Efficacy, effectiveness and cost-effectiveness of endoscopic screening methods

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Ongoing large scale randomized trials sigmoidoscopy

	UKFSST	SCORE	NORCCAP	PLCO
Country	UK	Italy	Norway	US
Recruitment	1996-99	1995-99	1995-99	1993-01
No. assigned	57254	17,148	20,003	77,465
No. Screened	40,674	9,911	12,960	64,658

Efficacy: Studies on risk reduction of CRC by endoscopic screening

Study	Country	Design	Endoscopy	Endpoint	Risk Reduction
Gilbertsen 1978	USA	cohort	sigmoidoscopy	incidence	85%
Newcomb 1992	USA	C-C	sigmoidoscopy	mortality	79%
Selby 1992	USA	C-C	sigmoidoscopy	mortality	59%
Winawer 1992	USA	cohort	colonoscopy	incidence	76-90%
Müller 1995	USA	C-C	various types	mortality	59%
This-Evensen 1999	Norway	RCT	sigmoidoscopy	incidence	80%
Slattery 2000	USA	C-C	sigmoidoscopy	incidence	45%
Citarda 2001	Italy	cohort	colonoscopy	incidence	66%
Brenner 2001	Germany	C-C	colonoscopy	incidence	72%
Newcomb 2003	USA	C-C	sigmoidoscopy	incidence	70%

Summary estimates based on recent literature review

Maciosek et al, Am J Prev Med 2006

Efficacy

Colonoscopy	70%	(4 studies)
Sigmoidoscopy	50%	(7 studies)
FOBT	38%	(12 studies)

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Efficacy

Colonoscopy	70%	(4 studies)
Sigmoidoscopy	50%	(7 studies)
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Effectiveness = adherence x efficacy

Adherence = 60% (19 studies)

Summary estimates based on recent literature review

Maciosek et al, Am J Prev Med 2006

	Efficacy		Effectiveness
Colonoscopy	70%	(4 studies)	42%
Sigmoidoscopy	50%	(7 studies)	30%
FOBT	38%	(12 studies)	23%

Effectiveness = adherence x efficacy

Adherence = 60% (19 studies)

Summary estimates based on recent literature review

Maciosek et al, Am J Prev Med 2006

Cost-effectiveness = (costs of prevention - costs averted)/QALY saved

Summary estimates based on recent literature review

Maciosek et al, Am J Prev Med 2006

Cost-effectiveness: (costs of prevention - costs averted)/QALY saved

Colonoscopy	8.840 $
Sigmoidoscopy	18,869 $
FOBT	13,334 $

Cost-effectiveness studies on CRC screening:

Common findings:

- FOBT, sigmoidoscopy, colonoscopy all cost-effective

- Cost-effectiveness compares favourably with other commonly endorsed prevention measures (e.g. mammography)

- A single optimal strategy cannot be determined

- Optimal age limits and screening intervals cannot be determined

Pignone et al, Ann Intern Med 2002
Maciosek et al, Am J Prev Med 2006

Cost-effectiveness studies on endoscopic CRC screening:

Common assumptions:

- Sigmoidoscopy: 5-year screening intervals

- Colonoscopy: 10-year screening intervals

- Surveillance intervals after polypectomy: 3 years

- Same risk reduction for proximal and distal CRC

- Identical schedules for women and men

Potential to further enhance cost-effectiveness of endoscopic screening

E.g.

- Optimal screening intervals ?

- Optimal surveillance intervals ?

- Enhanced risk adaptation of screening schedules ?

=> Evidence from epidemiological studies

DACHS-Study
(**Da**rmkrebs: **Ch**ancen der Verhütung durch **S**creening)

- Population-based case-control study, South-West Germany
- patients recruited in 22 clinics in Rhine-Neckar area
- controls from population registries
- no upper age limit
- meanwhile > 1,600 cases + > 1,800 controls recruited
- published results so far available for 600 patients / 600 controls recruited by 2004

DACHS-Study:
When does a negative colonoscopy need to be repeated ?

