



Public Health  
England

Protecting and improving the nation's health

# **Cost-effective commissioning of colorectal cancer care**

## **User guide for the Return on Investment tool**

Version 1.0/ October 2016

# About Public Health England

Public Health England exists to protect and improve the nation's health and wellbeing, and reduce health inequalities. We do this through world-class science, knowledge and intelligence, advocacy, partnerships and the delivery of specialist public health services. We are an executive agency of the Department of Health, and are a distinct delivery organisation with operational autonomy to advise and support government, local authorities and the NHS in a professionally independent manner.

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## Context and general information

The PHE colorectal cancer (CRC) ROI Tool allows CCGs to see the health outcomes and cost impact of initiatives that are known to contribute to earlier diagnosis of colorectal cancer, based on the available evidence.

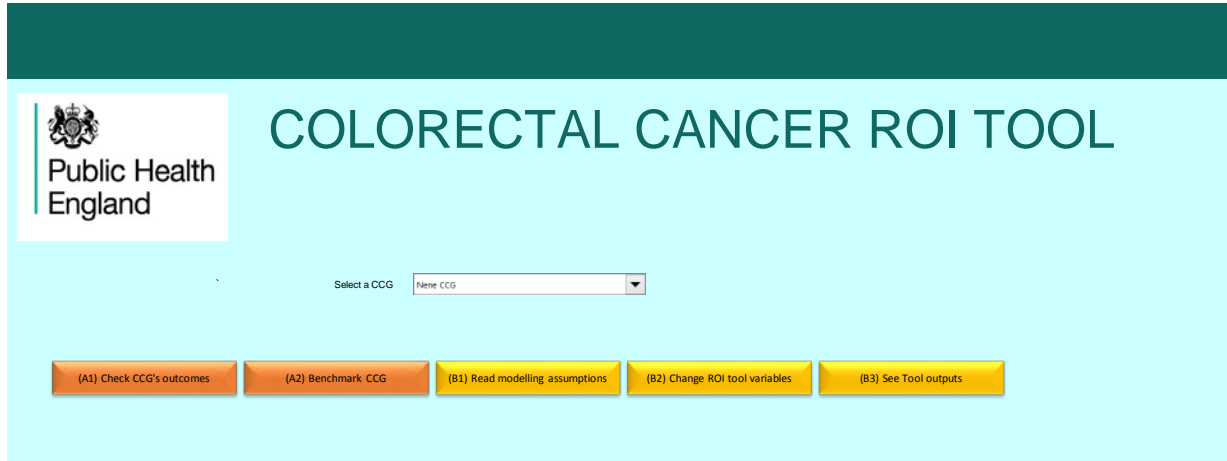
This document provides a step-by-step walk through the colorectal cancer (CRC) ROI tool. It contains general information about all the worksheets in the tool with key sections clearly highlighted.

For an analysis of the CRC pathway as well as detail on modelling assumptions, sources, and logic, please see the accompanying report, Cost-effective commissioning of CRC care. The tool's assumptions worksheet describes the key assumptions while the step-by-step calculations are described in the tool worksheets.

Before operating the tool, please read the following general instructions:

- the CRC ROI Tool is macro-enabled. After opening the workbook, please click on the "Enable macro" button on the top right corner of the file.
- all input variables where the user can change values are highlighted in yellow. Please do not change or edit the formula in any cell which is not highlighted.
- if after reading this document additional support is required or you would like to provide us with feedback to the tool, please contact us at [healthconomics@phe.gov.uk](mailto:healthconomics@phe.gov.uk).

