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Blindness and partial sight in an elderly population

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SUMMARY A cross sectional, prevalence survey of eye disease in the population over 75 years old of Melton Mowbray has been used to examine the accuracy and completeness of the Blind and Partially Sighted Registers. The Blind Register had high sensitivity and specificity but was found to underestimate the prevalence of blindness by a factor of 1·1. The Partially Sighted Register had high specificity, but the sensitivity was only 50% and it underestimated the prevalence of partial sight by a factor of 1·5. Seven persons eligible for registration, but previously not registered, were found, two as blind and five as partially sighted. This represented 21% of the registrable visually impaired population.

In the United Kingdom the placement of visually handicapped persons on the Blind and Partially Sighted Registers is not compulsory. Registration depends on having a certificate of blind registration (form BD8 in England and Wales) completed by a consultant ophthalmologist.

The definition of blindness for the purpose of registration is 'so blind as to be unable to perform work for which eyesight is essential'. Although there is no statutory definition of partial sight in the 1948 National Assistance Act, the Ministry of Health subsequently advised that a person who is not blind within the meaning of the Act, but who is 'substantially and permanently handicapped by defective vision caused by a congenital defect, illness or injury' is eligible to be registered as partially sighted.[1]

Persons registered as partially sighted may receive the same welfare services as are provided by the local authorities for the blind but are not eligible to receive other benefits specifically enjoyed by the blind, such as income tax concessions and supplementary benefit.

Since registration as blind or partially sighted is entirely voluntary, there is no method of ascertaining whether all those eligible for blind registration are so registered. Studies[2–4] have suggested that the Blind and Partially Sighted Registers may seriously underestimate the number of visually handicapped persons in the community.

In this report we present the results of a survey of eye disease in a defined, elderly population in England, which has been used to examine the Blind and Partially Sighted Registers. The main purpose of the study was to determine accurately the amount of unregistered blindness and partial sight in an elderly population. A considerable amount of data were obtained about the visual acuity in the elderly and they are also presented in this report.

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Materials and methods

Melton Mowbray is a market town in Leicestershire, England, that lies midway between the cities of Leicester and Nottingham. An unusual situation exists in Melton Mowbray in that virtually the whole population of the town and surrounding rural district is served by a single, 12-doctor general practice. The practice population (32 000 persons) is virtually identical with the geographically defined population of Melton Mowbray, and since 1980 has been established on a computerised age-sex register.

In 1981 the Department of Community Health, Leicester University, carried out a comprehensive household survey of all persons aged 75 years and over on the age-sex register. This survey was concerned with all aspects of health and social services.[5] The surviving members of this cohort still living in the town and surrounding rural area of Melton Mowbray on 1 April 1982 formed the target population for a study of the prevalence of eye disease in the elderly. The basis and preliminary results of this study have been reported elsewhere.[6]

The study population were listed in random order from the age-sex register and over a two-year period were asked to attend a special eye clinic which had

been set up for the purposes of this study. Each attender underwent a full examination by an ophthalmic optician (JRL) and an ophthalmologist (JMG).

A total of 677 persons were available for examination at the time the study was initiated, and 529 persons attended and took part in it, a response rate of 78·1%. Each person attending the eye clinic underwent a full ophthalmic examination, including fundus examination and photography, after pupillary dilatation. Distance visual acuity was measured by a standard illuminated Snellen test chart at a measured distance of 6 metres. Near vision was ascertained with a test type approved by the Faculty of Ophthalmologists. Vision was tested with and without spectacles, if worn, and after refraction with the appropriate correction. Subjects were referred to Leicester for formal visual field examination only if suspected of having open-angle glaucoma. Four hundred and seventy-four persons (90% of participants) attended the eye clinic at the War Memorial Hospital in Melton Mowbray and had a full ophthalmic examination. Fifty-five persons were examined at home, in nursing homes, or in hospital.

The Royal Leicestershire, Rutland, and Wycliffe Society for the Blind kindly provided an up-to-date list of all persons aged 75 years and over, living in the defined area of Melton Mowbray and surrounding villages, who were registered blind or partially sighted. The society also made available the completed BD8 forms for confidential examination, from which information including visual field data was recorded.

