

MEDICAL-ECONOMIC APPROACH TO MASS SCREENING FOR COLORECTAL CANCER IN THE WILAYA OF BEJAÏA

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Abstract

The economic evaluation finds its justification in the impossible market regulation of the health sector. Most sectors of the economy are in fact governed by market mechanisms which encourage consumers and producers to make the best use of the limited resources available to society, according to their own interests. The health sector escapes this mode of operation, in particular because of the difficulty for the consumer to access all the information allowing them to judge the characteristics (quality and price) of the health good or service which would be beneficial to them. We were called upon to carry out a mass screening strategy for colorectal cancer in the wilaya of Bejaia, this screening concerned more than 3000 citizens, the crucial and decisive step for maintaining this screening was to evaluate the cost-effectiveness of this operation which aims primarily to reduce mortality and the incidence of this cancer which remains a public health problem in Algeria. The main objective of this article is to have all the cost data linked to screening or management of CRC only in order to be able to estimate the different cost items linked to the disease and to ensure the medico-economic evaluation. organized screening carried out between 2017 and 2020 as part of the Algerian cancer plan in the wilaya of Bejaia. Screening for CRC with an immunological test cost more than 12 million dinars. Direct medical costs represent more than two thirds of the cost, or a rate of 69.6%. This study evaluated the cost-effectiveness ratio for a single screening strategy in the general population (50-74 years) based on the FIT. Direct and indirect costs were estimated from different sources. However, the problem deserves to be mentioned and taken up again in a few years. Such economic quantification is difficult, in particular because of the great complexity of estimating the cost of cancer in Algeria, including colorectal cancer, but also because of the absence of an epidemiological benchmark, notably data on mortality from cancer. colorectal cancer

INTRODUCTION

The economic evaluation finds its justification in the impossible market regulation of the health sector [1]. Most sectors of the economy are in fact governed by market mechanisms which encourage consumers and producers to make the best use of the limited resources available to society, according to their own interests. The health sector escapes this mode of operation, in particular because of the difficulty for the consumer to access all the information allowing them to judge the characteristics (quality and price) of the health good or service which would be beneficial to them. . The responsibility for the

optimal choice to be made therefore falls to an expert, the doctor, who must weigh the ratio cost/benefit of the decision he will make in favor of his patient. The misuse of collective resources is one of the possible consequences linked to this situation of information asymmetry. Indeed, since the 1970s, health spending has continued to increase, both due to the constant aging of the population and the rapid development of new medical techniques and their increasing cost [2]. If the proliferation of new techniques raises the question of controlling health spending, it also raises that of evaluating their impact on individual health. The examinations carried out are sometimes painful and involve risks [3]. They can also cause anxiety or even unnecessary treatment when their result is falsely positive. Furthermore, the effectiveness and performance of these innovations are often insufficiently demonstrated and their diffusion in the medical community generally poorly evaluated. It is this context of uncertainty associated with the strong constraint of resources weighing on the health system which has made economic evaluation an important decision-making tool in order to rationalize choices and make use efficient. resources mobilized by the community. [4-6] The main objective of this article is to have all the cost data linked to screening or management of CRC only in order to be able to estimate the different cost items linked to the disease and to ensure the medico-economic evaluation. organized screening carried out between 2017 and 2020 as part of the Algerian cancer plan in the wilaya of Bejaia.

MATERIALS AND METHOD

The costs associated with CRC were approached and analyzed from 3 angles: pre-therapeutic costs (diagnosis), treatment costs (hospitalization and follow-up) and post-therapeutic follow-up costs (after hospitalization). Pre-therapeutic costs, 1 month before hospitalization. These included, excluding medications, expenses for radiology procedures, analyzes and samples and consultations. In a study of patients diagnosed with cancer or a polyp, the costs generated between the date of screening and the date of the decision to undertake treatment or not. The overall average cost during the pre-therapeutic phase. This study evaluated the cost-effectiveness ratio for a single screening strategy in the general population (50-74 years) based on the FIT. Direct and indirect costs were estimated from different sources.

The four cost items related to CRC screening in this study were estimated at based on data provided by private diagnostic centers.