# Introduction



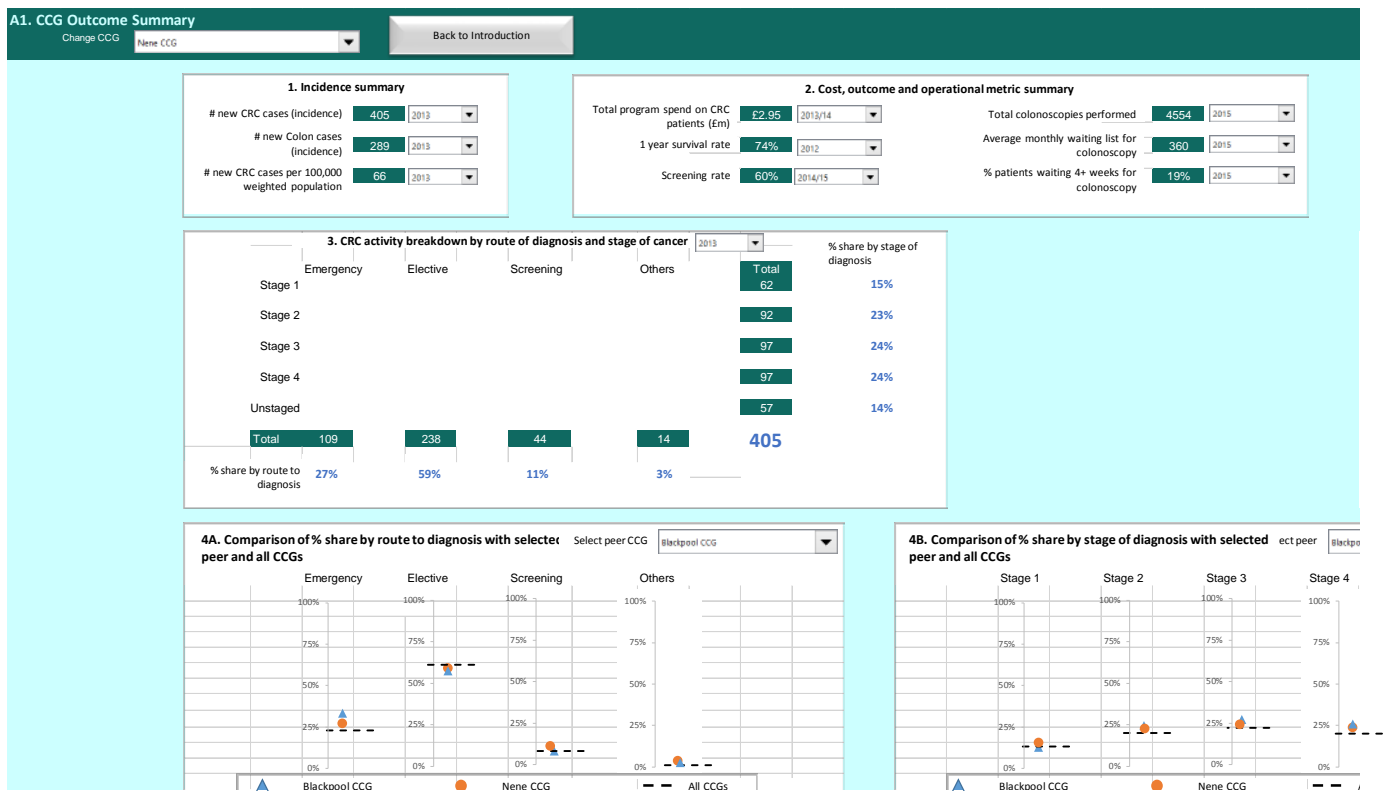
The **Introduction** tab is the first tab in the tool. On this page, the **Select a CCG** drop down contains names of all CCGs. Once the user selects any of these as the target, all calculations in the tool will work.

