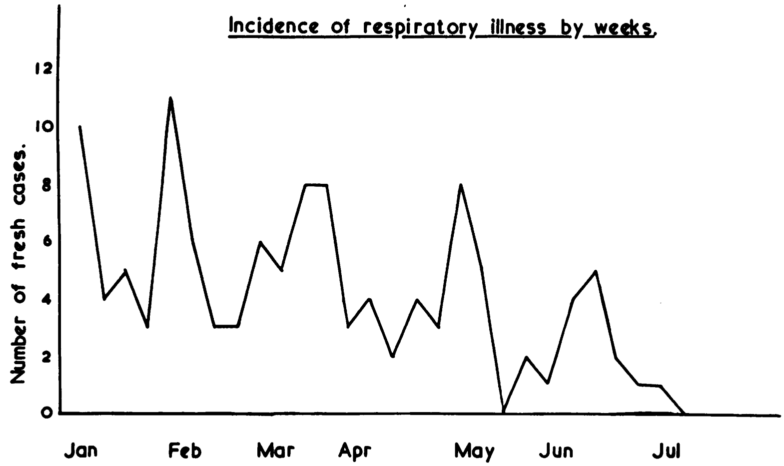

Figure 3. The incidence of respiratory illness by weeks.

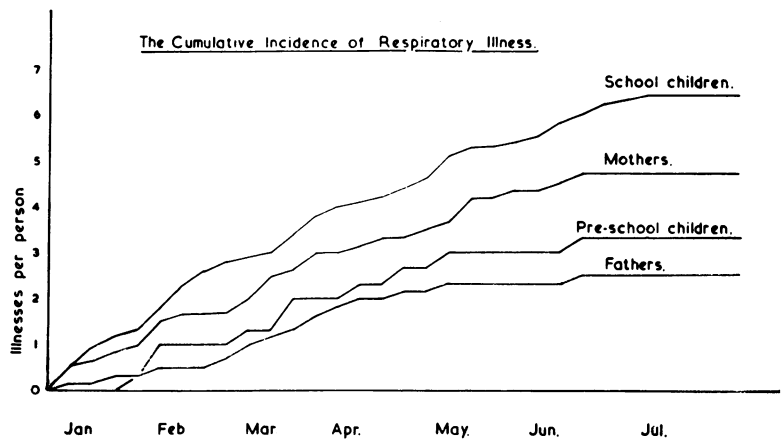

Figure 4. The cumulative incidence of respiratory illness.

Enquiry of the family doctors revealed that, out of the 118 respiratory illnesses recorded, one was seen professionally. In view of the cases of measles and scarlet fever reported by the families, this figure seems to be an underestimate. Nevertheless, even when this underestimate is allowed for, the proportion of mild respiratory illness which was never seen by a general practitioner remains very high.

Serological results

Paired sera, taken at the beginning and at the end of the 6 month period, were available from nine out of the 25 participants in the study. These nine individuals (eight of whom were adults) had experienced 34 episodes of respiratory illness during the survey. The nine pairs of sera were tested against a range of respiratory viruses, with the results given in table II. If each serological conversion were associated with an episode of respiratory illness, a not unwarrantable assumption, it would appear that three out of the 34 illnesses were associated with infection by known viruses. The presence of antibodies against six of the eight test viruses suggests that infection with these viruses had taken place in the period before the survey began.

TABLE II.

INVESTIGATIONS IN SERA COLLECTED BEFORE AND AFTER THE SURVEY

Test Virus	*Type of test**	*Number of sera tested*	*Number of sera with significant rises in antibody***	*Number of sera with antibody in both specimens*
Influenza A	CF	9	1 (<4/24)***	1
Influenza B	CF	9	0	3
Influenza C	CF	9	0	0
Para-influenza 1	CF	9	0	0
Para-influenza 2	HAI	9	0	8
Para-influenza 3	CF	9	0	3
Adenovirus	CF	9	1 (<4/16)	1
ECHO 11	HAI	9	1 (6/48)	6

*—CF—Complement-fixation test.
HAI—Haemagglutination-inhibition test.
**—Four-fold or greater rises in antibody were regarded as significant.
***—Titres are expressed as reciprocals of initial serum dilutions.

Discussion

In view of the small numbers of individuals under observation in the survey, the general agreement of the morbidity figures with those quoted in larger surveys (e.g. Dingle *et al.*, 1953) is surprising and suggests that the record card method is comparable with weekly visiting as a means of gathering epidemiological data. The information which can be obtained in this way is limited in detail, but the method is clearly much less prodigal of time and personnel than that of frequent visiting.

Serological surveys, such as the present one, are open to criticism on the ground that serological conversion may not necessarily be related to any clinical event. The period over which serological conversion occurred and its relation to respiratory illness can be determined by the recovery of virus from throat swab or gargling.

Such recovery is usually considered an essential step towards the establishment of aetiology. However, as these families' homes were their castles, the frequent visits necessary to obtain such throat swabs from every case of respiratory illness would have been regarded as unwarrantable intrusions and might have prejudiced the success of the record card programme. Throat swabs were, therefore, not taken.

The collection of sera also posed problems. The children in their own homes were less stoical, where venepuncture was concerned, than their colleagues in hospital and this dislike of the needle communicated itself readily to their parents. Perhaps the collection of blood from heel-pricks into saline (Fox *et al.*, 1957) or on to filter paper (C. E. Gordon Smith, personal communication) would have given better results from this point of view.

Such serological results as were obtained indicate that perhaps one tenth of the respiratory illnesses experienced in the group of families under study could be attibuted to three of the test viruses (influenza A, adenovirus, ECHO II). There was also evidence that infection with six out of the eight test viruses had occurred in the families before the survey began.

Family studies, such as the one described, offer a convenient method of assessing the prevalence of respiratory (and other) illness and of viruses in a population in a way which does not make excessive demands on laboratory or field worker's time.

Summary

A longitudinal survey of respiratory illness in six families is described in which Hope-Simpson record cards were used. Paired sera from nine individuals were tested against eight respiratory viruses; serological conversions occurred to three of these (influenza A, adenovirus, and ECHO 11).

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