Cost-effectiveness, harms & benefits of surveillance strategies for colorectal cancer

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Based on: Van Wifferen F, Greuter MJE, van Leerdam ME, Spanier MBW, Dekker E, Lansdorp-Vogelaar I, Canfell K, Meijer GA, Bisseling TM, Hoogerbrugge N, Coupé VMH

Van Wifferen et al. Gastroenterology 2025

DECISION MODELING CENTER

Content of this talk

1) How to make decisions in healthcare; the role of cost-effectiveness
2) How to assess cost-effectiveness when trials fall short
3) Cost-effectiveness ... and more…
   of surveillance strategies for colorectal cancer

How to make decisions in healthcare

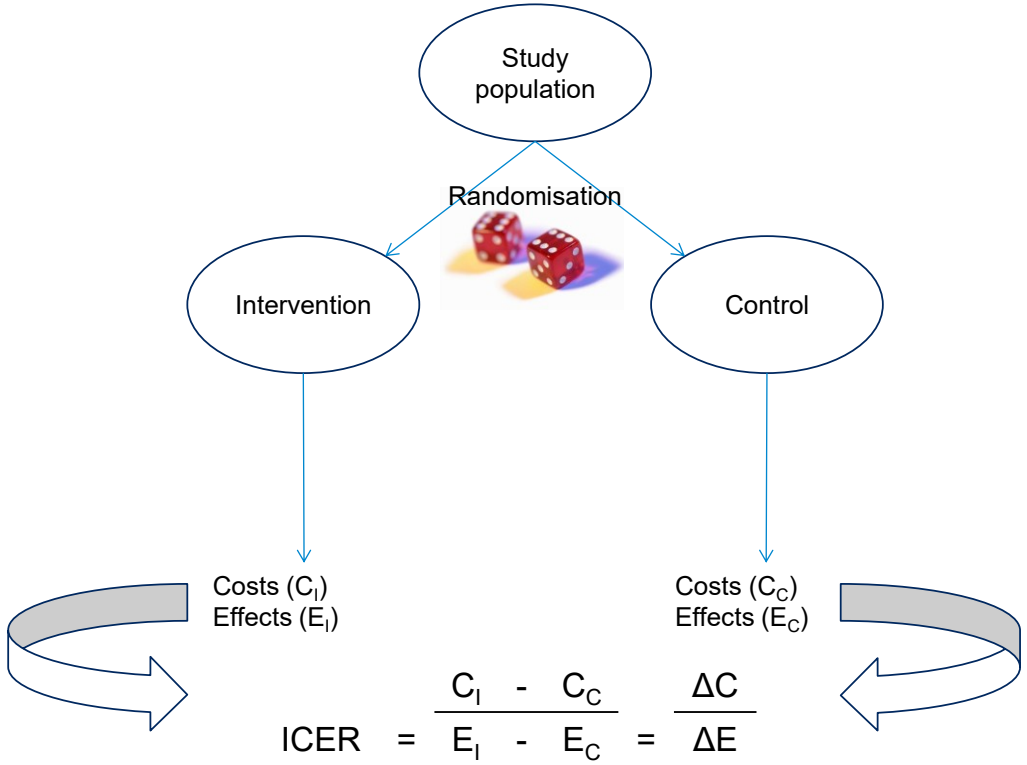
- Limited budgets available for health care

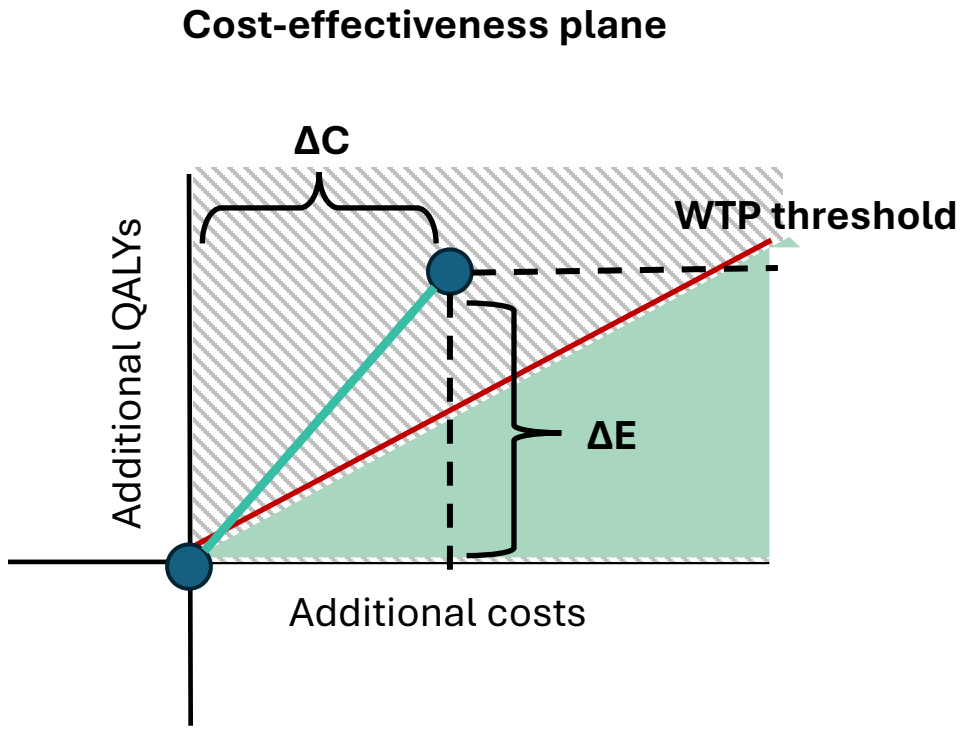
  ⇨ hard choices

- We want to **maximize outcomes** and **minimize costs**.

