

CHILDHOOD MORBIDITY AND ADULT ILL-HEALTH

by

Chris Power

Social Statistics Research Unit
The City University
Northampton Square
LONDON EC1V 0HB

and

Catherine Peckham

Department of Paediatric Epidemiology
Institute of Child Health
30 Guildford Street
LONDON WC1N 1EH

ABSTRACT

The relation of health status in childhood to ill-health in early adulthood was investigated in the National Child Development Study. A wide range of information on child health was available in the cohort which was used to construct a broader measure of health status than selected diagnostic categories. Children at age 7 were allocated to 13 morbidity groups comparable with those of Starfield et al (6). Twenty percent of children had no reported ill-health, apart from the common infectious diseases such as measles and chicken pox, but 10% were included in four or more of the morbidity groups.

Children with no reported morbidity by 7 years retained their health advantage into early adulthood, since ratios of observed to expected ill-health for four of the five adulthood indices examined at age 23 (self-rated health, asthma and/or wheezy bronchitis, allergies, and emotional health) were all significantly below one (0.81, 0.63, 0.79 and 0.75 respectively). Conversely, children with more morbidity had higher ratios of ill-health in adulthood. A chronic condition in childhood was associated not only with excess morbidity in the short term but with poor rating of health into early adulthood (ratio=1.38). Also morbidity was significantly increased for most of the adulthood indices among children with asthma and/or wheezy bronchitis. Despite these findings most ill-health in young adulthood occurred in study members with a relatively healthy childhood.

Introduction.

Several conditions experienced in adult life are thought to have links with ill-health in childhood (1,2,3). However, research has focussed upon only a few conditions and the extent to which health in childhood persists into adulthood has not been determined. More specifically it is not clear whether a healthy child becomes a healthy adult and an unhealthy child becomes an unhealthy adult, nor conversely, what proportion of adulthood ill-health is associated with morbidity in childhood. This paper attempts to address these questions using longitudinal data from the National Child Development Study.

The childhood and adolescent ill-health of this cohort have already been described in terms of a wide range of specific conditions (4,5) some of which have been followed through to early adulthood (1). Measures representing a broader view of morbidity have not been developed for the cohort and, with the exception of a previous study in America (6), are not generally available. It is important that such measures be constructed so that a wide range of childhood illnesses can be included in the assessment of health status and not just selected diagnoses. A secondary aim of this paper is, therefore, to describe the development of such indicators of ill-health from data already available for the cohort. The value of these indices is evident not only in analyses presented here but also for other studies, such as social inequalities in health, where the use of

specific conditions are inadequate (7).

Subjects and methods

The 1958 cohort - National Child Development Study (NCDS) - has its origins in the Perinatal Mortality Survey which was designed to examine social and obstetric factors associated with stillbirth and death in early infancy (8). The subjects included all children born in the week 3-9 March 1958 and resident in England, Scotland and Wales. From a target population of 17,733 births information was obtained on 98%. At ages seven, 11, 16 and 23 the sample was followed-up and at each age, except the last, immigrants to Britain born during the same week were incorporated into the study (4,5).

Measures of morbidity

During childhood and adolescence reports were based on medical examinations carried out by the school medical officers and, in a home interview, parents were also asked to report the child's past and present health problems. Data were collected on a wide range of conditions described in numerous publications (4,5). In an attempt to summarise childhood ill-health, the data were categorized retrospectively using a scheme similar to that used in America by Starfield et al (6). Although information contained in the NCDS was not strictly comparable the basic structure of the American classification was retained.

All health questions included in the 7-year follow-up were

scrutinised by the authors and conditions allocated to one of 13 groups of morbidity. It was not always possible to determine severity since categorization was being imposed retrospectively. However, scales of severity had been employed for several conditions such as visual acuity, so that it was possible to select cut-off values, albeit arbitrarily, for certain definitions. Appendix A shows the contents of each category but definitions are given in Appendix B.

At age 23 the health of the cohort was characterised by:

- i) Self-rated health: respondents were asked 'How would you describe your health generally? Would you say it is - excellent; good; fair; or poor?'
- ii) Asthma or wheezy bronchitis since age 16: self-reported by respondents.
- iii) Allergies: included eczema and hayfever suffered in the preceding year.
- iv) 'Malaise' score: derived from a 24-item self-completion questionnaire which was administered at the end of the 23-year interview. Adapted by Rutter et al (10) from the Cornell Medical Index, this was designed as a screening instrument and scores of more than 7 are suggested as indicative of depression (11,12).
- v) Emotional or psychological morbidity (excluding mental handicap): self-reported data of hospital admissions or specialist consultations between ages 16 and 23 for emotional problems.

Non-Response

A total of 12537 people were successfully retraced and interviewed at age 23. This represents 76% of all members of the study who were alive and still living in Britain. Those remaining in the study tended to be more from middle class backgrounds and certain disadvantaged groups have become under-represented, but differences between responders and non-responders were generally small (5,13).

