

# Cost Benefit Analysis Template

This template is a way of organising whatever information you have in a consistent and systematic way. It should be relevant for all initiatives. The level of detail required depends on the size of the initiative and the information available. Impacts should be quantified where possible, but the template can also be used to analyse descriptive, unquantified impacts.

The CBAX tool and database can help you estimate a dollar value for quantified impacts. The CBAX tool and supporting information is available on <http://www.treasury.govt.nz/publications/guidance/planning/costbenefitanalysis/cbax>. Contact [CBAX@treasury.govt.nz](mailto:CBAX@treasury.govt.nz) for support.

The Treasury's [Cost Benefit Analysis Guidance](#) has more information on how to do cost benefit analysis (CBA).

Public sector agencies should use this CBA Template to meet the CBA requirements as set out in the Budget guidance. Please refer to the Budget guidance and contact your Treasury Vote Analyst if you have questions about the template or how much detail to include. This template has been updated to be consistent with the CBAX Tool User Guidance, especially the illustrative example. The information required is unchanged.

## Section A Descriptive Information

Vote Health  
 Responsible Minister Hon Dr Jonathan Coleman  
 Initiative title National Bowel Screening Programme

Funding Sought (\$m)	2016/17	2017/18	2018/19	2019/20	2020/21 and outyears	Total
Operating						
Capital						

9(2)(f)(iv)

### Problem Definition

Please describe the problem or opportunity that this proposal seeks to address and the counterfactual (what would happen if the proposal doesn't go ahead). Be specific about who the problem affects and how it affects them.

New Zealand has one of the highest rates of bowel cancer in the developed world. When compared with other OECD countries, in 2011 (the latest year for which figures are available for this comparison), New Zealand had the fifth highest rate of bowel cancer mortality. The development of bowel cancer is preventable in many cases and is highly treatable when identified in the early stages. The high cancer mortality rates in New Zealand are, therefore, amenable to change. Bowel cancer is the third most commonly registered cancer (after prostate and breast) and is the second most common cause of cancer death (after lung cancer).

New Zealanders are more likely to be diagnosed with advanced stages of bowel cancer than people in Australia, the United States and the United Kingdom. This translates directly to death rates, which are 35% higher in New Zealand than Australia for women and 24% higher for men. There are population variations in cancer incidence, with higher rates for older people (94% occurring in those aged 50 or over), males, non-Māori/non-Pacific, and the most deprived (Quintile 5).

The proposed rollout of a national bowel screening programme over the next 2-4 years will capitalise on the outcomes of the bowel screening pilot (currently underway in the Waitemata DHB region), as well as on the concurrent investment which has been made in colonoscopy services. If the proposal does not go ahead then we lose an opportunity to reduce bowel cancer mortality rates in New Zealand.

Whilst bowel cancer is a significant cause of ill health and death, there are notable variations within the New Zealand population:



- Age: Bowel cancer incidence increases with age, with 94% of cases occurring in those aged 50 or over. The number of new cases of bowel cancer each year is projected to increase by 15% for men and 19% for women<sup>1</sup>. The age distribution of colorectal cancer is shown in Figure 1. Survival is marginally better for younger people with colorectal cancer.

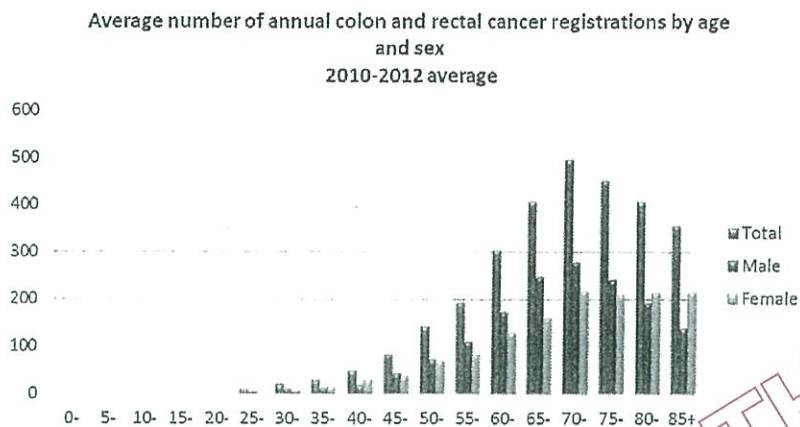


Figure 1: Colorectal Cancer Registrations by Age and Sex  
Source: Ministry of Health 2015: New Zealand Cancer Registry

