

INCORPORATING RISK SCORES IN CRC SCREENING MODELS: A EXAMPLE FROM THE INCA-PHE CRC MODEL

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CONTEXT

Colorectal cancer (CRC) simulations models have been extensively used to compare the cost and effectiveness of CRC screening in different contexts. These models sometimes included strategies focus on individuals with specific CRC risk factors such as familial history. **To our knowledge, no models included strategies based on a validated risk equation.**

OBJECTIVE

TO INCORPORATE A VALIDED RISK EQUATION IN THE INCA-PHE CRC MODEL, AND ASSESS THE COST-EFFECTIVENESS (CE) OF RISK-BASED SCREENING STRATEGIES

METHODOLOGY

The INCA-PHE CRC screening model is a CRC microsimulation model **validated for the French context**, that includes **medium risk and high-risk** (familial history) individuals¹.

- A validated CRC risk equation (RE)^A predicting the risk of advance neoplasia at colonoscopy was incorporated into the model to classify each simulated individual into one of five risk groups (RG) (Table 1) based on their baseline underlying risk (given by the model).
 - The accurately reproduced real-life, the grouping accounted for uncertainty in the RE (Figure 1)
- The model was used to assess the CE of fecal occult blood testing with an immunological test (iFOBT) at different thresholds (30 and 10µg/g) every 2 years, followed by colonoscopy if positive and colonoscopy every 5 years to the absence of screening in the 5 RG.
- Test efficacy was based on literature and costs on French prices. Participation rates were 29.1% for iFOBT and 25% for colonoscopy.
- A simulation of 4,000,000 individuals aged 50-74y at model initiation and representative of the French population was used.

Table 1. Description of the risk-equation

Risk Group	Avg. Risk of advanced neoplasia	RE score	% of French population
0	< 5%	0/1/2	41%
1	5-7.5%	3	17%
2	7.5-10%	4	17%
3	10%-14%	5/6	15%
4	>14%	7/8	10%