Analyses of response by health status showed similar response patterns for most groups of morbidity at age 7. By 23 years, however, under-representation of particular groups had occurred, notably among those with a chronic medical condition at 7 who comprised 4.7% of the sample, compared with 4.1% of those who subsequently responded at 23. Those with a chronic sensory condition at 7 were also under-represented at the latest follow-up (4.4% at 7 and 3.7% at 23) but the poorest response was in the psychosocial group (17.3% at 7 and 13.9% at 23) which included children identified as 'maladjusted'. Biases in response may lead to some underestimation of chronic conditions at age 23, but these are likely to be less relevant to within group comparisons.

Data analysis.

Ratios of observed to expected frequencies were calculated for each morbidity group at age 7 in order to indicate the likelihood of:

- a) belonging to the other morbidity groups at 7 and
- b) having ill-health subsequently in early adulthood.

For the former, expected numbers were calculated assuming that within any particular morbidity group, the prevalence of other groups was the same as in the population overall. Chi-square tests were used to establish whether ratios differed significantly from one, but because of the number of tests performed (66) only values of $p < .01$ were regarded as significant.

For the latter (b) expected numbers were derived from the prevalence of ill-health at age 23 applied to the population in each morbidity group at age 7. As fewer tests (35) were performed than for (a) 95% confidence intervals were calculated to assess the statistical significance of these ratios.

RESULTS

Morbidity at 7.

Table 1 shows the prevalence of the 13 morbidity groups for boys and girls in the NCDS. By 7 years virtually all children had experienced one or more of the common infectious diseases such as measles, German measles, whooping cough, chicken pox, mumps or scarlet fever. Forty percent had also suffered with ear and throat infections and related problems, often repeatedly. In contrast 4 percent of children had a chronic medical condition such as heart disease, epilepsy or a urogenital disorder (Appendix A).

Overall the prevalence of morbidity by age 7 was higher for boys than girls but sex differences were generally small. Exceptions to this

included injuries and 'other' morbidity; the latter resulted largely from the inclusion of hernia in this group.

Some children were included within a group for more than one condition. For example, one in ten children identified as having suffered from an allergy had had both eczema and hayfever in the first 7 years of childhood, and one in 16 of those with a chronic physical or mental handicap had both.

As the common childhood infectious diseases affected such a large proportion of the sample (97%) they have been omitted from subsequent figures and tables. Figure 1 is based, therefore, on the remaining 12 groups which are not mutually exclusive. The figure shows that the majority of children (70%) were included in one but no more than three morbidity groups while 10% were in four or more. A substantial percentage, 20%, were not included in any group. Differences between boys (18%) and girls (22%) were small.

Table 2 demonstrates the overlap between the 12 morbidity groups, as shown by the ratio of observed to expected frequencies. Results did not differ substantially for boys and girls therefore both sexes have been combined. Children included in one category were likely to be included in another; that is, most ratios were greater than one. However, additional ill-health was not equally distributed across all morbidity categories. For example, children who had suffered an injury generally had no further problems although they did display more

psychosocial morbidity than expected, with a ratio of 1.21 (95% CI 1.11-1.31).

In contrast, children with chronic medical conditions were included in a significantly greater number of morbidity groups than expected. The highest ratio, 4.44 (95% CI 4.09-4.79) was between chronic medical and acute recurring conditions. This was largely accounted for by children with urogenital abnormalities being especially prone to recurring urinary tract infections, whereas the high ratio of 1.60 (95% CI 1.37-1.83) between chronic medical and other acute conditions could not be explained by associations between particular illnesses within the two groups. Children with chronic medical conditions also had significantly higher ratios for chronic sensory or physical or mental handicap, asthma and/or bronchitis and wheezing, psychosocial, psychosomatic and 'other' conditions (Table 2).

The chronic sensory and physical and mental handicap groups were also associated (ratio=2.34, 95% CI 2.05-2.63). However this was largely explained by children with mental handicaps having speech impairments.

A statistically significant excess of observed to expected cases occurred between the asthma, bronchitis and wheezing group and allergies group (ratio=1.84, 95% CI 1.73-1.95). Both groups also suffered more 'other' acute conditions than expected with ratios of 1.69 (95% CI 1.58-1.80) and 1.21 (95% CI 1.08-1.34) respectively. Further investigation revealed that the high ratios for asthma and

allergy groups were accounted for by an excess prevalence of pneumonia in these children.

Subsequent ill-health for morbidity groups at age 7.

