EEPRU

Economic Evaluation of Health and Social Care Interventions Policy Research Unit

Research Report

Title: Early awareness interventions for cancer: Colorectal Cancer

Authors: Sophie Whyte, Sue Harnan, Alison Scope, Emma Simpson, Paul Tappenden, Stephen Duffy, Bernard Rachet, Mark Sculpher, Seb Hinde, Claire McKenna & Ruth Wong

Correspondence to: Sophie Whyte, HEDS, ScHARR, University of Sheffield, Regent Court, 30 Regent Street, Sheffield, S1 4DA. Email: sophie.whyte@sheffield.ac.uk

Number: 004

Date: November 2012

The University Of Sheffield.

THE UNIVERSITY of York

The Policy Research Unit in Economic Evaluation of Health and Care Interventions is funded by the Department of Health Policy Research Programme. It is a collaboration between researchers from the University of Sheffield and the University of York.

The Department of Health's Policy Research Unit in Economic Evaluation of Health and Care Interventions is a 5-year programme of work that started in January 2011. The unit is led by Professor John Brazier (Director, University of Sheffield) and Professor Mark Sculpher (Deputy Director, University of York) with the aim of assisting policy makers in the Department of Health to improve the allocation of resources in health and social care.

This is an independent report commissioned and funded by the Policy Research Programme in the Department of Health. The views expressed are not necessarily those of the Department.

School of Health And Related Research

We acknowledge the input of our advisors Sue Moss and Willie Hamilton who provided useful feedback on the content of the report. We acknowledge Emma Everson-Hock for commenting on the systematic review section.

We acknowledge the following people for assisting by providing data in relation to the pilot signs and symptoms campaign: Andy Pring (SWPHO), Jem Rashbass (ERIC), Claire Nickerson (NHS Cancer Screening), Kathy Elliott, Jennifer Benjamin, Karen Eldridge and Hannah Davies.

Contents

Figures

Tables

Abbreviations

NAEDI	The National Awareness and Early Diagnosis Initiative
CRC	Colorectal Cancer
QALY	Quality-adjusted Life Year
BME	Black or Minority Ethnic
RCT	Randomised Controlled Trial
BCSP	Bowel Cancer Screening Programme
gFOBT	Guaiac faecal occult blood test
ICER	Incremental cost effectiveness ratio

Executive Summary

Background

The National Awareness and Early Diagnosis Initiative (NAEDI) has been established in England as part of the Government's strategy to improve cancer outcomes. The NAEDI consists of four work streams:

(1) Raising public awareness and promoting earlier presentation by patients
(2) Optimising clinical practice and systems
(3) Improving GP access to diagnostics
(4) Research, evaluation and monitoring.

This project focuses on raising public awareness and promoting earlier presentation by patients with colorectal cancer (CRC).

Aims

To identify the effectiveness and design of public awareness programmes which aim to encourage early detection of CRC, and to estimate the cost-effectiveness of such programmes.

Systematic Review

A systematic review was conducted to identify studies which assessed the efficacy of public awareness programmes about CRC delivered to whole populations or discrete subpopulations, with follow-up greater than one day and which did not involve one-to-one attention. A basic logic model was constructed, and stages within that model were extracted as study outcomes. Outcomes included: changes in campaign awareness, knowledge, attitudes, beliefs and intentions, screening uptake, GP visits, GP referrals, diagnoses and survival. Key electronic databases and grey literature sources were searched. Studies were selected, data extracted and quality assessed by one reviewer, and a narrative synthesis conducted. To describe the scope and variety of interventions in the literature, a mapping review of studies which narrowly missed inclusion but which described interventions which may be of interest to the review question was also conducted.

Eleven studies were included in the review. Four described interventions which aimed to increase self-presentation through awareness of symptoms, and seven described interventions which aimed to increase compliance with screening guidelines. The risk of bias within the studies was moderate to high and all results should be interpreted with caution. All studies reported mostly positive results that generally supported the early stages of the basic logic model such as awareness and knowledge. However, there was very little evidence to inform the final stages of the logic model, where increased self-presentation or screening attendance is expected to be associated with early detection. Only one study reported information relating to diagnoses of CRC, and in this case there was an increase in diagnoses via the urgent referral route, but there was only a non-significant increase in diagnoses with no spread (outcome as defined in the study; nodal or distal metastases). It is possible that use of a dichotomous outcome (spread or no spread) is not sensitive enough to capture a shift in stage at presentation. The review did not identify any evidence relating to changes in survival resulting from the use of public awareness programmes.

Interventions designed to reach black and minority ethnic or disadvantaged subpopulations were also generally successful in achieving an improvement in outcomes at some stage in the logic model. Studies which incorporated community involvement in the design of the intervention reported highly individualised methods of communicating similar messages. The methods were often creative and

engaging, including plays, games and comedy, and were often delivered in unusual settings such as pubs, barbers' and bingo halls.

The mapping review of excluded studies described whether interventions were delivered to populations, groups or had an individual component, whether interventions were designed to be culturally relevant or had a bilingual aspect, what types of media were employed, what topics were covered, whether practical help was provided and whether screening (usually faecal occult blood test) was provided with the intervention. Most studies reported positive results.

Cost-effectiveness analysis

Several studies with the potential to contain data to inform the cost-effectiveness modelling were identified by the systematic review. However, the only study which collected data on changes in CRC incidence due to the campaign (essential for the modelling) was the pilot 'signs and symptoms' campaign run in the South West and East of England in January 2011.

Data from the 'signs and symptoms' campaign pilot were analysed, including: changes in GP attendances, secondary care appointments, CRC incidence, screening uptake and campaign running costs. Available data illustrated an increase in the number of GP attendances, secondary care appointments, colonoscopy activity and CRC incidence as a result of the campaign. The increase in GP attendances observed was associated with considerable uncertainty dues to large variations between practices and a possible change in symptom coding. Data on CRC incidence suggested a possible increase in incidence for a period of 1 month. Data on CRC incidence by stage involved very small numbers so it was not possible to draw any significant conclusions. No significant change in screening uptake which could be attributed to the campaign was observed.

An existing CRC screening model was adapted to incorporate the costs and benefits of an awareness campaign. The analysis captures the direct costs of the campaign, the costs of any additional GP consultations/appointments in secondary care resulting from the campaign, and the expected benefits of the campaign resulting from earlier diagnosis or a change in screening uptake. The campaign effects were modelled as a temporary increase in the transition probabilities associated with symptomatic presentation with cancer.

Due to limitations of the pilot data available it was necessary to make several modelling assumptions:

- The duration of the effect of the campaign was assumed to be short-term with an increase in CRC incidence only observed for one month following the campaign.
- The campaign was assumed to have the same proportional effect on the presentation rates for CRC regardless of stage.
- The campaign was assumed to have the same proportional effect on presentation rates for all age groups.
- Of the increases in GP consultations and GP referrals, it was assumed that 50% were 'additional' (i.e. would not have presented in the absence of the campaign) as opposed to 'earlier'.

Model predictions for no awareness campaign, a one-off awareness campaign and an annual awareness campaign for five years were produced. The results reflect model predictions for effects on incidence for the lifetime of the entire current population of England aged over 30. Predicted total costs were broken down to include: campaign costs, CRC treatment costs, and costs associated with additional GP attendances and referrals. Total QALYs, changes in cancer incidence, cancer stage distribution, and cancer mortality were also estimated.

Even though the campaign was assumed to have the same proportional effect on the presentation rates for CRC regardless of stage, the additional incidence due to the campaign corresponds to

persons presenting earlier than they would have in the absence of the campaign. This earlier presentation results in a change in the stage distribution over the following few years which has a direct impact on CRC mortality. In the base-case model the campaign caused an increase in the number of cases of Dukes' stage A-C presenting symptomatically, and a decrease in the number of cases of stage D. Overall, an increase in symptomatic presentation and a small decrease in screen/surveillance detected cases is predicted. The increase in overall CRC incidence corresponds to a decrease in the number of persons dying with undiagnosed CRC. A significant reduction in CRC specific deaths was seen which was due to the reduction in the number of cases of CRC presenting in stage D. This reduction in deaths corresponded to an increase in QALYs gained.

The results show a reduction in total costs associated with screening caused by a decrease in the number of positives at screening since more CRC presents symptomatically. An increase in CRC treatment costs is seen for two reasons. Firstly, CRC is presenting at younger ages which are associated with higher treatment costs. Secondly, there is a shift of cases from stage D to Dukes' C, and Dukes' C CRC is associated with higher treatment costs than stage D. Costs associated with increased GP consultations and referrals account for only a small proportion of total costs and are considerably less than the cost of the campaign itself.

The economic analysis suggests that a one-off awareness campaign causing an increase in presentation rates of 10% for one month would be associated with a total cost of £5.5 million, would be expected to prevent 66 deaths from CRC, and, result in a gain of 404 QALYs. The incremental cost-effectiveness ratio (ICER) for the one-off awareness campaign was £13,496 per QALY gained compared to 'no campaign' giving a net monetary benefit (NMB) of £2.6 million (with a willingness-to-pay threshold of £20K). Assuming that a repeated annual campaign would have similar effects, a 5-year repeated campaign is expected to have a similar ICER of approximately £13,032 per QALY gained whilst providing a NMB of £13 million. Scenario analyses suggest that the ICER increases slightly if a higher proportion of the increase in GP consultations/referrals was additional as opposed to earlier. If the duration of the effects of the campaign on CRC incidence were assumed to last for 3 months rather than 1 month, expected QALY gains would increase considerably and the ICER would reduce to approximately £4,500 per QALY. Scenario analyses also indicated that results were highly sensitive to both the magnitude and stage distribution of the immediate increase in incidence due to the campaign. For example, if the magnitude of the increase was just 5% and restricted to Dukes C and stage D CRC then the ICER is approximately £55,000 per QALY. An exploratory analysis which compared the benefits of an awareness campaign (that increased symptomatic presentation rates by 10% for 1 month) to a screening campaign (that reduced the number of persons never attending screening by 10%) demonstrated that the screening campaign would reduce five times the number of CRC deaths compared to the awareness campaign.

Conclusions and Research Recommendations

Research on interventions to increase early detection of CRC (through patient awareness campaigns to increase self-presentation or to increase screening attendance) show generally positive results at all stages of the logic model. However, there is only a small amount of evidence towards the end of the logic model, and the available evidence throughout is not of high quality due to study design (mostly before-after studies), and a potentially high risk of bias. It was not possible to draw comparative conclusions between interventions or which components of interventions conferred the positive effects. There is a lack of evidence to inform the link between increased self-presentation and screening attendance to earlier detection of CRC, though it should be noted that all evidence relating to this came from the US.

The data available from the 'signs and symptoms' pilot campaign which was used in the cost-effectiveness modelling was associated with limitations and considerable uncertainty. A priority for future research is to co-ordinate and maximise the evaluation and dissemination of efforts that have

already been made to increase CRC awareness. For example, clear reporting of completeness of data, and comparison with non-intervention regions are important. To establish the potential effectiveness and cost-effectiveness of such a campaign, information on ‘duration of effect of campaign’, ‘effect of campaign on CRC incidence’ and ‘effect of campaign by age’ are of importance.

1. Introduction

Cancer survival rates in England are poor compared to several other European countries.[1] It has been estimated that if 5-year survival rates for colorectal cancer (CRC) in England matched those for the best countries in Europe, around 1,700 deaths per year would be avoided. Similarly across all cancer types a total of 10,000 deaths could be avoided. There is increasing recognition that a considerable proportion of these avoidable deaths relate to late diagnosis.[2]

A National Awareness and Early Diagnosis Initiative (NAEDI) has been established in England as part of the Government's strategy to improve cancer outcomes.[3] The NAEDI consists of four work streams: (1) raising public awareness and promoting earlier presentation by patients, (2) optimising clinical practice and systems, (3) improving GP access to diagnostics and (4) research, evaluation and monitoring.

This project focuses on raising public awareness and promoting earlier presentation by patients with CRC. A similar report considering lung cancer is due to follow. This report aims to address the following questions:

(1) What methods for raising public awareness and promoting earlier presentation by patients have been shown to be effective?
(2) How cost-effective are methods for raising public awareness and promoting earlier presentation by patients?

Evidence on the efficacy of a range of early presentation interventions was obtained by undertaking a systematic review. The review included both early awareness interventions and interventions which aimed to increase screening attendance. In addition, a mapping review was performed, which summarised interventions from studies which narrowly missed the inclusion criteria. Data were also available from the English bowel cancer signs and symptoms campaign which was piloted in January 2011 and this is analysed here. [4]

Data from the campaign pilot were used to inform an assessment of the cost-effectiveness of such a campaign using a mathematical model. This analysis captures the direct costs of the campaign, the costs of any additional GP consultations/appointments in secondary care resulting from the campaign, and benefits of the campaign in the form of earlier diagnosis and improved screening uptake.

2. Systematic Review

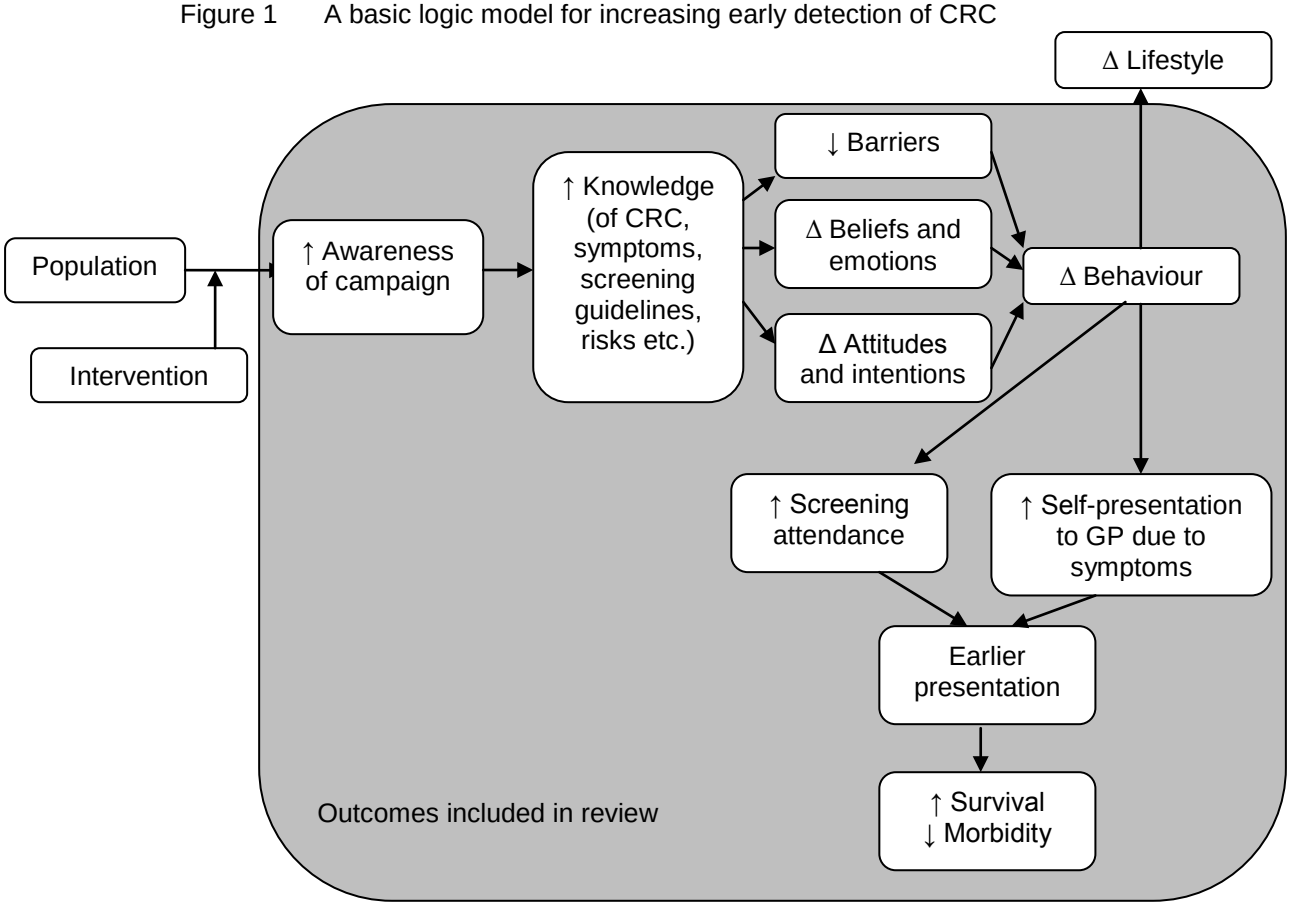
2.1. Background

Awareness raising campaigns in healthcare take many forms. Simple interventions may make use of a leaflet distributed through GP waiting rooms, through mail-outs or via community organisations. Interventions designed to reach as many people as possible may include wide-ranging media campaigns with billboards, TV adverts, newspaper articles and so on. Interventions designed to help those with particular needs such as literacy or language barriers, may take a small group or one-to-one approach to deliver the message and help remove barriers to screening or early presentation to a GP. Campaigns usually aim to increase knowledge of a condition or disease (for example: prevalence, prognosis, risk factors, symptoms) and may attempt to influence people's beliefs about the disease and the importance and benefits of attending screening or getting symptoms checked. Interventions may also help to remove practical barriers such as access to a diagnostic test, affording transport to get screening/attend clinics, or having someone to go with them to an appointment.

