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Appendices

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The clinical effectiveness and cost-effectiveness of screening for open angle glaucoma: a systematic review and economic evaluation

JM Burr, G Mowatt, R Hernández, MAR Siddiqui, J Cook, T Lourenco, C Ramsay, L Vale, C Fraser, A Azuara-Blanco, J Deeks, J Cairns, R Wormald, S McPherson, K Rabindranath and A Grant

October 2007

Health Technology Assessment
NHS R&D HTA Programme
www.hta.ac.uk

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You can post or fax these, but they must be from public bodies (i.e. NHS or universities) within the UK. We cannot at present accept purchase orders from commercial companies or from outside the UK.

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Appendix 1

Markov model for glaucoma

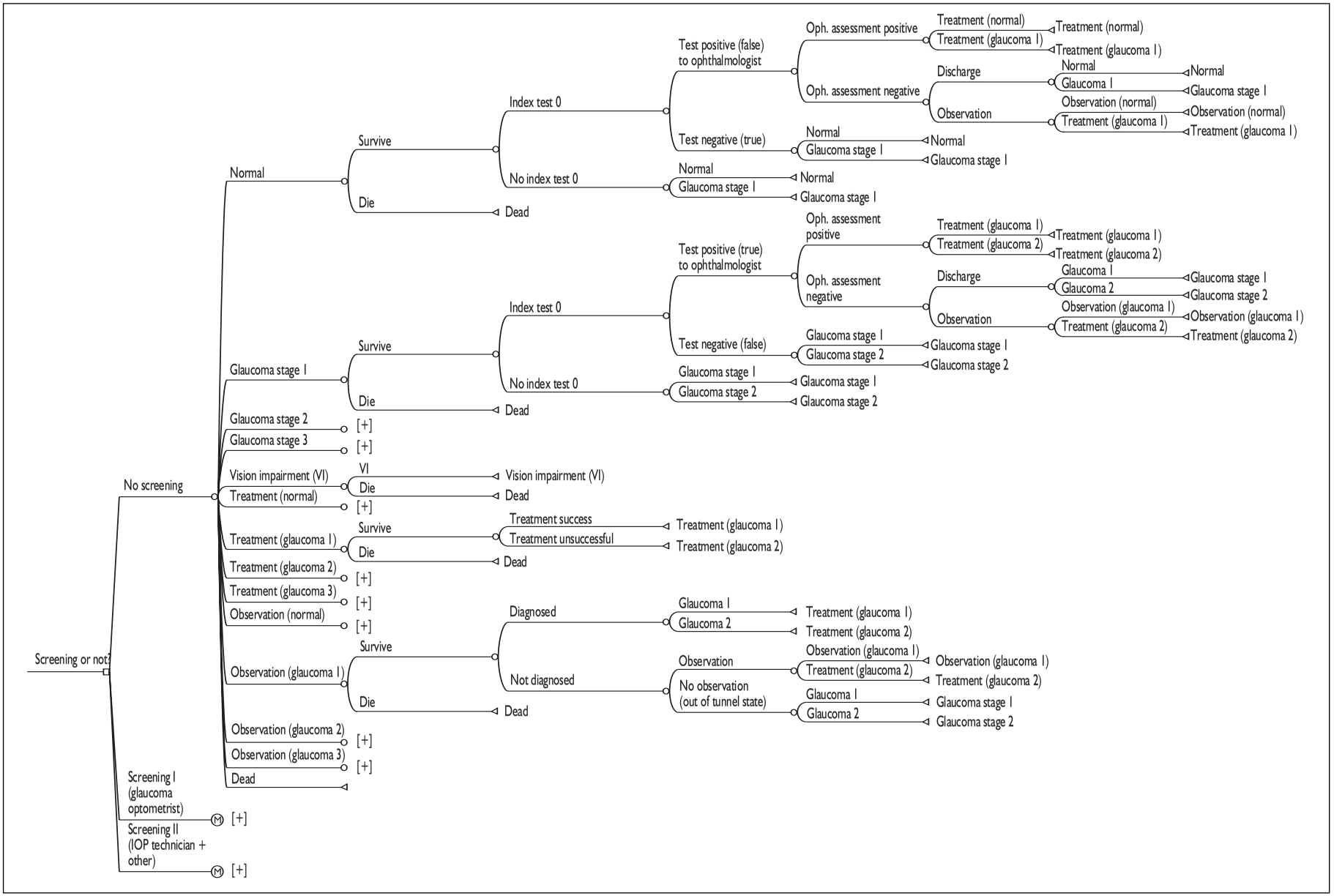

FIGURE 50 *Glaucoma current practice branch. Glaucoma 1 = mild; glaucoma 2 = moderate; glaucoma 3 = severe.*

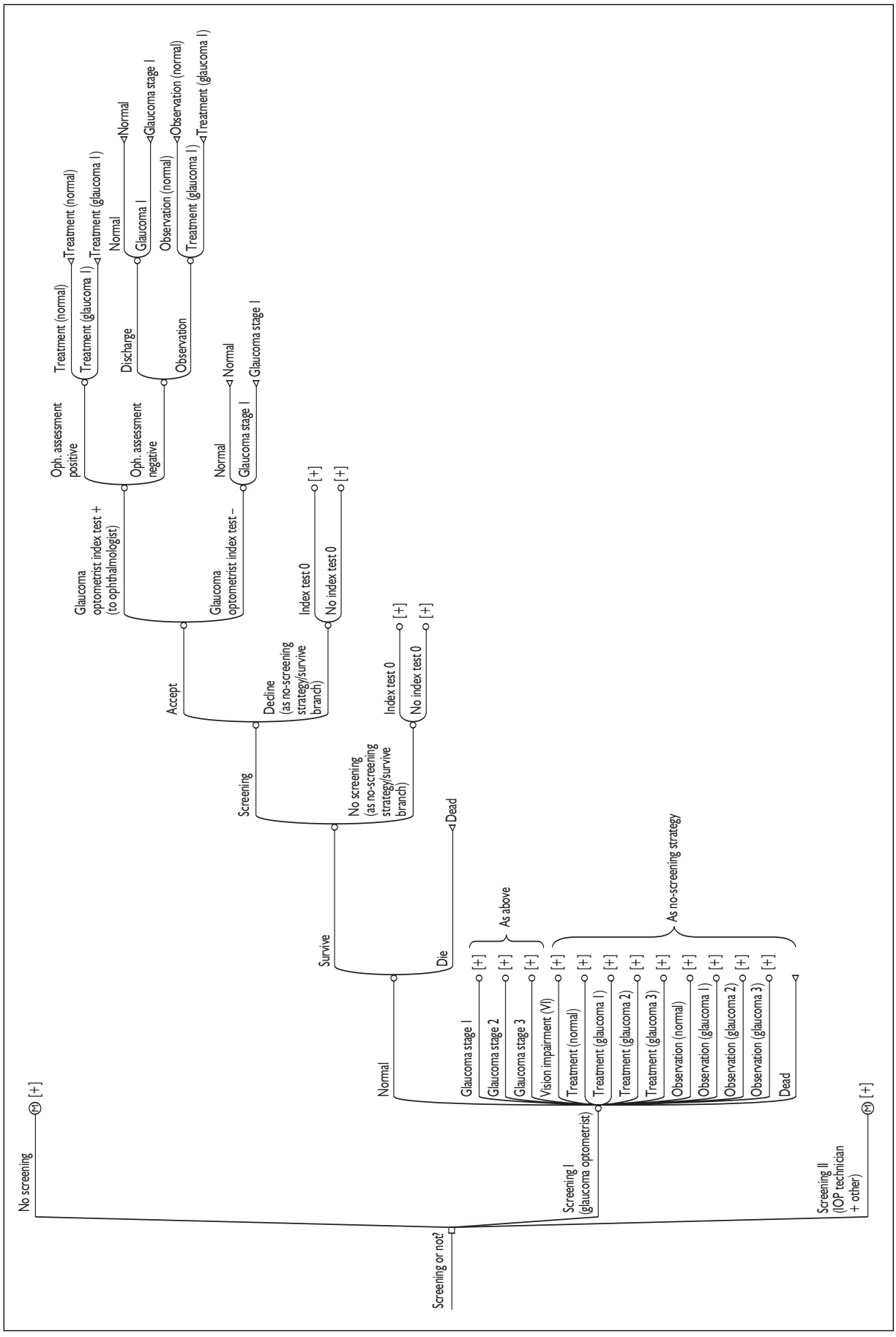

FIGURE 51 *Glaucoma model: glaucoma optometrist screening. Glaucoma 1 = mild; glaucoma 2 = moderate; glaucoma 3 = severe.*

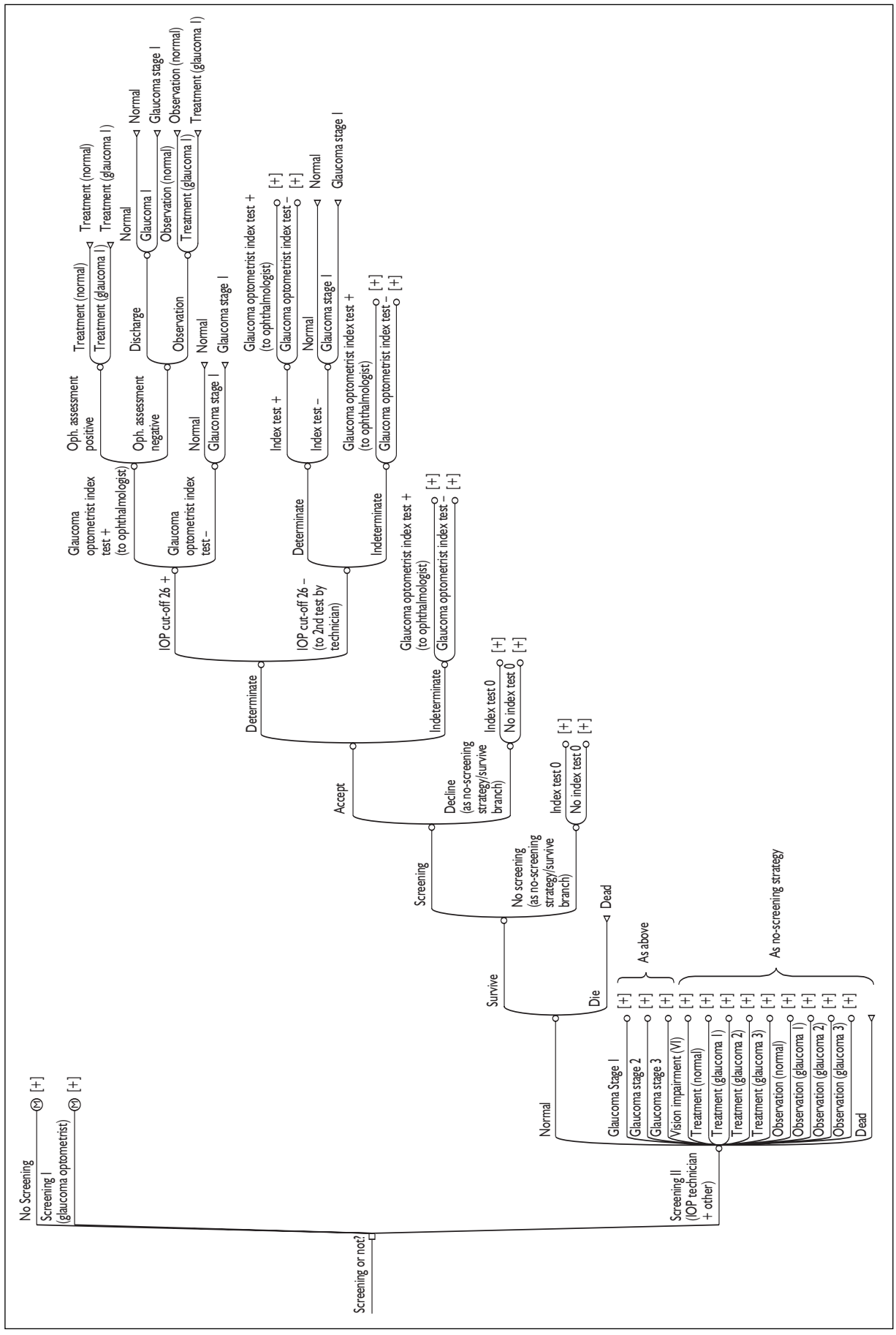

FIGURE 52 *Glaucoma model: technician IOP-based screening, IOP plus GO screening. Glaucoma 1 = mild; glaucoma 2 = moderate; glaucoma 3 = severe.*

Appendix 2

Literature search strategies

Effectiveness of glaucoma screening

MEDLINE (1966 to November week 3 2005), EMBASE (1980 to 2005 week 49) (MEDLINE In Process 6 December 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

1 exp glaucoma,open-angle/
2 glaucoma/
3 ocular hypertension/
4 intraocular pressure/
5 intraocular pressure abnormality/ use emez
6 low tension glaucoma/ use emez
7 cornea thickness/ use emez
8 glaucoma.tw.
9 poag.tw.
10 (ocular adj3 (hypertension or pressure)).tw.
11 (intraocular adj3 (hypertension or pressure)).tw.
12 corneal thickness.tw.
13 or/1-12
14 mass screening/
15 vision screening/ use mesz
16 vision test/ use emez
17 screening/ use emez
18 screen$.tw.
19 or/14-18
20 13 and 19
21 exp controlled clinical trials/ use mesz
22 exp controllled study/ use emez
23 clinical trial/ use emez
24 random allocation/ use mesz
25 randomization/ use emez
26 comparative study/
27 random$.tw.
28 compara$.tw.
29 (control adj (group? or subject? or patient?)).tw.
30 (control adj (group? or subject? or patient?)).tw.
31 or/21-30
32 20 and 31
33 animal/ not human/ use mesz
34 (animal/ or nonhuman/) not human/ use emez
35 32 not (33 or 34)
36 remove duplicates from 35

Science Citation Index (1981 to 3 December 2005)

Web of Knowledge URL: http://wok.mimas.ac.uk/

#1 TS=(glaucoma or poag)
#2 TS=(ocular SAME (pressure OR hypertension))
#3 TS=(intraocular SAME (pressure or hypertension))
#4 TS=corneal thickness
#5 #1 or #2 or #3 or #4
#6 TS=screen*
#7 #5 and #6
#8 TS=random*
#9 TS=trial*
#10 TS=compara*
#11 TS=(control* SAME (group* OR subject* or patient*))
#12 #7 and (#8 or #9 or #10 or #11)

BIOSIS (1985 to 30 November 2005))

Edina URL: http://edina.ac.uk/biosis/

((((((al: (control n1 group*) or al: (control n1 subject*) or al: (control n1 patient*)) and ()) or (al: (compara*))) or ((al: (random*) or al: (trial*)) and ())))) and (((al: (screen*)) and (((((al: (ocular n3 hypertension) or al: (intraocular n3 hypertension)) and ()) or ((al: ((ocular n3 pressure)) or al: ((intraocular n3 pressure))) and ())) or ((al: (glaucoma) or al: (poag) or al: (corneal thickness)) and ()))))))

Cochrane Library Issue 4, 2005

URL: http://www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME

#1 MeSH descriptor Glaucoma, Open-Angle explode all trees in MeSH products
#2 MeSH descriptor Glaucoma, this term only in MeSH products
#3 MeSH descriptor Ocular Hypertension, this term only in MeSH products
#4 MeSH descriptor Intraocular Pressure, this term only in MeSH products
#5 glaucoma in All Fields or poag in All Fields in all products
#6 corneal thickness in All Fields or ocular near/3 (hypertension or pressure) in All Fields in all products

#7 intraocular near/3 (hypertension or pressure) in All Fields in all products
#8 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7)
#9 MeSH descriptor Mass Screening, this term only in MeSH products
#10 MeSH descriptor Vision Screening, this term only in MeSH products
#11 screen* in All Fields in all products
#12 (#9 OR #10 OR #11)
#13 (#8 AND #12)

Accuracy and reproducibility of diagnostic tests

MEDLINE (1966 to November week 3 2005), EMBASE (1980 to 2005 week 49) (MEDLINE In Process 23 February; 6 December 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

1 exp glaucoma,open-angle/di
2 open angle glaucoma/di use emez
3 glaucoma/di
4 glaucoma/di use emez
5 ocular hypertension/di
6 intraocular hypertension/di use emez
7 or/1-6
8 exp glaucoma,open-angle/
9 glaucoma/
10 ocular hypertension/
11 Intraocular Pressure/
12 intraocular pressure abnormality/ use emez
13 low tension glaucoma/ use emez
14 cornea thickness/ use emez
15 glaucoma.tw.
16 poag.tw.
17 (ocular adj3 (hypertension or pressure)).tw.
18 (intraocular adj3 (hypertension or pressure)).tw.
19 corneal thickness.tw.
20 or/8-19
21 ophthalmoscopy/
22 scanning laser ophthalmoscopy/ use emez
23 photography/
24 eye photography/ use emez
25 exp tomography,optical/
26 tomography/
27 perimetry/
28 computer assisted perimetry/ use emez
29 tonometry,ocular/ use mesz
30 oculoplethysmography/ use emez
31 tonometry/
32 diagnostic techniques,ophthalmological/
33 ophthalmoscop$.tw.
34 (photograph$ or stereophoto$).tw.
35 planimet$.tw.
36 (stereoscop$ or monoscop$).tw.
37 (retina$ adj3 (tomograph$ or tomogram$)).tw.
38 (coherence adj3 (tomograph$ or tomogram$)).tw.
39 heidelberg.tw.
40 (hrt or oct or gdx or rnfl or rta).tw.
41 scan$ laser polarimet$.tw.
42 nerve? fib$ analy$.tw.
43 retina$ nerve fib$.tw.
44 (retina$ adj5 analy$).tw.
45 perimet$.tw.
46 frequency doubling.tw.
47 humphrey.tw.
48 (okp or sap or swap or fdt or mdp).tw.
49 tonomet$.tw.
50 goldmann.tw.
51 applanation.tw.
52 (tonopen or tono pen).tw
53 (gat or nct).tw.
54 or/21-53
55 20 and 54
56 7 or 55
57 "sensitivity and specificity"/
58 roc curve/
59 receiver operating characteristic/ use emez
60 predictive value of tests/
61 diagnostic errors/
62 reproducibility of results/
63 observer variation/
64 reliability/
65 false positive reactions/ use mesz
66 false negative reactions/ use mesz
67 diagnosis,differential/
68 diagnostic accuracy/ use emez
69 diagnostic value/ use emez
70 early diagnosis/
71 du.fs. use mesz
72 (sensitivity or specificity).ti
73 or/57-72
74 sensitivity.tw.
75 distinguish$.tw.
76 differentiate.tw.
77 identif$.tw.
78 detect$.tw.
79 diagnos$.tw.
80 accura$.tw.
81 compar$.tw.
82 or/74-81
83 di.xs. use mesz
84 82 and 83
85 82 use emez
86 73 or 84 or 85
87 (reliab$ or reproduc$).tw.
88 86 or 87
89 56 and 88

90 animal/ or nonhuman/
91 human/
92 90 not 91
93 89 not 92
94 eng.la.
95 93 and 94
96 remove duplicates from 95

Science Citation Index (1981 to 3 December 2005)

Web of Knowledge URL: http://wok.mimas.ac.uk/

#1 TS=glaucoma
#2 TS=ocular hypertension
#3 TS=intraocular hypertension
#4 TS=corneal thickness
#5 TS=POAG
#6 #1 or #2 or #3 or #4 or #5
#7 TS=ophthalmoscop*
#8 TS=(photgraph* or stereophoto*)
#9 TS=planimet*
#10 TS=(stereoscop* or monoscop*)
#11 TS=(retina* SAME (tomograph* or tomogram*))
#12 TS=(coherence SAME (tomograph* or tomogram*))
#13 TS=heidelberg
#14 TS=(hrt or oct or gdx or rnfl or rta)
#15 TS=scan* laser polarimet*
#16 TS=(nerve* fib* analy*)
#17 TS=perimet*
#18 TS=frequency doubling
#19 TS=Humphrey
#20 TS=(okp or sap or swap or fdt or mdp)
#20 TS=tonomet*
#21 TS=goldmann
#22 TS=applanation
#23 TS=(tonopen OR tono pen)
#24 TS=(gat or nct)
#25 #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24
#26 #6 AND #25
#27 TS=(sensitivity or specificity)
#28 TS= (ROC or receiver operat* characteristic)
#29 TS=diagnos*
#30 TS=(distinguish* or differentiate*)
#31 TS=accura*
#32 TS=detect*
#33 TS=identify*
#34 #27 or #28 or #29 or #30 or#31 or #32 or #33
#35 #26 and #34

BIOSIS (1985 to 30 November 2005))

Edina URL: http://edina.ac.uk/biosis/

((tn: ((humans))) and ((((((((al: (identif*) or al: (accura*)) and ()) or ((al: (distinguish*) or al: (differentiate) or al: (detect*)) and ())) or ((al: (receiver operat* characteristic) or al: (diagnos*)) and ())) or ((al: (sensitivity) or al: (specificity) or al: (roc)) and ()))) and ((((((((((((((al: (tono pen) or al: (gat) or al: (nct)) and ()) or ((al: (goldmann) or al: (applanation) or al: (tonopen)) and ())) or ((al: (fdt) or al: (mdp) or al: (tonomet*)) and ())) or ((al: (okp) or al: (sap) or al: (swap)) and ())) or ((al: (perimet*) or al: (frequency doubling) or al: (humphrey)) and ())) or ((al: (rta) or al: (scan* laser polarimat*) or al: (nerve* fib* analys*)) and ())) or ((al: (oct) or al: (gdx) or al: (rnfl)) and ())) or ((al: (coherence n3 tomograph*) or al: (coherence n3 tomogram*) or al: (hrt)) and ())) or ((al: (coherence n3 tomograph*) or al: (coherence n3 tomogram*) and al: (hrt)) and ())) or ((al: (retina* n3 tomograph*) or al: (retina* n3 tomogram*) or al: (heidelberg)) and ())) or ((al: (planimet*) or al: (stereoscop*) or al: (monoscop*)) and ())) or ((al: (ophthalmoscop*) or al: (thotograph*) or al: (stereophoto*)) and ()))) and ((((al: (corneal thickness)) and ()) or ((((al: (ocular hypertension) or al: (intraocular hypertension)) and ()) or ((al: (glaucoma) or al: (poag) or al: (corenal thicknesss)) and ()))))))))))

Cochrane Library Issue 4, 2005

URL: http://www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME

#1 MeSH descriptor Glaucoma, Open-Angle explode all trees with qualifier: DI in MeSH products
#2 MeSH descriptor Glaucoma, this term only with qualifier: DI in MeSH products
#3 (#1 OR #2)
#4 MeSH descriptor Glaucoma, Open-Angle explode all trees in MeSH products
#5 MeSH descriptor Glaucoma, this term only in MeSH products
#6 MeSH descriptor Ocular Hypertension, this term only in MeSH products
#7 MeSH descriptor Intraocular Pressure, this term only in MeSH products
#8 glaucoma in All Fields, from 1800 to 2005 in all product
#9 poag in All Fields, from 1800 to 2005 in all products
#10 ocular near (hypertension or pressure) in All Fields, from 1800 to 2005 in all products
#11 intraocular near (hypertension or pressure) in All Fields, from 1800 to 2005 in all products
#12 corneal thickness in All Fields, from 1800 to 2005 in all products

#13 (#4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12)
#14 MeSH descriptor Ophthalmoscopy, this term only in MeSH products
#15 MeSH descriptor Photography, this term only in MeSH products
#16 MeSH descriptor Tomography, Optical explode all trees in MeSH products
#17 MeSH descriptor Tomography, this term only in MeSH products
#18 MeSH descriptor Perimetry, this term only in MeSH products
#19 MeSH descriptor Tonometry, Ocular, this term only in MeSH products
#20 MeSH descriptor Diagnostic Techniques, Ophthalmological, this term only in MeSH products
#21 opthalmoscop* in All Fields or photograph* in All Fields or stereophoto* in All Fields or stereoscop* in All Fields or monoscop* in All Fields, from 1800 to 2005 in all products
#22 planimet* in All Fields or retina* near (tomograph* or tomogram*) in All Fields or coherence near (tomograph* or tomogram*) in All Fields or heidelberg in All Fields, from 1800 to 2005 in all products
#23 hrt in All Fields or oct in All Fields or gdx in All Fields or rnfl in All Fields or rta in All Fields, from 1800 to 2005 in all products
#24 scan* laser polarimet* in All Fields or nerve* fib* analy* in All Fields or retina* nerve fib* in All Fields or retina* near analy* in All Fields or perimet* in All Fields, from 1800 to 2005 in all products
#25 frequency doubling in All Fields or humphrey in All Fields or tonomet* in All Fields or goldmann in All Fields or applanation in All Fields, from 1800 to 2005 in all products
#26 okp in All Fields or sap in All Fields or swap in All Fields or fdt in All Fields or mdp in All Fields, from 1800 to 2005 in all products
#27 gat in All Fields or nct in All Fields or tonopen in All Fields or tono pen in All Fields, from 1800 to 2005 in all products
#28 (#14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22)
#29 (#23 OR #24 OR #25 OR #26 OR #27 OR #28)
#30 (#13 AND #29)
#31 (#3 OR #30)

Full-text searches

Science Direct (1998 to November 2005)

(*American Journal of Ophthalmology; Ophthalmology*)
URL: http://www.sciencedirect.com/

Glaucoma or poag (ti ab kw)
And
(Diagnos! Or sensitivity or specificity or detect!) (ft)
Glaucoma or poag (ti ab kw)
And
Ophthalmoscop! Or tomograph! Or tomogram! Or planimet! Or polarimet! Or tonomet!(ft)

High Wire Journals (1998 to November 2005)

(*British Journal of Ophthalmology; Investigative Ophthalmology and Vision*)
URL: http://highwire.stanford.edu/cgi/search

Glaucoma or poag (ti ab kw)
And
(Diagnos* Or sensitivity or specificity or detect*) (ft)
Glaucoma or poag (ti ab kw)
And
Ophthalmoscop* Or tomograph* Or tomogram* Or planimet* Or polarimet* Or tonomet*(ft)

Journal of Glaucoma (2001 to November 2005)

URL: http://www.glaucomajournal.com/

Glaucoma or poag (ti ab kw)
And
(Diagnosis or diagnostic Or sensitivity or specificity or detect or detected or detection) (ft)
Glaucoma or poag (ti ab kw)
And
Ophthalmoscope Or tomography Or tomogram Or planimetry Or polarimetry Or tonometry(ft)

Patient acceptability of glaucoma testing

MEDLINE (1966 to November week 3 2005), EMBASE (1980 to 2005 week 49) (MEDLINE In Process 23 February; 6 December 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

1 exp glaucoma,open-angle/di
2 open angle glaucoma/di
3 glaucoma/di
4 glaucoma/di use emez
5 ocular hypertension/di
6 intraocular hypertension/di use emez
7 or/1-6

8 exp glaucoma,open-angle/
9 glaucoma/
10 ocular hypertension/
11 Intraocular Pressure/
12 intraocular pressure abnormality/
13 low tension glaucoma/ use emez
14 cornea thickness/ use emez
15 glaucoma.tw.
16 poag.tw.
17 (ocular adj3 (hypertension or pressure)).tw.
18 (intraocular adj3 (hypertension or pressure)).tw.
19 corneal thickness.tw.
20 or/8-19
21 ophthalmoscopy/
22 scanning laser ophthalmoscopy/ use emez
23 photography/
24 eye photography/ use emez
25 exp tomography,optical/ (
26 tomography/
27 perimetry/
28 computer assisted perimetry/ use emez
29 tonometry,ocular/ use mesz
30 oculoplethysmography/ use emez
31 tonometry/
32 diagnostic techniques,ophthalmological/
33 ophthalmoscop$.tw.
34 (photograph$ or stereophoto$).tw.
35 planimet$.tw.
36 (stereoscop$ or monoscop$).tw.
37 (retina$ adj3 (tomograph$ or tomogram$)).tw.
38 (coherence adj3 (tomograph$ or tomogram$)).tw.
39 heidelberg.tw.
40 (hrt or oct or gdx or rnfl or rta).tw.
41 scan$ laser polarimet$.tw.
42 nerve? fib$ analy$.tw.
43 retina$ nerve fib$.tw.
44 (retina$ adj5 analy$).tw.
45 perimet$.tw.
46 frequency doubling.tw.
47 humphrey.tw.
48 (okp or sap or swap or fdt or mdp).tw.
49 tonomet$.tw.
50 goldmann.tw.
51 applanation.tw.
52 (tonopen or tono pen).tw.
53 (gat or nct).tw.
54 or/21-53
55 20 and 54
56 7 or 55
102 exp patient acceptance of health care/ use mesz
103 consumer satisfaction/ use mesz
104 patient dropouts/ use mesz
105 exp patient attitude/ use emez
106 ((patient$ or consumer$) adj3 (satisfaction or attitude? or perception? or preference?)).tw.
107 ((patient$ or consumer$) adj3 (compliance or participat$ or acceptab$ or refus$)).tw.
108 or/102-107
109 56 and 108
110 remove duplicates from 109
111 110 and eng.la.

PsycINFO (1967 to June week 3 2005)

Ovid URL: http://gateway.ovid.com/athens

1 glaucoma/
2 glaucoma.tw.
3 (ocular adj3 (hypertension or pressure)).tw.
4 (intraocular adj3 (hypertension or pressure)).tw.
5 or/1-4
6 diagnosis/
7 screening/
8 screening tests/
9 health screening/
10 (ophthalmoscop$ or tomograph$ or tomogram$ or photograph$ or stereophotograph$).tw.
11 (planimet$ or polarimet$ or perimet$ or tomomet$).tw.
12 (heidelberg or goldmann or applanation or tonopen or tono pen).tw.
13 (frequency doubling or humphrey).tw.
14 (retina$ adj5 analy$).tw.
15 (hrt or oct or gdx or rnfl or rta or gat or nct).tw.
16 (okp or sap or swap or fdt or mdp).tw.
17 or/6-16
18 5 and 17
19 english.lg.
20 18 and 19

Social Science Citation Index (1981 to 27 June 2005)

Web of Knowledge URL: http://wok.mimas.ac.uk/

#1 TS=glaucoma
#2 TS=poag
#3 TS=intraocular hypertension
#4 TS=ocular hypertension
#5 #1 or #2 or #3 or #4
#6 TS=ophthalmoscop*
#7 TS=(okp or sap or swap or fdt or mdp or gat or nct)
#8 TS=(hrt or oct or gdx or rnfl or rta)
#9 TS=frequency doubling
#10 TS=(heidelberg or goldmann or humphrey or applanation)
#11 TS=(tonomet* or tonopen ot tono pen)
#12 TS=(polarimet* or perimet*)

#10 TS=(tomogram* or tomograph*)
#13 TS=planimet*
#14 TS=photograph*
#15 #6 or #7 OR #8 OR #10 OR #11 OR #12 OR #13 OR #14
#16 #5 AND #15
#17 TS=screen*
#18 #5 AND #17
#19 #16 OR #18

Applied Social Science Index and Abstracts (28 June 2005)

CSA URL: http://www.csa1.co.uk/

DE=glaucoma or glaucoma

Effectiveness of glaucoma treatment

MEDLINE (2004 to October week 1 2005), EMBASE (2004 to 2005 week 42) (MEDLINE In Process 18 October 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

#1 Glaucoma, Open-Angle/dt, pc, su, th
#2 glaucoma/pc, dt, su, th
#3 ocular hypertension/pc, dt, su, th
#4 (glaucoma$ or ocular hypertensi$).tw.
#5 or/1-4
#6 randomized controlled trial.pt.
#7 randomization/ use emez
#8 random$.tw.
#9 or/6-8
#10 5 and 9
#11 limit 10 to yr="2004 - 2005"
#12 remove duplicates from 11

Cochrane Library Issue 4, 2005

URL: http://www3.interscience.wiley.com/cgi-bin/mrwhome/106568753/HOME

#1 MeSH descriptor Glaucoma, Open-Angle, this term only with qualifiers: DT,PC,SU,TH in MeSH products
#2 MeSH descriptor Glaucoma this term only with qualifiers: PC,DT,SU,TH in MeSH products
#3 MeSH descriptor Ocular Hypertension, this term only with qualifiers: PC,DT,SU,TH in MeSH products
#4 glaucoma* in All Fields or ocular hypertens* in All Fields in CENTRAL
#5 (#1 OR #2 OR #3 OR #4), from 2004 to 2005

Epidemiology, risk and progression

MEDLINE (1966 to November week 3 2005), EMBASE (1980 to 2005 week 49) (MEDLINE In Process 6 December 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

1 exp glaucoma,open-angle/ep use mesz
2 open angle glaucoma/ep use emez
3 exp glaucoma,open-angle/
4 glaucoma/
5 low tension glaucoma/ use emez
6 (glaucoma or poag).tw.
7 or/3-6
8 prevalence/
9 incidence/
10 epidemiology/
11 prevalence studies/
12 longitudinal studies/ (
13 ((incidence or prevalence or epidemiol$) adj3 (glaucom$ or poag or vision or visual or blind$)).tw.
14 or/8-13
15 1 or 2 or (7 and 14)
16 age factors/
17 aged/
18 middle age/ use mesz
19 elderly.tw.
20 exp population groups/ use mesz
21 exp race/ use emez
22 (race or racial).tw.
23 ethnic$.tw.
24 familial incidence/ use emez
25 family history.tw.
26 (inherited or familial).tw.
27 myopia/
28 (myopia or myopic).tw.
29 ((short or near) adj2 sight$).tw.
30 (shortsight$ or nearsight$).tw.
31 exp Diabetes Mellitus, Type 2/
32 diabetes.tw.
33 ocular hypertension/
34 intraocular pressure/
35 intraocular pressure abnormality/ use emez
36 (ocular adj3 (hypertension or pressure)).tw.
37 (intraocular adj3 (hypertension or pressure)).tw.
38 iop.tw.
39 or/16-38
40 7 and 39
41 exp risk/
42 causality/
43 precipitating factors/
44 prognosis/
45 prediction/ use emez

46 (risk adj3 (stratif$ or assess$ or factor?)).tw.
47 (risk adj1 relative).tw.
48 (predict$ or prognosis or prognostic).tw.
49 or/41-48
50 40 and 49
51 baltimore eye survey.tw.
52 barbados eye study.tw
53 beaver dam eye.tw.
54 53 and glaucoma.tw.
55 blue mountains eye study.tw.
56 55 and glaucoma.tw.
57 konga.tw.
58 proyecto ver.tw.
59 rotterdam study.tw.
60 59 and glaucoma.tw.
61 visual impairment project.tw.
62 early manifest glaucoma trial.tw.
63 long island glaucoma.tw.
64 reykjavic eye.tw.
65 los angeles latino eye.tw.
66 advanced glaucoma intervention.tw.
67 african caribbean eye.tw.
68 bergen glaucoma.tw.
69 melbourne visual impairment.tw.
70 tajimi.tw.
71 egna neumarkt glaucoma.tw.
72 or/51-52,54,56-58,60-71
73 15 or 50 or 72
74 animal/ or nonhuman/
75 human/
76 74 not 75
77 73 not 76
78 77 and eng.la.
79 remove duplicates from 78

Science Citation Index (1981 to 3 December 2005)

Web of Knowledge URL: http://wok.mimas.ac.uk/

#1 TS=(glaucoma SAME incidence)
#2 TS=(glaucoma SAME prevalence)
#3 TS=(glaucoma SAME epidemiol*)
#4 TS=(POAG SAME (incidence OR prevalence OR epidemiol*))
#5 TS=(glaucoma SAME risk)
#6 TS=(glaucoma SAME predict*)
#7 TS=(glaucoma SAME prognosis)
#8 TS=(glaucoma SAME prognostic)
#9 TS=(ocular hypertension SAME (predict* OR prognosis OR prognostic))
#10 TS=(ocular pressure SAME (predict* OR prognosis OR prognostic))
#11 TS=(intraocular hypertension SAME (predict* OR prognosis OR prognostic))
#12 TS=(intraocular pressure SAME (predict* OR prognosis OR prognostic))
#13 TS=(iop SAME (predict* OR prognosis OR prognostic))
#14 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 OR #10 OR #11 OR #12 or #13
#14 TS=Baltimore eye survey
#15 TS=Barbados eye study
#16 Ts= ((beaver dam study) AND glaucoma)
#17 TS=((blue mountains eye) AND glaucoma)
#18 TS=((Rotterdam study) AND glaucoma)
#19 TS=konga OR proyecto ver OR tajimi
#20 TS= visual impairment project
#21 TS=early manifest glaucoma trial
#22 TS=long island glaucoma
#23 TS=reykjavic eye
#24 TS=los angeles latino eye
#25 TS= advanced glaucoma intervention
#26 TS=African Caribbean eye
#27 TS= Bergen glaucoma
#28 TS=Melbourne visual impairment
#29 TS= egna neumatkt glaucoma
#30 #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29
#31 #13 or #30

BIOSIS (1985 to 30 November 2005))

Edina URL: http://edina.ac.uk/biosis/

((((((((((al: (bergen glaucoma)) or al: (melbourne visual impairment)) or al: (egna neumatkt glaucoma) and dt= "Article" and la= "English") or (((al: (los angeles latino eye)) or al: (advanced glaucoma intervention)) or al: (african caribbean eye) and dt= "Article" and la= "English")) or (((al: (early manifest glaucoma trial)) or al: (long island glaucoma)) or al: (reykjavic eye) and dt= "Article" and la= "English")) or (((al: (konga)) or al: (proyecto)) or al: (tajimi) and dt= "Article" and la= "English")) or ((al: (rotterdam study)) and al: (glaucoma) and dt= "Article" and la= "English")) or ((al: (blue mountains eye)) and al: (glaucoma) and dt= "Article" and la= "English")) or ((al: (beaver dam study)) and al: (glaucoma) and dt= "Article" and la= "English")) or (((al: (baltimore eye survey)) or al: (barbados eye study)) or al: (visual impairment project) and dt= "Article" and la= "English")) or (((((((al: (intraocular pressure n3 predict*)) or al: (intraocular pressure n3 prognos*) and dt= "Article" and la= "English") or ((al: (intraocular hypertension n3 predict*)) or al: (intraocular hypertension n3 prognos*) and dt= "Article" and la= "English")) or ((al: (ocular pressure n3 predict*)) or al: (ocular pressure n3 prognos*) and dt= "Article" and la= "English")) or ((al: (ocular hypertension n3 predict*)) or al: (ocular hypertension n3 prognos*) and dt=

"Article" and la= "English")) or ((al: (iop n3 predict*)) or al: (iop n3 prognos*) and dt= "Article" and la= "English")) or (((((al: (glaucoma n3 risk)) or al: (glaucoma n3 predict*)) or al: (glaucoma n3 prognos*) and dt= "Article" and la= "English") or (((al: (glaucoma n3 incidence)) or al: (glaucoma n3 prevalence)) or al: (glaucoma n3 epidemiol*) and dt= "Article" and la= "English")) or (((al: (poag n3 incidence)) or al: (poag n3 prevalence)) or al: (poag n3 epidemiol*)and dt= "Article" and la= "English")))

Economic evaluation of screening

MEDLINE (1966 to November week 3 2005), EMBASE (1980 to 2005 week 49) (MEDLINE In Process 6 December 2005)

Ovid Multifile Search URL:
http://gateway.ovid.com/athens

1 exp glaucoma, open-angle/di
2 glaucoma/di
3 or/1-2 (
4 exp glaucoma, open-angle/
5 glaucoma/
6 ocular hypertension/
7 intraocular pressure/
8 low tension glaucoma/ use emez
9 cornea thickness/ use emez
10 (glaucoma adj3 open-angle).tw.
11 (glaucoma adj3 low tension).tw.
12 (glaucoma adj3 normal tension).tw.
13 (glaucoma adj3 low pressure).tw.
14 (glaucoma adj3 normal pressure).tw.
15 (glaucoma adj3 (pigmentary or pseudoexfoliation)).tw.
16 poag.tw.
17 (ocular adj3 (hypertension or pressure)).tw.
18 (intraocular adj3 (hypertension or pressure)).tw.
19 corneal thickness.tw.
20 or/4-19
21 mass screening/
22 vision screening/
23 (screen or screening).tw.
24 exp diagnosis/
25 (di or us or ra or ri).fs.
26 or/21-25
27 20 and 26
28 ophthalmoscopy/
29 scanning laser ophthalmoscopy/ use emez
30 tomography,optical coherence/
31 tomography/
32 tonometry,ocular/
33 tonometry/
34 oculoplethysmography/ use emez
35 perimetry/
36 gonioscopy/
37 pachometry/ use emez
38 mass screening/
39 vision screening/
40 ophthalmoscop$.tw.
41 tomograph$.tw.
42 heidelberg.tw.
43 GDx.tw.
44 biomicroscop$.tw.
45 polarimet$.tw.
46 (retina$ adj5 analy$).tw.
47 (stereo$ adj3 photo$).tw.
48 (slp or oct or hrt$).tw.
49 tonomet$.tw.
50 perimet$.tw.
51 humphrey.tw.
52 goldmann.tw.
53 (sap or fdt or swap or okd).tw.
54 (pachymet$ or pachomet$).tw.
55 gonioscop$.tw.
56 or/28-55
57 20 and 56
58 exp "costs and cost analysis"/ use mesz
59 economics/
60 exp economics,hospital/ use mesz
61 exp economics,medical/ use mesz
62 exp budgets/
63 exp economic evaluation/ use emez
64 exp models, economic/ use mesz
65 exp decision theory/
66 ec.fs. use mesz
67 monte carlo method/
68 markov chains/ use mesz
69 quality of life/
70 quality adjusted life year/
71 "Value of Life"/ use mesz
72 health status indicators/ use mesz
73 cost$.ti.
74 (cost$ adj2 (effective$ or utilit$ or benefit$ or minimis$)).ab.
75 economic$.tw.
76 (price$ or pricing$).tw.
77 (financial or finance or finances or financed).tw.
78 (value adj2 (money or monetary)).tw.
79 (quality adj1 life).tw.
80 quality adjusted life.tw.
81 disability adjusted life.tw.
82 (qaly? or qald? or qale? or qtime? or daly?).tw.
83 (euroqol or euro qol or eq5d or eq 5d).tw.
84 (hql or hqol or h qol or hrqol or hr qol).tw.
85 (hye or hyes).tw.
86 health$ year$ equivalent$.tw.
87 (hui or hui1 or hui2 or hui3).tw.
88 (health utilit$ or disutili$).tw.