History of screening colonoscopy	Relative risk (95% CI)*
No previous colonoscopy	**1.00 (Ref.)**
„Negative“ colonoscopy	
1-2 years ago	**0.16 (0.07-0.36)**
3-4 years ago	**0.29 (0.13-0.68)**
5-9 years ago	**0.25 (0.09-0.69)**
10-19 years ago	**0.33 (0.12-0.91)**
20+ years ago	**0.46 (0.16-1.32)**

* adjusted for age, sex, county, education, family history of CRC, BMI, use of NSAIDS, HRT

Brenner et al, Gut 2006;55:1145-50

Risk of CRC according to age at and time since „negative“ colonoscopy

History of screening colonoscopy	Relative risk (95% CI)*
No previous colonoscopy	**1.00 (Ref.)**
„negative“ colonoscopy < 55 years	
1-4 years ago	**0.58 (0.17-1.93)**
5+ years ago	**0.41 (0.19-0.90)**
„negative“ colonoscopy 55-64 years	
1-4 years ago	**0.18 (0.06-0.51)**
5+ years ago	**0.17 (0.05-0.58)**
„negative“ colonoscopy 65+ years ago	
1-4 years ago	**0.16 (0.07-0.39)**
5+ years ago	**0.51 (0.12-2.21)**

* adjusted for age, sex, county, education, family history of CRC, BMI, use of NSAIDS, HRT

Gut 2006;55:1145-50

DACHS-Study:
When to schedule surveillance colonoscopy after polypectomy ?

History of screening colonoscopy	Relative risk (95% CI)*
No previous colonoscopy	**1.00 (Ref.)**
Colonoscopy with polypectomy	
1-10 years ago	**0.56 (0.32-1.00)**
1-2 years ago	**0.25 (0.09-0.69)**
3-5 years ago	**0.27 (0.08-0.87)**
6-10 years ago	**2.43 (0.78-7.57)**

* adjusted for age, sex, county, education, family history of CRC, BMI, use of NSAIDS, HRT

Brenner et al, Am J Gastroenterol 2007

Risk of CRC according to number/type of polyps and time since colonoscopic polypectomy

History of screening colonoscopy	Relative risk (95% CI)*
No previous colonoscopy	**1.00 (Ref.)**
Colonoscopy with removal of high risk polyps	
up to 5 years ago	**0.27 (0.10-0.77)**
6-10 years ago	**2.09 (0.41-10.69)**
Colonoscopy with removal of other polyps	
up to 5 years ago	**0.14 (0.05-0.43)**
6-10 years ago	**1.76 (0.45-6.85)**

* adjusted for age, sex, county, education, family history of CRC, BMI, use of NSAIDS, HRT

Am J Gastroenterol 2007

Suggestions from DACHS-Study

- **Screening intervals may be extended to 20 years**
- **Even once only screening endoscopy may be highly (cost-)-effective**
- **Surveillance intervals may be extended to 5 years**
- **Possibility of extension of screening /surveillance intervals may also enhance compliance**

⇒Large potential to further enhance (cost-)effectiveness of endoscopic screening

Potential to increase cost-effectiveness by enhanced risk adaptation of screening offers ?

