CHILDHOOD ASTHMA: A PSYCHOSOMATIC DISORDER? SOME EPIDEMIOLOGICAL CONSIDERATIONS

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Epidemiologists with an interest in bronchial asthma, have given little attention to the psychiatric aspects of this condition, particularly as it occurs in childhood. Clinical impressions, rather than the results of systematic studies, are responsible for the fact that some paediatricians and psychiatrists have come to view the personality of the asthmatic child in terms of a stereotype engendered by a particular type of mother-child relationship (Abramson, 1954). Moreover, there is a general belief that asthmatic children are neurotic and that this neurosis is manifest in their general behaviour, but in fact there is conflicting evidence on this point (Harris and Shure, 1956; Leigh and Marley, in press) and no definitive information is available. Children corresponding to this stereotype, over-dependent on their over-protective mothers, anxious, tense, shy, afraid to show their emotions, yet at the same time intelligent, ambitious, and perfectionist, are not uncommon, but the evidence for the stereotype is lacking (Dubo, McLean, Ching, Wright, Kaufman, and Sheldon, 1961). Studies carried out on total populations (Kraepelin, 1954; Eriksson-Lihr, 1955) have stopped short of the examination of psychiatric correlates, while those that have looked at the prevalence of psychological factors in established asthmatics have in general based their studies on patients attending hospitals (Neuhaus, 1958) or, more rarely, general practitioners (Leigh and Marley, in press). Such patients may well be highly selected from the point of view of personality and neurotic illness, and total population studies have something to contribute in these areas. The findings of a study of this type form the material of the present paper.

METHOD

Over the past 2 years a collaborative study of the inter-relations of physical, educational, and psychiatric handicaps in children living in the Isle of Wight

has been undertaken. Broadly speaking, each phase of the investigation has been carried out in two stages. First the total population at risk—in most cases all those children born between September 1, 1952, and August 31, 1955—has been screened. Screening procedures having identified those likely to be at risk, intensive investigations involving personal examinations and interviews of these selected children and their parents have then been carried out.

The study began in 1964, when the total population (numbering 3,300) of children then 9, 10, and 11-years-old whose parents were resident on the Isle of Wight was given National Foundation for Educational Research group tests of intelligence (non-verbal) and tests of reading and arithmetic. The tests given were Primary Verbal 1 (P.V.1), Non-Verbal 5 (N.V.5), Sentence Reading 1 (S.R.1), and Mechanical Arithmetic 1C (M.A.1C). Of the 9 and 10-year-olds, 452 children selected on the basis of poor performance in these tests were, at that time, examined more intensively, together with 147 randomly-selected controls. (159 controls were initially selected by random procedure, but twelve (7.5 per cent.) refused further testing.) During the following year, 1965, and before the results of these group tests had been analysed, an attempt was made to identify all children in this age group, other than those in independent schools, who were suffering from any significant physical handicap, including asthma, neurological, and epileptic disorders (see Table I, opposite).

A register of physical disorders in the total school population provided the main source of cases. The register (which had been specially set up by the Principal School Medical Officer on the Island to assist in the identification of handicapped children) was based on routine school medical examinations of the child at which the mother was normally interviewed. 90.6 per cent. of the mothers of the

TABLE I

randomly-selected control group of children gave information that was available at one or more of these medical examinations. In addition, a check was made of the hospital records of children who had attended the paediatric departments on the Island during the previous 5 years, and head teachers were provided with lists of children with known physical conditions and were asked to add names of any handicapped children not included.

In June, 1965, parents and teachers of all the children in the age group were asked to complete check-lists about their behaviour. 99.8 per cent. of the children had forms completed about them by their teachers and 88.5 per cent. by their parents. The teachers' questionnaire is in the form of a series of 26 statements about the child which must be marked "Does not apply", "Applies somewhat", or "Definitely applies". The parents' questionnaire is very similar, containing 31 items, eighteen of which are identical with those in the teachers' check-list. The test-retest reliability of both questionnaires has been shown to be high—for the teachers 0.89 (Rutter, 1967), and for the parents 0.74 (Rutter, in preparation). In addition, the scores on both questionnaires have been shown satisfactorily to differentiate children under psychiatric care from normal children.