89 willingness to pay.tw.
90 standard gamble.tw.
91 factor analy$.tw.
92 markov$.tw.
93 monte carlo.tw.
94 (decision$ adj2 (tree? or analy$ or model$)).tw.
95 or/58-93
96 3 or 27 or 57
97 95 and 96
98 remove duplicates from 97

Science Citation Index (1981 to 3 December 2005)

Web of Knowledge URL: http://wok.mimas.ac.uk/

#1 TS=glaucoma
#2 TS=poag
#3 TS=(ocular SAME (pressure OR hypertension)
#4 TS=(intraocular SAME (pressure OR hypertension)
#5 TS=corneal thickness
#6 #1 OR #2 OR #3 OR #4 OR #5
#7 TS=(screen OR screening)
#8 #6 AND #7
#9 TS=(ophthalmoscop* OR biomicroscop*)
#10 TS=tomograph
#11 TS=(Heidelberg OR Humphrey OR Goldmann)
#12 TS=(polarimet* OR tonomet* OR perimet*)
#13 TS=(pachymet OR pachomet* OR gonioscop*)
#14 TS=(gdx OR slp OR oct OR hrt OR sap OR fdt OR swap OR okd)
#15 TS=(retina* SAME analy*)
#16 TS=(stereo* SAME photo*)
#17 #9 OR #10 OR #11 OR #12 OR #13 OR #14 OR #15 OR #16
#18 #6 AND #17
#19 #8 OR #18
#20 TI=cost*
#21 TS=(cost * SAME (effective* OR utility* OR benefit* OR minimis*))
#22 TS=economic*
#23 TS=(price OR pricing)
#24 TS=(financial OR finance OR finances OR financed)
#25 TS=(value SAME (money OR monetary))
#26 TS=quality of life
#27 TS=quality adjusted life
#28 TS=disability adjusted life
#29 TS= (qaly* OR qald* OR qale* OR qtime* OR daly)
#30 TS=(euroqol* OR euro qol* OR eq5d OR eq 5d)
#31 TS=(hql OR hqol OR h qol OR hrqol OR hr qol)
#32 TS=health* year* equivalent*
#33 TS=(hye OR hyes OR hui OR hui1 OR hui2 OR hui3)
#34 TS=(health utilit* OR disutilit*)
#35 TS=willingness to pay
#36 TS=standard gamble
#37 TS=markov OR monte carlo)
#38 TS=(decision SAME (tree* OR analy* OR model*))
#39 #20 OR #21 OR #22 OR #23 OR #24 OR #25 OR #26 OR #27 OR #28 OR #29 OR #30 OR #31 OR #32 OR #33 OR #34 OR #35 OR #36 OR #37 OR #38
#40 #19 AND #39

NHS Economic Evaluation Database (November 2005)

NHS Centre for Reviews and Dissemination
URL:http://nhscrd.york.ac.uk/welcome.htm

Glaucoma (subject headings exploded) or glaucoma (all fields)

General searches

Health Management Information Consortium (November 2005)

Ovid URL: http://gateway.ovid.com/

glaucoma/ or glaucoma.tw

DARE and HTA Databases (November 2005)

NHS Centre for Reviews and Dissemination
URL:http://nhscrd.york.ac.uk/welcome.htm

Glaucoma (subject headings exploded) or glaucoma (all fields)

Clinical Trials (March 2005)

URL: http://clinicaltrials.gov/ct/gui/c/r

Current Controlled Trials (March 2005)

URL: http://www.controlled-trials.com/

glaucoma

National Research Register (Issue 3, 2005)

URL: http://www.update-software.com/National/

#1 GLAUCOMA, OPEN-ANGLE explode all trees (MeSH)
#2 GLAUCOMA single term (MeSH)
#3 OCULAR HYPERTENSION single term (MeSH)

#4 INTRAOCULAR PRESSURE single term (MeSH)
#5 glaucoma
#6 poag
#7 ocular near (hypertension or pressure)
#8 intraocular near (hypertension or pressure)
#9 corneal thickness
#10 #1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9

Websites consulted

Agency for Healthcare Research and Quality
URL: http://www.ahrq.gov/ (accessed January 2006)

American Academy of Ophthalmology
URL: http://www.aao.org/ (accessed January 2006)

American Glaucoma Society
URL: http://www.glaucomaweb.org/ (accessed January 2006)

Association of International Glaucoma Societies
URL: http://www.globalaigs.org/ (accessed January 2006)

Association of Optometrists
URL: http://www.assoc-optometrists.org/ (accessed January 2006)

Glaucoma DOAS Project, UK NHS Connecting for Health programme
URL: http://www.doasglaucoma.org/index.htm (accessed January 2006)

National Eye Institute
URL: http://www.nei.nih.gov/ (accessed January 2006)

Royal National Institute for the Blind
URL: http://www.rnib.org.uk/xpedio/groups/public/documents/code/InternetHome.hcsp (accessed January 2006)

UK National Screening Committee
URL: http://www.nsc.nhs.uk/ (accessed January 2006)

UK Department of Health
URL: http://www.dh.gov.uk/Home/fs/en (accessed January 2006)

UK Department of Transport
URL: http://www.dft.gov.uk/stellent/groups/dft_control/documents/homepage/dft_home_page.hcsp (accessed January 2006)

US Preventative Services Taskforce
URL: http://www.ahrq.gov/clinic/prevenix.htm#uspstf (accessed January 2006)

US Department of Veterans Affairs
URL: http://www.va.gov/ (accessed January 2006)

Appendix 3

Data extraction form: epidemiology review of open angle glaucoma

Systematic Review to determine the risk factors for screen-detected open angle glaucoma

Reviewer ID: ☐

Study		
Study ID:	**Country:**	**Systematic review** ☐
Study name:		**Cross-sectional** ☐
Other papers this study may link: _____		**Cohort study** ☐
_____		**Unclear** ☐

Participants	
Recruitment dates: _____	**Number accepted screening:** _____
Number of eligible participants: (Number approached if screening study)	**Number of included participants:** _____
Method of recruitment:	

Eligibility Criteria:

Diagnostic Criteria for Glaucoma

Prevalence/Incidence	
No of OAG cases detected **Possible** **Probable** **Definite** ——————————— **Mild** **Moderate** **Severe** **Blind** (specify diagnostic criteria, e.g. DB loss, extent of visual field loss or WHO classification criteria)	
No of OAG cases with previously unknown diagnosis	
Time to OAG diagnosis according to IOP level (*by severity if possible*)	
Relative Risk of OAG (*by severity if possible*) **Age** **Myopia** **Race** **Diabetes** **Family history** **IOP**	

Incidence (*by severity if possible*)	
Other e.g. UK prevalence of risk factors	
Comments **Additional information/Other comments:**	

Risk factors (*by severity if possible*)				
	Glaucoma	**No Glaucoma**	**Overall**	**Percentage 95% CI ***
Age (years)				
IOP (mmHg)				
Myopia **Mild/Moderate ⩽6 D** **High > 6**				
Race **White** **Black** **Other**				
Diabetes **Type I** **Type II**				

Participant Characteristics (*by severity if possible*)				
	Glaucoma	**No Glaucoma**	**Overall**	**Percentage 95% CI ***
Family history				
Follow-up period _____ **Number lost to follow-up** _____				
Additional information/Other comments:				

* % as reported in the study (do not work out if not reported)

Date ..... / ..... / ..... Signature .....

Appendix 4

Included studies: epidemiology review of open angle glaucoma

Baltimore Eye Survey

Primary reference

Tielsch JM, Sommer A, Katz J, Royall RM, Quigley HA, Javitt J. Racial variations in the prevalence of primary open angle glaucoma. The Baltimore Eye Survey. *JAMA* 1991;**266**:369–74.

Secondary references

Rahmani B, Tielsch JM, Katz J, Gottsch J, Quigley H, Javitt J, *et al*. The cause-specific prevalence of visual impairment in an urban population. The Baltimore Eye Survey. *Ophthalmology* 1996;**103**:1721–6.

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Appendix 6

Characteristics of included studies: epidemiology review of open angle glaucoma

TABLE 69 *Studies included in the epidemiology review of OAG*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Anton, 2004[99] Segovia Study Country: Spain	Randomly selected in a stratified manner according to gender and age group from the door-to-door census in Segovia (A)		510 (89.6%)	11	10/10 (100%)	Any eye that had an open angle, GON and glaucomatous visual field in the absence of any identifiable cause of IOP elevation or optic nerve damage (A) *Additional information:* *Visual fields* Suprathreshold 76-point Humphrey fields, abnormal on two contiguous locations, went to a Humphrey full-threshold fields. A GVFD was defined as CPSD outside the 95% normal limits and/or a GHT outside the 99% normal limits *Optic disc* Stereophotographs with Topcon TRL 50X fundus camera. GON was defined as one or more of CDR $\geq$ 0.9, cup disc asymmetry $\geq$0.3, rim thinning, disc haemorrhage or a nerve fibre layer defect. Two independent observers evaluated the optic disc photographs and visual fields; an arbiter was consulted in cases of disagreement	*IOP* One tonometry reading was performed but was repeated if it was judged to be unreliable or if IOP > 21 mmHg (A) *Family history* Family histories of glaucoma were recorded using a detailed questionnaire during an interview with each person (the questionnaire included questions on diabetes, ocular hypertension and general (B)
Bankes, 1968[64,308] Bedford Glaucoma Survey Country: UK	After a preliminary publicity campaign, cards requesting an appointment for the tests were distributed to people over the age of 40 (B)	Seven excluded because they had known glaucoma	NR	78 (death, removal from district, and preference for consulting own ophthalmologist)	Unsure on which type of glaucoma	A screen positive was one of (a) IOP $\geq$ 21, (b) difference of IOP of 5 mmHg between eyes, (c) suspicious discs, (d) history suggestive of angle closure or (e) family history of glaucoma *OAG diagnosis:* an ocular tension of $\geq$21 mmHg by applanation tonometry on two or more occasions, glaucomatous cupping of the disc, and visual field defects typical of glaucoma, and with no evidence of angle closure *Low-tension glaucoma:* as for OAG, except IOP persistently <21 mmHg by applanation tonometry (A) *Additional information:* (1) Only screen positives went on to full diagnostic examination (verification bias) (2) Low-tension glaucoma and chronic simple glaucoma were joined together for analysis purposes (3) Visual field was measured with the Globuck semi-automatic field recorder	*IOP* Applanation tonometry (three readings on each eye) (A)

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	Risk factor
Bengtsson, 1980[100,309,310] Dalby Population Survey Country: Sweden	Entire population listed in the Dalby Community Care centre in December 1976 (A)	One (blind); 24 (subjected to antiglaucomatous therapy)	1511 (78%)	NR	15/39 (38%) Denominator is unclear	Optic disc abnormalities (haemorrhages, large cups, rim notching, vertically oval cups) were noted by ophthalmoscopy plus associated GVFD. A GVFD was defined as a repeatable visual field defect consistent with glaucoma but not explained on other grounds Diagnosis was either OAG or angle closure glaucoma (B)	
Bonomi, 2001[20,106,311] Egna–Neumarkt Glaucoma Study Country: Italy	Entire population over 40 from the register office (A)	NR	4296 (74%)	NR	94/121 (77.6%)	At least two of the following: IOP $\geqslant$ 22 mmHg; glaucomatous optic disc abnormalities; glaucomatous visual field abnormalities; open and normal chamber angle. In this category subjects with capsular pseudoexfoliative glaucoma were also included. Normal tension glaucoma: glaucomatous optic disc abnormalities with IOP < 22 mmHg confirmed at the second and third examinations, and open chamber angle (A) *Additional information:* (1) Screening examination included IOP, suprathreshold fields and optic disc evaluation by direct ophthalmoscopy (2) Low-pressure and high-pressure glaucoma were joined together for analysis purposes *Visual field* Suprathreshold perimetry, Humphrey threshold-related three-zone strategy, three or more contiguously missed points indicated a VFD. VFDs were verified by full threshold automated or Goldmann perimetry. A GVFD required agreement between two perimetry experts *Optic disc* Dilated direct ophthalmoscopy. A CDR of $\geqslant$0.7, or difference of $\geqslant$0.2 between two eyes, rim notching or haemorrhage was considered glaucomatous	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Cedrone, 1996[107] Country: Italy	Total population over 40 identified by a house-to-house census in Ponza (A)	70 (mobility handicaps and did not complete examination)	1034 (84.3%)	NR	24/26 (92.3%)	Typical GVFD or a localised sensitivity decrease ⩾6 dB in at least one location of the central 10°, two locations of the central 20° or three locations of the central 30° and at least one of the following: IOP > 20 mmHg; CDR ⩾ 0.5 or difference in CDR 0.2 (A) *Additional information:* A full-field 120 screening test of the Humphrey field analyser and a central 30-2 full threshold test were performed. Defective locations were retested at the end of each examination by means of custom grid Only suspects were referred for definitive diagnosis, but 55% of non-suspect cases were referred for full diagnostic testing to verify screening standard	*IOP* Average of three consecutive readings by applanation tonometry (A)
Coffey, 1993[108] Country: Ireland	Random sample from the electoral register (A)	Nine were unable to perform a visual field test because of poor acuity in one or both eyes	2186 (99.5%)	NR	12/36 (33.3%)	CDR > 0.5; IOP > 21 mmHg or <21 mmHg; and when at least two quadrants were involved and the typical arcuate shape was observed (A) *Additional information:* Only suspects (55.8% of the sample) had visual fields tested. Central visual field analysis using the Henson CFS 2000 semi-automated perimeter was performed on both eyes of initially one in ten and subsequently all suspects using the 132-point test	*IOP* Applanation tonometry by Goldmann tonometer or Perkins Mk2 handheld applanation tonometry (A)
Cooper, 1986[101] Country: Australia	Unclear; aged over 40 or anyone who reported a family history of glaucoma (B)	NR	NR	NR	NR	*Suspects:* CDR > 0.5 in either eye or asymmetry of >0.2 between the two eyes, the less cupped disc being ⩾0.4. The final diagnosis of the glaucomas given by the ophthalmologists was based on their own criteria and may not fulfil all the requirements for a true diagnosis in each case (B)	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Dielemans, 1996[70,71,105,124,135,312–314] Rotterdam Study Country: The Netherlands	Randomly selection from the register office, but invitations to participate were sent according to their postcode (A)	NR	3062 (72%)	For two patients who had dementia, a reliable Goldmann visual field could not be made	18/34 (52.9%)	Presence of GVFD on glaucoma perimetry combined with either a VCDR ⩾ 0.5 or a difference in VCDR of ⩾0.2, or an IOP > 21 mmHg with open or normal chamber angles (A) *Additional information:* Screening examination: 24-2 threshold fields, direct ophthalmoscopy. Confirmatory diagnosis on abnormal or unreliable 24-2 by Goldmann perimetry *Visual field* The 24-2 test points of the Humphrey perimeter were tested as a suprathreshold test in all people. Three or more contiguously missed points on the screening test were taken as an indication of a visual field defect	*IOP* IOP was measured with GAT and the median three consecutive measurements were taken (A) *Family history* First-degree relatives of patients (glaucoma) and controls (no glaucoma) were invited for testing (A) *Diabetes* Newly diagnosed diabetes mellitus was considered to be present if the random serum glucose level or the serum glucose level 2 hours after a non-fasting glucose load (75 g) was >11.0 mmol l^{-1} (A) *Race* 98% of participants were white *Age* 72.3 (6.5 years), mean age (SD) of people with definite OAG

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	Risk factor
Ekstrom, 1996[109,171] Tierp Glaucoma Survey Country: Sweden	Participants were invited by letter from two lists of eligible residents aged between 65 and 74 (A)	23 (death or moved out of the area); three (patients undergoing OAG treatment but did not meet diagnostic criteria)	760 (90.7%)	NR	25/45 (55.5%)	Chronic simple glaucoma and capsular glaucoma were defined as OAG, i.e. no signs of angle closure or secondary glaucoma. A glaucomatous optic disc was decided if there was (a) notching or rim pallor, (b) saucerisation, or (c) asymmetry between eyes. A reproducible VFD consistent with glaucoma and not explained on other grounds with automated perimetry (Competer) using the screening programme or the threshold programme NTG was defined as a variety of OAG having no more than one reading ⩾21 and none >24 mmHg. For analysis OAG is grouped with NTG (A) *Additional information:* Screening examination: IOP, slit-lamp biomicroscopy, and goniscopy and Competer fields. Positives went on for follow-up and definitive diagnosis as prospective cohort study *Visual fields* A VFD was defined as the occurrence in two consecutive examinations of one or more abnormal test points outside the blind spot, an abnormal point being ⩾12 dB relative to the threshold value	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Ellis, 2000[102] Country: UK	Total population over 40 registered with a GP in the Tayside region (A)	2436 (prevalent glaucoma or treated OHT)	NR	NR	NR	Cases were identified from the Medicines monitoring database in Tayside (MEMO). A database definition for glaucoma or treated OHT was used in which a case was defined as any patient within the diabetic and non-diabetic cohorts who had either (1) an operation or laser procedure intended to reduce IOP in a Tayside hospital, or (2) encashed prescriptions for pressure-lowering medication before or during the study period *Case-note review* Significant disc cupping with matching field defect (at least arcuate or nasal step) in the worse eye regardless of presenting pressure taken from case records; photographs were not available (B)	*Diabetes* Ascertainment of diabetes was achieved using the Diabetes Audit Research in Tayside Study (DARTS) DARTS: multiple source electronic capture techniques are used to record information relating to diabetes from eight independent data sources (e.g. hospital admissions, regional biochemistry database, community prescriptions, primary care data). Case-note review has demonstrated DARTS to have sensitivity and positive predictive value of 96% and 95%, respectively, for the diagnosis of diabetes (A)

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Gibson, 1985[103] Country: UK	Random sample of people over 75 from 12-doctor general practice (A)	NR	484 (71.5%)	NR	10/32 (31%)	Suspects were referred for full ophthalmic examination if all of (a) suspect glaucomatous change on ophthalmoscopy, (b) IOP > 21 mmHg, (c) open angles were identified by the screening examination. OAG diagnosis: All of the following: (a) Glaucomatous cupping of the optic disc, defined as CDR ⩾ 0.5 or the presence of notching of the neural rim, or asymmetry of the optic discs (b) IOP by applanation tonometry >21 mmHg. Included in this group are those subjects whose IOP were known to have been in this range at hospital visits (c) An open anterior chamber angle as judged by the method of Herick and Schaffer[a] (d) If the above criteria were met, a repeat ophthalmic examination including Goldmann perimetry was performed. Glaucomatous field defects were considered as baring of the blind spot, arcuate scotoma, paracentral scotoma, nasal step and advanced field loss A diagnosis of low-tension glaucoma was made if (b) was not present (B)	

[a] van Herick W, Shaffer RN. *Am J Opthalmol* 1969;**68**:626–9.

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Grodum, 2002[26,28,128,315,316] Malmo Eye Survey	All population between 1918 and 1939 were offered a free eye examination, except for people who had been seen by the eye department a year earlier (therefore excluded) (A)	30 excluded from the IOP analysis	32,918 (77%)	NR	402/32,918 (1.2%)	Positive screen if one or more of the following: IOP > 25 mmHg; VCDR, localised narrowing of the optic disc rim; or localised nerve fibre layer defects or family history of glaucoma in at least one first-degree relative. Glaucoma suspects underwent full threshold (Humphrey) visual field testing. Glaucoma diagnosis based on repeatable VFD comparable with glaucoma and not explained by other causes (A) *Additional information:* Some verification bias in that only screen positives had full diagnostic assessment *Visual fields* Visual field test results were classified with the GHT. Patients with GHT results outside normal limits or borderline were re-examined whenever possible at a second visit 1 or 2 weeks later *Optic disc* At screening one single picture after pupil dilation using the non-mydriatic camera; photographs were evaluated by a single examiner	*IOP* Applanation tonometry (but some were examined with Schiotz tonometry) (B) *Diabetes* Positive answers provided by participants with and without glaucoma (B)
Hiller, 1999[22,121,123,317–319] Framingham Eye Study Country: USA	Participants from the Framingham Heart Study were asked to participate by letter (A)	NR	2675 (67%)	NR	NR	Any of: (1) a definite history of glaucoma, (2) average of three IOP readings ⩾22, (3) average IOP differing between eyes ⩾3 mmHg with higher eye having ⩾16, (4) CDR differing between eyes by ⩾0.2 in either eye, and (5) CDR in either axis ⩾0.5 in either eye (A), plus visual field loss *Additional information:* Only suspects on screen had visual field, thus may be verification bias Visual field was tested with the Goldmann perimeter according to a modification of Armaly's screening technique for glaucoma	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Hollows, 1966[21,320] Country: USA	MRC census; entire population over 40 and younger than 75 (A)	NR	4231 (91.9%)	NR	14/20 (70%)	*Chronic simple glaucoma* One or both eyes incidence of: glaucomatous cupping of the optic disc, VFDs, IOP known to have been >21 mmHg, and an anterior chamber angle free of abnormal mesoderm and unobstructed by the root of the iris *Low-tension glaucoma* One or both eyes incidence as above whose pressure on first examination was <21 mmHg with both Goldmann and Schiotz tonometry in the eye or eyes concerned. In addition, subsequent readings did not equal or exceed 21 mmHg on any occasion (A) *Additional information:* These two were joined together for analysis purposes	
Jonasson, 1987[117] Country: Iceland	Population census 1982; entire population over 43 years (A)	NR	751 (81.2%)	NR	Unclear	Same criteria as used in the Framingham Study	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	Risk factor
Jonasson, 2003[110] Reykjavik Eye Study Country: Iceland	Random sample using the national population census (A)	NR	1045 (75.8%)	NR	25/42 (59.5%)	One of the following: (1) Structural and functional evidence: two out of three of the following criteria with GVFD: (a) VCDR ⩾ 97th percentile (>0.7) (b) focal glaucomatous disc change (disc haemorrhage, notch of the NRR, marked sloping of rim tissue, narrowest remaining rim of 0.1 disc diameter or less) (c) CDR asymmetry ⩾97.5th percentile (>0.2) (2) Structural evidence only with unproved field loss: two out of three of the following criteria: (a) same as above except (>0.8) (b) same as above (c) same as above except (⩾0.3) (3) Optic disc not seen, no field test. One of the following: (a) VA < 3/60 and IOP > 99.5th percentile; (b) VA < 3/60 and the eye shows evidence of glaucoma filtering surgery (A) *Additional information:* The screening examination included air puff tonometry (mean of three measurements), photography of anterior segment, slit-lamp biomicroscopy with fundus examination with the 78D lens, and simultaneous stereophotography. Glaucoma suspects were referred for automated full threshold fields (Octopus G1X), thus there may be verification bias	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Klein, 1992[65,111,131,132,321–326] Beaver Dam Eye Study Country: USA	Total population aged 43–84 from a private census (A)	NR	4926 (83.14%)	NR	94/104 (90.3%)	Two of the three following criteria: (1) VFD compatible with diagnosis of glaucoma (2) CDR > 0.8 or difference in CDR of 0.2 in the involved eye (3) IOP ⩾ 22 in the involved eye Low-tension glaucoma was defined by the same visual field and CDR criteria as for definite glaucoma but in the absence of IOP > 21 mmHg (A) *Additional information:* These two categories were joined together for analysis purposes *Visual field* Threshold-related suprathreshold static perimetry using multiple stimulus patterns (Henson). Any point missed twice on three attempts was a confirmed miss. People with a confirmed miss underwent a 132-point field. The field results were graded by glaucoma experts, masked to other clinical findings and each other's grading *Optic disc assessment* Dilated stereoscopic photography. Grading of the optic discs and photographs was to a standardised protocol	*IOP* Applanation tonometry (A) *Myopia* Standardised refraction using an autorefractor. Myopia was defined as a spherical equivalent of –1 D or less (A) *Diabetes* The presence of diabetes was defined as a history of diabetes treated with insulin or oral hypoglycaemic agents or HBA_{1C} >2 SD above the mean for the relevant age–gender group and or a blood sugar >11.1 mmol l^{-1} (A)

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Kozobolis, 2000[112] Country: USA	Tables of random numbers from the local register office (A)	NR	1107 (85.17%)	NR	22/31 (71%)	Non-occludable chamber angle without goniosynechiae, and a glaucomatous optic disc and/or nerve fibre layer defect, a visual defect and IOP > 21 mmHg NTG was as above except IOP < 21 mmHg Pseudoexfoliactive glaucoma: only if pseudoexfoliative deposits on the anterior lens surface, the papillary borders, the typical central disc or the typical peripheral zone were present after dilating and glaucoma as above (A) *Additional information:* The three groups were joined together for analysis purposes Only suspects went on to visual field examination, thus may be verification bias *Visual fields* Henson 25° full threshold fields, an abnormal field being at least disturbed points anywhere in the visual field, two or more adjacent points of ⩾5-dB loss each, one or more adjacent points each of ⩾10-dB loss each, difference of ⩾5 dB across nasal horizontal meridian at two or more adjacent points and three consecutive points with a difference >2 dB. A GVFD was agreed by consensus between two glaucoma experts *Optic discs* Dilated fundus examination with direct and indirect ophthalmoscopy and biomicroscopy by 'quality assured' ophthalmologists. GON if one of CDR > 0.5, oval excavation with a difference >0.2 between horizontal and vertical CDR, notching of neural rim, neural rim thinning, disc margin haemorrhage	*IOP* IOP was measured with GAT and the final measurement was the mean value of three sequential IOP measurements (A)

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Lee, 2003[104] Country: USA	Random sample of US adults over 65 collected by the US census (used individuals enrolled in the National Long-term Care Survey) (B)	NR	NR	NR	NR	Specific diagnostic codes from Medicare database from the International Classification of Diseases (365.1, 365.10, 365.11, 365.12, 365.15) (B)	
Mitchell, 1997[63,122,126,129,133,327–337] Blue Mountains Eye Study Country: Australia	Total population from a door-to-door census aged 49 or older (A)	779 (people who died or moved away from the area); non-phakic eyes	3654 (87.9%)	NR	55/108 (51%)	OAG was diagnosed by the presence of matching optic disc cupping with rim thinning (CDR $\geqslant$ 0.7) or cup disc asymmetry between the two eyes of $\geqslant$0.3), and characteristic visual field loss on automated perimetry, after excluding rubeotic, angle closure or secondary glaucoma other than pseudoexfoliation by gonioscopy. OAG diagnosis was made without reference to IOP (A) *Additional information:* The Humphrey 76-point threshold-related suprathreshold screening field test was completed by 89% of the population examined; glaucoma suspects (10%) on the basis of an abnormal visual field or suspect optic disc underwent a Humphrey full-threshold 30-2 field test. A GVFD was defined as an abnormal hemifield test plus one or more of the following defects not explained by other ocular or neurological causes: (1) arcuate or paracentral scotoma, at least four contiguous points on the pattern deviation plot depressed at $p < 0.05$; (2) nasal step at least two horizontal points width on the pattern deviation plot depressed at $p < 0.05$; or (3) advanced GVFD	*Diabetes* Past history or elevated fasting blood glucose $\geqslant$7.8 mmol l^{-1} (140 mg%) (A) *Family history* Self-report (participants were asked whether mother, father, siblings or children had been diagnosed with glaucoma (B) *Myopia* Myopic spherical equivalent of the eye (SEq) was –1.0 D or greater; low myopia was defined in eyes with a myopic SEq of –1.0 D or greater to less than –3.0 D. Moderate to high myopia was defined in eyes with a myopic SEq of –3.00 D or greater (A) *IOP* Applanation tonometry (A)

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	Risk factor
Reidy, 1998[113] Country: UK	Two-stage random sampling of individuals from seven general practice groups of people aged 65 or over (A)	NR	1547 (84%)	NR	35/47 (74.5%)	OAG was defined as an absolute field defect and either a CDR of ⩾0.7 or substantial asymmetry of the cups (a difference in CDR of ⩾0.3) between the two eyes. Gonioscopy was performed when the Van Herick method suggested an narrow angle (A) *Additional information:* *Visual fields* Visual fields were assessed in all subjects by 76-point suprathreshold fields with a Humphrey 730 screener. A GVFD was defined as an absolute defect within 10° of eccentricity, or when there were two or more absolute defects adjacent to each other, or when there were three or more defects in one quadrant. Two glaucoma experts independently classified the visual fields; disagreements were resolved by joint reassessment	
Ringvold, 1991[118] Country: Norway	Total population over 64 from lists with personal data drawn from the Central Bureau of Statistics of Norway, Oslo. (B: uptake not reported)	54 (pseudo-exfoliation syndrome could not be evaluated); 32 (could not be judged for glaucoma)	1941 (?%)	NR		Two out of three criteria: (1) IOP ⩾ 25 (2) VCDR ⩾ 0.8 by direct ophthalmoscopy. (3) GVFD, i.e nasal steps, arcuate scotomata or more advanced defects. A defect equating to areas with a minimum of three adjacent points with depressions of ⩾4 dB (A) *Additional information:* People with IOP ⩾ 25 or suspect glaucomatous cupping were referred for further investigation: visual field examination with Humphrey, Armaly, full field, quantify defects	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Schoff, 2001[119] Country: USA	Computerised search of the database of the Rochester Epidemiology Project. Population data for the Olmsted county were drawn from the 1960, 1970 and 1980 US census (B)	NR	60,666 (no. of included participants)	NR	NR	Elevated IOP (⩾21 mmHg), optic nerve damage or visual field loss consistent with glaucoma. Optic nerve damage considered consistent with glaucoma, not attributable to other causes; visual field loss considered consistent with glaucoma if one of the following defects was present: nasal step, arcuate scotoma, generalised constriction relative to the fellow eye, temporal wedge, or remaining central or temporal islands of vision. *Classic glaucoma:* had evidence of glaucomatous damage either by visual field testing or by clinical evaluation of the optic nerve or both, could have NTG, met diagnostic criteria that correspond roughly to the American Academy of Ophthalmology preferred practice pattern definition of OAG (A) *Additional information:* *Visual fields* Visual fields were reviewed by one glaucoma expert, and a GVFD was considered present if one of the following defects was present (1) nasal step, (2) arcuate scotoma, (3) generalised constriction relative to the fellow eye (4) temporal wedge, or (5) advanced loss not attributable to other causes	

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Tielsch, 1991[23,72,114,127,134,235,338–343] Baltimore Eye Survey Country: USA	Stratified, multistage, random cluster sampling to select 16 geographical clusters of Baltimore (A)	NR	5308 (79.2%)	NR	94/161 (58.3%)	Evidence of GON damage (irrespective of IOP) and the presence of normal angles in the absence of other likely causes when the glaucomatous process was first recognised (A) *Additional information:* *Visual field* Humphrey 24-2 screening fields, 17 or more absolute or relative defects or eight or more absolute or relative visual field loss in any one quadrant were also defined as potential visual field loss. People with potential visual field loss underwent automated threshold fields or Goldmann perimetry if unable to be tested on automated perimetry *Optic disc* Stereoscopic optic disc photography	*IOP* GAT, median IOP calculated from three readings, highest IOP in either eye taken as person-level IOP (A) *Diabetes* Personal interview. Owing to logistical constraints, they were unable to collect fasting blood glucose levels at the time of the screening examination. Participants were asked: 'has a doctor ever told you that you had diabetes or sugar diabetes?' (B) *Family history* Personal interview at the screening centre, in which subjects were asked whether each first-degree relative had a history of glaucoma (B) *Race* Black American

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	**Risk factor**
Weih, 2001[24,115,125,130,344–347] Visual Impairment Project Country: Australia	Random selection from the Australian Bureau of Statistics census collector districts (A)	11 (no information on IOP, CDRs or visual fields)	4744 (86%)	NR	51/85 (60%)	Glaucoma suspects were defined as IOP > 21 mmHg, a GVFD, CDR > 0 .7 in either eye, CDR > 0.3, or who reported a history of glaucoma (either diagnosis or treatment). Suspected glaucoma cases were classified as definite, probable or possible OAG based on records (definition of GVD was not specified) and photographs by a panel of experts (A) *Additional information:* *Visual field* Threshold Humphrey 24-2 Fastpac statistical package. A Bjerrum tangent screen visual field was performed where a Humphrey visual field was unobtainable. If this was also unobtainable, a confrontation field was attempted *Optic disc* Dilated biomicroscopy with a 90D lens, and stereophotography with a Topcon TRC FET retinal camera	*IOP* Tonopen; if IOP > 21 mmHg was repeated and if positive checked with GAT (A) *Family history* Questionnaire (B) *Myopia* Visual acuity was measured using a logMAR E chart if the participant was illiterate or had problems reciting the English alphabet. Others used a logMAR chart. If the participant was unable to read at least 53 letters (20/20 minus 2 letters) a refraction was performed. Two definitions of myopia: refractive error worse than –0.5 D or worse than –1.00 D (A) *Race* White, 35% were born overseas primarily in Greece and Italy. No aboriginal or Torres ancestry

continued

TABLE 69 *Studies included in the epidemiology review of OAG (cont'd)*

Study	Sample selection	Excluded (no. and reason)	Uptake (no. who accepted)	Incomplete diagnosis	Proportion of undetected glaucoma	Detection	
						Outcome	Risk factor
Wormald, 1992[116] Country: UK	Random sample from the age–gender register from a general practice (A)	NR	207 (72%)	NR	3/9 (33%)	Suprathreshold Henson field, confrontation fields if automated perimetry not possible. IOP using Perkins and confirmed on Goldmann. Optic disc assessment by dilated slit-lamp biomicroscopy. Glaucoma diagnosis by ophthalmologist assessment based on these findings (A)	
Wormald, 1994[120] Country: UK	Voluntary sample; insufficient resources were available to the study to raise a population-based random sample (B)	NR	NA	NA	19/33 (58%)	Screening examination included visual acuity, suprathreshold fields applanation tonometry, ophthalmoscopy and stereophotography if possible. Suspects were referred for definitive examination Glaucoma diagnosis based on repeatable GVFD defect (A) *Additional information:* May be verification bias as only suspects had visual field examination	*Diabetes* A positive history of diabetes on treatment including diet alone, tablets and insulin dependence or a random blood sugar tested on the Glucocheck device with BM sticks > 15 mmol (A) *Ethnicity* Skin colour was graded by one of two ophthalmologists as light, medium or dark. Light skin colour was defined as unusually light for this ethnic group and dark as noticeably darker than average. Although these gradings were subjective, they were based on simple observation with good informally assessed concordance between the two observers

CPSD, corrected pattern standard deviation; GON, glaucomatous optic nerve; GVFD, glaucomatous visual field defect; MRC, Media Research Center; OHT, ocular hypertension; VA, visual *acuity; VFD, visual field defect.*

Appendix 7

Modified QUADAS quality assessment checklist

Study ID: Paper no:

Assessor initials: Date assessed:

Item		Yes	No	Unclear
1.	Was the spectrum of patients representative of the patients who will receive the test in practice?			
	a. Was the sample selected from an unscreened population with a glaucoma prevalence between >0 and 20%? (if NO go to 'b')			
	b. Is the sample constructed from previously undiagnosed glaucoma patients referred from primary care or are the cases and controls representative of those detected in primary care?			
2.	Is the reference standard follow-up confirmation of glaucoma?			
3.	Did the whole sample or a random selection of the sample receive verification using a reference standard of diagnosis?			
4.	Did patients receive the same reference standard regardless of the index test result?			
5.	Was the reference standard independent of the index test (i.e. the index test did not form part of the reference standard)? (e.g. in a HRT-II study if clinical assessment of optic disc was part of reference standard it will be regarded as independent reference standard and score YES)			
6.	Were the index test results interpreted without knowledge of the results of the reference standard? (Studies in which cut-off is calculated by a machine and no subjective decision is involved should be scored YES)			
7.	Were the reference standard results interpreted without knowledge of the results of the index test?			
8.	Were the same clinical data available when test results were interpreted as would be available when the test is used in practice?			
	a. For screening studies: index test results alone			
	b. For diagnostic studies: may include information from ophthalmic examination and/or co-morbidity			
9.	Were uninterpretable/intermediate/incomplete test results reported? (record %)			
10.	Were withdrawals from the study explained? (record %) (Withdrawals are participants who entered the study but did not get both tests)			
11.	Is the technology of the index test used in the study still current?			
12.	Did the study provide a clear definition of what was considered to be a 'positive' result?			
13.	Was the definition of a positive index test result determined before the study was carried out?			

Appendix 8

Included studies: screening and diagnostic tests review

These studies provided data on test accuracy (A), uptake (U), interpretability (I) and reliability (R)

Airaksinen, 1984

Airaksinen PJ, Drance SM, Douglas GR, Mawson DK, Nieminen H. Diffuse and localized nerve fiber loss in glaucoma. *Am J Ophthalmol* 1984;**98**:566–71. ***A R***

Anton, 1997

Anton A, Maquet JA, Mayo A, Tapia J, Pastor JC. Value of logistic discriminant analysis for interpreting initial visual field defects. *Ophthalmology* 1997;**104**:525–31. ***A***

Artes, 2002

Artes PH, Iwase A, Ohno Y, Kitazawa Y, Chauhan BC. Properties of perimetric threshold estimates from full threshold, SITA standard, and SITA fast strategies. *Invest Ophthalmol Vis Sci* 2002;**43**:2654–9. ***I R***

Atanassov, 2002

Atanassov MA, Konareva MI. Reproducibility and agreement between three methods of intraocular pressure measurement. *Folia Med (Plovdiv)* 2002;**44**:19–22. ***I R***

Azuara-Blanco, 2000

Azuara-Blanco A, Katz LJ, Spaeth GL, Nicholl J, Lanzl IM. Detection of changes of the optic disc in glaucomatous eyes: clinical examination and image analysis with the Topcon Imagenet system. *Acta Ophthalmol Scand* 2000;**78**:647–50. ***R***

Baltimore Eye Survey

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. ***A U I***

Tielsch JM, Katz J, Singh K, Quigley HA, Gottsch JD, Javitt J, *et al*. A population-based evaluation of glaucoma screening: the Baltimore Eye Survey. *Am J Epidemiol* 1991;**134**:1102–10. ***A R***

Beaver Dam Eye Study

Klein BE, Klein R, Jensen SC. Open angle glaucoma and older-onset diabetes. The Beaver Dam Eye Study. *Ophthalmology* 1994;**101**:1173–7. ***U***

Bengtsson, 2000

Bengtsson B. Reliability of computerized perimetric threshold tests as assessed by reliability indices and threshold reproducibility in patients with suspect and manifest glaucoma. *Acta Ophthalmol Scand* 2000;**78**:519–22. ***I R***

Bjerre, 2004

Bjerre A, Grigg JR, Parry NR, Henson DB. Test–retest variability of multifocal visual evoked potential and SITA standard perimetry in glaucoma. *Invest Ophthalmol Vis Sci* 2004;**45**:4035–40. ***I R***

Blue Mountains Eye Study

Ivers RQ, Optom B, Macaskill P, Cumming RG, Mitchell P. Sensitivity and specificity of tests to detect eye disease in an older population. *Ophthalmology* 2001;**108**:968–75. ***A U I***

Brush, 2004

Brush MB, Chen PP. Test–retest variability in glaucoma patients tested with C-20-1 screening-mode frequency doubling technology perimetry. *J Glaucoma* 2004;**13**:273–7. ***I R***

Caprioli, 1986

Caprioli J, Klingbeil U, Sears M, Pope B. Reproducibility of optic disc measurements with

computerized analysis of stereoscopic video images. *Arch Ophthalmol* 1986;**104**:1035–9. ***R***

Capris, 1999

Capris P, Corallo G, Gatti G, Zingirian M. SITA and full threshold strategies in the study of the perimetric defects in glaucoma. *Acta Ophthalmol Scand Suppl* 1999;(229):18–19. ***I R***

Carpineto, 2003

Carpineto P, Ciancaglini M, Zuppardi E, Falconio G, Doronzo E, Mastropasqua L. Reliability of nerve fiber layer thickness measurements using optical coherence tomography in normal and glaucomatous eyes. *Ophthalmology* 2003;**110**:190–5. ***R***

Cedrone, 1997

Cedrone C, Culasso F, Cesareo M, Zapelloni A, Cedrone P, Cerulli L. Prevalence of glaucoma in Ponza, Italy: a comparison with other studies. *Ophthalmic Epidemiol* 1997;**4**:59–72. ***U I***

Christoffersen, 1995

Christoffersen T, Fors T, Waage S, Holtedahl K. Glaucoma screening with oculokinetic perimetry in general practice: is its specificity acceptable? *Eye* 1995;**9**(5 Suppl):36-9. ***A U I***

Ciancaglini, 2002

Ciancaglini M, Sebastiani A, Carpineto P, Costagliola C, Ciafre M, Parmegiani F, *et al*. Reproductibility of retinal thickness measurements with retinal thickness analyser in healthy and glaucomatous subjects. *Acta Ophthalmol Scand Suppl* 2002;**80**:43–4. ***R***

Dalby Population Survey

Bengtsson B. Findings associated with glaucomatous visual field defects. *Acta Ophthalmol* 1980;**58**:20–32. ***A U I***

Damato, 1989

Damato BE, Ahmed J, Allan D, McClure E, Jay JL. The detection of glaucomatous visual field defects by oculokinetic perimetry: which points are best for screening? *Eye* 1989;**3**:727–31. ***A***

Detry-Morel, 2004

Detry-Morel M, Zeyen T, Kestelyn P, Collignon J, Goethals M, Belgian Glaucoma Society. Screening for glaucoma in a general population with the non-mydriatic fundus camera and the frequency doubling perimeter. *Eur J Ophthalmol* 2004;**14**:387–93. ***A I R***

Dielemans, 1994

Dielemans I, Vingerling JR, Hofman A, Grobbee DE, de Jong PT. Reliability of intraocular pressure measurement with the Goldmann applanation tonometer in epidemiological studies. *Graefes Arch Clin Exp Ophthalmol* 1994;**232**:141–4. ***I R***

Egna–Neumarkt Glaucoma Study

Bonomi L, Marchini G, Marraffa M, Morbio R. The relationship between intraocular pressure and glaucoma in a defined population. Data from the Egna–Neumarkt Glaucoma Study. *Ophthalmologica* 2001;**215**:34–38. ***A U I***

Bonomi L, Baravelli S, Cobbe C, Tomazzoli L. Evaluation of Keeler Pulsair non-contact tonometry: reliability and reproducibility. *Graefes Arch Clin Exp Ophthalmol* 1991;**229**:210–12. ***I R***

Eiden, 1986

Eiden SB, Cooper J, Olivares G, Horn D, London R. Interexaminer reliability of the optic cup to disc ratio assessment. *Am J Optometry Physiol Optics* 1986;**63**:753–6. ***I R***

Eikelboom, 2000

Eikelboom RH, Barry CJ, Jitskaia L, Voon AS, Yogesan K. Neuroretinal rim measurement error using PC-based stereo software. *Clin Exp Ophthalmol* 2000;**28**:178–80. ***R***

Enger, 1987

Enger C, Sommer A. Recognizing glaucomatous field loss with the Humphrey STATPAC. *Arch Ophthalmol* 1987;**105**:1355–7. ***A***

Framingham Eye Study

Leibowitz HM, Krueger DE, Maunder LR, Milton RC, Kini MM, Kahn HA, *et al*. The Framingham Eye Study monograph: an ophthalmological and epidemiological study of cataract, glaucoma, diabetic retinopathy,

macular degeneration, and visual acuity in a general population of 2631 adults, 1973–1975. *Surv Ophthalmol* 1980;**24**(Suppl):335–610. ***A U I***

Frenkel, 2005

Frenkel S, Slonim E, Horani A, Molcho M, Barzel I, Blumenthal EZ. Operator learning effect and interoperator reproducibility of the scanning laser polarimeter with variable corneal compensation. *Ophthalmology* 2005;**112**:257–61. ***R***

Garway-Heath, 1999

Garway-Heath DF, Poinoosawmy D, Wollstein G, Viswanathan A, Kamal D, Fontana L, *et al*. Inter- and intraobserver variation in the analysis of optic disc images: comparison of the Heidelberg retina tomograph and computer assisted planimetry. *Br J Ophthalmol* 1999;**83**:664–9. ***R***

Gillespie, 2003

Gillespie BW, Musch DC, Guire KE, Mills RP, Lichter PR, Janz NK, *et al*. The Collaborative Initial Glaucoma Treatment Study: baseline visual field and test–retest variability. *Invest Ophthalmol Vis Sci* 2003;**44**:2613–20. ***I R***

Glaucoma Screening Study

Katz J, Sommer A, Gaasterland DE, Anderson DR. Comparison of analytic algorithms for detecting glaucomatous visual field loss. *Arch Ophthalmol* 1991;**109**:1684–9. ***A I***

Katz J, Quigley HA, Sommer A. Repeatability of the glaucoma hemifield test in automated perimetry. *Invest Ophthalmol Vis Sci* 1995;**36**:1658–64. ***A***

Groningen Longitudinal Glaucoma Study

Heeg GP, Blanksma LJ, Hardus PL, Jansonius NM. The Groningen Longitudinal Glaucoma Study. I. Baseline sensitivity and specificity of the frequency doubling perimeter and the GDx nerve fibre analyser. *Acta Ophthalmol Scand* 2005;**83**:46–52. ***A***

Heeg GP, Stoutenbeek R, Jansonius NM. Strategies for improving the diagnostic specificity of the frequency doubling perimeter. *Acta Ophthalmol Scand* 2005;**83**:53–6. ***A***

Heeg GP, Ponsioen TL, Jansonius NM. Learning effect, normal range, and test–retest variability of frequency doubling perimetry as a function of age, perimetric experience, and the presence or absence of glaucoma. *Ophthalmic Physiol Optics* 2003;**23**:535–40. ***R***

Stoutenbeek R, Heeg GP, Jansonius NM. Frequency doubling perimetry screening mode compared to the full-threshold mode. *Ophthalmic Physiol Optics* 2004;**24**:493–7. ***A***

Hammond, 1979

Hammond EA, Begley PK. Screening for glaucoma: a comparison of ophthalmoscopy and tonometry. *Nurs Res* 1979;**28**:371–2. ***A I***

Harasymowycz, 2005

Harasymowycz P, Papamatheakis D, Fansi AK, Gresset J, Lesk MR. Validity of screening for glaucomatous optic nerve damage using confocal scanning laser ophthalmoscopy (Heidelberg retina tomograph II) in high-risk populations: a pilot study. *Ophthalmology* 2005;**112**:2164–71. ***A I***

Harper, 1994

Harper RA, Hill AR, Reeves BC. Effectiveness of unsupervised oculokinetic perimetry for detecting glaucomatous visual field defects. *Ophthalmic Physiol Optics* 1994;**14**:199–202. ***A***

Harper, 2001

Harper R, Radi N, Reeves BC, Fenerty C, Spencer AF, Batterbury M. Agreement between ophthalmologists and optometrists in optic disc assessment: training implications for glaucoma co-management. *Graefes Arch Clin Exp Ophthalmol* 2001;**239**:342–50. ***I R***

Harper R, Reeves B, Smith G. Observer variability in optic disc assessment: implications for glaucoma shared care. *Ophthalmic Physiol Optics* 2000;**20**:265–73. ***R***

Hatch, 1999

Hatch WV, Trope GE, Buys YM, Macken P, Etchells EE, Flanagan JG. Agreement in assessing glaucomatous discs in a clinical teaching setting with stereoscopic disc photographs, planimetry, and laser scanning tomography. *J Glaucoma* 1999;**8**:99–104. ***R***

Hollo, 1992

Hollo G, Follmann P, Pap G. A clinical evaluation of XPERT NCT (Reichert) for glaucoma screening by optometrists. *Int Ophthalmol* 1992;**16**:291–3. ***R***

Hollo, 1997

Hollo G, Suveges I, Nagymihaly A, Vargha P. Scanning laser polarimetry of the retinal nerve fibre layer in primary open angle and capsular glaucoma. *Br J Ophthalmol* 1997;**81**:857–61. ***R***

Ieong, 2003

Ieong A, Murdoch I, Cousens S, Healey P, Theodossiades J. Sensitivity and specificity of two glaucoma case-finding strategies for optometrists. *Ophthalmic Physiol Optics* 2003;**23**:341–6. ***A***

Johnson, 1999

Johnson CA, Cioffi GA, Van Buskirk EM. Evaluation of two screening tests for frequency doubling technology perimetry. *13th International Perimetric Society Meeting*, Garda, Italy, September 1999. pp. 103–9. ***A I***

Khong, 2001

Khong JJ, Dimitrov PN, Rait J, McCarty CA. Can the specificity of the FDT for glaucoma be improved by confirming abnormal results? *J Glaucoma* 2001;**10**:199–202. ***A I R***

Kocak, 1998

Kocak I, Orgul S, Saruhan A, Haefliger I, Hendrickson P, Flammer J. Measurement of intraocular pressure with a modern noncontact tonometer. *Ophthalmologica* 1998;**212**:81–7. ***I R***

Kozobolis, 2000

Kozobolis VP, Detorakis ET, Tsilimbaris M, Siganos DS, Vlachonikolis IG, Pallikaris IG. Crete, Greece glaucoma study. *J Glaucoma* 2000;**9**:143–9. ***A U I***

Liu, 2001

Liu X, Ling Y, Luo R, Ge J, Zheng X. Optical coherence tomography in measuring retinal nerve fiber layer thickness in normal subjects and patients with open angle glaucoma. *Chin Med J* 2001;**114**:524–9. ***R***

Lotti, 1999

Lotti R, Frau B, Cerruti S, Trillo C, Traverso CE. Reliability of applanation tonometry readings obtained with a disposable latex cap. *Ophthalmologica* 1999;**213**:277–80. ***I R***

Mansberger, 2005

Mansberger SL, Johnson CA, Cioffi GA, Choi D, Krishnadas SR, Srinivasan M, *et al*. Predictive value of frequency doubling technology perimetry for detecting glaucoma in a developing country. *J Glaucoma* 2005;**14**:128–34. ***A I R***

Marraffa, 1989

Marraffa M, Marchini G, Albertini R, Bonomi L. Comparison of different screening methods for the detection of visual field defects in early glaucoma. *Int Ophthalmol* 1989;**13**:43–5. ***A I***

Mok, 2004

Mok KH, Lee VW, So KF. Increasing scans per examination improves the reproducibility on retinal nerve fiber layer measurements by optical coherence tomography. *Optometry Vis Sci* 2004;**81**:268–71. ***R***

Mundorf, 1989

Mundorf TK, Zimmerman TJ, Nardin GF, Kendall KS. Automated perimetry, tonometry, and questionnaire in glaucoma screening. *Am J Ophthalmol* 1989;**108**:505–8. ***A I***

Phelps, 1976

Phelps CD, Phelps GK. Measurement of intraocular pressure: a study of its reproducibility. *Albrecht Von Graefes Arch Klin Exp Ophthalmol* 1976;**198**:39–43. ***I R***

Quigley, 1980

Quigley HA, Miller NR, George T. Clinical evaluation of nerve fiber layer atrophy as an indicator of glaucomatous optic nerve damage. *Arch Ophthalmol* 1980;**98**:1564–71. ***A***

Reykjavik Eye Study

Jonasson F, Damji KF, Arnarsson A, Sverrisson T, Wang L, Sasaki H, *et al*. Prevalence of open angle glaucoma in Iceland: Reykjavik Eye Study. *Eye* 2003;**17**:747–53. ***U I***

Rhondda Valley Study

Hollows FC, Graham PA. Intra-ocular pressure glaucoma and glaucoma suspects in a defined population. *Br J Ophthalmol* 1966;**50**:570–86. ***A U I***

Robin, 2005

Robin TA, Muller A, Rait J, Keeffe JE, Taylor HR. Performance of community-based glaucoma screening using frequency doubling technology and Heidelberg retinal tomography. *Ophthalmic Epidemiol* 2005;**12**:167–78. ***A U I***

Rotterdam Study

Wolfs RC, Ramrattan RS, Hofman A, de Jong PT. Cup-to-disc ratio: ophthalmoscopy versus automated measurement in a general population: the Rotterdam Study. *Ophthalmology* 1999;**106**:1597–601. ***A U I R***

Sanchez-Galeana, 2001

Sanchez-Galeana C, Bowd C, Blumenthal EZ, Gokhale PA, Zangwill LM, Weinreb RN. Using optical imaging summary data to detect glaucoma. *Ophthalmology* 2001;**108**:1812–18. ***R***

Schultz, 1995

Schultz RO, Radius RL, Hartz AJ, Brown DB, Eytan ON, Ogawa GSH, *et al*. Screening for glaucoma with stereo disc photography. *J Glaucoma* 1995;**4**:177–82. ***A I***

Segovia Study

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Appendix 9

Studies providing data on reliability: screening and diagnostic tests review

TABLE 70 *Ophthalmoscopy*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Ciancaglini, 2002[216]	Laser biomicroscopy retinal thickness			CV (intraobserver): 3.4% intravisits, 5.6% intervisits
2	Eiden, 1986[200]	Direct			Interobserver ICC: 0.9
3	Theodossiades, 2001[177]	Direct	VCDR kw 0.84 (0.81–0.87)		
4	Wolfs, 1999[169]		VCDR kw 0.85	0.92 and 0.88; two technicians	

CV, coefficient of variation; ICC, intraclass correlation coefficient.