- I) The cost of organizing the screening program, including labor, operating costs and equipment. This cost was independent of participation.
- II) The cost of informing and inviting the population included the design and printing the invitation letter and information leaflet sent at the start of the screening campaign, the cost of training general practitioners and informing the entire medical profession involved. These costs were also independent of participation.
- III) The cost of distribution which varied depending on the purchase price of the test used and the participation. These included:

- 1) The cost of distributing the tests carried out during a normal consultation with a general practitioner
- 2) The cost of a first reminder letter if the screening test has not been carried out during the first four months of the medical phase,
- IV) The cost of processing tests in a centralized analysis center However, the cost of maintaining the machine, wiring between the machine and the computer and purchase of associated software were included in the treatment cost.
- V) The cost of a colonoscopy performed after a positive test. A distinction was made between the cost of negative colonoscopy and the cost of colonoscopy with polypectomy
- VI) The cost of follow-up after resection of the adenoma was based on the use of a diagnostic colonoscopy performed every 3 years after polypectomy
- VII) The average cost of CRC treatment by stage corresponded to the first year of care after diagnosis.

RESULTS

This involves evaluating and analyzing the costs of the program and presenting some medico-economic indicators.

1. Evaluation and analysis of the costs of the colorectal cancer screening pilot program
 The purpose of this section is to evaluate and analyze the costs of the colorectal cancer screening pilot program which took place in the three pilot dairas of the wilaya from Bejaia. Even if it is an approximation of the real costs, this evaluation will allow us to better understand the economic issues of the feasibility of screening in the event of generalization on the national territory and will thus serve as a basis for calculation. It is also important to specify that only direct costs are considered, because indirect and intangible costs are very difficult to evaluate.

A Direct non-medical cost of the program The direct non-medical costs of the screening program include all the costs of the actions necessary for its implementation and which do not concern the screening actions themselves. Direct non-medical costs can be divided into two categories of costs: organizational costs and information and awareness costs. The various direct non-medical cost items are shown in table (1) below.

Table 1: direct non-medical costs of mass CRC screening

nature of costs	Amount (in dinars)	%
information/awareness costs		
awareness through media (radio)	40,000	1.09%
Meeting with civil society and associative movement	50,000	1.36%
Organization of media and poster communications campaigns.	36,000	0.98%
transport and logistics of awareness campaigns	61,500	1.67%
total	187,500	5.11%
costs related to the organization of the program		
Creation of the screening management structure	3,197,000	87.06%

launch of DOCCR	20,000	0.54%
training of doctors (general practitioner and gastro)	250,000	6.81%
pre-epidemiological investigation	12,500	0.34%
Verification of the implementation of the screening process circuit	5,000	0.14%
total	3,484,500	94.89%
grand total	3,672,000	100.00%

According to the data in **Table 1** and **Graph 1**, direct non-medical costs are dominated by program organization costs, which represent almost 95%, and information and awareness costs represent only 5%. In addition, the cost of creating the screening management structure alone represents more than 87% of direct non-medical costs. The training of doctors represents the second largest expenditure item with a rate of almost 7% of direct non-medical costs.