Tables 3 and 4 show morbidity at 7 in relation to self-reported health at age 23. As previously described, measures used to define morbidity were different for the two ages. Indices for age 23 are not yet as comprehensive as for 7, but some measures do indicate broadly similar aspects of ill-health. There was a consistent and statistically significant ($p < 0.001$) pattern of increasingly poorer health than expected at age 23 (from the population prevalence at this age) as the number of morbidity groups at 7 increased (Table 3). Children with no reported ill-health at 7 had less subsequent ill-health than expected. This was also the case for 7 year-olds included in one morbidity group only, 40% of whom had had acute illness(es). Conversely, those included in four or more morbidity groups at age 7 had raised levels of morbidity for each of the 23-year health indicators.

Patterns of subsequent ill-health are also presented for the specific morbidity groups at 7. Table 4 shows this using groups similar to those in Table 1, although the three groups of acute conditions (ear and throat, recurring and 'other') have been combined, as have chronic (medical, sensory, physical and mental handicap) conditions. Infectious diseases and 'other' morbidity, have been omitted. Only two groups, acute illness and injuries, had morbidity ratios at age 23 consistently

close to one. Further analyses performed for the sub-group of children who had had acute illness(es) but no other conditions before age 7 (Table 5) showed ratios comparable with those for children with no reported morbidity before age 7 (Table 3); the increases in morbidity at 23 for children with three or more reported acute conditions were not statistically significant.

In comparison with the acute and injuries groups, all other specific childhood morbidity groups were associated with greater ill-health than expected at age 23. The asthma group, in particular, had significantly poorer ill-health, not just in relation to later asthma but also in relation to allergies; emotional problems and self-rated health status. Children with a chronic condition before age 7 more often experienced emotional problems in early adulthood than expected, with a significantly raised level of 'depression' identified from the Malaise Score (ratio= 1.29, 95% CI 1.11-1.47) and a non-significant excess of "medical treatment" for a psychological problem (ratio= 1.20, 95% CI 0.98-1.44). This group also rated their health as 'poor' or 'fair' more frequently than the population as a whole (ratio=1.38, 95% CI 1.22- 1.54). The childhood psychosocial group had the greatest ratios for later depression and "treatment" for a psychological or emotional problem (1.38, 95% CI 1.19-1.57 and 1.31, 95% CI 1.09-1.53 respectively) compared with other morbidity groups, although the psychosomatic groups had ratios of 1.20 (95% CI 1.07-1.33) and 1.22 (95% CI 1.07-1.37) for the two measures of

emotional health in early adulthood.

Previous morbidity for those with ill-health in early adulthood.

Tables 3 and 4 show that morbidity before age 7 was associated with excess ill-health problems in early adulthood. Ill-health at 23 was not, conversely, associated with specific morbidity in childhood. This finding reflects the prevalence of the morbidity groups at age 7 (Table 1 and Fig 1) as well as the magnitude of ratios in Table 4. So, for example, children with chronic conditions had the highest ratio of observed to expected 'poor' rating of health at age 23 yet the majority (80%) of those rating their health as 'poor' or 'fair' at 23 had not had a chronic condition before age 7. Even in 7-year groups where the subsequent excess of observed cases was greatest, as for example in children with asthma and bronchitis and later asthma/ bronchitis, the majority of young adults who reported this complaint had not experienced this in early childhood. The group with psychosocial morbidity at 7 had higher ratios of 'depression' and "treatment" for psychological problems at age 23 than the asthma/bronchitis group but their later contribution towards psychological ill-health in young adults did not differ markedly.

Discussion.

The purpose of this paper was to provide an overall assessment of the relationship between ill-health early in life and that experienced later on. In doing so it was necessary to consolidate the wide amount of information available in the 1958 cohort study into meaningful

categories. The large number of questions asked of parents and doctors identified both trivial and severe conditions, acute and chronic, making an overall assessment of the child's health status a difficult task. As a result most research has concentrated on specific medical conditions, such as asthma (1) migraine (14) epilepsy (15) and obesity (16,17,18) to study associations and natural history and few attempts to construct more comprehensive indicators of health status have been made. An approach based upon comprehensive measures is useful because the total burden of ill-health can then be represented, allowing for the interaction between conditions. Such a picture will not necessarily emerge when the focus is restricted to specific diagnoses.

One previous study, conducted in the USA, attempted to characterise childhood health status (6) and the categorisation used formed the basis for the groupings in the present study. Subsequent analysis of the NCDS data was reassuring in respect of the classification scheme adopted since well-known relationships emerged. There was, for example, an association between asthma, bronchitis, wheezing and allergies in early childhood which has been demonstrated in numerous studies (19) and children identified as having chronic conditions up to age 7 were more likely to have an ascertained handicap at age 11 (Appendix C). These findings lend credence to the classification scheme used.