TABLE 71 *Optic disc photography*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Azuara-Blanco, 2000[213]	Imagenet (Topcon)		0.75 and 0.6; two observers	
2	Caprioli, 1986[197]	Stereoscopic video camera			VCDR: CV (interobserver): 8.1% (five observers) CV (intraobserver): 5.4%
3	Detry-Morel, 2004[155]	Non-mydriatic fundus camera	0.51–0.54		
4	Eikelboom, 2000[217]	Nidek stereo camera			NRR: CV (interobserver): right eye 1.9–11.2%; left eye 2.1–9.3%
5	Garway-Heath, 1999[219]	Canon CF60U camera			CV (interobserver): disc area 8.1%; NRR 16.3%
6	Harper, 2000[220]	Stereoscopy: fundus camera	VCDR: kw 0.23–0.64	VCDR: kw 0.71–0.86	
	Harper, 2001[202]	Stereoscopy: fundus camera	VCDR: mean kw 0.39 (optometrists) and 0.51 (ophthalmologists)	VCDR: mean kw 0.69 (range 0.5–0.85)	
7	Hatch, 1999[221]	Stereoscopic camera			ICC (interobserver): 0.83
8	Spalding, 2000[230]	Stereoscopic viewer	VCDR: kw 0.57	VCDR: kw 0.77	

continued

TABLE 71 *Optic disc photography (cont'd)*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
9	Sturmer, 1992[209]	Canon fundus camera			Pearson coefficient (interobserver): 0.00 ± 0.002 Pearson coefficient (intraobserver): 0.0004 ± 0.0004
10	Takamoto, 1985[232]	Donaldson fundus camera; Kodak Ektachrome film			CV (interobserver): 4.7%
11	Tielsch, 1991[72]				ICC (intraobserver): 0.8
12	Varma, 1992[233]	Topcon camera	VCDR: kw 0.67	VCDR: kw 0.79	

TABLE 72 *RNFL photography*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Airaksinen, 1984[178]	Canon CF60Z			CV (intraobserver): 15% for 20 photographs
2	Sommer, 1991[229]	Zeiss fundus			67.4% agreement between two observers for 172 photographs
	Sommer, 1984[228]	Zeiss fundus		0.562	

TABLE 73 *HRT II*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Strouthidis, 2005[231]	HRT II explorer			CV (interobserver): 11% (10%) ICC (interobserver): 0.95 (0.95) CV (intraobserver): 11% (9%) ICC (intraobserver): 0.93 (0.97)
2	Watkins, 2005[234]	HRT II ± optic disc photography			ICC (Intraobserver): 0.96 for both observers; mean 95%, tolerance limits 10%

TABLE 74 *GDx VCC*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Frenkel, 2005[218]				CV (interobserver): 71%, 72%, 74% for three observers
2	Hollo, 1997[224]				CV (intraobserver): 3.7–8.9% (mean 6.0)

TABLE 75 *OCT*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Carpineto, 2003[215]				ICC (interobserver): group 1: 1.5 radius 0.52, 1.73 mm R 0.50, 2.0 radius 0.50 group 2: 1.5 radius 0.54, 1.73 mm R 0.50, 2.0 radius 0.49
2	Liu, 2001[225]				ICC (intraobserver): 0.74
3	Mok, 2004[226]				CV (intraobserver): 8 ± 1% for intra and inter visits
4	Sanchez-Galeana, 2001[227]		0.51 ± 0.09 to 0.73 ± 0.07		

TABLE 76 *SAP*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Artes, 2002[192]	SITA standard			Global RMS 2.9–6.4 dB
		SITA fast			RMS 3–8.4 dB
		Full threshold			RMS 3–7.62, 9–6.4 dB
2	Bengtsson, 2000[194]	SITA standard			CV (intraobserver): RMSE (square root of the average test–retest variance): 0.32
3	Bjerre, 2004[195]	SITA standard		0.65	
4	Capris, 1999[198]	SITA standard			Mean test–retest difference: 3.96 ± 1.83 dB
		Full threshold			Mean test–retest difference: 3.13 ± 1.44 dB
5	Gillespie, 2003[201]	Humphrey 24-2			ICC (intraobserver): test–retest 0.36 (0.26–0.45), mean deviation 0.91 (0.88–0.92)
6	Sekhar, 2000[206]	SITA standard			ICC (intraobserver): pattern deviation: 0.844 mean deviation: 0.952 pattern SD: 0.907

continued

TABLE 76 *SAP (cont'd)*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
		SITA fast			ICC (intraobserver): pattern deviation: 0.820 mean deviation: 0.704 pattern SD: 0.780
		Full threshold			ICC (intraobserver): pattern deviation: 0.917 mean deviation: 0.916 pattern SD: 0.946
7	Spry, 2000[208]	Suprathreshold 5 dB			14.4%
		Suprathreshold 8 dB			7.2%
		Suprathreshold 12 dB			4.8%
		FastPac			10.6–11.4%

RMS, root mean square; RMSE, root mean square error.

TABLE 77 *FDT*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Brush, 2004[214]	C-20-1			87.8±12.8% agreement
2	Detry-Morel, 2004[155]				91% reliable
3	Heeg, 2003[222]	C-20			Test–retest coefficient of repeatability 2 dB and 5 dB
4	Khong, 2001[173]	C-20-5			Test–retest of 44 patients, 84%
5	Mansberger, 2005[161]	24-2	0.6–0.8		
6	Tatemichi, 2002[210]	FDT-GSP			57.6% agreement

TABLE 78 *GAT*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Atanassov, 2002[193]				CV (intraobserver): 2.0%
2	Dielemans, 1994[199]				CV (intraobserver): 1.31%
3	Lotti, 1999[204]				CV (intraobserver): 4.5% and 6.26%
4	Phelps, 1976[205]				ICC (interobserver): 0.71 ICC (intraobserver): 0.69 and 0.73

TABLE 79 *NCT*

No.	Study	Test detail	Interobserver kappa	Intraobserver kappa	Other
1	Bonomi, 1991[196]	Pulsair	≤24 mmHg: 0.71; >24 mmHg: 0.6		
2	Hollo, 1992[223]	XPERT			Mean difference (SD): 0.17 (1.56) mmHg
3	Kocak, 1998[203]	Pulsair 2000			CV (intraobserver): median 10.6% for five observers (range 10.6–12.4)

Appendix 10

Excluded case–control studies: screening and diagnostic tests review

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Chandrasekhar G, Kunjam V, Rao VS, Nutheti R. Humphrey visual field and frequency doubling perimetry in the diagnosis of early glaucoma. *Indian J Ophthalmol* 2003;**51**:35–8.

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Fabre K, Michiels I, Zeyen T. Med 1001-1500. The sensitivity and specificity of TOP, FDP and GDX in screening for early glaucoma. *Bulletin de la Societe Belge d'Ophtalmologie* 2000;**275**:17–23.

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Garway-Heath DF, Hitchings RA. Quantitative evaluation of the optic nerve head in early glaucoma. *Br J Ophthalmol* 1998;**82**:352–61.

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Guedes V, Schuman JS, Hertzmark E, Wollstein G, Correnti A, Mancini R, *et al*. Optical coherence tomography measurement of macular and nerve fiber layer thickness in normal and glaucomatous human eyes. *Ophthalmology* 2003;**110**:177–89.

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Pugesgaard T, Autzen T, Nielsen N, Work K. Retinal nerve fibre layer photography in glucomatous and normal eyes. *Acta Ophthalmol* 1990;**68**:441–4.

Reus NJ, Lemij HG. Diagnostic accuracy of the GDx VCC for glaucoma. *Ophthalmology* 2004;**111**:1860–5.

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Appendix 11

Results of the quality assessment for the individual studies

TABLE 80 *Population-based studies*

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Anton, 2004[99]	+	–	+	–	–	–	–	–	+	+	+	+	+
Bengtsson, 1980[100]	+	–	+	+	+	?	?	+	+	+	+	+	?
Bonomi, 2001[106]	+	+	+	–	+	+	–	–	+	+	+	+	+
Christoffersen, 1995[154]	+	–	–	–	+	+	–	–	+	+	+	+	+
Detry–Morel, 2004[155]	+	–	+	+	+	+	+	+	+	+	–	+	+
Harasymowycz, 2005[156]	+	–	+	+	+	+	+	+	+	+	+	+	+
Hollows, 1966[21]	+	–	+	+	+	+	–	+	+	+	+	+	+
Ivers, 2001[157]	+	–	+	–	–	+	–	+	–	–	–	+	+
Katz, 1991[158]	–	–	+	+	–	+	–	+	+	–	–	+	+
Katz, 1993[159]	+	–	–	–	+	+	–	?	+	–	+	+	–
Kozobolis, 2000[112]	+	–	?	–	+	+	?	+	+	+	+	+	+
Mansberger, 2005[161]	–	–	+	+	+	+	+	+	+	–	–	+	+
Mundorf, 1989[162]	+	–	+	+	–	–	–	–	–	+	–	+	+
Robin, 2005[163a]	+	–	+	+	+ –	+	+	+	+	+	–	+	+
Vernon, 1990[164]	+	–	+	–	+	+	?	+	+	+	?	+	+
Vitale, 2000[166]	+	+	+	+	+	+	+	+	?	+	+	+	+
Wang, 1998[168b]	+	–	+	–	+ –	+	?	+	+ –	+	+	+	+
Weih, 2001[115]	+	–	+	–	–	+	+	+	–	+	+	+	+
Wolfs, 1999[169]	+	–	+	+	+	+	+	+	–	–	+	+	+
Yamada, 1999[170]	+	–	+	+	+	+	+	?	+	–	–	+	–

[a] Question 5 was Yes for FDT, No for HRT II, No for SAP.
[b] Question 5 was Yes for ophthalmoscopy, Yes for RNFL photography, No for SAP, No for GAT. Question 9 was Yes for RNFL photography, No for ophthalmoscopy, No for SAP, No for GAT.

TABLE 81 *Studies containing an already suspect population (cohort studies and case–control studies)*

Study	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13
Cohort studies													
Ekstrom, 1993[171]	–	+	+	–	?	+	–	+	+	+	+	+	+
Hammond, 1979[172]	?	–	+	+	–	+	?	+	+	+	+	+	+
Khong, 2001[173]	–	–	+	+	+	+	?	+	–	+	–	+	+
Leibowitz, 1980[22]	+	+	–	–	+	+	?	+	+	?	+	+	+
Marraffa, 1989[174a]	+	+	+	+	–	?	?	+	+	+	+ ?	+	+
Schultz, 1995[175]	+	–	+	+	–	+	+	+	+	+	–	–	?
Spry, 2005[176b]	+	–	+	+	+ –	+	+ –	+	+	+	+	+	+
Theodossiades, 2001[177]	?	–	+	+	–	?	?	?	–	+	+	–	+
Case–control studies													
Airaksinen, 1984[178]	?	+	+	+	+	+	+	+	+	+	+	+	+
Anton, 1997[179]	+	–	+	+	+	–	+	+	–	+	?	–	–
Damato, 1989[180]	?	–	?	?	+	?	+	+	+	+	?	–	–
Enger, 1987[181]	–	–	?	?	–	–	+	?	+	+	–	–	?
Harper, 1994[182c]	+	–	?	?	+ –	–	?	+	+	+	+	+ –	?
Heeg, 2005[183]	+	–	?	–	+	–	+	+	+	+	–	+	+
Ieong, 2003[186]	–	–	+	+	+	+	+	+	+	+	+	–	?
Johnson, 1999[187]	?	?	?	?	?	?	+	+	–	+	–	+	+
Quigley, 1980[188d]	+	–	+	+	+ –	+	?	+	+	+	+	+	?
Sommer, 1979[189]	–	+	+	+	?	+	?	+	–	–	–	–	–
Wollstein, 2000[190]	–	–	+	–	+	+	+	?	+	+	+	–	–
Wood, 1987[191]	?	?	+	+	?	+	+	+	+	+	+	–	–

[a] Question 11 was Yes for Henson, Unclear for the other perimetry tests.
[b] Questions 5 and 7 were Yes for FDT, No for SAP.
[c] Questions 5 and 12 were Yes for OKP, No for SAP.
[d] Question 5 was Yes for RNFL, No for optic disc photography.

Key to questions:

Q1. Patient spectrum representative?
Q2. Reference standard follow-up confirmation of glaucoma?
Q3. Whole/random sample received verification with reference standard?
Q4. Same reference standard regardless of index test?
Q5. Reference standard independent of index test?
Q6. Index test interpreted without knowledge of results of reference standard?
Q7. Reference standard interpreted without knowledge of results of index test?
Q8. Same clinical data available as when test would be used in practice?
Q9. Uninterpretable/intermediate/incomplete test results reported?
Q10. Withdrawals explained?
Q11. Technology of index test still current?
Q12. Clear definition of positive result provided?
Q13. Definition of a positive index test determined before study was carried out?

The wording of both Q1 and Q8 differed according to whether the study was population based or carried out on an already suspect population. For population-based studies Q1 was 'Was the sample selected from an unscreened population with a glaucoma prevalence between >0 and 20%?' and for studies on an already suspect population Q1 was 'Is the sample constructed from previously undiagnosed glaucoma patients referred from primary care or are the cases and controls representative of those detected in primary care?'

For population-based studies Q8 was 'Were the same clinical data available when test results were interpreted as would be available when the test is used in practice? For screening studies: index test results alone?' and for studies on an already suspect population Q8 was 'Were the same clinical data available when test results were interpreted as would be available when the test is used in practice? For diagnostic studies: may include information from ophthalmic examination and/or co-morbidity.'

Appendix 12

Characteristics of the included studies: screening and diagnostic tests review

TABLE 82 *Studies included in the screening and diagnostic tests review*

Study	Index test(s)	Test(s) carried out and interpreted by	Reference standard	Enrolled (people)	Analysed	Mean age, years (range)	Gender	Country	Period
Population-based studies									
Anton, 2004[99]	GAT	Ophthalmologists	Ophthalmic examination	569	510	(40–79)	M: 232; F: 278	Spain (Segovia Study)	NS
Bengtsson, 1980[100]	GAT	Ophthalmologists	Ophthalmic examination	1938	1511	(55–69)	NS	Sweden (Dalby Population Survey)	1977–1978
Bonomi, 2001[106]	GAT	Ophthalmologists	Follow-up confirmation	5816	4297 eyes of 4297 people	(40 –80+)	M: 1882; F: 2415	Italy (Egna–Neumarkt Study)	NS
Christoffersen, 1995[154]	OKP	GPs, medical secretaries	Ophthalmic examination	195	187	57 (40–84)	M: 51; F: 136	Norway	NS
Detry-Morel, 2004[155]	FDT C-20-5	Residents in training, paramedical staff	Ophthalmic examination	1802	3211 eyes of 1620 people	63 (22–97)	M: 680; F: 940	Belgium	October 1999
Harasymowycz, 2005[156]	HRT II	Ophthalmic photographer	Ophthalmic examination	303	264 right eyes, 265 left eyes of 271 people	62.2 (SD 11.6)	M: 90; F: 179	Canada	August 2003 – February 2004
Hollows, 1966[21]	GAT	Ophthalmologists	Ophthalmic examination	4608	4231	55 (40–74)	Approx. M: 3639; F: 592	UK (Rhondda Valley Study)	Summer 1963
Ivers, 2001[157]	SAP suprathreshold; GAT	NS	Ophthalmic examination	4433	3654 (both tests)	(49–97)	M: 1582; F: 2072	Australia (Blue Mountains Eye Study)	1992–1994
Katz, 1991[158,160]	SAP threshold	NS	Ophthalmic examination	355	355 eyes of 355 people	Cases: 61; controls: 53	NS	USA (Glaucoma Screening Study)	1981–1992
Katz, 1993[72,159]	SAP suprathreshold	NS	Ophthalmic examination	5308	4733	(40–80+)	M: 2109; F: 3199	USA (Baltimore Eye Survey)	January 1985 to November 1988
Kozobolis, 2000[112]	GAT	Ophthalmologists?	Ophthalmic examination	1300	1107	(40–80+)	M: 463; F: 644	Greece (Crete, Greece Glaucoma Study)	February 1993 to June 1998
Mansberger, 2005[161]	FDT C-20-5	NS	Ophthalmic examination	296	251 eyes of 251 people	45 (30–65)	M: 117; F: 174	India	NS
Mundorf, 1989[162]	SAP suprathreshold	NS	Ophthalmic examination	145	145	71	M: 40; F: 105	USA	NS

continued

TABLE 82 *Studies included in the screening and diagnostic tests review (cont'd)*

Study	Index test(s)	Test(s) carried out and interpreted by	Reference standard	Enrolled (people)	Analysed	Mean age, years (range)	Gender	Country	Period
Robin, 2005[163]	Ophthalmoscopy; HRT II; SAP threshold; FDT C-20-5	Appropriately trained staff	Ophthalmic examination	704	261 eyes of 261 people (both tests)	65	M: 281; F: 378	Australia	November 2001
Vernon, 1990[164,165]	Ophthalmoscopy; SAP suprathreshold; NCT	Ophthalmoscopy: experienced ophthalmologists; NCT/SAP: non-ophthalmological trained staff	Ophthalmic examination	988	854 (ophthalmoscopy); 855 (SAP); 874 (NCT)	65	M: 374; F: 500	UK	NS
Vitale, 2000[166]	Optic disc photography; SAP suprathreshold	Experienced technicians	Follow-up confirmation	249	182 (disc photography); 228 (SAP);	68 F: 149	M: 100;	USA (Baltimore Eye Study Follow-up Study)	1994
Wang, 1998[167,168]	Ophthalmoscopy; SAP suprathreshold; GAT (RNFL photography)	NS	Ophthalmic examination	530	400 (ophthalmoscopy); 214 (SAP); 357 (GAT) (136 RNFL photo)	(40–65+)	M: 111; F: 294	USA	July 1991 to February 1992
Weih, 2001[115]	Ophthalmoscopy	NS	Consensus by panel of ophthalmo-logists, based on results of ophthalmic examination	4744	4636	59 (SD 12)	M: 2230; F: 2514	Australia (Visual Impairment Project)	1992–1996
Wolfs, 1999[169]	Optic disc photography	Technicians	Ophthalmic examination	6777	5143 eyes of 5143 people	(55+)	NS	Netherlands (Rotterdam Study)	NS

continued

TABLE 82 *Studies included in the screening and diagnostic tests review (cont'd)*

Study	Index test(s)	Test(s) carried out and interpreted by	Reference standard	Enrolled (people)	Analysed	Mean age, years (range)	Gender	Country	Period
Yamada, 1999[170]	OKP; FDT C-20-1	Technicians	Decision of glaucoma specialists, based on ophthalmologic history, examination and Humphrey visual field results	259	175 eyes of 175 people (OKP); 240 eyes of 240 people (FDT)	FDT: 59.6 (SD 14.7); OKP: 58.8 (SD 15.6)	M: 108; F: 135	USA	NS
Already suspect population (cohort studies)									
Ekstrom, 1993[171]	GAT	NS	Follow-up confirmation	760	413	(65–74)	M: 364; F: 396	Sweden (Tierp Glaucoma Survey)	March 1984 to March 1986
Hammond, 1979[172]	Ophthalmoscopy	Nurses skilled in use of the ophthalmoscope	Ophthalmic examination	219	188	(21+)	NS	USA	NS
Khong, 2001[173]	FDT C-20-5	NS	Ophthalmic examination	228	113	68.5 (23–91)	M: 104; F: 119	Australia	December 1999 to January 2000
Leibowitz, 1980[22]	GAT	Generally performed by second or third year residents in ophthalmology	Follow-up confirmation	2631	574	(<65–75+)	M: 272; F: 302	USA (Framingham Eye Study)	February 1973 to February 1975
Marraffa, 1989[174]	SAP suprathreshold	Ophthalmologists	Follow-up confirmation	104	182 eyes of 104 people	54.3 (18–76)	M:45; F: 59	Italy	NS
Schultz, 1995[175]	Optic disc photography	Carried out: NS; interpreted: third year ophthalmology residents	Ophthalmic examination	258	365 eyes of ? people	(<40–>70)	M: 112; F: 144; Unknown: 2	USA	NS
Spry, 2005[176]	SAP threshold; FDT C-20 matrix	SAP: clinic staff trained in visual field testing; FDT: NS	Ophthalmic examination	48	48 (both tests)	67.3 (SD 13.5)	M: 24; F: 24	UK	October 2003 to January 2004
Theodossiades, 2001[177]	Ophthalmoscopy	Optometrists	Ophthalmic examination	50	50 eyes of 50 people	NS	NS	UK	NS

continued

TABLE 82 *Studies included in the screening and diagnostic tests review (cont'd)*

Study	Index test(s)	Test(s) carried out and interpreted by	Reference standard	Enrolled (people)	Analysed	Mean age, years (range)	Gender	Country	Period
Already suspect population (case–control studies)									
Airaksinen, 1984[178]	RNFL photography	NS	Follow-up confirmation	142	132 eyes of 132 people	Glaucoma: 62 (SD 20.5); normal: 54 (SD 16.9); OHT: 57 (SD 12.7)	NS	Canada and Finland	NS
Anton, 1997[179]	SAP threshold	Ophthalmologists?	Ophthalmic examination	180	180 eyes of 180 people	Glaucoma: 61 (SD 8); normal: 59 (SD 9)	NS	Spain	NS
Damato, 1989[180]	OKP	Staff experienced in perimetry	Ophthalmic examination	102	102 eyes of 102 people	Glaucoma: 57.3; normal: 54.4	NS	UK	NS
Enger, 1987[181]	SAP threshold	NS	Ophthalmic examination	112	170 eyes of 112 people	Glaucoma: 61 (28–80); normal: 51 (26–75)	NS	USA	NS
Harper, 1994[182]	OKP; SAP suprathreshold	Ophthalmologists?	Ophthalmic examination	212	193 (OKP); 212 (SAP)	Glaucoma: 67.8 (43–85); normal: 61.5 (41–85)	NS	UK	NS
Heeg, 2005[183–185]	FDT C-20-1; FDT C-20 full threshold	NS	Ophthalmic examination	1112	208 (FDT C-20-1); 1112 (FDT C-20 full threshold)	Glaucoma: 65 (13–91); normal: 63 (33–94)	Glaucoma: M: 509; F: 542 Normal: M: 118; F: 119	Netherlands (Groningen Longitudinal Glaucoma Study)	July 2000 to June 2001
Johnson, 1999[187]	FDT C-20-1	NS	Ophthalmic examination	108	160 eyes of 108 people	Glaucoma: 64 (35–85); normal: 46 (18–81)		USA	NS
Ieong, 2003[186]	HRT II; SAP suprathreshold	Optometrists	Ophthalmic examination	66	66 eyes of 66 people (both tests)	Glaucoma: 69; normal: 60	Glaucoma: M: 16; F: 13 Normal: M: 16; F: 21	UK	NS

continued

TABLE 82 *Studies included in the screening and diagnostic tests review (cont'd)*

Study	Index test(s)	Test(s) carried out and interpreted by	Reference standard	Enrolled (people)	Analysed	Mean age, years (range)	Gender	Country	Period
Quigley, 1980[188]	Optic disc photography; RNFL photography	Ophthalmologists	Ophthalmic examination	175	294 eyes of ? people	Readable photographs: glaucoma: 52.7 (SD 2.78); glaucoma suspect: 45.2 (SD 1.56); normal: 37.9 (SD 2.8) Unreadable photographs: glaucoma: 62.5 (SD 4.0); glaucoma suspect: 59.6 (SD 6.3); normal: 50 (SD 12.1)	Glaucoma: M: 39; F: 30 Glaucoma suspect: M: 93; F: 101 Normal: M: 36; F: 36	USA	January 1978 to April 1979
Sommer, 1979[189]	Optic disc photography; RNFL photography	NS	Follow-up confirmation	Unclear	223 eyes of ? people (both tests)	NS	NS	USA	NS
Wollstein, 2000[190]	Optic disc photography	Photographs taken by trained technicians; assessed by glaucoma consultants, glaucoma fellow, clinical glaucoma technician	Ophthalmic examination	123	123 eyes of 123 people	Glaucoma: 65.1 (SD 10.06); normal: 57.1 (SD 12.52)	NS	UK	NS
Wood, 1987[191]	Ophthalmoscopy	Ophthalmologists; junior doctors	Ophthalmic examination	22	43 eyes of 22 people	(32 to 75)	NS	UK	NS

Numbers analysed are people unless otherwise stated.
NS, not stated.

Appendix 13

Results by type of test: screening and diagnostic tests review

TABLE 83 *Ophthalmoscopy*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Robin, 2005,[163] 1 Directly compares ophthalmoscopy with HRT II, SAP threshold and FDT C-20-5	261 (eyes of 261 people)	Slit-lamp stereo-biomicroscopy	VCDR ⩾ 0.4	19	104	0	138	100	57	7.3
				VCDR ⩾ 0.5	18	62	1	180	95	74	
				VCDR ⩾ 0.6	18	33	1	209	95	86	
				VCDR ⩾ 0.7[a]	9	6	10	236	47	98	
				VCDR ⩾ 0.8	9	10	10	232	47	96	
				VCDR ⩾ 0.9	2	19	17	223	11	92	
2	Vernon, 1990,[164] 1 Directly compares ophthalmoscopy with SAP suprathreshold and NCT	854 (people)		Discs graded as normal or suspicious[a]	7	11	5	831	58	99	1.4
3	Wang, 1998,[168] 1 Directly compares ophthalmoscopy with SAP suprathreshold and GAT	400 (people)		CDR ⩾ 0.5	63	86	6	245	91	74	17.0
4	Weih, 2001,[115] 1	4636 (people)		VCDR > 0.7[a]	33	138	47	4418	41	97	1.8
				CD asymmetry >0.3	11	109	74	4529	13	98	
5	Hammond, 1979,[172] 2a	188 (people)		CDR ⩾ 0.5	6	9	1	172	86	95	
6	Theodossiades, 2001,[177] 2a	50 (eyes of 50 people)		Subjective[a]	21	7	2	20	91	74	
7	Wood, 1987,[191] 2b Early/moderate glaucoma	43 (eyes of 22 people)		Subjective criteria[a] Consultants	9	6	7	21	56	78	
				Subjective criteria Junior doctors	10	8	6	19	63	70	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section ‘Data analysis’ (p. 43) for an explanation of the common cut-off.

TABLE 84 *Optic disc photography*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Vitale, 2000,[166] 1[b] Directly compares optic disc photography with SAP suprathreshold	182 (people)	Imagenet (Topcon)	VCDR > 0.59[a]	34	57	10	81	77	59	
				Rim area/disc area <0.66	32	50	12	85	73	62	
2	Wolfs, 1999,[169] 1 (Rotterdam Study)	5143 (eyes of 5143 people)	Imagenet (Topcon)	VCDR ⩾ 0.7[a] or asymmetry in VCDR of ⩾ 0.3 between the two eyes or minimal neural rim of ⩽0.15	28	1394	9	3712	76	73	0.7
3	Quigley, 1980,[188] 2b Directly compares optic disc with RNFL photography	294 (eyes of 175? people)	Optic disc stereo photographs	VCDR > 0.6[a]	43	38	13	200	77	84	
4	Schultz, 1995,[175] 2a	411 (eyes of ?? people)	Nidek fundus camera, X16 stereo photographs	Clinical judgement	111	11	42	247	73	96	
				VCDR ⩾ 0.5	129	36	24	222	84	86	
				VCDR ⩾ 0.6	104	4	49	254	68	98	
		365 (eyes of ?? people)	Nidek fundus camera, 35-mm stereo photographs	Clinical judgement	96	9	41	219	70	96	
				VCDR ⩾ 0.5	118	25	19	203	86	89	
				VCDR ⩾ 0.6[a]	89	4	48	224	65	98	
5	Sommer, 1979,[189] 2b Directly compares optic disc with RNFL photography	223 (eyes of ?? people)	Optic disc stereo photographs (very old method)	Horizontal CDR ⩾ 0.6	11	17	6	189	65	92	
				VCDR ⩾ 0.6[a]	12	13	5	193	71	94	
				Width of the narrowest rim	12	10	5	196	71	95	
				Concave slopes	10	16	7	190	59	92	
				Concave slopes and CDR ⩾ 0.05 in the vertical than horizontal direction	6	1	9	205	40	100	
		109 (eyes of ?? people)		Asymmetry of the narrowest rim	9	6	4	90	69	94	

continued

TABLE 84 *Optic disc photography (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
6	Wollstein, 2000,[190] 2b Early glaucoma	123 (eyes of 123 people)	Canon CF6OU camera, 30° setting with Kodak Ektachrome EPR 150 film	Normal/glaucomatous disc based on majority opinion of five observers[a]		36	4	15	68	71	94
		58 (eyes of 58 people)		Subanalysis of photographs rated as good. (Number of participants with glaucoma not stated)					47	98	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.
[b] Prevalence not given: case–control study with the participant sample taken from screening studies.

TABLE 85 *RNFL photography*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Airaksinen, 1984,[178] 2b	132 (eyes of 132 people)	Canon CF 60z wide angle camera	Diffuse and/or localised defect[a]	48	32	3	49	94	61	
2	Sommer, 1979,[189] 2b Directly compares RNFL with optic disc photography	223 (eyes of ?? people)	NFL (optic disc) stereo photographs	NFL (flattened or lost) NFL (lost)[a]	13 10	19 4	4 7	187 202	77 59	91 98	
3	Wang, 1994[167] (secondary report to Wang, 1998[168]), 1	136 (people)	Topcon system	Diffuse and/or localised defect[a]	9	20	5	102	64	84	17.0
4	Quigley, 1980,[188] 2b Directly compares RNFL with optic disc photography	294 (eyes of 175? people)	Black-and-white monochromatic photographs	Diffuse or localised defect[a]	37	24	19	214	66	90	

NFL, nerve fibre layer.
Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.

TABLE 86 *HRT II*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Robin, 2005,[163] 1 Directly compares HRT II with ophthalmoscopy, SAP threshold and FDT C-20-5	261 (eyes of 261 people)	HRT II	⩾1 borderline or outside normal limits[a]	18	47	1	195	95	81	7.3
				⩾2 borderline or outside normal limits	17	26	2	216	90	89	
				⩾3 borderline or outside normal limits	17	23	2	219	90	91	
2	Harasymowycz, 2005,[156] 1	265 (left eyes of 271 people) and 264 (right eyes of same 271 people)	HRT II. MRA	⩾1 borderline or outside normal limits[a] Left eyes	12	28	2	223	86	89	5.3 (in those who could do the test)
				⩾1 borderline or outside normal limits. Right eyes	13	33	0	218	100	87	
3	Ieong, 2003,[186] 2b Directly compares HRT II with SAP suprathreshold	66 (eyes of 66 people)	HRT II	Global or one of the six segments flagged abnormal[a]	20	2	9	35	69	95	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.

TABLE 87 *FDT*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
C-20-1											
1	Yamada, 1999,[170] 1 Directly compares FDT C-20-1 with OKP	240 (eyes of 240 people)	Screening mode (assumed C-20-1)	1 abnormal point (counting)[a]	24	31	2	183	92	86	10.7
				Grading method (cut-off two points)	24	31	2	183	92	86	
2	Johnson, 1999,[187] 2b	160 (eyes of 108 people)	C-20-1 screening	1 abnormal point[a]	52	0	4	104	93	100	
				2 abnormal points	45	0	11	104	80	100	
				2 clustered abnormal points	43	0	13	104	77	100	
3	Stoutenbeek, 2004,[185] 2b (secondary report to Heeg, 2005[183]) (Groningen Longitudinal Glaucoma Study)	208 (people)	C-20-1 screening mode	1 abnormal point[a]	91	13	9	95	91	88	
				2 abnormal points	84	6	16	102	84	94	
				3 abnormal points	78	5	22	103	78	95	
				4 abnormal points	68	3	32	105	68	97	
				5 abnormal points	65	2	35	106	65	98	
C-20-5											
1	Detry-Morel, 2004,[155] 1	3211 (eyes of ?? people)	C-20-5 screening (reliable or otherwise)	1 abnormal point[a]	39	1117	28	2027	59	64	3.6
				2 clustered abnormal points	30	770	37	2374	45	76	
2	Mansberger, 2005,[161] 1	251 (eyes of 251 people)	C-20-5 screening (reliable and repeated)	1 abnormal point[a]	4	26	53	168	7	87	24.4
3	Robin, 2005,[163] 1 Directly compares FDT C-20-5 with ophthalmoscopy, HRT II and SAP threshold	261 (eyes of 261 people)	C-20-5 screening (repeated results)	1 abnormal point[a]	16	109	3	133	84	55	7.3
				2 abnormal points	15	83	4	159	79	66	
				3 abnormal points	15	65	4	177	79	73	
				1 abnormal point at moderate or severe level	13	57	6	185	68	76	

continued

TABLE 87 *FDT (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
4	Johnson, 1999,[187] 2b	160 (eyes of 108 people)	C-20-5 screening	1 abnormal point[a]	55	11	1	93	98	89	
				2 abnormal points	54	7	2	97	96	93	
				2 clustered abnormal points	52	5	4	99	93	95	
5	Khong, 2001,[173] 2a	113 (people)	C-20-5 screening (repeated)	1 abnormal point on repeat testing[a]	2	35	0	76	100	69	
C-20 full threshold, C-20 matrix											
1	Heeg, 2005,[183] 2b (Groningen Longitudinal Glaucoma Study)	1112 (people)	C-20 full threshold	MD < –1.8 dB	407	201	45	459	90	70	
				PSD > +4.8 dB	411	254	41	406	91	62	
				TD > 1 abnormal point at 1%	407	151	45	509	90	77	
				PD > 0 abnormal point at 1%	407	296	45	365	90	55	
	Heeg, 2005,[184] 2b (secondary report to Heeg, 2005[183])	689 (people)	C-20 full threshold	TD > 2 abnormal points at 1%	389	36	63	201	86	85	
				TD > 3 abnormal points at 1%	371	28	81	209	82	88	
				TD > 1 abnormal point at 1% and MD < –1.8 dB	393	40	59	197	87	83	
				TD or MD	416	71	36	166	92	70	
				TD and PSD > +4.8 dB	384	38	68	199	85	84	
				TD or PSD	434	83	18	154	96	65	
				TD and PD > 0 abnormal points at 1%	375	38	77	199	83	84	
				TD or PD	438	104	14	133	97	56	
		Subgroup of 249		FDT1 > 1 abnormal point at 1% and FDT2 > 1 abnormal point at 1%	100	15	20	114	83	88	
				FDT1 > 1 and FDT2 > 1, same location	98	13	22	116	82	90	
				FDT1 > 5 or (FDT1 > 1 and FDT2 > 1), same location	101	13	19	116	84	90	
		Subgroup of 566 (early glaucoma excluded)		TD > 1 abnormal point at 1%	329	45	0	192	100	81	
				TD > 2 abnormal points at 1%	326	36	3	201	99	85	
				TD > 3 abnormal points at 1%	319	28	10	209	97	88	
		Subgroup of 206 (early glaucoma excluded)		FDT1 > 1 abnormal point at 1% and FDT2 > 1 abnormal point at 1%	76	15	1	114	99	88	
				FDT1 > 1 and FDT2 > 1, same location	75	13	2	116	97	90	
				FDT1 > 5 or (FDT1 > 1 and FDT2 > 1), same location	76	13	1	116	99	90	

continued

TABLE 87 *FDT (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
	Stoutenbeek, 2004,[185] 2b (secondary report to Heeg, 2005[183])	208 (people)	C-20 full threshold (total deviation 5%)	1 abnormal point	96	30	4	78	96	72	
				2 abnormal points	91	18	9	90	91	83	
				3 abnormal points	87	16	13	92	87	85	
				4 abnormal points	82	11	18	97	82	90	
				5 abnormal points	75	9	25	99	75	92	
2	Spry, 2005,[176] 2a Directly compares FDT C-20 matrix with SAP threshold	48 (people)	Humphrey Matrix 24-2	GHT 'outside normal limit' and/or PSD $p < 0.05$ in one or both eyes	15	24	0	9	100	27	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.
PSD, pattern standard deviation.

TABLE 88 *OKP*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Christoffersen, 1995,[154] 1	187 (people)		⩾1 or more points missing[a]	16	11	0	160	100	94	1.6
2	Yamada, 1999,[170] 1 Directly compares OKP with FDT C-20-1	175 (eyes of 175 people)	Damato campimetry	1 abnormal point[a]	18	35	1	121	95	78	10.7
3	Damato, 1989,[180] 2b	102 (eyes of 102 people)		⩾1 of 6 points missed[a]	42	5	9	46	82	90	
4	Harper, 1994,[182] 2b Early glaucoma	193 (people)	Excluding 16 patients unable to provide a test outcome	If ⩾1 OKP chart numbers consistently made the black stimulus disappear[a]	13	9	39	132	25	94	
		209 (people)	Including 16 patients unable to provide a test outcome and classifying them as test positive	If ⩾1 OKP chart numbers consistently made the black stimulus disappear	25	13	39	132	39	91	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.

TABLE 89 *SAP*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
Suprathreshold											
1	Ivers, 2001,[157] I Directly compares SAP suprathreshold with GAT (Blue Mountains Eye Study)	3654 (people)	Humphrey 76 point suprathreshold	⩾1 points missing	87	1784	0	1783	100	50	2.4
				⩾3 points missing[a]	77	980	10	2587	89	73	
				⩾5 points missing	41	624	46	2943	47	83	
				⩾10 points missing	32	303	55	3264	37	92	
2	Katz, 1993,[159] I (Baltimore Eye Survey)	4733 (people)	Humphrey FF120	⩾17 relative or absolute defects and/or cluster of 8 in any one quadrant[a]	122	1148	24	3439	84	75	3.0
				⩾17 without cluster of 8 criterion	109	967	37	3620	75	79	
				⩾20 without cluster of 8 criterion	105	892	41	3695	72	81	
				⩾25 without cluster of 8 criterion	89	582	57	4005	61	87	
				⩾30 without cluster of 8 criterion	78	446	68	4141	53	90	
				⩾35 without cluster of 8 criterion	64	348	82	4239	44	92	
				⩾40 without cluster of 8 criterion	53	271	93	4316	36	94	
3	Mundorf, 1989,[162] I	145 (people)	Humphrey Armaly suprathreshold	⩾4 abnormal points in any single quadrant[a]	9	40	1	95	90	70	6.9
4	Vernon, 1990,[164] I Directly compares SAP suprathreshold with ophthalmoscopy and NCT	855 (people)	Henson CFS2000 26 point suprathreshold	Sufficient points to drop the indicator into the suspicious zone or below[a]	3	30	9	813	25	96	1.4
5	Vitale, 2000,[166] I[b] Directly compares SAP suprathreshold with optic disc photography	228 (people)	Dicon (supra-threshold program 1)	2 abnormal adjacent points	35	47	23	123	60	72	
				3 abnormal adjacent points[a]	29	29	29	141	50	83	
				⩾2 abnormal adjacent points, any location	41	71	17	99	71	58	

continued

TABLE 89 *SAP (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
6	Wang, 1998,[168] 1 Directly compares SAP suprathreshold with ophthalmoscopy, and GAT	214 (people)	Humphrey FF120 test	Absolute or relative defects ⩾17[a]	48	48	21	97	70	67	17.0
7	Harper, 1994,[182] 2b Early/moderate glaucoma	212 (people)	Henson CFS2000 26 point suprathreshold	⩾1 missed point[a]	57	9	10	136	85	94	
8	Ieong 2003,[186] 2b Directly compares SAP suprathreshold with HRT II Early glaucoma	66 (eyes of 66 people)	Dicon SVFA 40 points	Optometrist judgement[a]	21	2	8	35	72	95	
9	Marraffa, 1989,[174] 2a	182 (eyes of 104 people)	Henson CFS2000	⩾1 absolute defect associated with 1 relative defect or 3 adjacent relative defects or 4 non-adjacent relative defects or sure nasal step[a]	72	5	68	37	51	88	
			Humphrey 630 Armaly full field test	⩾1 absolute defect associated with 1 relative defect or 3 adjacent relative defects or 4 non-adjacent relative defects or sure nasal step	90	15	50	27	64	64	
			Perikon (Opticon. Genoa screening	⩾1 absolute defect associated with 1 relative defect or 3 adjacent relative defects or 4 non-adjacent relative defects or sure nasal step	77	4	63	38	55	90	
			Octopus 2000R. G1 programme	⩾1 absolute defect associated with 1 relative defect or 3 adjacent relative defects or 4 non-adjacent relative defects or sure nasal step	129	7	11	35	92	83	

continued

TABLE 89 *SAP (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
Threshold											
1	Katz, 1991,[158] 1[b] Early/moderate glaucoma (Glaucoma Screening Study)	355 (eyes of 355 people)	Humphrey 30-2. Statpac 1	Global indexes, MD, $p < 0.05$	82	31	24	218	77	88	
				Global indexes, MD, $p < 0.01$	72	15	34	234	68	94	
				Global indexes, CPSD, $p < 0.05$	96	40	10	209	91	84	
				Global indexes, CPSD, $p < 0.01$	80	19	26	230	76	92	
			Humphrey 30-2	Clusters, AGIS	102	54	4	195	96	78	
				Clusters, LTG, dB	97	40	9	209	92	84	
				Clusters, LTG, *p*-values	103	39	3	210	97	84	
				Cross-meridional, GLASS mirror image	97	31	9	218	92	88	
				Cross-meridional, GHT abnormal only	97	32	9	217	92	87	
				Cross-meridional, GHT abnormal/borderline[a]	99	57	7	192	93	77	
2	Robin, 2005,[163] 1 Directly compares SAP threshold with ophthalmoscopy, HRT II and FDT C-20-5	261 (eyes of 261 people)	24-2 Threshold screening	AGIS score ⩾1	17	101	2	141	90	58	7.3
				AGIS score ⩾2	14	76	5	166	74	69	
				AGIS score ⩾3[a]	12	62	7	180	63	74	
3	Anton, 1997,[179] 2b	180 (eyes of 180 people)	Octopus 500	LDA 59 points[a]	80	7	16	77	83	92	
				LDA 59 points, MD, LV	80	13	16	71	83	85	
				LDA 7 zones	77	25	19	59	80	70	
				LDA 7 zones, MD, LV	81	25	15	59	84	70	
				7 zones (quantitative value of the defects)	81	34	15	50	84	60	
4	Enger, 1987,[181] 2b Early/moderate glaucoma	170 (eyes of 112 people)	Humphrey 30-2 threshold. Statpac	MD, significance level cut-off 0.005	53	3	19	95	74	97	
				MD, significance level cut-off 0.01	55	5	17	93	76	95	
				MD, significance level cut-off 0.02	56	5	16	93	78	95	
				MD, significance level cut-off 0.05	60	11	12	87	83	89	
				MD, significance level cut-off 0.10	62	13	10	85	86	87	
				PSD, significance level cut-off 0.005	47	4	25	94	65	96	
				PSD, significance level cut-off 0.01	52	7	20	91	72	93	
				PSD, significance level cut-off 0.02	58	12	14	86	81	88	
				PSD, significance level cut-off 0.05	67	16	5	82	93	84	

continued

TABLE 89 *SAP (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
				PSD, significance level cut-off 0.10	67	21	5	77	93	79	
				MD+PSD (most significant), significance level cut-off 0.005	58	5	14	93	81	95	
				MD+PSD (most significant), significance level cut-off 0.01	62	8	10	90	86	92	
				MD+PSD (most significant), significance level cut-off 0.02	62	12	10	86	86	88	
				MD+PSD (most significant), significance level cut-off 0.05	67	19	5	79	93	81	
				MD+PSD (most significant), significance level cut-off 0.10	68	22	4	76	94	78	
				MD+PSD (least significant), significance level cut-off 0.005	42	2	30	96	58	98	
				MD+PSD (least significant), significance level cut-off 0.01	45	4	27	94	63	96	
				MD+PSD (least significant), significance level cut-off 0.02	52	5	20	93	72	95	
				MD+PSD (least significant), significance level cut-off 0.05	60	8	12	90	83	92	
				MD+PSD (least significant), significance level cut-off 0.10	61	12	11	86	85	88	
				Mirror image method[a]	70	10	2	88	97	90	
5	Spry, 2005,[176] 2a Directly compares SAP threshold with FDT C-20 matrix	48 (people)	SITA fast	GHT 'outside normal limit' and/or PSD $p < 0.05$ in one or both eyes[a]	12	16	3	17	80	52	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.
[b] Prevalence not given: case–control study with the participant sample taken from screening studies.

