domised,[5] and our results suggest that claims of benefit based on such trials should not be readily accepted.

We thank Mr J Ransom for technical help, and Dr S Variend for reviewing the tumour histology in the patients studied.

References

[1] Lane, N, Lattes, R, and Malm, J, *Cancer*, 1958, **11**, 1025.
[2] Hamilton-Fairley, G, *British Medical Journal*, 1970, **4**, 483.
[3] *British Medical Journal*, 1976, **2**, 831.
[4] Morton, D L, *et al*, *Surgery*, 1970, **68**, 158.
[5] Eilber, F R, *et al*, *New England Journal of Medicine*, 1976, **294**, 237.
[6] Gutterman, J U, *et al*, *New England Journal of Medicine*, 1974, **291**, 592.
[7] Ikonopisov, R L, *et al*, *British Medical Journal*, 1970, **2**, 752.
[8] Bast, R C, *et al*, *New England Journal of Medicine*, 1974, **290**, 1413.
[9] Baldwin, R W, and Pimm, M V, *British Journal of Cancer*, 1973, **28**, 281.
[10] Ikonopisov, R L, *Tumori*, 1972, **58**, 121.
[11] Grant, R M, *et al*, *Lancet*, 1974, **2**, 1096.

(*Accepted 23 December 1976*)

CONDENSED REPORT

Acquired myopia in 11-year-old children

CATHERINE S PECKHAM, PETER A GARDINER, HARVEY GOLDSTEIN

British Medical Journal, 1977, **1**, 542-544

Summary

Children who had acquired myopia by the age of 11 years were identified from a nationally representative sample. There were no overall sex differences in its occurrence but myopia was more common in children from non-manual families than in those from manual families. Short-sighted children were more likely to come from small families and to be of higher birth order than children with normal vision, and these associations held within each social class.

At 11 years myopic children showed striking advantages in educational performance over their normal-sighted peers, as judged by tests of reading, arithmetic, and general ability. After adjustments had been made for social background, this age gain still amounted to over one year. Findings obtained at 7 years of age showed that superior educational attainments were already apparent before the onset of myopia. Children with myopia read in their leisure time more often than normally sighted children, but despite the visual impairment, they participated in outdoor sports as often as other children.

Introduction

Myopia, or short sight, is an important and common cause of visual impairment which is usually acquired and nearly always progressive.[1] It rarely occurs before the age of 6 years, and new cases appear throughout childhood and adolescence, particularly between the ages of 7 and 12. Recently Karlsson[2] has produced evidence that intellectual gain precedes the appearance of myopia and has suggested that the gene responsible for short-sightedness may have conferred an evolutionary advantage through its association with intelligence.

The National Child Development Study has presented us with an opportunity to identify from a nationally representative sample of children those who had acquired myopia by the age of 11 years and to examine their social background, growth, and educational performance at 7 and 11 years of age. This group was compared with children who had normal unaided visual acuity of 6/6 or better in both eyes.

Methods

The National Child Development Study, conducted by the National Children's Bureau, is a longitudinal survey of all children living in England, Scotland, and Wales who were born in one week in March 1958.[3] This originated from the 17 000 children in the National Birthday Trust Fund's Perinatal Mortality Survey.[4] Medical, social, and educational data were obtained at 7 and 11 years of age from four main sources. Parents were interviewed by health visitors in the home; community paediatricians carried out medical examinations; teachers filled in questionnaires at school; and the child completed a number of tests, and, at 11 years only, a questionnaire.

The educational tests used at 11 years included a reading comprehension test, which was developed to parallel the Watts-Vernon test,[5] an arithmetic test, and a test of general ability. These tests were constructed and standardised for 11 year olds by the National Foundation for Educational Research. An estimate of the average changes in test scores with age was available and the raw test scores were divided by this estimate and adjusted to give a mean of 11 years, so that the average differences could be expressed in terms of age equivalent changes. These values must not be interpreted too rigidly since they are specific to the tests and are applicable only within a limited range of ages.[6]

At 7 years the Southgate reading test and a specially designed problem arithmetic test were used, with similar age-related scales.[3]

ASSESSMENT OF VISUAL ACUITY

At both medical examinations distant visual acuity was tested using the Snellen chart of block capitals under standard conditions. Each eye was tested separately. When glasses were worn testing was carried out first without and then with the aid of glasses. At the 11-year examination near vision was also tested using a card especially designed for the study by Sheridan and Gardiner.[7]