- Gender: Worldwide, colorectal cancer is more common in men than in women and this is also true in New Zealand. It is the second most commonly registered cancer for men after prostate cancer and the second most common for women after breast cancer. Historically, the colorectal cancer rates in New Zealand women have been higher than for women in any of the other 32 countries within the international screening network.<sup>2</sup> Colorectal cancer is the second most common cause of cancer death for both men and women, after lung cancer.
- Ethnicity: Rates of colorectal cancer vary between population groups. Rates of colorectal cancer in the Asian population are lower than for other ethnicities with 18.3 per 100,000 population in 2012. Pacific people experienced a rate of 27.0 and Māori a rate of 33.3. Those in other population groups showed a rate of 45.3 registrations per 100,000 population. Rates of death for colorectal cancer are higher for non-Māori (compared to Māori) and for males (compared to females). Māori accounted for 5% of all colorectal cancer deaths between 2003 and 2012<sup>3</sup>.

Colorectal cancer is one of the few cancers for which Māori show lower registration and death rates than non-Māori. However, whilst colorectal cancer occurs less frequently in Māori compared to non-Māori, once diagnosed, Māori are more likely to die of colorectal cancer than non-Māori. This may be attributed to the higher rates of co-morbidity<sup>4</sup> (making treatment more challenging) found in Māori and disparities in access to cancer treatment, and highlights the need for proactive follow-up once a diagnosis has been made<sup>5</sup>. Māori are also more likely to present at a later stage at diagnosis, impacting their survival. Between 2003 and 2012, the non-Māori mortality rate for colorectal cancer showed a slight downward trend. Rates for Māori were more variable. The mortality rates by ethnic group and sex and shown in Figure 2.

<sup>1</sup> Ministry of Health Interim Evaluation Report of the Bowel Screening Pilot: Screening Round One 24 February 2015

<sup>2</sup> Surveillance of people at increased risk of colorectal cancer, <http://www.bpac.org.nz/BPJ/2012/may/colorectal.aspx>, referencing National Cancer Institute. International Cancer Screening Network, <https://appliedresearch.cancer.gov/icsn./olorectoal/moortality.html> (accesses May 2012)

<sup>3</sup> Ministry of Health 2015: New Zealand Cancer Registry

<sup>4</sup> Cancer, Comorbidity and Care: Key findings from the C3 (Quantitative) Study, <http://www.otago.ac.nz/wellington/otago067851.pdf>

<sup>5</sup> Surveillance of people at increased risk of colorectal cancer, <http://www.bpac.org.nz/BPJ/2012/may/colorectal.aspx>,



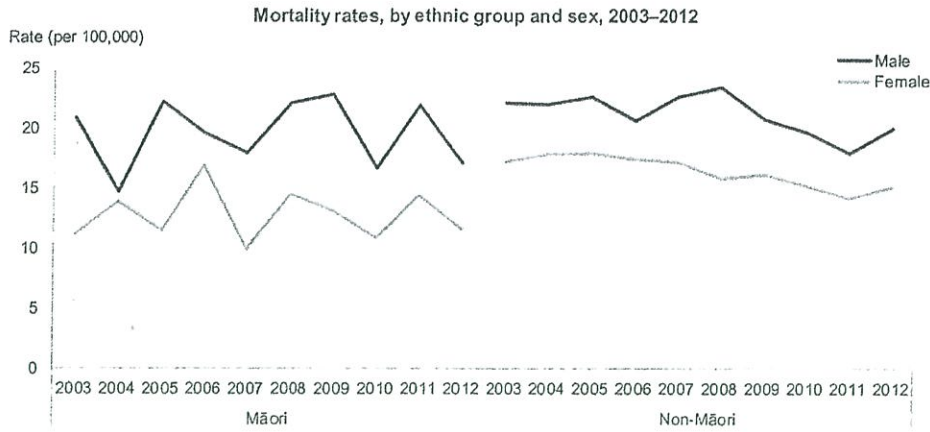


Figure 2: Mortality rates by ethnic group and sex, 2003-2012

Source: Ministry of Health 2015

Note: Rates are expressed per 100,000 population and age-standardised to the WHO World Standard Population.

- Deprivation:** Survival rates for people diagnosed with colorectal cancer vary significantly by deprivation quintile. Between 1998-99 and 2010-11, the 5-year relative survival rate increased from 60.5% to 69.2% for Quintile 1-2 (the least deprived). Over the same period for Quintile 5 (the most deprived), the rate remained relatively constant with a small increase from 55.4% to 55.9%. Survival by deprivation quintile is shown in Figure 3.