TABLE 90 *GAT*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Anton, 2004,[99] I	510 (people)		IOP > 21 mmHg[a]	3	5	7	495	30	99	2.0
2	Bengtsson, 1980,[100] I	1511 (people)		IOP > 20.5 mmHg[a]	7	103	8	1393	47	93	1.0
3	Bonomi, 2001,[106] I (Egna–Neumarkt Study)	4297 (eyes of 4297 people)	Ocular hypertension with normal	IOP 21–22 mmHg[a]	97	90	24	4086	80	98	2.0
4	Hollows, 1966,[21] I (Rhondda Valley Study)	4231 (people)		IOP > 21 mmHg[a]	13	384	7	3827	65	91	0.5
5	Ivers, 2001,[157] I Directly compares GAT with SAP suprathreshold, (Blue Mountains Eye Study)	3654 (people) 3654 (people)		IOP > 22 mmHg[a] IOP > 28 mmHg	12 3	89 53	75 84	3478 3514	14 3	98 99	2.4
6	Kozobolis, 2000,[112] I (Crete, Greece, Glaucoma Study)	1107 (people)		IOP > 21 mmHg[a]	28	73	3	1003	90	93	2.8
7	Leibowitz, 1980,[22] I[b] (Framingham Eye Study)	574 (people)		IOP > 21 mmHg[a]	5	82	45	442	10	84	
8	Wang, 1998,[168] I Directly compares GAT with ophthalmoscopy, RNFL photography and SAP suprathreshold	357 (people)		IOP > 21 mmHg[a]	19	12	50	276	28	96	17.0

continued

TABLE 90 *GAT (cont'd)*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
9	Ekstrom, 1993,[171] 2a	413 (people)		IOP ⩾ 21 mmHg[a]	8	76	5	324	62	81	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.
[b] Prevalence not given: data reported are for an already suspect subset of participants.

TABLE 91 *NCT*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Vernon, 1990,[164] 1 Directly compares NCT with ophthalmoscopy and SAP suprathreshold	874 (people)	Pulsair, four pulses per eye	IOP > 22 mmHg	11	38	1	824	92	96	1.4
	Vernon, 1991,[165] 1 (secondary report to Vernon, 1990[164])	874 (people)	Pulsair, four pulses per eye	IOP > 21 mmHg[a]	11	65	1	797	92	92	1.4
		874	Pulsair, four pulses per eye	IOP > 23 mmHg	10	21	2	841	83	98	
		874	Pulsair, four pulses per eye	IOP > 24 mmHg	9	13	3	849	75	99	
		874	Pulsair, four pulses per eye	IOP > 25 mmHg	7	6	5	856	58	99	
		874	Pulsair, four pulses per eye	IOP > 26 mmHg	5	3	7	859	42	100	
		874	Pulsair, one pulse per eye	IOP > 22 mmHg	9	65	3	797	75	93	
		874	Pulsair, two pulses per eye	IOP > 22 mmHg	10	51	2	811	83	94	
		874	Pulsair, three pulses per eye	IOP > 22 mmHg	10	39	2	823	83	96	

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.

TABLE 92 *Combined tests*

No.	Study, study type, stage targeted	Analysed	Test detail	Cut-off	TP	FP	FN	TN	Sensitivity (%)	Specificity (%)	Prevalence (%) of glaucoma
1	Robin, 2005,[163] 1	261 (eyes of 261 people)	Sequential testing with FDT then HRT II	FDT ⩾ 1 abnormal + HRT II ⩾ 1 abnormal	15	29	4	213	79	88	7.3
				FDT ⩾ 1 abnormal + HRT II ⩾ 2 abnormal	15	17	4	225	79	93	
				FDT ⩾ 2 abnormal + HRT II ⩾ 1 abnormal	14	21	5	221	74	91	
				FDT ⩾ 2 abnormal + HRT II ⩾ 2 abnormal	14	12	5	230	74	95	
2	Vernon, 1990,[164] 1	855 (people)	Pulsair NCT + Henson 26-point suprathreshold	Either IOP > 22 mmHg or sufficient points to drop the indicator into the suspicious zone or below	11	63	1	780	92	93	1.4

Study type: 1, population-based; 2, already suspect population (2a cohort, 2b case–control).
Prevalence of glaucoma is given for population-based studies only.
[a] The cut-off selected as the common cut-off. See the section 'Data analysis' (p. 43) for an explanation of the common cut-off.

Appendix 14

Quality assessment of the systematic review by Maier and colleagues (2005)[19]

TABLE 93 *Oxman quality assessment checklist for systematic reviews*

No. of reviews meeting criteria	Yes	Partially	No
1. Were the search methods used to find evidence (primary studies) on the primary question(s) stated?	✓		
2. Was the search for evidence reasonably comprehensive?	✓		
3. Were the criteria used for deciding which studies to include in the review reported?	✓		
4. Was bias in the selection of articles avoided?		✓	
5. Were the criteria used for assessing the validity of the studies that were reviewed reported?			✓
6. Was the validity of all of the studies referred to in the text assessed using appropriate criteria (either in selecting studies for inclusion or in analysing the studies that are cited)?	✓		
7. Were the methods used to combine the findings of the relevant studies (to reach a conclusion) reported?	✓		
8. Were the findings of the relevant studies combined appropriately relative to the primary question the review addresses?	✓		
9. Were the conclusions made by the author(s) supported by the data and/or the analysis reported in the review?	✓		
10. Overall, how would you rate the scientific quality of this review?	6		

1.	2.	3.	4.	5.	6.	7.
Extensive flaws		Major flaws		Minor flaws		Minimal flaws

Appendix 15

Included studies: glaucoma progression

Eid, 2003

Eid TM, Spaeth GL, Bitterman A, Steinmann WC. Rate and amount of visual loss in 102 patients with open angle glaucoma followed up for at least 15 years. *Ophthalmology* 2003;**110**:900–7.

Hattenhauer, 1998

Hattenhauer MG, Johnson DH, Ing HH, Herman DC, Hodge DO, Yawn BP, *et al*. The probability of blindness from open angle glaucoma. *Ophthalmology* 1998; **105**:2099–104.

Early Manifest Glaucoma Trial (EMGT)

Heijl A, Leske MC, Bengtsson B, Hyman L, Bengtsson B, Hussein M, *et al*. Reduction of intraocular pressure and glaucoma progression: results from the Early Manifest Glaucoma Trial. *Arch Ophthalmol* 2002;**120**:1268–79.

Collaborative Initial Glaucoma Treatment Study (CIGTS)

Lichter PR, Musch DC, Gillespie BW, Guire KE, Janz NK, Wren PA, *et al*. Interim clinical outcomes in the collaborative initial glaucoma treatment study comparing initial treatment randomized to medications or surgery. *Ophthalmology* 2001;**108**:1943–53.

Advanced Glaucoma Intervention Study (AGIS)

Nouri-Mahdavi K, Caprioli J, Coleman AL, Hoffman D, Gaasterland D. Pointwise linear regression for evaluation of visual field outcomes and comparison with the advanced glaucoma intervention study methods. *Arch Ophthalmol* 2005;**123**:193–9.

Olivius, 1978

Olivius E, Thorburn W. Prognosis of glaucoma simplex and glaucoma capsulare. A comparative study. *Acta Ophthalmol* 1978;**56**:921–34.

Quigley, 1996

Quigley HA, Tielsch JM, Katz J, Sommer A. Rate of progression in open angle glaucoma estimated from cross-sectional prevalence of visual field damage. *Am J Ophthalmol* 1996;**122**:355–63.

Collaborative Normal Tension Glaucoma Study (CNTGS)

Schulzer M, Alward WL, Feldman F, Cashwell LF, Wilensky J, Geijssen HC, *et al*. Comparison of glaucomatous progression between untreated patients with normal-tension glaucoma and patients with therapeutically reduced intraocular pressures. *Am J Ophthalmol* 1998;**126**:487–97.

Beaver Dam Study

Sponsel WE. Frequency of sustained glaucomatous-type visual field loss and associated optic nerve cupping in Beaver Dam Wisconsin. *Clin Exp Ophthalmol* 2001;**29**:352–8.

Spry, 2005

Spry PG, Sparrow JM, Diamond JP, Harris HS. Risk factors for progressive visual field loss in primary open angle glaucoma. *Eye* 2005;**9**:643–51.

Traverso, 2005

Traverso CE, Walt JG, Kelly SP, Hommer AH, Bron AM, Denis P, *et al*. Direct costs of glaucoma and severity of the disease: a multinational long term study of resource utilisation in Europe. *Br J Ophthalmol* 2005;**89**:1245–9.

Appendix 16

Glaucoma progression: approach 1 – randomised trials

TABLE 94 *Glaucoma progression: approach 1*

Study	Treatment	Age at recruitment (years)	Visual field at baseline (dB)	Length of follow-up	Visual field at follow-up (dB)	Definition of progression
CNTGS[254]	Treated (n = 61) Control (n = 79)	Mean (SD): 66.3 (10.3) 65.5 (9.6)	Mean (SD): 8.38 (5.26) Mean (SD): –7.54 (4.31) (moderate)	5 years	Mean defects [mean (SD)]: slope per year: –0.4992 (1.97) –0.4018 (3.65) Progressed at end of follow-up 22 (33%) = 6.6% per year 31 (39%) = 7.8% per year	Two adjacent points declined by 10 dB from baseline, 3× short-term fluctuation and worse than any corresponding value at baseline New defect: three points in previously normal area
EMGT[27]	Treated (n = 129) Control (n = 126)	Mean: 68	Mean (SD): –5.0 (3.7) Mean (SD): –4.4 (3.3) (mild)	6 years	Mean defects [mean (SD)] dB change per month: –0.03 (0.05) –0.05 (0.07) Progressed at end of follow-up 58 (45%) = 7.5% per year 78 (62%) = 10.3% per year	Progression based on visual field outcome (used glaucoma change probability maps to assess true non-chance from baseline to follow-up, three test points showing significant progression classed as definite progression)

Appendix 17

Glaucoma progression: approach 2 – studies

TABLE 95 *Glaucoma progression: approach 2*

Study	Treatment/model	Age at recruitment (years)	Visual field at baseline (dB)	Length of follow-up	Visual field at follow-up (dB)	Definition of progression
CIGTS[255]	Medicine (n = 307) Surgery (n = 300) (treated)	Mean (range): 57.5 (28–75)	Mean (SD): 4.6 (4.2) Mean (SD): 5 (4.3) Visual field scoring scale (mild)	5 years 63% had data at 5 years	Mean: 5.0 (SE 0.4) Mean: 5.2 (SE 0.4) Visual field scoring scale Progressed at end of follow-up (visits not patients): 314 (10.7%) = 2.1% per year 372 (13.5%) = 2.8% per year	Clinically substantial visual field loss: increase of ⩾3 from baseline in visual field score units
Nouri-Mahdavi, 2005 (AGIS)[262]	AGIS study subset (n = 591; eyes = 789) with a number of different types of progression criteria compared (treated)	65 (SD 9.5)	AGIS study patients had mean of 9 on visual field scale (moderate)	Mean 7.4 years (SD 1.7)	–2.07 (SD 0.86) dB per year in those who progressed only; (conservatively assuming that all non-progressed patients had 0-dB per year slopes, the population mean = –0.6 dB per year) Progressed at end of follow-up 30% = 4% per year	Pointwise linear regression: 1 point, 2 point, 2-point cluster, 2-point hemifield, 2-point GHT
Sponsel, 2001[267]	Beaver Dam Study; 120 patients (treated)	Range 43–84	(moderate)	5 years (treated)	Mild/moderate and no progression: 11/120 Progressed a category: 44/120 Improved one category: 22/120 Severe and stayed severe: 43/120 Progressed at end of follow-up: 44 (37%) = 7.5% per year	*Mild/early*: no defects within the central 10°; and field survived at 90% or more; and N/S/D rating of normal or suspicious; and <7 defects, with ⩾1 at 8 dB or greater which is >3° from blind spot *Moderate*: <4 defects within central 10°; and field survival of ⩾90%; and N/S/D rating of suspicious or defective; and 7–14 defects present *Severe*: threshold <23 dB or ⩾4 defects within central 10°, or field survival <90%; and N/S/D rating of defective; and ⩾15 defects present

continued

TABLE 95 *Glaucoma progression: approach 2 (cont'd)*

Study	Treatment/model	Age at recruitment (years)	Visual field at baseline (dB)	Length of follow-up	Visual field at follow-up (dB)	Definition of progression
Eid, 2003[263]	102 patients (treated)	54.7 (SD 12.0)	Stage at presentation Grade I: 45 Grade II: 31 Grade III: 17 Grade IV: 9 (Mild/moderate)	Mild to moderate: 7 years Moderate to severe: 6 years Severe to visually impaired: 14 years	Stable: 19/102 ⩾1 stage lost: 83 ⩾2 stages lost: 39 3 stages lost: 9 Mild to moderate: 36/45 = 11% per year Moderate to severe: 32/48 = 11% per year Severe to visually impaired: 4/9 = 3% per year	*Grade I*: rim present in all quadrants with early signs of glaucomatous damage either superiorly or inferiorly or diffuse change with CDR < 0.7 *Grade II*: no rim in less than one quadrant; or superior or inferior change without loss of rim tissue in either quadrant; or CDR < 0.9 *Grade III*: no rim in more than one but fewer than two quadrants; or diffuse narrowing at the NRR in all quadrants without total loss in any quadrant (ratio = 0.9) *Grade IV*: no rim in >2 <3 quadrants *Grade V*: no rim in ⩾3 quadrants The authors graded I mild, II and III moderate, IV severe and V visually impaired
Hattenhauer, 1998[264]	Olmsted County Study: 114 'classic' glaucoma cases (treated)	Mean 66 (SD 14)	(Mild/moderate)	15 years (SD 8)	Taking only 'classic' glaucoma patients bilateral blindness: 22% (8–38%), unilateral blindness: 54% (42–72%)	Blindness defined as corrected visual acuity of 20/200 or worse as measured by Snellen acuity, and/or visual constriction to ⩽20° in its widest diameter to the Goldmann III4e test object, or its equivalent on automated perimetry or tangent screen

continued

TABLE 95 *Glaucoma progression: approach 2 (cont'd)*

Study	Treatment/model	Age at recruitment (years)	Visual field at baseline (dB)	Length of follow-up	Visual field at follow-up (dB)	Definition of progression
Quigley,1996[266]	151 patients from the Baltimore Eye Study used to develop a model of progression (treated)	Approx. 65	(Mild/moderate)		Progression was 0.23 of a grading scale per year (95% CI 0.04 to 0.50) (i.e. 2 grades progressed in 10 years) Using the present study criteria, the probability of progressing would be 10% per year for each stage	*Grade I*: >16 defects on the full field 120 screening test on the Humphrey field analyser, and a normal Goldmann visual field *Grade II*: early visual field detection on Goldmann perimetry *Grade III*: definite visual field defect (Goldmann) *Grade IV*: visual field defect in both upper and lower visual fields of the same eye *Grade V*: visual field with absolute loss of one full quadrant (to V4e target) *Grade VI*: absolute loss of one full hemifield, or complete loss of one quadrant and a grade 3 level defect in other hemifield *Grade VII*: damage worse than that of grade VI but not satisfying grade VIII *Grade VIII*: blindness, indicated by visual acuity of 20/2000 or worse caused by glaucoma or by a central island of remaining field smaller than 10° to the V4e target The authors graded I and II mild, III and IV moderate; V and VI severe, and VII and VIII visually impaired
Traverso, 2005[259]	194 patients across Europe (treated)	Mean 64.7 (SD 12.1)	Stage 0: 33/194 Stage 1: 32/194 Stage 2: 34/194 Stage 3: 33/194 Stage 4: 31/194 Stage 5: 31/194 (Moderate)	5 years	29.6% progressed at least one stage = 6% per year	Bascom Palmer (Hodapp–Anderson–Parrish) glaucoma staging system

continued

TABLE 95 *Glaucoma progression: approach 2 (cont'd)*

Study	Treatment/model	Age at recruitment (years)	Visual field at baseline (dB)	Length of follow-up	Visual field at follow-up (dB)	Definition of progression
Spry, 2005[268]	108 patients (treated)	Mean 71 (SD 11)	AGIS score =3.3 (Mild cases)	3.6 years (SD 1.3)	19% progressed = 5% per year	AGIS criteria used
Olivius, 1978[265]	160 eyes (119 patients)	66	Grade I – 27 Grade II – 34 Grade III – 39 Grade IV – 24 Grade V – 16 Grade VI – 5 Grade VII – 12 Grade VIII – 3	5 years	Mild to moderate (20/61 = 6.6% per year) Moderate to severe (19/31 = 12% per year) Severe to blind (13/16 = 16% per year)	*Stage I*: diagnosed OAG without glaucomatous disc cuppings (ocular hypertension excluded) *Stage II*: glaucomatous disc cupping but normal visual field *Stage III*: glaucomatous disc cupping and one scotoma within 30°, or nasal step or sector-shaped defect in the periphery *Stage IV*: as stage III with the addition of a new scotoma within 30° or the creation of a breakthrough to the periphery *Stage V*: as stage IV with the addition of breakthrough to the periphery both upwards and downwards from the central scotoma *Stage VI*: a small central remnant of the visual field plus a temporal remnant *Stage VII*: a temporal remnant, loss of the whole central visual field *Stage VIII*: amuarosis The authors graded I and II mild, III and IV moderate, V severe, and VI–VIII visually impaired

Appendix 18

Included studies: cost-effectiveness of screening for open angle glaucoma

Boivin, 1996

Primary reference

Boivin JF, McGregor M, Archer C. Cost-effectiveness of screening for primary open angle glaucoma. *J Med Screen* 1996;**3**:154–63.

Duplicate reference

Boivin J, McGregor M. *The screening of primary open angle glaucoma – systematic review*. Montreal: Conseil d'Evaluation des Technologies de la Sante du Quebec; 1995.

Gooder, 1995

Gooder P. *Screening for glaucoma*. Development and Evaluation Committee (DEC) Report No. 38. Bristol: Research & Development Directorate South and West, 1995.

Gottlieb, 1983

Gottlieb LK, Schwartz B, Pauker SG. Glaucoma screening. A cost-effectiveness analysis. *Surv Ophthalmol* 1983;**28**:206–26.

Tuck, 1997

Tuck MW, Crick RP. The cost-effectiveness of various modes of screening for primary open angle glaucoma. *Ophthalmic Epidemiol* 1997;**4**:3–17.

Appendix 19

Characteristics of included studies: cost-effectiveness of screening for open angle glaucoma

TABLE 96 *Cost-effectiveness of screening for OAG: included studies*

Study and setting	Target population	Strategies	Type of study	Outcome measures	Source of data	Time-horizon	Unit costs	Results/authors' conclusions	Comment
Boivin, 1996[279,280] Canada	Population of Quebec province of Canada aged 40–79 years (estimated to be 2,607,210 in 1991)	Two main screening strategies were compared: (1) Screening with tonometry and fundoscopy initially followed by gonioscopy and perimetry (2) Screening with tonometry initially followed by fundoscopy, gonioscopy and perimetry Both strategies were further assessed by varying age groups, compliance, participation and treatment efficacy	Cost-effectiveness analysis	Cost per year of blindness prevented	*Data on effectiveness*: one meta-analysis published in 1993, which included three trials conducted between 1975 and 1991 and expert opinion *Unit costs*: costs for screening tests based on professional fees for medical specialists working in a private healthcare set-up. Costs for treating glaucoma included costs of drugs and professional fees. Societal costs were based on data from Regie des Rentes du Quebec. *Currency*: Canadian dollars Professional fees 1994 prices; drug prices 1993; aids for the blind 1992; disability pensions 1993 *Resource use*: stated explicitly	Unclear	Tonometry and fundoscopy as part of visit to ophthalmologist Can$31.60 Gonioscopy Can$10.00 Static perimetry in both eyes Can$35.00 Retinophoto-graphy Can$14.00 Examination with contact lens of fundus under dilatation Can$10.00 Annual cost of treatment of patients with glaucoma Can$353.00 Average societal costs due to blindness (per person per year) Can$1507.00 Discounting not performed	Cost-effectiveness of screening programme at a frequency of every 3 years, targeting population between 40 and 79 years old was estimated to prevent 354 cases of blindness per year at a cost of Can$100,000 per year of blindness prevented The lowest cost-effectiveness estimate was Can$36,000 per year of blindness avoided, when patients aged 65–79 years were screened every 3 years. Using this strategy would have prevented 207 prevalent cases of blindness Both results were obtained assuming a participation rate of 75% and treatment efficacy of 50% The authors concluded that screening for glaucoma in the population of Quebec was not cost-effective	Authors have not reported on any assumptions regarding sensitivities for the included tests in their model

continued

TABLE 96 *Cost-effectiveness of screening for OAG: included studies (cont'd)*

Study and setting	Target population	Strategies	Type of study	Outcome measures	Source of data	Time-horizon	Unit costs	Results/authors' conclusions	Comment
Gottlieb, 1983[282] USA	One million people aged 40–79 years	Screening with tonometry at cut-offs of >21 mmHg and >24 mmHg, ophthalmoscopy, perimetry (using the following types: Harrington–Flock, MPT, Goldmann, Globuck and automated)	Cost-effectiveness analysis	QAVY saved; average cost per year of vision saved; marginal cost per year of vision saved	Data on effectiveness based on studies from 1960–1977. Methods of literature search unclear *Unit costs*: based on Massachusetts Blue Cross/Blue Shield reimbursement rates *Currency*: US dollars for the year 1980 *Resource use*: not stated	Unclear	*Costs of tests (per person)* Tonometry $7.50 (range $5.00–10.00) Ophthalmoscopy $7.50 (range $5.00–10.00) Perimetry $10.00 (range $7.50–15.00) *Costs of treatment (per person per year)* Primary drugs $107–214 Secondary drugs $334–668 Tertiary drugs $380–760 Physician visits with treatment $80–160 Physician visits without treatment $50–100 Filtering surgery $2400–4800 Cataract surgery $2500–5000 *Discounting*: costs discounted to base year of 1980 at a rate of 5% per annum	The marginal costs per year of vision saved varied from $1100 (age group 60–64 years, ophthalmoscopy) to $11,400 (age group 75–79, tonometry ⩾21 mm Hg) Tonometry >21 mm Hg was found to be the most cost-effective for the under-50 age group. Tonometry ⩾21 mmHg and ophthalmoscopy were cost-effective alternatives for all age groups aged 50 years and over. Screening of high-risk individuals (black people, people with diabetes, first-degree relatives of glaucoma patients) was found to be significantly more cost-effective than screening the general population, with average cost per year of vision saved ranging from $1100 (for black people) to $1200 (for people with diabetes)	

continued

TABLE 96 *Cost-effectiveness of screening for OAG: included studies (cont'd)*

Study and setting	Target population	Strategies	Type of study	Outcome measures	Source of data	Time-horizon	Unit costs	Results/authors' conclusions	Comment
Gooder, 1995[281] UK	100,000 of the UK population aged 40 or more with a 1% incidence of glaucoma and 5% incidence of ocular hypertension	(1) Current UK practice (opportunistic screening at eye tests) (2) Tonometry (3) NCT (22 mmHg threshold) and Henson fields	Cost-effectiveness analysis and cost–utility analysis	Cost per case detected; cost per year of blindness saved; cost per DALY saved	*Data on effectiveness*: three studies published between 1990 and 1993. Each strategy was informed by data from a single study *Costs:* included costs of screening tests to the NHS. For standard practice this was based on a cost of an optometrist's eye test and assumed costs for the other tests Only other costs were the first outpatient visit and cost of treatment (only included in the estimation of cost per year of blindness saved and cost per DALY saved) Currency was pounds sterling. Price year was not stated but was probably 1995/96	10 years	Optometrist eye test £13.15 Tonometry £10 NCT and fields £17 First outpatient appointment £62 Cost of treatment for 5 years £770 No discounting performed	*Costs* (1) £581,000 + (Tx £254.1,000) (2) £1521,000 + (Tx £385.0,000) (3) £2217,000 + (Tx £706.1,000) *Effectiveness* Cases detected (1) 330 (2) 500 (3) 917 Years of blindness saved (1) NA (2) 85 (3) 294 DALYs saved (1) NA (2) 34 (3) 117.6 *ICERs* Cases detected (1) £1759 (2) £5531 (3) £1670 Blindness saved (1) Not estimated (2) £18,790 (3) £11,758 DALYs saved (4) Not estimated (5) £46,975 (1) £29,396 The conclusion drawn is that current case finding is a more rational policy	No sensitivity analysis was performed and the results of the study are based on indirect comparisons which might be biased

continued

TABLE 96 *Cost-effectiveness of screening for OAG: included studies (cont'd)*

Study and setting	Target population	Strategies	Type of study	Outcome measures	Source of data	Time-horizon	Unit costs	Results/authors' conclusions	Comment
Tuck, 1997[283] UK	10,000 Caucasians aged over 40 years	Screening with tonometry, ophthalmoscopy, and perimetry individually and also using different combinations of these three tests. Referral criteria were classified as severe and lax depending on cut-offs used	Cost-effectiveness analysis	Average cost per true-positive case identified	Data on sensitivity and specificity derived from ad hoc review of literature. Unit costs derived from literature on screening for glaucoma and from personal communication. *Currency*: UK prices based on 1992 prices converted to 1995 prices. UK pound prices have been expressed as US dollars using a conversion rate of £1 = $1.55 *Resource use:* not stated	Unclear	UK commercial sight test (per test): $67.00 Equipment costs NCT: $6975 Automated perimetry: $7750 Annual servicing costs for tonometer and perimeter: $155 per instrument Costs of secondary examination: $62	The least-cost modes were TP[a] ($760 per true positive) and T > 22[b] ($894 per true positive), but they had less than 60% sensitivity. The modes OTPhr (sv)[c] and OTP (sv)[d] struck a good balance between being cost-effective while having sufficiently high sensitivities of 80% and 87%, respectively. The cost per true-positive case for these two modes was $1234 and $1418 (or $736 and $962 if the costs of primary ophthalmoscopy are excluded, this test always being conducted by optometrists for other reasons)	

[a] Tonometry and perimetry.
[b] Tonometry with a referral cut-off of >22 mmHg.
[c] Ophthalmoscopy and tonometry followed by perimetry in high-risk patients, but referral criteria set to be severe.
[d] Ophthalmoscopy, tonometry and perimetry in all patients and referral criteria set to be severe.

Appendix 20

Complete incremental cost-effectiveness data for each included study

TABLE 97 *Cost-effectiveness data from screening model according to Gottlieb et al. (1983)*[282]

Test	Age range (years)	Total costs (1980 US$)	Years of vision saved	Incremental costs (1980 US$)	Incremental effectiveness	ICER compared to	ICER (1980 US$)
Ophthalmoscopy	40–44	9,300,000	2,750				
Tonometry >24	40–44	14,400,000	5,600	5,100,000	2,850	Ophthalmoscopy	1,789
HF fields	40–44	16,400,000	2,600				Dominated
MPT fields	40–44	17,500,000	2,530				Dominated
Globuck fields	40–44	19,400,000	3,770				Dominated
Tonometry >21	40–44	21,000,000	11,150	6,600,000	5,550	Tonometry >24	1,189
Goldmann fields	40–44	28,000,000	6,410				Dominated
Ophthalmoscopy	45–49	10,600,000	5,270				
Tonometry >24	45–49	15,400,000	6,700	4,800,000	1,430	Ophthalmoscopy	3,357
HF fields	45–49	17,700,000	5,010				Dominated
MPT fields	45–49	18,800,000	4,740				Dominated
Globuck fields	45–49	21,500,000	6,980	6,100,000	280	Tonometry >24	21,786
Tonometry >21	45–49	30,700,000	18,300	9,200,000	11,320	Globuck fields	813
Goldmann fields	45–49	32,500,000	11,160				Dominated
Ophthalmoscopy	50–54	12,600,000	9,100				
Tonometry >24	50–54	16,000,000	7,980				Dominated
HF fields	50–54	19,600,000	8,750				Dominated
MPT fields	50–54	20,500,000	7,820				Dominated
Globuck fields	50–54	23,800,000	11,210	11,200,000	2,110	Ophthalmoscopy	5,308
Tonometry >21	50–54	32,900,000	20,800	9,100,000	9,590	Globuck fields	949
Goldmann fields	50–54	35,000,000	15,380				Dominated
Ophthalmoscopy	55–59	17,200,000	17,300				
Tonometry >24	55–59	17,700,000	11,410				Dominated
HF fields	55–59	24,000,000	16,760				Dominated
MPT fields	55–59	24,200,000	14,430				Dominated
Globuck fields	55–59	28,900,000	20,330	11,700,000	3,030	Ophthalmoscopy	3,861
Tonometry >21	55–59	37,300,000	27,100	8,400,000	6,770	Globuck fields	1,241
Goldmann fields	55–59	40,400,000	24,370				Dominated
Ophthalmoscopy	60–64	16,900,000	15,420				
Tonometry >24	60–64	17,700,000	10,020				Dominated
HF fields	60–64	23,800,000	14,930				Dominated
MPT fields	60–64	24,000,000	12,880				Dominated
Globuck fields	60–64	28,800,000	18,160	11,900,000	2,740	Ophthalmoscopy	4,343
Tonometry >21	60–64	39,900,000	24,800	11,100,000	6,640	Globuck fields	1,672
Goldmann fields	60–64	41,000,000	22,250				Dominated

continued

TABLE 97 *Cost-effectiveness data from screening model according to Gottlieb et al. (1983)*[282] *(cont'd)*

Test	Age range (years)	Total costs (1980 US$)	Years of vision saved	Incremental costs (1980 US$)	Incremental effectiveness	ICER compared to	ICER (1980 US$)
Tonometry >24	65–69	19,300,000	11,540				
Ophthalmoscopy	65–69	20,900,000	19,840	1,600,000	8,300	Tonometry >24	193
MPT fields	65–69	27,300,000	16,390				Dominated
HF fields	65–69	27,700,000	19,270				Dominated
Globuck fields	65–69	33,300,000	22,950	12,400,000	3,110	Ophthalmoscopy	3,987
Tonometry >21	65–69	43,800,000	26,500	10,500,000	3,550	Globuck fields	2,958
Goldmann fields	65–69	45,800,000	26,690	2,000,000	190	Tonometry >21	10,526
Tonometry >24	70–74	21,000,000	10,430				
Ophthalmoscopy	70–74	24,100,000	18,900	3,100,000	8,470	Tonometry >24	366
MPT fields	70–74	29,900,000	15,520				Dominated
HF fields	70–74	30,800,000	18,380				Dominated
Globuck fields	70–74	36,800,000	21,640	12,700,000	2,740	Ophthalmoscopy	4,635
Tonometry >21	70–74	46,400,000	22,500	9,600,000	860	Globuck fields	11,163
Goldmann fields	70–74	49,400,000	24,410	3,000,000	1,910	Tonometry >21	1,571
Tonometry >24	75–79	23,100,000	10,120				
Ophthalmoscopy	75–79	26,100,000	18,680	3,000,000	8,560	Tonometry >24	350
MPT fields	75–79	31,300,000	15,270				Dominated
HF fields	75–79	32,800,000	18,180				Dominated
Globuck fields	75–79	38,700,000	21,230	12,600,000	2,550	Ophthalmoscopy	4,941
Tonometry >21	75–79	43,800,000	20,200				Dominated
Goldmann fields	75–79	50,100,000	23,400	11,400,000	2,170	Globuck fields	5,253

TABLE 98 *Cost-effectiveness data from screening model according to Boivin* et al.[280]

Strategy no.	Initial test(s)	Subsequent tests	Screening frequency (years)	Age (years)	Participation (%)	Compliance (%)	Treatment efficacy (%)	Prevalence reduction (cases)	Average cost per year of blindness avoided (1994 Can$)	Total costs	ICER compared to which strategy no.?	ICER
1	T	F,G,P	3	65–79	75	75	50	209	36,000	7,763,604		
2	T,F	G,P	3	65–79	75	75	50	287	42,000	12,574,620	1	61,680
3	T	F,G,P	3	40–79	75	75	50	248	74,000	19,154,063		
4	T,F	G,P	5	40–79	75	75	50	354	78,000	28,679,520	3	89,863
5	T,F	G,P	3	40–79	60	75	50	284	100,000	29,108,053		Dominated
6	T,F	G,P	3	40–79	75	60	50	284	114,000	33,041,718		Dominated
7	T,F	G,P	3	40–79	75	75	50	354	100,000	36,385,066		Dominated
8	T,F	G,P	3	40–79	75	75	30	213	168,000	36,385,066		Dominated
9	T,F	G,P	3	40–79	75	75	70	496	70,000	36,385,066	4	54,264
10	T,F	G,P	3	40–79	75	90	50	425	90,000	39,728,414		Dominated
11	T,F	G,P	3	40–79	90	75	50	425	100,000	43,662,079		Dominated
12	T,F	G,P	1	40–79	75	75	50	354	208,000	74,912,797		Dominated

F, fundoscopy; G, gonioscopy; P, perimetry; T, tonometry.

TABLE 99 *Cost-effectiveness data from screening model according to Tuck and Crick*[283]

Strategy no.	Screening strategies	Total true positives	Sensitivity (%)	Specificity (%)	Average cost per true-positive case (1995 US$)	Total costs (1995 US$)	ICER compared to strategy no.	ICERs (1995 US$)
1	Tonometry and perimetry if IOP >20 mmHg	40	48	99	760	30,400		
2	Tonometry and perimetry if IOP >22 mmHg	47	56	99	764	35,908	1	787
3	Tonometry at thresholds of IOP >22 mmHg	49	58	96	416	43,806	2	3,949
4	Ophthalmoscopy (sv)	30	36	98	1,738	52,140		Dominated
5	Perimetry	55	66	96	1,054	57,970	3	2,361
6	Ophthalmoscopy and tonometry (sv)	40	48	99	1,451	58,040		Dominated
7	Ophthalmoscopy and tonometry followed by perimetry for 'referral' candidates (sv)	47	56	99	1,373	64,531		Dominated
8	Ophthalmoscopy and tonometry followed by perimetry for 'referral' candidates (lx)	56	67	99	1,367	76,552	5	18,582
9	Ophthalmoscopy and perimetry (sv)	33	39	99	2,342	77,286		Dominated
10	Ophthalmoscopy and tonometry (lx)	54	64	96	1,480	79,920		Dominated
11	Ophthalmoscopy and tonometry followed by perimetry for 'high-risk' candidates (sv)	67	80	98	1,234	82,678	8	557
12	Tonometry at thresholds of IOP >20 mmHg	58	69	90	1,457	84,506		Dominated
13	Ophthalmoscopy and tonometry followed by perimetry for 'high-risk' candidates (lx)	70	83	97	1,358	95,060	11	4,127
14	Ophthalmoscopy and perimetry (lx)	70	83	95	1,476	103,320		Dominated
15	Ophthalmoscopy and tonometry and perimetry (sv)	73	87	97	1,418	103,514	13	2,817
16	Ophthalmoscopy and tonometry and perimetry (lx)	80	95	95	1,469	1,117,520	15	2,001
17	Ophthalmoscopy (lx)	56	67	86	2,362	132,272		Dominated

Appendix 21

Interim life table

TABLE 100 *Interim life table: expectation of life (Scotland, males), based on data for the years 2002–2004*

Age *x*	*qx*	Age *x*	*qx*
0	0.005862	51	0.005569
1	0.000493	52	0.006351
2	0.000263	53	0.006886
3	0.000218	54	0.007109
4	0.000235	55	0.007739
5	0.000148	56	0.009137
6	0.000101	57	0.009230
7	0.000088	58	0.010978
8	0.000098	59	0.011729
9	0.000150	60	0.014471
10	0.000093	61	0.015468
11	0.000203	62	0.017541
12	0.000161	63	0.019046
13	0.000162	64	0.019963
14	0.000202	65	0.021213
15	0.000301	66	0.023363
16	0.000516	67	0.025836
17	0.000727	68	0.026730
18	0.000956	69	0.031159
19	0.000911	70	0.032368
20	0.001024	71	0.038335
21	0.001102	72	0.040495
22	0.001311	73	0.044996
23	0.001235	74	0.050523
24	0.001234	75	0.053944
25	0.001323	76	0.059338
26	0.001150	77	0.066269
27	0.001599	78	0.071343
28	0.001488	79	0.075206
29	0.001498	80	0.088011
30	0.001660	81	0.096520
31	0.001436	82	0.097352
32	0.001661	83	0.107601
33	0.001723	84	0.118526
34	0.001738	85	0.132787
35	0.001957	86	0.152222
36	0.001730	87	0.156370
37	0.001948	88	0.172315
38	0.002073	89	0.187888
39	0.002319	90	0.185945
40	0.002351	91	0.212929
41	0.002630	92	0.226651
42	0.002353	93	0.248127
43	0.003045	94	0.252039
44	0.002946	95	0.282443
45	0.003075	96	0.317949
46	0.003510	97	0.355311
47	0.003961	98	0.357698
48	0.004150	99	0.366492
49	0.004988	100	0.389381
50	0.004954		

Produced by the Government Actuary's Department (http://www.gad.gov.uk/Life_Tables/docs/wltscom0204.xls)
qx is the mortality rate between age *x* and (*x* + 1), that is the probability that a person aged *x* exactly will die before reaching age (*x* + 1).

Appendix 22

Utility scores

Table 101 reports the estimates of health state utilities for those people for whom an objective assessment of the severity of glaucoma is available. *Table 102* describes the health state utilities for the same people but based on the respondents' own assessments of glaucoma severity. As can be seen from these tables the number of people contributing data at each level of severity varied and hence the utility scores also varied.

Where data were available from both sources a comparison between the objective grading and respondents' assessment of severity showed that the two methods of assessment agreed only 50% of the time. It is for this reason that the data based on the objective assessment were used in the base case of the model.

Rather more data were available from the whole sample. Assuming that the majority of people assessed the severity of their glaucoma the same or within one level of its objective assessment (*Table 103* indicates that this occurred 90% of the time), then the data from whole sample may be more precise. These data have therefore been used in a sensitivity analysis.

TABLE 101 *Health state utilities by stage of disease: objective assessment*

Value	Mild severity (*n* = 37)	Moderate severity (*n* = 14)	Severe severity (*n* = 9)
Mean	0.802	0.7471	0.713
Median	0.796	0.7435	0.796
SD	0.125	0.18807	0.255
Minimum	0.29	0.20	0.09
Maximum	0.92	0.90	0.92

TABLE 102 *Health state utilities by stage of disease: subjective assessment*

Value	Mild severity (*n* = 30)	Moderate severity (*n* = 23)	Severe severity (*n* = 10)
Mean	0.793	0.722	0.764
Median	0.796	0.796	0.760
SD	0.142	0.236	0.095
Minimum	0.20	0.09	0.62
Maximum	0.92	0.92	0.92

TABLE 103 *Cross-tabulation of numbers self-reported and objective assessment of disease*

		Self-reported level of glaucoma			Total
		Mild	Moderate	Severe	
Validated assessment of glaucoma		2	2	0	4
	Mild	20	12	4	36
	Moderate	6	6	2	14
	Severe	2	3	4	9
Total		30	23	10	63

TABLE 104 *Health state utilities by stage of disease: objective assessment from the whole sample (IGA, Aberdeen, Leeds)*

Value	Mild severity (*n* = 98)	Moderate severity (*n* = 125)	Severe severity (*n* = 41)
Mean	0.833	0.813	0.733
Median	0.919	0.848	0.796
SD	0.131	0.146	0.201
Minimum	0.16	0.09	0.16
Maximum	0.92	0.92	0.92

Based on data from 266 usable responses from the 286 returned questionnaires.