Early presentation of CRC can be achieved through two main routes:
1) Encouraging people to stay up to date with regular screening and
2) Raising awareness of the symptoms of CRC and encouraging people to visit their doctor if they have the symptoms.

A basic logic model to represent these routes is presented in Figure 1. This model was constructed by the review authors based on their understanding of the pathways involved.

Figure 1 A basic logic model for increasing early detection of CRC



↑, increase; ↓, decrease; Δ, change; GP, general practitioner; CRC, colorectal cancer

2.2. Aims

This report aims to provide more detailed information than has been available to date on the likely costs and benefits of early detection interventions in colorectal cancer to assist the Department of Health in policy making. In order to establish the efficacy of population-based interventions designed to improve early detection, a systematic review was undertaken. In addition, a mapping review[5] of interventions from studies which narrowly missed inclusion was conducted to describe the scope and variety of interventions reported in the literature.

Interventions to support GPs to assess, investigate and refer more appropriately or to provide GPs with better access to diagnostic tests were beyond the scope of this review.

2.3. Methods

A comprehensive search using terms for 'colorectal cancer' combined with 'health promotion' or 'awareness' was carried out in December 2011. The detailed search strategy for PubMed can be found in Appendix 8.1. This was adapted according to syntax and MeSH terms for other databases. Sixteen electronic databases were searched including: Medline and Medline in Process & Other Non-Indexed citations; Embase; Cochrane Library comprising the Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, NHS Health Economic Evaluation Database, Health Technology Assessment Database, Database of Abstracts of Review of Effects; Web of Science Citation Index, Social Science Citation Index and the Conference Proceedings index; CINAHL; PsycINFO; HMIC; Social Policy and Practice; and Dissertation Abstracts. Searches were limited to English language only.

For ongoing and unpublished research, the following sources were searched: UK CRN Portfolio Database; Clinical Trials.gov; Open Grey; American Society of Cancer Oncology; and European Society for Medical Oncology. International cancer registries were also searched using 'bowel cancer awareness' or 'awareness' terms: the United Kingdom Association of Cancer Registries; the Australasian Association of Cancer Registries; the European Network of Cancer Registries; and the North American Association of Central Cancer Registries.

Studies were excluded from the review on the basis of their title or abstract and included with reference to the full text article. Inclusion and exclusion criteria were developed and are provided in detail in Appendix 8.2. These included:

- **Population:** Include populations not selected on the basis of familial/historical risk or compliance with screening recommendations (as such interventions would require a resource-heavy screening stage and would not provide efficacy data relating to campaigns delivered to whole populations). Studies which selected discrete sub-populations, such as a BME population within the wider general population, were included.
- **Intervention:** Campaigns aiming to raise awareness and promote early presentation, or campaigns aiming to promote screening compliance and increase early detection. Resource-heavy interventions which relied on one-on-one attention were not included as these were not deliverable to a whole population.
- **Comparator:** Any or no comparator was acceptable.
- **Outcomes:** One or more of the following outcomes: campaign awareness, change in knowledge or beliefs relating to CRC or CRC screening, numbers of GP visits, number screened, referrals, diagnoses, time to diagnoses, stage at presentation and

survival/mortality. Studies which recorded outcomes on the same day that the intervention was delivered (usually relating to attitude or knowledge) were not included, as this was not thought to give a reliable indication of long-term effects.

Items relating to study design, population, intervention, comparator and outcomes were extracted by one reviewer (SH or ES) into a piloted, standardised data extraction form in Excel. Quality assessment was performed by one reviewer (SH) using criteria adapted from the CASP tool for cohort studies,[6] the Downs and Black criteria for non-randomised studies[7] and the Newcastle Ottawa Scales for cohort and case-control studies[8] arranged under the risk of bias domains described in the Cochrane Handbook,[9] namely: selection bias, performance bias, detection bias, attrition bias and reporting bias. An additional item on confounding was included for uncontrolled studies. The rubric for scoring is provided in Appendix 8.3.

A narrative review was used to summarise the included studies. A meta-analysis was planned where data was allowing, but heterogeneity of study variables prevented this.

As a large number of studies narrowly missed the inclusion criteria (being included on the basis of their abstract, but being excluded on the basis of the full text article) but appeared to be of some interest to the review question, an *ad hoc* mapping analysis was performed to provide a wider overview of the types of interventions which may be effective. Key study variables were extracted and coded by one reviewer. Variables were classed as relating to "how" the intervention was delivered (to the population, groups or individuals, via which resources), or to "what" was included, and represented visually. Results were extracted as either showing a significant improvement or showing a non-significant improvement or negative result. The magnitude of effect was not extracted, and studies were not subject to quality assessment. In addition, it should be noted that as this mapping review is a by-product of the wider review, it should not be relied upon as systematic or comprehensive; studies may have been excluded at the abstract stage that could have been included. However, it is unlikely that selection bias has occurred as a result of this, and the sample is likely to be proportionally representative of the full body of literature available, and the wide range of approaches that have been implemented in promoting early presentation of CRC.

2.4. Results

The systematic literature search identified 2,897 titles, of which 95 abstracts were included, with an additional five abstracts included from grey literature sources or hand sifting. The selection process is summarised in the PRISMA flow chart[10] in Appendix 8.4. Eleven studies met all the inclusion criteria and were included in the systematic review. Studies which were included on the basis of their abstract, but excluded from the final review, are listed in Appendix 8.5. Of these, 56 described interventions which the review team felt may be of interest, even though they did not meet the inclusion criteria. These are summarised in the mapping review.

2.4.1 Systematic review results

Study characteristics

Eleven studies were included in the review (Table 1).[11-21] One was a randomised controlled trial (RCT), [11] four were non-randomised controlled trials [12,15-17] and the remaining six studies were before-after studies or interrupted time series.[13,14,18-21] Most studies took place in the USA, with three studies in the UK [12-14] and another in Holland.[11] Four studies targeted or reported on communities with a black or minority ethnic (BME) identity (Vietnamese Americans; [15] African Americans;[16,17] and Hispanic men).[21] Three studies targeted low income

areas,[13,18,20] one of which targeted women in a predominantly African American community,[18] and one of which was an area with low screening rates.[20] Two studies targeted older adults,[12,19] one targeted older men,[14] and one targeted all adults.[11]

Table 1 Study characteristics

Study	Study Design	Country	Dates	N Centres	N	Population
Aim to increase self-presentation						
de Nooijer 2004[11]	RCT	Holland	1999	National	1,358	Adults (excluded cancer patients)
WoSCAP[12]	NRCT & BA, IS	Scotland	2004	Regional	NRCT: 583 (Int) 351 (C)	Adults over 50
Lyon 2009[13]	BA*	England	2007 to '09	111 practices (10 areas)	630,000	Disadvantaged areas (spearhead PCTs)
Ramsay, date NR[14]	BA, IS	England	2010	Regional	300 (B) 300 (A)	Men over 50
Aim to increase screening attendance						
Blumenthal 2005[16]	NRCT, IS	USA	1994 to '96	4 Regions	4,053(B) 3,914 (A)	African Americans
Nguyen 2010[15]	NRCT	USA	2004 to '07	Regional	894 (B) 533 (A)	Vietnamese Americans; medical staff
Powe 2004[17]	NRCT	USA	NR	15 senior citizen centres	134	Older adults, predominantly African Americans
Katz 2007[18]	ITS, IS	USA	2000 to '03	11 cities (4 regions)	2,098	Women, subsidised/low-income housing, mostly African American
Broadwater 2004[22]	BA, IS	USA	2003	Regional	409 (B) 403 (A)	Older adults
Katz 2011[20]	BA, IS	USA	2007	Regional	170 (B) 61 (A)	Low-income area with high incidence and low screening rates.
Zhou 2011[21]	BA, IS**	USA	1999 to '05	Regional	4,048 (B) 4,285 (A)	Hispanic and white non-Hispanic men

*Interim results - project dissolved when Improvement Foundation ceased trading.

** Before data recorded one year after campaign started

BA, before-after study; IS, independent sample where the before sample comprised different individuals than the after sample; RCT, randomised controlled trial; NRCT, non-randomised controlled trial; ITS, interrupted time series; B, before; A, after; Int, intervention; C, control

Quality assessment

Overall, the quality of the body of evidence comprising this review is at best moderately good, at worst, poor, but remains to a significant extent, unknown. As most studies are either observational or non-randomised, even if studies were to score well on every quality assessment item, there would remain limitations to the data within this review.

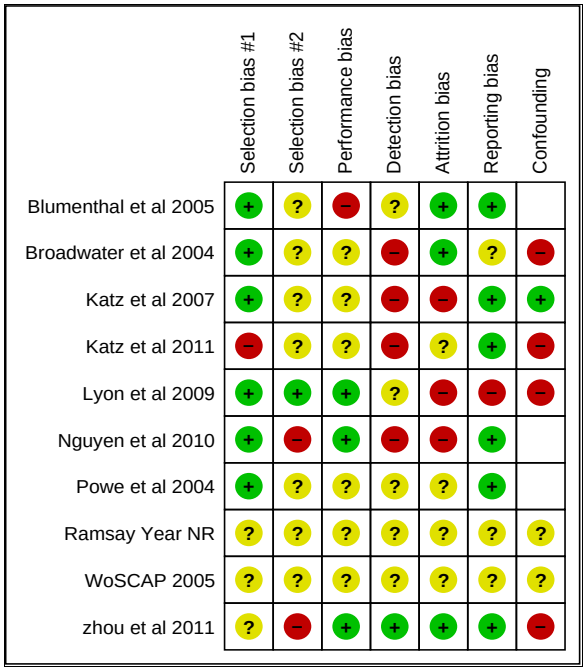
A summary of the quality assessment of studies is presented in Figure 2. No study scored well for every item, and no item scored well in every case. Zhou et al[21] scored best overall, but was at risk of confounding and selection bias. Amongst non-randomised trials, before-after studies and interrupted time series studies, many did not provide enough information to enable assessment of risk

of bias. Notably, data for two studies from the UK[12,14] were only available as unpublished data from online sources, and information relating to risk of bias was not reported in either case. Most studies selected their participants in a way that had a low risk of bias. However, information relating to comparativeness of the two arms, or the before and after cohorts was not provided or scored negatively, meaning the risk of selection bias affecting the results is unknown, but potentially high. Likewise, the blinding of participants was poorly reported and only one study clearly avoided detection bias, meaning that there is a potentially high risk of performance and detection bias affecting the results. For the six before-after and interrupted time series studies, confounding was only adequately dealt with by one study. There is therefore a high risk that the results of this review are subject to confounding.

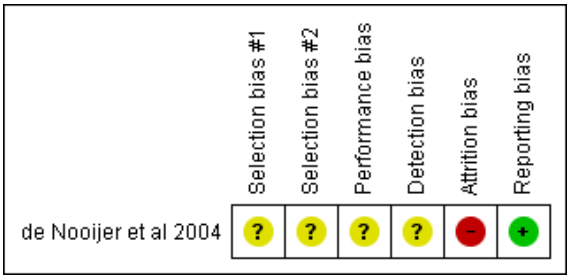
The one RCT, de Nooijer et al,[11] scored unclear or negative for most items and is therefore of unknown quality.

Figure 2 Risk of bias summary: review authors' judgements about each risk of bias item for each included study, scored according to study design. Marking rubric can be found in Appendix 8.3.

i. Non-randomised controlled trials, interrupted time series and before-after studies



ii. Randomised controlled trial study design



+, low risk of bias; -, high risk of bias; ?, unknown risk of bias; blank, not applicable.

Interventions to increase early detection of CRC

A description of the interventions is provided in Table 2.

Aim of intervention. Four interventions [11-14] aimed to increase self-presentation. All appeared to include a description of symptoms to look out for (detail from de Nooijer et al[11] is vague). Other studies aimed to increase screening rates: whilst it was not clear what message was given about symptoms in all cases, in at least one case (Broadwater et al)[22] the message was that CRC has no early warning signs, and screening was therefore necessary. Six interventions targeted CRC alone, whilst five assessed campaigns which included at least one other cancer in the same study. It was not always clear if there were separate materials for each cancer in these campaigns, although this appeared likely in most cases.

Target population. Four interventions targeted the general population or older adults in the general population. One included the use of an information leaflet (this study also tested a tailored letter, which did not meet the inclusion criteria for this review) (de Nooijer et al)[11], whilst the other three were complex interventions with multiple components and outlets including (variously) TV, radio, print materials, comedy shows, photo exhibitions and so on (see Table 2).[12,14,19] One intervention also included a television broadcast of a live colonoscopy.[19]

Interventions aimed at BME populations used a variety of means to reach the target group, including an innovative community-led approach where interventions were devised and delivered by members of the community (Blumenthal et al)[16]; a programme which reached Vietnamese Americans through Vietnamese language outlets including TV, radio and newspapers, as well as through local businesses and at community events (Nguyen et al);[15] a national programme which incorporated a bilingual component to target Hispanic Americans (Zhou et al);[21] and a culturally relevant intervention which included a Christian faith message for a community which was predominantly African American (Powe et al).[17]

One of the interventions aimed at disadvantaged areas also employed a community-based approach where members of the local community were involved in devising and delivering the interventions in a wide range of venues and in very creative ways.[13] The two remaining interventions were targeted at disadvantaged areas engaged in community consultation to inform the design of more appropriate interventions which aimed to address barriers and be culturally acceptable.