National Children's Bureau, London EC1V 7QE
CATHERINE S PECKHAM, MD, MFCM, senior medical research officer
PETER A GARDINER, MD, DOMS, research fellow in ophthalmology, Guy's Hospital, London
HARVEY GOLDSTEIN, BSC, professor of statistical methods, University of London Institute of Education, London WC1H 0AL

IDENTIFICATION OF MYOPIC CHILDREN

Children with acquired myopia were identified from the results of vision screening carried out at both 7 and 11 years. As such children have normal near vision and show a deterioration in distant visual acuity during childhood, they were selected if they had (*a*) optimal or near-optimal near vision—that is, reduced Snellen 6 or 9 in both eyes—but poor distant vision—6/12 or worse in the better eye—at 11 years; and (*b*) a deterioration in distant visual acuity of two or more lines in both eyes between 7 and 11 years. When both these criteria were met the children were considered to show progressive bilateral acquired myopia.

Visual acuity was tested at both 7 and 11 years in 11 179 children. Of the 515 children with bilateral impairment of distant vision and satisfactory near vision at 11 years, 403 (78%) showed deterioration of visual acuity of at least two lines between 7 and 11 years (table I).

TABLE I—*Identification of 11-year-old children with acquired myopia. Results are numbers (and percentages) of children*

Poor distant vision (6/12 or worse) and satisfactory near vision	Change in distant visual acuity between 7 and 11 years				Total
	Deterioration of ≥2 lines			Deterioration of <2 lines	
	In both eyes	In right eye	In left eye		
In both eyes	403 (78·3)	20 (3·9)	19 (3·7)	73 (14·2)	515 (100)
In right eye	12 (5·5)	115 (53·0)	3 (1·4)	87 (40·1)	217 (100)
In left eye	14 (6·2)	4 (1·8)	100 (44·2)	108 (47·8)	226 (100)

These 403 children (189 boys and 214 girls; 3·6% of the sample) were those whom we regarded as having progressive bilateral acquired myopia. The method used for selection meant that several people with congenital or early myopia would be missed because their visual acuity might not have deteriorated between 7 and 11 years, and hence the prevalence of myopia reported in this study was an underestimate.

A further 215 children showed a unilateral progressive acquired myopia (115 right and 100 left), but we disregarded these children. Myopia is commonly acquired in one eye before the other and several of them will probably acquire bilateral myopia; information gathered at 16 years may shed further light on this group.

There were also 73 children who had bilateral poor distant vision and good near vision whose acuity did not change by as much as two lines between 7 and 11 years. Although many were undoubtedly myopic, it is uncertain how many must have been congenitally myopic and how many had acquired myopia. In either case children with stationary myopia for four years are possibly a group with different characteristics from those with progressive myopia,[1 8] and they were excluded from this study.

Results

SEX AND SOCIAL CLASS DISTRIBUTION

There was no significant difference in the overall occurrence of myopia between the sexes or within social class (table II). Acquired myopia was more common in children who came from non-manual families than in those from manual families.[9] Since the myopic children were identified by tests of visual acuity and a representative sample of children from each social class was screened, this could not be explained by selection bias.

TABLE III—*Results of statistical analyses of results in reading comprehension, arithmetic, and general ability tests shown in the figure*

	χ^2	DF	P value
*Test for difference between myopes and those with perfect vision**			
Reading comprehension	136·4	1	<0·001
Arithmetic score	83·5	1	<0·001
General ability	89·6	1	<0·001
Test interaction			
Reading comprehension	0·1	1	
Arithmetic score	0·3	1	
General ability	0·3	1	
Test for difference after adjusting also for No of older and younger sibs			
Reading comprehension	124·3	1	<0·001
Arithmetic score	74·0	1	<0·001
General ability	78·8	1	<0·001

*After adjusting for social class.

FAMILY CHARACTERISTICS

The family background of children with acquired myopia differed from that of children with a normal visual acuity in ways other than social class. The proportion of children with myopia was highest in families with only one or two children under 21 years (4%) and lowest in families with four or more children (2%) (table A*). Myopia was also significantly more common in first-born children (4%) than in children who were fourth or subsequent children in the family (2%) (table B). Both these differences persisted within social class groups and were statistically significant ($P < 0·001$).

The proportion of myopes was higher among children whose parents were reported by the teachers to be "very interested" in their child's school progress (5%), compared with the proportion in the group whose parents showed less interest (3%) (table C). These differences persisted when comparisons were made within social class ($P < 0·001$). The proportion of myopes was also higher among children whose parents wished their child to remain at school beyond the school leaving age and who, according to the teacher, had taken the initiative to discuss their child with the school staff ($P < 0·02$ and $P < 0·01$ after adjustment for social class).

