

**Number of Adenomas Needed to Remove  
and Dwell Time Avoided -  
Metrics for Assessing Screening Efficiency**

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- No Conflicts of Interest to Disclose



# Current metrics of screening efficiency

- NNS – Number needed to screen
- Assessed from a randomized screening trial
- NNS - to prevent one death from cancer of interest
- $\# \text{ Screened (or intended to screen)} / \text{Difference in deaths across arms}$
- NNS - to prevent one incident case of cancer of interest
- $\# \text{ Screened (or intended to screen)} / \text{Difference in cases across arms}$



# Endoscopic screening and CRC prevention – Drilling down



- Endoscopic screening, per se, does not prevent CRC
- CRC is prevented by identifying and removing polyps, and specifically adenomas
- How can we quantitatively assess the link between adenomas removed and CRCs prevented?

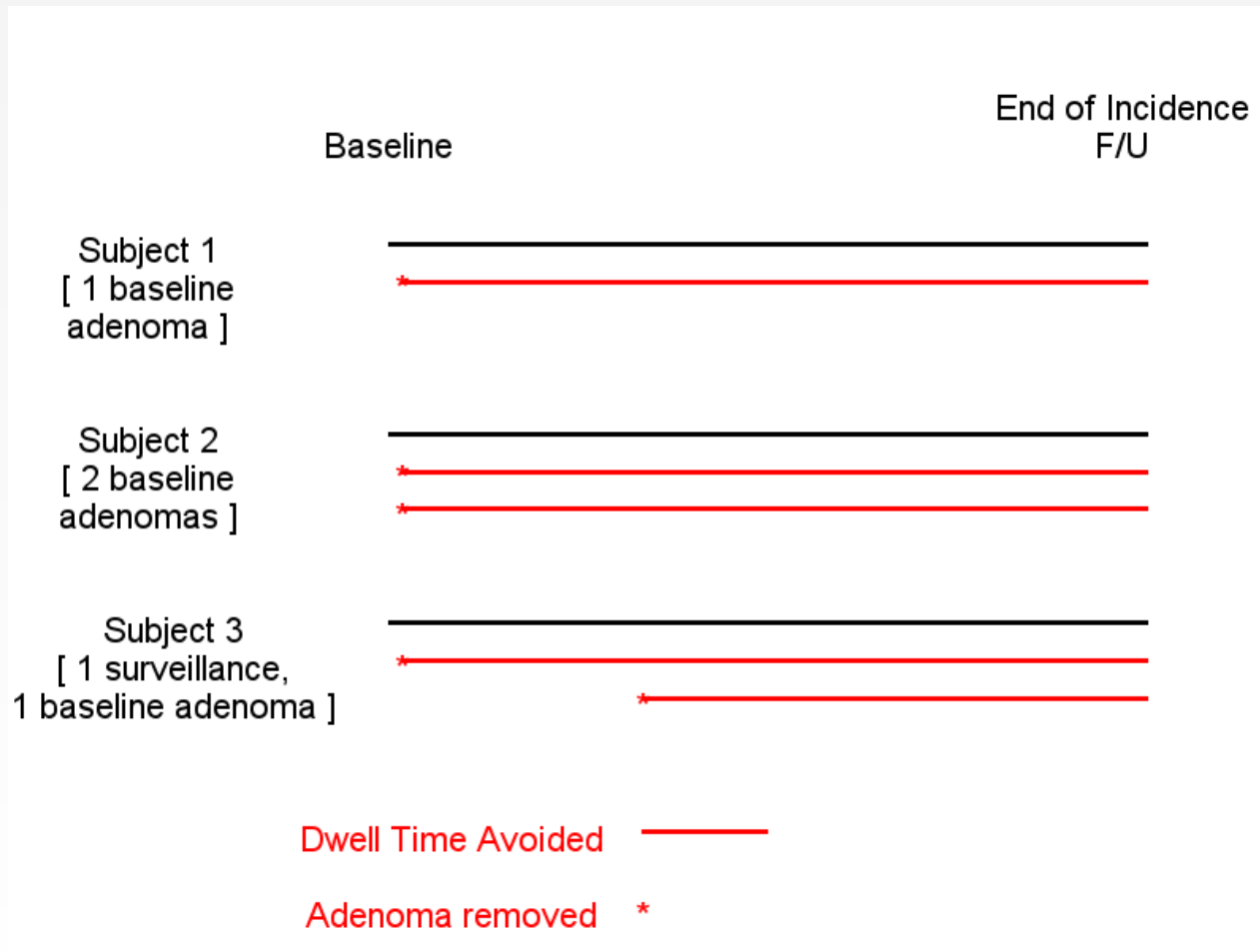


# Two New Metrics for Endoscopic Screening Efficiency

- Number Needed to Remove (NNR)
- $[\# \text{ of adenomas removed from screened arm subjects}] / [\text{difference in CRC cases across arms}]$
- Dwell Time Avoided (DTA)
- $[\text{total adenoma dwell time avoided in screened arm subjects}] / [\text{difference in CRC cases across arms}]$
- **Dwell time avoided – summed time from adenoma removal to end of follow-up**