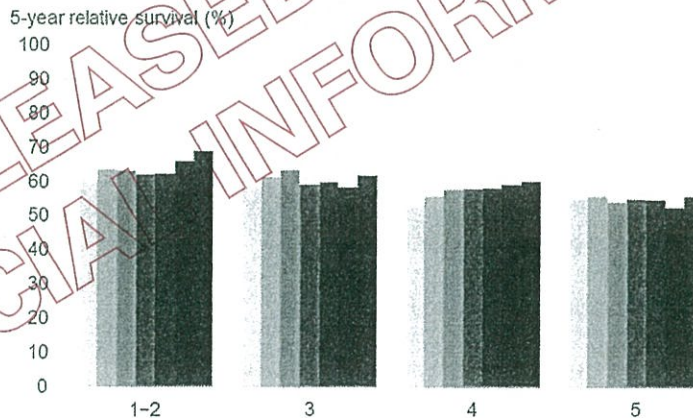


Figure 3: Bowel cancer 5-year relative survival, by deprivation quintile, 1998-2011

Source: Ministry of Health 2015: New Zealand Cancer Registry, New Zealand Mortality Collection

### Benefits of Bowel Screening

The single most important benefit from a national bowel screening programme is the reduction in mortality and increase in quality, and length, of life for individual people. Other benefits are listed in Table 1.

Table 1: Anticipated Benefits of a National Bowel Screening Programme

Main Benefits	Beneficiary	Description and Possible Measures
Improved health outcomes	Individual Society	Screening should result in a reduction in bowel cancer incidence and mortality, and an improvement in quality and length of life. Improved health outcomes may be measured through: <ul style="list-style-type: none"> <li>• Reduction in bowel cancer mortality</li> <li>• Progress towards the OECD average bowel cancer rates</li> <li>• Increase in people diagnosed with bowel cancer who need no</li> </ul>



		further treatment following colonoscopy <ul style="list-style-type: none"> <li>• Increase in percentage of cancers diagnosed at the earlier stages</li> </ul>
Cost effective health care	DHBs State	Screening should be cost-effective. All international studies show that bowel screening is cost-effective. Cost effectiveness could be measured through: <ul style="list-style-type: none"> <li>• Cost effectiveness (cost of screening for quality life years gained)</li> <li>• Cost savings (cost of screening vs cost of treatment)</li> </ul>
Improved service delivery	Individual DHBs	The implementation of a national bowel screening programme will impact on wider service delivery, and should result in improved services including and beyond bowel screening. This could be measured through: <ul style="list-style-type: none"> <li>• Increase in the number of patients discussed at multi-disciplinary meetings (MDM)</li> <li>• Reduction in patients with bowel cancer with first presentation at Emergency Department</li> <li>• Implementation of quality standards for screening will encourage the implementation of quality standards for symptomatic services</li> <li>• Increase in number of endoscopy units using an electronic endoscopy reporting system that allows clinicians to monitor quality of the endoscopic procedure</li> </ul>

One of the key outcomes of screening is stage shift, where cancer is diagnosed at an earlier stage. Where pre-clinical disease or very early stage cancer are detected, these may be treated immediately with no further treatment required. This improves quality and length of life, as treatment for later-stage cancer (e.g. radiotherapy, chemotherapy) can be intrusive and unpleasant, and the chance of survival reduces rapidly with more advanced stage cancers. Screening may also identify other, non-cancer conditions which may be treated, resulting in an improved quality of life. In the Bowel Screening Pilot, 39% of patients were diagnosed at Stage 1 (localised cancer) compared with 13% in the PIPER study (of the non-screened population)<sup>6</sup>. Diagnosis at Stage 2 and 3 was broadly similar for screened and non-screened populations, but diagnosis at Stage 4 (where cancer has spread to other organs) was significantly lower in the Pilot, with only 8% diagnosed at that stage compared with 24% of the unscreened population. The comparisons are shown in Table 2.

Table 2: Stage of Diagnosis - Bowel Screening Pilot and PIPER study

Bowel cancer ONLY                      Rectal cancers (N=47) have been removed

50-74

Stage of diagnosis	New Zealand: Bowel Screening Pilot (20012-2015) aged 50-74		New Zealand: PIPER study (2007-2008) aged 50-79	
	Stage distribution - No.	Stage distribution - %	Stage distribution - No.	Stage distribution - %
i	78	39%	367	13%
ii	49	24%	774	27%
iii	42	21%	723	25%
iv	16	8%	699	24%
Unknown (or non metastatic for PIPER)	17	8%	293	10%
<b>Total</b>	<b>202</b>	<b>100%</b>	<b>2856</b>	<b>100%</b>

<sup>6</sup> The PIPER Project Final report 7 August 2015, Health Research Council reference: 11/764