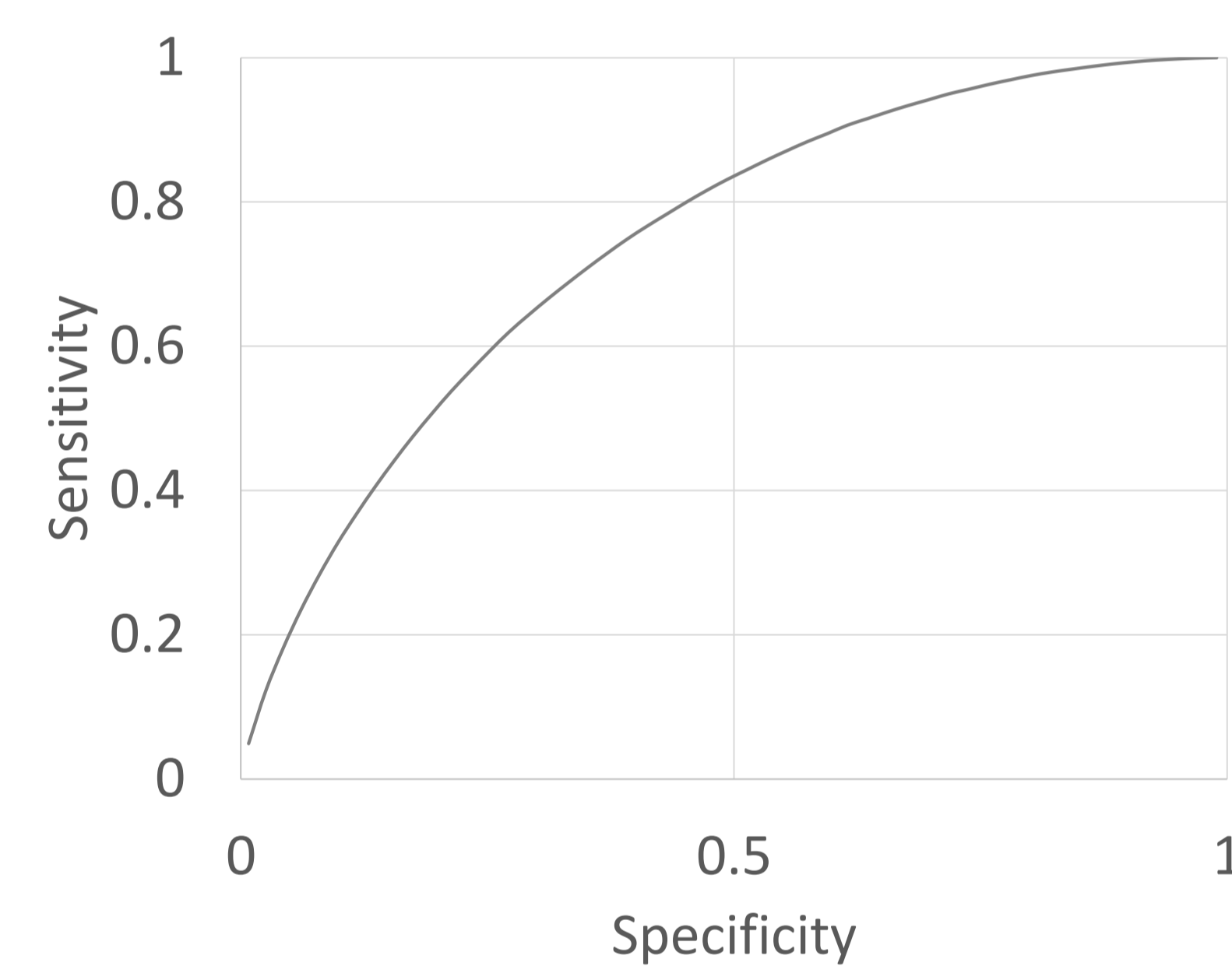


Figure 1. ROC of the risk equation in the model. As can be seen, the score did not perfectly group individuals in the model allowing for similar uncertainty than in real-life. Obtained ROC is similar to the observed ROC published with the RE^A.

THESE RESULTS SUGGEST THAT USING A RISK EQUATION TO OFFER RISK ADAPTED SCREENING STRATEGIES MIGHT IMPROVE OVERALL SCREENING EFFECTIVENESS WHILE MAXIMIZING EFFICACY.

- On average, higher risk groups are associated with lower QALY and higher cost as the incidence of CRC increase (Figure 2)
- Incremental efficacy of each strategy tend to increase with risk group.
- Strategies' cost-effectiveness varies with the risk group:
 - In RG0, screening strategies are only marginally more effective than no screening with iFOBT 30µg/g associated with the lowest ICER at €51,000/QALY,
 - In RG1, iFOBT is the only cost-effective strategy at a €30,000/QALY threshold with an ICER of €8,800/QALY,
 - In RG2, both iFOBT 30µg/g and 10µg/g or cost-effective with ICER of €3,500/QALY and €6,000/QALY respectively,
 - In RG3 and RG4, colonoscopy every 5 years becomes a cost-effective strategy with an ICER of €29,000/QALY and €16,000/QALY.

References:

A Kaminski MF, Polkowski M, Kraszewska E, et al. A score to estimate the likelihood of detecting advanced colorectal neoplasia at colonoscopy. Gut. 2014; 63.

1. Full description of the model is available in Institut National du Cancer. Évaluation médico-économique du dépistage du cancer colorectal - Rapport technique. 2019. Available at <https://www.e-cancer.fr/Expertises-et-publications/Catalogue-des-publications/Evaluation-medico-economique-du-depistage-du-cancer-colorectal-Rapport-technique>