In mid 1965, too, parents and teachers of children now suspected to be suffering from a physically handicapping condition were sent a questionnaire which inquired about the extent and severity of the condition during the previous year, how much schooling the child had missed, and how much restriction had been placed on the child's activities. All children who, on the basis of the screening information thus far collected, might have suffered from their condition in the previous year were then selected for more intensive investigation. Children selected as possibly maladjusted on the basis of their

scores on the teachers' or parents' behaviour check-lists were also selected for intensive study. These studies were carried out in late 1965 and, amongst others, 57 of the asthmatic children were investigated in this way. The parents of these children were seen either by a doctor or by a graduate in one of the social sciences, using a standard open-ended interview lasting on average about an hour and a quarter. The interviewers obtained information about the composition of the family and illnesses suffered by other children. They asked in detail about the nature of the condition, its precipitants and severity (especially during the previous year), and its impact upon family life. A series of 36 questions was asked about the child's behaviour and feelings. Great stress was laid here on the need to obtain actual examples of the child's behaviour and to ignore inferences or generalizations made by the parents about how their children felt or might be feeling.

In addition at this time the teacher was asked to complete another, more up-to-date, behaviour check-list together with a form asking for free comments under a number of headings. Finally, each child received individual psychological testing which included a short form of the WISC and the Neale Analysis of Reading test. The behaviour of the child was rated on the basis of all available information by one or other of the two psychiatrists engaged in the study and an overall assessment of psychiatric disorder on a 4-point scale was made. Inter-rater reliability of this judgement was shown to be high (0.81) (Rutter and Graham, 1966). Judgement was made in isolation of any consideration of the nature or severity of the physical complaint from which the child was suffering. This was made possible by the fact that details of the physical condition were recorded in a different part of the schedule from the description of the child's behaviour.

RESULTS

PREVALENCE

For the purpose of this study asthma was defined as a condition producing attacks of breathlessness with wheezing, and all children who had suffered one or more such attacks in the previous year were included. The group was divided into 66 definitely asthmatic (2 per cent. of the population) and ten only probably asthmatic (0.3 per cent. of the population). The prevalence rate of asthma in this population of 9, 10, and 11-year-old children was therefore 2.3 per cent. if probable cases are included and 2.0 per cent. if they are not (see Table II). The probable cases in fact differ little in terms of social class and intelligence from the definite ones, so they will not be referred to separately any further. Of the asthmatic children 56 per cent. were boys, a lower proportion of boys than was present in the "maladjusted" or neuro-epileptic groups, but a higher proportion than in the group of other (miscellaneous) physical handicaps where there was a preponderance of girls.

SOCIAL CLASS

The social class distribution of the asthmatic group differs strikingly from that of the control group, but less clearly from the group of children with other (miscellaneous) physical disorders. (see Table II). Classes I and II are significantly in excess ($P < 0.01$) and Classes IV and V are significantly under-represented ($P < 0.01$). Two possible ways in which this finding might have been due to selection bias were considered:

- (i) Classes I and II are known to be more geographically mobile and it might be that the parents of asthmatics chose to live on the Isle of Wight because of the child's condition. In three or four cases (not exclusively drawn from Classes I and II) this was mentioned at the interview. However, by examination of the school medical records, it was possible to determine that the proportion of children who

had arrived on the Island since starting school (a move to the Island before the age of 5 on account of asthma is perhaps rather unlikely) was not significantly greater in the asthmatics than in the control group. 10.1 per cent. of the control group families had moved onto the Island since their children had started school compared with 12.7 per cent. of the families of asthmatic children (this difference is not significant).

- (ii) It is possible that working-class mothers of asthmatic children tend not to attend school medical examinations, so that the child's condition remains unidentified. This is not likely to be an important source of error, as it was found that over 90 per cent. of the mothers of the control children attended the school medical examinations. However, as might be expected, non-attenders in the control group did come largely from Classes III (non-manual), IV, and V (12 out of 14), so that this factor may have contributed to some extent.