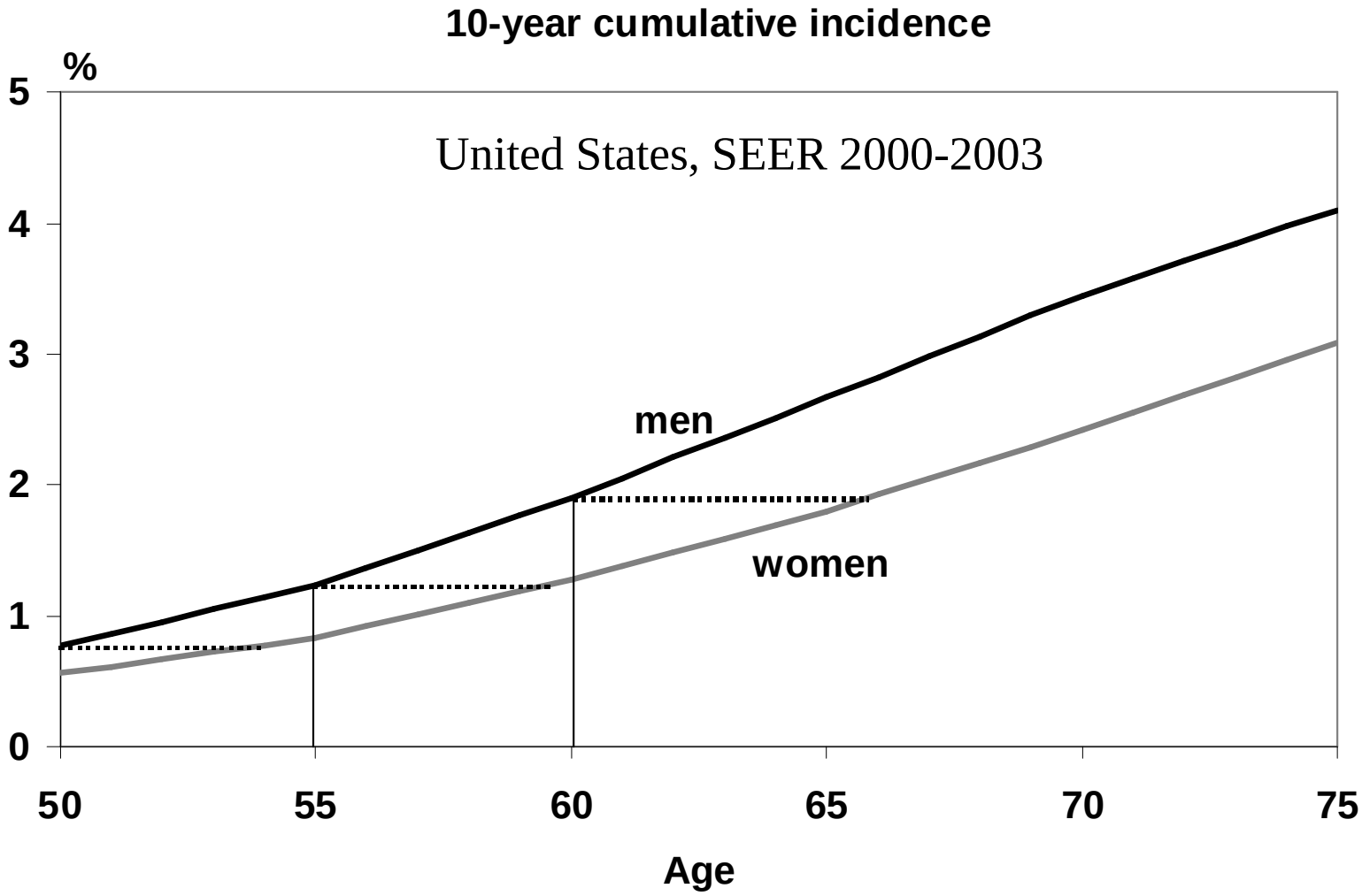
50,148 participants of screening colonoscopy in Poland:

Numbers needed to screen to detect advanced neoplasia

		Overall		Family history	
		Men	Women	Men	Women
Age	40-49	23	36	20	32
	50-54	17	28	13	20
	55-59	12	22	8	18
	60-66	10	18	6	16