In other respects the health status of these children may be less

adequately described. This applies especially to the ascertainment of short term common illnesses, in contrast to the prospective study conducted in the USA (6) in which more accurate recording of acute illness was possible. The American study was also able to establish consistency in definitions for particular conditions, while in the 1958 cohort study variability in reporting was inevitable due to the large number of doctors and parents providing information. Given these differences it is not surprising that marked variations exist between the two studies in percentages of children in the morbidity groups. For almost all groups prevalence percentages are notably higher in America with the exception of asthma and psychosomatic conditions.

Both studies were consistent, however, in showing that morbidity is not evenly distributed in childhood. It appears that a sub-group of children are more prone than others to a variety of apparently unrelated types of morbidity. Ten percent of children in the 1958 cohort were represented in four or more morbidity groups at age 7, while 20% had experienced no ill-health other than the common infectious diseases. It has been suggested that inherited predispositions might account for the greater proneness of some children to a larger burden of ill-health. Alternatively, environmental circumstances such as quality of housing, level of pollution and access to play areas and other facilities, might increase the risks simultaneously for a variety of conditions. The occurrence of one illness might also lead to reduced resistance to

further ill-health (6).

Continuity of such circumstances and/or inherited susceptibilities might lead us to postulate that those who experience multiple ill-health during childhood do so into adulthood. Data in the 1958 cohort study allowed us to investigate this and our results suggest that children with multiple problems do indeed have relatively poorer health as young adults. Since children with multiple problems included a disproportionate number with serious conditions likely to persist, this finding was not so surprising. It has been shown previously that serious illness in childhood was associated with similar ill-health in early adulthood (20). Correspondingly, the present study found that children with no reported ill-health up to age 7 appeared to maintain their health advantage into early adulthood. Despite this, most ill-health in early adulthood affects those who had been relatively healthy (as measured by the number of morbidity groups) in earlier childhood, thus reflecting the distribution of childhood morbidity.

Using number of morbidity groups as a measure of health status in childhood has several obvious limitations. Most importantly, this approach does not take account of the severity of conditions, the frequency with which episodes of illness recur, nor other aspects necessary to fully represent an individual's state of health (21). Even so, it utilises diverse data collected longitudinally and provides an indication, albeit crude, of cumulative ill-health during

childhood.

Grouping separate conditions into morbidity categories also enabled more comprehensive coverage of health status in childhood. By doing so it was possible to include data relating to a variety of health problems rather than just those reflecting a few selected diagnoses. Among the morbidity groups only acute conditions and injuries were associated with expected levels of ill-health in early adulthood. Other morbidity groups at age 7 showed subsequent excess of ill-health problems later on. In some instances, for example asthma, these findings have been well-documented but this is not the case for all the morbidity groups under consideration. In particular, evidence for the poorer subsequent emotional health of children with a chronic physical condition (21) gains support from these results. It was not the case, however, that ill-health in young adults was associated with particular morbidity groups in childhood, even for the groups with the highest ratios. This is consistent with previous investigation of asthma in young adulthood, which was more closely associated with asthma at age 16 than asthma in early childhood (1).

Comparisons have been limited, however, by the scarcity of measures of ill-health in adulthood. Indices used here tended to differentiate primarily on the basis of emotional health, whilst under-representing acute illness and chronic conditions. More complete assessment of the legacy of ill-health in childhood therefore awaits development of better indices, both in later childhood and at age 23, and ultimately

of further follow-up of the cohort into middle age. Meanwhile, the findings reported here suggest that although health status in childhood has long term implications, this does not form a substantial contribution to ill-health in early adult life.

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Figure 1: Distribution of number of morbidity groups for individual children in the NCDS