- Cost-effectiveness analyses provide the information needed to make these decisions

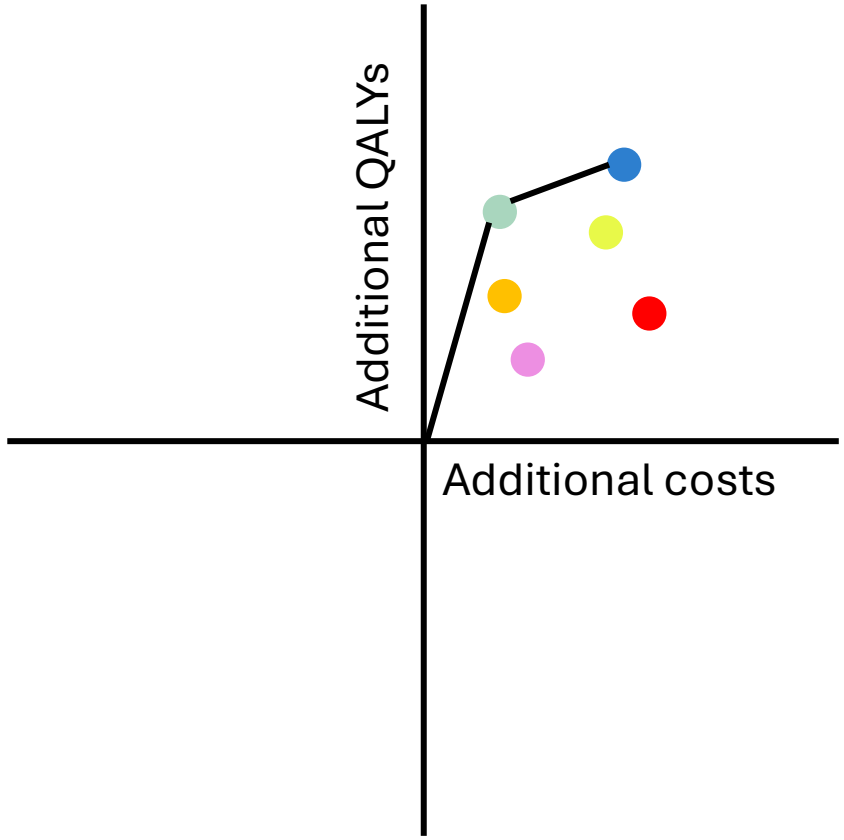
What is a cost-effectiveness analysis?





* Lifeyears lived corrected for quality of life

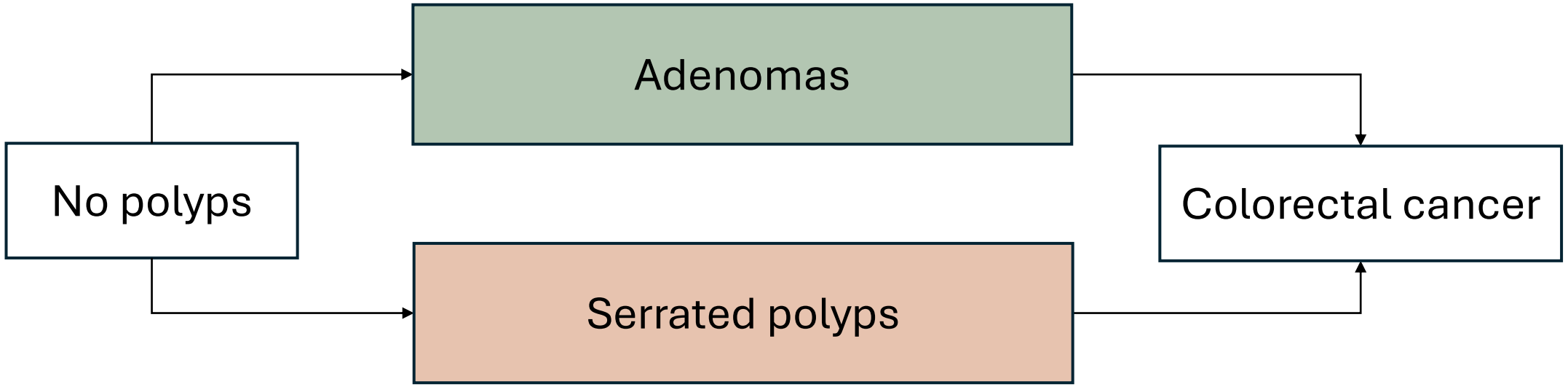
Cost-effectiveness analysis with many strategies



How to assess cost-effectiveness when trials fall short

- Many different strategies / interventions
- Long-term outcomes (lifetime)
- Example: ASCCA model

Use a model!