Results

The corrected distance visual acuity after refraction is presented for the 474 study participants by better eye in diagrammatic form in Fig. 1. The data for the 55 persons who were examined under non-standardised conditions at home or in hospital have been excluded from analysis. Eighteen persons (3·8%) were found to have corrected visual acuity of 6/60 or less in their better eye, and 11 of these had been previously registered, nine as blind and two as partially sighted. One hundred and twenty-two persons (25·7%) had corrected vision of less than 6/18 in their better eye, and therefore can be defined as visually impaired under the classification of the World Health Organisation.[7]

The data for corrected binocular near vision of 474 study participants is presented in diagrammatic form in Fig. 2. Over three-quarters of the participants had corrected binocular near vision, of N6 or better. Fifty-eight persons (11·1%) had corrected binocular vision of less than N8, which is usually considered the size of normal book print.

The binocular near vision of the 55 non-ambulatory participants, who were examined at home and in hospital, are presented in Fig. 3 for comparison. Nineteen persons (35%) had corrected binocular vision of less than N8.

BLIND REGISTER

Analysis of the Blind Register relating to patients from Melton Mowbray and its surrounding villages

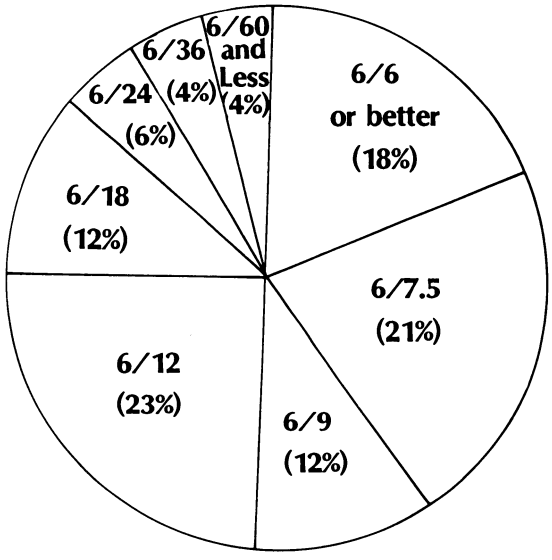

Fig. 1 *Corrected distance visual acuity of study participants by better eye for the sample examined under standard conditions (474=100%).*

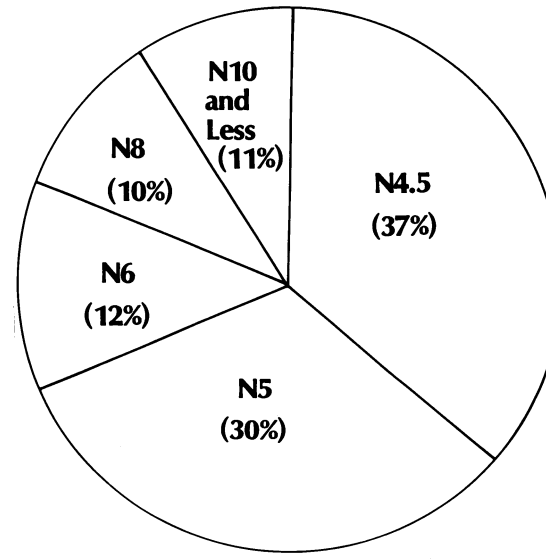

Fig. 2 *Corrected binocular near vision of study participants, for the sample examined under standard conditions (474=100%).*

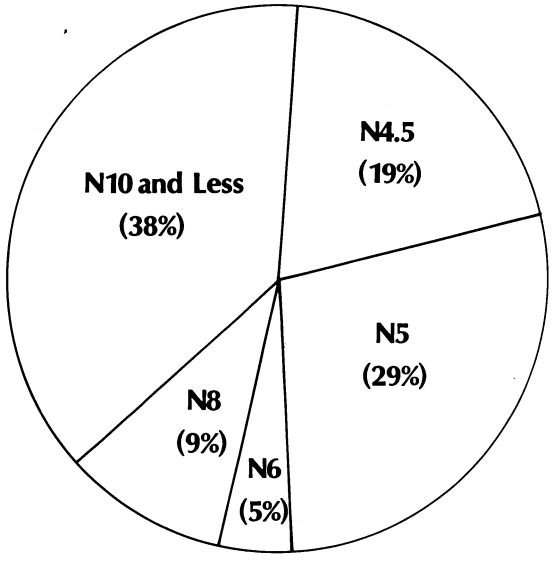

Fig. 3 *Corrected binocular near vision for non-ambulatory study participants (55=100%).*