Appendix 23

Cost-effectiveness acceptability curves

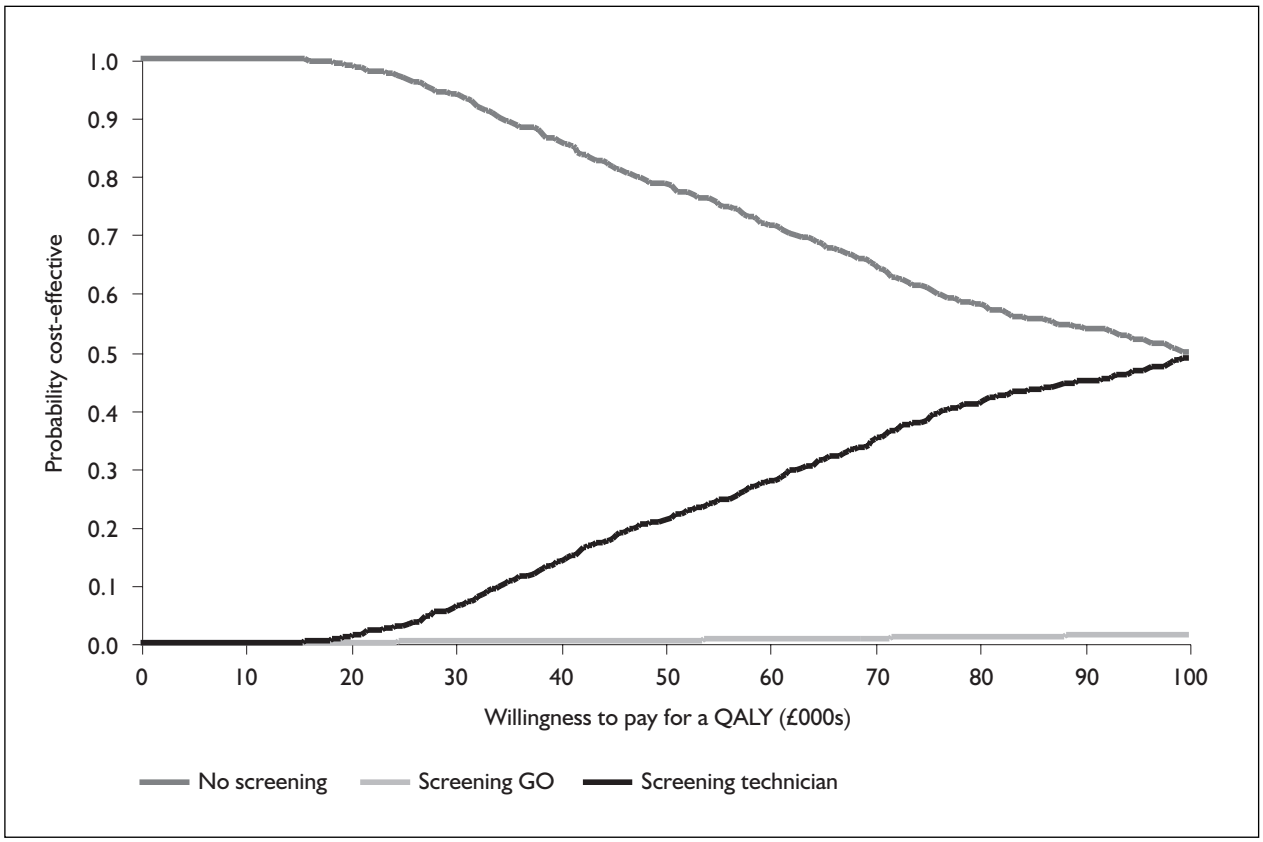

FIGURE 53 *Base case, 40-year-old cohort, 1% OAG prevalence rate*

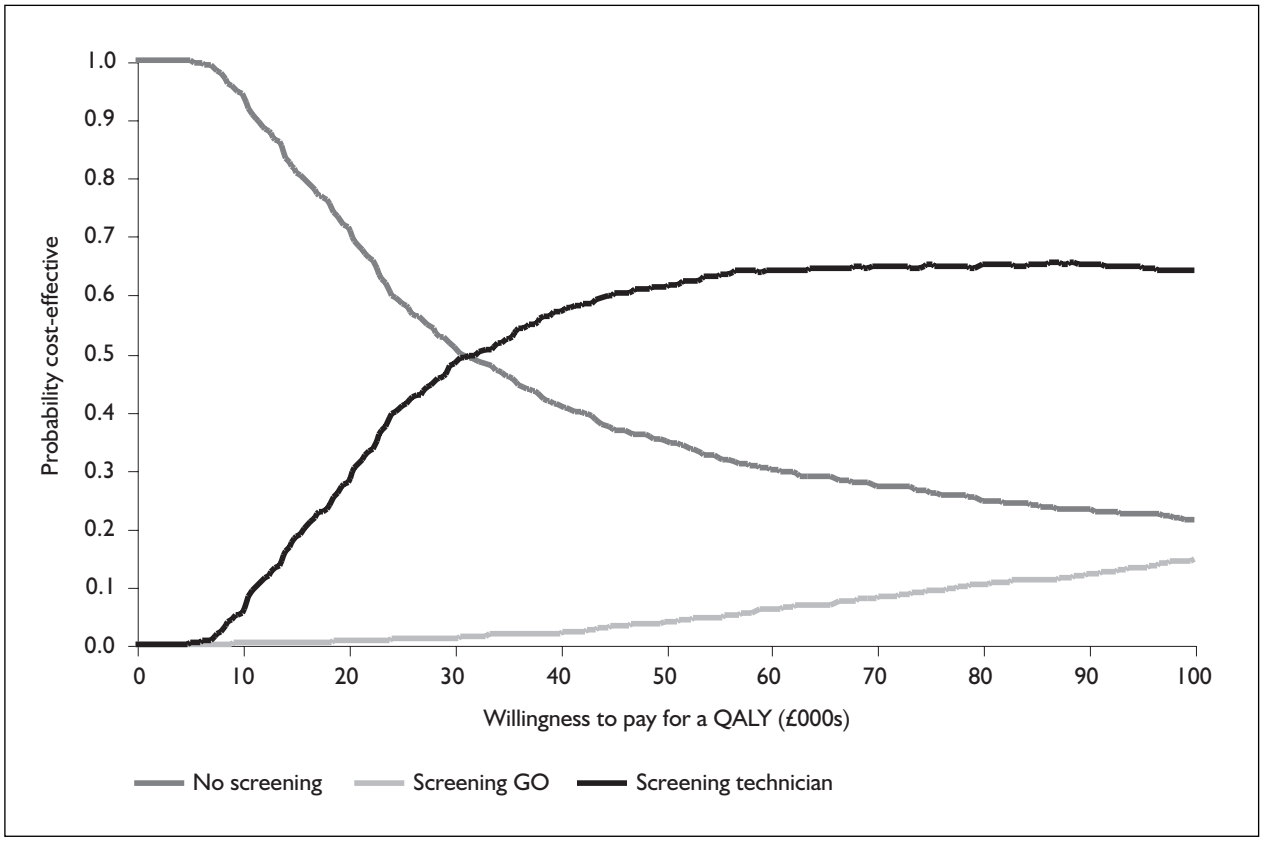

FIGURE 54 *Base case, 40-year-old cohort, 5% OAG prevalence rate*

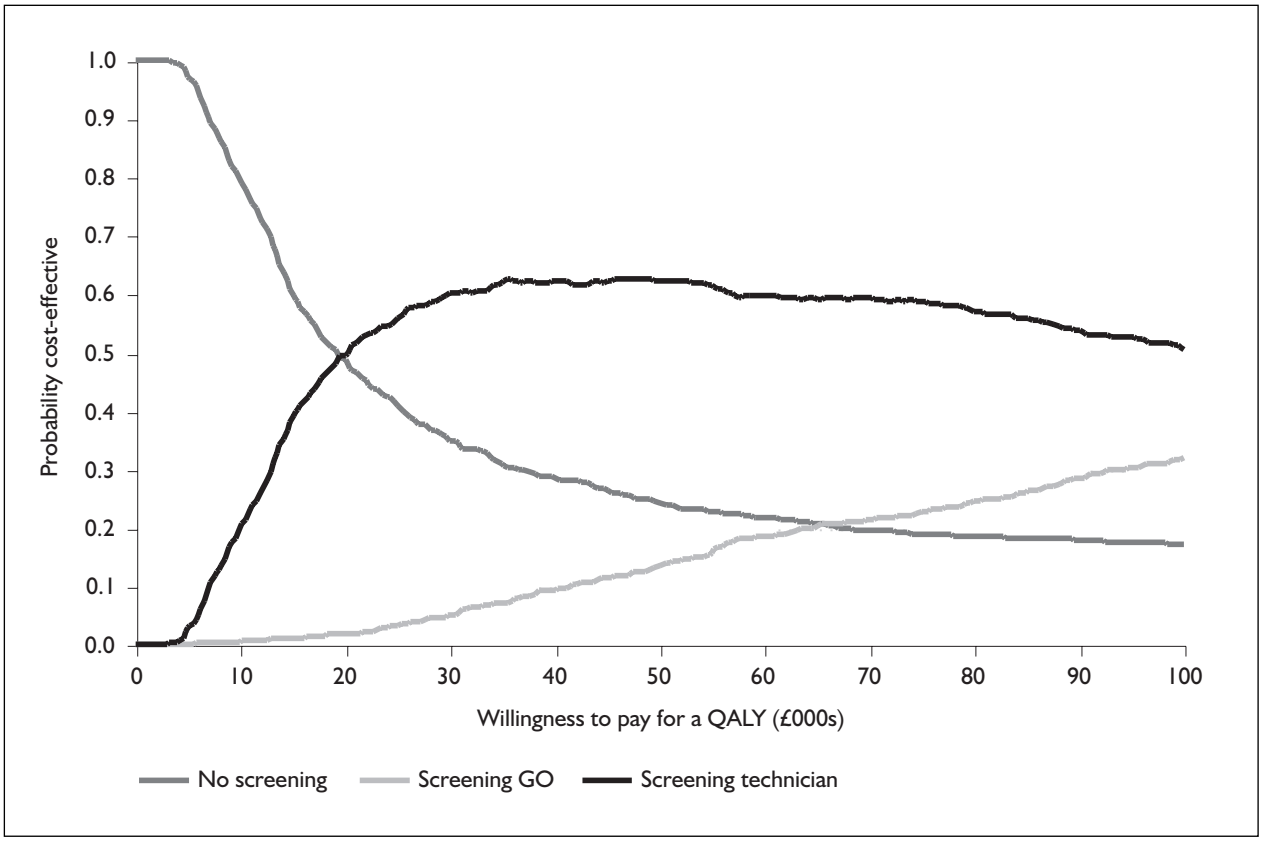

FIGURE 55 *Base case, 40-year-old cohort, 10% OAG prevalence rate*

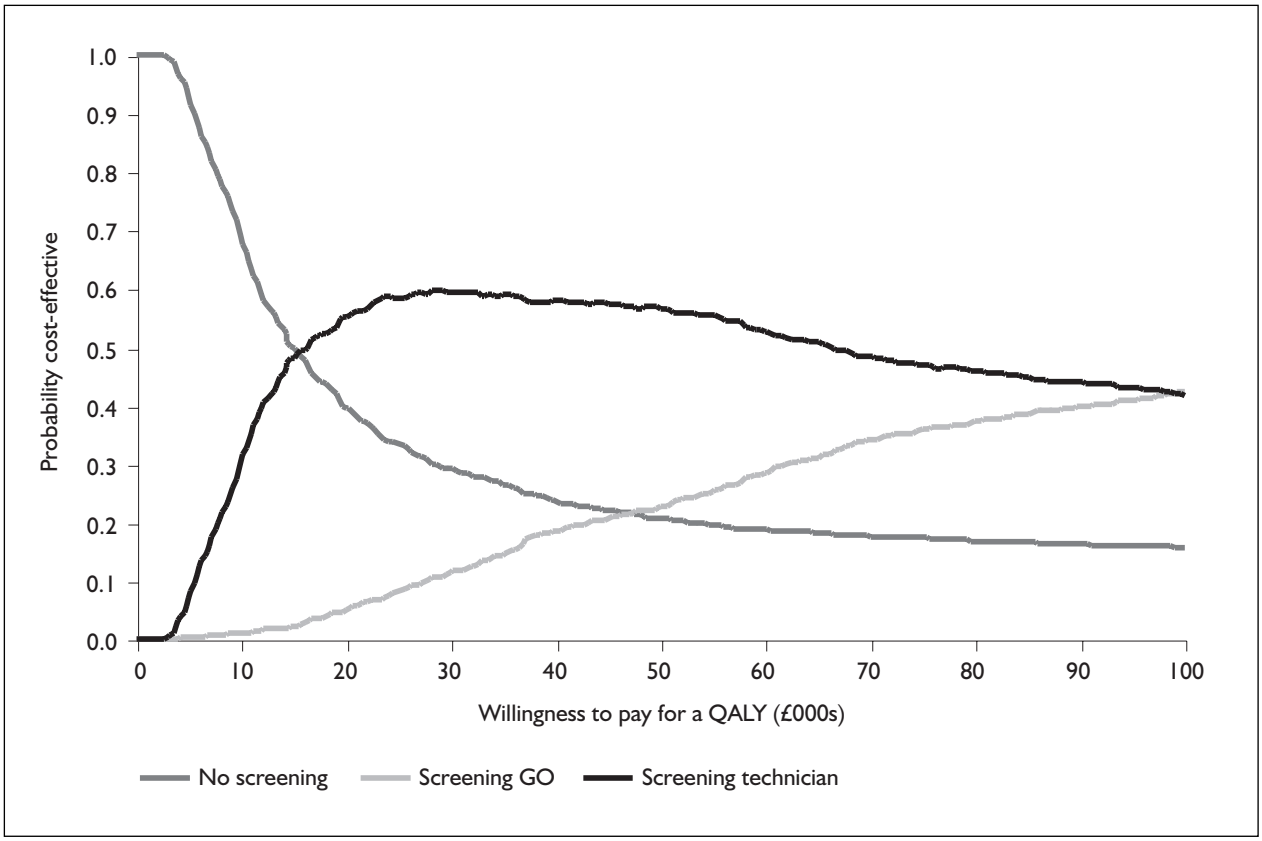

FIGURE 56 *Base case, 40-year-old cohort, 15% OAG prevalence rate*

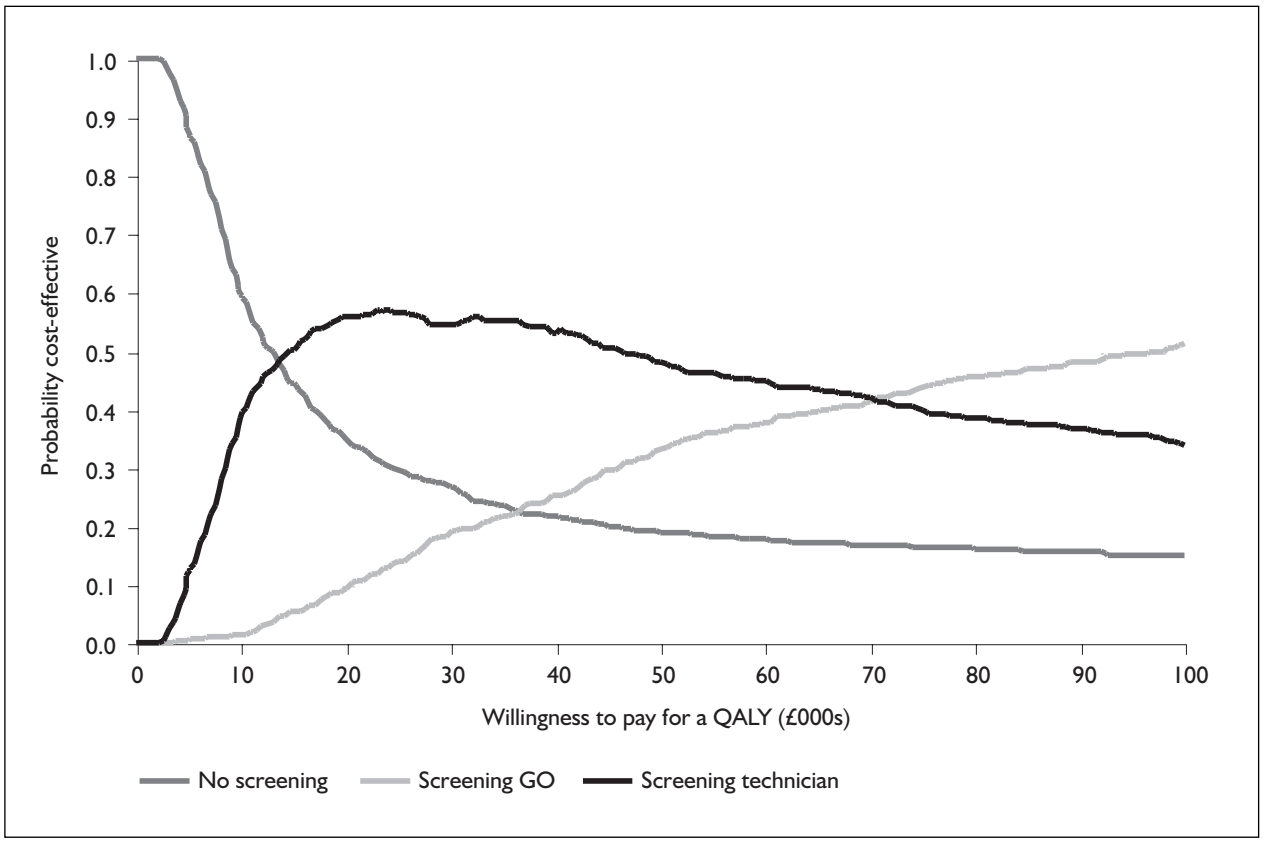

FIGURE 57 *Base case, 40-year-old cohort, 20% OAG prevalence rate*

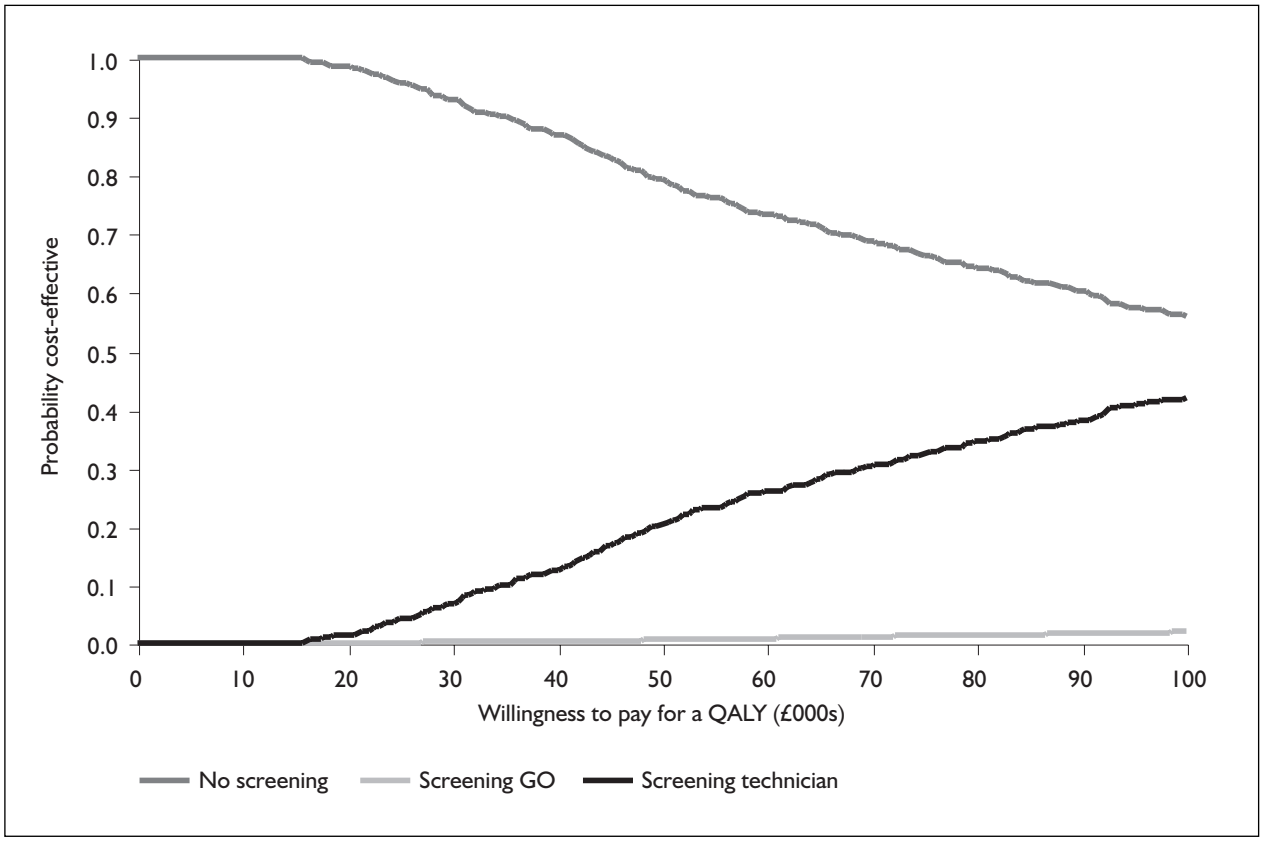

FIGURE 58 *Base case, 60-year-old cohort, 1% OAG prevalence rate*

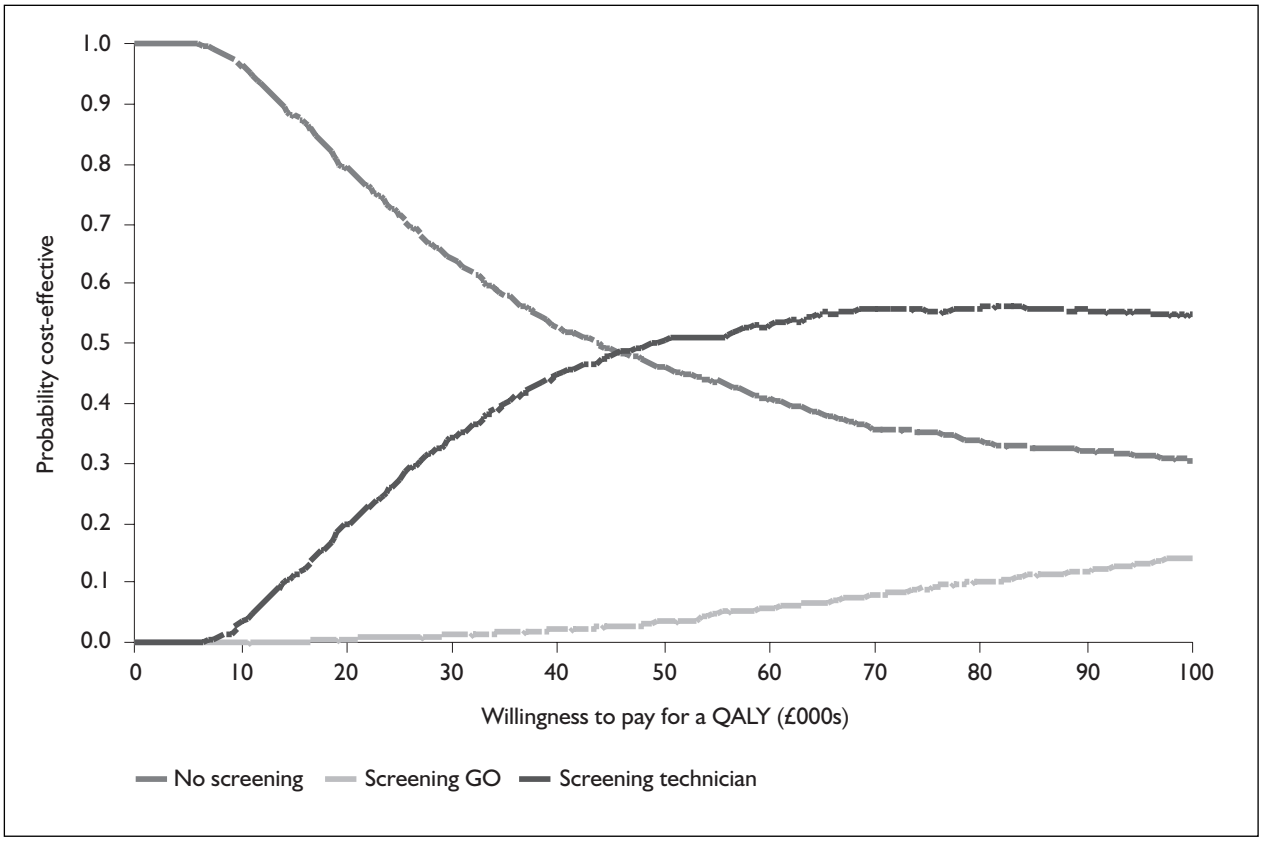

FIGURE 59 *Base case, 60-year-old cohort, 5% OAG prevalence rate*

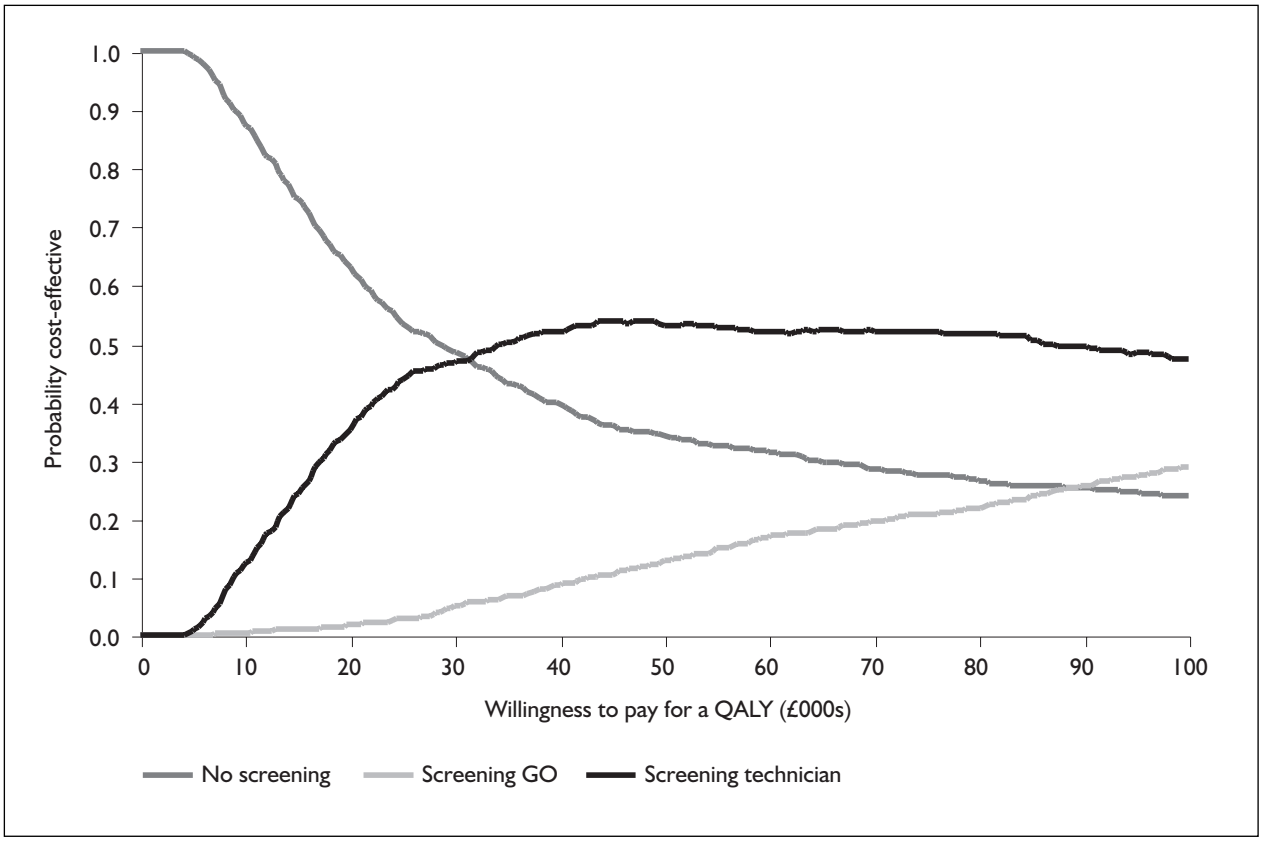

FIGURE 60 *Base case, 60-year-old cohort, 10% OAG prevalence rate*

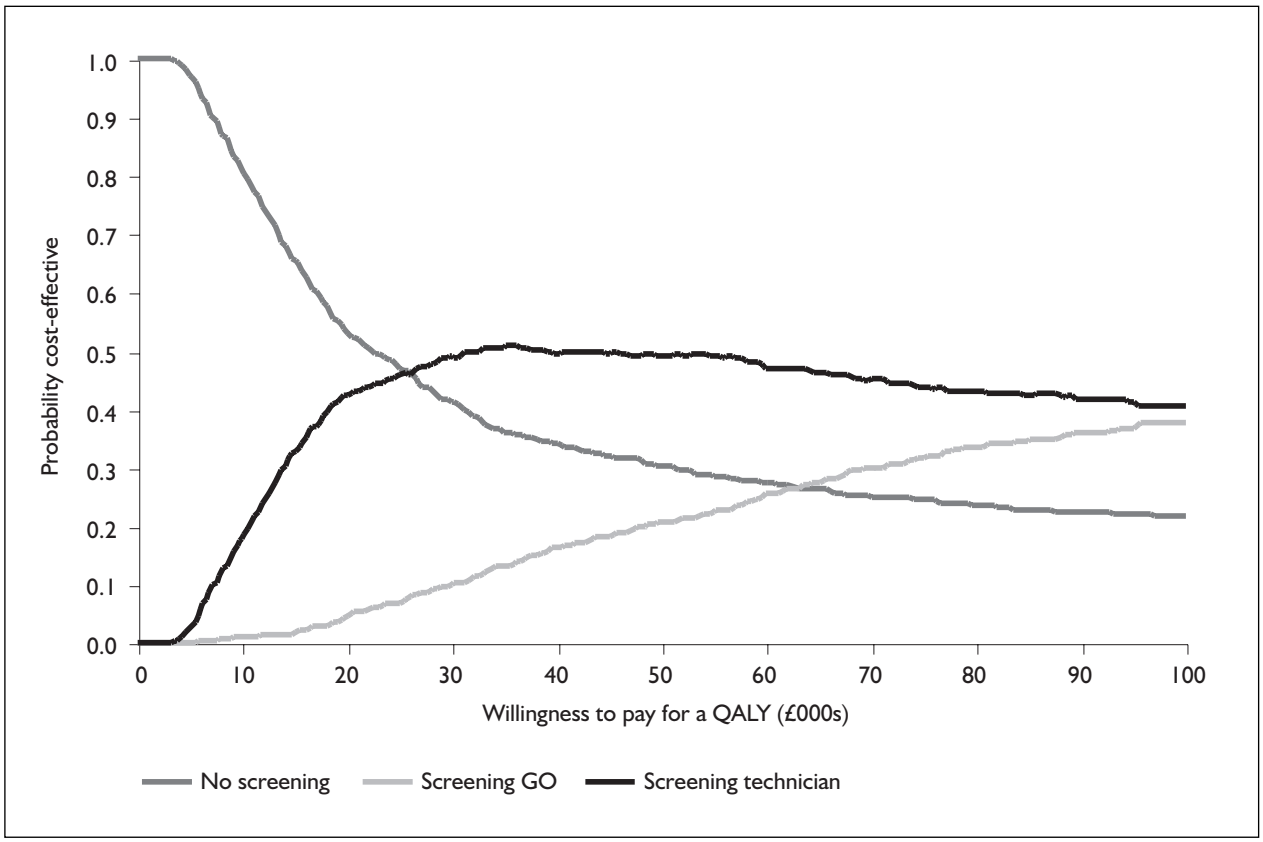

FIGURE 61 *Base case, 60-year-old cohort, 15% OAG prevalence rate*

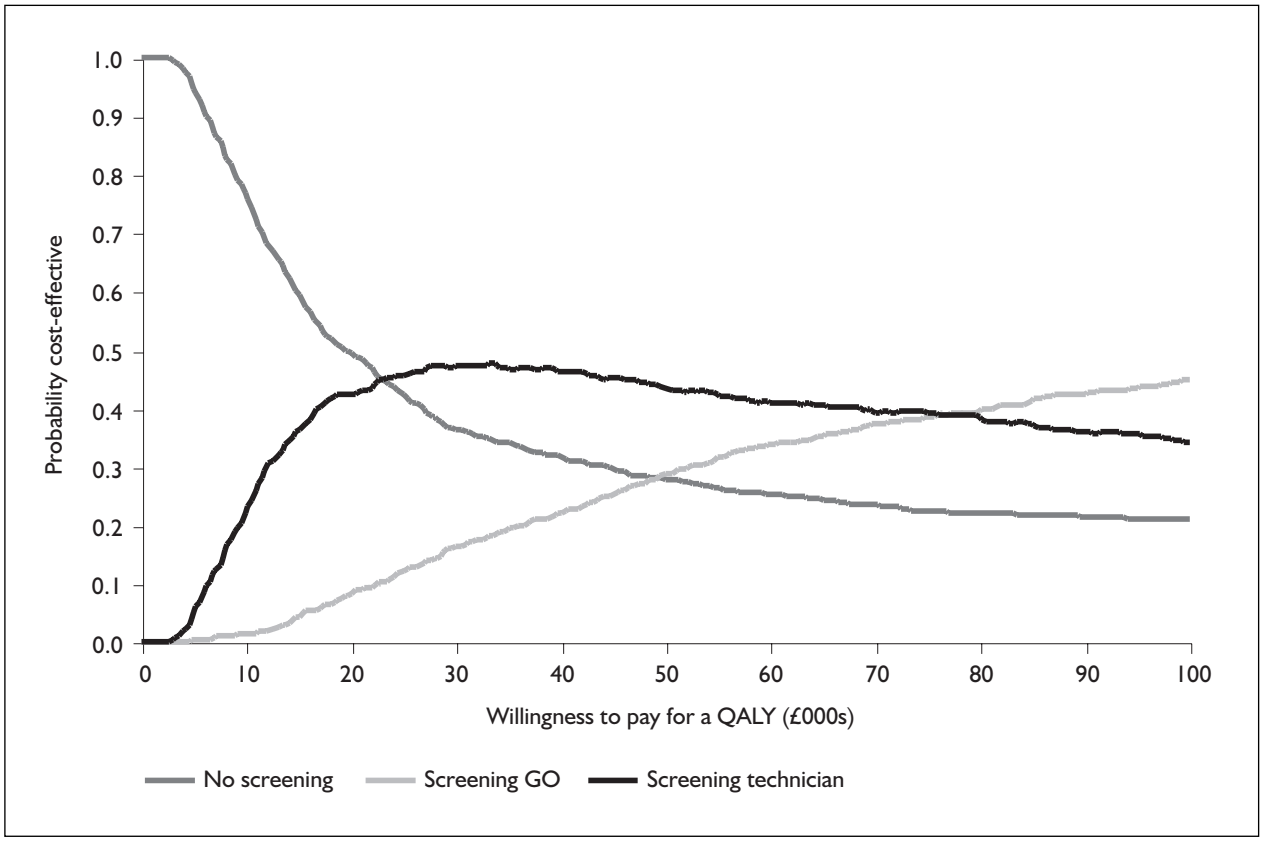

FIGURE 62 *Base case, 60-year-old cohort, 20% OAG prevalence rate*

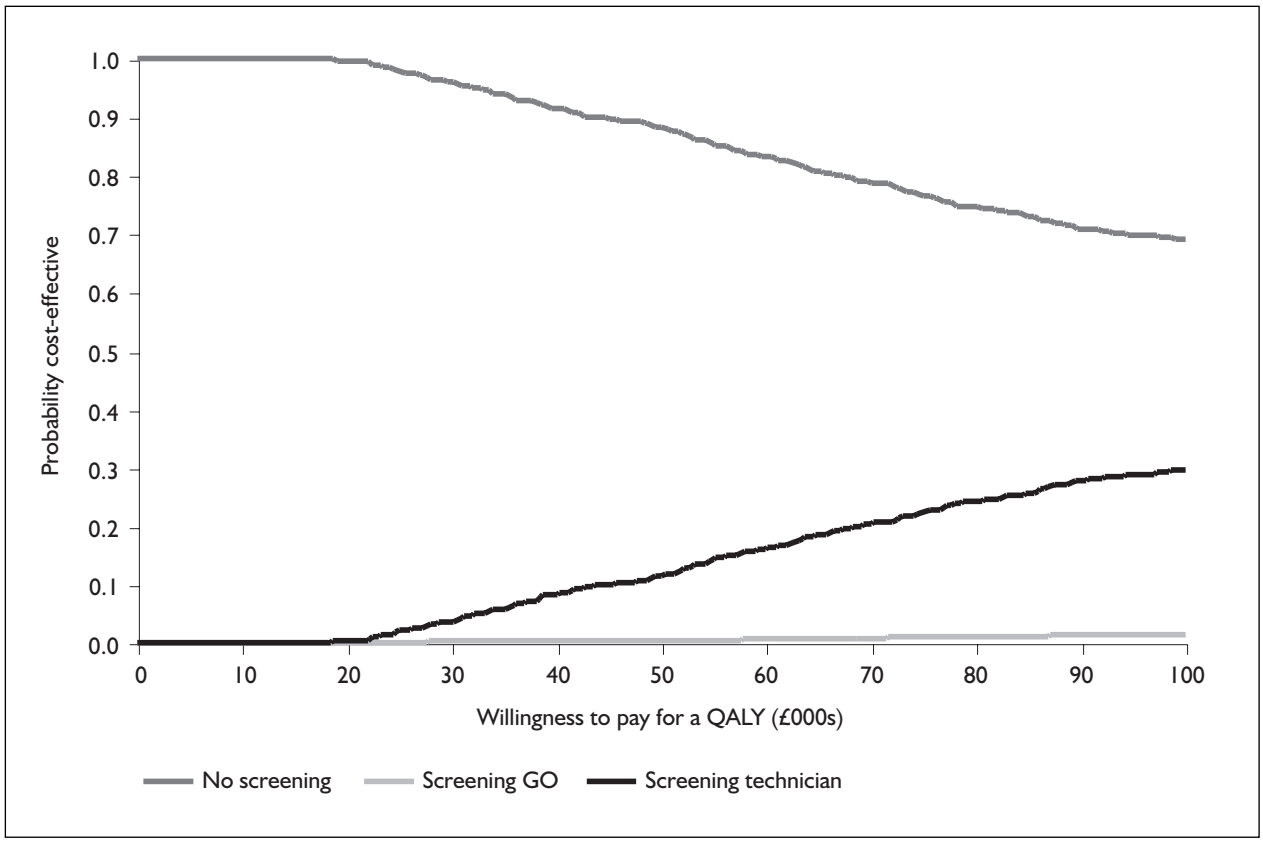

FIGURE 63 *Base case, 75-year-old cohort, 1% OAG prevalence rate*

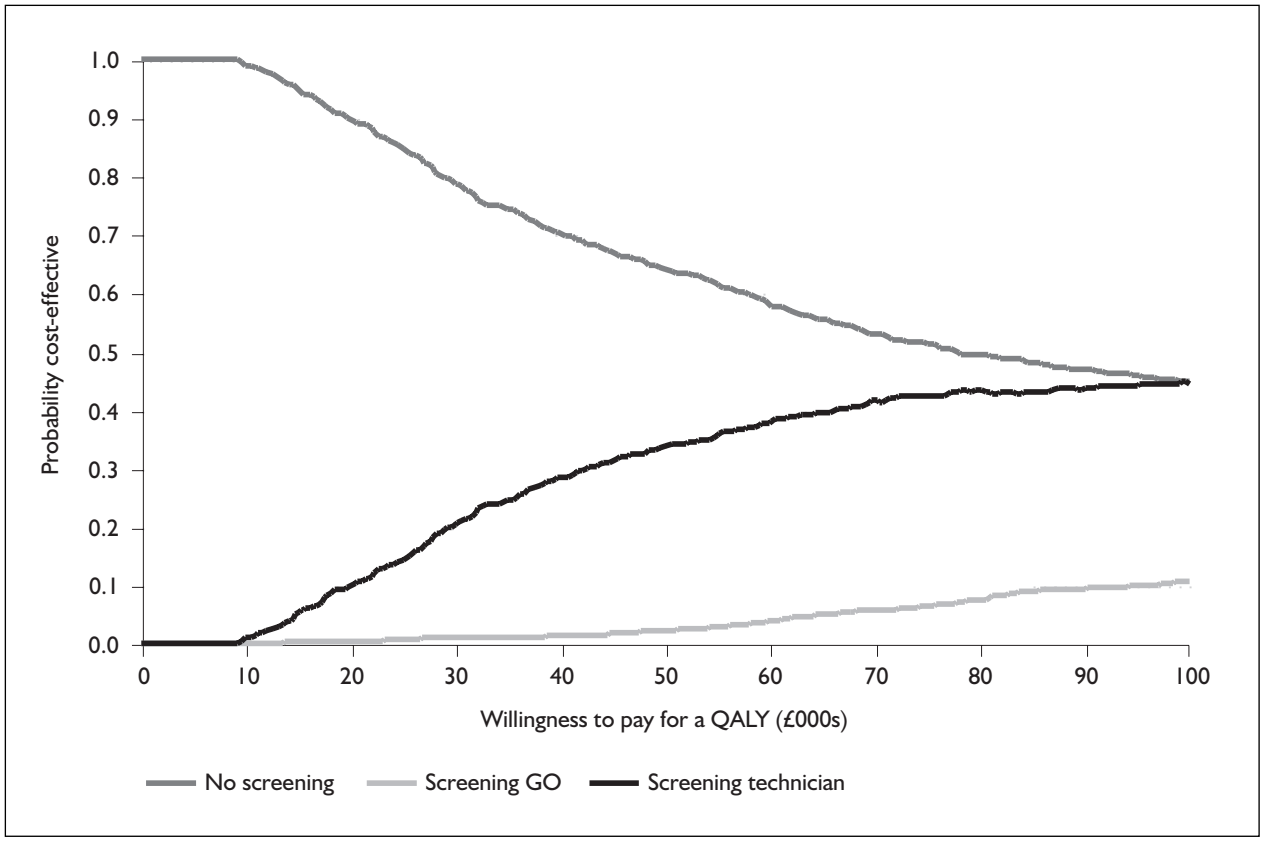

FIGURE 64 *Base case, 75-year-old cohort, 5% OAG prevalence rate*

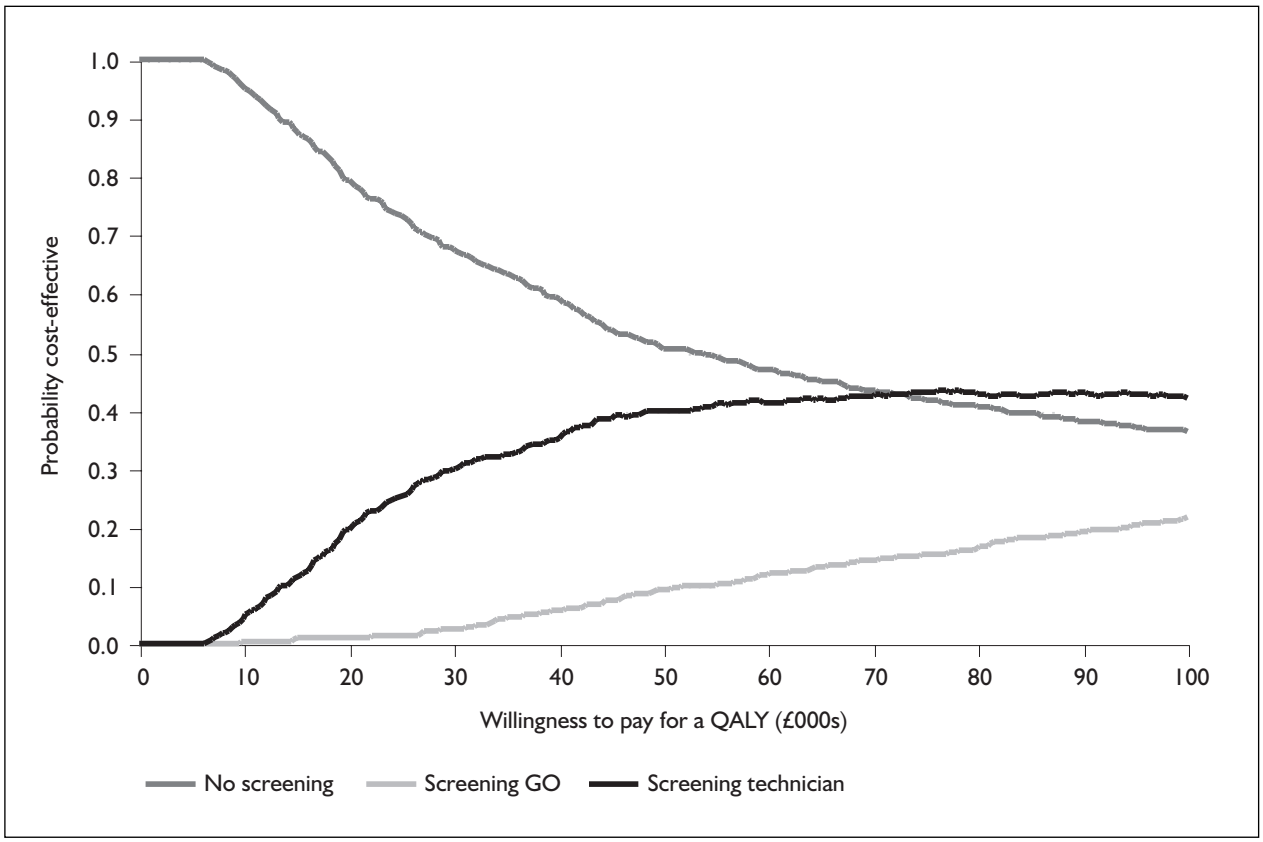

FIGURE 65 *Base case, 75-year-old cohort, 10% OAG prevalence rate*

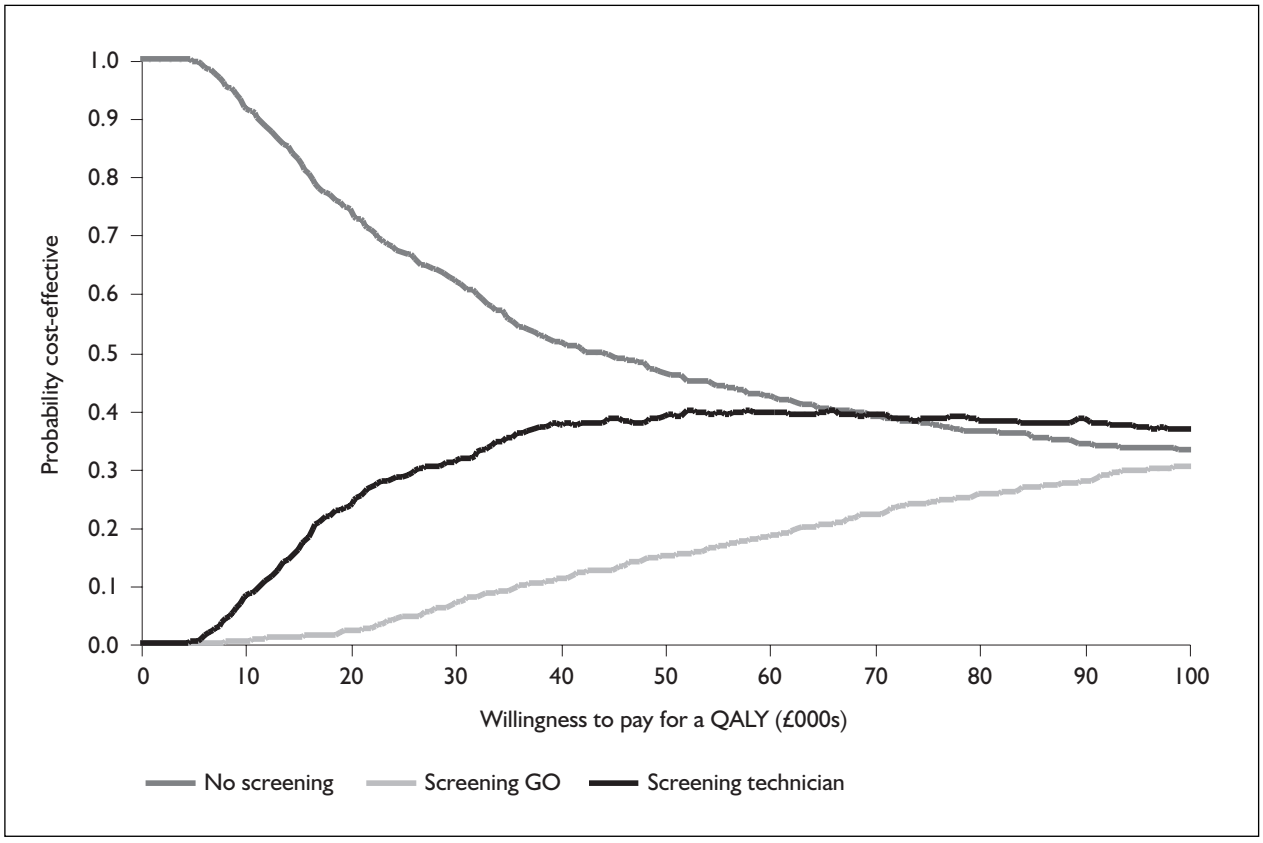

FIGURE 66 *Base case, 75-year-old cohort, 15% OAG prevalence rate*