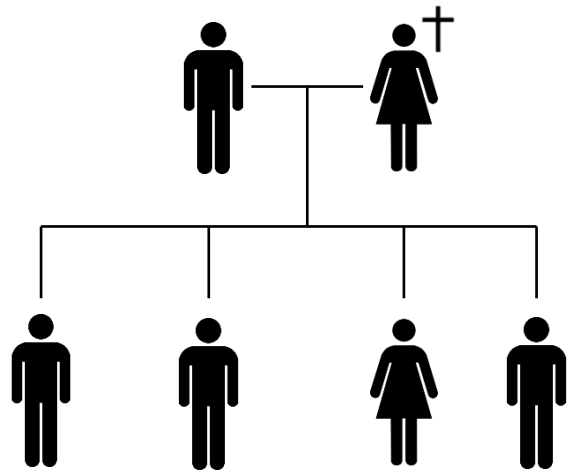


Surveillance strategies to prevent colorectal cancer in individuals at increased familial risk

a modelling study

Surveillance in familial colorectal cancer

- The Netherlands 2022: 12,000 new CRC cases
- Up to 30%: familial cause
  - 5% due to genetic mutation (e.g. Lynch)
  - Familial risk



Surveillance in familial colorectal cancer

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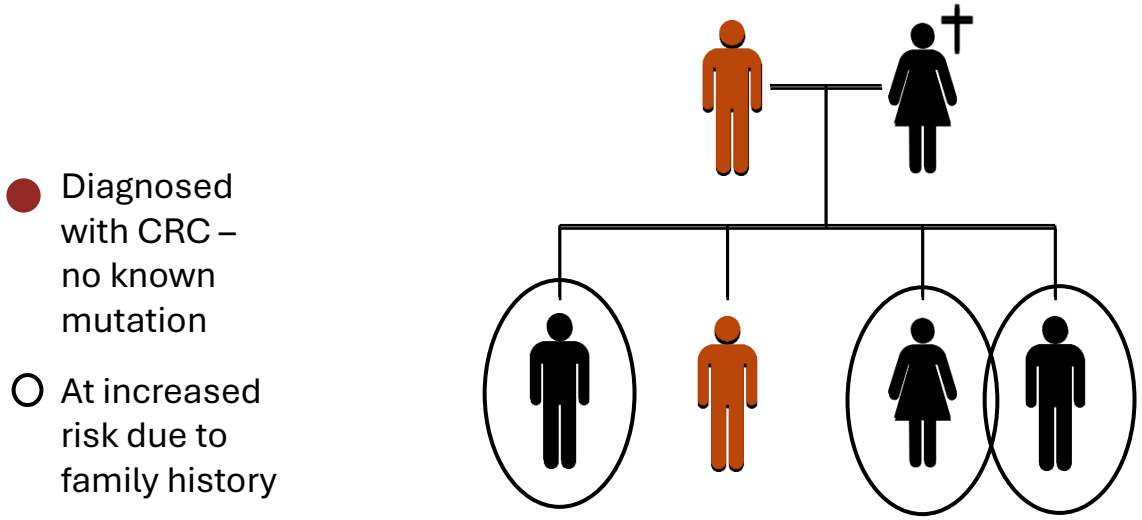
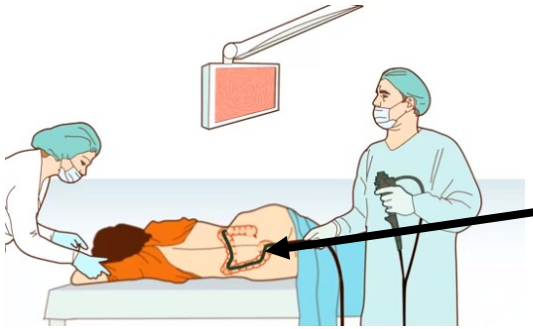
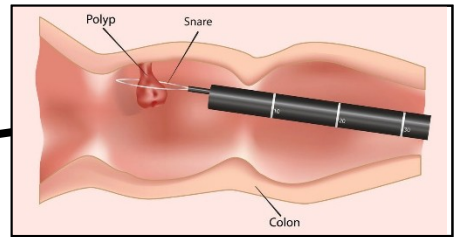


CRC surveillance



5-yearly colonoscopy
45-75 years



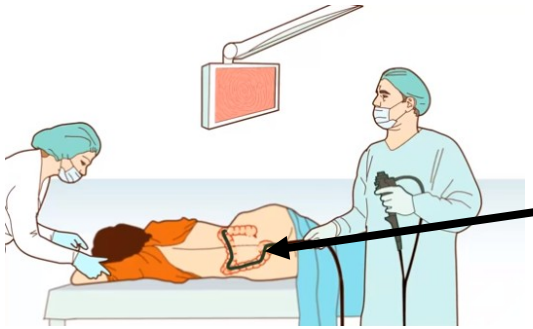
prevents CRC

Room for improvement:

- Risk lower than initially thought

	RR in individuals with 2 FDRs diagnosed with CRC
Butterworth et al 2006	3.97 (95% CI 2.60-6.06)
Roos et al 2019 Case-control studies Cohort studies	 2.81 (95% CI, 1.73–4.55) 2.40 (95% CI, 1.76–3.28)

CRC surveillance



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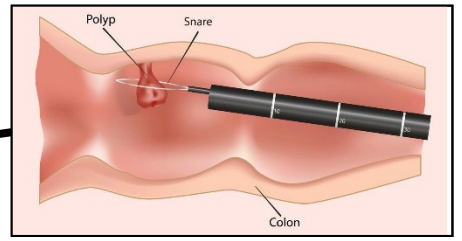


prevents CRC

Room for improvement:

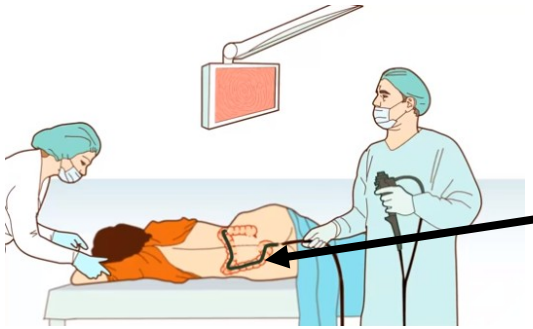
- Risk lower than initially thought
- Difference in risk -> personalization