The fact that the social class distribution of children with an extremely heterogeneous group of other physical disorders also showed a small relative excess of non-manual occupations is further evidence for some degree of reporting bias.

INTELLIGENCE AND EDUCATIONAL ATTAINMENT

When the asthmatic children were compared with the control group (see Table III) it was found that

TABLE III
INTELLIGENCE AND EDUCATIONAL ATTAINMENT OF
PHYSICALLY HANDICAPPED CHILDREN

Test	Asthmatics (72)		Other Handicaps (32)		General Population (3,300)	
	I.Q.	S.D.	I.Q.	S.D.	I.Q.	S.D.
Non-verbal I.Q.	102.9	12.3	96.9	9.2	100	15
Reading	102.5	14.4	98.8	16.2	100	15
Arithmetic	101.8	14.4	99.7	16.6	100	15

TABLE II
SOCIAL CLASS DISTRIBUTION OF PHYSICALLY-HANDICAPPED CHILDREN

Group		Controls	Handicapped Children			
			Asthmatic	Maladjusted	Neuro-epileptic	Other
Proportion of Population		—	2.3	5.7	1.9	1.1
Percentage Male		50.1	56.0	64.5	59.6	47.4
Social Class (per cent.)	I and II	15.7	39.7	14.3	21.7	26.3
	III (Non-manual)	15.7	13.7	14.3	21.7	21.1
	III (Manual)	43.6	35.6	42.8	33.3	26.3
	IV and V	23.0	10.9	28.6	23.3	26.3
No. of Children in Group		147	76	126	63	38

there was a very slight but consistent tendency for the asthmatics to achieve better results. This tendency was greatest in the group non-verbal test—and was a little less notable in the tests of educational attainment—reading and arithmetic. The asthmatic children almost, but not quite, achieved significantly better results at the 5 per cent. level than the control children in the non-verbal test. The differences in reading and arithmetic fell well below this level of significance. The asthmatic group was, therefore, not *markedly* superior in intelligence, nor was there any suggestion that they were educationally *over-achieving*; if anything, the reverse was the case.

PSYCHIATRIC DISORDER

In order that the psychiatric findings should not be biased in any way by the physical findings, neither the asthma itself nor its possible emotional determinants or sequelae were taken into account either in the questionnaire information or in the overall assessments of psychiatric disturbance. The behavioural questionnaires in fact contained no questions on difficulties in breathing.

The number of children scoring over the cut-off point which had been found to produce the best differentiation of children with psychiatric disorders (Rutter, in preparation) on the parents' questionnaire was 10.1 per cent. (seven out of 69 children) and the number scoring over this point on the teachers' questionnaire was 10.7 per cent. (eight out of 75 children) (Table IV).

TABLE IV
BEHAVIOUR OF PHYSICALLY-HANDICAPPED CHILDREN

Group	Controls (147)	Asthmatics (57-73)
Per cent. scoring over cut-off point on teachers' questionnaire	7.1	10.7
Per cent. scoring over cut-off point on parents' questionnaire	6.0	10.1
Per cent. definite psychiatric disorder on overall assessment	6.3	10.5

In the general population the numbers scoring as high as this were 6.0 and 7.1 per cent. respectively, so that there might have been a slight, but only a slight, tendency for asthmatic children to score more highly on both the parents' and teachers' questionnaire. Using comparable methods, 10.5 per cent. of the asthmatic children were found to have definite psychiatric disturbance on our overall assessment, compared with 6.3 per cent. of the general population. This is a trivial and statistically insignificant excess (only two more children were considered definitely maladjusted than might have been

expected by chance). In addition, a small number of children who had been selected as suffering from asthma were later found to have psychiatric disorders, although they had not been selected in the initial psychiatric screening tests. If these are included, eight out of 66 (13.6 per cent.) asthmatic children were found to have definite psychiatric disorders on overall assessment.