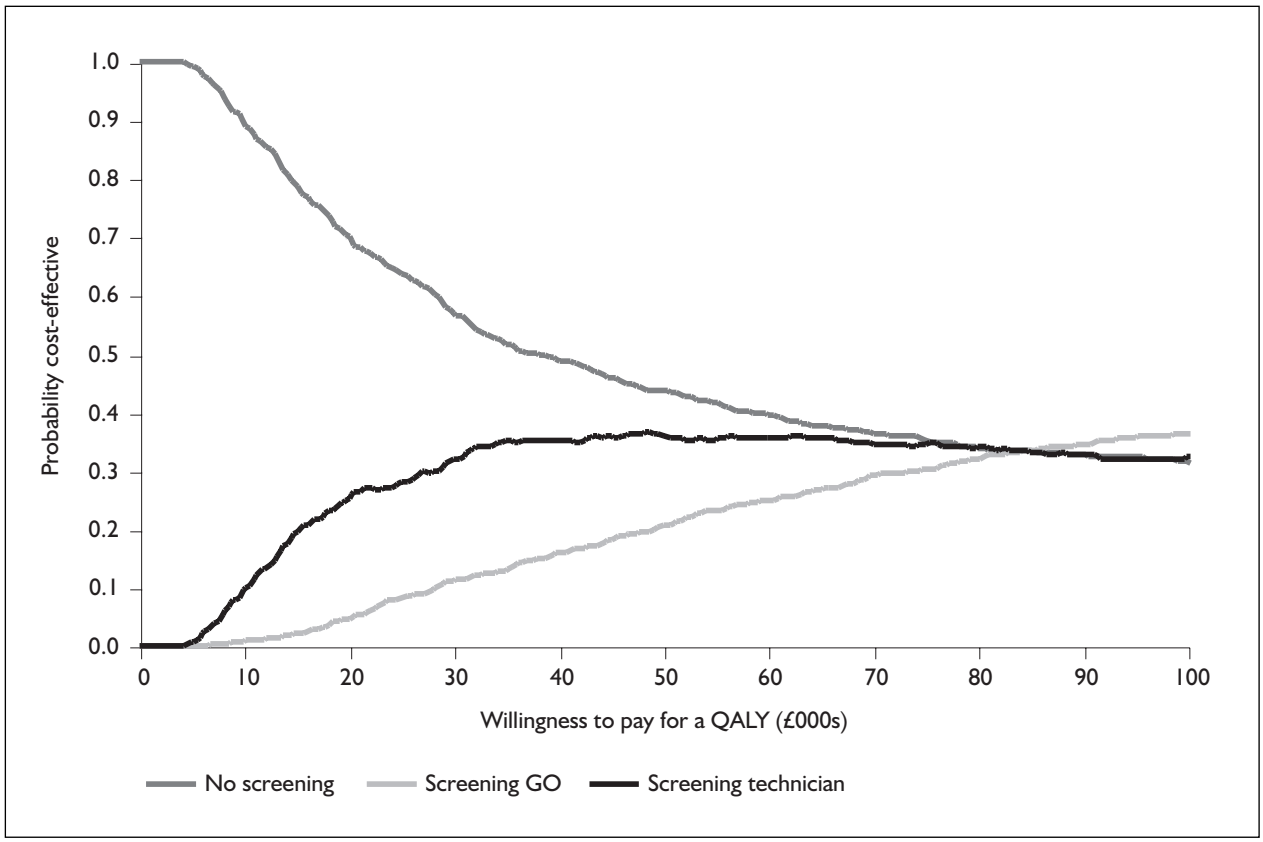

FIGURE 67 *Base case, 75-year-old cohort, 20% OAG prevalence rate*

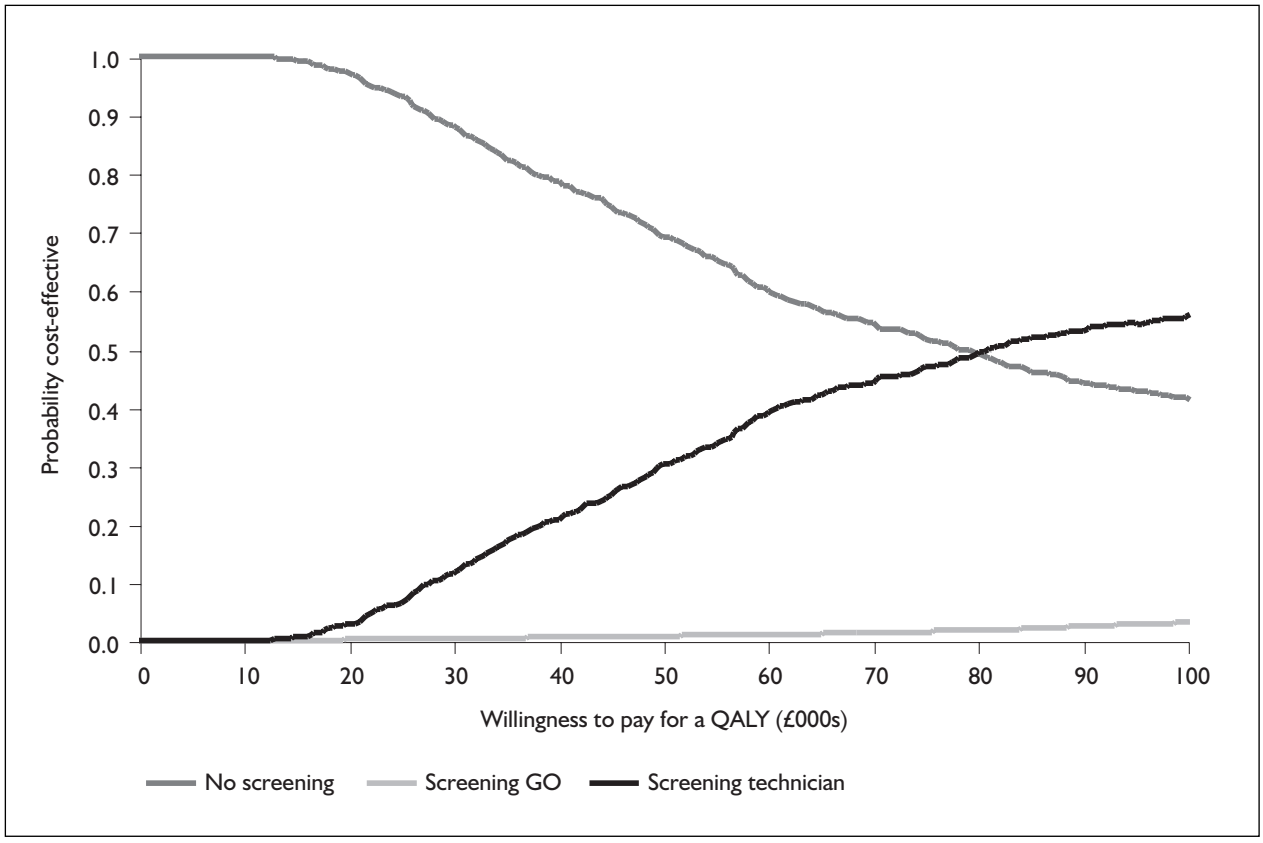

FIGURE 68 *Five-year screening interval, 40-year-old cohort, 1% OAG prevalence rate*

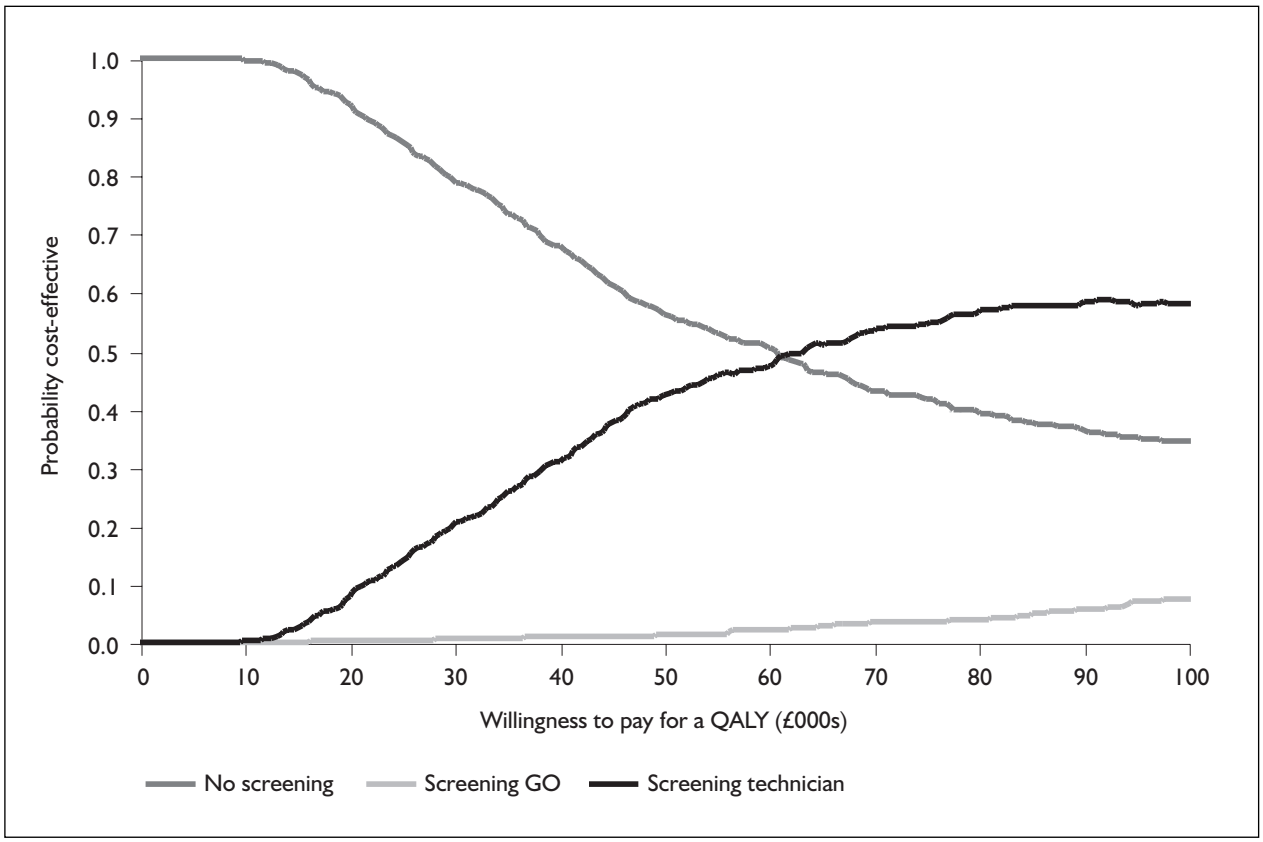

FIGURE 69 *Ten-year screening interval, 40-year-old cohort, 1% OAG prevalence rate*

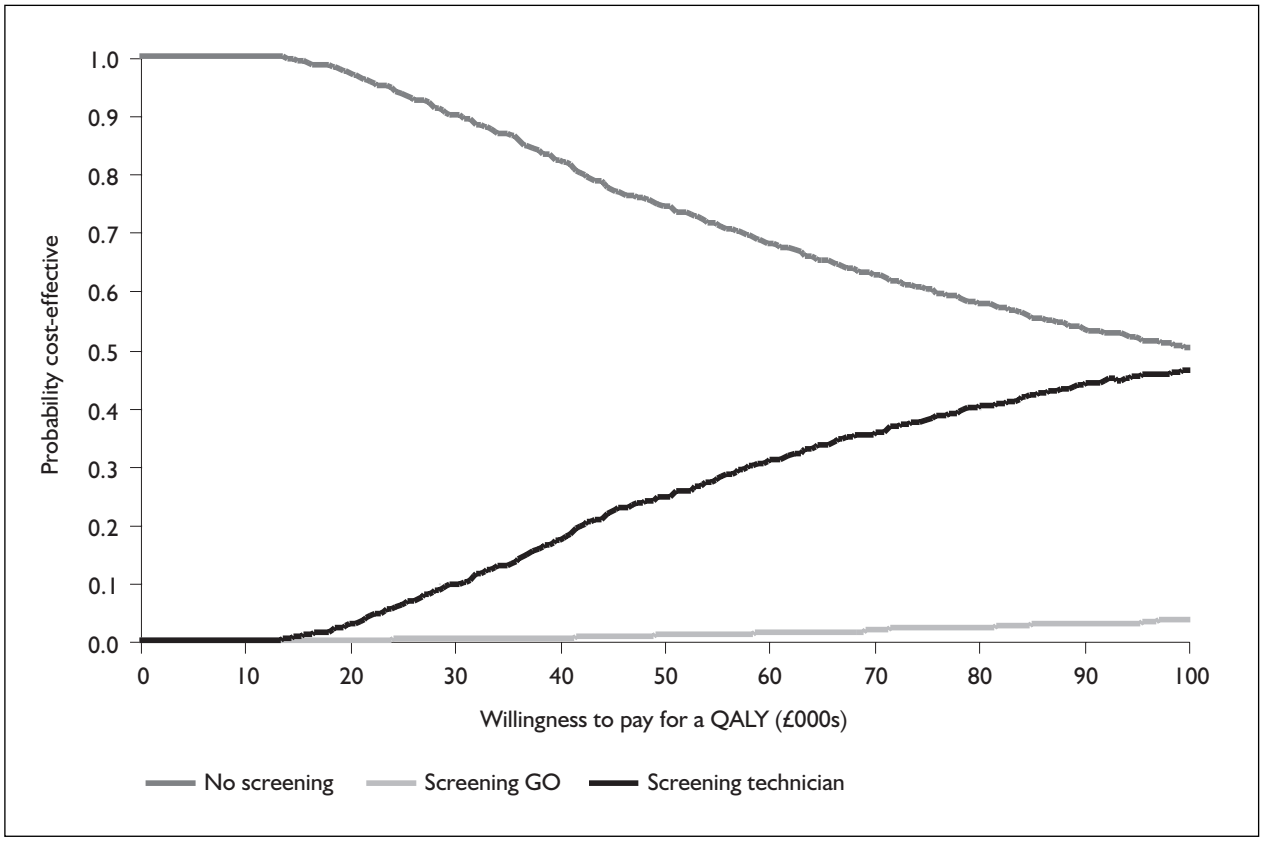

FIGURE 70 *Five-year screening interval, 60-year-old cohort, 1% OAG prevalence rate*

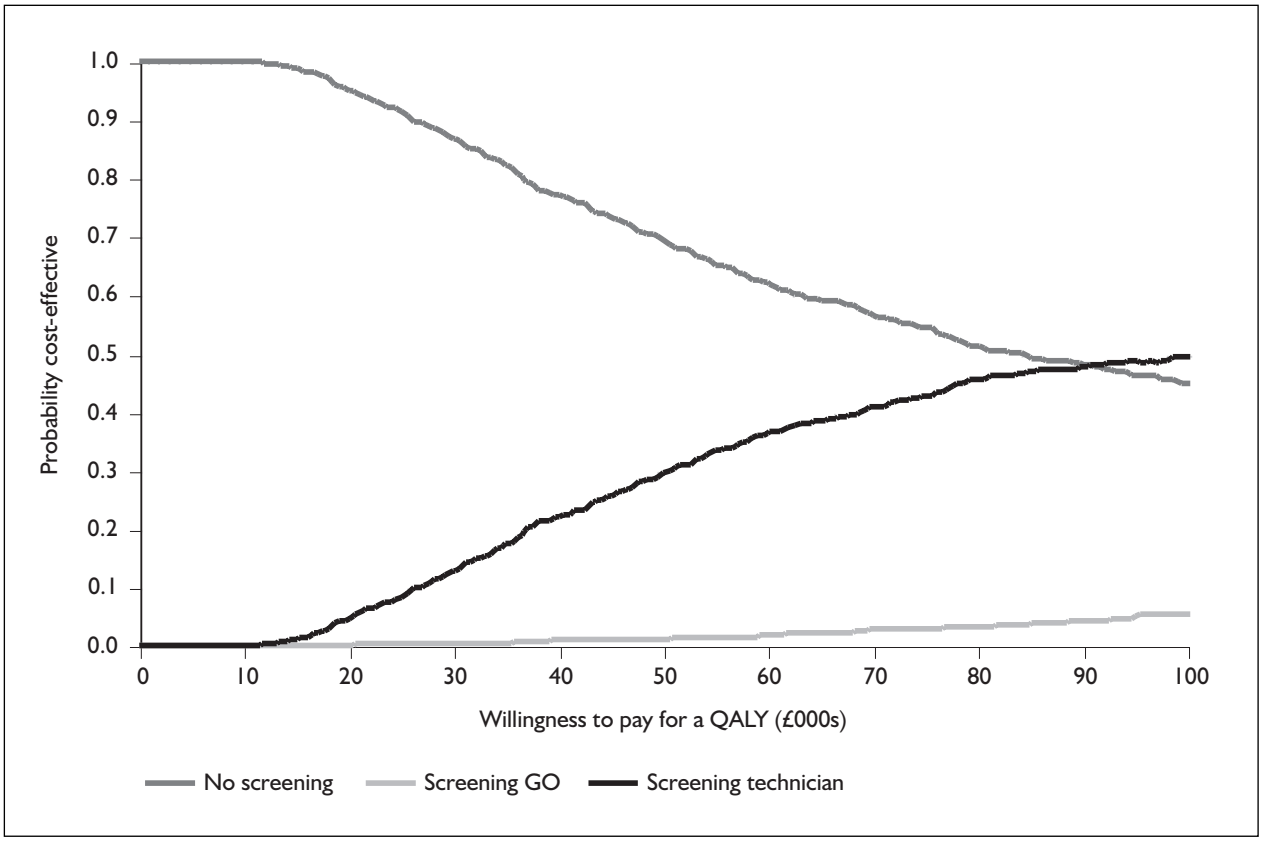

FIGURE 71 *Ten-year screening interval, 60-year-old cohort, 1% OAG prevalence rate*

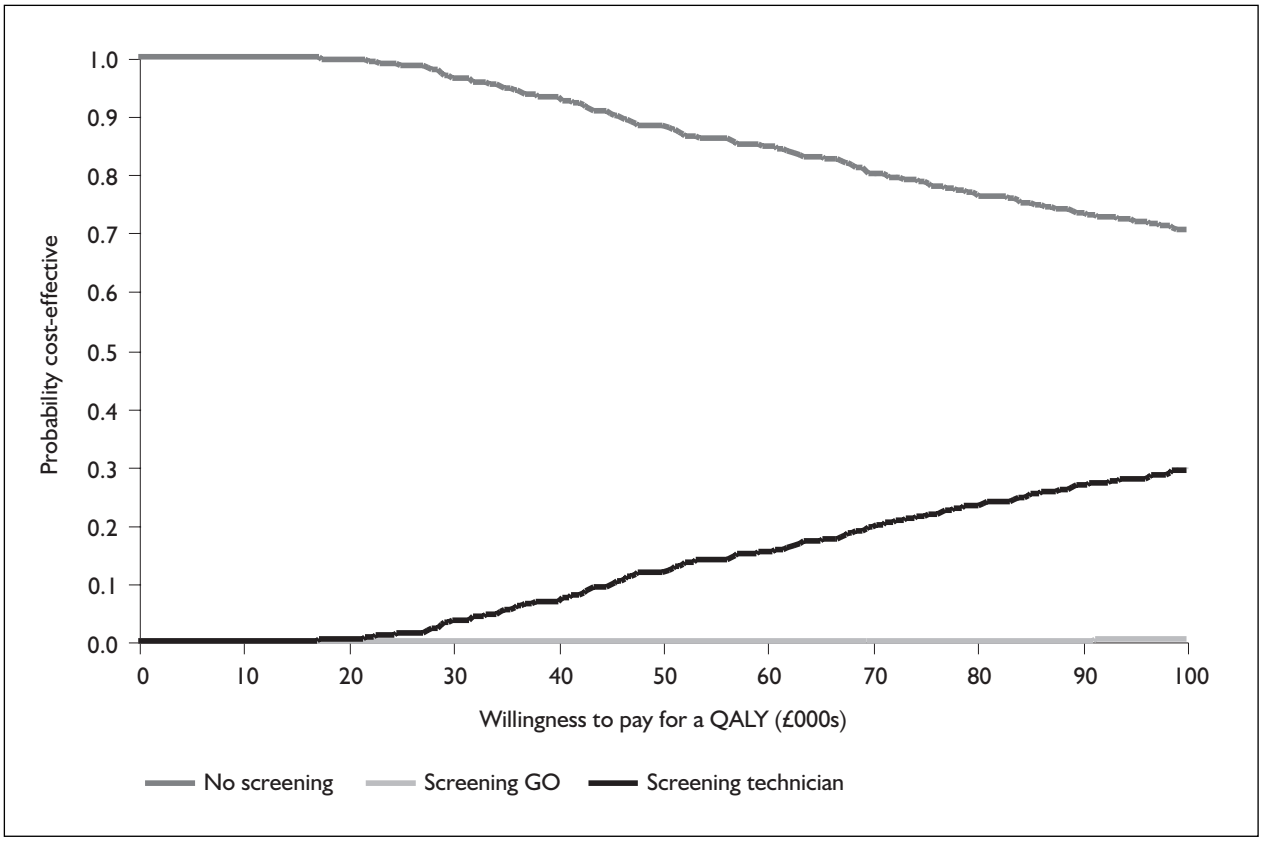

FIGURE 72 *Five-year screening interval, 75-year-old cohort, 1% OAG prevalence rate*

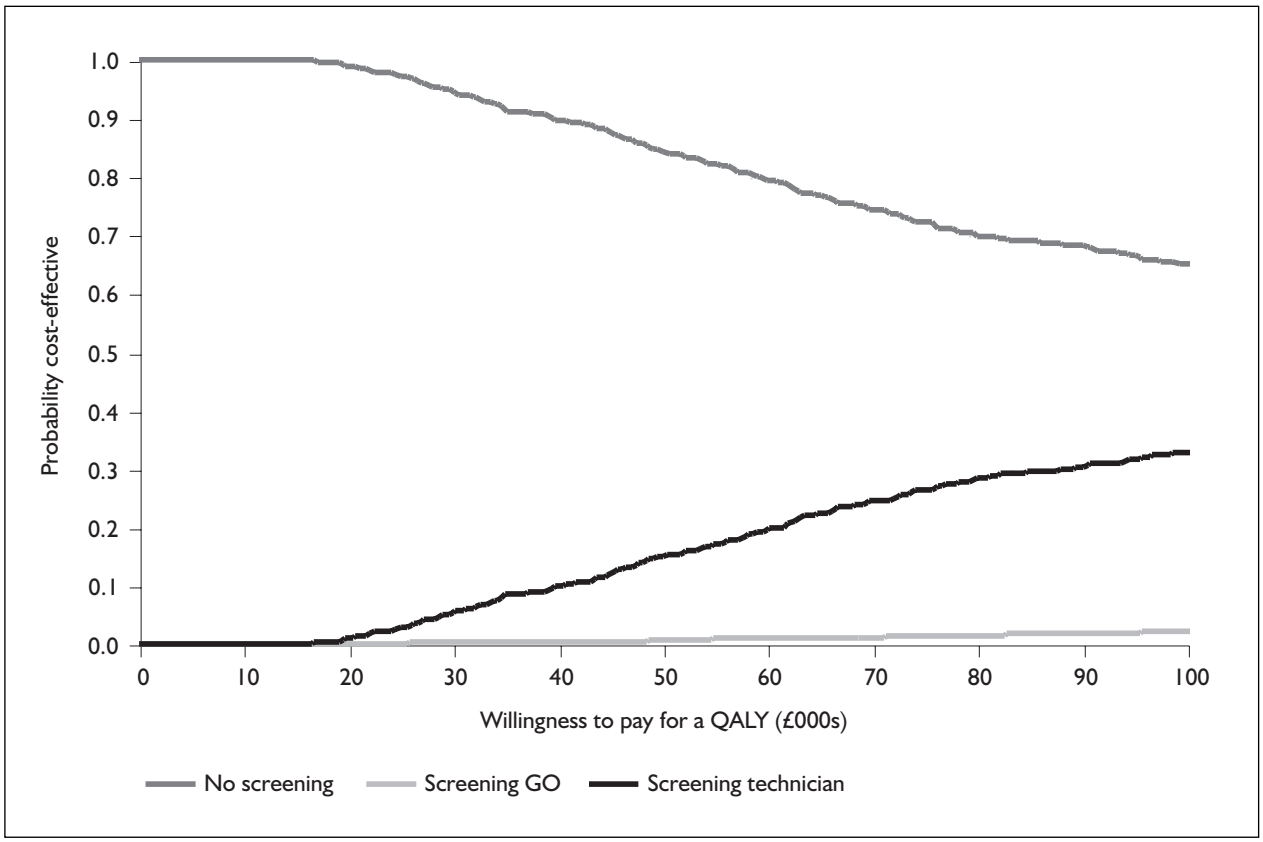

FIGURE 73 *Ten-year screening interval, 75-year-old cohort, 1% OAG prevalence rate*

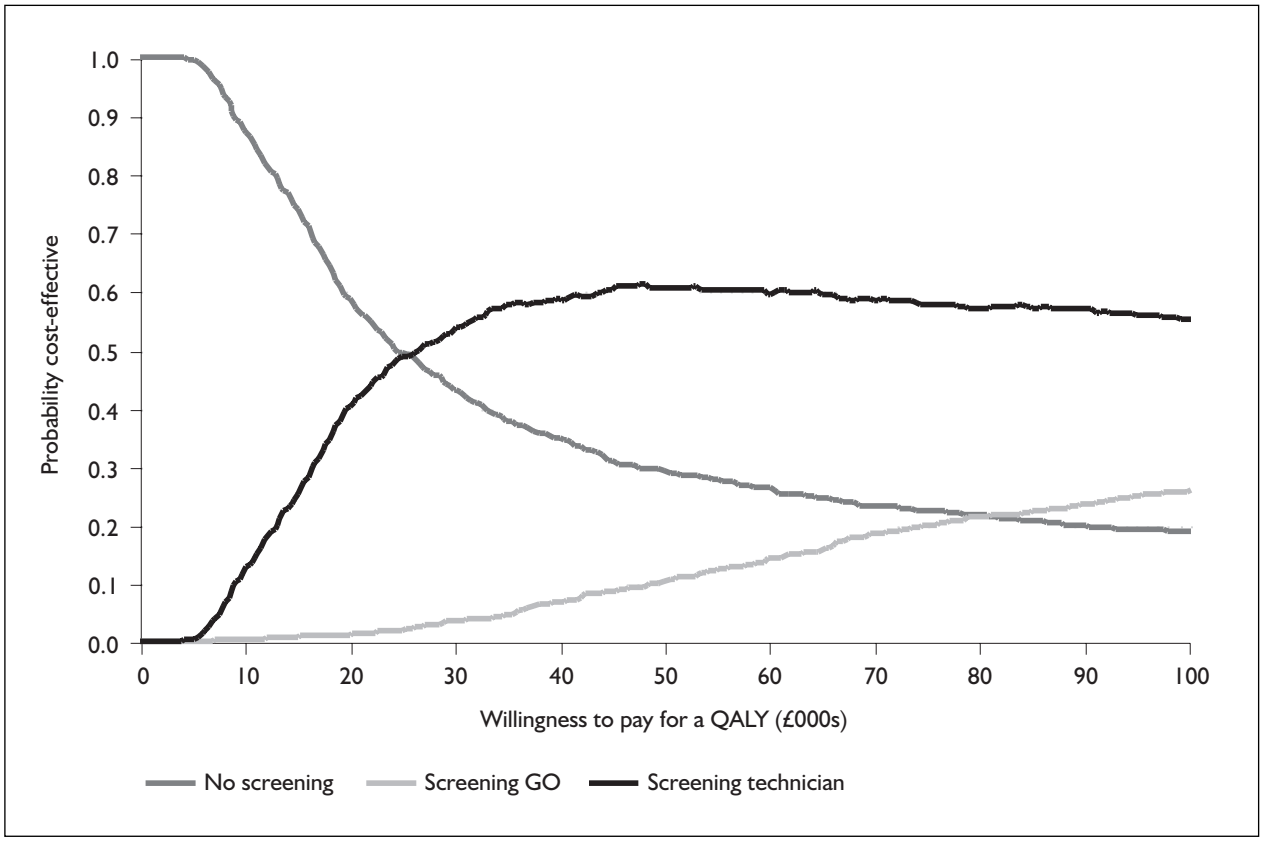

FIGURE 74 *Five-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

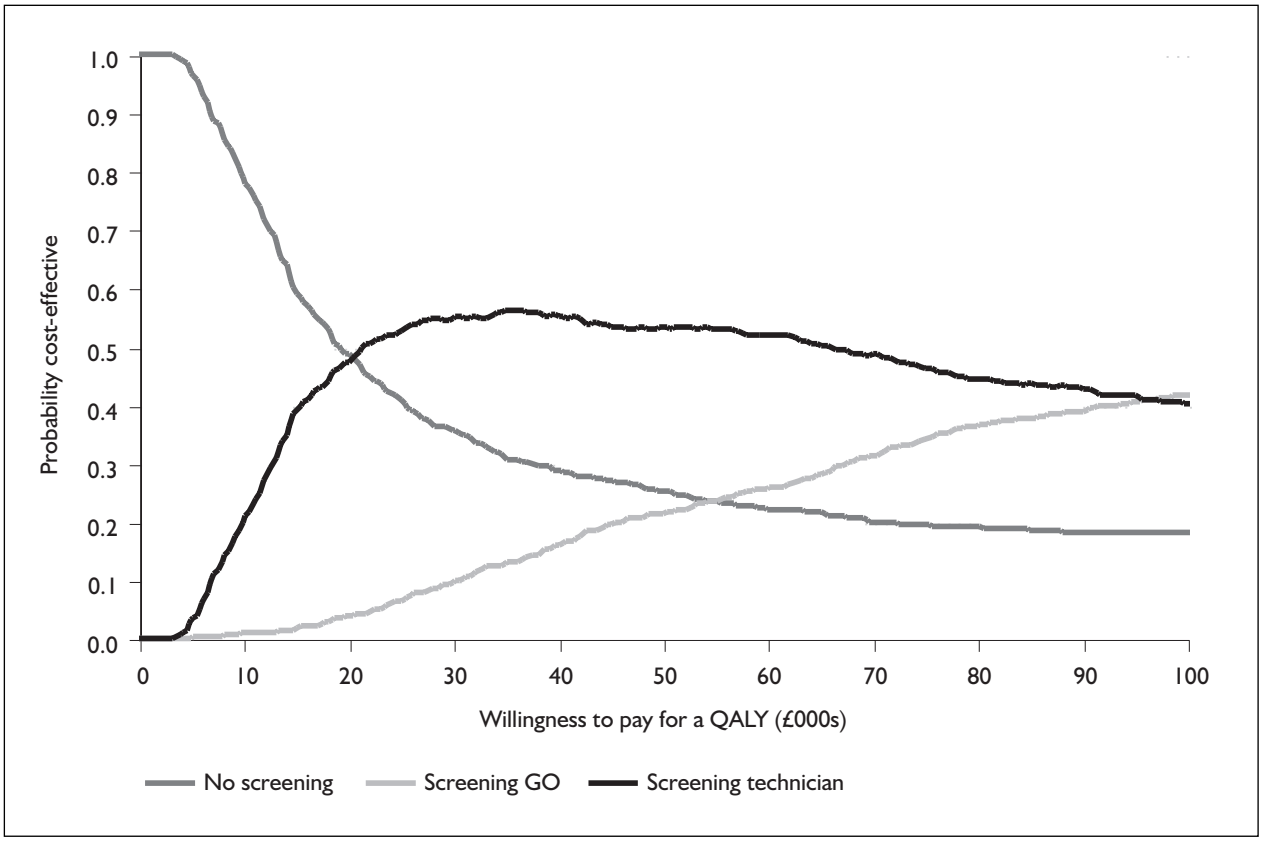

FIGURE 75 *Ten-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

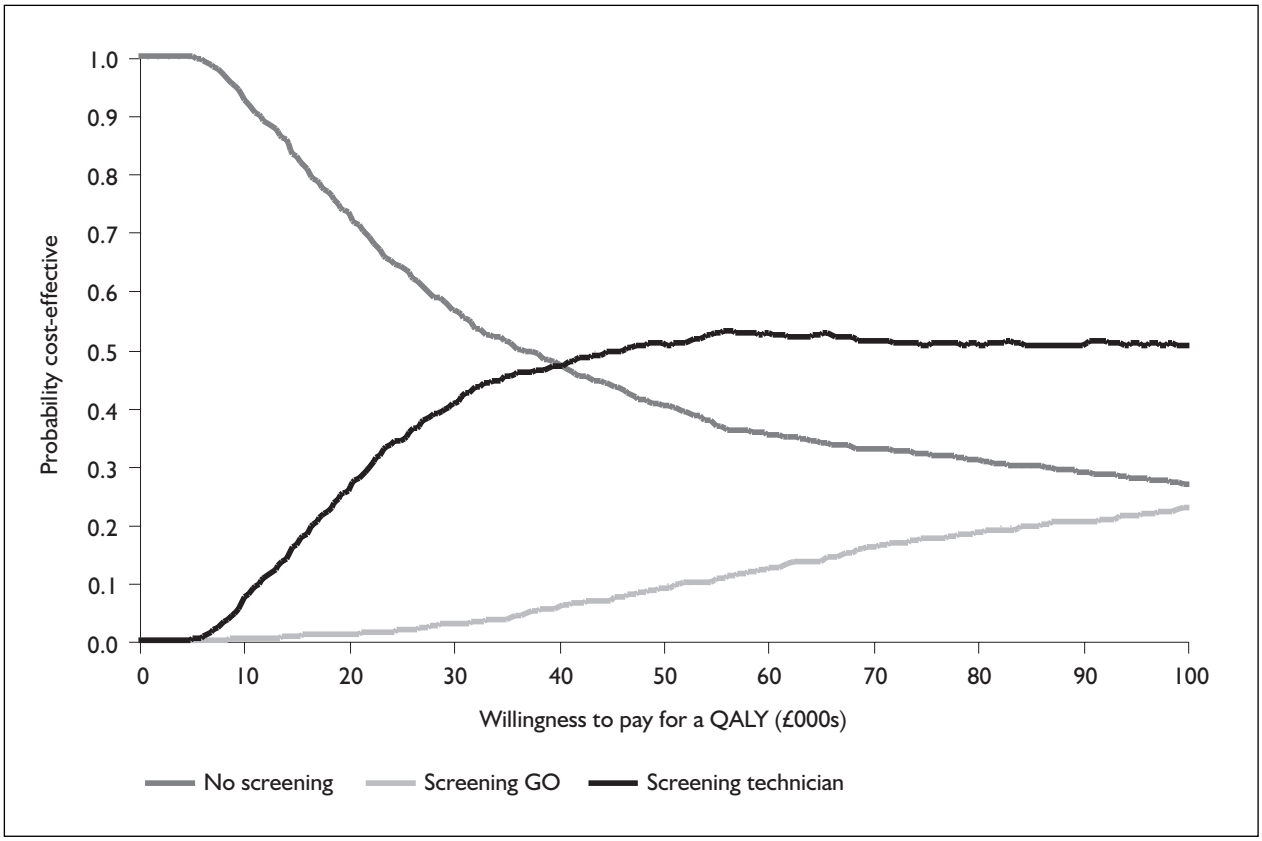

FIGURE 76 *Five-year screening interval, 60-year-old cohort, 5% OAG prevalence rate*

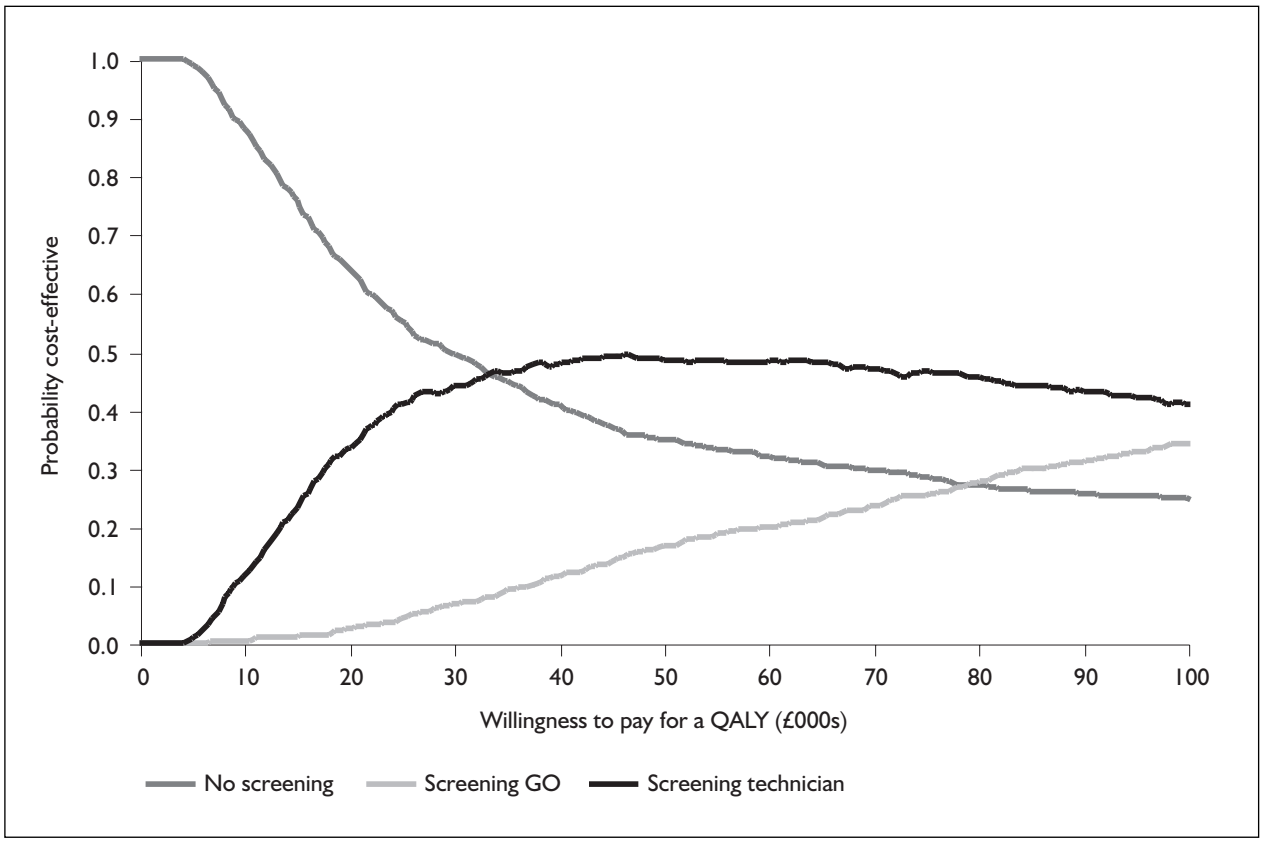

FIGURE 77 *Ten-year screening interval, 60-year-old cohort, 5% OAG prevalence rate*

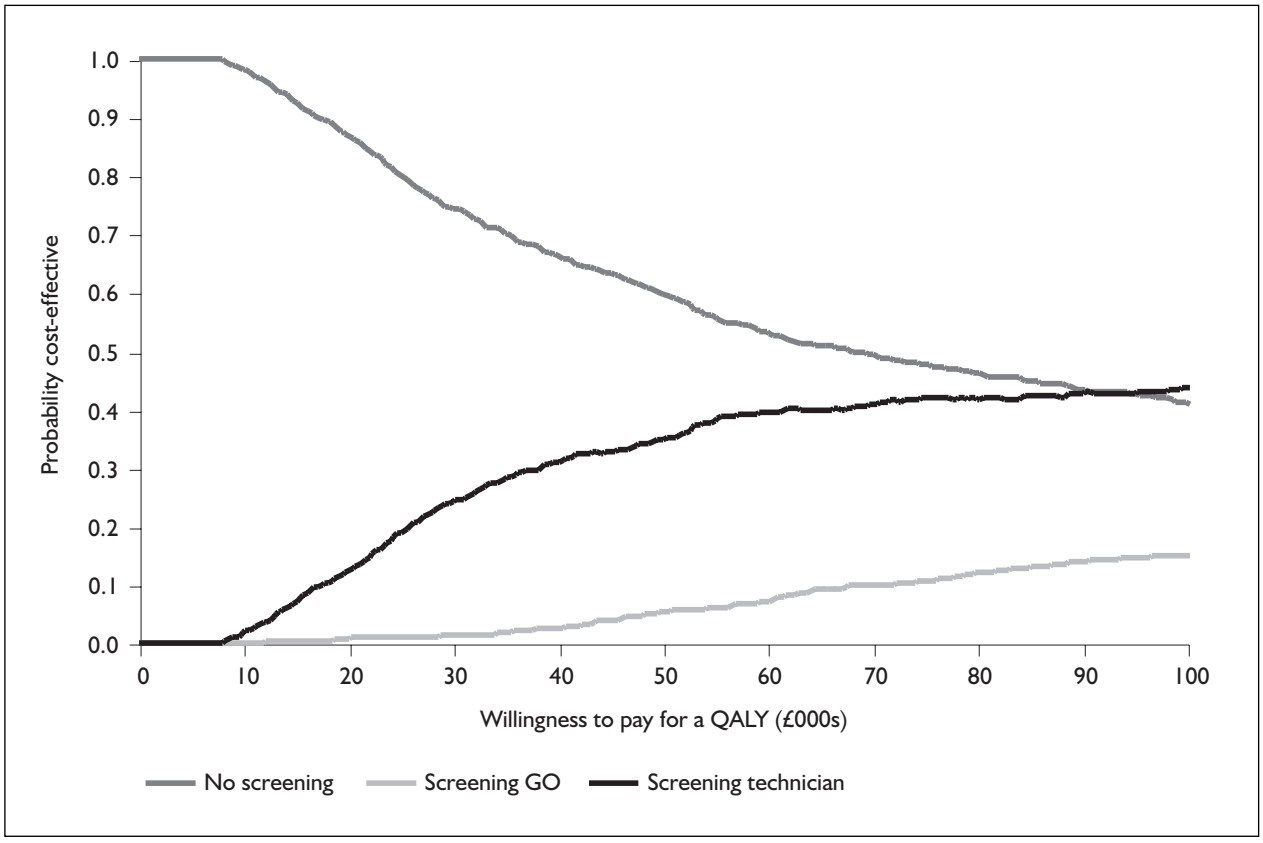

FIGURE 78 *Five-year screening interval, 75-year-old cohort, 5% OAG prevalence rate*

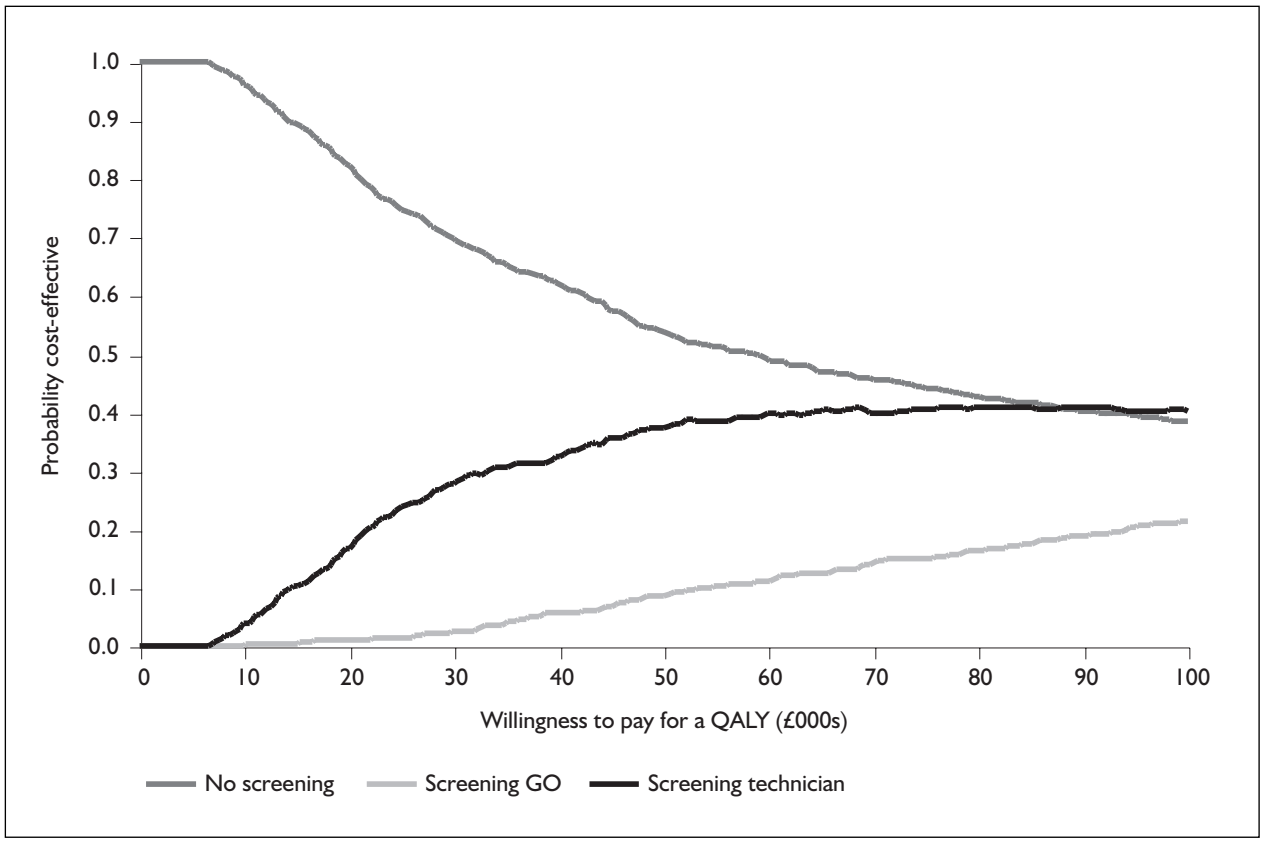

FIGURE 79 *Ten-year screening interval, 75-year-old cohort, 5% OAG prevalence rate*

