

Would Initiating Colorectal Cancer Screening from Age 45 be Cost-Effective in Germany? An Individual-Level Simulation Analysis

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Research for a Life without Cancer

Background

Colorectal cancer (CRC) screening has been shown to be effective and cost-saving. However, the trend of rising incidence of early-onset CRC challenges the current national screening program solely for people ≥50 years of age in Germany, where extending the screening to those 45-49 years might be justified^{1,2}. Our study aims to evaluate the cost-effectiveness of CRC screening starting at age 45 in Germany compared to the current screening strategy.

Method

A cost-effectiveness analysis using an individual-level CRC screening model that simulates the natural progression of CRC from the adenoma-carcinoma and serrated neoplasia pathways. The model was validated with German CRC epidemiology and screening effects³.

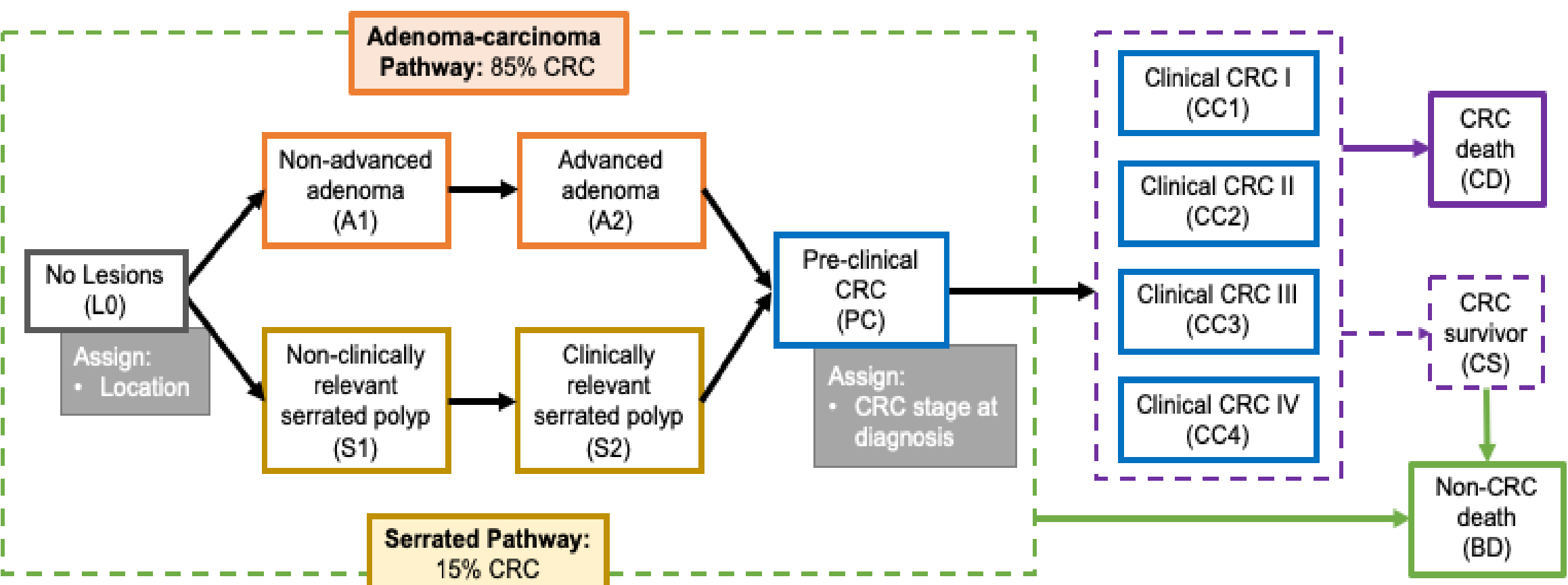


Figure 1. DECAS schematic model structure.

DECAS (Discrete Event simulation model for the natural history of colorectal cancer from the Adenoma and Serrated neoplasia pathways). The model was created in R software.

- Four new CRC screening strategies starting at age 45, were compared with the current screening eligibility starting at age 50 in Germany. See table 1 below.
- For each strategy, a cohort of 100,000 individuals with average CRC risk was simulated from age 20 until 90 or death.
- Outcome measures: CRC cases averted, prevented deaths, QALY (quality-adjusted life-years), and total incremental costs inclusive of both CRC treatment and screening costs.
- The incremental cost effectiveness ratios (ICERs) were further calculated for each strategy compared to the currently implemented screening strategy.
- A health system perspective was employed, with costs reported in 2023 euros and a 3% discount rate. The study simulated three adherence scenarios: perfect, current, and high adherence.

Table1. Overview of CRC screening strategies for comparison

No.	Strategy abbreviation	CRC screening strategy description
A	mCOL50/fFIT55+COL55 (current strategy)	Men: 2 colonoscopies at age 50 and 60 years; Women: annual FIT for age 50-54 years followed by 2 colonoscopies at age 55 and 65 years
B	FIT1y45+COL10y50	Annual FIT for age 45-49 years followed by 2 colonoscopies at age 50 and 60 years
C	FIT1y45+COL10y50-3X	Annual FIT for age 45-49 years followed by 3 colonoscopies at age 50, 60 and 70 years
D	FIT2y45	Biennial FIT for age 45-75 years
E	COL10y45-3X	3 colonoscopies at age 45, 55 and 65 years

Note: COL = colonoscopy; FIT = fecal immunochemical test.

Result

- Initiating 10-yearly colonoscopy or combined FIT+COL strategies at age 45 resulted in
- Incremental gains of **7-28 QALYs** per 1000 individuals when compared to current German CRC screening strategy considering a perfect adherence.
 - Incremental costs ranged from **€28,360-€71,759** per 1000 individuals.
 - The ICER varied from **€1,029 to €9,763** per QALY gained.
 - Additional colonoscopies ranged from **129 to 885** per 1000 individuals.
 - Among the alternatives, a three times colonoscopy strategy starting at 45 years of age (**COL10y45-3X**) was the most cost-effective alternative compared to current strategy.
 - The FIT-only strategy was dominated by the currently implemented strategy.