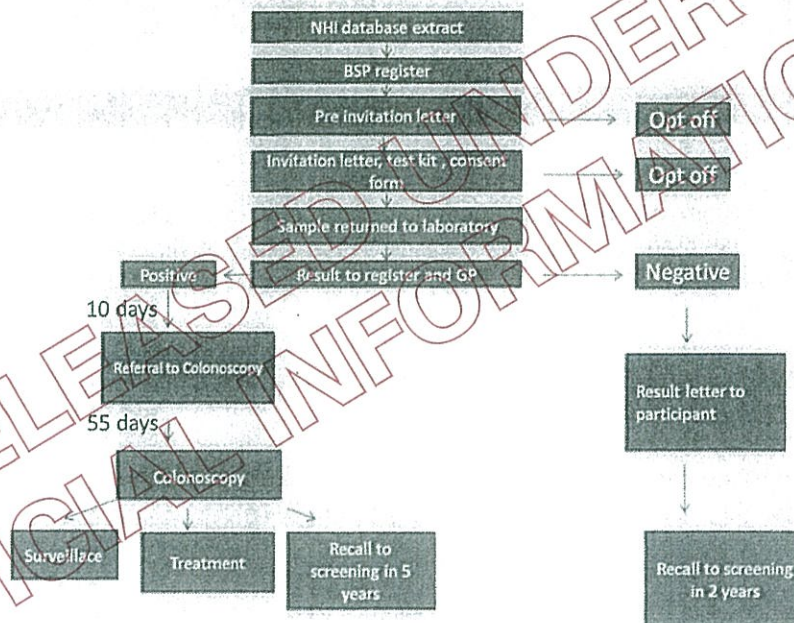


## Initiative Description

Introduce a bowel screening programme to people age 60-74, including the cost of ongoing surveillance colonoscopies, to reduce mortality from bowel cancer.

The bowel screening programme will mail a screening test, a faecal occult blood test (FOBT) to eligible people aged 60-74. The FOBT detects trace amounts of blood which may indicate the presence of bowel cancer. Those participants who have a positive FOBT result will be offered a colonoscopy. The colonoscopy can detect polyps and cancers if they are present. Those with bowel cancer will be referred on for treatment. Those who have a negative FOBT result will be returned to the screening programme and re-invited in two years' time while they remain eligible.

The screening pathway is based on international best practice and mirrors the bowel screening pilot pathway. The attached diagram outlines the bowel screening pathway.



The programme will have an eligible population of around 700,000 men and women aged 60-74 who will be invited over a two year period (a screening round). The first year at full capacity will see around:

- 350,000 people invited
- 210,000 people return an FOBT kit through the mail
- 9300 people have a colonoscopy
- 700 have a cancer detected.

A central laboratory/coordination centre will be established to manage the distribution of invitations as well as processing of FOBT kits and results notification. This will be supported by a centralised IT system. The IT system will be linked to DHB patient management systems to enable endoscopy and treatment information to be collected. Ideally there will also be linkages to the New Zealand Cancer Registry and to primary care providers to enable positive test management.

Four regional centres will be established to oversee participants who require a colonoscopy. Regional centres will be responsible for monitoring the quality of colonoscopies undertaken in the region, awareness raising, active follow up of non-responders and ensuring the quality standards for the programme are met consistently across



the region.

DHBs will undertake colonoscopies for their populations and will report through to a regional centre.

In addition to screening people age 60-74, ongoing surveillance costs incurred by the DHBs is included. One of the consequences of bowel screening is that some people will be identified as being at increased risk of bowel cancer. These individuals would require ongoing colonoscopies. The additional surveillance colonoscopies generated by a national bowel screening programme would be funded ensuring people at increased risk of bowel cancer receive appropriate care.

Those participants with cancer will be treated at their DHBs under usual care and are not included in this funding bid. Those people diagnosed with bowel cancer through the screening programme would have been diagnosed and treated by their DHB at some stage in the future. The screening programme just identifies them earlier (and likely at a more treatable stage) hence these costs are just bought forward.

The programme will be established following national (and international) best practice guidelines. Quality indicators will be monitored and published regularly at a national level by the Ministry of Health.

#### Alternative Options Considered

##### Option 1 – Do nothing

The pilot would discontinue and people would only have access to colonoscopy if they had symptoms or are at increased risk of bowel cancer. This option was discarded because New Zealand has one of the highest rates of bowel cancer in the developed world and the benefits of a national bowel screening programme would not be realised.

**Option 2 – Basic:** Screening to people aged 60-74, no primary care involvement in results management and no funding for surveillance colonoscopies.

Introduce a screening programme to people age 60-74 but only fund the basic screening pathway. This option was seen as being achievable given the current workforce capacity and the screening programme would generate an additional 9300 colonoscopies in the first full year.