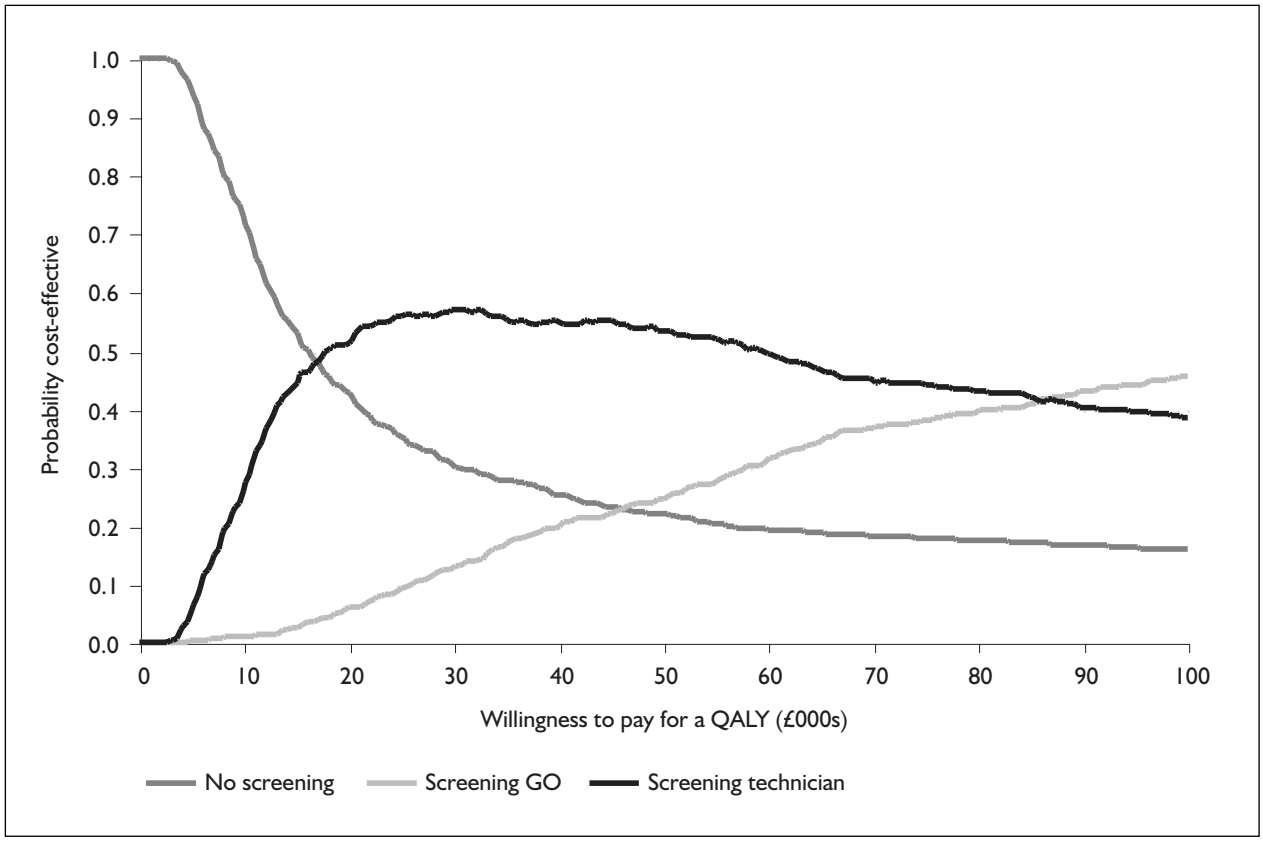

FIGURE 80 *Five-year screening interval, 40-year-old cohort, 10% OAG prevalence rate*

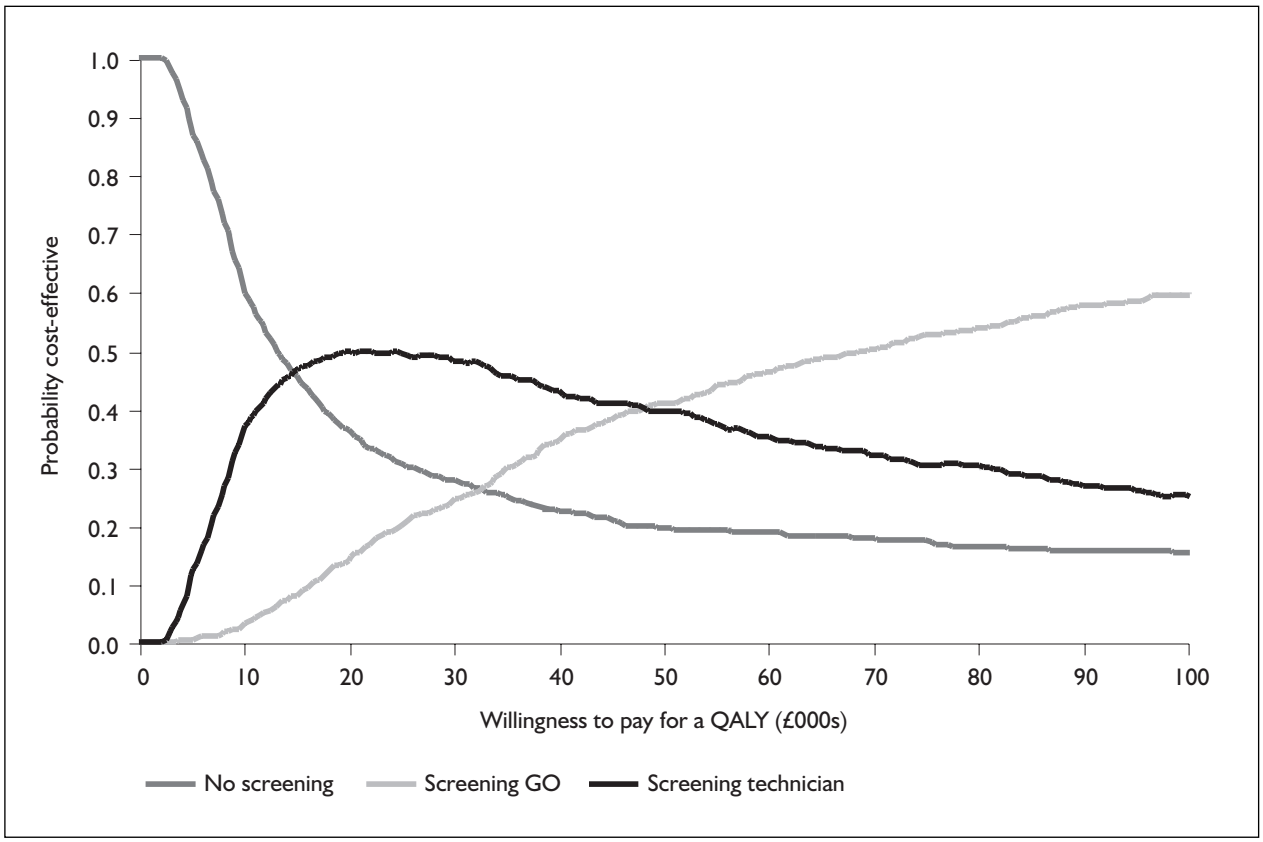

FIGURE 81 *Ten-year screening interval, 40-year-old cohort, 10% OAG prevalence rate*

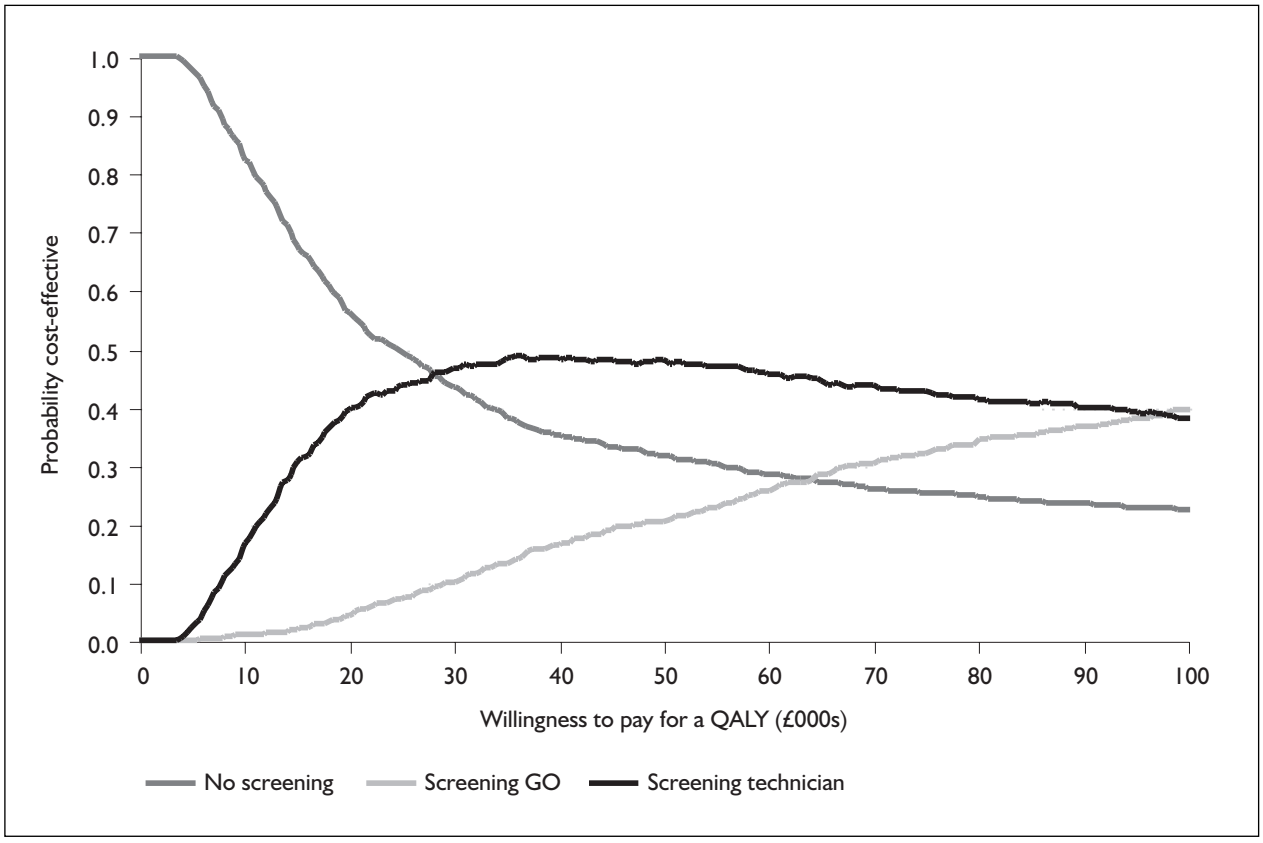

FIGURE 82 *Five-year screening interval, 60-year-old cohort, 10% OAG prevalence rate*

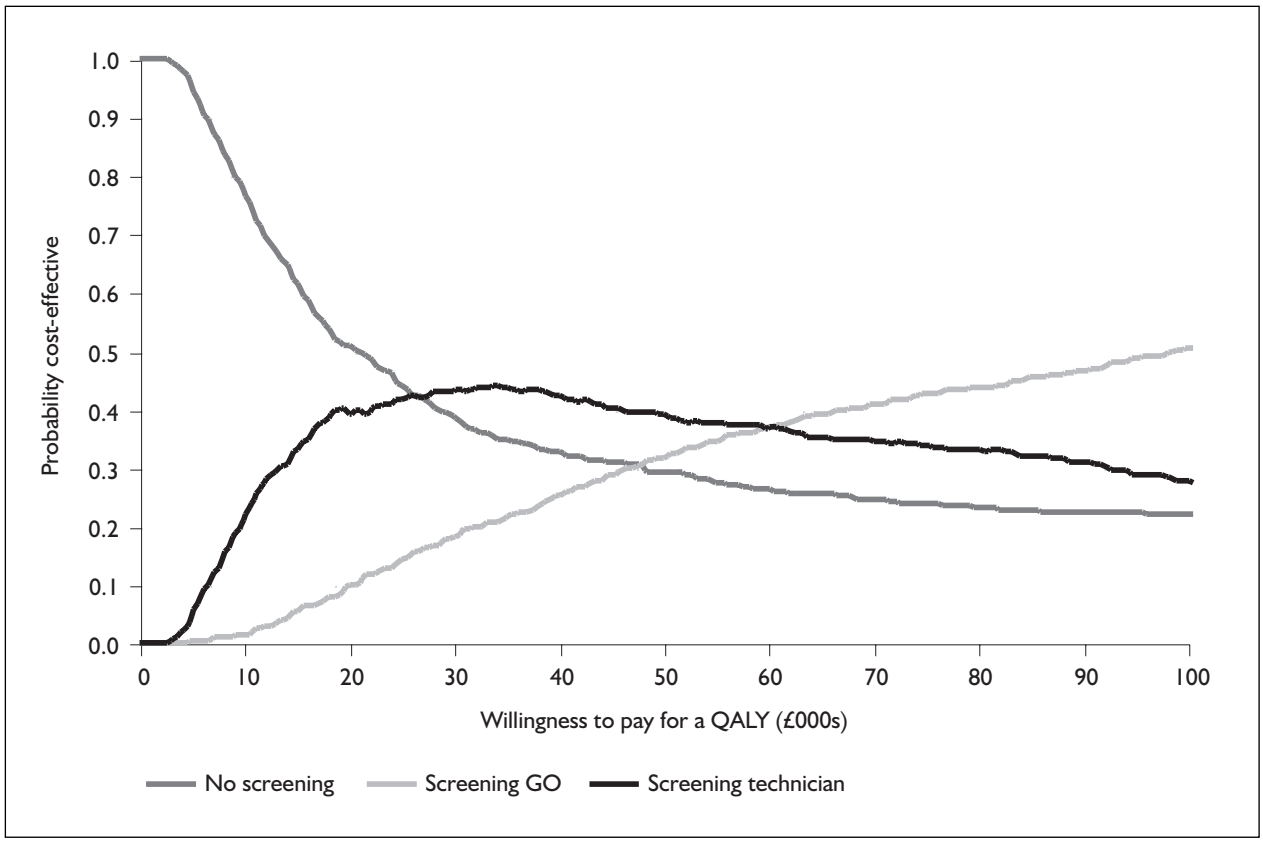

FIGURE 83 *Ten-year screening interval, 60-year-old cohort, 10% OAG prevalence rate*

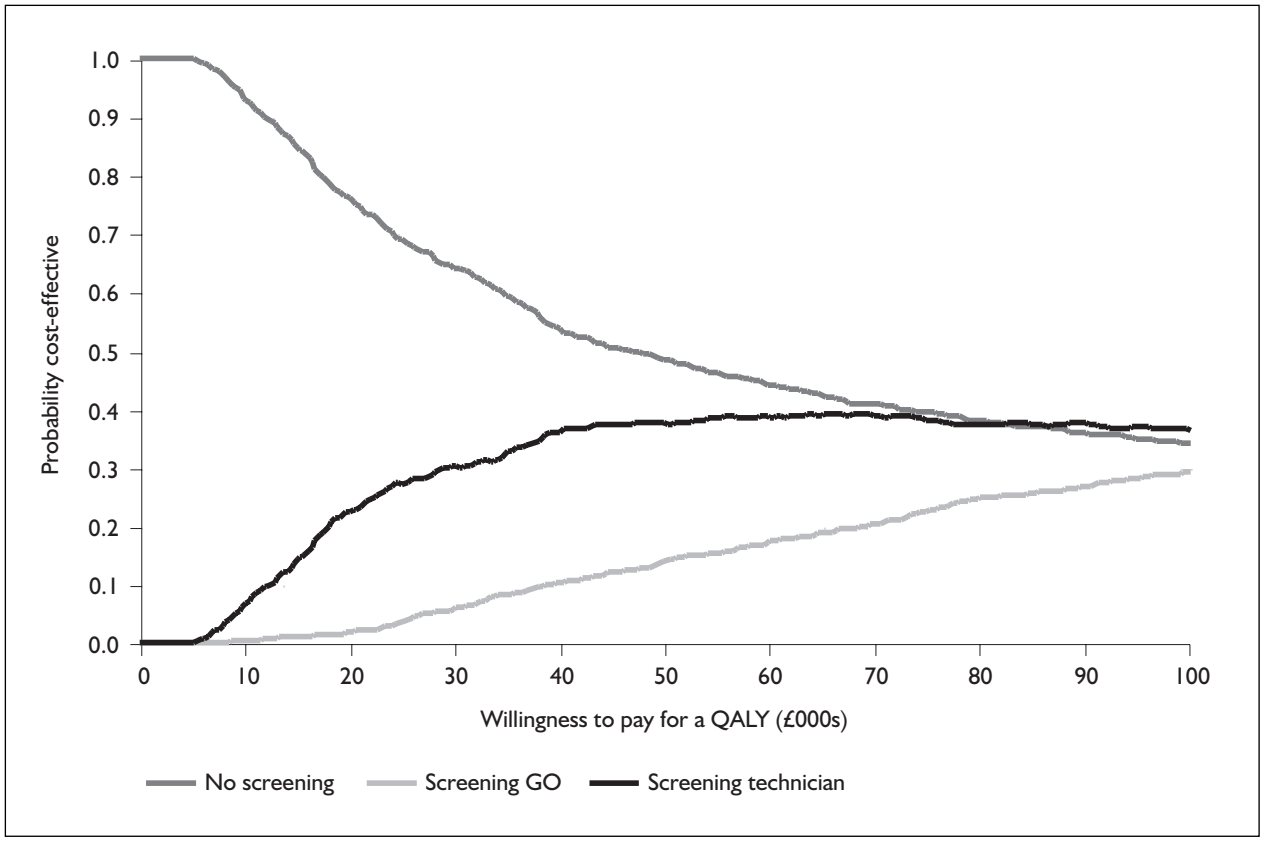

FIGURE 84 *Five-year screening interval, 75-year-old cohort, 10% OAG prevalence rate*

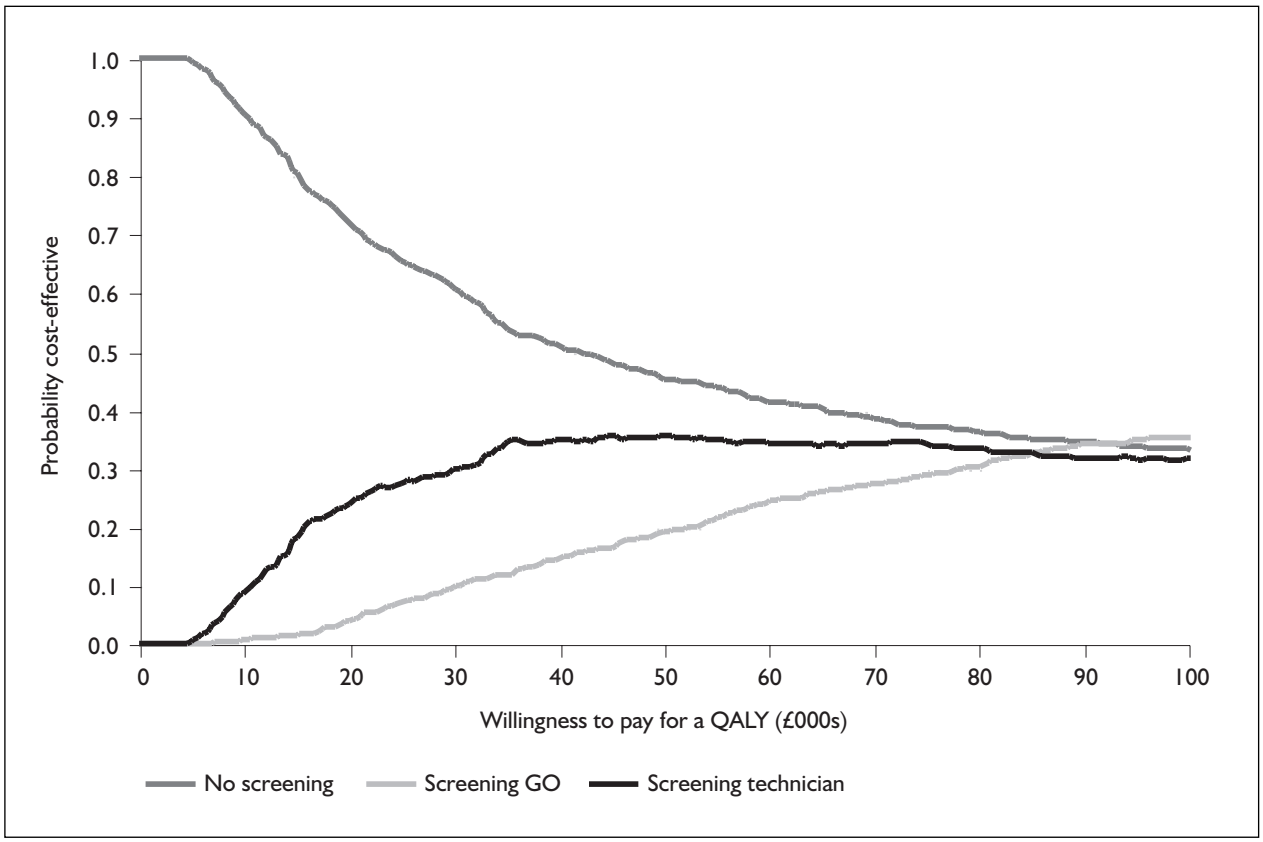

FIGURE 85 *Ten-year screening interval, 75-year-old cohort, 10% OAG prevalence rate*

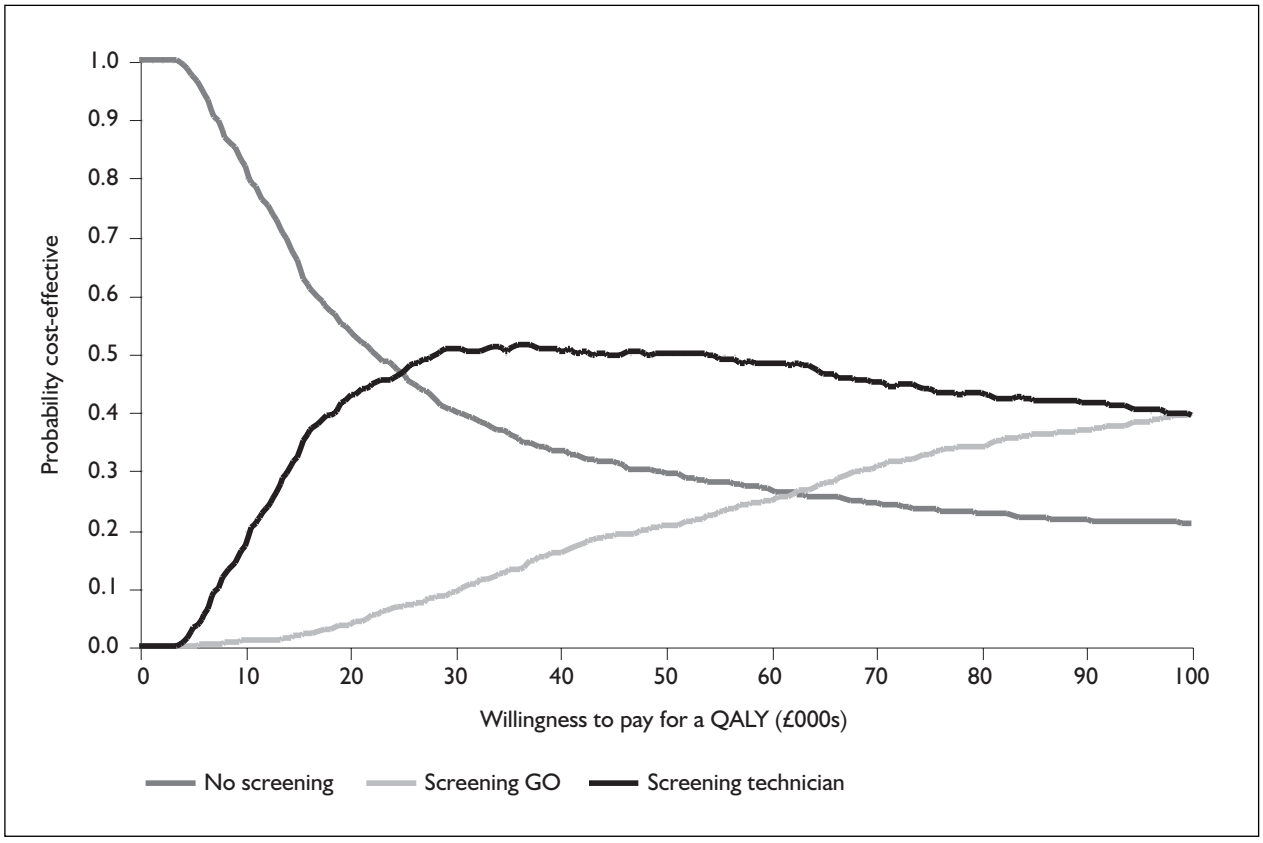

FIGURE 86 *Incidence of OAG high, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

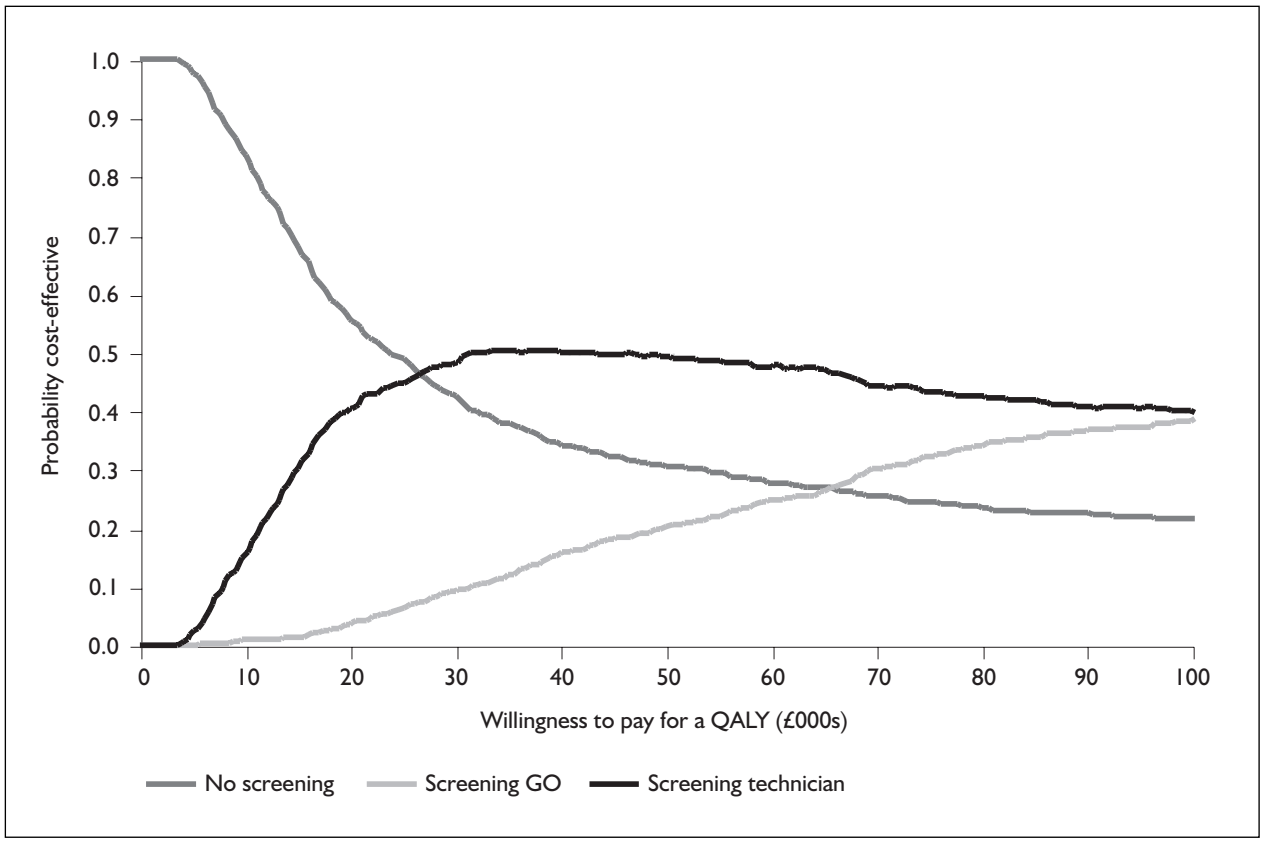

FIGURE 87 *Incidence of OAG low, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

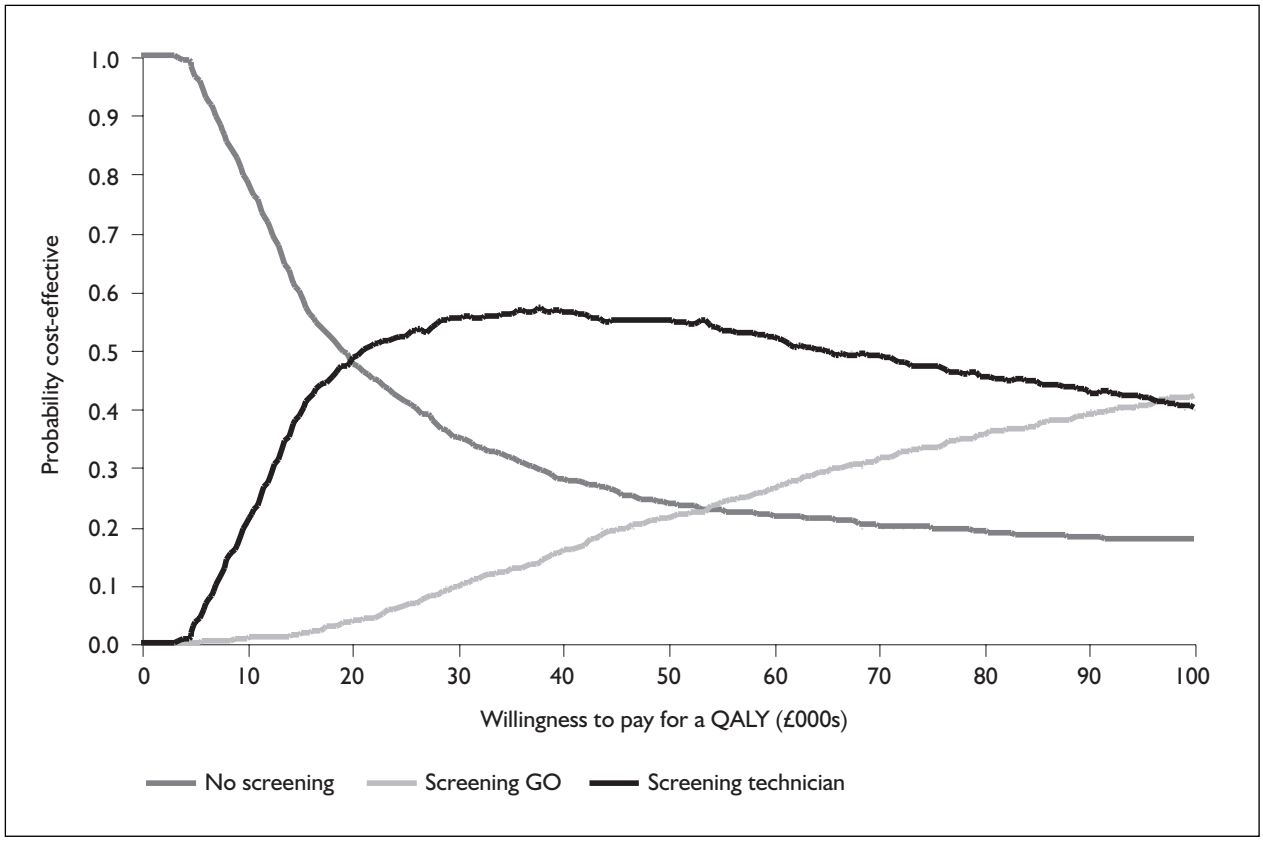

FIGURE 88 *OAG progression mild high, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

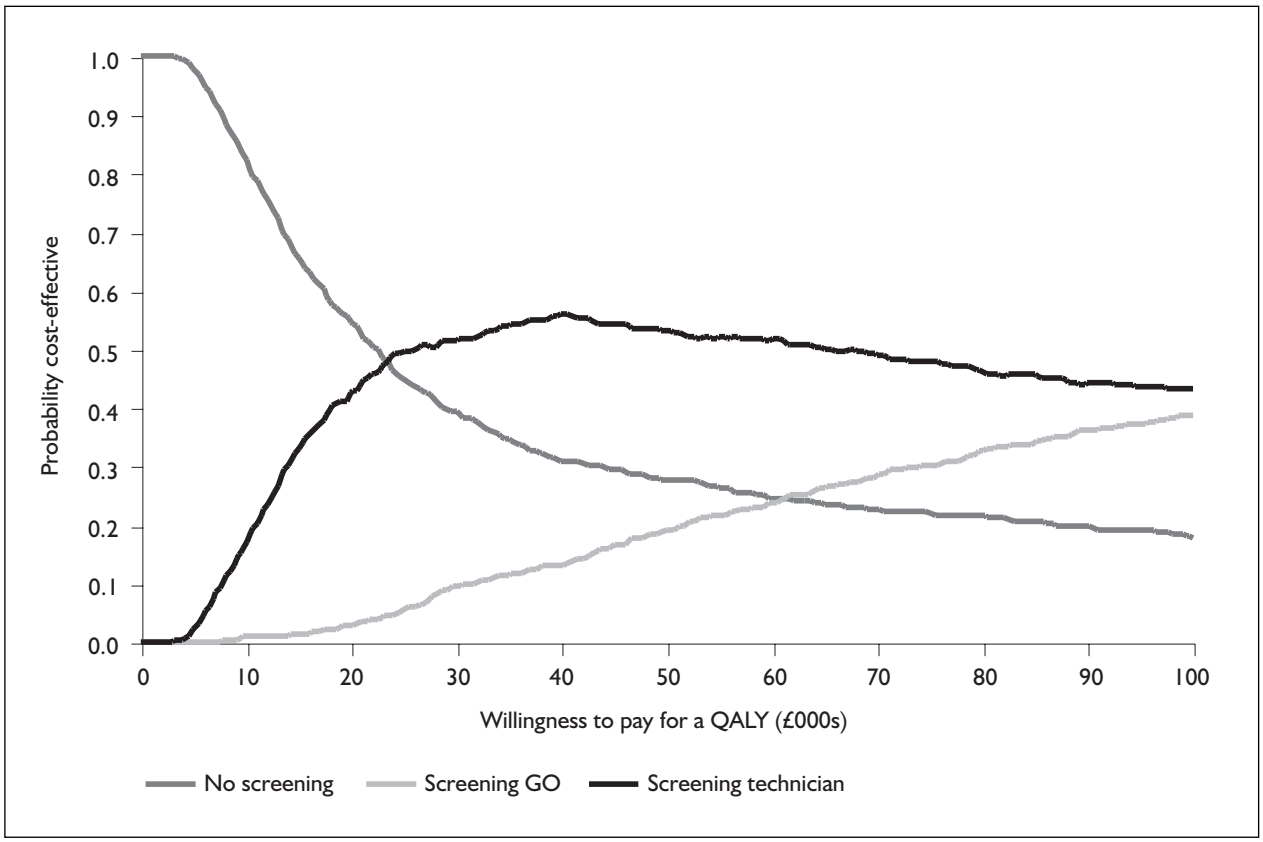

FIGURE 89 *OAG progression mild low, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

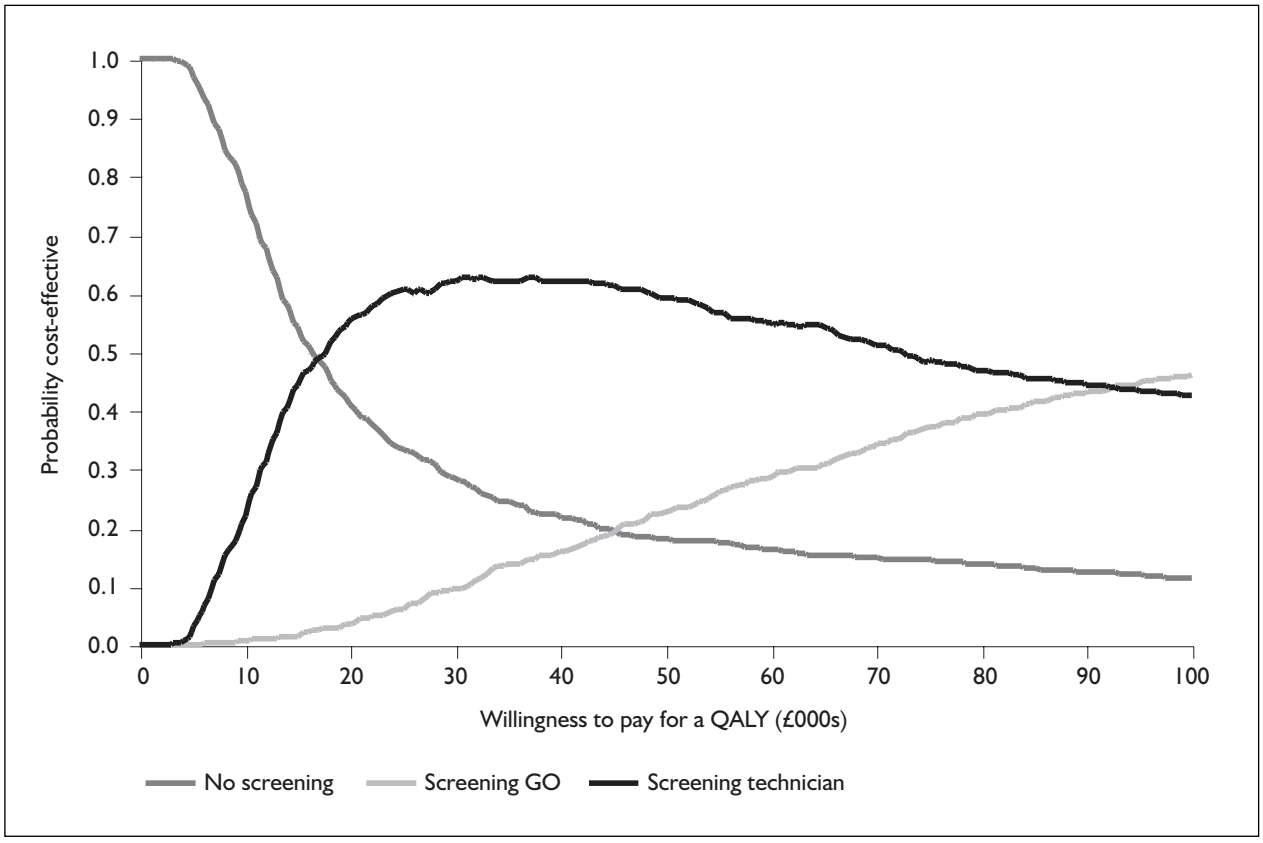

FIGURE 90 *OAG progression moderate high, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

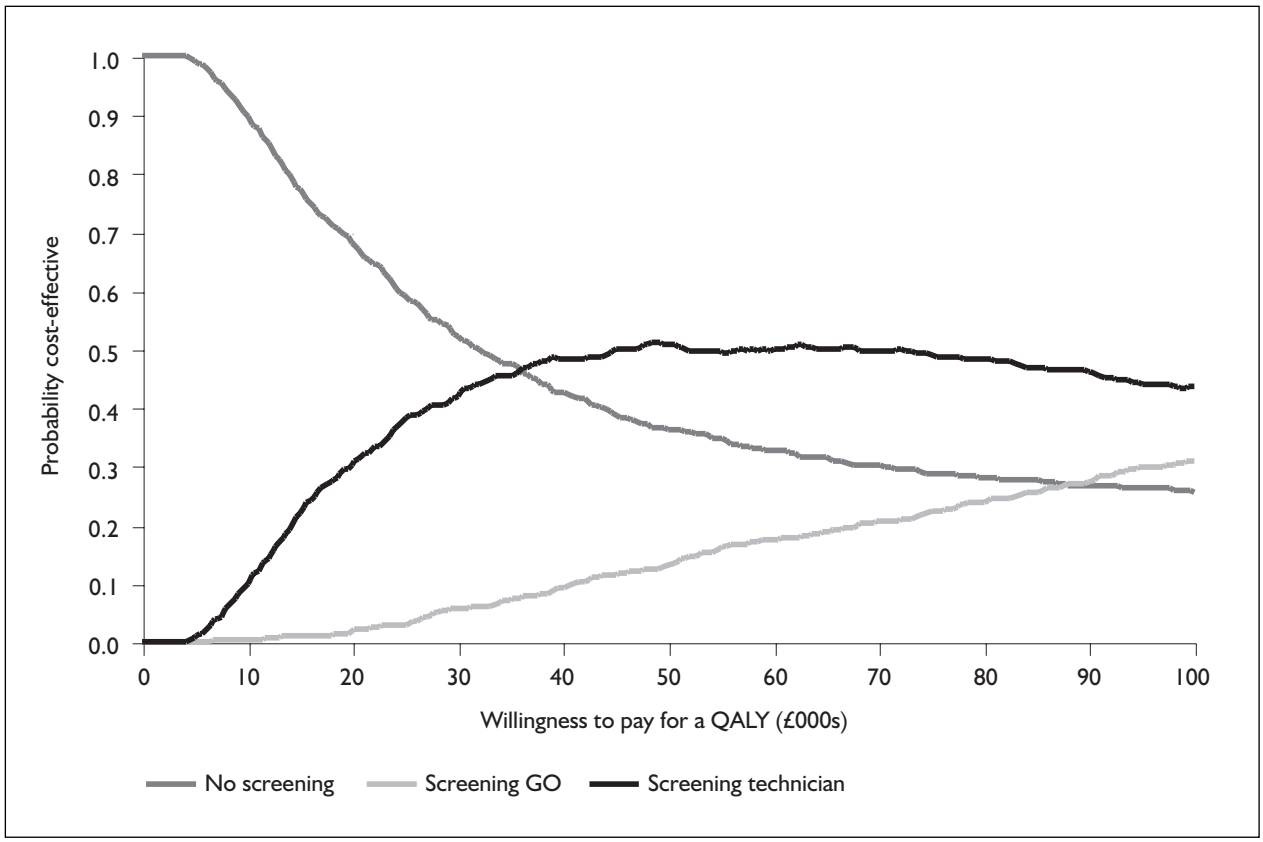

FIGURE 91 *OAG progression moderate low, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

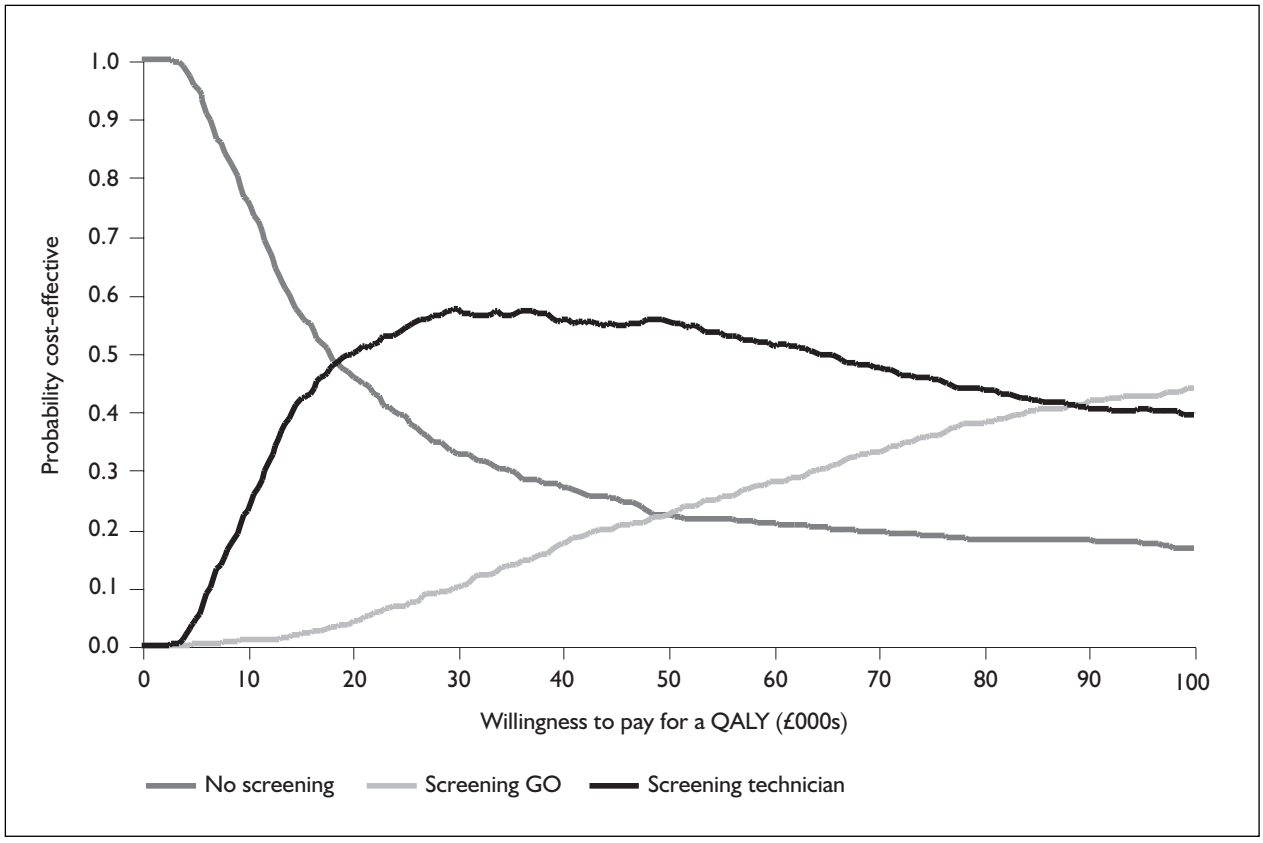

FIGURE 92 *OAG progression severe high, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