Risk to develop CRC

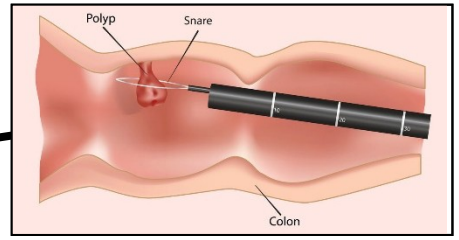
≥ 1 first degree family member with CRC: RR 1.8-2.2
≥ 2 first degree family members with CRC: RR 2.4-4.0
Risk possible dependent on age of diagnosis first degree family member (<50)

Butterworth et al. 2006. Eur J Cancer.
Wong et al. 2018. Am J Gastroenterol.
Roos et al. 2019. Clin Gastroenterol Hepatol.
Baglietto et al. 2006. J Clin Epidemiol.

CRC surveillance



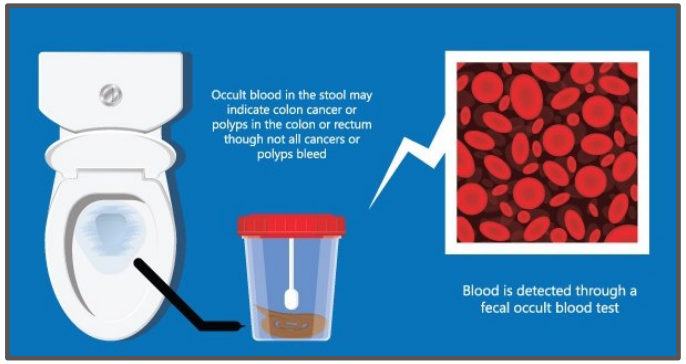
5-yearly colonoscopy
45-75 years



prevents CRC

Room for improvement:

- Risk lower than initially thought
- Difference in risk -> personalization
- Less invasive test



Fecal immunochemical test (FIT)

Research question

Can CRC surveillance be optimized based on (cost) effectiveness, burden to patients and costs by:

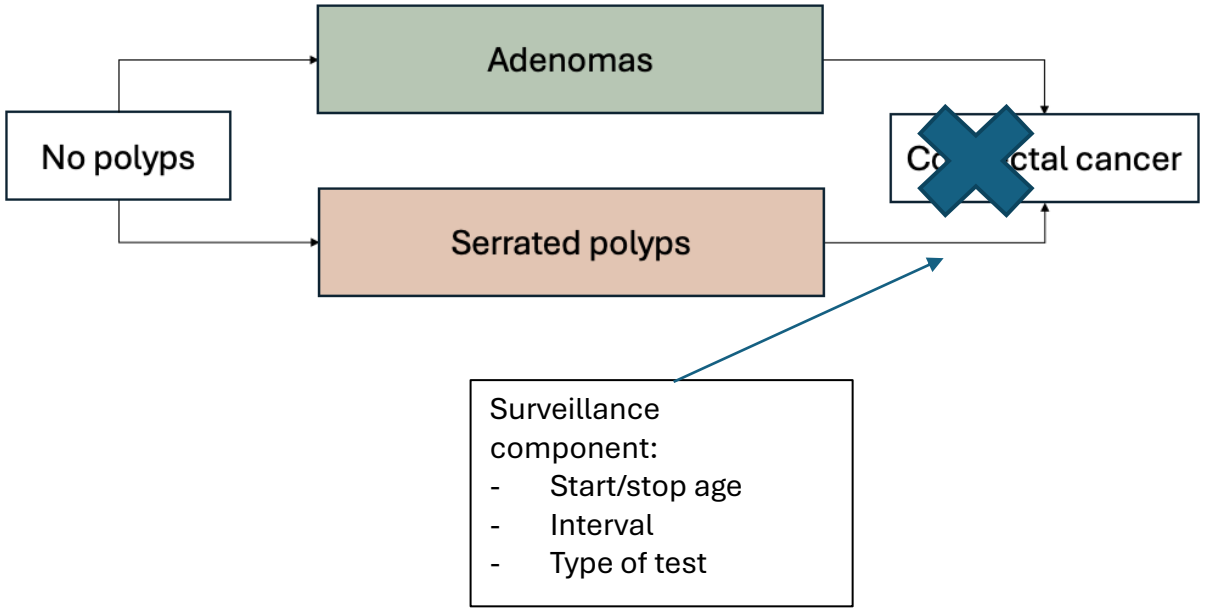
- ❑ tailoring it to personal risk of CRC
- ❑ and/or by using stool tests