This option was discounted as it did not include primary care involvement and did not include ongoing surveillance colonoscopies. Surveillance colonoscopies are currently undertaken and funded by DHBs many of whom struggle to keep up with referrals. Therefore it is unlikely that DHBs could undertake the additional surveillance colonoscopies if they were not funded. The recent gains made with additional funding to DHBs to reduce wait times for colonoscopies would be lost. Because the referral to surveillance was as a result of screening, there is a duty of care to that patient to have the complete screening process funded. This option did not involve primary care in positive results management, which has been shown to be beneficial to promoting equity and engagement in bowel screening. By not involving primary care a bowel screening programme would be less aligned with the principles of the New Zealand Health Strategy.

**Option 3 – Integrated:** Screening to people aged 60-74, primary care involved in results management, but no funding for surveillance colonoscopies.

Introduce a screening programme to people age 60-74 and enable positive iFOBT results to be managed by the patient's primary care provider, which is more in line with the principles of the New Zealand Health Strategy. The programme would be funded for a more integrated screening pathway but not for ongoing surveillance colonoscopies.

This option was discounted as it did not include ongoing surveillance colonoscopies. As mentioned in Option 2, surveillance colonoscopies are currently undertaken and funded by DHBs many of whom struggle to keep up with



referrals. Therefore it is unlikely that DHBs could undertake the additional surveillance colonoscopies if they were not funded. The recent gains made with additional funding to DHBs to reduce wait times for colonoscopies would be lost. Because the referral to surveillance was as a result of screening, there is a duty of care to that patient to have the complete screening process funded.

#### The preferred option

**Option 4 – Complete:** Screening to people aged 60-74, primary care involved in results management, and funding for surveillance colonoscopies.

This option was chosen as it is achievable in terms of capacity and is supported by the sector. It is more in line with the principles of the New Zealand Health Strategy, and more likely to ensure DHBs are able to safely manage surveillance colonoscopy demand as a result of screening. Analysis of the pilot data shows that an age range of 60-74 years, with an increased positivity threshold (ie the level at which blood is detected in the sample) compared with the pilot (which is similar to levels used in other OECD countries):

- will detect the most cancers possible within an achievable number of colonoscopies.
- will minimise the risk of adverse events from colonoscopy when compared to the number of cancers detected
- is the most cost effective age range.

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Impact Analysis

Headline Benefits

Stage shift, reduced treatment costs and increased survival

Bowel cancer screening will produce a pronounced shift in the proportion of patients being diagnosed with cancers at an earlier stage (ie the cancer is less advanced). In the unscreened population only 13% of all cancers are found at Stage 1, in the screened population 39% of cancers are found at Stage 1. This has massive implications for treatment costs and survival outcomes.

*NB - Stage shift will only be noted in people who have had their cancers found via screening – approximately 700 cancers per year for Round 1, and approximately 260 cancers per year for Round 2 and beyond. Please note that this assumes that all DHBs come online together, in 2017. The reality is that all DHBs will come online over a three year period.*

Cancers identified at the earlier stages are much more likely to survive. Of those people diagnosed with localised bowel cancer (stage I or Stage II are used here as a proxy for localised disease), 96% of people will survive to the 5 year mark, compared to stage IV cancer where only 11% survive this length of time. There are currently no accurate costs for lifetime treatment of bowel cancer for each stage in NZ (these are expected to be available in January 2016). In the meantime we have access to comparable values from Ireland, which have been used in this analysis.

See Figure 4 on the page 10 for a diagram of the benefits of screening on cancer registration rates and how this relates to treatment cost benefit and stage shift benefit.

Reduction in the mortality rate from bowel cancer

International publications estimate a reduction in the mortality rate of between 16% and 22% (for the cohort screened) 8-10 years following the implementation of a screening programme. Values vary depending on country, test type, the age of the screening cohort and the positivity threshold. We can confidently say that a national bowel screening programme would save many lives each year and applying rough estimates, the number of avoidable deaths could be between 70 and 100 per annum.

Quality adjusted life years (QALYs) saved

There are no NZ values currently available. Possible information relating to QALYs gained from a NBSP may be available in January 2016. However, a recent study from Ireland estimated that there would be 0.0237 QALYs saved per person screened, over and above the option of 'not screening'. The price of a QALY is currently estimated as \$40,082.

Other benefits

Reduction in the incidence of bowel cancer

Locating and removing pre-cancerous lesions (eg advanced adenomas or serrated polyps) may prevent a diagnosis of bowel cancer in the future. A recent Italian study showed that screening with iFOBT for people aged 50-69 reduced bowel cancer incidence by 10% in the 8-10 years following the implementation of the programme. It may be that NZ will also show a similar reduction in incidence, but this is an unknown.