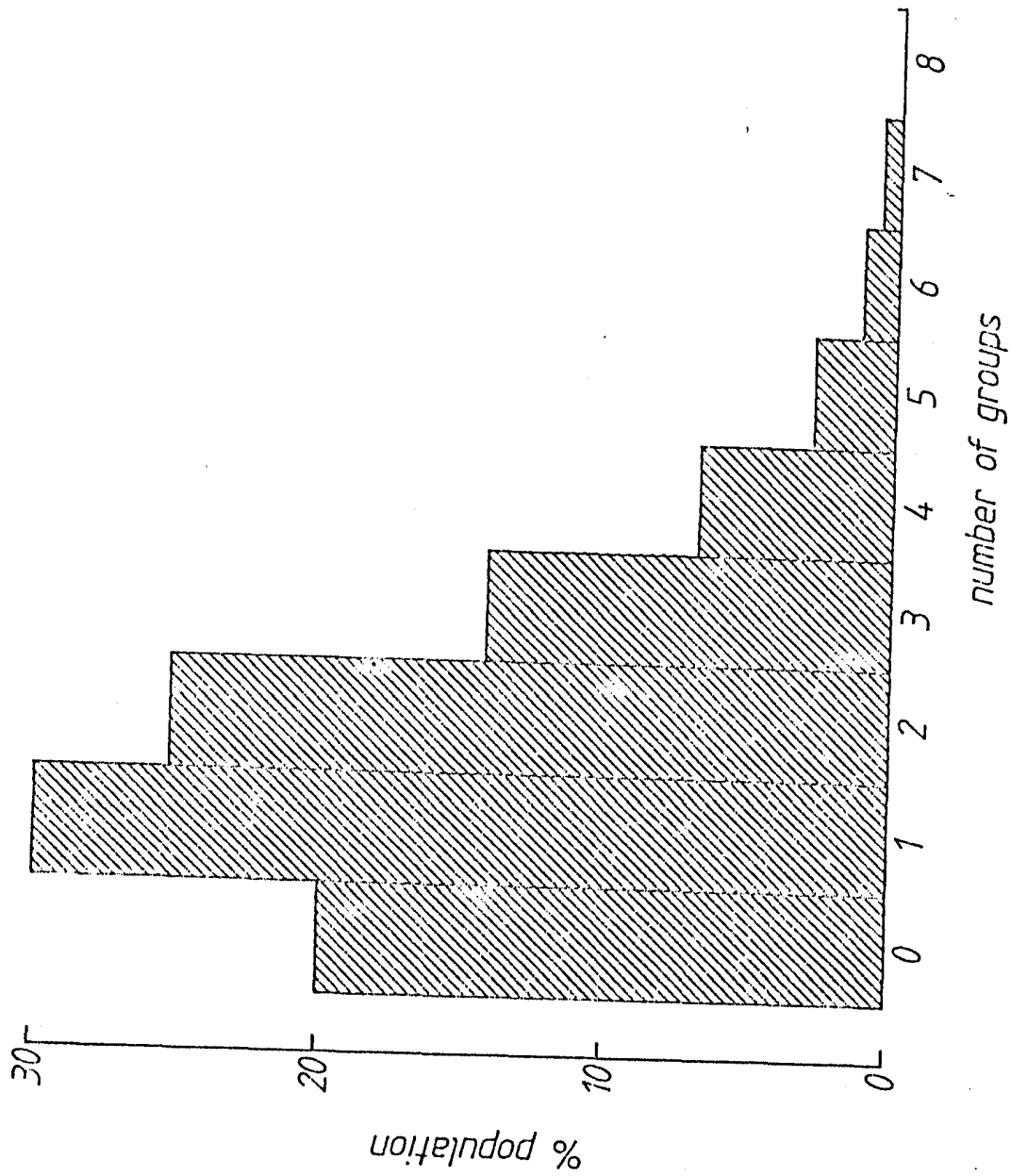


Table 1: Prevalence of 13 groups of morbidity in the NCDS at age 7

Morbidity Group	Girls		Boys	
	% [*]	(N)	% [*]	(N)
Infectious Disease	97.5	(6724)	97.1	(7075)
Ear and throat problems	39.6	(2492)	39.9	(2706)
Acute, likely to recur	6.7	(469)	4.3	(321)
Other acute conditions	12.6	(848)	14.4	(1015)
Asthma, bronchitis and wheezing	16.1	(1137)	20.5	(1528)
Allergies	12.1	(818)	13.1	(942)
Chronic Medical	4.4	(291)	4.2	(293)
Chronic physical/mental handicap	7.9	(523)	10.0	(703)
Chronic Sensory	3.3	(213)	4.4	(306)
Injuries	16.7	(1175)	22.7	(1684)
Psychosocial	12.9	(876)	16.5	(1183)
Psychosomatic	29.8	(2103)	28.7	(2132)
Other	6.1	(412)	11.5	(823)

* Percentages add to more than 100 because children are included in more than one morbidity grouping.

Table 2: Ratio of observed to expected+ ill-health for 12 groups of morbidity for children aged 7 in the NCDS

	Acute, likely to recur	Other acute condit.	Asthma, bronchitis /wheezing	Allergies	Chronic Medical	Chronic physical/ mental handicap	Chronic Sensory	Injuries	Psycho-social	Psycho-somatic	Other
Ear/throat problems	1.18*	1.20**	1.16**	1.08	1.06	1.05	0.95	1.07	1.09	1.19**	1.05
Acute, likely to recur		1.36**	1.30**	1.31*	4.44**	1.19	1.12	1.02	1.48**	1.41**	1.12
Other acute conditions			1.63**	1.21*	1.60**	1.24*	1.03	1.09	1.18*	1.23**	1.27**
Asthma, bronchitis and wheezing				1.84**	1.34**	1.19*	1.25	1.14*	1.18**	1.28*	1.07
Allergies					1.10	1.03	0.90	1.02	1.03	1.20**	0.97
Chronic Medical						1.84**	1.91**	0.97	1.53**	1.36**	1.49**
Chronic physical/ mental handicap							2.34**	1.11	1.59**	1.03	1.33**
Chronic sensory								0.98	1.53**	1.10	1.30**
Injuries									1.21**	1.14**	0.58**
Psychosocial										1.17**	1.12
Psychosomatic											1.07

+ expected numbers are calculated on the assumption that within any particular group the prevalence of other morbidity groups is the same as that in the population overall ie. as in table 1.