If the mean scores on the parents' and teachers' questionnaires are considered (Table V), it can be seen that the asthmatic children were regarded by parents as showing significantly more behavioural symptoms than the general population ($P < 0.05$). However, the difference between the asthmatic children and those with other physical handicaps is small and not significant. The mean score of the asthmatic children on the teachers' questionnaire did not differ significantly from the general population, although the children with other physical handicaps did differ significantly in this respect ($P < 0.05$). Again however the difference between the asthmatics and children with other physical handicaps is not significant.

TABLE V
MEAN SCORES OF THE GENERAL POPULATION OF 9 TO 11-YEAR-OLD CHILDREN, ASTHMATIC CHILDREN, AND CHILDREN WITH OTHER PHYSICAL HANDICAPS ON PARENTS' AND TEACHERS' BEHAVIOUR QUESTIONNAIRES

Questionnaire	General Population	Asthmatic	Other Physical Handicaps
Parents'	4.14	6.26 (N=69)	5.91 (N=32)
Teachers'	2.70	3.31 (N=75)	4.17 (N=35)

COMPARISON OF DISTURBED AND NON-DISTURBED ASTHMATIC CHILDREN

Of the 66 children identified as having definite asthma, 57 (86.4 per cent.) were intensively investigated by parental interview, individual psychological testing, and by obtaining further information from teachers. As mentioned above, of these eight (13.6 per cent.) had definite psychiatric disturbance on overall assessment. The number of children with other physical handicaps is too small to warrant any detailed separate consideration, but roughly the same proportion (six out of 38 or 15.8 per cent.) were found to have definite psychiatric disturbances as in the asthmatic group. A further sixteen asthmatic children were identified as showing minor antisocial or neurotic traits, and the manner in which this group of 24 asthmatic children with any psychiatric disorder, severe or minor, differed from the 33 others will now be considered (Table VI, overleaf). They were compared in three main ways: with respect to

TABLE VI
PSYCHIATRIC DISORDER IN ASTHMATIC CHILDREN
(Percentages in Brackets)

History	Serious or Minor Psychiatric Disorder	No Psychiatric Disorder	Total Numbers
Family History of Asthma	11 (45·8)	14 (42·4)	25
Both Family History of Asthma and History of Eczema	7 (29·2)	8 (24·2)	15
History of Eczema	11 (45·8)	14 (42·4)	25
Severe Disability and/or School Restriction	10 (41·7)	7 (22·6)	17
Total No.	24	33	57

the presence or absence of a history of asthma in first-degree relatives; in relation to a history of eczema; and in relation to the severity of the asthma. The family history was obtained systematically with respect to the sibs. In addition, parents often volunteered the information that one or other of them had suffered from the disease at some stage in the interview (especially when asked if they had been concerned about the cause of the child's condition). The finding that just under 50 per cent. had either a sib or a parent with a history of asthma does not differ greatly from the findings in other studies (e.g. Leigh and Marley, in press). It can be seen that neither a history of eczema in the child nor a family history of asthma affected the likelihood of the child's showing psychiatric disorder.

On the other hand, although the numbers are small, there did seem to be a tendency (not a significant one) for the disturbed group to include a somewhat higher proportion of children *severely* affected by their asthma (ten out of 24 or 41·7 per cent. compared to seven out of 33 or 22·6 per cent. less severely affected). Children were regarded as severely affected if (i) they had been prevented from going to school or from engaging in quiet play because of asthma on more than 20 days in the past year, or (ii) they were restricted by asthma in their school activities (usually games or physical education).

Apart from the rate of concomitant psychiatric disorder in the asthmatic group, the importance of emotion in precipitating attacks must be considered briefly. Twenty (35·1 per cent.) of the 57 parents interviewed stated that some of their children's attacks were brought on by emotion, usually by fear or anxiety, but sometimes by anticipatory excitement and sometimes by anger. In some children these emotional precipitants were thought by the parents to be the most important of the aetiological factors, although they were rarely thought to be solely responsible for the production of attacks.