Less Emergency Department (ED) admissions required

Earlier diagnosis of bowel cancer can only reduce the number of ED admissions. NZ has a much higher rate of bowel cancer diagnosed via ED than other countries with screening. No NZ ED data for bowel cancer is available, but the recent PIPER study showed that 34% of colon cancers and 14% of rectal cancers were first identified via an ED attendance. We could assume a 20% reduction in ED visits for the 700 cancers diagnosed, a reduction in 140 ED visits per year.

Decrease in hospice/palliative care requirements

A higher rate of survival from bowel cancer will result in a lower requirement for hospice services.

Increase in workforce

Those aged 60 to retirement age are more likely to be retained in the workforce if diagnosed with bowel cancer early. These people will have additional benefits for society as carers (eg grandparents caring for children whilst parents work). There will



also be fewer carers required for those who were diagnosed earlier than they would have been without screening.

#### **Identification of known genetic cancers in more families**

Additional detection of familial cancer genes, and the subsequent reduction in cancer incidence and mortality rates could have a significant impact on hospital resources. The current Familial Gastrointestinal Service has provided an estimated cost benefit of \$11M annually in saved hospital costs. This would only increase if more families were identified as colorectal cancer gene carriers and they received prophylactic treatment for bowel cancer.

#### **Raising awareness, the halo effect, and OECD 'standing'**

National advertising campaigns will encourage awareness of colorectal cancer symptoms which may encourage earlier detection in the unscreened population. Symptomatic, surveillance, pathology and cancer services may improve in quality and timeliness due to the imposed rigor of the new screening programme. NZ is often quoted as having some of the highest rates of bowel cancer in the OECD, yet does not have a screening programme. New Zealand needs to make progress towards achieving average OECD bowel cancer rates.

#### **Improvements in data collection, data sharing and IT systems**

Improvements required for a properly functioning NBSP IT system may also benefit other DHB service areas, data collection and data sharing. This will ultimately result in better information being collected by the Ministry (for use in benchmarking, and evaluating service delivery and outcomes).

### **Costs**

#### **Colonoscopy and pathology related capacity**

Bowel cancer screening will require additional colonoscopist capacity, additional theatre capacity, nurses, pathologists and technicians. This includes the need for additional surveillance colonoscopies.

#### **Adverse events following colonoscopy**

75 minor or intermediate events arose from people who received the 7000+ colonoscopies performed in the Bowel screening pilot to date. An additional 11 events were deemed serious; one of these required an admission to ICU.

#### **Additional retirees**

More people survive longer in the pensionable age-band, increasing pressure on government funding. However, this is offset by some retirees performing child minding activities making it easier for their parents to work benefitting society and the Crown.

