

Hysterectomies and 28 day readmissions to a district general hospital, 1997-2003. Figures are numbers (percentages)

	1997-8*	1998-9	1999-2000	2000-1	2001-2	2002-3	All years
No of hysterectomies	275	409	376	341	357	350	2108
Reason for readmission:							
Serious postoperative bleeding	3 (1.1)	2 (0.5)	14 (3.7)	14 (4.1)	6 (1.7)	7 (2.0)	46 (2.2)
Other postoperative complications	4 (1.5)	8 (2.0)	7 (1.9)	5 (1.5)	3 (0.8)	8 (2.3)	38 (1.8)
New acute medical or surgical problem	3 (1.1)	8 (2.0)	8 (2.1)	4 (1.2)	8 (2.2)	7 (2.0)	35 (1.7)
Postprocedural care	0 (0.0)	3 (0.7)	3 (0.8)	3 (0.9)	9 (2.5)	3 (0.9)	21 (1.0)
Total readmissions	10 (3.6)	21 (5.1)	32 (8.5)	26 (7.6)	26 (7.3)	25 (7.1)	140 (6.6)

\*1997-8 is a part year of eight months.

**What is already known on this topic**

Deep vein thrombosis and pulmonary embolism are risks after hysterectomy

Prophylaxis with anticoagulants is effective

**What this study adds**

Tinzaparin, a low molecular weight heparin, may result in a doubling of postoperative bleeding and an increased risk of readmission

**Discussion**

From 1997-8 to 1999-2000 there was a twofold increase in the risk readmission in the 28 days after hysterectomy and a twofold increase in the risk of serious postoperative bleeding in women given tinzaparin compared with those given calci-heparin. While previous studies have shown conflicting results,<sup>3-5</sup> our results indicate that tinzaparin is associated with an increased risk of bleeding after hysterectomy. This may be the case in other trusts with high readmission rates.

Our study shows that clinical performance indicators are useful in the monitoring of quality of care and outcomes. Early warning of adverse trends would be enhanced through reporting complications

such as these within a clinical incident reporting process and better clinical information systems.

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Ethical approval: The study was approved by the local research ethics committee.

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**Does amblyopia affect educational, health, and social outcomes? Findings from 1958 British birth cohort**

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**Abstract**

**Objective** To determine the association of amblyopia with diverse educational, health, and social outcomes in order to inform current debate about population screening for this condition.

**Design, setting, and participants** Comparison of 8432 people with normal vision in each eye with 429 (4.8%) people with amblyopia (childhood unilateral reduced acuity when tested with correction and unaccounted for by eye disease) from the 1958 British birth cohort, with respect to subsequent health and social functioning.

**Results** No functionally or clinically significant differences existed between people with and without amblyopia in educational outcomes, behavioural

difficulties or social maladjustment, participation in social activities, unintended injuries (school, workplace, or road traffic accidents as driver), general or mental health and mortality, paid employment, or occupation based social class trajectories.

**Conclusions** It may be difficult to distinguish, at population level, between the lives of people with amblyopia and those without, in terms of several important outcomes. A pressing need exists for


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 Tables A-D are on bmj.com.

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**Table 1** Associations between mild or moderate/severe amblyopia and educational attainment during childhood

Education tests (at age 11)	Normal vision (No)	Amblyopia		Adjusted difference (95% CI) in scores*	P value
		Degree	No		
Maths†	5894	Mild	194	0.02 (-0.10 to 0.15)	0.705
		Moderate/severe	79	-0.09 (-0.29 to 0.11)	0.366
Reading†	5938	Mild	197	0.09 (-0.03 to 0.20)	0.151
		Moderate/severe	80	-0.14 (-0.14 to 0.24)	0.600
Copy a design†	5622	Mild	186	0.14 (-0.02 to 0.29)	0.078
		Moderate/severe	76	-0.11 (-0.35 to 0.13)	0.370
Verbal score on general ability test	5526	Mild	184	-0.34 (-1.70 to 1.01)	0.619
		Moderate/severe	73	-0.86 (-2.99 to 1.27)	0.427
Non-verbal score on general ability test	5525	Mild	184	-0.27 (-1.38 to 0.83)	0.630
		Moderate/severe	73	-0.03 (-1.77 to 1.71)	0.970

\*Normal vision minus amblyopia, adjusted for social class, sex, age at testing, family size, ever having strabismus, treatment for amblyopia, and previous test scores where appropriate.