Design of interventions. Most interventions were designed with some degree of consultation with the community. These included:

- Baseline surveys or focus groups to establish needs in terms of current levels of knowledge, prevalent attitudes, behaviours and cultural norms, e.g. Broadwater et al.[19]
- Focus groups to comment on material designed by research team, e.g. WoSCAP[12]
- Engaging the community in the design and delivery of the intervention from the outset.[13,16]

However, in some cases the design method was not clear or only researchers or healthcare professionals were involved.

Duration of intervention. Interventions ranged in length from simply watching a video or reading a leaflet, to concerted campaigns over several years (see Table 2 for details).

Outcomes

The results reported by the included studies are summarised in Table 3. Only direction of effect and statistical significance has been included in this summary, with final value data provided for screening rates to allow comparison to other known screening rates.

Aim of intervention. Of the four studies[11-14] which aimed to increase early presentation or detection, only one[13] reported adequate data on outcomes towards the end of the logic model. This study showed an increase in urgent referrals, and whilst this resulted in an increase in diagnoses through the urgent referral route, there was only a non-significant increase in the number of early-stage diagnoses. However, the outcome in this study was dichotomised to early presentation (presentation with no nodal or distal metastases) or non-early presentation. It is possible that whilst statistically significantly more cancers were not detected in the early stage, a shift towards presentation at an earlier stage (e.g. only one nodal metastases rather than several) may have been achieved. Data on exact stage at presentation was not available from this study.

De Nooijer et al[11] concentrated on outcomes at the earlier stage of the logic model. For De Nooijer et al[11], there were proportionately more participants who reported an increase in knowledge and a change in their intentions in the intervention arm at T1, but this effect was not reported and not maintained at T2 respectively.

WoSCAP[12] reported increases throughout the logic model, but no statistical significance tests were reported for any of the results. Similarly, Ramsay[14] reported improvements throughout most of the

logic model, though consultation numbers appeared to fall. Again, the statistical significance of these results was not reported.

Target population. The data do not suggest any trend towards a greater or lesser likelihood of an intervention effect being statistically significant depending on which group it is targeted at. Interventions which targeted distinct subpopulations generally appeared to have some degree of success in reaching these previously underserved groups. However, whether the magnitude of the change brings these groups in line with population norms is unclear, except in the study reported by Zhou et al,[21] whereby the increase in screening amongst Hispanics did not bring rates in line with white non-Hispanics.

Community involvement. The two studies which engaged communities in the development and delivery of materials showed predominantly positive outcomes, though neither recorded the same outcomes. Blumenthal et al[16] reported statistically significant increases in screening rates in one area, but not in the other. Awareness of the campaign also varied by component and area. As already summarised, Lyon et al[13] reported a significant increase in diagnoses via urgent referrals, but only a non-significant increase in early-stage presentation.

Multiple cancers targeted. Of the four studies[15,17,18,20] which targeted CRC alone, three[15,17,18] reported results for screening uptake. All reported increases, but some outcomes did not reach statistical significance. Of the five studies which assessed campaigns targeting multiple cancers,[11,13,16,21,22] significant increases in screening were reported on three occasions,[13,16,21] though in one case[13] there was also a non-significant decrease in screening rates.

Coherence with logic model. In general, the logic model appeared to be supported by the available evidence, regardless of the target population and other heterogeneous study characteristics. Whilst most studies reported a mix of statistically significant and non-significant results, trends were in nearly all cases (apart from the Nashville screening rates outcome reported in Blumenthal et al[16] and consultation numbers reported in Ramsay[14]) consistent with the pathway. Nguyen et al[15] reported the most complete pathway, but fell short of reporting the number of diagnoses. Similarly, WoSCAP[12] reported a number of stages in the pathway, with changes coherent with the logic model, but did not report statistical significance of the changes. However, none of the studies reported long-term results for mortality and morbidity. The furthest point in the model is provided by Lyon et al [13], which only reports a non-significant improvement in diagnosing CRC before it has spread. As such, the final and crucial steps in the pathway are left under-informed or not supported.

Meta-analysis. A meta-analysis was not appropriate given the marked heterogeneity in all study variables.

Duration of effect. Only three studies aimed to record outcomes at more than one time-point. Attitudes were significantly improved at 3 months, but not maintained at 6 months after viewing a leaflet, compared to usual care in de Nooijer et al[11]. No data were available from the other two studies, as the first time-point was not reported by Lyon et al[13], and the intervention was still being delivered during all three time-points reported by Powe et al[17] for one intervention arm, whilst the other intervention arm (for whom intervention delivery only involved viewing a video once) was not reported at the interim time-point.

Two studies reported outcomes at more than one year (Nguyen et al and Zhou et al).[15,21] However, for both, the intervention was still being delivered at the time-point, and the data cannot be used to inform the duration of the effect of the intervention.

2.4.2 Mapping review results

The mapping review collated and categorised the components of the interventions that have been used to increase early detection of CRC, along with a top-level indication of reported estimates of efficacy (Figure 3).

Fifty-six studies excluded at full text reported interventions which are of relevance to the review question, regardless of the reasons for exclusion. Of the excluded studies: 22 were excluded because patients were selected on the basis of risk due to either not being up to date with screening, or due to family or personal history; two were excluded because they were published as an abstract only; one described the intervention, but provided no results; six because the intervention included one-to-one attention; 15 because the outcome was recorded on the same day as the intervention; four because they were published as theses; one because it was a staff intervention with no data on patient outcomes; and five because the study had an inappropriate study design.

Items relating to "how" an item was delivered are mapped in the lower half of Figure 3. Culturally relevant interventions included using bilingual patient navigators (who help patients make appointments, arrange travel, fill in forms, etc.), using images of people of the relevant ethnicity, using community establishments such as churches to reach people and using healthcare staff or lay volunteers of the same ethnicity to deliver the intervention. Filmed interventions were delivered via TV, radio, WebPages, projected during presentations, or played on DVD/video players. Electronic devices included portable DVD players, laptops, screens in doctors' waiting rooms, PowerPoint presentations, audience response systems and interactive computer programmes which delivered tailored messages. Literature included brochures, leaflets, pamphlets, and letters.

Items relating to the content of the interventions ("what") were coded and are mapped in the upper half of Figure 3. Messages about signs and symptoms varied from stating that there are no early warning signs and therefore screening is the best way to detect CRC early, to listing various signs, such as bleeding from the rectum, or having unusual bowel movements for more than a certain number of weeks, that mean you should visit a doctor. Some studies included a demonstration of how to complete an FOBT test. Such demonstrations included films shown to groups, where a nurse used peanut butter or play dough to demonstrate, as well as demonstrations given one-to-one. Instructions were usually written, sometimes with diagrams for those with low literacy. Risk messages included increased risk for Asians now living in America, increased risk due to age and family or personal history, and increased risk from lifestyle factors. Assessment and help with barriers was often performed via the telephone or in one-to-one and small group sessions. In some cases, this was automated by a computer programme, or involved an algorithm which was followed by telephone staff.

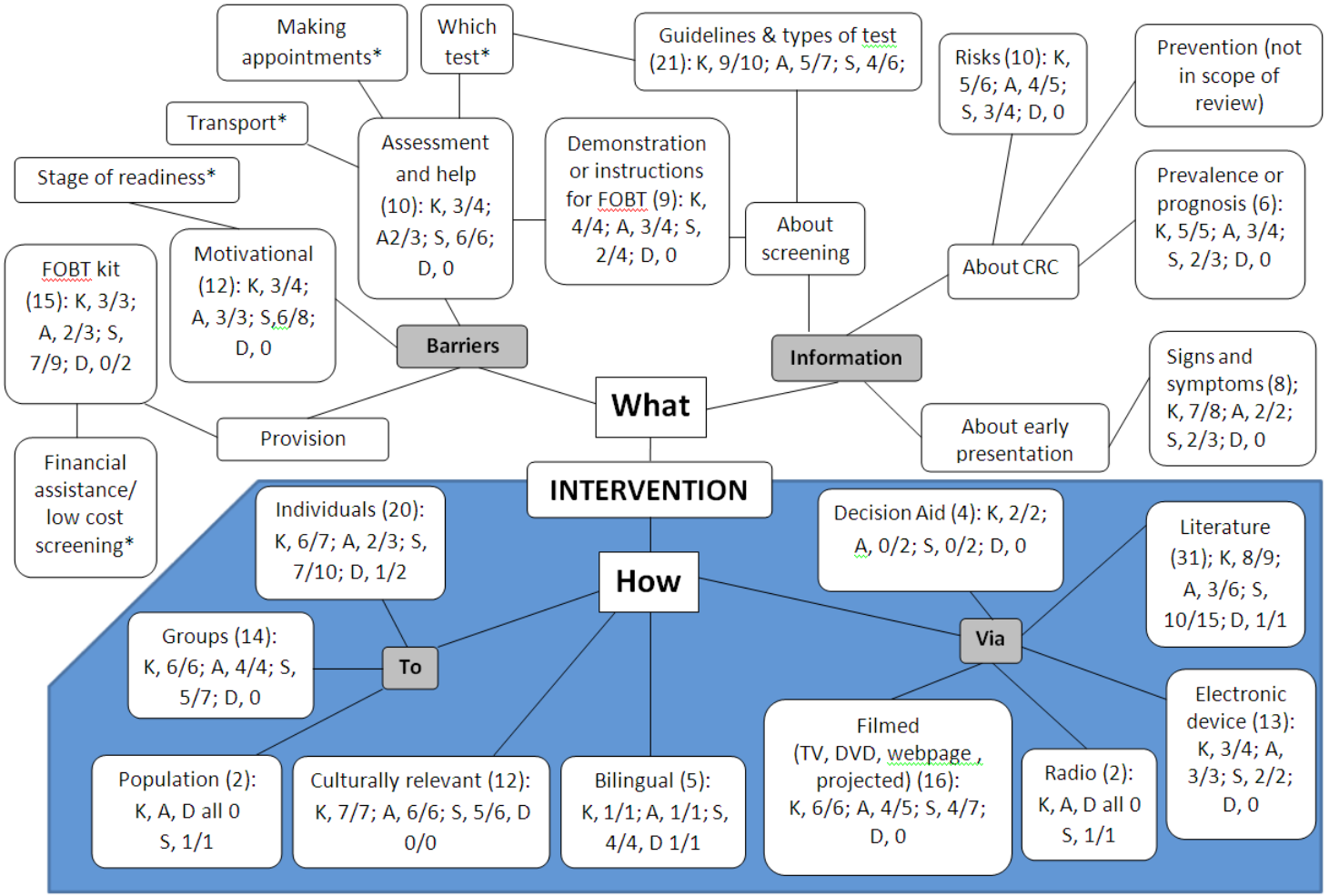
The number of studies for each item which reported a significant result shows that most components of the interventions appear to be associated with positive outcomes. However, nearly all interventions comprised several approaches, so it is not possible to ascertain which aspects conferred a positive effect. One association of interest is that decision aids (which aim to help people make a decision about whether to have screening, or which screening mode to opt for) did not appear to be associated with positive improvements in screening numbers or attitudes and intentions towards screening. As with the results of the main review, the data to inform the final step in the logic model, between an

increase in screening rates and an increase in detection or stage at detection, is not well informed by this mapping review.

2.4.3 Data for use in the model

Several studies with the potential to contain data to inform the cost-effectiveness modelling were identified by the systematic review. However, none of them provided enough data to be useful. The study of most relevance and with the most complete data-set was the study reported by Lyon et al. [13] As described above, this study was based in the UK and reported outcomes for urgent referrals and proportion presenting with early stage CRC. However, the cost-effectiveness of this targeted campaign could not be evaluated as sufficient information on effectiveness and costs of the campaign was not available.

Figure 3 Map of variables relating to design of interventions and number of studies reporting positive results



* Not coded separately. Stage of readiness = readiness to attend screening; Barriers = barriers to attending screening.
Variable with number of interventions using it in brackets, followed by number of studies reporting a statistically significant result over the number of studies reporting any result for the variable, for the outcomes K (knowledge), A (intentions or attitude), S (number screened) and D (number of polyps or cancers detected).

3. Bowel Cancer Signs and Symptoms Campaign

In addition to the studies identified by the systematic review, data was available via the Department of Health relating to a pilot awareness campaign in England. The data was provided in a report produced for the Department of Health: 'Evaluation of the Bowel Cancer Awareness Pilot…' and more recent data on cancer incidence were also obtained from the South West Public Health Observatory (SWPHO) and the Eastern Cancer Registration and Information Centre (ECRIC).[4,23,24] This section describes and analyses this data.

3.1. Campaign overview

A bowel cancer signs and symptoms campaign was piloted in two regions (the East of England and the South West) by the Department of Health in January 2011. The aim of the campaign was to increase awareness of the signs and symptoms of bowel cancer and to encourage persons with symptoms to visit their GP. The campaign message was: *"If you have (1) A persistent change in normal bowel habit, such as going to the toilet more often and diarrhoea, especially if you are also bleeding from your back passage, or (2) Bleeding from the back passage without any reason, particularly over the age of 55, then it's important to go and see your GP. The sooner you see your doctor to have it checked, the better."* The total population of the two pilot regions was approximately 11 million persons. The pilot campaign was delivered for seven weeks (24th January - 21st March 2011) via the following channels: regional TV, print media (regional/local press etc.), inserts into regional editions of national press, online, regional/local radio, and shopping centres. A bowel cancer resource pack was sent to GPs and this contained detailed information for each local authority. Although the message mentioned *"over the age of 55",* the campaign will have reached persons of all ages. Following the pilot a national campaign was run starting in January 2012.

Monitoring of the pilot campaign included: collection of data on incidence through Cancer Registries, data on referrals from Cancer Wait times, data on screening uptake from the NHS cancer screening, a survey of GP attendances undertaken by Mayden Health, and exit interviews at shopping centres to determine the reach of the advertising.[4,23-29] Data from the pilot campaign monitoring were used to inform the cost-effectiveness model. We present our analysis of the pilot campaign data here, including: changes in GP attendances, secondary care appointments, CRC incidence, screening uptake and campaign running costs.

3.2. GP attendances

Data on GP attendances associated with CRC symptoms were collected from a sample of 74 practices. The included practices were spread across three cancer networks and, for the purpose of this analysis, data from the three networks were grouped together (the Anglia network, the Avon, Somerset and Wiltshire network (ASWCN) and the part of the Mount Vernon Cancer network covered by the TV campaign). Data were collected on GP attendances prior to the campaign (January 2010 - January 2011), during the campaign (February-March 2011), and for one month following the campaign (April 2011). The data used here considers GP attendances associated with the three symptoms which directly relate to the campaign (rectal bleed, loose stools, and change in bowel habit) or diarrhoea. Diarrhoea was not specifically mentioned in the campaign but was included as it is so closely related to change in bowel habit and loose stools.

The data on GP attendances from the pre-campaign period (January 2010 - January 2011) displayed considerable monthly variation; see Figure 4. To reduce the impact of these monthly variations we compared average monthly attendances from the periods February 2010 – April 2010 and February 2011 – April 2011. (The original analysis adjusted by working days per month but as data were averaged over three months this was deemed unnecessary.) A summary of the GP attendance data

related to the campaign is shown in Table 2. Two analyses were undertaken: with and without diarrhoea included as a symptom. The number of GP attendances in the sample of practices increased by approximately 700 during the period February-April 2011 which would correspond to an increase of approximately 80,000 on a national scale - a 62% increase for the 3-month period. The increase was slightly less (around 60,000) when diarrhoea was included as a symptom. The available data provide no information on the duration of the increase in GP attendances as no data were collected for GP attendances following April 2011.