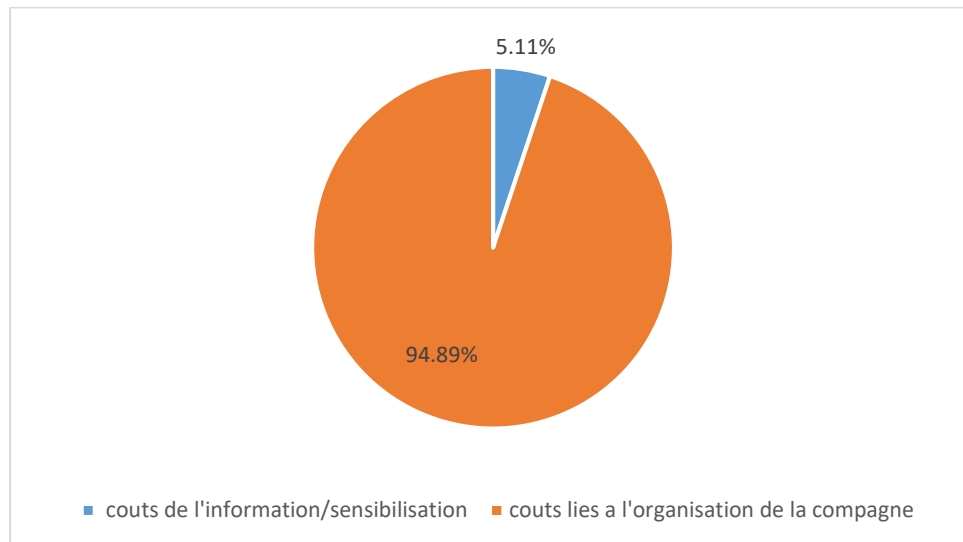


Figure 1: breakdown of direct non-medical costs

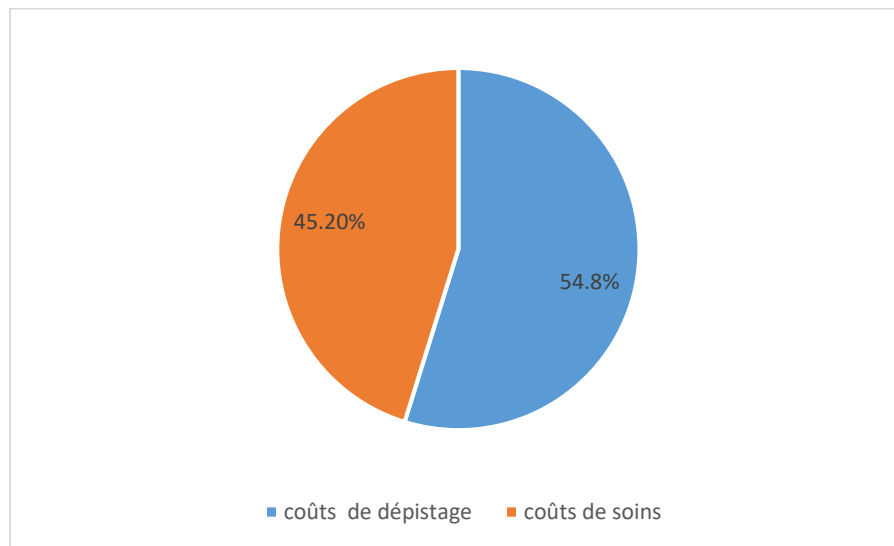
B Direct medical costs of the program

Direct medical costs represent all medical costs of the colorectal cancer screening program. They are also divided into two categories: screening costs, which include immunological test costs and colonoscopy costs for people with positive tests, and care and treatment costs for patients screened for a disease.

As shown in **Figure 2**, the distribution of direct medical costs between the two main cost items is almost balanced. However, there is a small advantage in screening costs with a rate of 54.8%. In addition, immunological test costs represent more than a third of medical costs, or nearly 37%. Regarding care and treatment costs, we see that medical oncology care costs represent more than half of this item, with a proportion of 29.23% of medical costs. We also observe that hospitalization costs and staff remuneration represent the lowest expenditure items, i.e. (both) 1.33%, while in studies evaluating the costs of illness, these two expenditure items expenses represent a much larger share.

Table 2: Direct medical costs of the CRC screening program

nature of costs	Rising	%
screening costs		
immunological test costs	3,100,000	36.91%
colonoscopy fees	1,503,218.3	17.90%
total	4,603,218.3	54.80%
care and treatment costs		
anatomopathology	570,000	6.79%
Oncology	2,454,979.73	29.23%
surgery	60,000	0.71%
radiotherapy	600,000	7.14%
hospitalization costs	7,500	0.09%
remuneration of medical staff	104,000	1.24%
total	3,796,479.73	45.20%
grand total	8,399,698.03	100.00%



Graph 2: breakdown of direct medical costs

C Overall direct cost of the colorectal cancer screening program: Screening for CRC with an immunological test cost more than 12 million dinars. Direct medical costs represent more than two thirds of the cost, or a rate of 69.6%.

Table 3: overall direct cost of the CRC screening program

nature of the cost	Rising	%
direct medical costs	8,399,698.03	69.58%
direct non-medical costs	3,672,000.00	30.42%
global cost	12,071,698.03	100.00%