PERSONALITY OF THE ASTHMATIC CHILD

Finally one prominent aspect of the so-called asthmatic personality stereotype was examined. Asthmatic children are often described as being tense and inhibited and having difficulties in showing emotion. For example, Burton (1964), comparing asthmatic children with matched controls of whom about a fifth had chronic physical handicaps and using the Bristol Social Adjustment Scale devised by Stott (1958), found the asthmatics to be less forthcoming, although they were not significantly more maladjusted. One of the questions the parents of all children intensively investigated in the present study were asked was "Is he or she an affectionate child"? (see Table VII); 22 of the 57 parents of asthmatic children spontaneously described their children as not liking to be fussed or not showing affection. In the group of neurological or epileptic children, ten out of 58, and in the group of children with other physical disorders eleven out of 37, showed this trait. The difference between the asthmatic and neuro-epileptic group is significant at the 0·02 level, but there is no significant difference between the asthmatic children and those suffering from other physical handicaps. In view of the fact that the neuro-epileptic children were duller, and probably less mature emotionally, the absence of a significant difference between the asthmatic children and those with other physical handicaps is probably the more meaningful finding.

TABLE VII
DEMONSTRATION OF AFFECTION IN GROUPS OF HANDICAPPED CHILDREN
(Percentages in Brackets)

Group	Lacking in Show of Affection	Number in Group
Asthmatic	22 (38·6)	57
Neuro-epileptic	10 (17·2)	58
Other Physical Handicaps	11 (29·8)	37

DISCUSSION

The prevalence rate for asthma in 9, 10, and 11-year-old children in the present study is a little higher (2·3 per cent.) than that found in previous studies (Kraepelien, 1954; Eriksson-Lihr, 1955; Harris and Shure, 1956; Smith, 1961). Eriksson-Lihr quoted a study carried out in Finland where the prevalence in children was found to be 0·6 to 0·7 per cent. Kraepelien found the prevalence in Swedish school children to be 0·73 per cent., but 1·4 per cent. in Stockholm where the case-finding technique was more thorough. Harris and Shure found a prevalence of 2 per cent. in children attending two North American schools. Smith found 1·8 per cent. of

10-year-old school children in Birmingham to be asthmatic. The fact that we used a number of sources to identify our cases may explain our higher figures. However, by far the largest number come from the school medical records. Only three cases were added as a result of the search of hospitals records and none was found by asking head teachers to add names to lists of children known to be handicapped. The only closely comparable study of prevalence in children of this age group elsewhere in the United Kingdom appears to be that of Smith (1961).

The prevalence rate of 1.83 per cent. found by Smith is rather similar to that of the present study (2.0–2.3 per cent.). It is interesting that Smith, in an urban population, found a higher proportion of boys (66.7 per cent.) than in the present study (56.0 per cent.). He pointed out that studies of young adults failed to show any marked differences between the sexes in prevalence, and that this reflected a general tendency for sex differences in this condition to decrease with age. Smith noted too that girls more commonly suffered from a mild form of asthma than did boys. In the present study too there was a tendency for girls to suffer less severely from their asthma, and it may be that the smaller difference in prevalence between the sexes in the present study is due to the inclusion of a greater number of mild cases. This would also explain why the prevalence figures of the present study are slightly higher.

The over-representation of Social Classes I and II, and the under-representation of Social Classes IV and V again confirms commonly held clinical impressions, but there seems to be no other comparable epidemiological study to which one might turn for further support. Grant (1957) found a high prevalence of asthma (3 per cent.) among undergraduates attending the University of Wales, and probably the middle class was over-represented in this undergraduate population as it is at most other universities. Logan's study in a number of general practices confirms that the consultation rate for asthma is higher in the children of the white-collar executive group (Logan, 1960). It is not easy to see why there should be this over-representation of the middle classes. Is the more varied diet to which these middle-class children are exposed an important source of allergens? Does their greater geographical mobility expose them to a greater number of allergens absorbed through the skin or nose? Are they subjected to a specifically middle-class type of psychological stress?