†Standardised education scores—that is, multiples of standard deviation.

further concerted research on what it means to have amblyopia and, specifically, how this varies with severity and how it changes with treatment, so that screening programmes can best serve those who have the most to gain from early identification.

## Introduction

Amblyopia is the most commonly encountered condition in paediatric ophthalmic practice. Whole population screening, which arose piecemeal, is now established in many industrialised countries, aiming to detect and treat children within the “critical period.” National guidance in the United Kingdom advocates screening by orthoptists of children aged 4-5 years,<sup>1</sup> but the value of screening has recently been debated.<sup>2,3</sup> This partly reflects concerns about the paucity of evidence of the functional consequences of amblyopia and their impact at a population level, a key factor in assessing the value of screening and its effectiveness. From a national cohort study, we report an investigation of the association of amblyopia with diverse health and social outcomes.

## Methods

The 1958 British birth cohort comprised everyone born in Britain in one week in 1958.<sup>4</sup> Members have been followed since birth, by clinical examination, interview, or both at 7, 11, 16, 23, 33, and 41 years. Distance visual acuity in each eye was assessed with habitual correction at 7, 11, and 16 years. We excluded people with bilateral visual loss, unilateral loss inconsistent with amblyopia, or known eye diseases.

We identified three “vision” categories for all participants at age 16: normal vision—acuity of 6/6 with or without correction in each eye throughout childhood; mild (“residual/persisting”) amblyopia—acuity of 6/6 in one eye and 6/9 or 6/12 in the other and unilateral visual loss, with or without strabismus, earlier in childhood; moderate or severe (“residual/persisting”) amblyopia—acuity of 6/6 in one eye and 6/18 or worse in the other and unilateral visual loss, with or without strabismus, earlier in childhood. For completeness, we analysed separately those with “resolved” amblyopia (see tables C and D on [bmj.com](#)).

We assessed the associations of amblyopia with: education (mathematics, reading, comprehension, and

perceptual and motor skills) at 7, 11, and 16 years; coordination at 16 years; highest educational qualification attained by 33 years; behavioural difficulties or social maladjustment at school or at home<sup>5,6</sup> at 7 and 11 years; participation in sport/outdoor games at 11, 16, and 23 years; social activities (going dancing or to the cinema, meeting friends) at 16 and 23 years; unintended injury needing hospital care between 11 and 33 years; general health, self reported at 23, 33, and 41 years as excellent, good, fair, or poor; mental health (seeing a doctor for depression or score  $\geq 7$  on malaise inventory) at 23, 33, and 41 years; employment experience by 33 years; occupation<sup>7</sup> at age 33 years in “target” jobs for which minimum visual acuity statutory requirements exist in the UK (see [bmj.com](#))<sup>8</sup>; impact on occupation based social class assessed as change from “expected” social class to “actual” social class; and all cause mortality.

**Statistical analysis**—We investigated amblyopia as a risk factor for adverse outcomes by using regression techniques, adjusting for potential confounders including sex, birth weight, social class, and highest educational attainment.

## Results

We included in the study the 8861 people at age 16 who were eligible, of whom 53% (4653) were male. In all, 95.2% (8432) had normal vision and 4.8% (429) had residual/persisting amblyopia: 3.6% (320) mild and 1.2% (109) moderate or severe. We present only key findings here; tables A-D on [bmj.com](#) give the full dataset.

### Education and occupation

Children with amblyopia did as well as those with normal vision on educational tests (table 1 and table A). Amblyopia was not associated with highest educational qualification achieved (table 2), or being in paid employment at age 33. Overall, 2321/3351 (69%) men had experienced upward shift in social class; we found no evidence that those with amblyopia had a different pattern (upward shift in 69% for normal, 73% for mild, and 63% for moderate or severe amblyopia;  $P=0.413$ ).