Although the target population for the campaign was persons aged over 55, the nature of the campaign meant that persons of all ages were exposed. The data analysis did not demonstrate a change in the gender or age distribution of patients as a result of the campaign.

The change in GP attendances caused by the campaign is associated with considerable uncertainty due to large variations between practices and a possible change in symptom coding between 2010 and 2011.

Figure 4: GP attendances associated with CRC symptoms

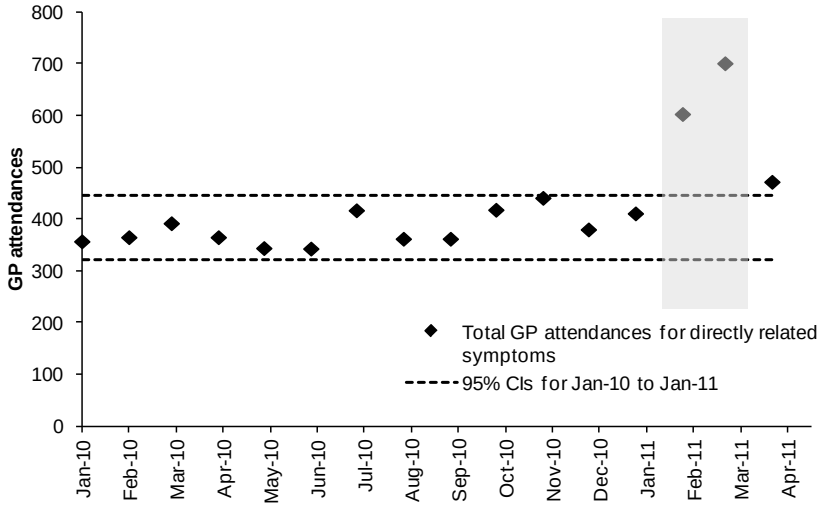


Table 2: GP attendances associated with CRC symptoms

		Rectal bleed, loose stools, and change in bowel habit	Rectal bleed, loose stools, change in bowel habit or diarrhoea
GP attendances during the 3 month period Feb-Apr			
	2010	1127	2685
	2011	1827	3217
	% increase	62%	20%
Increase in GP attendances	Sample	700	532
	England	79,645	60,595

3.3. GP referrals/Secondary care appointments

Data on the number of 2-week wait referrals from GP to secondary care with suspicion of lower gastrointestinal cancer were available for the East of England for the period 1st February to 30th June

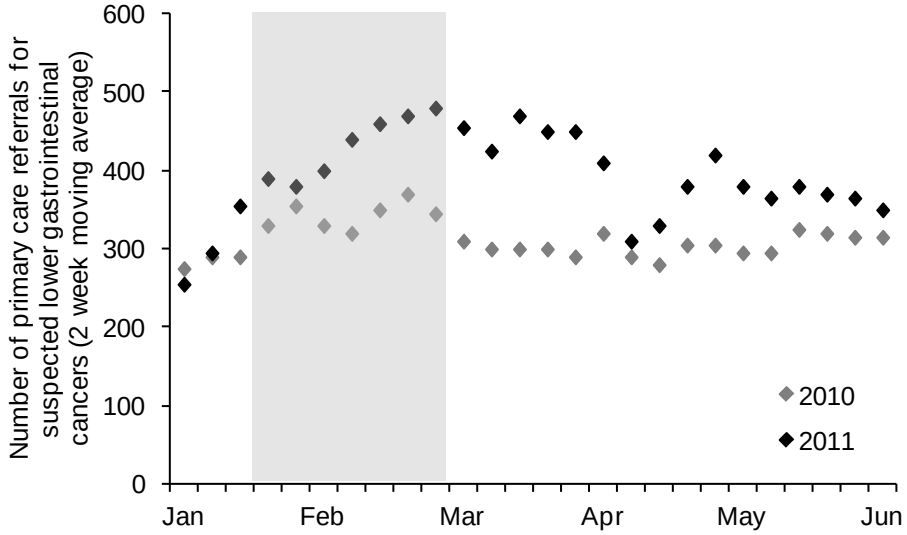
for both 2010 and 2011. A 28% increase in referrals was seen from 2010 to 2011 which corresponds to approximately 17,000 additional referrals on a national level; see Table 3. The data suggest that the campaign had a significant effect on the number of GP referrals during the latter half of the campaign and during the 6 weeks following the campaign; see Figure 5. However, without data for the period after June 2011 it is not possible to be sure of the duration of the effect of the campaign.

There was also evidence of an increase in colonoscopy demand and activity during the period February-June 2011 when compared to the previous year.

Table 3: Referrals from primary care for suspected lower GI cancer

Referrals from GP to secondary care for suspected lower gastrointestinal cancer		
Referrals during 5 month period 1 Feb - 30 Jun	2010	6967
	2011	8923
	increase	1956
	increase scaled up to England population	17,519
	% increase	28%

Figure 5: Referrals from primary care for suspected lower GI cancer



3.4. Cancer incidence

Data on monthly CRC incidence for the East of England and South West regions combined were available for the period January 2010 – September 2011, see Table 4 and Figure 6. There is a significant lag between a cancer diagnosis and a registry receiving information on a cancer diagnosis; referred to as 'reporting delay'. Cancer incidence data can usually be adjusted for reporting delay to account for anticipated future corrections to registry data due to inherent delays and errors in case reporting.[30] Due to changes in reporting methods during 2011, a precise reporting delay adjustment was not possible. However, the data used here was obtained from the Cancer Registries in October 2012 hence should be reasonably complete and not significantly biased by 'reporting delay'.

As the campaign started at the end of January 2011 it was assumed that a change in the incidence would not be expected until March 2011. A t-test was undertaken to see if the cancer incidence observed in March 2011 was statistically significantly different compared to the proceeding period (January 2010 - February 2011). The pooled data set and the East of England data set had p-values of less than 0.005 suggesting that an increase did occur in March 2011. When looking just at the

South-West data set the increase was less significant with a p-value of 0.109. No significant increase in incidence was observed for the period April 2011 onwards, considering a p-value of 0.01. We conclude that any increase in incidence caused by the pilot campaign was not sustained.

Table: Results of t-test comparing March 2011 to the period January 2010 - February 2011

	Two-tailed p-value
Pooled SW and EoE	0.002
South West	0.109
East of England	0.001

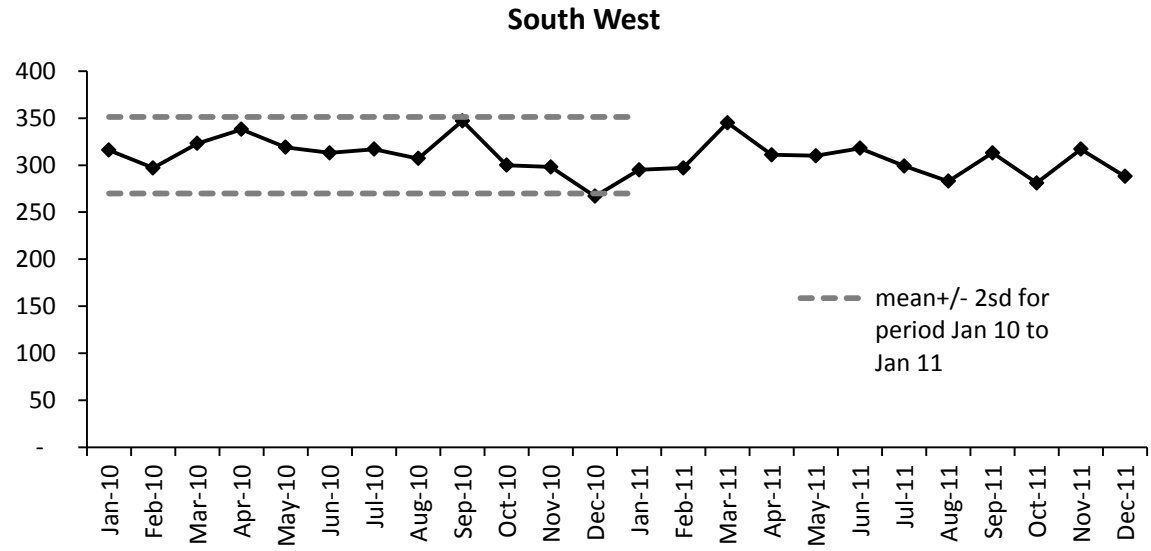
Although an increase in incidence was observed in March 2011 there is considerable uncertainty surrounding whether this increase was in fact due to the pilot campaign. Monthly variations may occur as a result of factors such as: different length months, different numbers of clinics, different numbers of working days, etc. Another possible limitation is the assumption that similar incidence would be expected in 2010 and 2011. A comparison of 2010 and 2011 incidence data from regions not participating in the pilot may clarify whether this assumption is indeed reasonable; however such data was not available. We conclude that the pilot campaign may have led to a small increase in incidence for a short period (1 month) following the campaign. The incidence for March 2011 was 11% higher than that seen in March 2010 and 7% higher than the mean+2sd for the period January 2012 to January 2011. So the modelling will assume that the pilot campaign may have led to an increase in incidence of 7-11% for a period of 1 month only.

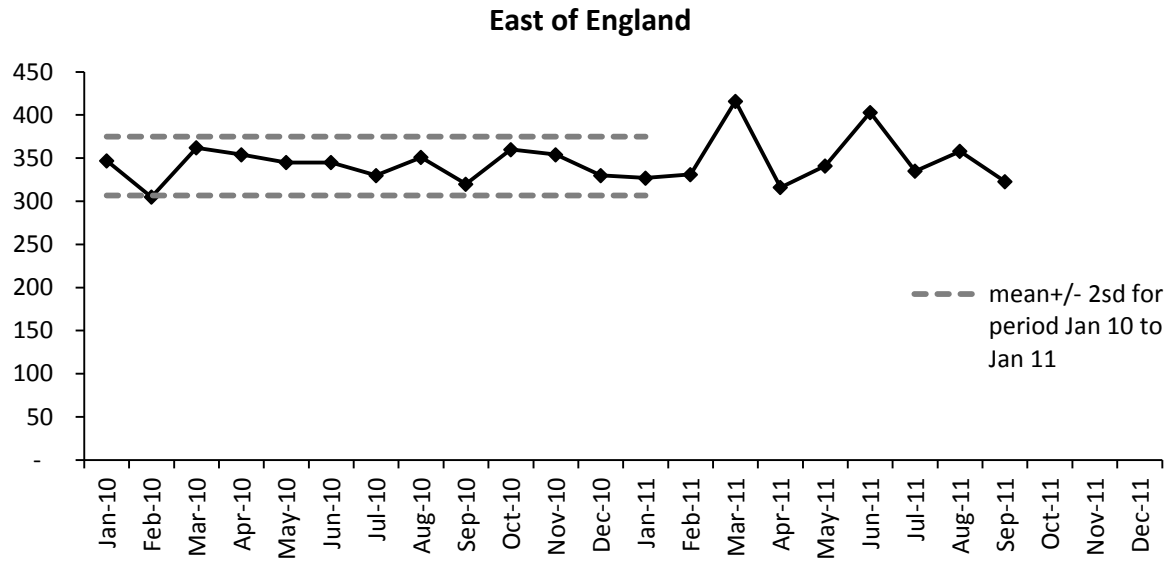
Note that this incidence includes screen-detected incidence as data were not available from the cancer registries on diagnosis route (i.e. whether the patient self-presented to a GP due to symptoms, completed a routine screening test, emergency presentation, etc.). In 2010, screen-detected incidence accounted for approximately 10% of the total CRC incidence in the pilot regions. Data on screen-detected CRC did not show any relationship with the awareness campaign.[27] It should be noted that screen-detected incidence may differ slightly to the CRC incidence reported by the cancer registries due to potentially different classifications e.g. differences in whether secondary colorectal tumours are classified as CRC. Assuming that the increase of 7-11% observed does not relate to screen detected cases, it follows that the increase in symptomatic-detected incidence would be 8-12%. Hence the base case analysis considers an increase in symptomatic-detected incidence of 10%.

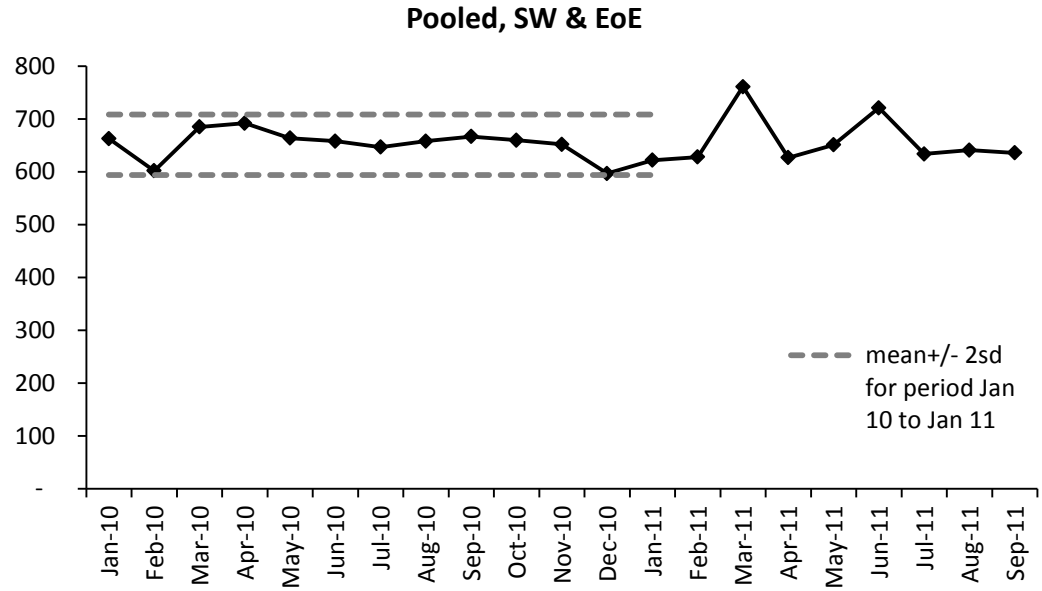
Table 4: CRC incidence in the East of England and South West regions combined (data extract date October 2012)

Month	South West	East of England	Pooled SW & EoE
Jan-10	316	347	663
Feb-10	297	305	602
Mar-10	323	362	685
Apr-10	338	354	692
May-10	319	345	664
Jun-10	313	345	658
Jul-10	317	330	647
Aug-10	307	351	658
Sep-10	347	320	667
Oct-10	300	360	660
Nov-10	298	354	652
Dec-10	267	330	597
Jan-11	295	327	622
Feb-11	297	331	628
Mar-11	345	416	761
Apr-11	311	316	627
May-11	310	341	651
Jun-11	318	403	721
Jul-11	299	335	634
Aug-11	283	358	641
Sep-11	313	323	636
Oct-11	281		
Nov-11	317		
Dec-11	288		

Figure 6: CRC incidence in the East of England and South West regions combined (data extract October
2012)







3.5. Cancer incidence by stage

Data on CRC incidence by stage was available for the period January 2010 – December 2011. A summary of the data is presented in Table 5. For the South West region there was a slight decrease in the proportion of stage D CRC and a slightly higher proportion unstaged for the post campaign period. Note that the data have not been pooled as different staging classifications were reported for the different regions. Generally the numbers of cases by stage are too small for the pilot regions to be able to reach any significant conclusions on changes to the stage distribution. This is illustrated by the confidence intervals presented in Table 5.