Disease modeling

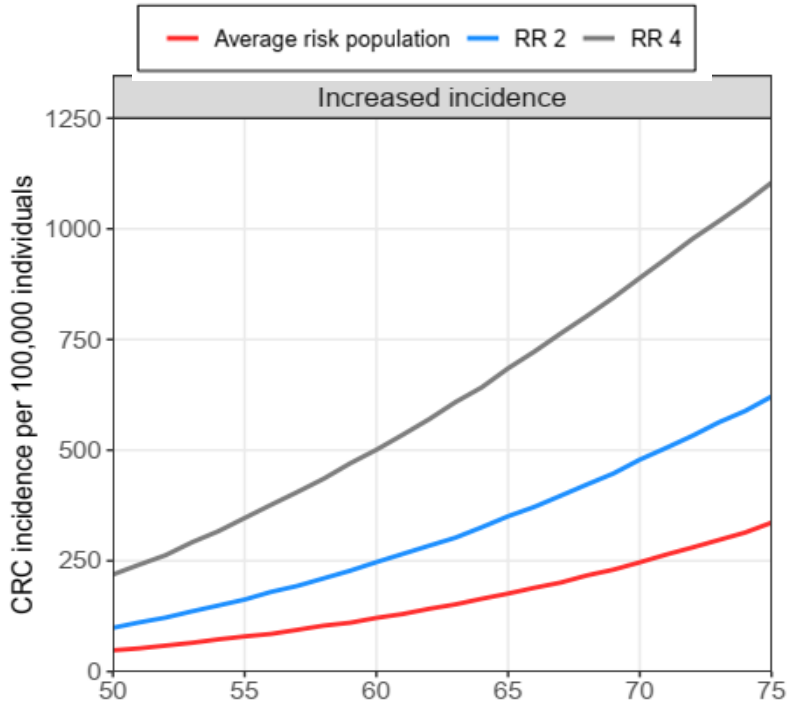
Many surveillance strategies are possible

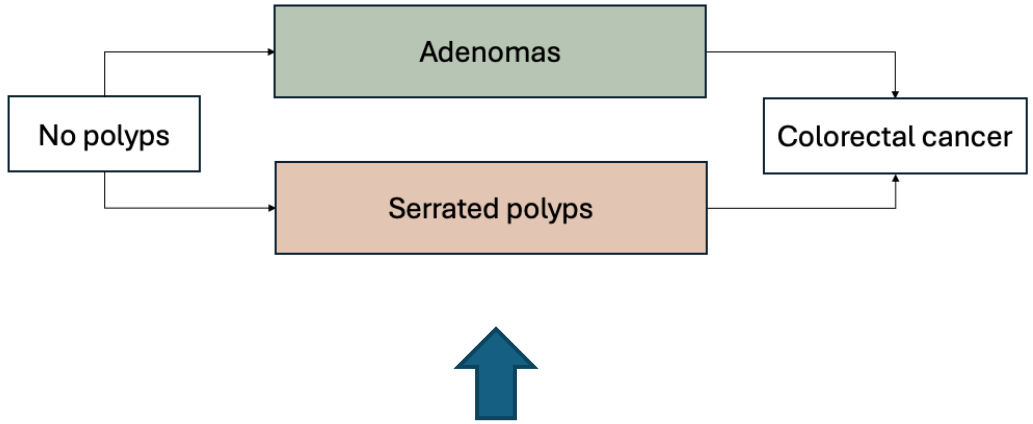
- *Start/stop age, interval, type of test*

ASCCA-FCRC model



Adapting the ASCCA model





Higher CRC risk due to higher incidence

Strategies

- No surveillance
- Current surveillance: 5-yearly colonoscopy aged 45-75 years

Alternative surveillance strategies (n=85):

- Colonoscopy surveillance
- Surveillance in which colonoscopy and FIT are alternated
- FIT surveillance

→ Start/stop age: 40-75, 40-80, 45-75 and 45-80

100% participation

Strategies

Test	Interval
Colonoscopy	5-yearly 3-yearly[a] 2 rounds of 5-yearly followed by 10-yearly 4 rounds of 5-yearly followed by 10-yearly
Colonoscopy + FIT	4 rounds of 3-yearly colonoscopy followed by 2-yearly FIT 4 rounds of 5-yearly colonoscopy followed by yearly FIT & exit colonoscopy at stop age 4 rounds of 5-yearly colonoscopy followed by 2-yearly FIT & exit colonoscopy at stop age 10-yearly colonoscopy with yearly FIT 10-yearly colonoscopy with 2-yearly FIT
FIT	Yearly 2-yearly

10-yearly colonoscopy, 40-80 y

2x colonoscopy + yearly FIT, 45-75 y

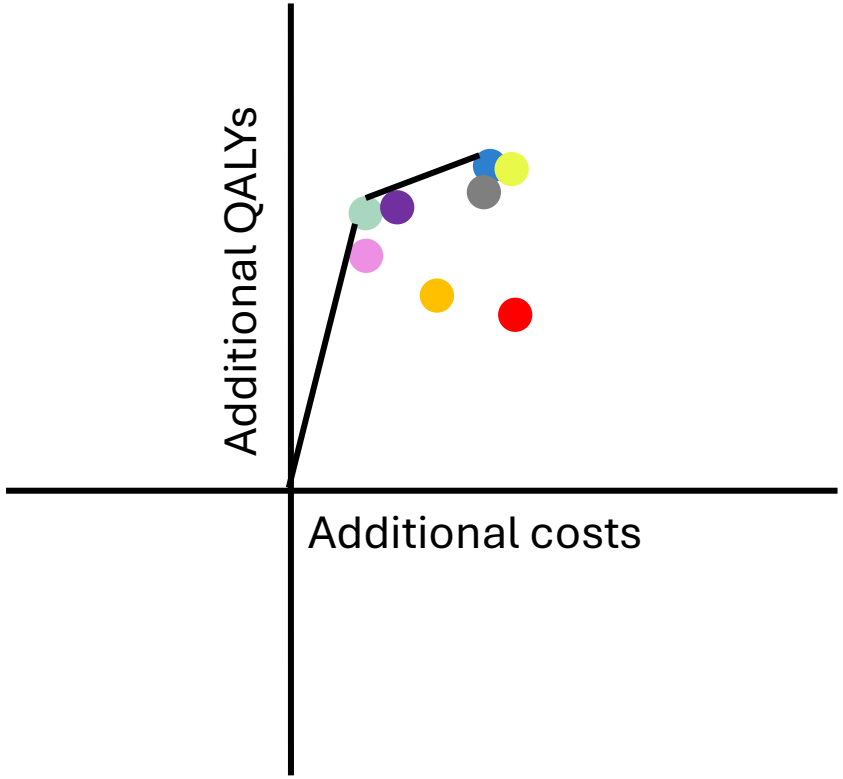
Yearly FIT, 40-80 y

High-risk findings -> 2022 post-polypectomy guideline

Outcomes (per 1000)

