

Glaucoma Screening Programme



Background: So far population screening of glaucoma has not been cost-effective in the Western world because of the high number needed to test and the high budget impact of screening. AI screening of fundus photos can reduce these testing costs substantially, making glaucoma screening potentially cost-effective.

Comprehensive Coverage: Population-wide screening identifies asymptomatic cases earlier than opportunistic case findings, increasing early treatment initiation and reducing the progression to severe glaucoma and visual impairment.



Target Population: Adults aged 50–75 across the Netherlands, without a prior glaucoma diagnosis are screened. Screening is repeated every five years until the age of 75.

Screening Setup: Individuals attend local diagnostic labs, where a fundus photo (retinal image) is taken. The AI model analyses the fundus photo with 85% sensitivity and 95% specificity to identify potential signs of glaucoma, serving as a triage mechanism.

Triage Process: Individuals with images flagged as positive are referred to ophthalmologists for further examination. This referral is essential to confirm the diagnosis and begin treatment.



Follow-Up Compliance: We assumed that 50% of those invited will comply with the initial screening, and 60% of those referred will follow through with ophthalmological assessment.

Results

Detection: AI-based screening detects glaucoma earlier, finding 1.6 times more cases than current care.

Table 1. Cost-effectiveness results per individual invited for screening over a lifetime horizon based on results of the probabilistic sensitivity analysis (PSA)

Parameter	Screening	SoC	Difference
Quality-adjusted life-years (QALYS)	16.7592	16.7455	0.0137
Total costs (€)	1530	1246	284
Societal perspective			
Screening costs (€)	161	-	161
Medication costs (€)	254	152	102
Monitoring costs (€)	510	381	12
Surgery & laser (€)	73	47	26
Costs related to visual impairment (€)	497	646	- 148
Productivity loss (€)	34	40	- 6
ICER: incremental costs per QALY	Societal perspective	Healthcare perspective	
Deterministic ICER (€)	16,600	19,575	
PSA ICER (€)	19,311	22,261	
PSA incremental cost per year of visual impairment prevented (€)	6305	6990	

Key Take-Aways

- Cost-effectiveness:** AI screening shows a cost-effectiveness ratio of €19,311 per QALY, with a chance of 94.7% being cost-effective at the €50,000 threshold and 51.2% at the €20,000 threshold.
- Sensitive to Key Parameters:** The scenario analysis showed results to be highly sensitive to uncertainty in different sources and assumptions regarding key parameters, especially for transition probabilities, costs of visual impairment, and compliance rates.
- Further Research Needed:** AI-screening needs more validation in clinical practice. Future studies should refine transition probabilities of treated glaucoma, as well as costs related to visual impairment.

Methodology

Start methodology with: A model-based CEA, using a model that consists of a decision tree for the diagnostic phase and a Markov model for the progression and treatment phase.

Figure 1. Health economic model. Panel A shows the decision tree: The two parts of non-compliance are truncated and displayed in the top left part of the figure. Panel B shows the Markov Model (Burr, 2006)

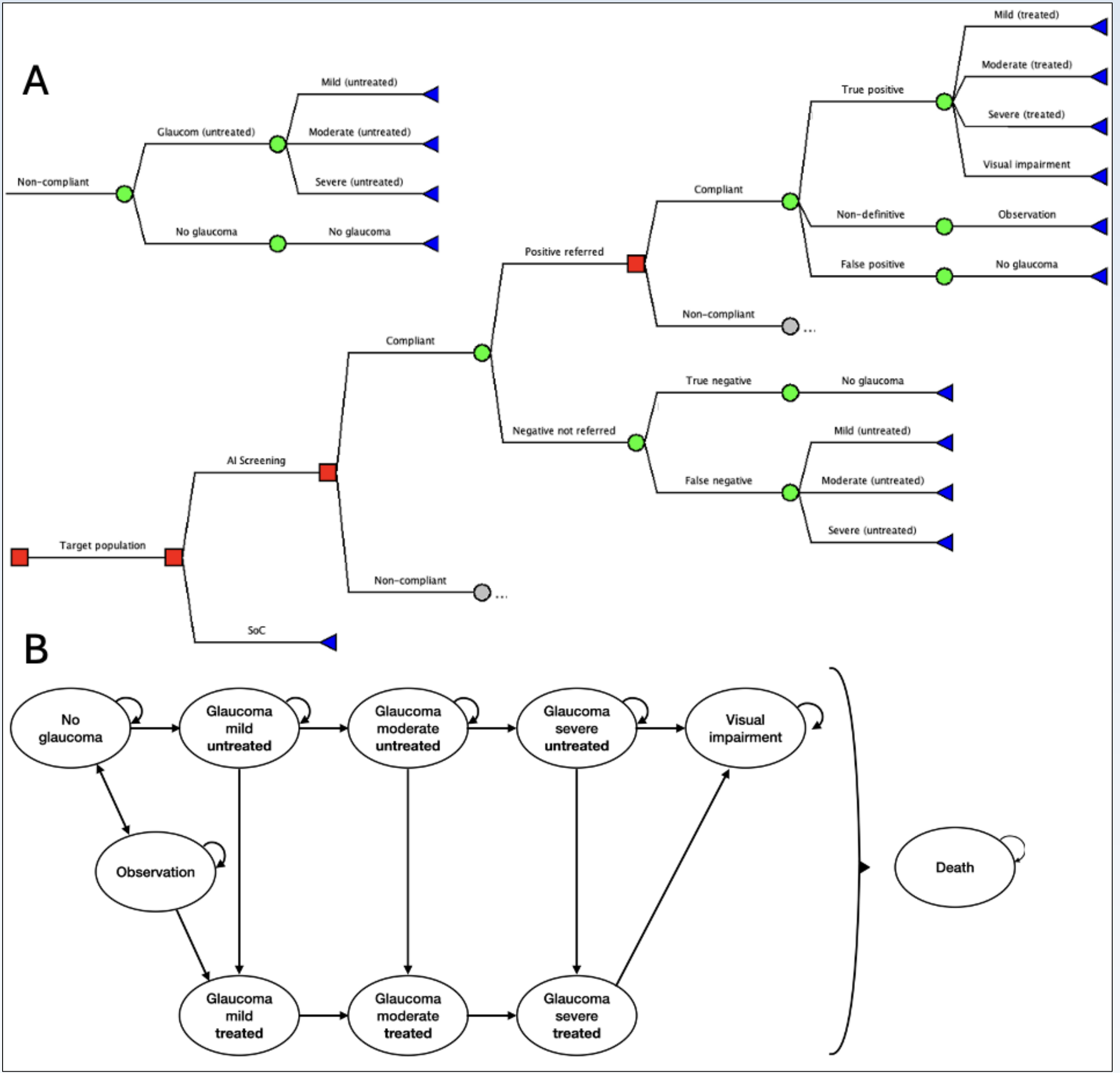


Figure 2. Scenario plot showing structural uncertainty Scenario (ICER)