Table 5: Colorectal cancer incidence by Dukes' stage

East of England

	Before Pilot		After Pilot	
Integrated clinical stage	Count	Proportion and CI	Count	Proportion and CI
In situ	745	0.15 (0.14, 0.16)	403	0.16 (0.15, 0.18)
1	719	0.15 (0.14, 0.16)	339	0.14 (0.12, 0.15)
2	997	0.21 (0.19, 0.22)	465	0.19 (0.17, 0.20)
3	988	0.20 (0.19, 0.22)	481	0.20 (0.18, 0.21)
4	820	0.17 (0.16, 0.18)	446	0.18 (0.17, 0.20)
Stage not known	567	0.12 (0.11, 0.13)	322	0.13 (0.12, 0.14)
Total	4836		2456	

South West Region

	Jan 2010-Feb 2011		March -Dec 2011	
	Count	Proportion and CI	Count	Proportion and CI
A	593	0.14 (0.13, 0.15)	475	0.15 (0.14, 0.17)
B	1249	0.29 (0.27, 0.30)	876	0.29 (0.27, 0.30)
C	1134	0.26 (0.25, 0.27)	844	0.28 (0.26, 0.29)
D	872	0.20 (0.19, 0.21)	411	0.13 (0.12, 0.15)
Invalid/ Unknown	486	0.11 (0.10, 0.12)	459	0.15 (0.14, 0.16)
Total	4334		3065	

3.6. Screening uptake

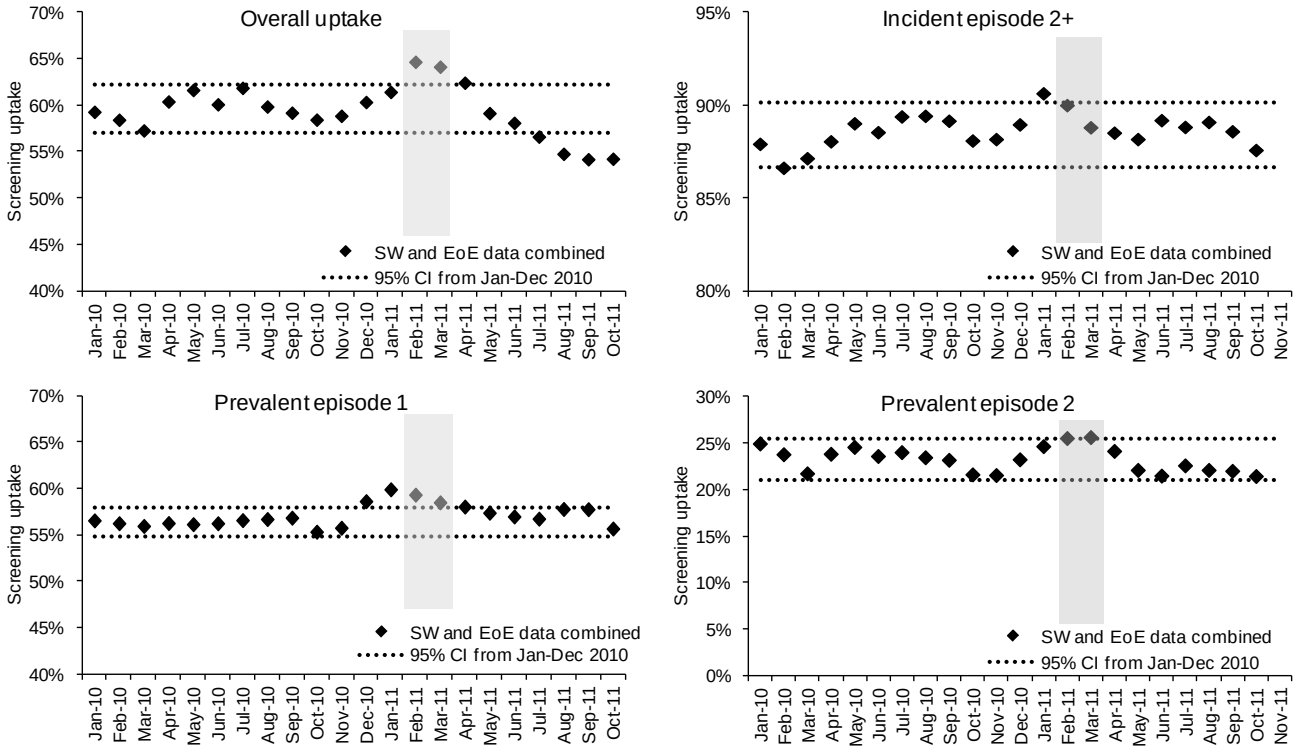
The Bowel Cancer Screening Programme (BCSP) in England offers biennial screening to all persons aged 60-74 with the guaiac faecal occult blood test (gFOBT). Screening started between 2006 and 2010 depending on region. Data on uptake at screening during the period January 2010 – November 2011 were available from the BCSP for the two regions covered by the pilot.[27] Variations in uptake are complex to understand as overall uptake can be confounded by other factors such as the screening round (prevalent/incident) and episode number. For example, low levels of overall uptake were observed in 2011 but these are due to a decrease in invites of type "prevalent episode 1" (persons not previously screened and invited for the first time - average uptake 57%) and an increase in invites of type "prevalent episode 2" (persons not previously screened and invited for second time - average uptake 23%); see Table 6.

An increase in overall uptake was observed during the campaign period, however, further data analysis suggests this may not be due to the campaign. An examination of the uptake graphs for the three subgroups: prevalent episode 1, prevalent episode 2, and incident episode 2+, demonstrated that only the subgroup 'prevalent episode 1' showed a significant increase. However, this increase occurred from December 2010 - March 2011 so cannot be attributed to the campaign. To conclude, the screening data do not demonstrate a significant increase in uptake during/following the awareness campaign period.

Table 6: Summary of screening uptake data

Subgroup	Invited		Adequately screened	Uptake
2010 (Jan-Dec)				
Prevalent episode 1	248042	65%	138621	56%
Prevalent episode 2	49124	13%	11059	23%
Incident episode 2+	85059	22%	75559	89%
Other	134	0%	79	59%
All persons	382359	100%	225318	59%
2011 (Jan-Nov)				
Prevalent episode 1	113862	33%	65223	57%
Prevalent episode 2	98837	29%	21791	22%
Incident episode 2+	127254	37%	112722	89%
Other	5857	2%	822	14%
All persons	345810	100%	200558	58%

Figure 7: Screening uptake for the SW and EoE regions combined



3.7. Awareness campaign costs

The total cost of running the pilot awareness campaigns in the East and South West of England was provided by the Department of Health. The total cost was £1,586,000 which is equivalent to £0.22 per person living in the region aged 30 or over. The components of this cost are detailed in Table 7. The budgeted spend for the national campaign in 2012 was £4.5 million, which is equivalent to £0.14 per person aged 30 or over.

Table 7 Bowel Cancer 'Signs and symptoms' campaign costs

Pilot Campaign Breakdown of costs	**Actual cost**
Delivery: Advertising Media, Events etc	£845,000
TV	*£213,000*
Radio	*£76,000*
Regional press	*£240,000*
Face to face events	*£103,000*
Paid for search (online advertisement)	*£21,000*
Other (includes partnership costs, fulfillment/deliver costs for leaflets and posters	*£65,000*
DRM (including inserts in newspapers, service to put leaflets in GP surgeries)	*£127,000*
Research and evaluation	£181,000
Creative development (costs of producing adverts and other materials)	£540,000
Other (includes strategy/planning costs and other miscellaneous costs)	£20,000
TOTAL	£1,586,000

Pilot Campaign 31st Jan-13th Mar 2011	**Actual cost**
Total cost	£1,586,000
Total population in East and South west of England aged 30+	7,148,045
Cost per person aged 30+	£0.22

Bowel cancer campaign NATIONAL Feb-Mar 2012	**Budgeted cost**
Total cost	£4,500,000
England population aged 30+	32,621,167
Cost per person aged 30+	£0.14

4. Cost-Effectiveness Methods

4.1. Modelling Overview

The model used here is an adaptation of a model used to assess the cost-effectiveness of various options for CRC screening.[31] The original model consisted of two components: the first describes the natural history of CRC by representing the development of adenomas and their progression to CRC, and the second describes the effect of screening and surveillance. This adaptation of the model also incorporates the costs and benefits of an awareness campaign. The analysis captures the direct costs of the campaign, the costs of any additional GP consultations/appointments in secondary care resulting from the campaign, and the benefits of the campaign resulting from earlier diagnosis or a change in screening uptake.

The modelling assumes that the awareness campaign results in a change in the probability of a person with undiagnosed CRC presenting symptomatically at their GP. This change in the symptomatic presentation probabilities is determined so that model predictions of change in CRC incidence reflect those seen following the pilot campaign. The model responds to these adjusted symptomatic presentation probabilities by predicting associated changes in time to diagnosis, stage of diagnosis and CRC mortality due to the campaign. Additional costs associated with GP attendances and referrals are modelled based on the data from the pilot.

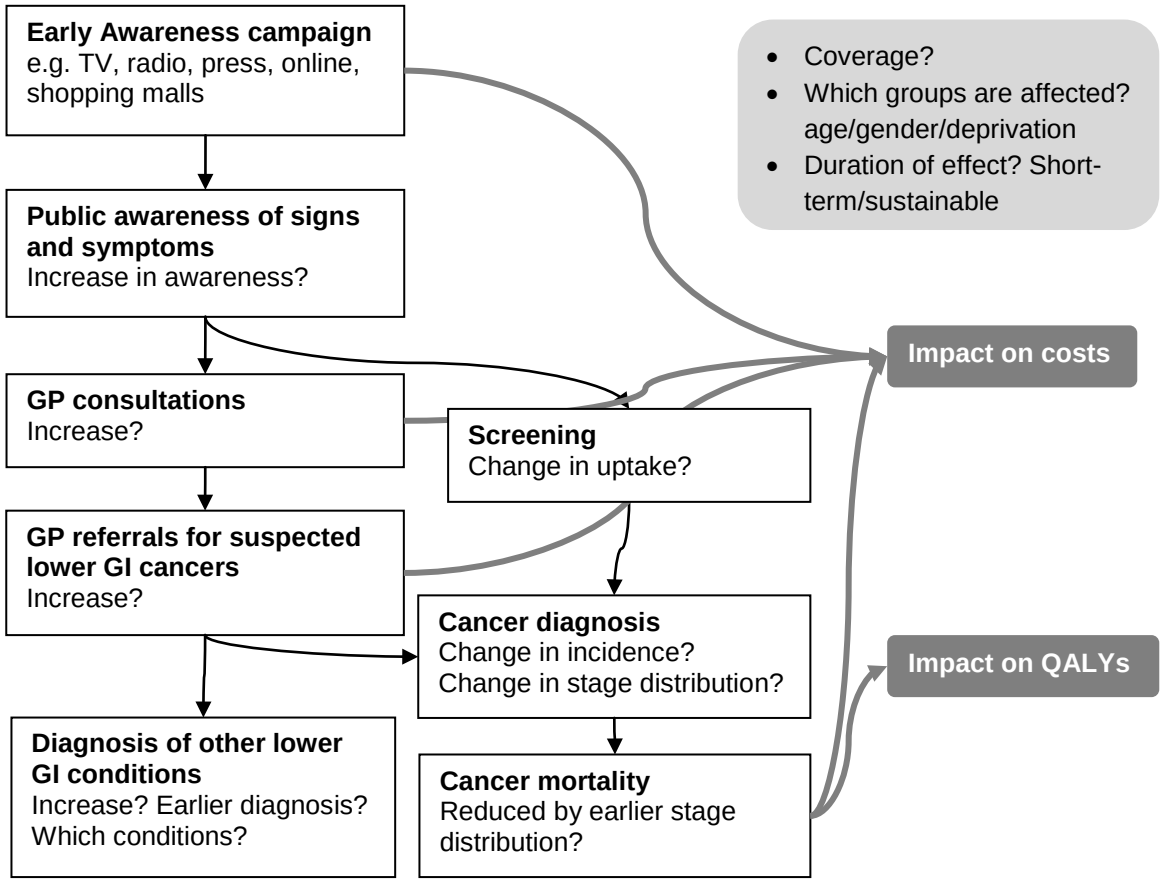
The comparator used for the modelling is no early awareness campaign and this baseline includes the current screening programme of biennial gFOBT. A one-off awareness campaign and a repeated annual awareness campaign are both evaluated as potential interventions. The natural history component of the model simulates development of adenomas and CRC and death for a cohort of individuals. The general population of England was modelled as a series of such cohorts. Each cohort is offered CRC screening and is exposed to the signs and symptoms campaign. Total costs and quality-adjusted life years (QALYs) accrued by the population were calculated.

The model takes the perspective of the NHS and a discount rate of 3.5% per annum was applied to costs and QALYs in line with current NICE recommendations.[32] Estimates of changes in expected costs, QALYs, resource use, CRC incidence and CRC mortality associated with the awareness

campaign were produced. The net monetary benefit (NMB) of each intervention was calculated assuming a willingness-to-pay threshold of £20,000 per QALY gained. In health economic terms, a strategy associated with a greater NMB is preferred. Incremental cost effectiveness ratios (ICERs) were evaluated compared to 'no early awareness intervention'.

The potential effects of an early awareness campaign are summarised in Figure 8.

Figure 8: Summary of potential effects of an early awareness campaign



Studies used to inform the evaluation

Several studies with the potential to contain data to inform the cost-effectiveness modelling were identified by the systematic review (see Chapter 2). However, the only study which collected data on changes in CRC incidence due to the campaign (essential for the modelling) was the unpublished data from the pilot signs and symptoms.[25-29]

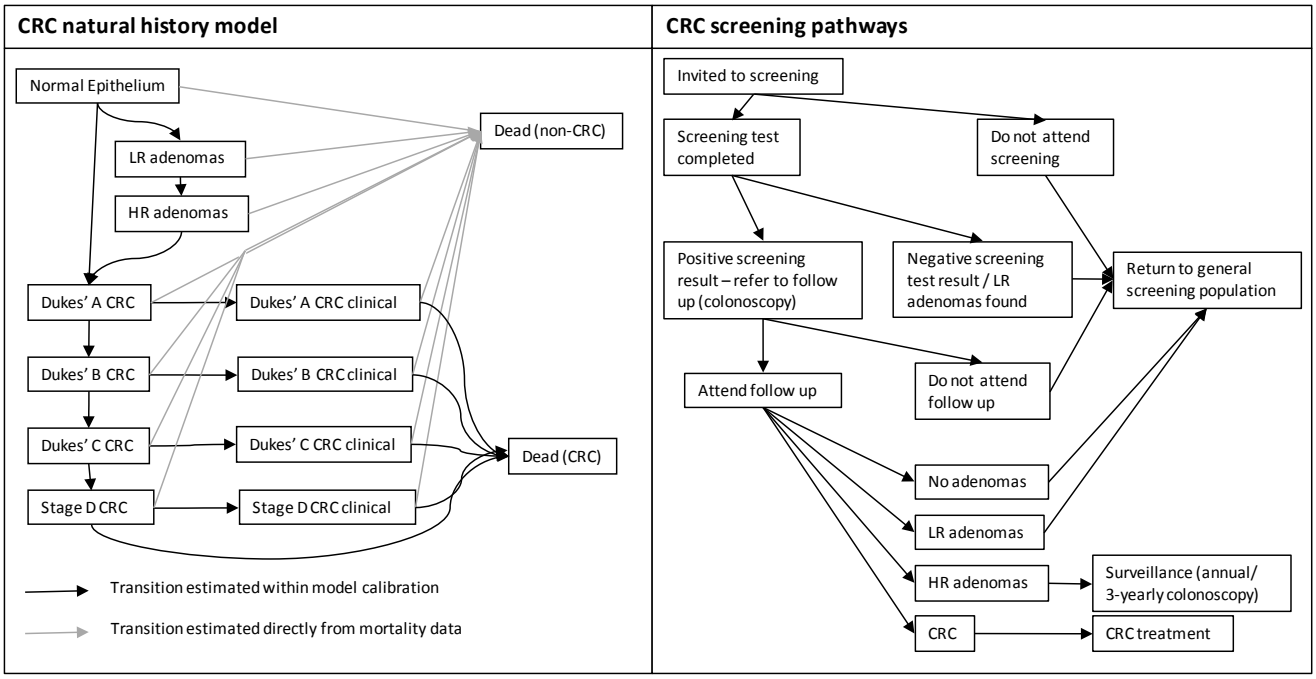
4.2. CRC natural history model and model calibration

A detailed description of the CRC natural history model and model calibration approach used are available in the report "Reappraisal of the options for CRC screening".[31] We will provide a brief overview of the methods here.