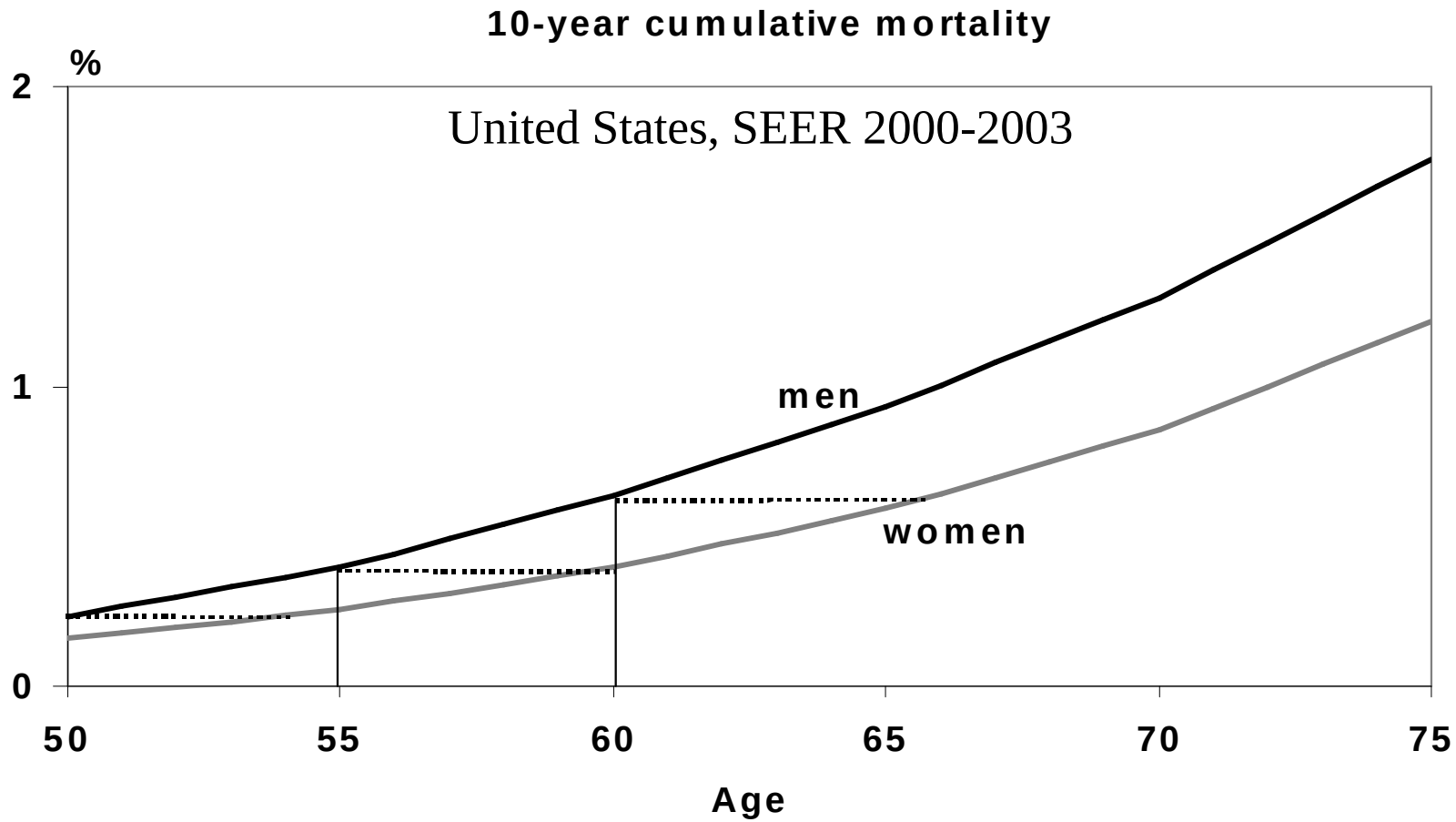
Regula et al. N Engl J Med 2006;355:1863-1872

Potential to increase cost-effectiveness by enhanced risk adaptation of screening offers ?



Brenner et al, Brit J Cancer 2007;96:828-831

Potential to increase cost-effectiveness by enhanced risk adaptation of screening offers ?



Brit J Cancer 2007;96:828-831

Potential to increase cost-effectiveness by enhanced risk adaptation of screening offers ?

Women reach mortality levels of men aged 50, 55, and 60 at ages

	50	55	60
Australia	54	61	67
Canada	55	61	67
France	56	61	68
Germany	56	62	66
Italy	54	61	68
Japan	57	64	70
Poland	55	61	68
Russia	52	59	67
Spain	55	62	69
United Kingdom	55	62	67

Brit J Cancer 2007;96:828-831

Potential to increase cost-effectiveness by enhanced risk adaptation of screening offers ?

Participation rate colonoscopy screening in Germany 2003

	Women	Men
55-59	3.5 %	2.0 %
60-64	4.2%	2.8%
65-69	3.4%	2.6%
70-74	1.9%	1.8%
75-79	1.0%	1.2%

⇒ Better matching of risk and offer/ utilisation could strongly enhance cost-effectiveness of endoscopic screening

Summary / Conclusions

Endoscopic screening for colorectal cancer ..

- Has very high efficacy, if offered at high levels of quality
- Can have high effectiveness with high population coverage
- Has consistently found to be cost-effective in multiple studies
- Cost-effectiveness may be further enhanced by optimization of screening/surveillance intervals and by better adaptation of screening offers to individual risks (e.g. family history, gender)
- Is a very powerful tool to reduce the burden of colorectal cancer: more than 160,000 cases and 80,000 deaths might potentially be prevented in Europe each year