* p<0.01

** p<0.001

Table 3: Ratio of observed to expected+ ill-health at age 23 for morbidity groups at age 7 (based on sample of approximately 10900† subjects).

Number of morbidity groups at age 7.‡ (% at age 23)	Indices of ill-health ages 16 - 23				
	Self-rated health 'poor' or 'fair' (9.4)	Asthma/ wheezy bronchitis (9.4)	Allergies (20.2)	Emotional health 'depressed' 'treatment' (7.3) (5.3)	
0	0.81	0.63	0.79	0.85	0.75
1	0.86	0.84	0.89	0.91	0.99
2	1.09	1.08	1.12	1.01	1.02
3	1.22	1.34	1.21	1.21	1.28
4+	1.55	2.11	1.35	1.50	1.24
χ^2 test for trend	p<0.001	p<0.001	p<0.001	p<0.001	p<0.001

+ Expected numbers were derived from the population prevalence of ill-health in the full NCDS sample at age 23.

† Numbers vary slightly for each comparison due to small variations in the amount of missing information for each question.

‡ Figures in brackets give prevalence of ill-health at age 23.

§ Based on collapsed groups in table 4.

Table 4: Ratio of observed to expected+ ill-health at age 23 for morbidity groups at age 7 (based on sample of approximately 10900† subjects).

Morbidity group at age 7. (% at age 23)	Indices of ill-health ages 16 - 23				
	Self-rated health 'poor' or 'fair' (9.4)	Asthma/ wheezy bronchitis (9.4)	Allergies (20.2)	Emotional health 'depressed' 'treatment' (7.3) (5.3)	
Acute	1.07	1.04	1.02	1.01	1.08
Asthma/bronchitis	1.35*	2.14*	1.30*	1.22*	1.09
Allergies	1.15	2.14*	2.22*	0.96	0.99
Chronic	1.38*	1.00	0.98	1.29*	1.20
Injuries	1.04	1.03	0.95	1.11	1.11
Psychosocial	1.33*	1.07	0.89	1.38*	1.31*
Psychosomatic	1.13*	1.15*	1.05	1.20*	1.22*

+ Expected numbers were derived from the population prevalence of ill-health in the full NCDS sample at age 23.

† Numbers vary slightly for each comparison due to small variations in the amount of missing information for each question.

Figures in brackets give prevalence of ill-health at age 23.

95% confidence intervals do not include one.

Table 5: Acute illness[#] only before age 7 and subsequent ill-health at age 23.
(ratios of observed to expected+).

Acute condition before age 7.	Indices of ill-health ages 16 - 23				
	Self-rated health 'poor' or 'fair'	Asthma/ wheezy bronchitis	Allergies	Emotional health 'depressed' 'treatment'	
Number of reported:					
1	0.82	0.72	0.82	0.76	0.94
2	0.87	0.73	0.82	0.92	1.32
3+	1.06	1.24	1.07	0.91	0.94

+ Expected numbers were derived from the population prevalence of ill-health in the full NCDS sample at age 23.

Numbers vary slightly for each comparison due to small variations in the amount of missing information for each question.

[#] Excludes (i) common infectious illnesses such as chicken pox (refer to Appendix A for conditions included) and (ii) children with other morbidity.

Appendix A: Percentages of children with specific diagnoses by each category of morbidity

Morbidity Group	%	(Number of children)
Ear and throat problems:		
Tonsils/adenoids	18.6	(2355)
Repeated ear and throat infections	14.5	(1836)
Running ears and/or otitis	14.9	(1890)
Acute likely to recur:		
Urinary infection	3.7	(533)
Fit or convulsion*	1.9	(270)
Other acute:		
TB, glandular fever etc.	7.6	(1088)
Pneumonia	4.8	(706)
Abdominal operation	1.6	(236)
Asthma, bronchitis and wheezing	18.3	(2665)
Allergy:		
Hayfever and sneezing	8.1	(1131)
Eczema	5.7	(801)
Chronic medical:		
Cardiovascular	1.7	(229)
Urogenital	1.4	(209)
Epilepsy	0.7	(91)
Other chronic	0.6	(79)
Chronic physical or mental handicap:		
Physical handicap	7.7	(1049)
Mental handicap	1.8	(252)
Chronic sensory:		
Speech	1.6	(218)
Vision	2.1	(293)
Hearing	0.2	(22)
Injuries:	19.7	(2859)
Psychosocial:		
Enuresis and or/soiling	14.0	(1951)
Maladjusted	1.4	(189)
Psychosomatic:		
Digestive	24.9	(3610)
Headaches or migraine	8.3	(1206)
Other:		
Hernia	3.7	(493)
Operations for unspecified conditions	4.8	(654)

* Excludes confirmed epilepsy

The base figures differ for each group due to small variations in the amount of data missing for each question.

