

ESTIMATING THE RESOURCES NEEDED TO IMPLEMENT A POPULATION-BASED COLORECTAL CANCER SCREENING PROGRAM THROUGH DISCRETE EVENT SIMULATION

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BACKGROUND & OBJECTIVES

Colorectal cancer is a major cause of both incidence and mortality by cancer. Recent European guidelines recommend colorectal cancer screening of average-risk population. Our objective was to estimate the resources needed (in terms of costs and demand of colonoscopies) to implement a population-based colorectal cancer screening program.

METHODS

A discrete-event simulation model was built to represent a colorectal cancer screening program for a target population of 100,000 women and men aged 50 to 69 years. The conceptual model for the screening process (**Figure 1**) was based on the European Guidelines, which recommend biennial screening with immunochemical faecal occult blood test (iFOBT) and colonoscopy for positives of iFOBT. Follow-up after adenoma removal differed according to findings of each colonoscopy classified by risk of adenomas. Parameters for costs (**Table 1**) and initial screening (**Table 2**) were estimated from the areas corresponding to Hospital del Mar within the Colorectal Cancer Screening Program of Barcelona. Parameters for successive screenings were obtained from the literature. A 20-year horizon was simulated. The model included the population ageing.

Table 1: Cost estimations.

	N	Cost per unit (€)
Administrative costs		
Letters		
Information		0.4695
Other letters		0.4165
Fixed cost per year		
Program coordinator	0.5*20	77,055
Nurse	1*20	38,531
Data manager	0.5*20	32,546
Administrative staff	1*20	31,294
Carrier	1*20	4,786
Hardware	1	200
Guides for GPs	1000	2
Screening tests costs		
Immuno-histological test		
Kit		3
Laboratory		1.88
Colonoscopy		289.66

GP: General Practitioner.

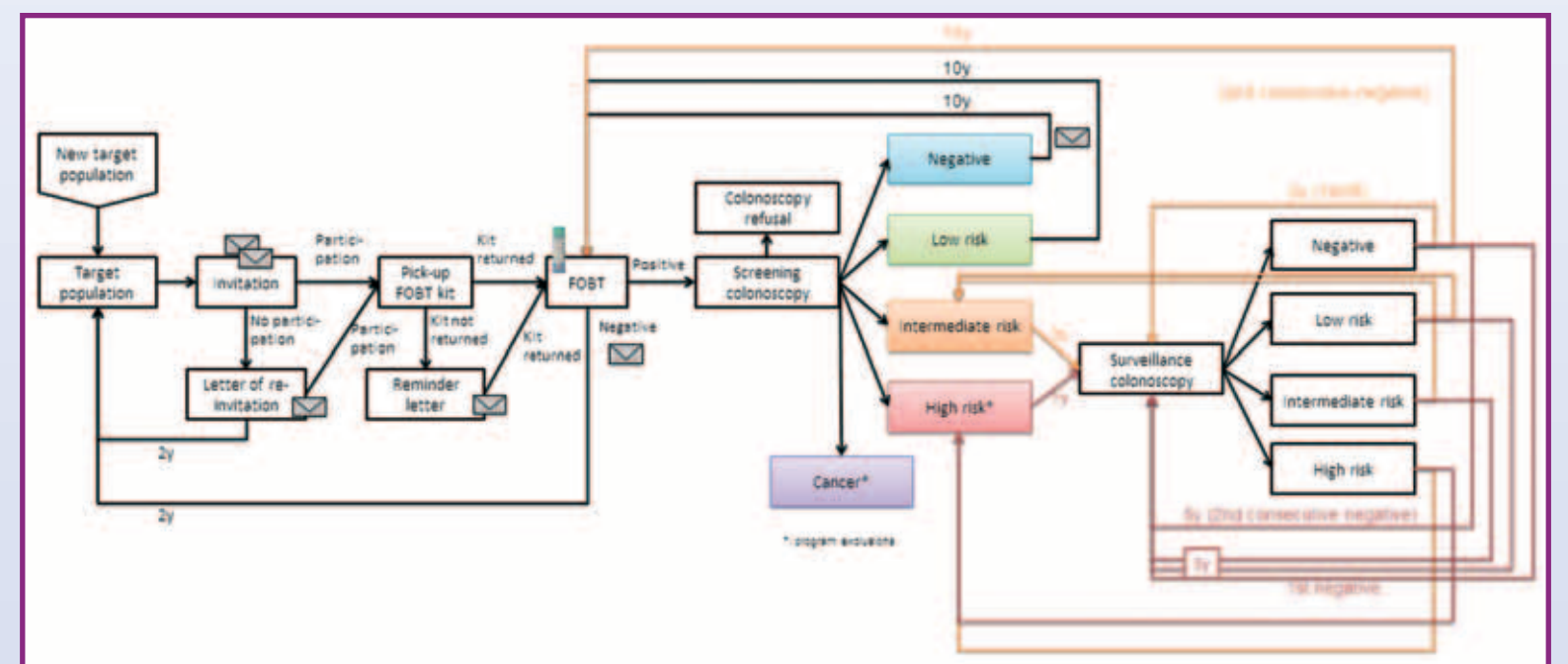


Figure 1: Conceptual model.