- Number of CRCs & CRC deaths
- Number of colonoscopies
- QALYs*
- Costs

Efficient

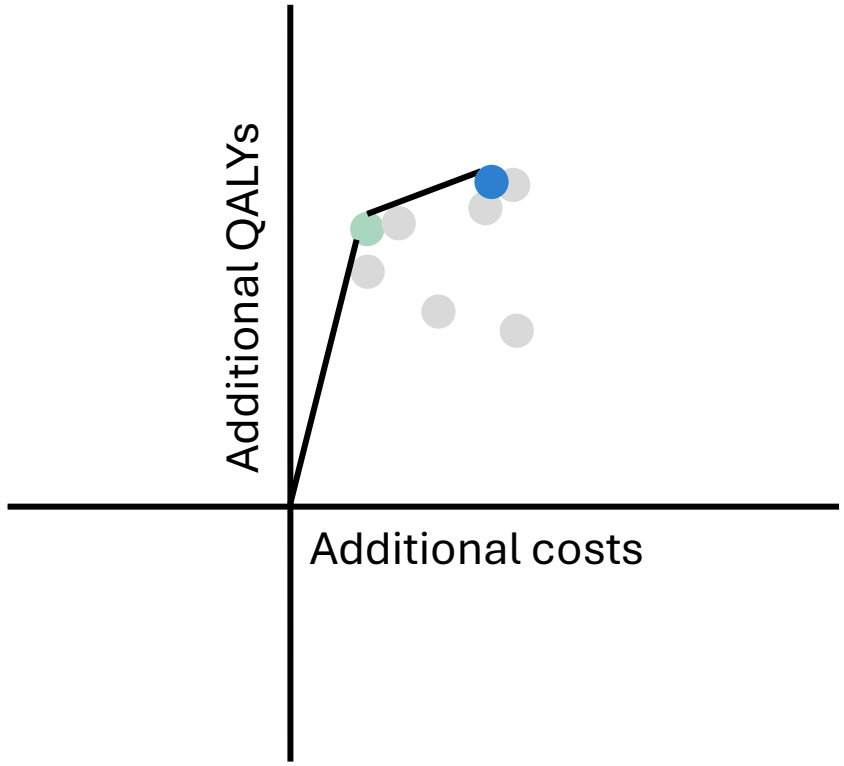


* Lifeyears lived corrected for quality of life

Outcomes (per 1000)

- QALYs*
- Costs

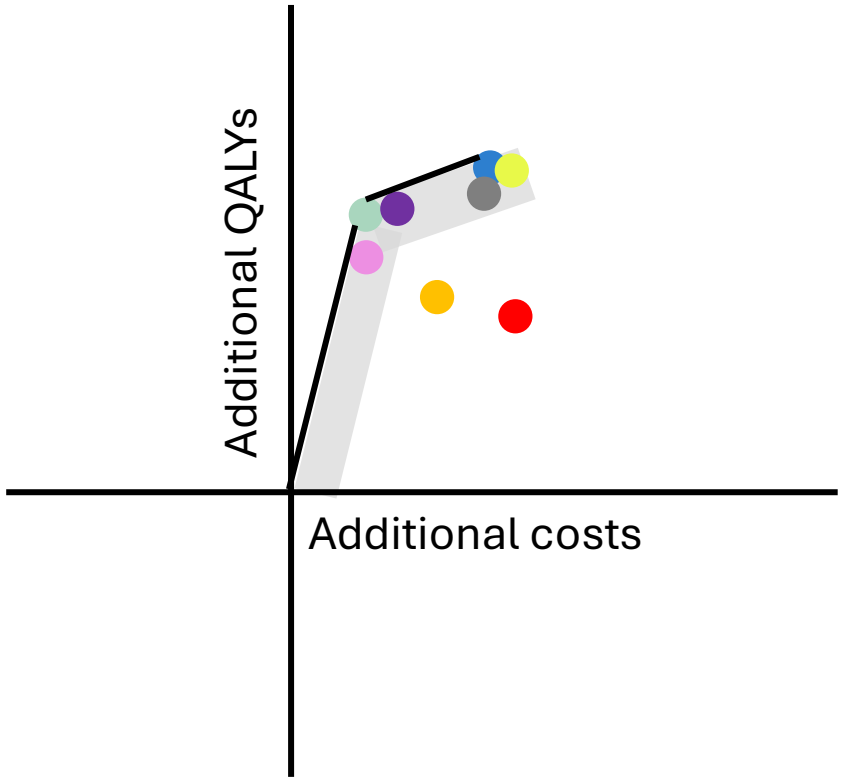
Efficient



* Lifeyears lived corrected for quality of life

Near-efficiency

- Near-efficient: predicted QALYs within 2% of efficiency frontier



Note: not possible to calculate ICERs

Outcomes

- QALYs
- Costs

~~Efficient~~ (near)-efficient

- Clinicians

Decision algorithm for optimal strategy

- QALYs

(near) efficient

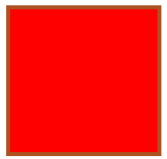
Optimal = strategy satisfying these 4 criteria & highest QALYs