# Schematic of DTA



# Sigmoidoscopy Screening Trials

## Data Source for Estimates

Trial (country)	Total # Enrolled Intervention/Control	Age Range	# of Screens	Median F/U (years)	CRC Incidence Rate Ratio
PLCO (US)	77445/77455	55-74	2	11.9	0.79
NORCCAP (Norway)	20572/78220	50-64	1	10.9	0.80
SCORE (Italy)	17136/17136	55-64	1	10.5	0.82
UKFSST (UK)	57099/112939	55-64	1	11.2	0.77



# Example: Calculating NNR in UKFSST

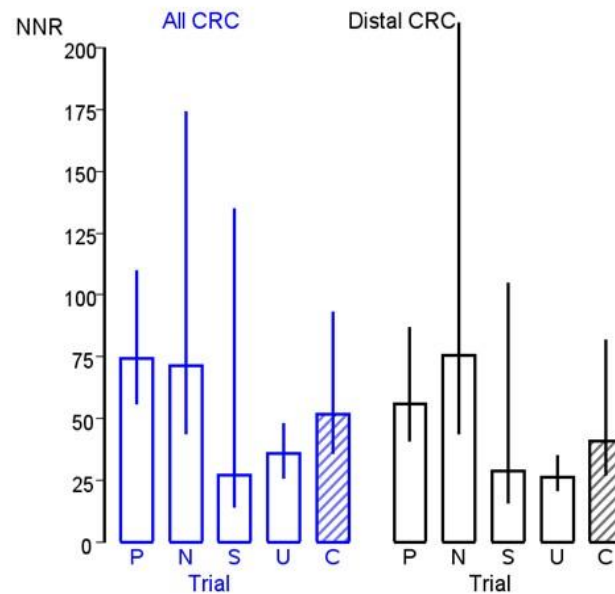
	Intervention Arm
Enrolled	57099
Screened (baseline)	40621
Baseline adenomas (sig + colo)	6838
Adenomas on surveillance	855
Total adenomas	<b>7693</b>
CRC cases (observed)	706
CRC cases (expected under no screening)	921 (706/RR = 706/0.765)
CRC cases prevented	<b>215</b>

$$\text{NNR} = 7693/215 = 36$$

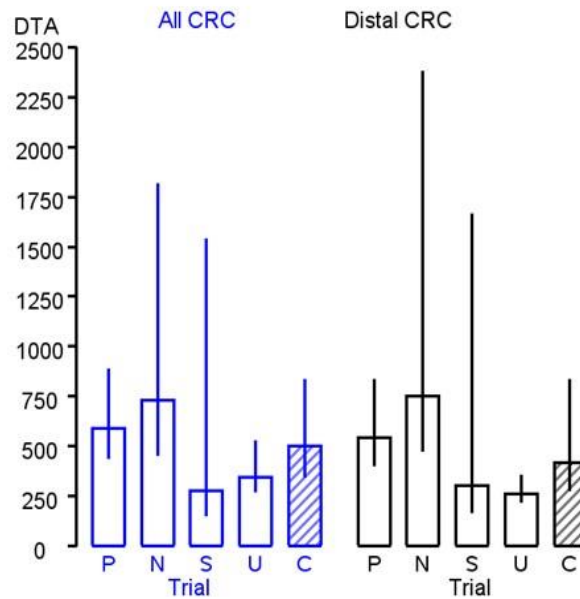




# NNR Estimates from Trials



# DTA Estimates from Trials



# Results of Meta Analysis

Metric	Population/Adenoma Type	Weighted Average (95% CI) [Heterogeneity]
NRR	All Subjects/All Adenomas	52 (36-93)
	Men/ All Adenomas	56 (42-83)
	Women/ All Adenomas	50 (29-185)
	All Subjects/Advanced Adenomas	13 (9-22) *
DTA	All Subjects/All Adenomas	500 (344-833)
	Men/ All Adenomas	517 (414-687)
	Women/ All Adenomas	497 (298-1497)
	All Subjects/Advanced Adenomas	122 (90-190) *



# DTA and Adenoma Transition Rate

- $DTA = [\text{dwell time avoided}] / [\text{CRC cases prevented}]$
- $1/DTA = [\text{CRC cases prevented} / \text{dwell time avoided}]$
- $= [\text{incident CRC cases}] / [\text{total adenoma dwell years}]$
- $= \text{transition rate from adenoma to CRC (Yrs}^{-1}\text{)}$
- Example
- 10000 dwell years avoided; 20 CRCs prevented
- $DTA = 10000 / 20 = 500$ ;  $1/DTA = 0.002$  or 0.2%  
transition rate per year



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