Table 1 *Study participants registered blind: comparison of data from BD8 and eye study*

Information from BD8 forms				*Information from survey*	
Case	*Diagnosis*	*Field of vision*	*Corrected vision in better eye*	*Corrected distance vision better eye*	*Binocular near vision*
1	AMD	Central scotoma	HM	CF	N48
2	AMD, OAG	<10°	6/60	6/18	N8
3	AMD	Contracted	6/24	6/18	N5
4	Cararact, diabetic retinopathy	<10°	HM	6/9	N6
5	Cataract	Contracted	CF	6/12	N9
6	CRAO	Central scotoma	CF	HM	<N48
7	AMD	Central	CF	CF	<N48
8	OAG	<10°	CF	6/60	N24
9	Cataract, ACG	Central scotoma	CF	PL	<N48
10	Corneal scar	Contracted	NPL	6/36	N36
11	AMD	Central scotoma	CF	CF	N24
12	AMD	Central scotoma	CF	CF	<N48
13	AMD	Central scotoma	CF	CF	N48
14	AMD, cataract	Central sctoma	CF	6/60	N8
15	AMD	Central scotoma	CF	6/24	N5

AMD=age-related macular degeneration. OAG=open-angle glaucoma. CRAO=central retinal artery occlusion. ACG=angle closure glaucoma.

showed that 15 persons aged 75 years and over who had participated in the study were registered as blind. The details of the visual acuity, field of vision, and diagnosis at registration obtained from the BD8 forms are presented in Table 1 and compared with the survey findings.

In terms of age and sex ratio those persons registered as blind were similar to the study participants as a whole.

PARTIALLY SIGHTED REGISTER

Eleven persons in the study population were registered as partially sighted, and the details of the visual acuity, field of vision, and diagnosis at registration of these persons are presented in Table 2, with the survey findings included for comparison.

The sex ratio and the mean age of these persons were not significantly different from those of the study participants as a whole.

UNDETECTED VISUAL HANDICAP

In the survey seven persons were found who had corrected visual acuity 6/60 or worse in their better eye but had not previously been registered as blind or partially sighted. This number represented 21%

Table 2 *Participants by partial sight registration: BD8 and survey data*

Information from BD8 forms				*Information from survey*	
Case	*Diagnosis*	*Field of vision*	*Corrected vision in better eye*	*Corrected distance vision better eye*	*Binocular near vision*
1	Cataract, CRVO AMD	Central scotoma	6/24	HM	<N48
2	AMD, CVA	Hemianopia, central scotoma	6/24	CF	N48
3	Cataract, CRVO, AMD	<10°	6/36	6/36	N8
4	Cataract	<10°	6/24	6/24	N8
5	Cataract, AMD	Central scotoma	6/60	6/36	N8
6	AMD	Central sotoma	6/36	6/36	N9
7	AMD	Central scotoma	CF	6/24	N9
8	AMD	Central scotoma	3/60	6/36	N18
9	Cataract	Central scotoma	6/36	6/24	N8
10	OAG	Contracted	6/36	6/18	N8
11	Cataract, AMD, RD	Full	6/60	6/24	N4·5

CRVO=central retinal vein occlusion. AMD=age related macular degeneration. CVA=cerebrovascular accident. RD=retinal detachment.

Table 3 *Participants with undetected visual handicap*

Case	*Age in years*	*Sex*	*Corrected distance V/A*	*Binocular near V/A*	*Diagnosis*
1	83	F	6/60	N18	AMD
2	82	F	6/60	N14	AMD
3	83	F	6/60	N12	AMD
4	82	F	6/60	N6	Cataract/ amblyopia
5	87	F	6/60	N9	Cataract/ ACG
6	86	F	CF	<N48	AMD
7	92	F	CF	<N48	AMD

(7/33) of all persons registrable as blind or partially sighted in the study, and their visual acuities and diagnoses are presented in Table 3.