**Navigation** buttons allow the user to move from one tab to another or directly to a selected tab. 'A' tabs present information about the CCG while 'B' tabs contain the tool inputs and outputs:

- **(A1) Check CCG's outcomes** tab includes a summary of the current CCG's performance in terms of CRC and allows the CCG to compare itself to other CCGs
- **(A2) Benchmark CCG** tab allows the user to compare the target CCG with the rest of England and view historical trends on various metrics
- **(B1) Read modelling assumptions** tab lists all of the assumptions and logic used in the tool
- **(B2) Change ROI tool inputs** tab lists input variables used in the tool. Here the user can change values based on local knowledge to alter tool outputs and select an intervention that either increases screening rates or increases elective referrals for diagnosis
- **(B3) See tool outputs** tab shows the impact of the interventions chosen in B2 on CCG costs and lives saved

Note that there are additional worksheets available for use if needed, namely B4 and C1 to C4. Although they provide additional functionality and transparency, the tool is usable without referring to these worksheets. To view these sheets, the user simply needs to click on the worksheet tab in Excel.

# CCG outcomes summary



This sheet provides a summary of the CCG’s new cases of CRC, current programme spending on CRC, and other basic operational metrics. This sheet can be divided into four sections:

**Incidence summary** provides high-level estimates of the selected CCG’s incidence cases - for example, new CRC cases diagnosed, new colon cases, and cases per 100,000 weighted population. Data used in this section has been extracted from the PHE Cancer Analysis System (CAS).

**Cost, outcome and operational metric summary** contains outcome metrics (such as survival rate and screening rate) as well as operational metrics (such as the percentage of patients waiting four or more weeks for a colonoscopy and the average waiting list for the procedure). Data in this section have been taken from NHS England, HSCIC, and the Department of Health.

**Activity breakdown** segments new cases of colon and rectal cancers by stage at time of and route to diagnosis. This section also includes patients who have yet to be assigned to a stage. Data in this section are taken from CAS.

**Activity share** compares a CCG with a selected peer and the rest of England and consists of two sets of charts: percent share by the route to diagnosis and percent share by stage of diagnosis. CCGs have the option of selecting their own peer by changing

the value in the drop-down. Data for this section is also taken from CAS and only represent new cases of CRC (for example, incidence cases).

In each of the first three sections, CCGs can access historical numbers for all metrics by changing the year value in the drop-down.

# CCG benchmarks



The **CCG benchmarks** tab contains benchmarking tools and trend charts to compare CCG performance on selected metrics. This tab has three key sections:

The **Quartile benchmarking** chart showcases the CCG’s performance on a selected metric as compared with the national median and quartile measures. Data in this section have been taken from public sources and CAS.

**Trend analysis** shows trends for a selected metric for the past four to five years, depending on data availability. Users can easily change the selected metric by using the metric drop-down option. Data in this section have been taken from public sources and CAS.

**% share by the route to diagnosis** is a simple illustration of the percent share of new CRC cases by stage and route to diagnosis. The number in bold in front of the chart shows total numbers by stage, and the data label on the chart shows percent share. CCGs can change the year value for this chart by changing from options in the year drop-down. Data for this section have been taken from CAS.



# B1. Modelling assumptions

**B1. Modelling assumptions** Back to Introduction

**General assumptions**

1. All patients at the same stage of cancer are similar to each other and hence, there is no case mix difference between them
2. Cost for recurring patients is distributed uniformly over years from 2nd year onwards
3. Growth rate for both colon and rectal cancer is the same
4. Impact of intervention is same for both colon and rectal cancer patients
5. Distribution of activity is same over the years for both colon and rectal cancer patients
6. Lifetime cost for patients diagnosed via elective and screening routes are the same
7. Lifetime cost for patients diagnosed via emergency route is 26% is higher than the cost of treating the electing patient. We have used this to compute the cost for treating patients diagnosed via the emergency route. The source is Tappenden et al. (2004)
8. Lifetime cost from 2013 has been updated using annual inflation rate to