People with amblyopia were as likely as those with normal vision to be in any “target” occupation.<sup>8</sup> Specifically, 7.7% (95% confidence interval 6.7% to 8.6%) of men with normal vision and 5.7% (1.8% to

**Table 2** Associations between mild or moderate/severe amblyopia and education, employment, social activities, unintended injuries, general and mental health in adult life

Outcome	Normal vision (No)	Amblyopia		Adjusted odds ratio (95% CI) (amblyopia v normal vision)	P value
		Degree	No (%) affected		
<b>Education (at age 33)*</b>					
Higher educational attainment	4965	Mild	184	1.22 (0.91 to 1.64)	0.189
		Moderate/severe	65	0.99 (0.61 to 1.61)	0.962
<b>Employment (at age 33)†</b>					
In paid employment (men)	2416	Mild	69/90 (77)	0.93 (0.55 to 1.60)	0.805
		Moderate/severe	22/33 (67)	0.51 (0.22 to 1.17)	0.112
In paid employment (women)	2502	Mild	59/91 (56)	0.92 (0.57 to 1.50)	0.747
		Moderate/severe	16/27 (60)	0.71 (0.31 to 1.64)	0.427
<b>Sport and social functioning (at age 23)‡</b>					
Not done any sport in previous month	6592	Mild	117/237 (49)	0.94 (0.71 to 1.26)	0.686
		Moderate/severe	41/82 (50)	1.07 (0.65 to 1.75)	0.800
Not been dancing in previous month	6592	Mild	101/238 (42)	1.00 (0.76 to 1.34)	0.954
		Moderate/severe	33/82 (40)	0.88 (0.54 to 1.44)	0.610
Not been to the cinema in previous month	6598	Mild	150/238 (63)	0.87 (0.65 to 1.16)	0.339
		Moderate/severe	49/82 (60)	0.76 (0.46 to 1.25)	0.283
<b>General health (at age 33)§</b>					
Self report of poorer health	3579	Mild	121	1.04 (0.73 to 1.49)	0.839
		Moderate/severe	51	1.12 (0.64 to 1.95)	0.700
<b>Mental health (at age 33)¶</b>					
Depression, seen general practitioner or specialist in past 10 years	3578	Mild	21/120 (18)	1.54 (0.93 to 2.56)	0.093
		Moderate/severe	8/50 (16)	1.61 (0.74 to 3.53)	0.233
Psychological distress (malaise inventory score >7)	3471	Mild	9/117 (8)	0.88 (0.41 to 1.90)	0.754
		Moderate/severe	4/49 (8)	1.29 (0.44 to 3.79)	0.649
<b>Unintentional injuries (at age 17-33)‡</b>					
Inpatient care	5355	Mild	33/198 (17)	1.56 (1.03 to 2.38)	0.037
		Moderate/severe	9/72 (13)	1.09 (0.50 to 2.40)	0.826
Outpatient care	5356	Mild	104/198 (53)	0.90 (0.65 to 1.24)	0.517
		Moderate/severe	44/72 (61)	1.04 (0.60 to 1.82)	0.882
Road accident as driver	5390	Mild	39/200 (20)	1.28 (0.87 to 1.89)	0.210
		Moderate/severe	22/72 (31)	2.33 (1.29 to 4.20)	0.005
Injury at work	5390	Mild	39/200 (20)	0.78 (0.52 to 1.17)	0.226
		Moderate/severe	17/72 (24)	0.76 (0.40 to 1.45)	0.408

\*Ordinal regression—odds of achieving higher level of education, independent of actual level considered, adjusted for sex, social class, marital status, ever having strabismus, and treatment for amblyopia.

†Adjusted for highest educational attainment, social class, ever having strabismus, and treatment for amblyopia.

‡Adjusted for sex, social class, ever having strabismus, and treatment for amblyopia.

§Ordinal regression—odds of self report of poorer health, independent of level, adjusted for highest educational attainment, marital status, home behaviour at 16 years, sex, school adjustment at 16 years, previous mental health, and change in social class in previous 10 years.

¶Adjusted for highest educational attainment, marital status, home behaviour at 16 years, sex, school adjustment at 16 years, previous mental health, and change in social class in previous 10 years.

9.6%) of those with amblyopia (P = 0.397 for difference in proportion) were in any of these occupational categories.

**Behaviour and social functioning**

Children with amblyopia were no more likely than those without amblyopia to have significant behav-

oural problems or maladjustment at home or school, or to be bullied (table 3, table A). We found no evidence for an association between amblyopia and participation in social activities in either childhood (table 3) or adulthood (table 2). Children with amblyopia were as likely as those with normal vision to play sport or outdoor games (table 3, table A).