A state transition model was used to simulate the life experience of a cohort of individuals in the general population of England. All persons are assumed to have a normal epithelium at age 30 and may then develop adenomatous polyps and malignant carcinoma and subsequently die. The health states are defined as normal epithelium, low risk (LR) adenomas, high risk (HR) adenomas, preclinical CRC Dukes' stages A-D, clinical CRC Dukes' stages A-D, and dead. (We use preclinical to

refer to the cases when CRC has developed but not yet been diagnosed.) The health states and transitions included within the natural history model are illustrated in Figure 9. We refer to the transition probabilities between the modelled health states (e.g. the probability of moving from HR adenomas to Dukes' A CRC) as the CRC natural history model parameters. The natural history model structure assumes that the rates of transition from preclinical to clinical CRC do not vary by age.

Figure 9: Diagram of colorectal cancer natural history model structure and screening pathways



CRC=colorectal cancer, LR=low risk, HR=high risk

Several data sets were used to inform the model parameters through a process of model calibration. Data on CRC incidence in the absence of screening categorised by age and Dukes' stage at diagnosis were taken from England cancer registry data for Oxford, Northern and Yorkshire, and Eastern regions from 2004 – 2006.[33] The CRC survival data used within the model were updated for this project using survival by age and stage at diagnosis from the ICBP; full details are provided within the Appendix 8.6.[34] Data from several screening programmes were also used within the calibration process. The current gFOBT BCSP in England reported numbers of persons with positive gFOBT results and the detection rates of low and high risk adenomas and CRC at screening.[35] Data from the flexible sigmoisoscopy (FS) trial consisted of detection rates of CRC, low/high risk adenomas and non-advanced/advanced adenomas at screening.[36] As UK data are only available for gFOBT and FS, screening test data from the Italian immunochemical FOBT screening programme were also incorporated.[37] A colonoscopy screening study by Brenner et al was selected due to the large sample sizes, broad age range, and the expected similarity between the German and English screening populations.[38] To incorporate information on LR adenomas (not reported by Brenner et al) and information for persons aged under 60, data from Chung et al 2010 was also included.[39]

The model calibration process applied the Metropolis Hastings (MH) algorithm to generate estimates of both CRC natural history model parameters and screening test characteristics from the observed data. The aim of model calibration is to obtain parameter sets whose predictions are close to the observed data. For a given parameter set, the model can be run to produce predictions of CRC incidence, adenoma prevalence and screening outcomes. This Bayesian calibration approach produces correlated parameter sets which can be used for probabilistic sensitivity analyses (PSA).[40] Correct representation of the joint uncertainty in these parameters is particularly important because of

the potential for correlation between several of these parameters. The calibration resulted in a set of model parameters which had a good fit to all of the observed data sets used. A comparison of model predictions and the observed data sets is presented in the screening reappraisal report.[31,41]

4.3. Modelling the effects of an early awareness campaign

Effect of an awareness campaign on CRC symptomatic presentation rates

The effect of an awareness campaign is represented within the model by adjusting the transition probabilities from preclinical CRC to clinical CRC to represent the increases in awareness outlined in the figure above (Figure 9). The model contains four rates relating to symptomatic or chance presentation with Dukes' A-D CRC. The baseline presentation rates within the model reflect the England population from years 2004 to 2006 i.e. before screening commenced. There are two potential limitations associated with the modelling of presentation rates. Firstly, the initiation of the screening programme may have increased awareness so the presentation rates could have changed between 2006 and today. Secondly, the rates of symptomatic presentation vary by Dukes' stage but not by age within the model. This is potentially a limitation; however sufficient data is not available to inform an age specific model.

The four transition probabilities are increased to result in an increase in incidence which matches the observed increase seen in the pilot campaign. As there were no data available to suggest a change in stage distribution as a result of the campaign, we assume that the additional incidence due to the awareness campaign is the same as the current CRC stage distribution in England. This is equivalent to assuming that the campaign results in the same proportional increase in presentation rates for each of the Dukes' stages. Even if the short-term stage distribution is unchanged by the campaign, the additional incidence due to the campaign corresponds to persons presenting earlier than they would have in the absence of the campaign. This earlier presentation will result in a change in the stage distribution over the following few years.

The model analysis assumes that the campaign results in a change in the transition probabilities from preclinical to clinical CRC and that, subsequently, these probabilities will return to their pre-campaign values. The model uses an annual cycle length; however the impact of the campaign is likely to have a shorter duration. The method used to adjust annual transition probabilities for a short-term change is described in the Appendix 8.7. The annual symptomatic presentation transition probabilities are presented in Table 8.

Table 8: Effect of an awareness campaign on CRC symptomatic presentation rates

	Symptomatic presentation rates			
	Dukes A	Dukes B	Dukes C	Stage D
Normal rates in absence of campaign	4.4%	17.6%	36.9%	73.5%
Increased incidence observed	119%	119%	119%	119%
Adjusted rates with campaign				
Duration of increase 1 month	4.4%	17.9%	37.4%	74.1%
Duration of increase 3 month	4.6%	18.4%	38.4%	75.5%

Campaign effectiveness by age

Although the target population for the campaign was persons aged over 55, the nature of the campaign meant that persons of all ages were exposed. The GP attendances data suggest that the campaign had a smaller effect in the 70+ age group but the magnitude of the effect of age on campaign response is unclear. No data were available on the age distribution of the additional GP

referrals and CRC diagnoses. As the effect of age on the increase in CRC diagnoses was unknown the model assumes that the campaign has the same effect on an individual's probability of transition from preclinical to clinical CRC irrespective of age.

Diagnosis of adenomas and other lower GI conditions

An awareness campaign may result in an increase in the detection of adenomas. Such an increase could change both potential costs and potential benefits as persons with adenomas detected may go on to receive surveillance colonoscopy. However, as no data were collected on number of adenomas detected as a result of the pilot campaign, this issue was omitted from the modelling.

The awareness campaign is designed to increase presentation rates for symptoms associated with CRC. These symptoms are also associated with other lower GI conditions such as Crohns disease, ulcerative colitis, inflammatory bowel disease and piles. It is suspected that the campaign may result in the earlier diagnosis of some of these other lower GI conditions. However, data on the rates of diagnosis of other conditions as a result of the pilot were not collected.

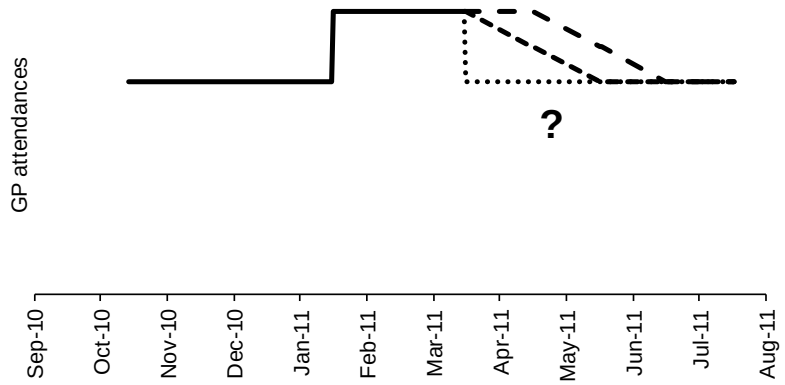
We assume that an earlier diagnosis of any one of these conditions will not be associated with any additional costs. Any QALY gain will be of the form:
('utility with treatment' – 'utility without diagnosis & treatment')('length of time diagnosis is earlier by')*
However, data on the difference in utility value caused by a diagnosis is not known. Hence, model estimates exclude benefits associated with earlier diagnosis of other lower GI conditions so are likely to underestimate the true benefit of the campaign.

Duration of effect of campaign

Data on the duration of the effect of the pilot awareness campaign were very limited. Incidence data show an increase for the month of March only but the data are incomplete; see Figure 10. GP attendance data show an increase for February-March only, but no data were collected after April 2011, see section 5. The data on GP referrals suggest that the campaign causes a significant increase during the latter half of the campaign and during the 6 weeks following the campaign (i.e. April and the start of May), see section 5. The effects of public health campaigns are often short term. Without further data the duration of the effect of the campaign is highly uncertain, as illustrated by the various possibilities shown in Figure10.

We note a technical point that once the effect of the campaign ends, a slight decrease in attendances may be seen due to the slightly lower prevalence of symptoms; this decrease is included within model predictions. For the base case analysis we assume that the effects of the campaign on incidence last for only one month as illustrated by the available data from the pilot. In the base case we will assume that there are no additional GP attendances as a result of the campaign following April 2011. Due to the uncertainty surrounding the duration of the effect, a scenario analysis was undertaken in which effect was assumed to continue for 3 months.

Figure 10: A representation of the uncertainty in duration of the effect of the campaign on GP Attendances



Additional versus earlier

A key issue in evaluating the potential costs and benefits of the awareness campaign is identifying whether observed increases in GP attendances/referrals are actually additional or simply earlier. We hypothesise that the change in GP attendances as a result of the campaign consists of two components:

(1) An increase due to persons attending earlier, and

(2) An increase due to persons who would otherwise not have attended their GP (e.g. those with transient symptoms not caused by CRC or *worried well*).

The proportion of additional GP visits which are additional, rather than simply earlier, are key to determining the costs associated with the increased GP attendances linked to the campaign, however, no data were available to inform these proportions. As the proportion must lie between 0% and 100% the base case analysis assumed 50% of the increase to be additional. To consider this uncertainty a scenario analysis applied a proportion of 90%.

Effect of campaign on screening uptake

The screening data from the pilot regions did not demonstrate a significant increase in uptake during/following the awareness campaign period, see section 5. For the purposes of the modelling we thus assume that the campaign has no effect on screening uptake.

Efficacy of a repeated campaign

It is plausible that an effective awareness campaign would be repeated. It is not clear whether a repeated campaign may have more effect due to reinforcement of the message or less effective if people become familiar with the message and 'digest' it less. We note that a repeat of a campaign may have slightly less impact on CRC incidence than an initial campaign due to a slightly reduced prevalence of symptoms in subsequent years and this effect is represented by the model.

No data were available on the efficacy of a repeated awareness campaign for CRC so evidence from other similar campaigns was considered. In the UK, a repeated awareness campaign is in place for breast cancer, however, enquires suggested that no data have been collected regarding the efficacy of the 'annual breast cancer awareness month' in the UK. A US study examined the number of diagnoses made in November (one month after national breast cancer awareness month (NBCAM)) during years before and after NBCAM was initiated. The study found that during the period when breast cancer advocacy was expanding rapidly into a nationwide movement, NBCAM led to an increase in the number of November diagnoses. However, during earlier periods when breast cancer advocacy was still a grassroots movement, and in later periods when breast cancer advocacy had become a well-established nationwide cause, there is little evidence that October NBCAM events had

an effect on November diagnoses.[42] None of the studies included in the systematic review included repeated campaigns.

Due to the lack of evidence we will assume for the purposes of the cost-effectiveness evaluation that the effectiveness remains the same for subsequent campaigns. It is not clear whether this assumption overestimates or underestimates the benefit of a repeated campaign.

Model timeframe and comparison

The campaign is assessed by calculating the costs and benefits accrued for the current population of England for the remainder of their lifetimes. To evaluate this we consider a series of 70 cohorts of ages 30 to 100 matched to the age distribution of England.[43] For each cohort of age *x* the model is run from the years 30 to *x* to estimate underlying CRC and adenoma prevalence at age *x*. At age *x* the awareness campaign (or sequence of campaigns) is applied. Costs incurred and QALYs accrued from age *x* onwards are counted with discounting applied from age *x+1* onwards. This process is repeated for each of the 70 cohorts to produce population estimates.

Screening in England commenced in 2006 in a few regions with the last regions starting in 2010 (so approximately 3 years ago on average). It will be several years until all persons will have been offered screening from age 60. We hypothesise that the greater the level of screening a population is receiving, the less cost-effective an awareness campaign will be. Hence, an awareness campaign may be more cost-effective today than in several years time when all persons have been offered screening from age 60. For the purposes of this evaluation the model will assume that screening started 3 years ago i.e. persons within the screening age range may have received at most 2 biennial screens before the early awareness campaign intervention is applied.

Uncertainty analysis

Several scenario analyses were undertaken to explore the impact of parameter uncertainty:

- An analysis was undertaken to reflect the potential benefits if the duration of the effect of the campaign on incidence was longer than seen in the pilot data.
- An analysis was undertaken to evaluate the impact of the proportion of GP consultations and referrals which were considered to be ‘additional’ rather than ‘earlier’. The base case assumed the proportion to be 50% and the scenario analysis applied a proportion of 90%.
- An analysis was undertaken in which a lower cost of the campaign was applied to reflect the lower budgeted cost of the national campaign compared to the pilot campaign.

Due to the significant limitations associated with the pilot campaign data, and the structural assumptions which were made, it was felt that PSA would not adequately represent the uncertainty present. It was felt that there would be value in undertaking PSA in the future if more complete data from the campaign pilot become available.

4.4. Costs and utility values used within the model

A summary of all model parameter values is provided within Appendix 8.7.

Cost of campaign

In the base case analysis a cost of £0.22 per head of population over the age of 30 was applied which corresponds to the cost of the pilot campaign. A scenario analysis was also run in which a lower cost of £0.14 was applied to reflect the budgeted cost of the 2012 national campaign.

Cost of additional appointments

The awareness campaign may result in additional GP surgery consultations. A GP surgery consultation (lasting 11.7 minutes including direct care staff costs and qualification costs, but excluding travel costs) has a cost of £36.[44]

The awareness campaign may result in additional appointments in secondary care for suspected lower GI cancer. This cost was estimated using a CRC whole disease model which describes possible diagnosis pathways.[45] For persons in whom no cancer is found, the cost of an appointment is applied which is estimated to be £544, see Table 9. For persons in whom cancer is found, no specific appointment costs is applied as it is assumed that the appointment costs are already incorporated within the estimates of cancer treatment cost.