**Do Nothing Scenario**

**Activity**

1. We have used activity figures, incidence only, for 2013 by stage and route to diagnosis from the Cancer registry database as the starting point. For forecasting activity, we have assumed it will grow uniformly by 2%. CCGs can enter their own rate of increase if required.
2. We have used aggregated activity for colon and rectal cancer as both have similar growth rate, similar activity distribution over the years, i.e. majority of activity been done in year 1 etc. and both will experience the same impact of intervention
3. Unstaged patients are distributed in all stages using weights derived from CCG's current share by stage and route to diagnosis
4. We have not included existing patients with CRC in this analysis, as impact of intervention will be on new cases only
5. We have used three sources to estimate how costs are spread out over time, as no one source is fully suitable for use in this model. The sources are M. Laudicella (2016), York (2008), CRUK/Incisive (2014).

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**The Modelling assumptions tab** is the next tab in the tool. This tab describes the assumptions and logic used in the ROI Tool to quantify the impact of interventions.

The tool presents two scenarios: “do nothing” and “do something.” In both scenarios, the future annual CRC incidence is forecast. In “do nothing,” the distribution of patients by stage at and route to diagnosis stays constant over time, while in “do something,” the distribution changes depending on the intervention selected.

The Modelling assumptions tab describes the key assumptions made in forecasting the future level and cost of CRC in the CCG’s population.

## B2. ROI user variables

This worksheet permits the user to change the main variables for the ROI analysis, based on local insight or data including:

Choosing whether to model a screening-increase or elective referral-increase intervention.

Annual recurring cost of the behavioural intervention—for example, the cost of a GP training programme or a mailing to the eligible population for screening. (See B4 for an estimate of the costs for the five screening interventions profiled in the report.) Section 2.3.3 in the accompanying report describes the potential benefits of screening interventions and sign posts to the relevant papers for more detail. For elective referral interventions we do not have information on effectiveness, so the user needs to input local assumptions on the potential increase in colonoscopies.

Assumptions for the impact of an intervention, which may be viewed one at a time.

- for **screening interventions**, the percentage point increase in screening uptake (screening uptake defined as the percent of the population eligible for screening that completes the screening kit)
- for **elective referral** interventions, the percent increase in diagnostic assessments (for example, colonoscopies)

**B2. Select ROI user variables**

**1. Please select type of behavioural intervention to be evaluated**

Screening (e.g., endorsement letters from GPs to patients to encourage uptake of screening)

Elective referrals (e.g., GP training to improve detection of cancer that increases the number of elective referrals for diagnostic assessments; could also be an increase in diagnostic capacity)

Enter your selection here -> Elective

[Back to Introduction](#)

Yellow for user inputs

Blue: optional variables the user can change if desired (see sheet B4 to change variables)

**2. Set an assumption of the annual recurring cost of behavioural intervention**

For example the cost of a GP training programme or the cost of mailing out leaflets to the eligible population for screening. See the model inputs worksheet for an estimate of what this might cost for the five screening interventions profiled in the report