**Table 3** Associations between mild or moderate/severe amblyopia and behaviour, social activities, and unintended injuries during childhood

Outcome	Normal vision (No)	Amblyopia		Adjusted odds ratio (95% CI)*	P value
		Degree	No (%) affected		
Behaviour (at age 7): BSAG score, in upper decile	6987	Mild	24/234 (10)	1.20 (0.77 to 1.88)	0.419
		Moderate/severe	14/94 (15)	1.73 (0.92 to 3.23)	0.087
Sport (at 11 years): "hardly ever"	6463	Mild	24/210 (11)	1.15 (0.72 to 1.85)	0.550
		Moderate/severe	9/89 (10)	1.02 (0.47 to 2.22)	0.951
Social activities—dancing/disco (at 16 years): "hardly ever"	5778	Mild	74/216 (34)	1.32 (0.96 to 1.82)	0.086
		Moderate/severe	20/75 (27)	0.86 (0.49 to 1.53)	0.611
Unintentional injuries needing hospital care:					
Inpatient care up to age 16	6757	Mild	71/255 (28)	1.17 (0.86 to 1.59)	0.319
		Moderate/severe	19/88 (22)	0.76 (0.44 to 1.33)	0.334
Outpatient care at age 12-16	6807	Mild	60/257 (23)	0.89 (0.65 to 1.23)	0.482
		Moderate/severe	25/89 (28)	1.05 (0.62 to 1.76)	0.858

BSAG=Bristol social adjustment guides.

\*Amblyopia v normal vision, adjusted for social class, sex, ever having strabismus, and treatment for amblyopia.

## Health

People with amblyopia were no more likely than those with normal vision to report poor general health, depression, or psychological distress in adulthood (table 3, table B). Overall, 213 (2.4%) people died between 16 and 41 years, including 5 (1.2%) of those who had amblyopia. The small numbers precluded further formal analysis. People with amblyopia were no more likely than those with normal vision to have unintended injuries in childhood requiring hospital care (table 3, table A). In adult life, amblyopia was not associated with increased odds of injuries at work; moderate/severe (but not mild) amblyopia was associated with road traffic accidents as a driver between ages 17 and 33 (table 2, table B).

## Discussion

Our findings indicate that, on average, people with amblyopia can expect to do as well as their peers with normal vision in both eyes in terms of educational attainment, employment, and occupational and socio-economic achievement. They do not seem to be disadvantaged in relation to social activities, nor are they at increased risk of behavioural difficulties or social maladjustment as children. They are no more likely to report overall worse general health or mental health, to be involved in serious unintended injuries generally, or to be at overall increased risk of death.

### Strengths and weaknesses of the study

Reliance on parental history for some information and on assessments by general medical examiners raises the possibility of misclassification of amblyopia. However, amblyopia is the most likely cause of unilateral reduced acuity despite optical correction and our prevalence of 1.2% for residual amblyopia at a threshold of 6/18 or worse is consistent with previous reports.<sup>9 10</sup> The 1958 birth cohort is a representative population, studied longitudinally, ensuring that visual status was known before measurement of outcomes. The size of the population studied was sufficient to detect even modest associations for key outcomes.

### Implications of the findings

The two main justifications for screening are occupational preclusion and the risk of visual disability through loss of vision in the normal eye. In the UK the lifetime risk to people with amblyopia or visual impairment or blindness through disease or injury to their normal eye is between 1% and 3%.<sup>11</sup> Although important, this event is, nevertheless, likely to be too rare at a whole population level (affecting 4.8-14.4/10 000 of the whole population<sup>11</sup>) to be sufficient sole justification for screening for all levels of amblyopia. A stronger case can be made for screening for moderate and severe amblyopia—using, for example, the minimum visual standards for driving as the threshold for acuity in the amblyopic eye—to identify people who would have predictable and measurable adverse outcomes should they lose the use of their non-amblyopic eye. This argument is supported by recent UK data from a randomised trial of the outcomes of preschool vision screening for and treatment of unilateral visual loss.<sup>12</sup>

The limited literature on employment and occupational limitations associated with amblyopia, and their

## What is already known on this topic

Amblyopia is the most common disorder seen in paediatric ophthalmic practice in industrialised countries

Debate about the value of established whole population screening partly reflects the paucity of evidence of the functional consequences of amblyopia and their impact at a population level