EDUCATIONAL ATTAINMENT

Children with myopia had higher mean scores on the 11-year reading comprehension, arithmetic, and general ability tests than the normally sighted children. The gains in mean scores were equivalent to 1·9 years on the reading test, 1·2 years on the arithmetic test, and 1·4 years on the general ability test. Since they were more likely to have fathers in non-manual occupations and to come from small families, factors which are also associated with educational performance, allowance was made in an analysis of variance for social class background and the number of older and younger siblings in the family. After we had adjusted for these factors, the myopic children still showed striking advantages in educational performance over the normally sighted children (table III) and were 1·6 years ahead in reading comprehension, 1·0 year ahead on the arithmetic test, and 1·3 years ahead on the test of general ability. These advantages at 11 years are shown for each social class in the figure. The scores were expressed in terms of age-equivalent changes, and the age gain of myopes over children with normal vision was similar in each social class. No group of myopes achieved a mean attainment score below that of the overall mean.

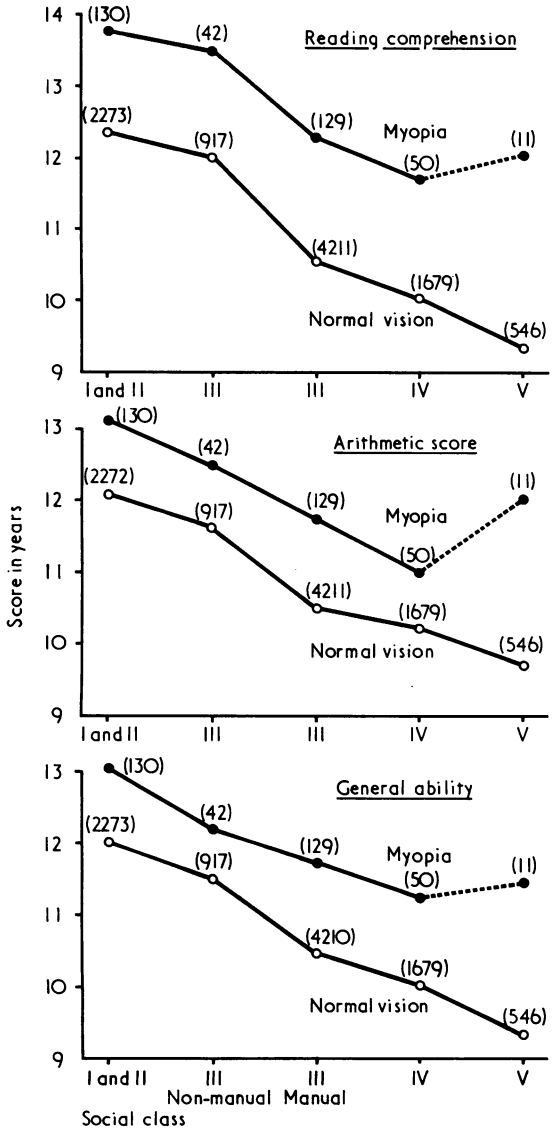
Even at 7 years, before most affected children had become short sighted, those who were myopic at 11 years had shown an advantage

*Copies of tables A-E are available from the authors.

TABLE II—*Myopia according to sex and social class. Results are numbers (and percentages)*

	Non-manual background			Manual background			Total
	Boys	Girls	Total	Boys	Girls	Total	
No with myopia	82 (4·3)	105 (5·7)	187 (5·0)	102 (2·9)	94 (2·9)	196 (2·9)	383* (3·7)
Total No of children	1893	1855	3748	3485	3224	6709	10 457†

*20 children excluded (in 11 there was no male head of family and in nine social class was not known).
†Information on social class was not available for all children.
Test for difference in proportion of myopes, χ^2 values adjusted for the other factor—Social class: non-manual *v* manual $\chi^2 = 27·7$; 1 DF; $P < 0·001$. Sex: boy *v* girl $\chi^2 = 1·6$; 1 DF; $P > 0·05$. No significant interaction between sex and social class.



Reading comprehension, arithmetic score, and general ability in children with myopia and those with normal vision at 11 years of age according to social class. Numbers of children in each social class are given in parentheses. Not all children completed all tests.

of approximately six months over their peers, as judged by the 7-year arithmetic and reading scores.

The teacher's assessment indicated that the oral ability of myopes at the age of 11 years was better than that of normal sighted children (table D). Sixteen per cent of children with exceptional or above average oral ability were myopic, whereas this applied to only 5% of children with below average or little or no oral ability. This finding persisted when adjustment was made for social class ($P < 0.001$).