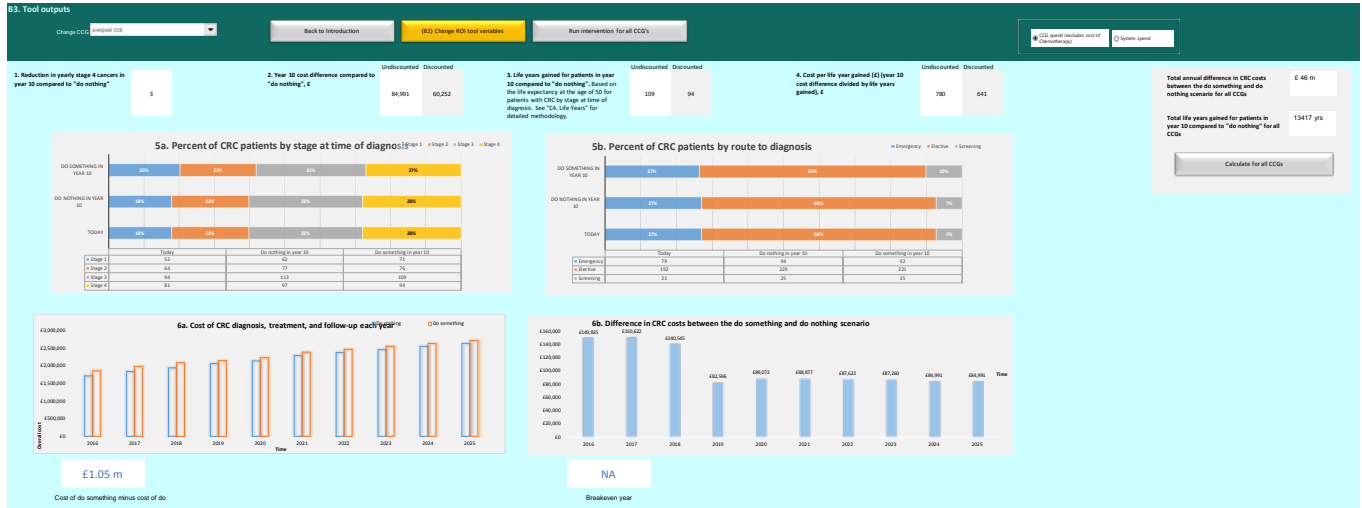
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**3. Set assumptions for the impact of the intervention (your choice highlighted in pink)**

Elective referrals for diagnostic assessment	
Variable	Value
% Increase in diagnostic assessments (e.g., colonoscopies)	10%
Current # of diagnostic assessments in your CCG (NHS England annual elective colonoscopy data (2015) used as proxy for diagnostic assessment)	5664
New # of diagnostic assessments	6230
Additional diagnostic assessments	566
Cost of a diagnostic assessment (e.g., colonoscopy; based on CRUK/Incisive costs)	£550
Total cost for diagnostic assessment (assume costs of other diagnostics related activities like CT scans are included here)	£311,520
Current annual number of CRC patients found via elective route	238
CRC patients found via the elective route as a percent of total diagnostic assessments	4.2%
Assumption: % of diagnostic assessments that result in a positive cancer diagnosis (either (i) above or 5% if (i) > 5% or 1% if (i) < 1%	4.2%
Number of CRC cases found after intervention	261.80
Additional cases found	23.80
<b>Total annual cost for diagnostic assessment and behavioural intervention</b>	<b>£311,520</b>

**4. Go to tool outputs by clicking here:** (B3) Tool outputs

# Tool outputs



The Tool outputs tab summarises the impact of the intervention on costs and outcomes for the CCG. It contains output metrics and graphs, which are described in the tool itself. The user can choose to model costs with or without the cost of chemotherapy, which is considered a “system cost” as it is currently paid for by Specialised Commissioning. Cost difference and life years gained are shown both discounted and undiscounted. Last, the user can also run the selected intervention from B3 on all CCGs to calculate the average annual cost of implementing the intervention in England. Section 3.2 of the report presents an illustration of the outputs of the model and how to interpret them.

# Optional variables

**1. Impact of intervention variables**

Percent of screened patients who go for a diagnostic assessment (i.e. colonoscopy)	5.0%	Estimate drawn from DH, Impact of earlier diagnosis, 2011, p34
% referred to diagnostics who are diagnosed with cancer	5.0%	Estimate drawn from DH, Impact of earlier diagnosis, 2011, p34 (implied based on 0.25% assumption of FOBT test takers having cancer)
Cost of a diagnostic assessment (e.g., colonoscopy)	£550	CRUK / Incisive - averaged from different stages and rounded; includes CT scan
Unit cost of screening	£2	Ranges provided in 2015 FIT review summary from the Bowel Cancer Screening Programme

