3. Katz J, Tielsch JM, Quigley HA, Javitt J, Witt K, Sommer A. Automated suprathreshold screening for glaucoma: the Baltimore Eye Survey. Invest Ophthalmol Vis Sci 1993;34:3271–7.
4. Harper RA, Reeves BC. Glaucoma screening: the importance of combining test data. Optom Vis Sci 1999;76:537–43.
5. Werner EB, Drance SM. Early visual field disturbances in glaucoma. Arch Ophthalmol 1977;95:1173–5.
6. Flammer J, Drance SM, Zulauf M. Differential light threshold: short- and long-term fluctuation in patients with glaucoma, normal controls, and patients with suspected glaucoma, and patients with glaucoma. Arch Ophthalmol 1984;102:704–6.
7. Chauhan BC, Tompkins JD, LeBlanc RP, McCormick TA. Characteristics of frequency-of-seeing curves in normal subjects, patients with suspected glaucoma, and patients with glaucoma. Invest Ophthalmol Vis Sci 1993;34:3534–40.
8. Keltner J, Johnson G, Spurr J, Kass M, Gordon M. Classification of visual field abnormalities in the Ocular Hypertension Treatment Study (OHTS). Invest Ophthalmol Vis Sci 1999;40:370.
9. Sommer A, Tielsch JM, Katz J, Quigley HA, Gottsch JD, Javitt J, Singh K. Relationship between intraocular pressure and primary open angle glaucoma among white and black Americans: the Baltimore Eye Survey. Arch Ophthalmol 1991;109:1090–5.

Paul G.D. Spry, PhD ✉

Legacy Clinical Research and Technology Center
1225 NE Second Avenue
PO Box 3950 Portland
OR 97208-3950, USA
Tel: +1 (503) 413 5315
Fax: +1 (503) 413 5179

Sir,

Spry interprets one of the conclusions from the Nottingham study[1] to be 'that visual field testing by optometrists either causes or is associated with unnecessary false positive referrals'. An important word missed by Spry is *routine*. The study by the Baltimore group, used by Spry to elevate the importance of routine field screening,[2] compares a full 120 point Humphrey field test with a simple cup/disc ratio and narrowest rim width measure from photography. Even under what could be considered to be the ideal conditions in a prospective epidemiological project, the specificity of field screening was only 75% at a sensitivity level of 85%. When translated to a population of 1000 with a prevalence of undetected disease of 2%, 17 true positives (for field defects not necessarily glaucoma) will be detected along with 250 false positives, a ratio of approximately 1:15. This is clearly unacceptable for a screening programme unless a defect is considered as a risk factor for referral rather than an absolute indication for the same.

Our study used dilated stereoscopic disc assessment by experienced personnel (equivalent of a fellow upwards) to define a disc as normal, suspect or pathological. Knowledge of the visual field result in the clinic was not available prior to this assessment. To suggest that an individual with normal Humphrey fields, normal IOPs and a disc classified as unequivocally normal might be a case of normal tension glaucoma because a single screening field performed at a high street optometrist shows a 'defect' is absurd. That some individuals with ocular hypertension produce early defects which revert to 'normal' on serial field testing is irrelevant to the discussion. These at-risk individuals would be identified by tonometry, provided it was performed reliably.

It is my experience, and that of many of my colleagues, both general ophthalmologists and glaucoma subspecialists, that significant numbers of referrals are being seen where the only abnormality has been the visual field performed by the optometrist, or his/her 'assistant'. Often the 'defects' are very minor and do not conform to a defect characteristic of glaucoma (or any neurological defect) and can be explained by a recognised 'false positive' association such as blepharochalasis/ptosis.

To date, no screening study has assessed the efficacy of individuals trained in stereoscopic optic disc assessment, despite the widespread use of stereoscopy by ophthalmologists. Studies, such as one quoted by Spry, which use an uncorrected (for disc height) cup/disc ratio as the only discriminating factor[3] will grossly underestimate the value of careful optic disc assessment in the detection of glaucoma and are therefore of little value in the screening debate.

Some health authorities, my own included, have sanctioned the training and accreditation of optometrists to screen for sight-threatening diabetic retinopathy. Perhaps the time has come to consider a similar system related to glaucoma screening in order to act as a buffer between an overstretched Hospital Eye Service and some optometrists who appear to have a low threshold for referral of glaucoma suspects.

References

1. Vernon SA. The changing pattern of glaucoma referrals by optometrists. Eye 1999;12:854–7.
2. Katz J, Tielsch JM, Quigley HA, *et al.* Automated suprathreshold screening for glaucoma: the Baltimore Eye Survey. Invest Ophthalmol Vis Sci 1993;34:3271–7.
3. Harper RA, Reeves BC. Glaucoma screening: the importance of combining test data. Optom Vis Sci 1999;76:537–43.

S.A. Vernon, DM, FRCS, FRCOphth ✉
Department of Ophthalmology
University Hospital
Nottingham NG7 2UH, UK

Tel: +44 (0)115 924 9924
Fax: +44(0)115 970 9749

Sir,

We thank Dr Spry for his comments on our paper.[1] While visual field testing can perform better than other screening tests for glaucoma, this only applies if appropriate screening methodology is employed.[2] The purpose of our study was to assess the positive predictive value of visual field testing *as currently practised by optometrists*. Visual field testing was found to be associated with unnecessary false positive referrals because validated screening methodology was not always observed. For perimetry, this includes selective screening of a population at increased risk of glaucoma and repeating abnormal perimetry (in the absence of other features of glaucoma) to confirm genuine field loss before referral.[2–4]

The Baltimore Eye Survey, for example, was a large population-based study of subjects aged ⩾ 40 years.[2] It employed the Humphrey Field Analyzer (full-field 120 suprathreshold screening test) for initial visual field screening with confirmation of abnormal fields by Goldmann perimetry. This visual field screening strategy performed better than non-perimetric screening tests for glaucoma. The predictive value of a screening test is, however, strongly dependent on the prevalence of the condition in the population being screened. Non-selective visual field screening (subjects aged < 40 years with no risk factors for glaucoma) would therefore be expected to have a low positive predictive value. This was indeed one source of unnecessary false positive referrals in our study.

The Rotterdam Study demonstrated the importance of the learning effect in visual field screening.[3] This population-based study assessed 3062 subjects aged ⩾ 55 years with the Humphrey Field Analyzer (76-point suprathreshold screening test). A visual field defect or unreliable field was present in 18.4% of