Table 9: Procedures received by persons referred for suspected lower GI cancer (in whom CRC is not found)

Procedure	**Probability**	**Cost**
Receive CT pneumocolon / CT as unfit for endoscopy	0.015	£ 157.35
Receive colonoscopy as first test	0.936	£ 563.45
Receive a repeat test after first COL (probably barium enema)	0.075	£ 117.43
Receive barium enema first due to presence of mass (can't have COL)	0.049	£ 117.43
	Total average cost per person	£ 544.18

* Costs taken from NHS reference costs 2011, probabilities taken from Tappenden 2011

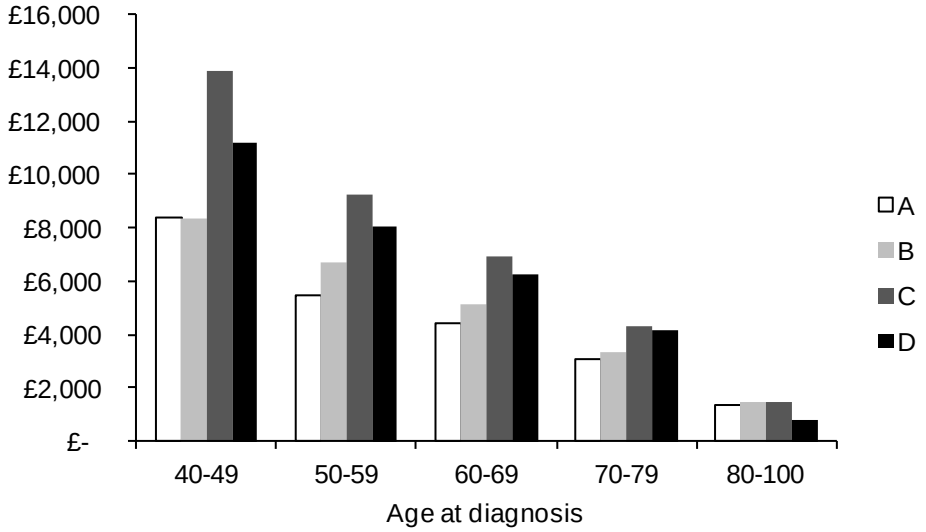
Cost of CRC treatment

The awareness campaign may result in a change in the stage distribution of diagnosed CRC thus effecting total CRC treatment costs. The cost of CRC treatment according to Dukes' stage at diagnosis were estimated specifically for this project using a CRC whole disease model.[45] The costs generated are lower than those used in previous work as they reflect patient pathways more accurately and incorporate more recent unit costs. Costs which are dependent on age were used to reflect variations in treatment rates; see Table 10 and Figure 11.

Table10: Average colorectal cancer treatment cost by Dukes' stage at diagnosis

Age at diagnosis	Dukes' Stage at diagnosis A	B	C	D
40-49	£ 8,375	£ 8,362	£ 13,862	£ 11,198
50-59	£ 5,465	£ 6,712	£ 9,272	£ 8,078
60-69	£ 4,423	£ 5,120	£ 6,945	£ 6,227
70-79	£ 3,040	£ 3,305	£ 4,291	£ 4,176
80-100	£ 1,320	£ 1,479	£ 1,493	£ 772

Figure 11: Average colorectal cancer treatment cost by Dukes' stage at diagnosis



Other costs included within the model

As the awareness campaign may impact on the both the number of persons attending screening and the number of CRC cases diagnosed via screening, the costs associated with CRC screening were incorporated. These costs are detailed in the report "Reappraisal of the options for CRC screening".[31] Several costs were updated within the model using 2011 Reference Costs. The new costs used are detailed in Appendix 8.7.

Utility values

General utility values for a person with and without cancer were applied as there were issues and inconsistencies with CRC-specific utility data. Full details of the other values identified and the inconsistencies identified are provided in the report "Reappraisal of the options for CRC screening".[31] Persons with cancer were assigned a utility value of 0.697 and persons without cancer a value of 0.798 taken from the health survey for England.[46] Utility values were assumed to be the same regardless of Dukes' stage and age.

5. Cost-Effectiveness Results

This chapter presents lifetime results which reflect the entire population of England. A breakdown of total costs is presented and includes: campaign costs, CRC treatment costs, costs associated with additional GP attendances and referrals. In addition to total QALYs changes in cancer incidence, cancer stage distribution, and cancer mortality are presented.

Base case results

Table 11 presents model predictions for no awareness campaign, a one-off awareness campaign and an annual awareness campaign for five years. The change compared to 'no campaign' is presented. The results reflect model predictions for effects on incidence for the lifetime of the entire current population of England aged over 30. Hence the total incidence figures are very high as they include cases of CRC presenting for up to 70 years (in the case of a 30-year-old living to age 100).

Even though the effect of the campaign on the rates of symptomatic presentation are assumed the same for each Dukes' stage, the additional incidence due to the campaign corresponds to persons presenting earlier than they would have in the absence of the campaign. This earlier presentation

results in a change in the stage distribution over the following few years which in turn has a direct impact on CRC mortality.

In our base case model the campaign causes an increase in the number of cases of Dukes' stage A-C presenting symptomatically and a decrease in the number of cases of stage D(e.g. 92 less cases of Stage D CRC occur as a result of the campaign). Overall, there is an increase in the number of cases of CRC presenting symptomatically. A small decrease is seen in the number of screen/surveillance detected cases because of the increase in cases presenting symptomatically. Overall there is an increase in CRC incidence and this corresponds to a decrease in the number of persons dying with undiagnosed CRC. A significant reduction in CRC specific deaths was seen which was due to the reduction in the number of cases of CRC presenting in stage D. This reduction in deaths corresponded to an increase in QALYs gained.

The results show a reduction in total costs associated with screening caused by a decrease in the number of positives at screening since more CRC presents symptomatically. An increase in CRC treatment costs is seen for two reasons. Firstly, CRC is presenting at younger ages which are associated with higher treatment costs. Secondly, there is a shift of cases from stage D to Dukes' C, and Dukes' C CRC is associated with higher treatment costs than Stage D. Costs associated with increased GP consultations and referrals account for only a small proportion of total costs and are considerably less than the cost of the campaign itself.

The total (discounted) cost associated with the one-off campaign was approximately £5.5 million. Assuming an increase in symptomatic presentation rates of 10% for a period of 1 month, the campaign prevented 66 deaths from CRC resulting in a gain of 404 QALYs. The ICER for the one-off awareness campaign was £13,496 per QALY gained, compared to 'no campaign' giving a NMB of £2.6 million. The total (discounted) cost associated with the campaign repeated annually for 5 years was approximately £25 million. The campaign prevented 330 deaths from CRC resulting in a gain of 1,898 QALYs. The ICER for the 5-year awareness campaign was £13,032 per QALY compared to 'no campaign' giving a NMB of £13 million.

A sensitivity analysis demonstrated that the ICER associated with a one-off awareness campaign would be less than £20,000 per QALY (the threshold commonly used by NICE) if an increase in symptomatic presentation rates of at least 7% was obtained for a period of 1 month.

Table 11a: Model predictions for a one-off awareness campaign and five years of annual awareness campaigns (total and percentage change compared to 'no campaign')

	Model predictions for the current population of England evaluated over a lifetime			**Change compared to 'no awareness campaign'**	
	No awareness campaign	One-off awareness campaign	Five years of annual awareness	One-off awareness campaign	Five years of annual awareness
Dukes' A CRC, symptomatic presentation	169,904	169,930	170,037	26	133
Dukes' B CRC, symptomatic presentation	413,428	413,480	413,691	52	262
Dukes' C CRC, symptomatic presentation	562,025	562,059	562,193	33	167
Dukes' D CRC, symptomatic presentation	635,013	634,921	634,551	-92	-462
Total incidence through symptomatic presentation	1,780,370	1,780,390	1,780,472	20	101
Dukes' A CRC, screen/surveillance detected	67,653	67,653	67,651	-0	-2
Dukes' B CRC, screen/surveillance detected	37,818	37,817	37,813	-1	-5
Dukes' C CRC, screen/surveillance detected	22,595	22,593	22,585	-2	-10
Dukes' D CRC, screen/surveillance detected	9,875	9,873	9,865	-2	-10
Total incidence though screening/surveillance	137,940	137,935	137,914	-5	-27
CRC-specific deaths	1,020,002	1,019,937	1,019,673	-66	-330
Deaths with undiagnosed CRC	535,114	535,100	535,041	-14	-73
Total costs related to screening (discounted)	991,214,492	991,211,085	991,198,885	-£ 3,407	-£ 15,607
Cancer management (inc. pathology) costs (discounted)	3,613,360,394	3,613,454,837	3,613,807,545	£ 94,443	£ 447,151
Cost of additional GP consultations/referrals (discounted)	-	855,716	3,882,488	£ 855,716	£ 3,882,488
Cost of awareness campaign (discounted)	£ -	£ 4,499,995	20,417,036	£ 4,499,995	£ 20,417,036
Total cost (discounted)	£4,604,574,886	£4,610,021,632	4,629,305,955	£ 5,446,745	£ 24,731,068
Total life years gained (discounted)	559,242,232	559,242,854	559,245,158	622	2,926
Total QALYs gained (discounted)	445,074,314	445,074,718	445,076,212	404	1,898

Table 11b: Model predictions for a one-off awareness campaign and five years of annual awareness campaigns (percentage change compared to 'no campaign')

Change compared to "No awareness campaign" for the population of England	One-off awareness campaign		Five years of annual awareness campaign	
Dukes' A CRC, symptomatic presentation	26	0.0%	133	0.1%
Dukes' B CRC, symptomatic presentation	52	0.0%	262	0.1%
Dukes' C CRC, symptomatic presentation	33	0.0%	167	0.0%
Dukes' D CRC, symptomatic presentation	-92	0.0%	-462	-0.1%
Total incidence through symptomatic presentation	20		101	
Dukes' A CRC, screen/surveillance detected	-0	0.0%	-2	0.0%
Dukes' B CRC, screen/surveillance detected	-1	0.0%	-5	0.0%
Dukes' C CRC, screen/surveillance detected	-2	0.0%	-10	0.0%
Dukes' D CRC, screen/surveillance detected	-2	0.0%	-10	-0.1%
Total incidence though screening/surveillance	-5		-27	
CRC-specific deaths	-66	0.0%	-330	0.0%
Deaths with undiagnosed CRC	-14	0.0%	-73	0.0%
Total costs related to screening (discounted)	-£ 3,407	0.0%	-£ 15,607	0.0%
Cancer management (inc. pathology) costs (discounted)	£ 94,443	0.0%	£ 447,151	0.0%
Cost of additional GP consultations/referrals (discounted)	£ 855,716	0.0%	£ 3,882,488	0.0%
Cost of awareness campaign (discounted)	£ 4,499,995	0.0%	£ 20,417,036	0.0%
Total cost (discounted)	£ 5,446,745	0.1%	£ 24,731,068	0.5%
Total life years gained (discounted)	622	0.0%	2,926	0.0%
Total QALYs gained (discounted)	404	0.0%	1,898	0.0%
ICER	£ 13,496		£ 13,032	
NMB	£ 2,624,770		£ 13,222,909	

Scenario analyses

Several scenario analyses were undertaken to test the impact of model assumptions and data uncertainty on the results. These analyses are presented in Tables 12 and 13.

(1) Duration of effect of campaign on incidence

The base case assumed an increase in symptomatic presentation rates of 10% for one month. A scenario analysis which assumed the effect of the campaign on presentation rates and incidence continued for 3 months was performed. In this scenario the number of additional GP attendances and referrals was not changed from the base case. This scenario analysis resulted in 202 less CRC deaths compared to 'no campaign'. This led to a gain of 1,243 QALYs and an ICER of £4,536 per QALY gained.

(2) Proportion of increased attendances which are assumed to be additional

The base case assumed that 50% of the increased GP consultation and referrals associated with the campaign were additional rather than earlier but this value is highly uncertain. A scenario analysis considered a proportion of 90%. Although there will be a relationship between this proportion and the impact of the campaign on incidence, this relationship is unknown. So, for this sensitivity analysis the impact of the campaign on CRC incidence was not changed. This analysis resulted in a total cost of additional GP attendances and consultations of approximately £1.5 million which increased the ICER to £15,192 per QALY gained. Hence the cost-effectiveness results are not very sensitive to this highly uncertain parameter.

(3) Duration, magnitude and stage distribution of the increase in incidence immediately following the campaign

The sensitivity analysis demonstrates that the ICER associated with an awareness campaign is highly dependent on the magnitude of the increase in incidence following the campaign, the duration of the increase in incidence following the campaign and the stage distribution of any additional incidence following the campaign. For example, if the magnitude of the increase was just 5% and restricted to Dukes' C and stage D CRC then the ICER is approximately £55,000 per QALY.

Table 12: Scenario analyses to explore the effect of varying uncertain parameters Model predictions for a one-off awareness campaign (total change compared to 'no campaign' and % change)

Change compared to "No awareness campaign" for the population of England	One-off awareness campaign					
	Base case: Effect duration = 1 month, 50% of GP referrals/ consultations increase is additional		Effect duration = 3 months		90% of GP referrals/ consultations increase is additional	
Dukes' A CRC, symptomatic presentation	26	0.0%	80	0.0%	26	0.0%
Dukes' B CRC, symptomatic presentation	52	0.0%	159	0.0%	52	0.0%
Dukes' C CRC, symptomatic presentation	33	0.0%	107	0.0%	33	0.0%
Dukes' D CRC, symptomatic presentation	-92	0.0%	-283	0.0%	-92	0.0%
Total incidence through symptomatic presentation	20		62		20	
Dukes' A CRC, screen/surveillance detected	-0	0.0%	-1	0.0%	-0	0.0%
Dukes' B CRC, screen/surveillance detected	-1	0.0%	-3	0.0%	-1	0.0%
Dukes' C CRC, screen/surveillance detected	-2	0.0%	-6	0.0%	-2	0.0%
Dukes' D CRC, screen/surveillance detected	-2	0.0%	-7	-0.1%	-2	0.0%
Total incidence though screening/surveillance	-5		-17		-5	
CRC-specific deaths	-66	0.0%	-202	0.0%	-66	0.0%
Deaths with undiagnosed CRC	-14	0.0%	-44	0.0%	-14	0.0%
Total costs related to screening (discounted)	-£ 3,407	0.0%	-£ 10,482	0.0%	-£ 3,407	0.0%
Cancer management (inc. pathology) costs (discounted)	£ 94,443	0.0%	£ 295,434	0.0%	£ 94,443	0.0%
Cost of additional GP consultations/referrals (discounted)	£ 855,716	0.0%	£ 855,716	0.0%	£1,540,288	0.0%
Cost of awareness campaign (discounted)	£ 4,499,995	0.0%	£ 4,499,995	0.0%	£4,499,995	0.0%
Total cost (discounted)	£ 5,446,745	0.1%	£ 5,640,663	0.1%	£6,131,318	0.1%
Total life years gained (discounted)	622	0.0%	1,917	0.0%	622	0.0%
Total QALYs gained (discounted)	404	0.0%	1,243	0.0%	404	0.0%
ICER	£ 13,496		£ 4,536		£ 15,192	
NMB	£ 2,624,770		£ 19,229,261		£1,940,197	

Table 13: Sensitivity analysis on duration, magnitude and stage distribution of the increase in incidence immediately following the campaign

Increase in CRC incidence immediatley following the awareness campaign		ICER	
Duration of increase	Magnitude of increase	One-off awareness campaign	Five years of annual awareness
Identical increase in Dukes' stages A-D			
1 month	5%	£ 26,767	£ 25,818
1 month	10%	£ 13,496	£ 13,032
3 months	5%	£ 8,843	£ 8,549
Increase in Dukes' C and Stage D only			
1 month	5%	£ 55,210	£ 53,272
1 month	10%	£ 27,826	£ 26,868
1 month	20%	£ 14,135	£ 13,666
3 months	5%	£ 17,965	£ 17,359

Comparison with a campaign to improve screening uptake

In the model base case 37% of people never attend screening and 85% of the remainder population attend in each round giving an overall uptake by round of 54% as seen in NHS BCSP. An exploratory analysis was undertaken to allow a comparison between the potential benefits associated with an awareness campaign compared with the potential benefits associated with an intervention designed to increase screening uptake. The exploratory analysis considered the potential benefits associated with a reduction in the number of persons never attending screening by 1% and 10%[1]. A reduction in screening non-attendees of 10% has the potential to reduce CRC mortality by considerably more than may be achieved by a one-off awareness campaign.