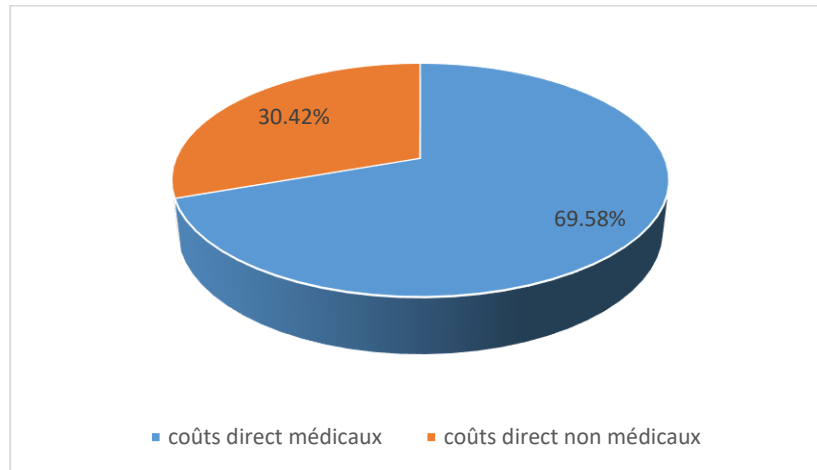


Chart 4: breakdown of overall direct costs

2. Some medico-economic indicators

Table 4: Medico-economic indicators of the CRC screening program

indicators	values
cost per person screened	3,753.64
cost per positive test	55,374.76
cost per adenocarcinoma detected	710,099.88
cost per case avoided ¹	502,987.42

Cases avoided represent the number of people with adenomas of all types that have a high probability of degenerating into adenocarcinoma. There are 24 cases in number.

DISCUSSION

Study of the direct costs of the 1st^{OD} campaign of a pilot program excluding **costs** linked to the diagnosis (colonoscopy) and treatment of CRC and indirect costs.

A cost-effectiveness study of the study is well beyond the scope of this evaluation. However, the problem deserves to be mentioned and taken up again in a few years.

Such economic quantification is difficult, in particular because of the great complexity of estimating the cost of cancer in Algeria, including colorectal cancer, but also because of the absence of an epidemiological benchmark, notably data on mortality from cancer. colorectal cancer and its prevalence. Given the pilot nature of this study, in this part it is in no way a question of judging the effectiveness of screening and less of making arguments or recommendations in terms of health policy, but rather of constructing indicators medico-economic data which could serve as points of comparison for subsequent studies on CRC screening campaigns in Algeria or even in the developing world. Therefore, we cannot comment further on the results. We constructed four ratios of screening program outcome indicators. The results that we were able to produce are recorded in **Table 4**. The limits of this economic analysis of the colorectal cancer screening pilot program in the wilaya of Bejaia are as follows:

- it is a pilot CRC screening study, and constitutes the first in Algeria, we cannot carry out a cost-effectiveness type medico-economic study, because measuring the effectiveness of a CRC screening program CCR in terms of years of life gained, reduction in incidence and mortality requires epidemiological and demographic data on the three study dairas to be able to feed the simulation model for reconstitution of the natural history of the disease based on **the model of Markov[199, 200]** .
- In addition, the Markov model also requires data on the probabilities of transition of health states inherent to the natural evolution of the disease which are taken from the literature using a meta-analysis of the results of the studies. However, the literature in this area mainly consists of studies carried out in developed countries and the hypotheses for calibrating models of transition states are based on the characteristics (epidemiological, demographic and healthcare system) of these countries. In fact, we cannot calibrate a demographic cohort simulation model supposed to reconstruct the characteristics of the study population of a developing country, in this case Algeria, with data relating to developed countries.
- The absence of studies assessing the costs of colorectal cancer does not allow us to carry out a cost-benefit analysis by taking as benefit indicators the costs avoided per screening companion.

CONCLUSION

Few medico-economic analyzes of colorectal cancer screening in the general population have been undertaken in Europe [7-8]. Proof of the effectiveness and medico-economic benefit of the immunological test was provided by two European randomized studies and a French controlled study. Immunological tests represent an alternative to this test, but the results of studies seeking to demonstrate their effectiveness are discordant [9]. As for CT colonography and genetic screening, they have not yet been evaluated in Europe from a medico-economic perspective, due to lack of available data. The Anglo-Saxon scientific literature is rich in cost-effectiveness analyzes of colorectal cancer screening. But the assumptions on which the models are based can be discussed [10]. Furthermore, the models constructed often differ in costs due to significantly different valuation methods, but above all by the nature of the epidemiological hypotheses used such as the natural history of the disease, the diagnostic performance of the tests and the participation rates in campaigns. screening.[11] These methods could only be used in specific groups at risk of colorectal cancer for which there are no screening recommendations yet (and in particular in first-degree relatives of subjects suffering from colorectal cancer after the age of 60).). To conclude, it appears important to develop new areas of research in order to provide relevant answers and decision-making tools on a medico-economic level, both in the general population and in groups at high risk of colorectal cancer.

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