Percentages do not total those shown in Table 1 since the most common diagnoses only are presented here and no allowance has been made for overlap within categories.

Appendix B: Morbidity Groups at age 7.

***** Listing of variables incorporated in the groups *****

	Variable numbers
Childhood Infectious Disease:	
* Parents report history of measles, German measles, whooping cough, chicken pox, mumps, scarlet fever.	n215 to n220
Ear and Throat problems:	
* Parents report "ever had" running ears	n258
* Parents report "ever had" hearing difficulty (excluding hearing impairment)	n282
* Parents report of hospital admission for tonsils / adenoids	n246
* Parents report of > 3 throat + ear infections with fever in the last year	n256
* Doctors examination showed signs of past or present otitis media	n349
Other Acute Illness:	
* Parents report of TB, Glandular fever etc	n221
* Parental report of pneumonia	n261
* Parental report of abdominal operation	n247
Acute likely to recur:	
* Parents report "ever had" medical treatment for urinary infection	n284
* Parents report of fit or convulsion either before or after the 1st year of life (excludes epilepsy)	n274 + n275
Asthma, Bronchitis and Wheezing:	
* Parents report "ever had" asthma	n259
* Parents report "ever had" bronchitis with wheezing	n260
Allergies:	
* Parents report "ever had" hayfever and sneezing	n257
* Parents report "ever had" eczema before or after the 1st year of life	n270 + n271
* Doctors examination showed eczema	n364
Chronic Medical:	

* Doctors examination - heart condition (murmur excluded)	n350
* Doctors examination - other signs of heart disease	n351
* Doctors summary - heart condition present	n412
* Parents report - congenital heart condition	n263
* Parents report "ever had" nephritis or urogenital disorder	n285
* Doctors summary - alimentary system (slight to severe handicap)	n410
* Doctors summary - epilepsy	n415
* Ascertained epilepsy / delicate	n390
* Doctors summary - blood disorder / diabetes (slight to severe handicap)	n413 + n417
* Parents report of rheumatic fever	n262

Chronic (Physical) nonmedical:

* Ascertained - physical handicap (cerebral palsy)	n390
* Parents report of having had congenital dislocation of hip	n288
* Parent report of having had talipes	n289
* Doctors summary - upper or lower limb or spinal abnormality	n406 + n407
* - general motor handicap	n401
* - other cns condition (moderate to severe handicap)	n416
* Doctors examination - congenital limb defects	n369
* - malfunction upper limb	n370
* - lower limb defect	n371
* - malfunction lower limb	n372
* - cerebral palsy	n367
* - spina bifida	n422
* - talipes	n424
* - spinal disorder	n423
* - neurological or skeletal disorder	n425
* Doctors summary - mental retardation	n403
* Ascertained ESN	n390

Chronic (Sensory) nonmedical:

* Ascertained - speech	n390
* Ascertained - deaf or partial hearing	n390
* Ascertained - blind or partially sighted	n390
* Doctors examination - stammer (mod to severe)	n385
* - speech unintelligible (mod to severe)	n386
* - hearing impaired (mod to severe)	n389
* - vision (handicap with	n382

- reading)
- * Visual acuity with glasses - 6/12 or worse in one or both eyes n378
n379

Injuries:

- * Parental report of hospital admission for road accidents n250
- * Parental report of hospital admission for home accident n251
- * Parental report of hospital admission for other accident or injury n252
- * Parental report of concussion or head injury with unconsciousness n280

Psychosocial:

- * Ascertained as maladjusted n390
- * Doctors summary - emotional maladjustment (slight to severe handicap) n404
- * Parental report - wet by day after age 3 n267
- * Parental report - wet by night after age 5 n268
- * Parental report - soils by day after age 4 n269

Psychosomatic:

- * Parents report - vomiting or bilious attack n264
- * Parents report - abdominal pain n265
- * Parents report - frequent headaches or migraine n277

Other:

- * Parents report hospital admission for hernia repair n248
- * Parents report hospital admission for other operation (incl. blood transfusion) n249
- * Doctors report - inguinal hernia on examination n362
- * - other hernia n363
- * Parents report of hernia of any sort n266
- * Doctors and parents report of major handicapping condition (only if respondent not included elsewhere) n281 + n342

(Those included in the injury group have been excluded from this category on variable n249 to avoid duplication of the same problem)

Appendix C: Morbidity groups at 7 and ill-health at age 11.