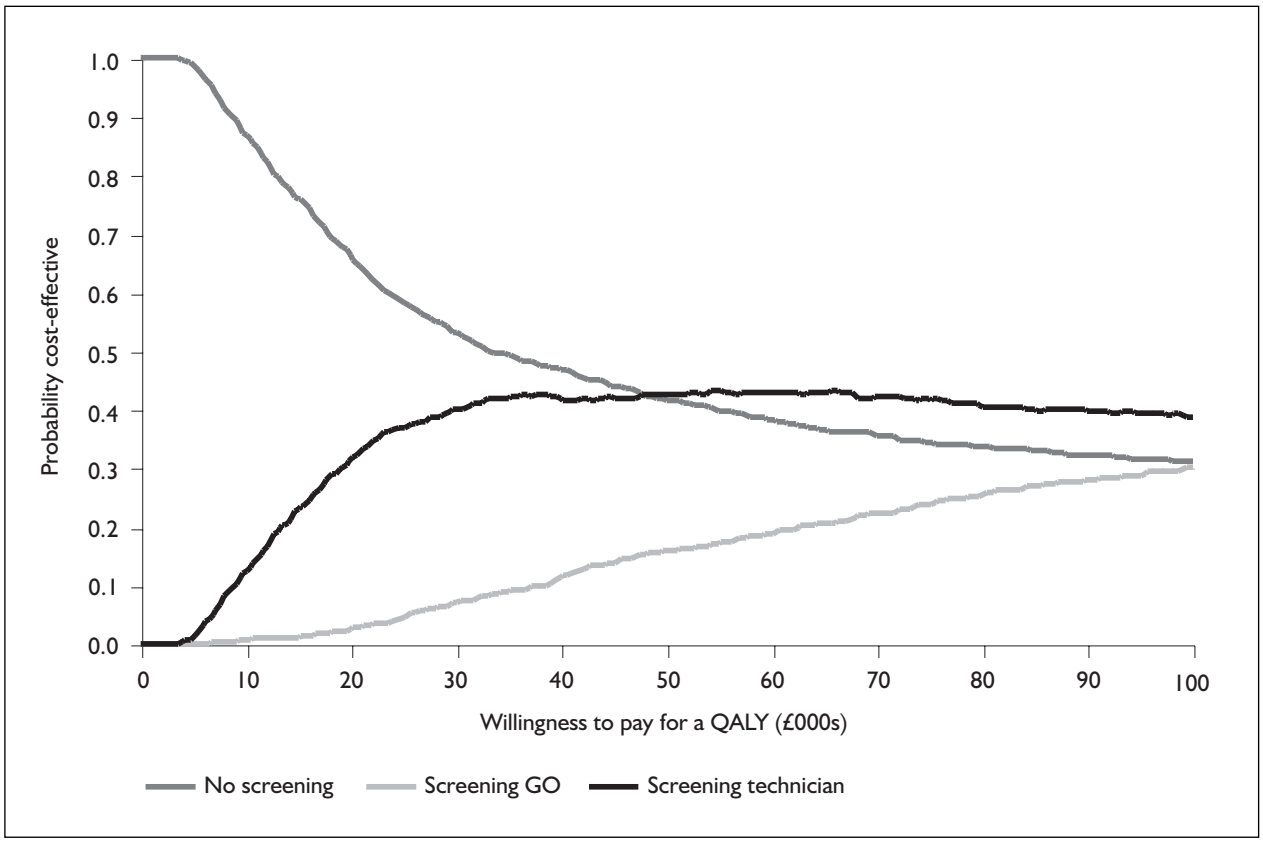

FIGURE 93 *OAG progression severe low, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

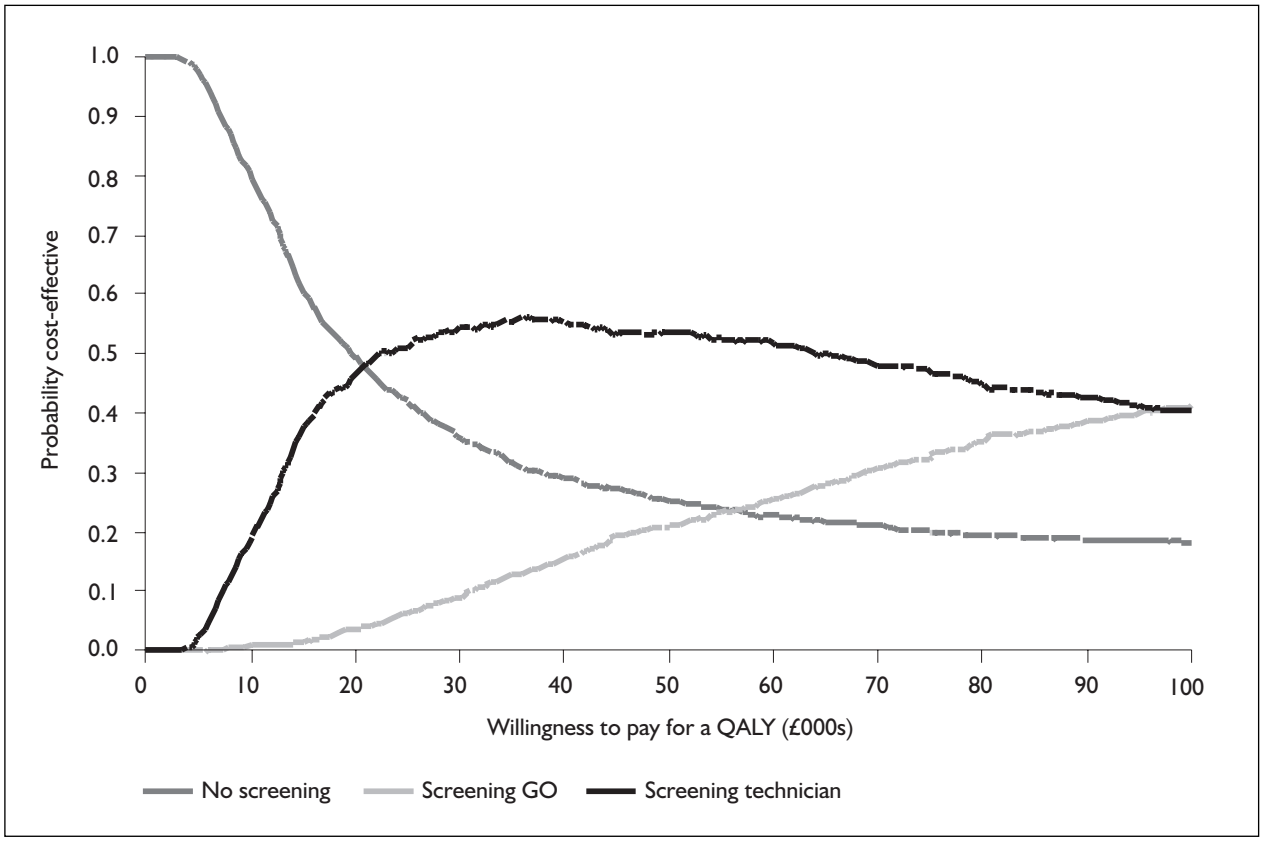

FIGURE 94 *Alternative OAG progression mean values, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

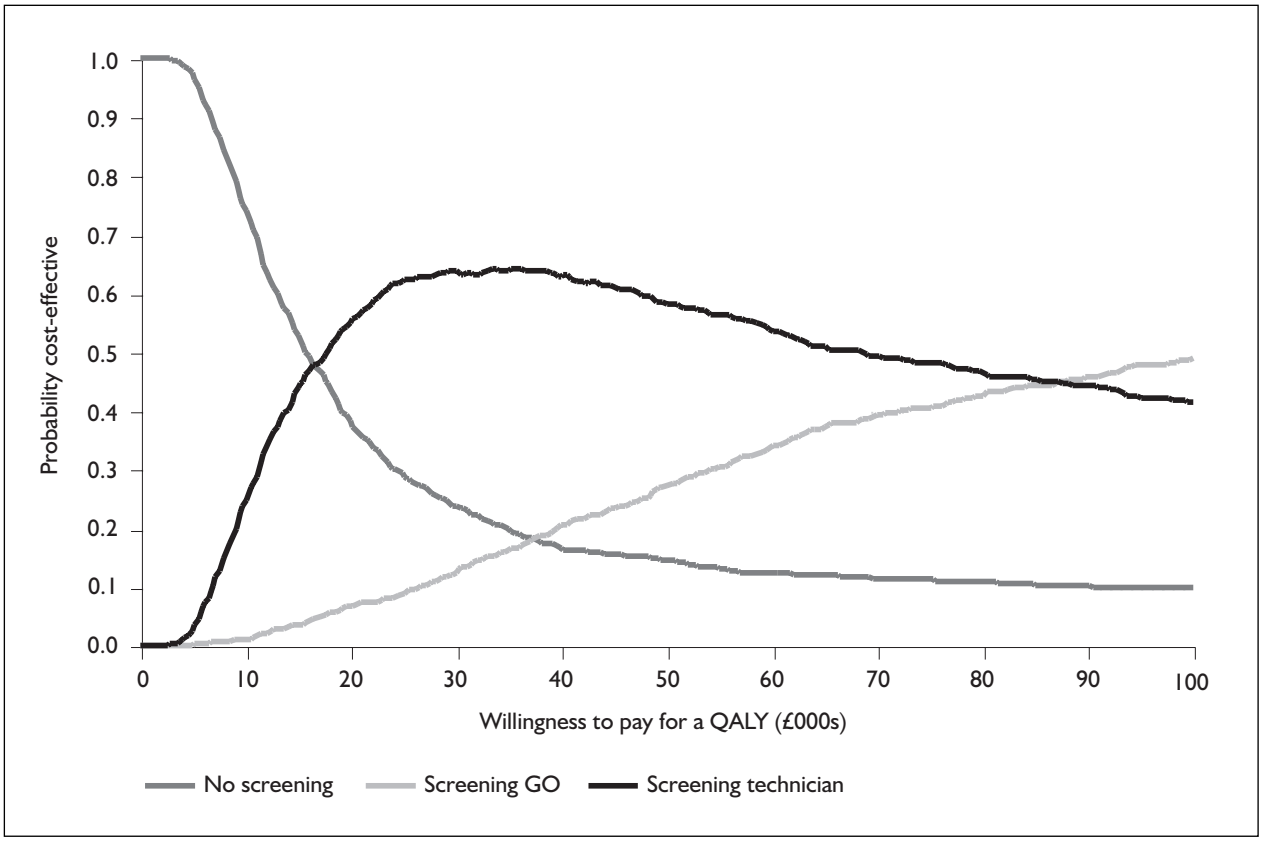

FIGURE 95 *Health state utility subjective assessment, 10-year screening interval, 40-year-old cohort, 5% OAG prevalence rate*

Appendix 24

The wider costs of visual impairment

Data relevant to the costs of blindness and visual impairment relevant to the UK are sparse. A recent study by Meads and Hyde[299] estimated the annual costs of blindness caused by age-related macular degeneration. This study attempted to estimate the costs to the NHS, local and central government using data from the literature and unit costs from a variety of standard sources or previously published estimates.

Although it is unclear whether the best available data were used, the sources and values used were explicitly stated so their validity can be considered (*Table 105*). In *Table 105* the costs from Meads and Hyde have been inflated from 2000/01 to 2005/06 UK pounds sterling using the Hospital and Community Health Services Pay and Price Index and a 2% inflation rate for where no inflation rate indices were available.

In 2006 UK pounds Meads and Hyde estimated that the cost of the first year of blindness was £7851 and subsequent years was £7657 (the costs of vision aids and rehabilitation were only incurred in the first year). Using these figures, the cost to society can be estimated as £6569 in the first year and £6487 in subsequent years (societal costs exclude tax and benefits, which are transfer payments, rather than costs, but would include the proportion of residential costs incurred by patients).

TABLE 105 *Elements of the cost of visual impairment considered by Meads and Hyde*[299]

		Proportion incurring cost
Blind registration	72.61	95%
Low vision aids	165.82	33%
Low vision rehabilitation	249.71	11%
Housing benefit and council tax	3,301.56	45%
Social security	2,340.19	63%
Tax allowance	388.00	5%
Depression	476.76	39%
Hip replacement	4,462.65	5%
Community care	3,464.83	6%
Residential care	19,344.75	30%[a]

[a] In their analysis Meads and Hyde assumed that 30% of people paid their own residential care costs.

Appendix 25

Further details of the estimation of the numbers eligible and ineligible for screening

As described in the section 'Estimating the numbers eligible for screening' (p. 135), the number of people eligible for screening and the number of cases of OAG that might be expected to occur in the groups eligible and ineligible for screening can be estimated from the data reported in *Table 63* (p. 135). The estimates, shown in *Table 106*, have been provided for a standard 100,000 cohort of the UK population aged 40 years and above. Estimates have been calculated for two alternative sets of assumptions. First, it has been assumed that the prevalence of the risk factors is independent and, second, it has been assumed that the prevalence of risk factors is not

TABLE 106 *Size of eligible population and estimate of level of need in the target populations*

Parameter	Mean	High[a]	Notes
Total population (aged 40 years and over)	100,000		
Eligible population			
Number aged 40 with risk factors at first screen	1,312		Assume no double counting
Number aged 50 with risk factors at first screen	1,177		Assume no double counting
Number aged 60 with risk factors at first screen	585		Assume no double counting
Number aged 40 with risk factors at first screen	1,004		Assume double counting
Number aged 50 with risk factors at first screen	926		Assume double counting
Number aged 60 with risk factors at first screen	390		Assume double counting
Cases of OAG			
Cases in the population of 100,000[b]	2,100	2,500	
Cases in age 40 cohort	10	16	
Cases in age 50 cohort	24	34	
Cases in age 60 cohort	29	37	

[a] Based on the upper limits of the confidence intervals reported in *Table 63* and the underestimate of OAG in the population.
[b] Based on an estimated population prevalence of OAG of 2.1% (95% CI 1.7 to 2.5%).

TABLE 107 *Estimated number of cases of OAG included in and excluded from the target groups*

	Mean	High	Notes
Expected number of cases in the at-risk group invited for screening			
Number at first screen with risk factors, age 40	8	16	Assume no double counting; bounded at upper limit
Number at first screen with risk factors, age 50	22	34	Assume no double counting; bounded at upper limit
Number at first screen with risk factors, age 60	18	30	Assume no double counting
Number at first screen with risk factors, age 40	6	12	Assume double counting
Number at first screen with risk factors, age 50	16	28	Assume double counting
Number at first screen with risk factors, age 60	10	16.	Assume double counting
Expected number of cases without risk factors in the same age group			
First screen risk factors, age 40	1	0	Assume no double counting
First screen risk factors, age 50	2	0	Assume no double counting
First screen risk factors, age 60	11	7	Assume no double counting
First screen risk factors, age 40	4	4	Assume double counting
First screen risk factors, age 50	8	6	Assume double counting
First screen risk factors, age 60	19	21	Assume double counting

independent. This means that the cumulative prevalence of the risk factors is equal to the prevalence of the single most common risk factor. In the analysis that assumes double counting it has also been assumed that the prevalence of OAG for each risk factor is independent.

Table 107 reports the estimates of the expected number of OAG cases in the target age groups who have the specified risk factors and the expected number of cases of OAG among people of the same age but who do not have any of the risk factors. As this table illustrates (and as would be expected), the extreme assumptions give unrealistic estimates, indicating that there will be considerable overlap between the risk factors.

Appendix 26

Number of people in the observation state over time

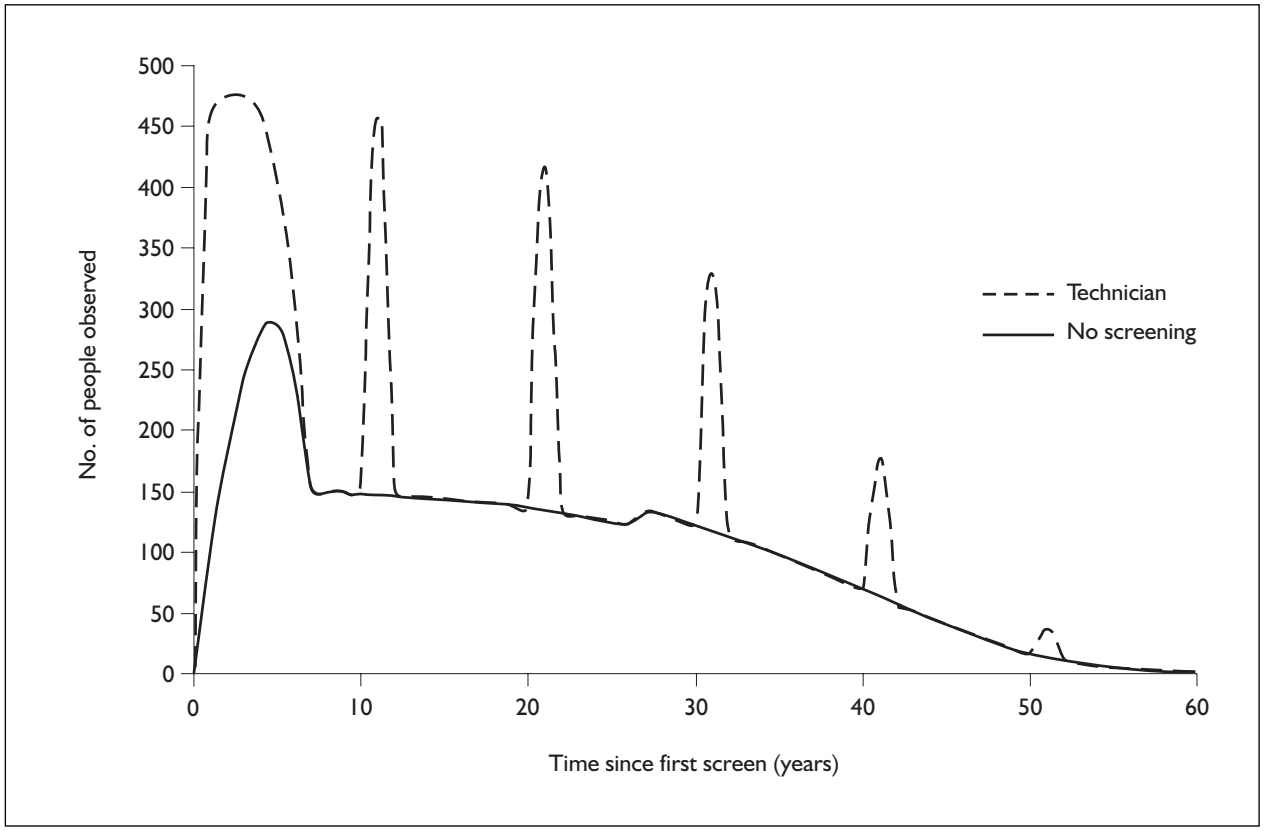

FIGURE 96 *Number of people in the observation state*

Appendix 27

Costs of diagnosis and cases detected for the technician and no-screening strategies

TABLE 108 *Costs of diagnosis, cases detected for each year and cumulatively for the comparison of the technician and no-screening strategies for a 40-year-old cohort and a 10-year screening interval*

	Technician strategy				No-screening strategy						
Stage	**Stage cost**	**Stage effectiveness**	**Cumulative cost**	**Cumulative effectiveness**	**Stage cost**	**Stage effectiveness**	**Cumulative cost**	**Cumulative effective**	**Incremental cost**	**Incremental effectiveness**	**Incremental cost per case detected**
0	£39.58	0.02456	£39.58	0.02456	£4.54	0.00376	£4.54	0.00376	£35.04	0.02079	£1,685
1	£4.24	0.00180	£43.83	0.02636	£4.35	0.00342	£8.89	0.00718	£34.94	0.01917	£1,822
2	£4.08	0.00165	£47.91	0.02800	£4.17	0.00311	£13.06	0.01029	£34.85	0.01771	£1,967
3	£3.92	0.00150	£51.83	0.02951	£4.00	0.00282	£17.06	0.01311	£34.77	0.01640	£2,120
4	£3.77	0.00137	£55.60	0.03088	£3.84	0.00254	£20.90	0.01565	£34.70	0.01523	£2,279
5	£3.63	0.00124	£59.23	0.03212	£3.68	0.00229	£24.58	0.01794	£34.65	0.01418	£2,444
6	£5.30	0.00172	£64.53	0.03384	£5.37	0.00313	£29.95	0.02107	£34.58	0.01276	£2,709
7	£5.10	0.00149	£69.63	0.03532	£5.16	0.00268	£35.11	0.02375	£34.52	0.01157	£2,983
8	£4.90	0.00129	£74.53	0.03661	£4.94	0.00229	£40.05	0.02604	£34.48	0.01057	£3,262
9	£4.70	0.00112	£79.23	0.03772	£4.74	0.00196	£44.79	0.02799	£34.45	0.00973	£3,540
10	£25.77	0.00424	£105.01	0.04197	£4.54	0.00167	£49.33	0.02966	£55.68	0.01230	£4,526
11	£4.30	0.00047	£109.31	0.04244	£4.35	0.00143	£53.68	0.03109	£55.62	0.01134	£4,903
12	£4.14	0.00043	£113.45	0.04286	£4.17	0.00122	£57.85	0.03231	£55.59	0.01055	£5,270
13	£3.97	0.00039	£117.42	0.04325	£3.99	0.00105	£61.85	0.03336	£55.57	0.00989	£5,619
14	£3.81	0.00036	£121.22	0.04361	£3.83	0.00090	£65.67	0.03426	£55.55	0.00935	£5,944
15	£3.65	0.00033	£124.87	0.04394	£3.66	0.00078	£69.33	0.03505	£55.54	0.00890	£6,242
16	£3.49	0.00031	£128.36	0.04425	£3.50	0.00068	£72.84	0.03572	£55.52	0.00853	£6,509
17	£3.34	0.00029	£131.70	0.04455	£3.35	0.00059	£76.19	0.03632	£55.51	0.00823	£6,746
18	£3.19	0.00028	£134.89	0.04483	£3.20	0.00052	£79.38	0.03684	£55.51	0.00798	£6,952
19	£3.04	0.00026	£137.93	0.04509	£3.05	0.00046	£82.43	0.03731	£55.50	0.00778	£7,130
20	£16.50	0.00111	£154.44	0.04620	£2.90	0.00041	£85.34	0.03772	£69.10	0.00848	£8,152
21	£2.74	0.00019	£157.18	0.04639	£2.76	0.00042	£88.09	0.03814	£69.08	0.00825	£8,377
22	£2.61	0.00024	£159.79	0.04663	£2.62	0.00043	£90.71	0.03857	£69.08	0.00806	£8,571
23	£2.48	0.00028	£162.27	0.04691	£2.48	0.00043	£93.19	0.03901	£69.08	0.00791	£8,737
24	£2.34	0.00031	£164.61	0.04723	£2.35	0.00044	£95.54	0.03945	£69.07	0.00778	£8,877
25	£2.21	0.00034	£166.82	0.04757	£2.22	0.00044	£97.75	0.03989	£69.07	0.00768	£8,994
26	£2.33	0.00040	£169.15	0.04797	£2.33	0.00049	£100.08	0.04038	£69.07	0.00759	£9,102
27	£2.19	0.00041	£171.34	0.04838	£2.19	0.00048	£102.27	0.04087	£69.07	0.00752	£9,190
28	£2.06	0.00042	£173.40	0.04880	£2.06	0.00048	£104.33	0.04134	£69.07	0.00746	£9,260
29	£1.92	0.00042	£175.32	0.04922	£1.93	0.00046	£106.26	0.04181	£69.06	0.00741	£9,316
30	£9.24	0.00164	£184.56	0.05086	£1.80	0.00045	£108.06	0.04226	£76.50	0.00861	£8,890
31	£1.66	0.00034	£186.22	0.05120	£1.67	0.00052	£109.73	0.04278	£76.49	0.00842	£9,084
32	£1.54	0.00042	£187.77	0.05163	£1.55	0.00057	£111.27	0.04335	£76.49	0.00827	£9,248
33	£1.42	0.00049	£189.19	0.05211	£1.43	0.00061	£112.70	0.04396	£76.49	0.00815	£9,384
34	£1.30	0.00053	£190.49	0.05264	£1.31	0.00062	£114.01	0.04459	£76.49	0.00806	£9,496

continued

TABLE 108 *Costs of diagnosis, cases detected for each year and cumulatively for the comparison of the technician and no-screening strategies for a 40-year-old cohort and a 10-year screening interval (cont'd)*

Stage	Technician strategy				No-screening strategy						
	Stage cost	Stage effectiveness	Cumulative cost	Cumulative effectiveness	Stage cost	Stage effectiveness	Cumulative cost	Cumulative effective	Incremental cost	Incremental effectiveness	Incremental cost per case detected
35	£1.19	0.00055	£191.69	0.05319	£1.19	0.00063	£115.20	0.04522	£76.49	0.00798	£9,586
36	£1.08	0.00056	£192.77	0.05376	£1.08	0.00062	£116.28	0.04584	£76.49	0.00792	£9,657
37	£0.97	0.00056	£193.74	0.05432	£0.98	0.00061	£117.26	0.04645	£76.49	0.00787	£9,714
38	£0.87	0.00055	£194.61	0.05487	£0.87	0.00058	£118.13	0.04703	£76.48	0.00784	£9,758
39	£0.78	0.00053	£195.39	0.05540	£0.78	0.00055	£118.91	0.04758	£76.48	0.00781	£9,791
40	£3.53	0.00196	£198.93	0.05735	£0.69	0.00052	£119.60	0.04810	£79.33	0.00925	£8,574
41	£0.59	0.00038	£199.52	0.05774	£0.60	0.00057	£120.19	0.04867	£79.33	0.00906	£8,754
42	£0.52	0.00045	£200.04	0.05819	£0.52	0.00060	£120.71	0.04927	£79.32	0.00892	£8,897
43	£0.45	0.00049	£200.48	0.05868	£0.45	0.00060	£121.16	0.04987	£79.32	0.00880	£9,009
44	£0.38	0.00049	£200.86	0.05917	£0.38	0.00057	£121.54	0.05045	£79.32	0.00872	£9,094
45	£0.32	0.00047	£201.18	0.05964	£0.32	0.00053	£121.86	0.05098	£79.32	0.00866	£9,156
46	£0.26	0.00043	£201.44	0.06007	£0.26	0.00048	£122.12	0.05145	£79.32	0.00862	£9,201
47	£0.21	0.00039	£201.65	0.06046	£0.21	0.00042	£122.33	0.05187	£79.32	0.00859	£9,233
48	£0.17	0.00034	£201.82	0.06080	£0.17	0.00036	£122.50	0.05223	£79.32	0.00857	£9,255
49	£0.13	0.00029	£201.95	0.06109	£0.13	0.00030	£122.63	0.05253	£79.32	0.00856	£9,270
50	£0.53	0.00094	£202.48	0.06203	£0.10	0.00025	£122.73	0.05278	£79.75	0.00925	£8,619
51	£0.08	0.00012	£202.56	0.06215	£0.08	0.00020	£122.81	0.05298	£79.75	0.00917	£8,694
52	£0.06	0.00010	£202.62	0.06225	£0.06	0.00016	£122.87	0.05313	£79.75	0.00912	£8,744
53	£0.04	0.00008	£202.66	0.06234	£0.04	0.00012	£122.91	0.05325	£79.75	0.00909	£8,776
54	£0.03	0.00007	£202.69	0.06241	£0.03	0.00009	£122.94	0.05334	£79.75	0.00907	£8,796
55	£0.02	0.00005	£202.71	0.06246	£0.02	0.00006	£122.96	0.05340	£79.75	0.00905	£8,809
56	£0.01	0.00004	£202.72	0.06249	£0.01	0.00004	£122.97	0.05345	£79.75	0.00905	£8,816
57	£0.01	0.00002	£202.73	0.06252	£0.01	0.00003	£122.98	0.05348	£79.75	0.00904	£8,819
58	£0.01	0.00002	£202.74	0.06254	£0.01	0.00002	£122.99	0.05350	£79.75	0.00904	£8,821
59	£0.00	0.00001	£202.74	0.06255	£0.00	0.00001	£122.99	0.05351	£79.75	0.00904	£8,823
60	£0.00	0.00000	£202.74	0.06255	£0.00	0.00000	£122.99	0.05351	£79.75	0.00904	£8,823

Appendix 28

Diagnostic performance of the technician and no-screening strategies

TABLE 109 *Diagnostic performance of the technician and no-screening strategies for a 40-year-old cohort at the start of follow-up*

Stage	Total			False positives			True positives			True negatives			False negatives		
	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference
0	611	3,535	2,923	235	1,079	844	376	2,456	2,079	94,542	93,698	–844	4,363	2,283	–2,079
1	576	413	–163	234	233	–1	342	180	–162	94,164	93,803	–361	3,969	2,089	–1,879
2	544	397	–147	233	233	–1	311	165	–146	93,834	93,547	–288	3,606	1,911	–1,695
3	514	382	–132	232	232	–1	282	150	–131	93,457	93,228	–229	3,267	1,744	–1,523
4	486	368	–118	231	231	0	254	137	–118	93,115	92,944	–171	2,951	1,588	–1,363
5	460	355	–105	231	230	0	229	124	–105	92,795	92,682	–113	2,659	1,443	–1,215
6	662	521	–142	349	349	0	313	172	–141	92,366	92,310	–56	2,281	1,251	–1,030
7	616	497	–119	348	348	0	268	149	–119	92,063	92,063	0	1,953	1,083	–869
8	576	475	–100	347	347	0	229	129	–100	91,653	91,653	0	1,669	939	–731
9	540	457	–84	345	345	0	196	112	–84	91,169	91,169	0	1,425	814	–612
10	510	1,486	976	343	1,062	719	167	424	257	90,690	89,971	–719	1,218	380	–837
11	484	387	–97	341	340	–1	143	47	–96	90,158	89,852	–306	1,041	342	–698
12	461	381	–80	339	339	0	122	43	–80	89,558	89,559	0	891	311	–580
13	441	375	–66	336	336	0	105	39	–66	88,915	88,915	0	764	284	–480
14	424	370	–54	334	334	0	90	36	–54	88,257	88,257	0	658	262	–397
15	409	365	–45	331	331	0	78	33	–45	87,547	87,547	0	570	243	–327
16	396	359	–37	328	328	0	68	31	–37	86,721	86,721	0	495	227	–268
17	384	354	–30	325	325	0	59	29	–30	85,895	85,895	0	433	214	–219
18	374	349	–25	321	321	0	52	28	–25	84,927	84,927	0	382	203	–179
19	364	344	–20	317	317	0	46	26	–20	83,905	83,905	0	339	193	–145
20	354	1,079	725	313	968	655	41	111	69	82,666	82,011	–655	302	99	–203
21	350	326	–24	308	307	–1	42	19	–23	81,323	81,046	–276	308	141	–167
22	345	326	–19	302	302	0	43	24	–19	79,832	79,833	0	313	176	–137
23	340	324	–15	296	296	0	43	28	–15	78,249	78,249	0	317	205	–112
24	334	321	–12	290	290	0	44	31	–12	76,626	76,626	0	320	229	–91
25	328	318	–10	284	284	0	44	34	–10	74,940	74,940	0	322	248	–74
26	358	348	–9	308	308	0	49	40	–9	73,099	73,099	0	318	259	–59
27	349	341	–7	300	300	0	48	41	–7	71,140	71,140	0	312	265	–47
28	339	334	–6	292	292	0	48	42	–6	69,183	69,183	0	306	269	–37
29	329	324	–4	282	282	0	46	42	–4	66,974	66,974	0	299	270	–29
30	318	929	611	273	765	492	45	164	119	64,754	64,263	–492	291	146	–145
31	314	295	–19	262	261	–1	52	34	–18	62,159	61,957	–202	336	217	–119
32	308	293	–15	251	251	0	57	42	–15	59,534	59,535	0	369	273	–96
33	300	288	–12	239	239	0	61	49	–12	56,753	56,753	0	391	313	–78
34	289	280	–10	227	227	0	62	53	–10	53,788	53,788	0	402	341	–62
35	277	270	–8	214	214	0	63	55	–8	50,794	50,794	0	406	357	–49

continued

TABLE 109 *Diagnostic performance of the technician and no-screening strategies for a 40-year-old cohort at the start of follow-up (cont'd)*

Stage	Total			False positives			True positives			True negatives			False negatives		
	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference	No-screening	Technician	Difference	No screening	Technician	Difference
36	264	258	–6	201	201	0	62	56	–6	47,694	47,694	0	402	364	–38
37	248	244	–5	187	187	0	61	56	–5	44,452	44,452	0	391	361	–30
38	232	229	–4	174	174	0	58	55	–4	41,206	41,206	0	376	353	–23
39	216	213	–3	160	160	0	55	53	–3	38,038	38,038	0	357	339	–17
40	198	605	407	146	409	263	52	196	144	34,628	34,365	–263	333	173	–159
41	189	169	–20	131	131	0	57	38	–19	31,156	31,055	–101	369	246	–123
42	178	163	–15	118	118	0	60	45	–15	28,006	28,007	0	386	292	–94
43	165	154	–11	105	105	0	60	49	–11	24,889	24,889	0	385	314	–71
44	150	141	–8	92	92	0	57	49	–8	21,849	21,849	0	370	317	–53
45	133	127	–6	80	80	0	53	47	–6	18,869	18,869	0	343	304	–38
46	115	111	–4	67	67	0	48	43	–4	15,930	15,930	0	307	279	–27
47	98	95	–3	56	56	0	42	39	–3	13,384	13,384	0	270	251	–19
48	82	80	–2	47	47	0	36	34	–2	11,032	11,032	0	231	218	–13
49	68	66	–1	38	38	0	30	29	–1	8,922	8,922	0	193	184	–9
50	55	180	125	31	85	55	25	94	70	7,233	7,178	–55	160	84	–76
51	44	36	–8	24	24	0	20	12	–8	5,669	5,651	–18	128	77	–51
52	34	29	–5	18	18	0	16	10	–5	4,366	4,366	0	100	67	–34
53	26	22	–3	14	14	0	12	8	–3	3,269	3,269	0	76	55	–21
54	19	17	–2	10	10	0	9	7	–2	2,435	2,435	0	57	44	–14
55	14	12	–1	7	7	0	6	5	–1	1,740	1,740	0	41	33	–8
56	9	9	–1	5	5	0	4	4	–1	1,182	1,182	0	28	24	–5
57	6	6	0	3	3	0	3	2	0	759	759	0	18	16	–2
58	4	4	0	2	2	0	2	2	0	485	485	0	12	10	–1
59	2	2	0	1	1	0	1	1	0	306	306	0	7	7	–1
60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

TABLE 110 *Sensitivity and specificity by each strategy by each year*

Stage	PPV: TPs/positives			Sensitivity: TPs/(TPs + FNs)			NPV: TNs/(FNs + TNs)			Specificity: TNs/(TNs + FPs)		
	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference
0	61.5%	69.5%	7.9%	7.9%	51.8%	43.9%	95.6%	97.6%	2.0%	99.8%	98.9%	–0.9%
1	59.4%	43.6%	–15.8%	7.9%	7.9%	0.0%	96.0%	97.8%	1.9%	99.8%	99.8%	0.0%
2	57.1%	41.5%	–15.7%	7.9%	7.9%	0.0%	96.3%	98.0%	1.7%	99.8%	99.8%	0.0%
3	54.8%	39.3%	–15.5%	7.9%	7.9%	0.0%	96.6%	98.2%	1.5%	99.8%	99.8%	0.0%
4	52.4%	37.2%	–15.2%	7.9%	7.9%	0.0%	96.9%	98.3%	1.4%	99.8%	99.8%	0.0%
5	49.8%	35.1%	–14.8%	7.9%	7.9%	0.0%	97.2%	98.5%	1.3%	99.8%	99.8%	0.0%
6	47.2%	32.9%	–14.3%	12.1%	12.1%	0.0%	97.6%	98.7%	1.1%	99.6%	99.6%	0.0%
7	43.5%	29.9%	–13.6%	12.1%	12.1%	0.0%	97.9%	98.8%	0.9%	99.6%	99.6%	0.0%
8	39.8%	27.1%	–12.7%	12.1%	12.1%	0.0%	98.2%	99.0%	0.8%	99.6%	99.6%	0.0%
9	36.2%	24.4%	–11.7%	12.1%	12.1%	0.0%	98.5%	99.1%	0.7%	99.6%	99.6%	0.0%
10	32.7%	28.5%	–4.2%	12.1%	52.7%	40.7%	98.7%	99.6%	0.9%	99.6%	98.8%	–0.8%
11	29.5%	12.1%	–17.4%	12.1%	12.1%	0.0%	98.9%	99.6%	0.8%	99.6%	99.6%	0.0%
12	26.5%	11.2%	–15.3%	12.1%	12.1%	0.0%	99.0%	99.7%	0.6%	99.6%	99.6%	0.0%
13	23.8%	10.4%	–13.4%	12.1%	12.1%	0.0%	99.1%	99.7%	0.5%	99.6%	99.6%	0.0%
14	21.3%	9.7%	–11.6%	12.1%	12.1%	0.0%	99.3%	99.7%	0.4%	99.6%	99.6%	0.0%
15	19.1%	9.1%	–9.9%	12.1%	12.1%	0.0%	99.4%	99.7%	0.4%	99.6%	99.6%	0.0%
16	17.2%	8.7%	–8.5%	12.1%	12.1%	0.0%	99.4%	99.7%	0.3%	99.6%	99.6%	0.0%
17	15.5%	8.3%	–7.2%	12.1%	12.1%	0.0%	99.5%	99.8%	0.3%	99.6%	99.6%	0.0%
18	14.0%	8.0%	–6.0%	12.1%	12.1%	0.0%	99.6%	99.8%	0.2%	99.6%	99.6%	0.0%
19	12.8%	7.7%	–5.1%	12.1%	12.1%	0.0%	99.6%	99.8%	0.2%	99.6%	99.6%	0.0%
20	11.7%	10.3%	–1.4%	12.1%	52.7%	40.7%	99.6%	99.9%	0.2%	99.6%	98.8%	–0.8%
21	12.1%	5.9%	–6.1%	12.1%	12.1%	0.0%	99.6%	99.8%	0.2%	99.6%	99.6%	0.0%
22	12.4%	7.4%	–5.0%	12.1%	12.1%	0.0%	99.6%	99.8%	0.2%	99.6%	99.6%	0.0%
23	12.8%	8.7%	–4.1%	12.1%	12.1%	0.0%	99.6%	99.7%	0.1%	99.6%	99.6%	0.0%
24	13.2%	9.8%	–3.4%	12.1%	12.1%	0.0%	99.6%	99.7%	0.1%	99.6%	99.6%	0.0%
25	13.5%	10.7%	–2.8%	12.1%	12.1%	0.0%	99.6%	99.7%	0.1%	99.6%	99.6%	0.0%
26	13.8%	11.5%	–2.3%	13.4%	13.4%	0.0%	99.6%	99.6%	0.1%	99.6%	99.6%	0.0%
27	13.9%	12.1%	–1.8%	13.4%	13.4%	0.0%	99.6%	99.6%	0.1%	99.6%	99.6%	0.0%
28	14.0%	12.5%	–1.5%	13.4%	13.4%	0.0%	99.6%	99.6%	0.1%	99.6%	99.6%	0.0%
29	14.1%	12.9%	–1.2%	13.4%	13.4%	0.0%	99.6%	99.6%	0.0%	99.6%	99.6%	0.0%
30	14.2%	17.7%	3.5%	13.4%	53.0%	39.6%	99.6%	99.8%	0.2%	99.6%	98.8%	–0.8%
31	16.6%	11.4%	–5.2%	13.4%	13.4%	0.0%	99.5%	99.7%	0.2%	99.6%	99.6%	0.0%
32	18.6%	14.4%	–4.2%	13.4%	13.4%	0.0%	99.4%	99.5%	0.2%	99.6%	99.6%	0.0%
33	20.2%	16.9%	–3.3%	13.4%	13.4%	0.0%	99.3%	99.5%	0.1%	99.6%	99.6%	0.0%
34	21.6%	18.9%	–2.7%	13.4%	13.4%	0.0%	99.3%	99.4%	0.1%	99.6%	99.6%	0.0%
35	22.7%	20.6%	–2.2%	13.4%	13.4%	0.0%	99.2%	99.3%	0.1%	99.6%	99.6%	0.0%
36	23.7%	21.9%	–1.8%	13.4%	13.4%	0.0%	99.2%	99.2%	0.1%	99.6%	99.6%	0.0%

continued

TABLE 110 *Sensitivity and specificity by each strategy by each year (cont'd)*

Stage	PPV: TPs/positives			Sensitivity: TPs/(TPs + FNs)			NPV: TNs/(FNs + TNs)			Specificity: TNs/(TNs + FPs)		
	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference	No screening	Technician	Difference
37	24.5%	23.0%	–1.4%	13.4%	13.4%	0.0%	99.1%	99.2%	0.1%	99.6%	99.6%	0.0%
38	25.1%	24.0%	–1.2%	13.4%	13.4%	0.0%	99.1%	99.2%	0.1%	99.6%	99.6%	0.0%
39	25.7%	24.7%	–0.9%	13.4%	13.4%	0.0%	99.1%	99.1%	0.0%	99.6%	99.6%	0.0%
40	26.1%	32.4%	6.2%	13.4%	53.0%	39.6%	99.0%	99.5%	0.4%	99.6%	98.8%	–0.8%
41	30.4%	22.6%	–7.8%	13.4%	13.4%	0.0%	98.8%	99.2%	0.4%	99.6%	99.6%	0.0%
42	33.7%	27.7%	–5.9%	13.4%	13.4%	0.0%	98.6%	99.0%	0.3%	99.6%	99.6%	0.0%
43	36.3%	31.7%	–4.6%	13.4%	13.4%	0.0%	98.5%	98.8%	0.3%	99.6%	99.6%	0.0%
44	38.4%	34.8%	–3.6%	13.4%	13.4%	0.0%	98.3%	98.6%	0.2%	99.6%	99.6%	0.0%
45	40.1%	37.3%	–2.8%	13.4%	13.4%	0.0%	98.2%	98.4%	0.2%	99.6%	99.6%	0.0%
46	41.5%	39.2%	–2.2%	13.4%	13.4%	0.0%	98.1%	98.3%	0.2%	99.6%	99.6%	0.0%
47	42.6%	40.8%	–1.8%	13.4%	13.4%	0.0%	98.0%	98.2%	0.1%	99.6%	99.6%	0.0%
48	43.5%	42.1%	–1.4%	13.4%	13.4%	0.0%	97.9%	98.1%	0.1%	99.6%	99.6%	0.0%
49	44.3%	43.1%	–1.2%	13.4%	13.4%	0.0%	97.9%	98.0%	0.1%	99.6%	99.6%	0.0%
50	44.9%	52.5%	7.6%	13.4%	53.0%	39.6%	97.8%	98.8%	1.0%	99.6%	98.8%	–0.8%
51	45.4%	33.3%	–12.1%	13.4%	13.4%	0.0%	97.8%	98.7%	0.9%	99.6%	99.6%	0.0%
52	45.8%	35.9%	–9.9%	13.4%	13.4%	0.0%	97.8%	98.5%	0.7%	99.6%	99.6%	0.0%
53	46.2%	38.1%	–8.1%	13.4%	13.4%	0.0%	97.7%	98.4%	0.6%	99.6%	99.6%	0.0%
54	46.4%	39.8%	–6.6%	13.4%	13.4%	0.0%	97.7%	98.2%	0.5%	99.6%	99.6%	0.0%
55	46.7%	41.3%	–5.4%	13.4%	13.4%	0.0%	97.7%	98.1%	0.4%	99.6%	99.6%	0.0%
56	46.8%	42.4%	–4.4%	13.4%	13.4%	0.0%	97.7%	98.0%	0.4%	99.6%	99.6%	0.0%
57	47.0%	43.4%	–3.6%	13.4%	13.4%	0.0%	97.6%	98.0%	0.3%	99.6%	99.6%	0.0%
58	47.1%	44.1%	–3.0%	13.4%	13.4%	0.0%	97.6%	97.9%	0.3%	99.6%	99.6%	0.0%
59	47.2%	44.8%	–2.4%	13.4%	13.4%	0.0%	97.6%	97.8%	0.2%	99.6%	99.6%	0.0%
60	–	–	–	–	–	–	–	–	–	–	–	–

NPV, negative predictive value; PPV, positive predictive value.

Feedback

The HTA Programme and the authors would like to know your views about this report.

The Correspondence Page on the HTA website (http://www.hta.ac.uk) is a convenient way to publish your comments. If you prefer, you can send your comments to the address below, telling us whether you would like us to transfer them to the website.

We look forward to hearing from you.

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