RESULTS

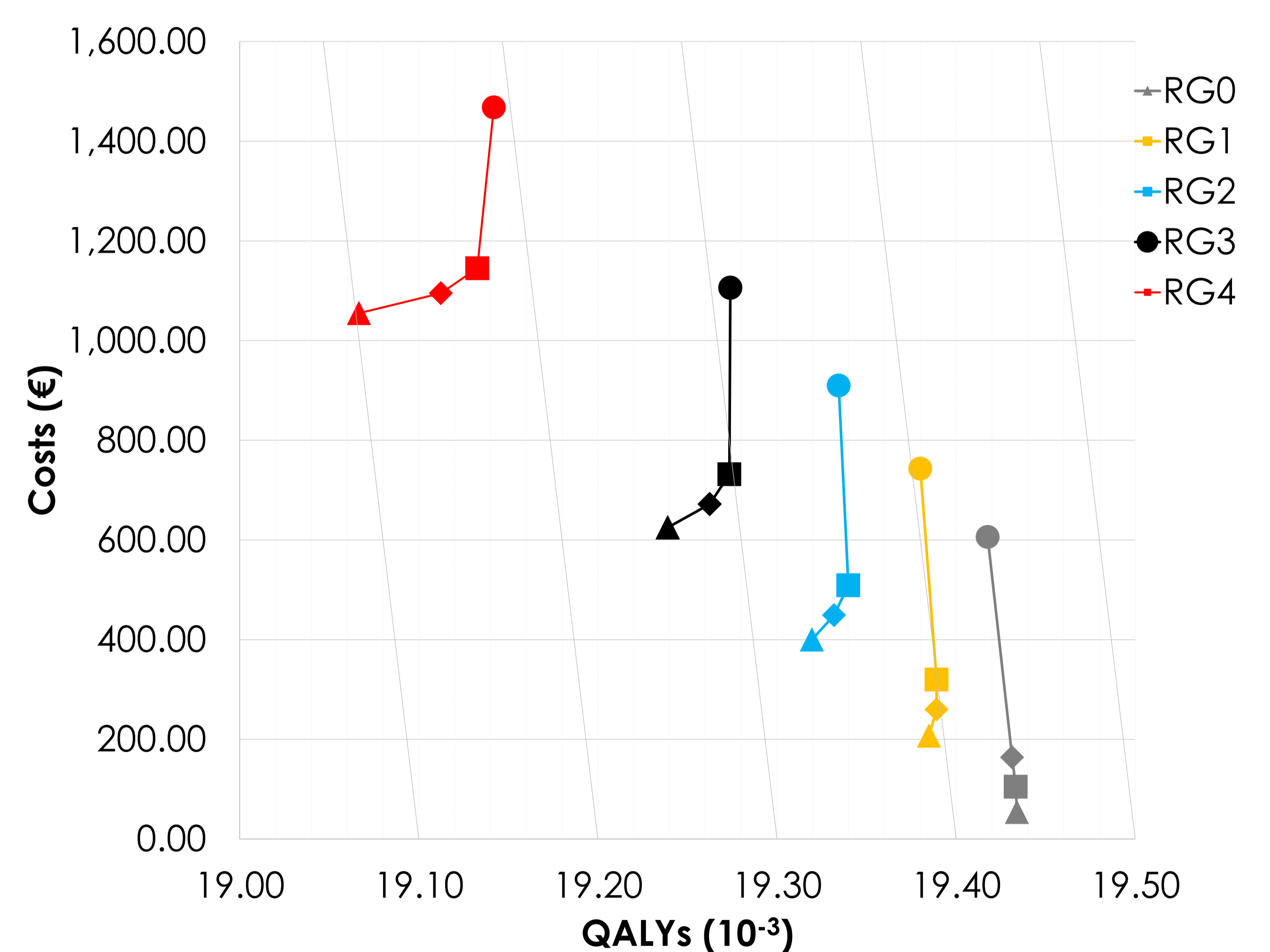


Figure 2. Cost-Effectiveness Plane

The plane has been slanted so that a vertical line represent a slope €30,000/QALY. This has been done for ease of interpretation. Any points directly above the previous one has an ICER of €30,000/QALY, to the right < €30,000/QALY and to the left > €30,000/QALY. No screening = Triangle; iFOBT 30µg/g = Diamond; iFOBT 10µg/g = Square; Colonoscopy = Circle.