One such stress which it is possible to examine here is "educational pressure", yet there is no confirmation in the findings of the present study that this factor is of any general importance. The asthmatic

children were perhaps, very slightly, under-achieving in relation to their level of general intelligence. For this, the amount of schooling missed may be adequate explanation, but in any event there is no evidence that they were achieving higher standards than might be expected from their general level of intelligence. Their level of intelligence on the other hand did appear to be slightly higher than that of the general population from which they were drawn. Evidence in the literature on this point is conflicting. Rogerson (1943) found hospitalized asthmatics to be more intelligent than other children in the wards. On the other hand, Piness, Miller, and Sullivan (1937) found allergic children to differ from the general population only in being somewhat retarded educationally, but the tests used in the allergic group were not strictly comparable with those used in the general population. Coghlan (1962) found the rate of asthma to be low in mongol children, but not in those suffering from other varieties of mental defect. The results of the present study are not conclusive, but there was a tendency in each age group for the asthmatic children to score more highly than the controls on the test of non-verbal intelligence.

As many writers have stressed, psychological factors can be important in asthma in a number of different ways. Some of these modes of psychophysical interaction, such as the effect of the illness itself on the life and behaviour of the patient, are shared with all other forms of disease. Others (such as the precipitation of attacks by events disturbing to the emotions) are shared only by a smaller number of diseases sometimes labelled psychosomatic. Psychosomatic disorders are sometimes stated to occur only in vulnerable personalities or in children made vulnerable by specific types of relationship with their parents, especially their mothers.

If the concept of vulnerable personality is to have any value, then there must be some external criterion for identifying it—otherwise it is no more useful to say that the child develops his asthma for this reason than because he has sensitive lungs or a delicate chest. An excess of vulnerable personalities might be expected to be reflected in a high rate of psychiatric disorder. There is little evidence in the present study for this view in the amount of psychiatric disorder the asthmatic children showed either at home or at school. They scored a little higher both on the teachers' and parents' questionnaires and somewhat more of them than might be expected by chance were found to be maladjusted on overall assessment, but these differences were small and not statistically significant. The rate of maladjustment was closely similar in the group of children with a miscellaneous selection of other physical handicaps. This suggests

that the psychiatric disorder associated with asthma was in no way specific—rather it appeared to be the result of chronic illness and consequent impairment in social relationships. This explanation is supported by studies which have found asthmatics to differ somewhat in their behaviour from healthy controls (Leigh and Marley, *in press*) but to share personality traits with other chronically-ill groups, such as children with cardiac lesions (Neuhaus, 1958).

A high proportion (35.1 per cent.) of the asthmatic children in the present study had attacks precipitated by emotions of one sort or another. This is a minimum figure, and it is likely that psychological factors play an important part in this illness. Nor is this importance confined to children without evidence for an allergic diathesis in their personal or family histories. Ten (28.6 per cent.) of 35 children with a history of eczema or with a family history of asthma had some of their attacks precipitated by emotional causes. Although this figure is proportionally somewhat (but not significantly) lower than that for children who had no such obvious genetic and allergic factors in their background (ten out of 22: 45 per cent.), it is clear that disturbing emotional experiences are often important in the genesis of attacks, regardless of other influences acting upon the child. It could be argued that, at any rate for a proportion of asthmatic children, our attempts to assess their degree of psychiatric disorders have been misdirected, the evidence for such disorder lying in the presence of the asthma itself. Is asthma then a psychiatric disorder in its own right? The difficulty inherent in this view is that it gives rise to no unambiguous testable predictions, and certainly our findings cannot provide an answer to this question. If asthma is a type of neurosis, it might be predicted that the rate of psychiatric disorder, judged by independent criteria, would be less in asthmatics than in the general population, because such children were able to deal with their conflicts by developing asthmatic attacks. Alternatively, because neurotic attempts to deal with conflict are usually partially unsuccessful and other modes of emotional discharge are called into play, asthmatic children might be expected to show a higher rate of psychiatric disorder.