In response to a question on reading habits outside school, twice as many myopic children as normally sighted children indicated that they often read books in their spare time ($P < 0.001$ after adjustment for social class). As many myopes as normally sighted children said that they often played outdoor games or took part in sport outside school hours (table E).

GROWTH AND DEVELOPMENT

The essential process in myopia is a lengthening of the antero-posterior axis of the eye, which is not compensated for during growth by the normal changes in the corneal and lens dimensions. It has often been suggested that myopia becomes manifest just before or at the time of puberty, during a rapid period of growth. Douglas[8] showed an association between myopia and a prepubertal growth spurt and Gardiner[10] reported an earlier onset of puberty in myopic children. It is premature to examine this question here since few of the children had reached full maturity by 11 years. There was no evidence, however, that myopia at this age was associated with an early onset of puberty. Information provided by the follow-up examination at 16 years may throw further light on the relation between puberty and myopia.

Children with myopia were taller than those with normal vision, the mean heights at 11 years being 145·4 cm and 144·4 cm respectively. When comparisons were made in an analysis of variance allowing for differences in family size and social class, however, this difference was almost entirely accounted for by the different social class distribution and smaller families of myopes.

Relative weight was also examined but no differences between the two groups were found.

Discussion

We have found that myopia is more prevalent among children from non-manual family backgrounds than among those from manual family backgrounds. It is important therefore that the requisite adjustments are made for background factors in an attempt to define the physical and intellectual characteristics that may be associated with myopia. For example, the observation that myopic children are 1 cm taller than children with normal vision can be explained by the social class disparity between the two groups.

Several investigators have produced evidence that myopes achieve higher academic attainments than non-myopes.[2 8] Our results add support to these observations, since 11-year-old myopic children achieved significantly higher scores on all three tests of attainment than children with normal vision, a finding that persisted even when adjustment was made for social class. Our findings, which agree with the conclusions reached by Karlsson,[2] show that children who acquire myopia already exhibit differences in attainment before they become myopic. It was once commonly thought that short-sighted children tended to be more academic because defective distant visual acuity prevented them from pursuing active physical lives, with the result that they spent more time in reading and other sedentary occupations. The results of this study suggest that myopes participate in outdoor sports to a similar extent to children with normal vision.

We identified 215 (1·9%) children with unilateral myopia. A high proportion of this group will probably develop bilateral myopia, but a few are likely to remain myopic in one eye. This throws doubt on the relevance of reading in causing myopia since reading is usually a binocular activity. Although our findings show that myopic children do read more than those with normal vision, this may be an expression of their academic tendencies. Alternatively, it might be argued that children who are academically inclined and who are avid readers whould be more likely to develop myopia. This latter view was so strongly held in the 1920s and 1930s that special sight-saving schools were established at which near-work of any sort was prohibited.[11 12] This approach was abandoned when it became clear that the myopic process was uninfluenced.

Myopia has a strong genetic basis.[13] In view of the superior academic achievement of myopes and the fact that the appearance of myopia was preceded by evidence of this superiority, Karlsson[2] postulated that the "myopic gene had a stimulating action on the brain." Our evidence suggests, however, that parental interest may be an important determinant of the myopic child's academic attainments. Of course, these two views are not mutually exclusive: the most practical issue is the relative importance of genetic and environmental influences. Families with a history of myopia may encourage near-work and their attitudes to education and employment might be influenced over generations.

We thank our colleagues at the National Children's Bureau for their advice and support. This work was carried out with the aid of a grant from the DES and DHSS.

Copies of the unpublished tables may be obtained from Dr C S

Peckham, National Children's Bureau, 8 Wakley Street, Islington, London EC1V 7QE.