- Maximum 10% increase in colonoscopies
- Not more expensive

Your opinion

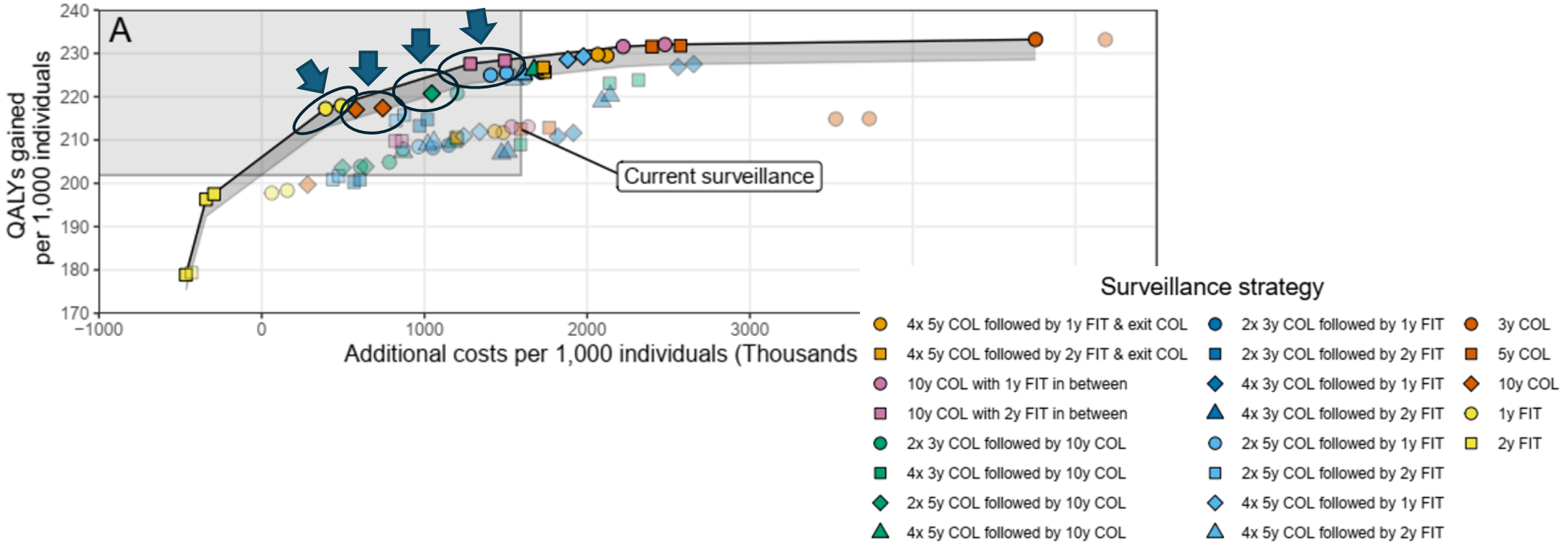
I agree with these criteria to determine the optimal surveillance strategy