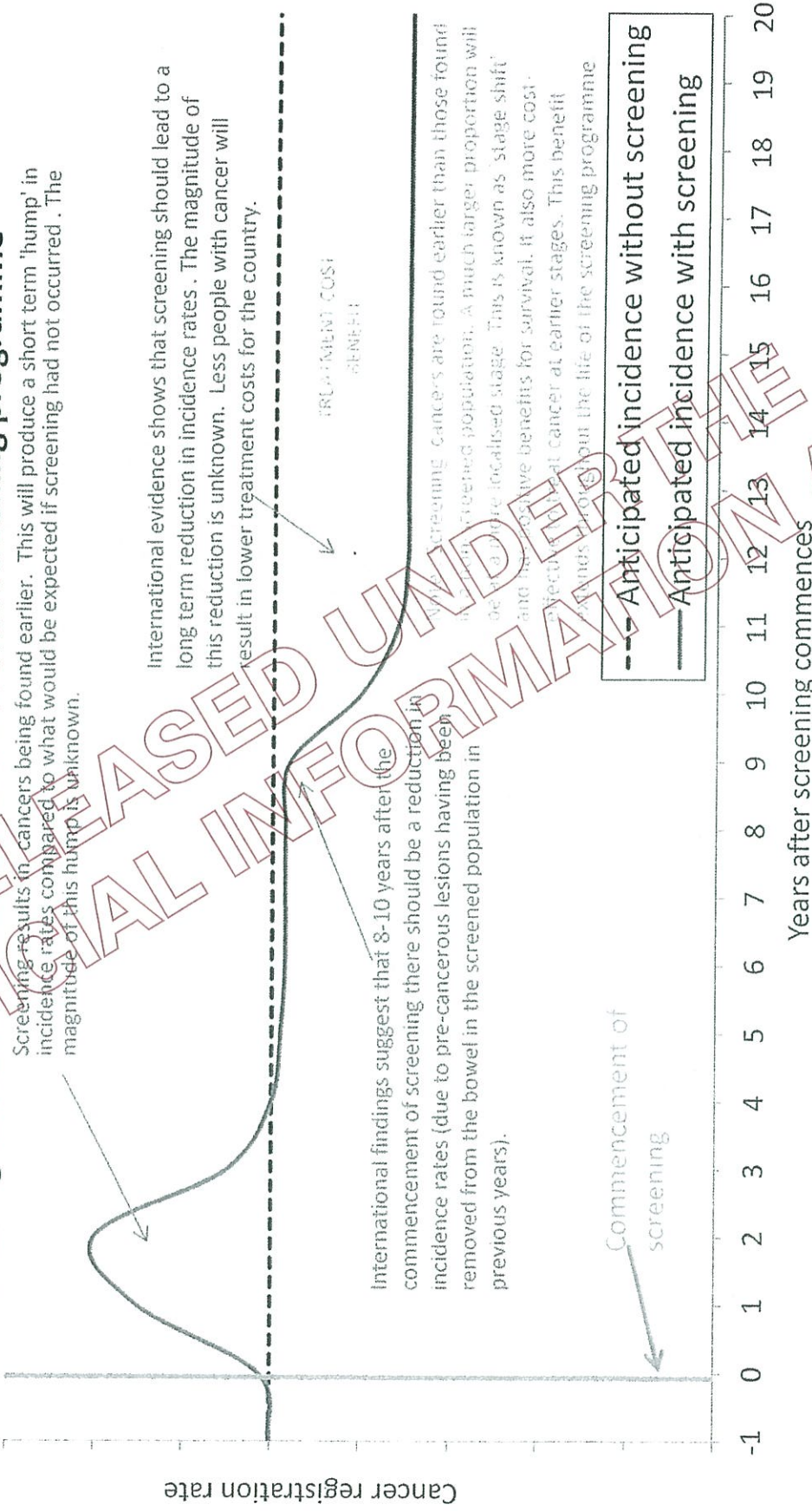
#### **Mental health considerations**

People waiting for a colonoscopy following a positive test may become anxious if wait times are too long.



Figure 4: Benefits of screening on cancer registration rates

### Possible changes in colorectal cancer registration rates following the commencement of a national screening programme





## Impact Summary Table

Impacts - Identify and list \$m present value, for monetised impacts	Option/scenario		Assumptions and evidence (quantify if possible, and use ranges where appropriate)	Certainty <sup>7</sup>
	1	2		
<b>Estimated impact on key outcomes</b>				
Round 1 Stage Shift cost	Calculate using information from Ireland and apply 85% probability	Calculate using information from Ireland and apply 70% probability	Round 1 stage shift cost using Ireland data and at 100% probability has been calculated as \$6 million. Assumed 85% probability and time lag of 1 year to recognise that not all DHBs will have gone live at same time.	Medium
Round 2 Stage Shift cost	Calculate using information from Ireland and apply 85% probability	Calculate using information from Ireland and apply 70% probability	Round 2 stage shift cost using Ireland data and at 100% probability has been calculated as \$2 million. Assumed 85% probability to 1 year to recognise that not all DHBs will have gone live at same time.	Medium
Treatment Costs	1,122 current treatment avoided per annum and apply 85% probability	90% of option 1 figure and apply 70% probability	Screening will shift the <i>timing</i> of the detection of cancer. This is independent to the stage shift benefit described above. By the end of year 4, it is assumed that screening would have shifted current projected treatment numbers for the next 5 years. Allowance has been made that some treatments will still be required as per current, and a 85% probability applied.  Bowel cancer screening produces a pronounced shift in the proportion of patients being diagnosed with cancers at an earlier stage. During round 1, we could estimate an increase of 12% in the number of bowel cancers identified (due to screening finding cancers earlier than in the symptomatic population). Finding cancers earlier would then result in fewer cancers being found in later years. Treatment costs for bowel cancers that have been <i>avoided</i> through this screening programme will no longer be incurred in future years providing a financial benefit (see figure 4).	Medium
QALY	Rate of 0.0237 per person screened	Nil	This benefit has been costed at \$562 million (NPV 10 years) with 100% probability.	High
Avoidable Mortality	Nil	Nil	This benefit has not been included in NPV analysis.	High
<b>Cost of the Initiative (\$'M)</b>				
Fiscal operating and capital costs of the initiative <sup>8</sup>				Medium
<b>Government Benefits/(Costs) at 8% discount rate</b>				
Round 1 Stage Shift Cost	5	4		Medium
Round 2 Stage Shift Cost	1	1		Medium
Treatment Costs Avoided	212	157		Medium

<sup>7</sup> Rate your level of confidence in the assumptions and evidence as high (green) if based on significant research and evaluations that is applicable, medium (amber) if based on reasonable evidence and data, or low (red) if there is little relevant evidence. Colour the rating box for each impact.