## What this study adds

Distinguishing, at a population level, between the lives of people with amblyopia and those without in terms of important educational, health, and social outcomes may be difficult

implications for socioeconomic advancement, suggests that it has little impact on occupational class.<sup>13</sup> Our findings strengthen this view. The proportion of the population working in the “target” occupations to which acuity restrictions apply in the UK is not high (7.6%), so fewer than 4/1000 people overall (that is, those with amblyopia) would face potential occupational preclusion. We found no evidence for differential impact of occupational preclusion by social class, and injuries in the workplace were no more common among people with amblyopia. We urge ophthalmic professionals to engage in work delineating the safety risks associated with amblyopia, so that affected people are advised more informatively and occupational preclusions are more firmly evidence based.

Elaboration of the nature and severity of the disability conferred by amblyopia, and the extent to which it is improved by treatment, is essential to further characterising its public health importance, which remains uncertain. Our study does not examine the qualitative impact of amblyopia at the level of the individual. Methodologically robust research, combining qualitative and quantitative approaches would be of value in characterising the nature and degree of limitation to everyday life of people with amblyopia. This could be complemented by information obtained through routine assessment of vision related quality of life in clinical settings and in trials and other research on amblyopia. Extensive psychophysical and neurophysiological work has delineated clear deficits in specific components of vision, such as contrast sensitivity, that occur in amblyopia.<sup>14</sup> Our findings fail to identify “real life” functional correlates. The value of experimental research to decisions about screening needs to be enhanced by considering the impact of specific visual abnormalities on everyday activities, as well as the degree to which these are permanently reversed by treatment.

## Conclusion

We suggest that the need is greater than ever before for concerted research on what it means to be amblyopic and how this varies with severity of amblyopia and how it changes with treatment, so that screening programmes can be designed to best serve those people who have the most to gain from the earliest possible identification.

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## Commentary: Does amblyopia matter?

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Rahi and colleagues report that, “distinguishing, at a population level, between the lives of people with amblyopia and those without in terms of important educational, health, and social outcomes may be difficult.”<sup>1</sup> Understanding of amblyopia has moved beyond the traditional concept of a “lazy eye” to the knowledge that it is a form of cerebral visual impairment, caused by a disturbance of vision during a sensitive period of development. Amblyopia is the effect on the developing visual system of another pathology—often refractive error or strabismus (squint)—and is the most common cause of reduced visual acuity (in one eye) in children and young adults, with a generally accepted prevalence of 2-3%.<sup>2</sup>

Clinical and experimental data, indicating better results from early treatment of amblyopia, have led to the development of childhood visual screening programmes, which detect around 7% of children as abnormal, usually because of reduced visual acuity or strabismus. Reduced visual acuity detected at screening may be due to refractive error only, in which vision immediately corrects to normal with glasses, or to amblyopia, in which a residual visual deficit exists even with refractive correction. Rarely, other pathology such as congenital cataract or retinoblastoma may be discovered.

Associations between performance at school and amblyopia are complicated by the independent associations of strabismus and refractive error with a variety of neurodevelopmental disorders, including those caused by premature birth. Nevertheless, bilateral visual deficits (which were excluded from Rahi and colleagues' study) that cannot be corrected with glasses are clearly associated with educational difficulty and reduced life chances.<sup>3</sup>

Although bilateral refractive errors are relatively common in children, bilateral amblyopia is rare and a

person with one amblyopic eye generally has good vision in the other. Although it is intuitively desirable that all children should develop good vision in both eyes, the extent of disability attributable to having amblyopia in one eye, when the other sees well, is less clear but is, according to this study, minimal.

Chua and Mitchell found that unilateral amblyopia in people aged 49 or over did not affect lifetime occupational class, but that a lower proportion of such people had completed university degrees<sup>4</sup> (this was not confirmed by Rahi and colleagues). Membreno et al calculated utility values for unilateral amblyopia, but these were based on adult perceptions of acquired visual loss.<sup>5</sup>

Childhood visual screening continues to be a controversial subject, but two main justifications have emerged for trying to ensure that all children leave the critical period with good vision in both eyes: reduced occupational opportunity and the risk of visual impairment if the eye with better vision is affected by trauma or pathology. In the light of this study, the somewhat random occupational visual requirements could be regarded as unjustifiably discriminatory and should be reviewed.

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