 ***YES***

 ***NO***

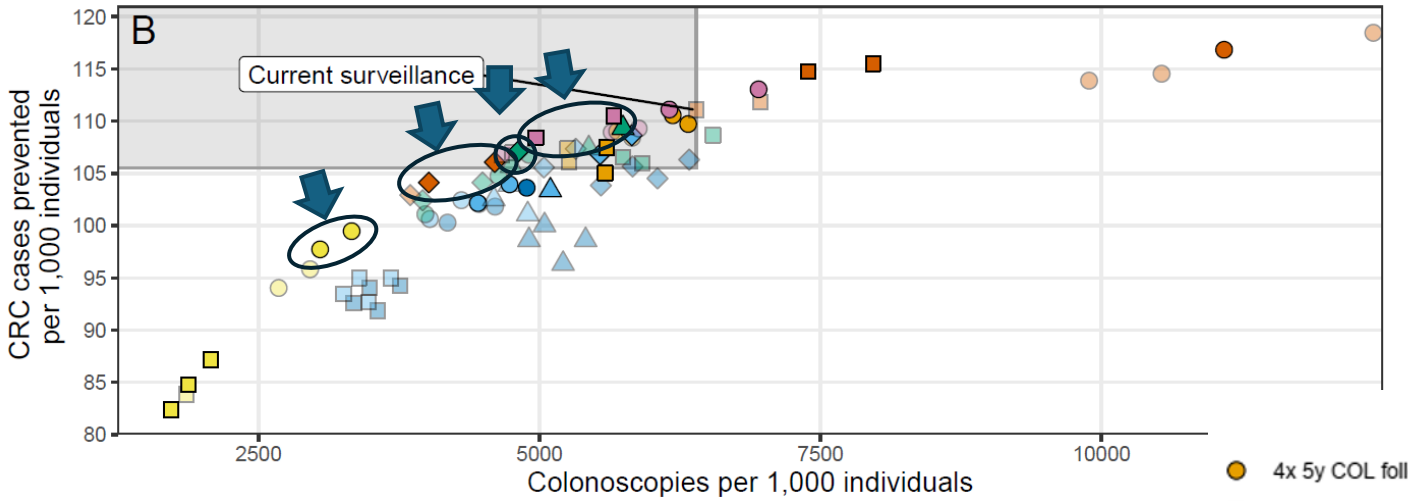
Results: 2-fold increased risk

Criteria: (near)efficient + non-inferior (QALYs) + not more expensive



Results

Criteria: non-inferior (CRC cases) + not more colonoscopies

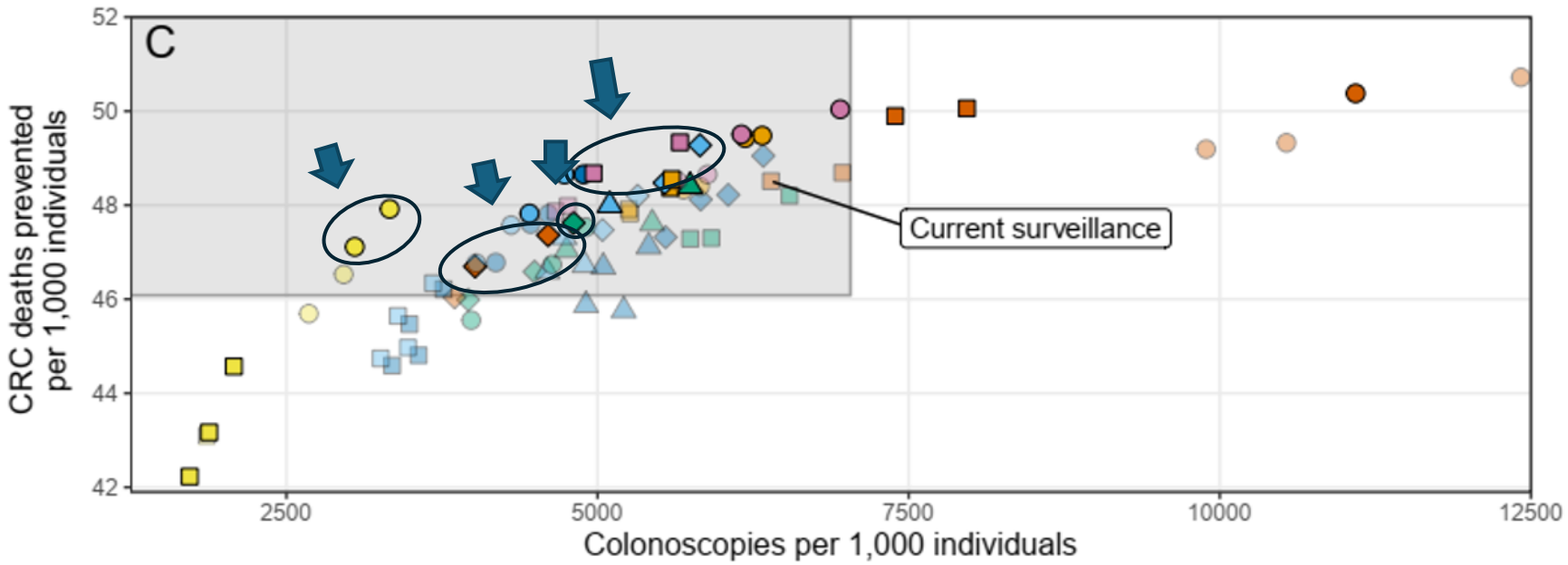


Surveillance strategy

- 4x 5y COL followed by 1y FIT & exit COL
- 4x 5y COL followed by 2y FIT & exit COL
- 10y COL with 1y FIT in between
- 10y COL with 2y FIT in between
- 2x 3y COL followed by 10y COL
- 4x 3y COL followed by 10y COL
- 2x 5y COL followed by 10y COL
- 4x 5y COL followed by 10y COL
- 2x 3y COL followed by 1y FIT
- 2x 3y COL followed by 2y FIT
- 4x 3y COL followed by 1y FIT
- 4x 3y COL followed by 2y FIT
- 2x 5y COL followed by 1y FIT
- 2x 5y COL followed by 2y FIT
- 4x 5y COL followed by 1y FIT
- 4x 5y COL followed by 2y FIT
- 3y COL
- 5y COL
- 10y COL
- 1y FIT
- 2y FIT

Results

Criteria: non-inferior (CRC deaths) + max 10% additional colonoscopies



Strategies fulfilling all criteria

Strategy	Age	QALYs
10-yearly COL	40-80	217
2x 5-yearly COL followed by 10-yearly COL	40-75	221
10-yearly COL with 2-yearly FIT in between	40-75	228
10-yearly COL met 2-yearly FIT in between	40-80	228

7.4% more QALYs
Comparable number of CRC cases and deaths
11.4% less colonoscopies
€98.000 cheaper per 1,000 individuals

Results: 4-fold increased risk

Same optimal strategy

- 9.1% more QALYs
- Comparable CRC cases and deaths
- 8.7% less coloscopies
- €127.000 cheaper per 1,000 individuals

Sensitivity analyses

- 70% participation FIT and coloscopy:
  - 2x risk: same strategy as main analysis
  - 4x risk: satisfied criteria but not optimal
- Increased progression of polyps to cancer:
  - 2x risk: same strategy as main analysis
  - 4x risk: satisfied criteria but not optimal
- 85% participation FIT and 70% participation colonoscopy: same strategy
- Lower sensitivity FIT: same strategy

Research question

Can CRC surveillance be optimized based on (cost) effectiveness, burden to patients and costs by:

- ✗ tailoring it to personal risk of CRC
- ✓ and/or by using stool tests

Conclusion

- Optimal strategy:

  10-yearly colonoscopy with 2-yearly FIT in between from age 40-80
  - More effective, less coloscopies and lower costs
  - Independent of level of CRC risk

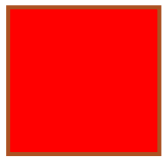
- Current surveillance: not cost-efficient

- In NL: guideline is undergoing revision

Your opinion

I would be willing to offer the proposed optimal strategy, which decreases the number of colonoscopies, to individuals with a family history of CRC

YES



NO

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