<sup>8</sup> This present value of the initiative costs, including both operating and where relevant capital spending, should be included for all initiatives. Other fiscal flow-on costs and benefits that are not included in the initiative costs are to be set out in a separate row.

9/2/14 11:00



Emergency Room	0	0		Medium
Superannuation	(13)	0		
Additional Treatment Costs in Yr 1 & 2	(15)	(11)		
Total Quantified Government Impact	193	151	Mainly due to shifting the stage when cancer detected and the less expensive cost of screening versus cost of treatment	Medium
<b>Wider Societal Benefits/(Costs)</b>				
QALY	562	-		High
Avoidable Mortality	-	-	Has not been included for analysis	High
Total Quantified Wider Societal Impact	562	-		High
Net Present Value of Total Quantified Societal Impacts				Medium

0/2/14/11/16

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**Section C Conclusions**

**Conclusions**

Based on data collected from many international screening programmes and pilots, bowel cancer screening has, in every case, been found to be cost effective. This is particularly true when using immunochemical faecal occult blood tests (iFOBTs).

The Bowel Screening Pilot run in Waitemata has consistently shown results that are comparable with other similar screening programmes. There is no evidence to suggest that a national bowel screening programme would not be cost effective in a New Zealand setting.

Although New Zealand cost-effectiveness data will not be available until early in 2016, it is possible to estimate benefits from a national screening programme using comparable data from overseas. An Irish study (although using a slightly different age range than planned in New Zealand) reported that over the lifetime of the cohort screened, compared with no screening, iFOBT-based screening would offer a 15% fall in colorectal cancer incidence and a 36% fall in mortality. This screening scenario would have the potential to change the stage distribution of cancers in the population, such that a greater proportion would be diagnosed at an early stage.

The stage distribution shown in the Irish study is very similar to what is being seen in the Bowel Screening Pilot in Waitemata. The Irish study predicted that there would be an incremental QALY gain per person screened (over the lifetime of the cohort) of 0.0237 and this value has been used in this Cost Benefit Analysis.

In addition to a large number of QALYs gained, there are also monetary benefits relating to the identification of colorectal cancer at an earlier stage when compared with no screening. This results in an overall reduction in treatment costs.

There are also innumerable societal benefits associated with saving lives, diagnosing and treating people at an earlier stage of cancer and the implications for survival. Conservative estimates suggest that between 60 and 100 lives could be saved per year. These figures are based on a study from the Netherlands that showed a reduction in the mortality rate of between 16 and 22%, 8-10 years following the implementation of a screening programme.

**Summary of monetised results [only fill this out if you have monetised costs and benefits]**

Option 1 / Option 2	Discount Rate	
	8% real (default)	4% real (sensitivity)
Net Present Value 10 Years (NPV) <sup>9</sup>		
Benefit Cost Ratio (BCR) <sup>10</sup>		

*19/12/15*

<sup>9</sup> **Net Present Value (NPV)** - The NPV is the sum of the discounted benefits, less the sum of the discounted costs (relative to the counterfactual). This gives a dollar value representing the marginal impact on the collective living standards of all New Zealanders of the initiative, in today's dollar terms.

<sup>10</sup> **Benefit Cost Ratio (BCR)** - The BCR is the ratio of total discounted benefits to the total discounted costs. A proposal with a BCR greater than 1.0 has a positive impact, because the benefits exceed the costs. The BCR is the same as the Return on Investment Societal Total, unless there are negative impacts in addition to the fiscal cost of the initiative. All negative impacts are included in the denominator for the BCR measure. For example, the BCR measure would reduce if the private cost to people of attending was monetised for the illustrative example and therefore included in the denominator for the BCR calculation.



Return on Investment (ROI) – Societal Total <sup>11</sup>

Return on Investment (ROI) – Government <sup>12</sup>



9(2)(f)(iv)

### Supporting Evidence

Comparable data from Ireland showing cost effectiveness values, QALYs gained and potential reductions in incidence and mortality rates:

<http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3305953/>

Colorectal cancer screening: a global overview of existing programmes:

Schreuders EH, Ruco A, Rabeneck L, et al. Gut 2015; 64:1637-1649.

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<sup>11</sup> **Return on Investment (ROI) - Societal Total** - Calculate the ROI by dividing the discounted net change in wider societal impact, including benefits to government, by the discounted cost of the initiative. This can be interpreted as the impact on New Zealanders per dollar the government spends on the initiative, as an example for every \$1 the government spends on this programme, New Zealanders receive benefits of \$3.

<sup>12</sup> **Return on Investment (ROI) – Government** – Calculate the ROI by dividing the discounted net change in impact for the government by the discounted cost of the initiative. This measures the discounted net marginal (fiscal) benefits to the government.