References

[1] Gardiner, P A, *Factors Associated with the Development of Myopia in the Growing Child*. New York, Myopia Research Foundation, 1964.
[2] Karlsson, J L, *Clinical Genetics*, 1975, **8**, 314.
[3] Davie, R, Butler, N, and Goldstein, H, *From Birth to Seven*. London, Longman and the National Children's Bureau, 1972.
[4] Butler, N R, and Alberman, E, (editors), *Perinatal Problems*. Edinburgh, Livingstone, 1969.
[5] Start, K B, and Wells, B K, *The Frequency Reading Standards*. Slough, National Foundation for Educational Research, 1972.
[6] Fogelman, K, and Goldstein, H, *Educational Studies* (Oxford), 1976, **2**, No 2, 95.
[7] Peckham, C S, and Adams, B, *Child Care, Health, and Development*, 1975, **1**, 93.
[8] Douglas, J W B, Ross, J M, and Simpson, H R, *Journal of the Royal Statistical Society*, 1967, **130**, 479.
[9] *Registrar-General's Classification of Occupations*. London, HMSO, 1960.
[10] Gardiner, P A, *Lancet*, 1954, **1**, 476.
[11] Ministry of Education, *Health of the School Child*, Report of the Chief Medical Officer for the Years 1952 and 1953, Ch 9, p 78. London, HMSO, 1954.
[12] Ministry of Health, *A Historical Sketch of the Origins, Development and Present Organisation of the School Health Service*, Report of the Chief Medical Officer of Health and Principal Schools Medical Officer for 1954, p 24. London, HMSO, 1955.
[13] Sorsby, A, Sheridan, M, and Leary, G A, *Refraction and its Components in Twins*. London, HMSO, 1962.

(*Accepted 22 December 1976*)

Patients in acute surgical wards: a survey in Glasgow

I W STRANG, F A BODDY, BRYAN JENNETT

British Medical Journal, 1977, **1**, 545-548

Summary

A survey was made of all patients in general surgical, urological, and orthopaedic and accident wards in Glasgow on one day in June 1975. Its purpose was to define features of acute surgical practice of relevance to the future planning of resources, particularly bed numbers. Over 40% of the patients in both surgical and orthopaedic wards were over 65 years. Most patients had serious conditions and could not have been treated other than by admission to an acute surgical ward. But a substantial minority no longer needed such facilities and could have been transferred to second-line beds, although many still required skilled nursing care. Delay in the discharge of elderly patients from acute surgical wards as a consequence of non-surgical (often medical or social) problems results in a proportion of acute surgical beds fulfilling a second-line function. Unless arrangements for the earlier discharge of these patients are made any reduction in acute surgical beds is likely to restrict elective surgery, especially in orthopaedics.

Introduction

"Norms" for the provision of acute hospital beds are now being used in planning the future provision of surgical services. Relating a declared norm to estimates of the future local population produces a simple statement of limits within which surgical services must be constrained. The assumption that both the present pattern of surgical morbidity and present techniques of surgical practice will continue unchanged may, however, be challenged. A more serious objection is that planning procedures of this kind assume that acute beds are in fact used for acute cases. There is little allowance for the inappropriate use of these facilities that may arise because services of other kinds are inadequate in some areas.

In October 1975 the Greater Glasgow Health Board circulated a discussion document[1] that proposed an overall reduction of acute beds by 1991. The projected bed numbers were based on an expected fall in population and the application of a desired rate of "patient throughput" proposed by the Scottish Home and Health Department (throughput is the average number of patients per bed per year). This method of estimation resulted in the proposal to reduce the number of acute surgical and urological beds from about 1200 to 690 and orthopaedic and accident beds from 720 to 360—that is, an overall reduction of 45%. When the area subcommittee in surgery was invited to comment it considered that there was need for objective data about certain aspects of the use of surgical beds and the characteristics of surgical patients. The Orthopaedic Council in Glasgow had already begun a limited inquiry of this kind, and the community medicine specialists whom the Council had consulted were invited to broaden their inquiry. The collaborative survey which followed is described here.

Objectives

The survey was planned to describe the pattern of surgical work and to define those features of surgical inpatient care that may be relevant to the planning of future resources. We were particularly interested in the problem of discharging elderly patients once their surgical treatment had been completed and in the possible use of "second-line" beds as an alternative way of caring for patients who no longer needed acute facilities.

Methods

The survey took the form of a census of all inpatients in general surgical, urological, and accident and orthopaedic beds in the area of the Greater Glasgow Health Board at 9.00 am on 19 June 1975.

Greater Glasgow Health Board

I W STRANG, MB, DIPSOCMED, senior registrar in community medicine
BRYAN JENNETT, MD, FRCS, chairman of area subcommittee on surgery,* and professor of neurosurgery, University of Glasgow

Department of Community Medicine, University of Glasgow

F A BODDY, MRCP, FFCM, senior lecturer in operational studies in health care

*Members of the area subcommittee on surgery were: Professor L H Blumgart, Professor D L Hamblen, Mr K Fraser, Mr J S F Hutchison, Mr C W Imrie, Mr A Litton, Mr A Marshall, Mr D C Miln, Mr E A Osborne, Mr Gavin Smellie, Mr D C Smith, Mr J White, Mr G A Whitefield, Mr I C Whyte.