It may be that in a small proportion of asthmatic children emotional factors outweigh all others in importance and psychological methods of treatment offer the best hope of therapeutic success. However, the finding that asthmatic children who show behaviour disturbances come as frequently from those with heavy allergic or genetic loading as from those without such adverse elements in their constitution does argue against the presence of an important

dichotomy between asthma of psychogenetic origin and asthma of organic origin. One is almost as likely, perhaps just as likely, to find important psychological mechanisms at work where organic factors are obvious as where they are apparently absent.

In order to determine how much of the psychiatric disorder that one finds occurs *as a result* of the presence of this frightening and disabling condition rather than the reverse, longitudinal prospective studies are necessary. The present study, by virtue of the fact that the children with psychiatric disorder had little in common except their asthma, suggests either that the asthma itself was responsible for the psychiatric disorder or that, in general, factors quite unrelated to the asthma played the major part in causation. However, the issues are badly in need of clarification. Pre-school children known to be particularly at risk, either by virtue of their family histories or because of the presence of other allergic conditions, might be investigated longitudinally to determine whether, amongst other factors, specific behaviour or personality patterns are predictive of the development of asthma. The subsequent progress of those who did develop the disease would be further helpful in identifying the important stresses that result from its presence. Our impression is that the second phase of such an investigation might be the more rewarding.

SUMMARY

In an epidemiological study of the inter-relations of physical, psychiatric, and educational handicaps, the one-year prevalence rate for asthma in the population of 9, 10, and 11-year-old children living on the Isle of Wight was found to be 2.0 per cent. (2.3 per cent. if probable as well as definite cases are included). Analysis of the group by social class showed that there was an over-representation of Social Classes I, and II, and an under-representation of Social Classes IV and V. The general intelligence of the asthmatics was somewhat higher and their educational attainments somewhat lower than in the general population. Neither of these differences was significant. Concomitant psychiatric disorder was slightly more common in the asthmatic group (10.5 per cent.) than in the general population (6.3 per cent.) but, children suffering from a miscellaneous group of other physical disorders showed a rate similar to that of asthmatic children. On the other hand emotional stress frequently precipitated the onset of the individual asthmatic attack.

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REFERENCES

- Abramson, H. A. (1954). *Ann. Allergy*, **12**, 129.
- Burton, L. (1964). Unpublished Ph. D. thesis. Queen's University of Belfast.
- Coghlan, M. (1962). "Incidence of Allergic Diseases in Children with Mongolism". D.P.M. Dissertation, University of London.
- Dubo, S., McLean, J. A., Ching, A. Y. T., Wright, H. L., Kauffman, P. E., and Sheldon, J. M. (1961). *J. Pediat.*, **59**, 402.
- Eriksson-Lihr, Z. (1955). *Acta allergol. (Kbh.)*, **8**, 289.
- Grant, G. (1957). *Ibid.*, **11**, 37.
- Harris, M. C., and Shure, N. (1956). *J. Allergy*, **27**, 312.
- Kraepelien, S. (1954). *Acta paediat.*, **43**, Suppl. 100, p. 149.
- Leigh, A. D., and Marley, E. (in press). "Bronchial Asthma; A population and Genetic Study". Pergamon Press, Oxford.
- Logan, W. P. D. (1960). "Morbidity Statistics from General Practice", vol. 2. (Occupation). *Studies on Medical and Population Subjects*, No. 14. General Register Office, London.
- Neuhaus, E. C. (1958). *Psychosom. Med.*, **20**, 181.
- Piness, G., Miller, H., and Sullivan, E. B. (1937). *J. Allergy*, **8**, 168.
- Rogerson, C. H. (1943). *Brit med. J.*, **1**, 406.
- Rutter, M. (1967). "A Children's Behaviour Questionnaire for Completion by Teachers: Preliminary Findings", *J. Child Psychol. Psychiat.* (in press).
- and Graham, P. (1966). *Proc. roy. Soc. Med.* **59**, 382.
- Smith, J. M. (1961). *Brit. med. J.*, **1**, 711.
- Stott, D. H. (1958). "The Social Adjustment of Children: Manual to the Bristol Social Adjustment Guides". University of London Press, London.