Data for age 11 were collected in a similar way to those at 7 but have not yet been categorised using the classification described in the paper and cruder indices of health and development have been used here, namely:

- i) absence from school in the preceding year for reason of ill-health or emotional disturbance, as reported by parents. The number of days absence was subsequently categorised into those with more than one month in total and those with less.
- ii) ascertained handicap: reported by doctors who carried out a special examination and consulted school health records to identify children who had been formally ascertained as in need of special education. The majority of children included in this category were educationally subnormal (5).

The table shows these 11-year indices in relation to the morbidity groups for age 7. Groups at age 7 are similar to those in Table 1, although the three groups of acute conditions (ear and throat, recurring and 'other') have been combined, as have chronic (medical and nonmedical) conditions. Two groups, infectious illnesses and 'other' morbidity, have been omitted.

The table shows that children with lower levels of reported morbidity before age 7 were less likely to have prolonged school

absence through ill-health four years later. For example, of children with no problems up to age 7, only two-thirds of the number expected were absent from school for more than a month at 11 and just over one third had an ascertained handicap. In contrast, children with several conditions at 7 lost more days of education than was expected and were more likely to be ascertained as handicapped.

For specific morbidity groups the highest ratio for school absence occurred among those who had suffered from asthma and/or bronchitis and wheezing (1.80). Ascertained handicap at 11 was more prevalent in the chronic and psychosocial groups (the latter encompassing the 'maladjusted') with ratios of 4.39 and 3.05 respectively. However, a proportion of handicapped children lived in residential schools or hospitals and the concept of school days lost through ill-health may have been inapplicable or ambiguous for them. Perfect agreement between chronic and psychosocial conditions at 7 and ascertained handicap at 11 was not anticipated since many conditions would not be formally ascertained as needing special education. There are also some conditions (for example perthes) which would be regarded as chronic but which were amenable to treatment and, therefore, not apparent at age 11. However, the likelihood of later ascertained handicap for both chronic and psychosocial groups contrasts with that for other morbidity groups and, to some extent, lends credence to the classification scheme used.

Appendix C: Ratio of observed to expected* ill-health at age 11 for morbidity groups at age 7

Morbidity group at age 7	Indices of ill-health at age 11	
	School absence > 1 month++	Ascertained handicapped
Number of groups+		
0	0.67	0.39
1	0.73	0.62
2	1.06	0.92
3	1.47	1.64
4+	2.26	3.86
Type of group:		
Acute	1.21	1.15
Asthma, bronchitis	1.80	1.51
Allergies	1.17	1.14
Chronic	1.36	4.39
Injuries	1.17	1.13
Psychosocial	1.27	3.05
Psychosomatic	1.37	1.23

* expected numbers were derived from the population prevalence of ill-health in the full NCDS sample at age 11
 + based on collapsed categories in lower half of table
 ++ in the preceding year

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NATIONAL CHILD DEVELOPMENT STUDY

The National Child Development Study (NCDS) is a continuing longitudinal study which is seeking to follow the lives of all those living in Great Britain who were born between 3 and 9 March, 1958.

It has its origins in the Perinatal Mortality Survey (PMS). This was sponsored by the National Birthday Trust Fund and designed to examine the social and obstetric factors associated with the early death or abnormality among the 17,000 children born in England, Scotland and Wales in that one week.

To date there have been four attempts to trace all members of the birth cohort in order to monitor their physical, educational and social development. These were carried out by the National Children's Bureau in 1965 (when they were aged 7), in 1969 (when they were aged 11), in 1974 (when they were aged 16) and in 1981 (when they were aged 23). In addition, in 1978, details of public examination entry and performance were obtained from the schools, sixth-form colleges and FE colleges.

For the birth survey information was obtained from the mother and from medical records by the midwife. For the purposes of the first three NCDS surveys, information was obtained from parents (who were interviewed by health visitors), head teachers and class teachers (who completed questionnaires), the schools health service (who carried out medical examinations) and the subjects themselves (who completed tests of ability and, latterly, questionnaires). In addition the birth cohort was augmented by including immigrants born in the relevant week in the target sample for NCDS1-3.

The 1981 survey differs in that information was obtained from the subject (who was interviewed by a professional survey research interviewer) and from the 1971 and 1981 Censuses (from which variables describing area of residence were taken). Similarly, during the collection of exam data in 1978 information was obtained (by post) only from the schools attended at the time of the third follow-up in 1974 (and from sixth-form and FE colleges, when these were identified by schools). On these last two occasions case no attempt was made to include new immigrants in the survey.

All NCDS data from the surveys identified above are held by the ESRC Data Archive at the University of Essex and are available for secondary analysis by researchers in universities and elsewhere. The Archive also holds a number of NCDS-related files (for example, of data collected in the course of a special study of handicapped school-leavers, at age 18; and the data from the 5% feasibility study, conducted at age 20, which preceded the 1981 follow-up), which are similarly available for secondary analysis.

Further details about the National Child Development Study can be obtained from the NCDS User Support Group.