Table 2: Parameters estimated for participation and screening results.

	N	%
Target population	100,000	
Exclusions		0.3
Information + Invitation		99.7
Exclusions		3.6
Reinvitation		26.5
Acceptance		49.2
Return of kit		96.6
Reminder of acceptance		4.5
Participation		47.5
Results of FOBT		
Positive		6.5
Results of colonoscopy		
Positive for cancer		8.5
Positive no cancer		67.0
High-risk adenomas		15.7
Intermediate-risk adenomas		30.6
Low-risk adenomas		20.7
Negative		24.5

RESULTS

Annual cost of screening 100,000 people varied from 899 thousand euro the first simulated year to 1,322 thousand euro the 20th year (**Figure 2**). The number of screening colonoscopies varied from 1,659 the first year to 1,790 the 20th year (**Figure 3**). Colonoscopies for following-up the screening findings should be added to this numbers, starting in the second year: from 245 to 1,371 follow-up colonoscopies the 20th year (**Figure 3**).

Figure 2: 20-year overall cost of screening 100,000 people.

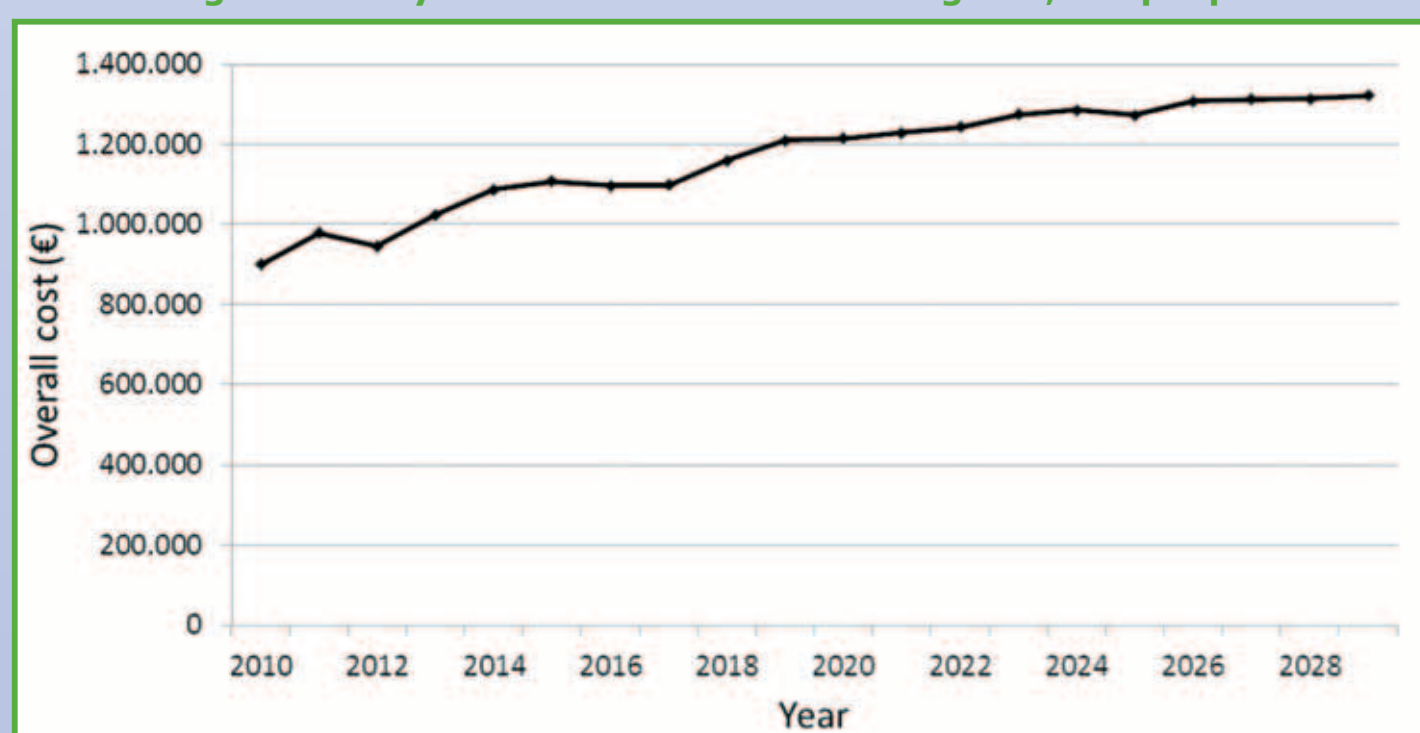
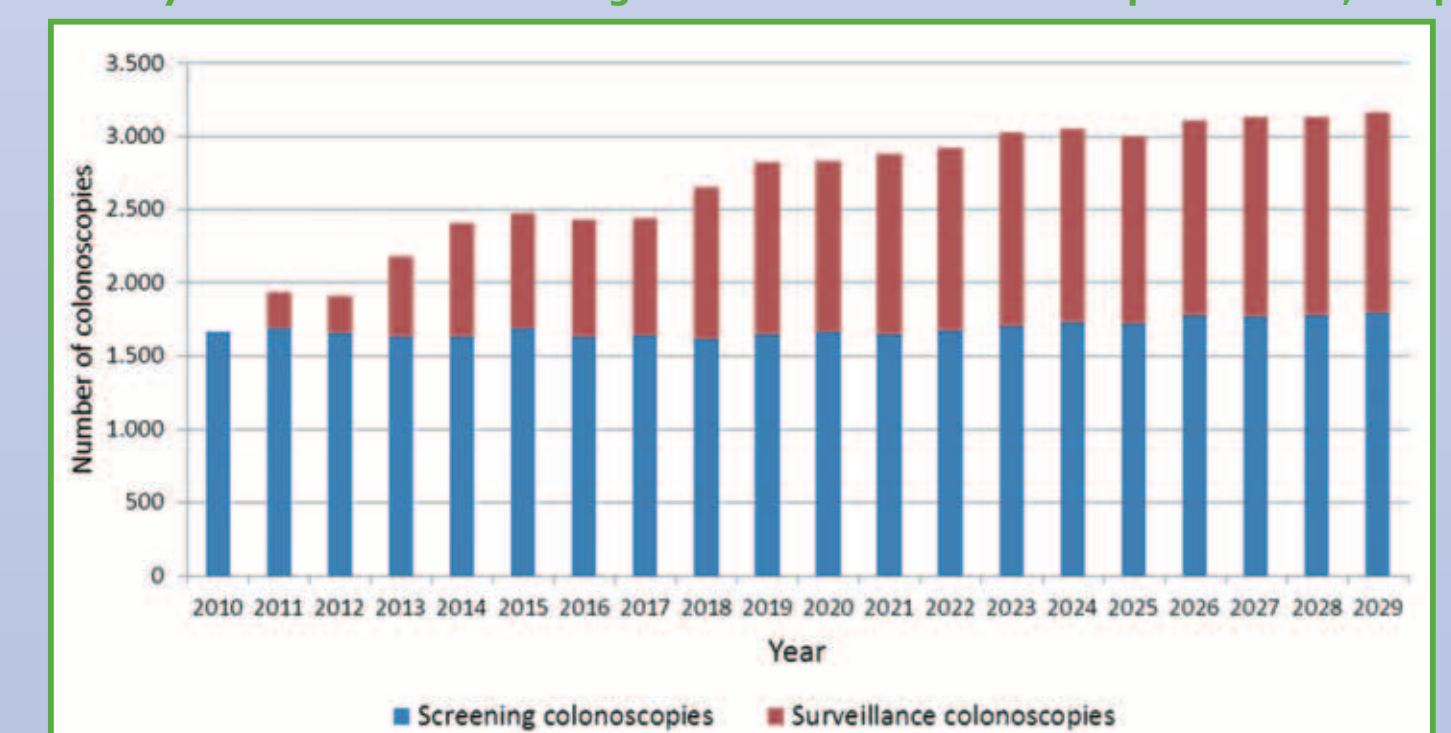


Figure 3: 20-year demand of screening and surveillance colonoscopies for 100,000 people.



CONCLUSIONS

Implementing a population-based colorectal cancer screening program following the European guidelines represents a cost of around 1 million euro by year the first five years for a target population of 100,000 inhabitants aged 50-69. The cost increases during the following 15 years until 1,322 thousand euro. An important consequence of screening is the increase in the demand of confirmatory and follow-up colonoscopies related to the findings generated by the program. The demand of follow-up colonoscopies is directly related to the intensity of follow-up through colonoscopy.