Discussion

In his reports on blindness and partial sight in England and Wales Sorsby observed that these registers probably seriously underestimated the true prevalence of blindness and partial sight in the population.[8] Since there are less obvious financial benefits for those registered as partially sighted, it is generally suspected that the Blind Register is more complete than the Partially Sighted Register.

Several studies have examined the accuracy of the Blind and Partially Sighted Registers. Graham and coworkers[2] assessed registrable blindness in a 1600-patient group practice in Wales, by means of a postal survey and follow-up examination of a random sample of participants. Although the visual criteria considered necessary for registration were not presented, they found that nine of 31 blind persons were not on the Blind Register. Brennan and Knox[3] studied the accuracy and variability of the Blind Register in England by reviewing data derived from local authority returns to the Department of Health and Social Security. They found that there was a wide variation in the prevalence of blind and partial sighted registrations between different areas, which could not be accounted for by differences in age or socioeconomic features. They concluded that these variations were accounted for by differences in registration procedures and that the true prevalence of blindness was higher than that shown on the register by a factor of from 1·1 to 1·4. For the Partially Sighted Register they suspected that this ratio must be even greater.

Cullinan[4] has performed surveys of visually handicapped persons in Canterbury and also on a wider scale in England and Wales. In his report he provides a comprehensive review of the literature and suggested that the Blind Register underestimates the true number of persons potentially eligible for registration by about 30%, and the Partially sighted Register did so by approximately 20%.

The major problem confronting any assessment of the accuracy of the Blind and Partially sighted Registers is the absence of exact visual acuity criteria in the definitions of blindness and partial sight. It should be remembered, however, that the main purpose of these registers is the identification of persons for whom welfare measures might be undertaken, and not for medical research. In this context, therefore, it is a positive advantage not to have rigid visual acuity conditions in the definitions, since their absence preserves a flexibility for registration that is probably beneficial.

Nevertheless for the purpose of considering the accuracy and completeness of these registers the lack of exact criteria is a significant problem. In fact clear guidelines are laid down in the form BD8 on the visual acuity requirements for registration. In general terms a person may be registered as blind if there is a corrected visual acuity of 3/60 or worse in the better eye; or with corrected vision of 3/60 but less than 6/60 with a contracted field of vision; or if the corrected vision is better than 6/60 but the visual field is markedly restricted. For partial sight registration the conditions are: a corrected visual acuity of 3/60 to 6/60 with full visual field, in the better eye; or a visual acuity of up to 6/24 with moderate constriction of the field; or 6/18 and better corrected vision in the better eye with a gross visual field defect.

Using these visual acuity criteria, we found that seven persons who were previously 'undetected' were eligible for registration by consideration of the corrected distance visual acuity alone. Two of this number could be considered registrable as blind, since the corrected visual acuity was only counting fingers at 1 metre, while the remaining five persons would be eligible for partial sight registration. These details are presented in Table 3. The Blind Register therefore apparently underestimated the true prevalence of blindness in the sample by a factor of 1·1 (17/15), while the Partially Sighted Register did so by a factor of 1·5 (16/11).

It would perhaps be dangerous to extrapolate these findings to the population of England and Wales as a whole. One reason for this is that these figures were based on only the qualifying central visual acuity as described above, and did not take into account visual field examinations, which were performed in the study only on glaucoma suspects. This lack of consideration of visual field data might underestimate the true prevalence of blindness and partial sight but only to a very small degree.

Although the original sample was randomly chosen, our study participants were in fact volunteers and therefore self-selected and may not have been

representative of the study population as a whole. However, information about the visual status of the 148 non-responders was obtained from two sources —the original Household Survey Data[5] and from the Blind and Partially Sighted Registers. In the Household Survey participants were asked if they had any visual difficulty at the time of the survey (1981–2). 6% of the Eye Study participants and 14% of the non-participants admitted to some form of difficulty with vision, and this difference was statistically significant ($p<0{\cdot}001$). More importantly, 10 of the non-responders were registered as blind and six as partially sighted. Of the non-responders, therefore, 16/148 were registered compared with 26/529 of the study participants, a marked discrepancy.

These figures suggest that the prevalence of blinding eye disease was higher for the non-responders than for the study participants. Therefore our figures should perhaps be regarded only as indicators of the minimum likely prevalence of undetected blindness and partial sight.