Type	Intervention Name	Percentage point change in the screening uptake rate (i.e. the number of people returning FOBT tests) with the intervention compared to without the intervention	Unit	Number of units	Unit Cost (£)	Total cost (£)	Source for further information
Screening	GP letter endo	5.6%	Letters	14398.9274	£3	43,197	Hewitson, P., Ward, A., Heneghan, C., Halloran, S
Screening	Enhanced leaf	5.9%	Leaflets	14398.9274	£4	57,596	Hewitson, P., Ward, A., Heneghan, C., Halloran, S
Screening	GP letter and e	11.8%	Letters and e	14398.9274	£1	14,399	Hewitson, P., Ward, A., Heneghan, C., Halloran, S
Screening	Kit enhance	6.1%	Kits	14398.9274	£8	115,191	White, B., Power, E., Ciurej, M. et al. Piloting the In
Screening	Face to face h	4.7%	Leaflets	14398.9274	£10	143,989	Shankleman, J., Massat, N., Khagram, L., Ariyana

**2. YoY % change in incidence**

Stage 1	Stage 2	Stage 3	Stage 4
2%	2%	2%	2%

**3. Average time spent in stage [Tappenden et al. (2004). Colorectal cancer screening options]**

Stage 1	Stage 2	Stage 3	Stage 4
2.0	1.0	0.5	0.3

**4a. Recurrence rate for Colon (CRUK / Incisive health 2014)**

Stage 1	Stage 2	Stage 3	Stage 4
10%	20%	34%	0%

**4b. Recurrence rate for Rectal (CRUK / Incisive health 2014)**

Stage 1	Stage 2	Stage 3	Stage 4
3%	16%	28%	0%

**5. Distribution of costs over time (totals 100). Three sources to estimate how costs are spread out over time, as no one source is fully suitable for use in this model. The sources are M. Laidi**

Stage 1	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Emergency	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%
Elective	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%
Screening	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%

Stage 2	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Emergency	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%
Elective	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%
Screening	90%	2%	2%	2%	1%	3%	0%	0%	0%	0%

Stage 3	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Emergency	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%
Elective	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%
Screening	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%

Stage 4	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Emergency	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%
Elective	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%
Screening	89%	3%	2%	2%	0%	4%	0%	0%	0%	0%

Inflation rate	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

The **Optional variables worksheet** contains all other input variables and their default values. Users can change the values of these input variables as required in order to change the output of the tool. There are five key sets of input variables which a user can change:

**Impact of intervention.** These variables are used on B2 to help calculate the impact of the intervention being evaluated. Included here is a table from the literature which compares the percentage point change in the screening uptake rate when there is an intervention and when there is not (for five interventions).

**CRC change in incidence.** In this section, the user can change the annual growth rate for CRC patients. A default value of 2% year-on-year growth has been used.

**Average time spent in stage.** This section contains values for the average number of years which a patient spends in a stage before moving to the next stage. Default values based on existing research have been populated in the tool.

**Recurrence rate for colon and rectal cancers:** this is the estimated proportion of patients diagnosed at this stage who will suffer a recurrence of cancer. Recurrence is assumed to occur at stage 4 of cancer.

**Patient cost/activity profile.** This section contains a distribution of activity and costs for CRC patients by stage at and route to diagnosis. These distributions are then used to convert the lifetime cost of treating a CRC patient into the annual cost. Default values of these distributions have been calculated by triangulating values from three existing research papers. The inflation rate table allows the user to forecast the change in costs over the life of the analysis (set to zero as default).

## C1-C4: tool workings

These worksheets allow the user to investigate the workings of the tool. They are meant for users familiar with Excel and will not be described in detail in this user guide. Briefly, the worksheets are:

- **(C1) Impact of intervention** calculates how an intervention leads to a change in CRC diagnoses over time
- **(C2) Lifetime cost adjustment** calculates the total cost of a CRC diagnosis, split by stage and route
- **(C3) Overall cost** shows the annual cost calculations that feed into the output charts on B3
- **(C4) Life years** shows how the assumptions for costs per life year are calculated