In fact the amount of visual disability in the elderly population at large is probably much greater than would be expected from clinic measurements, since the level of vision obtained in the clinic, after refraction, is probably considerably better than the functioning vision of these persons at home. Cullinan and others[6] have already pointed out that for elderly, visually handicapped subjects clinic visual acuity measurements can often be misleading compared with home measurements.

Consideration of Tables 1 and 2 reveals a wide variation in recorded visual acuities between those measured for the purposes of registration and those obtained in the survey. Since both values were for corrected vision by better eyes, it is somewhat surprising that such large differences should occur, since in most of the cases one would only have expected a deterioration in vision in the period between completion of form BD8 and examination in the study.

Inspection of the study data shows that, in persons with visual handicap, there is little apparent correlation between corrected distance acuity and corrected binocular near vision. This has also been noted by Cullinan.[4] Since form BD8 is under review, it is perhaps an opportune moment to consider whether attention should be given to near as well as distance acuity measurements.

Despite the discrepancies in visual acuity measurements between registration and survey measurements, only two persons could be considered to be falsely registered on the Blind Register on the above-mentioned criteria (Table 1). The two participants in question (numbers 14 and 15) were found in the survey to have corrected visual acuity for distance, outside the usually accepted levels for registration as blind. In addition they both had full peripheral fields.

Table 4 *Sensitivity and specificity of Blind register*

	Registrable as blind	*Non-registrable*
Registered as blind	(a) 13 (True positive)	(b) 2 (False positive)
Not registered as blind	(c) 2 (False negative)	(d) 457 (True negative)

$$\text{Sensitivity of Blind Register} = \frac{a}{a+c} = 87\%$$

$$\text{Specificity of Blind Register} = \frac{d}{b+d} = 99{\cdot}6\%$$

For the Partially Sighted Register, however, at least six persons (numbers 6–11) appear to fall outside the usual criteria for registration. More importantly, two persons (1 and 2) were found to have sufficient visual handicap to be eligible for full blind registration.

When considering the accuracy of any screening test it is important to measure the extent to which a test measures what it purports to measure. Although the Blind and Partially Sighted Registers cannot be considered as methods of screening for visual disability in the population, it is nevertheless appropriate that the specificity and sensitivity of the registers be considered. The sensitivity of a test is a measure of its ability to detect true positive values of a particular variable, while the specificity is a measure of its ability to detect true negative values.

For the Blind Register 15 persons were registered of whom 13 could be regarded as fulfilling the visual criteria (true positives) and two who did not meet these criteria (false positives). In addition two persons were registered as partially sighted who were eligible for blind registration (false negatives). The calculations of specificity and sensitivity are illustrated in Table 4 and show that for the Blind Register the sensitivity was 87%, while the specificity was over 99%. For the Partially Sighted Register, however, these measurements are not so reassuring. Five persons were found to fulfil the visual criteria (true positives) and a further five were unregistered (false negatives). Six persons who were registered were found not to fulfil the visual criteria. The calculation of sensitivity and specificity are illustrated in Table 5. The sensitivity of the Partially Sighted Register was only 50%, but specificity was almost 100%.

The findings of this study and others suggest that the true prevalence of visual handicap is greatly underestimated in the registration of the partially

Table 5 *Sensitivity and specificity of Partially Sighted Register*

	Registrable as partially sighted	*Non-registrable*
Registerd as partially sighted	(a) 5 (True positive)	(b) 6 (False positive)
Not registered as partially sighted	(c) 5 (False negative)	(d) 458 (True negative)

$$\text{Sensitivity of Partially Sighted Register} = \frac{a}{a+c} = 50\%$$

$$\text{Specificity of Partially Sighted Register} = \frac{d}{b+d} = 99\%$$

sighted, while that of the blind is remarkably accurate. It should be emphasised that the main purpose of both the Blind and Partially Sighted Registers is social rather than statistical. Indeed the wide variation of visual acuity recordings between the survey and forms BD8 suggests that both registers are far from ideal for research purposes. Most ophthalmologists and others concerned in the welfare of the visually disabled will welcome the fact that the BD8 registration form is under review. The inclusion of a near vision test as an extension of visual assessment for disability could be a useful addition.

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