[1] Note: this analysis assumes that if a person is removed from the screening non-attendees group they will continue to attend screening rounds with a probability of 85%

Table 14: Comparison of awareness campaign with an intervention which increases screening uptake

Change compared to "No awareness campaign" for the population of England	One-off awareness campaign		Reduction in number of persons never attending screening by 1%		Reduction in number of persons never attending screening by 10%	
Dukes' A CRC, symptomatic presentation	26	0.0%	-5	0.0%	-50	0.0%
Dukes' B CRC, symptomatic presentation	52	0.0%	-16	0.0%	-153	0.0%
Dukes' C CRC, symptomatic presentation	33	0.0%	-27	0.0%	-255	0.0%
Dukes' D CRC, symptomatic presentation	-92	0.0%	-36	0.0%	-341	-0.1%
Total incidence through symptomatic presentation	20		-83		-798	
Dukes' A CRC, screen/surveillance detected	-0	0.0%	18	0.0%	175	0.3%
Dukes' B CRC, screen/surveillance detected	-1	0.0%	13	0.0%	125	0.3%
Dukes' C CRC, screen/surveillance detected	-2	0.0%	10	0.0%	94	0.4%
Dukes' D CRC, screen/surveillance detected	-2	0.0%	5	0.0%	46	0.5%
Total incidence though screening/surveillance	-5		46		440	
CRC-specific deaths	-66	0.0%	-38	0.0%	-359	0.0%
Deaths with undiagnosed CRC	-14	0.0%	-14	0.0%	-136	0.0%

6. Conclusions

The clinical evidence review yielded eleven studies which met the inclusion and exclusion criteria. Only one study was an RCT. The mapping review reported the characteristics of an additional 56 interventions, though this review has limitations. Of the eleven included studies, most studies were from the USA and mainly focussed on BME or socio-economically disadvantaged subgroups within the general population. Only four studies involved interventions which aimed to increase early presentation on the basis of symptoms whilst the remainder aimed to increase screening attendance. Data on campaigns in the UK were under-reported and often unpublished. Overall, studies were not reported well enough to enable an assessment of risk of bias, but seemed likely to be of moderate to high risk of bias. As such, all results should be interpreted with caution.

Studies tended to report positive results at all stages of the logic model, but it is not possible to draw comparative conclusions between interventions, or which components of interventions, conferred the positive effects. The logic model was generally supported, though evidence to inform the link between increased self-presentations to a GP or increased screening attendance leading to increased early detection and decreased morbidity and mortality was lacking. Only one study reported data for increased early detection, and found a non-significant increase in detection of CRC with no spread. It is unclear whether a larger event rate/sample size, or a more sensitive measure of progression also including pre-cancerous states, may have produced a significant result. It is also unclear what constitutes a clinically relevant change in early detection. The final stage in the logic model, mortality and morbidity, may have been more sensitive to the effects of earlier detection but would require much longer study durations.

A cost-effectiveness analysis was undertaken based on data from the pilot signs and symptoms campaign. The reliance on this single study is a major limitation. There were several key limitations associated with data available from the pilot signs and symptoms campaign:

- Although an increase in CRC incidence was observed in March 2011 compared to the previous year, there is considerable uncertainty surrounding whether this increase was in fact due to the pilot campaign. Monthly variations may occur as a result of factors such as: different length months, different numbers of clinics, different numbers of working days, etc. An analysis of similar incidence data non-pilot regions was not available.
- Data on GP consultation numbers was not collected for a long enough period to see the duration of the effect of the campaign on GP consultations.
- The increase in GP referrals seen in the Cancer Wait times was only available for one of the pilot regions and was not available for a long enough period to see the duration of the effect of the campaign on GP referrals.

- The data on the stage distribution of CRC following the pilot involved very small numbers so it was not possible to draw any significant conclusions.
- No data on the effect of the campaign on GP referrals or CRC incidence by age was available.
- There was no information on what proportion of the increase in GP consultations and GP referrals are likely to be 'additional' as opposed to 'earlier'.
- There was no information on the increase in the detection of adenomas or the increase in the detection of other lower GI conditions which have similar symptoms to CRC.
- No data was available on the effect of the campaign on rates of emergency presentation with CRC. A reduction in emergency presentation rates could potentially lead to cost savings.

Due to limitations with the data available it was necessary to make several assumptions:

- The duration of the effect of the campaign was assumed to be short-lived with an increase in CRC incidence only observed for one month following the campaign.
- The campaign was assumed to have the same proportional effect on presentation rates for each CRC stage.
- The campaign was assumed to have the same effect on presentation rates for all age groups.
- Of the increases in GP consultations and GP referrals, it was assumed that 50% were 'additional' (i.e. would not have otherwise occurred) as opposed to 'earlier' (i.e. would have occurred at a later date).

Given these assumptions, the analysis demonstrated that an awareness campaign would be cost-effective with an ICER of £13,496 per QALY gained. Assuming that a repeated annual campaign would have similar effects, a 5-year repeated campaign would have a similar ICER. Scenario analyses showed that the ICER would increase slightly if a higher proportion of the increase in GP consultations/referrals were additional as opposed to earlier. The results of the analysis are highly sensitive to changes in the duration of the effect of the campaign. If the duration of the effects were assumed to last for 3 months rather than 1 month, QALY gains would increase considerably and the ICER would reduce to approximately £4,500 per QALY gained. If the campaign only affects symptomatic presentation rates for late stage CRC then the ICER may increase to £28K. An exploratory analysis which compared the benefits of an awareness campaign (that increased symptomatic presentation rates by 10% for 1 month) to a screening campaign (that reduced the number of persons never attending screening by 10%) demonstrated that the screening campaign would reduce five times the number of CRC deaths compared to the awareness campaign.

7. Priorities for Future Research

Design of early awareness interventions

The studies described within the systematic review highlight the range of early awareness interventions which are potentially effective. Such interventions should be considered when designing a future campaign or targeted intervention, and the lessons of previous campaigns taken into account.

Several interventions made use of focus groups in the design stage, and two interventions involved the target community in the design and delivery of the intervention. It is unclear whether such approaches confer an effective advantage, and future research may focus on ascertaining whether this is the case.

An intervention can be designed to target specific subgroups such as a particular socioeconomic group, age group or region. As areas of socioeconomic deprivation are known to be associated with lower levels of screening uptake and slightly higher levels of CRC, [47] campaigns focussing on the different needs of such groups are likely to have different cost-effectiveness due to different resource implications and different QALY gains to be made. This is especially true where community engagement and tailoring to the socio-cultural norms of an area is involved. This general principle also holds true for all campaigns, and it is likely that an evaluation, ideally at multiple heterogeneous sites, of any new campaign is necessary to ascertain its effectiveness and cost-effectiveness.

Campaign monitoring and data collection

During the process of this review, a number of CRC campaigns that have been trialled or implemented regionally across the UK were encountered, but, as they were not evaluated, they were not includable in the review and their efficacy and cost-effectiveness remains unknown. One UK study's (Lyons et al)[13] umbrella organisation (Improvement Foundation) dissolved before the project evaluation was completed. Another (WoSCAP)[12] is only available through the Cancer Research UK website as an unpublished report to funders; the project website itself, which is referred to as a source of additional material, appears to no longer be available (presumably due to the end of funding). The third (Ramsay)[14] is (as yet) unpublished and only available as an online report. The data available from the 'signs and symptoms' pilot campaign which was used in the cost-effectiveness modelling was associated with serious limitations which have been discussed previously. It would therefore seem that a priority for future research is to co-ordinate and maximise the evaluation and dissemination of efforts that are already been made to increase CRC awareness in a way that is not dependent on short-term project funding.

Few studies encountered throughout this review reported the number of diagnoses achieved as a result of the intervention, and none reported the final outcome: mortality. Data relating to the link between increased self-presentation or increased screening and increased early detection should be sought, either through primary or secondary research. Ideally, all studies assessing the effectiveness of CRC interventions should include 'stage at' diagnosis and number of diagnoses.

Few studies were at low risk of bias. Future research should consider carefully the sources of bias and confounding that non-randomised studies are prone to and seek to minimise their potential to influence the study. As event rates are low, any future studies should carefully consider the power of the sample size to detect small but clinically relevant changes in outcomes.

Specific suggestions for improved monitoring of campaigns include:

- To allow a clear observation of the duration of the effect of a campaign it is suggested that data be collected for a period of at least two years (one year before campaign and one year after campaign). This approach would also allow observation of seasonal variations so these could be differentiated from the effect of the campaign.
- Comparison with other non-intervention regions to establish whether any changes observed are likely to be attributable to the campaign.
- Investigation of reasons behind regional variations in campaign effect.
- To enable information to be obtained on the effect of the campaign on different age groups: all should be reported and split into 5- or 10-year age bands.
- An analysis of the effects of an awareness campaign should incorporate data on GP consultations, GP referrals, and CRC incidence (by stage) if possible.
- If possible, data on the rates of diagnosis of other lower GI conditions which have similar symptoms to CRC should be collected.

8. Appendix

8.1. Appendix: Search strategy

Database/sources searched

1. Medline and Medline in Process & Other Non-Indexed citations (Ovid)
2. Embase (Ovid)
3. Cochrane Database of Systematic Reviews (Cochrane)
4. Cochrane Central Register of Controlled Trials (Cochrane)
5. NHS Health Economic Evaluation Database (Cochrane)
6. Health Technology Assessment Database (Cochrane)
7. Database of Abstracts of Review of Effects (Cochrane)
8. Science Citation Index (Web of Science)
9. Social Science Citation Index (Web of Science)
10. Conference Proceedings index (Web of Science)
11. Cumulative Index to Nursing and Allied Health Literature (EBSCO)
12. PsycINFO (Ovid)
13. Health Management Information Consortium (Ovid)
14. Social Policy and Practice (Ovid)
15. Dissertation Abstracts (ProQuest)
16. UK CRN Portfolio Database (NIHR)
17. Clinical Trials.gov (NIH)
18. Open Grey
19. American Society of Cancer Oncology
20. European Society for Medical Oncology
21. Cancer registers (see separate document)

Limits applied

Date: None
Language: English only
Study design: None
Country of publication: None

Summary table of searches

Database	Keywords in database	Records retrieved	With bowel	Total
Medline and Medline in Process & Other Non-Indexed citations	$$medline	557	+9	566
EMBASE	$$embase	681	+22	703
Cochrane Library	$$cochrane	143	+2	145
SCI-E, SSCI, CPI-S	$$wos	754	+95	849
CINAHL	$$cinahl	215	+3	218
PsycINFO	$$psycinfo	62	+2	64
HMIC	$$hmic	29	+16	45
Social Policy and Practice	$$spp	24	+9	33
Dissertation Abstracts	$$proquest	193	+3	196
Total retrieved	**-**	**2658**	**161**	**2819**

Number of unique records in database	**$$electronic searches**	**1804**	**131**	**-**
UK CRN	See end	6	-	-
Clinical Trials.gov	See end	16	-	
metaRegister of Controlled Trials	See end	1	-	
Open Grey	See end	17	-	
ASCO	See end	20	-	
ESMO	See end	25	-	
Cancer registers	NA	Selective	-	
Records in Word file	**-**	**85**	**-**	

MEDLINE(R) In-Process & Other Non-Indexed Citations and MEDLINE(R): Ovid. 1948 to Present 1st December 2011

1. exp Colorectal Neoplasms/
2. exp Cecal Neoplasms/
3. ((colorect$ or colo rect$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
4. ((colon or colonic) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
5. ((rectal$ or rectum$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
6. ((sigmoid$ or rectosigmoi$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
7. ((cecum or cecal or caecum or caecal or il?eoc?ecal or il?eoc?ecum) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
8. (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
9. (large intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
10. (lower intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
11. (hepatic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
12. (splenic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
13. or/1-12
14. exp Health Promotion/
15. health promotion.tw.
16. promot$ health.tw.
17. Health Education/
18. health education.tw.
19. Patient Education as topic/
20. Mass Media/
21. Social Marketing/
22. social marketing.tw.
23. campaign$.tw.
24. or/14-23
25. Awareness/
26. (aware$ or knowledge$ or attitude$ or recogni$).tw.

27. 25 or 26
28. (delay$ or late or later or early or earlier or postpone$ or wait$ or accept$ or deny or denial or promot$).tw.
29. (helpseeking or diagnos$ or present$ or detect$ or attend$ or consult$ or seek or sought or refer or treatment or care).tw.
30. 28 and 29
31. (symptom$ and (detect$ or identif$)).tw.
32. 30 or 31
33. 13 and 24 and 27
34. 13 and 24 and 32
35. 33 or 34
36. limit 35 to English language

Embase: Ovid. 1974 to 2011 Week 47
December 2011

1. exp large intestine tumor/
2. ((colorect$ or colo rect$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
3. ((colon or colonic) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
4. ((rectal$ or rectum$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
5. ((sigmoid$ or rectosigmoi$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
6. ((cecum or cecal or caecum or caecal or il?eoc?ecal or il?eoc?ecum) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
7. (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
8. (large intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
9. (lower intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
10. (hepatic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
11. (splenic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
12. or/1-11
13. exp health promotion/
14. health promotion.tw.
15. promot$ health.tw.
16. health education/
17. health education.tw.
18. patient education/
19. mass medium/
20. social marketing/
21. social marketing.tw.
22. campaign$.tw.
23. or/13-22
24. awareness/
25. (aware$ or knowledge$ or attitude$ or recogni$).tw.
26. 24 or 25

27. (delay$ or late or later or early or earlier or postpone$ or wait$ or accept$ or deny or denial or promot$).tw.
28. (helpseeking or diagnos$ or present$ or detect$ or attend$ or consult$ or seek or sought or refer or treatment or care).tw.
29. 27 and 28
30. (symptom$ and (detect$ or identif$)).tw.
31. 29 or 30
32. 12 and 23 and 26
33. 12 and 23 and 31
34. 32 or 33
35. limit 34 to English language

Cochrane Database of Systematic Reviews (CDR): Wiley Interscience. 1996-present
Cochrane Central Register of Controlled Trials (CCRT): Wiley Interscience. 1898-present
NHS Economic Evaluation Database (NHS EED): Wiley Interscience. 1995-present
Health Technology Assessment Database (HTA): Wiley Interscience. 1995-present
Database of Abstracts of Reviews of Effects (DARE)): Wiley Interscience. 1995-present
1st December 2011

#1 MeSH descriptor Colorectal Neoplasms explode all trees
#2 MeSH descriptor Cecal Neoplasms explode all trees
#3 ((colorect* near cancer*) or (colorect* near neoplasm*) or (colorect* near malignan*) or (colorect* near oncolog*) or (colorect* near tumor*) or (colorect* near tumour*) or (colorect* near carcinoma*) or (colorect* near adenocarcinoma*))
#4 ((colon* near cancer*) or (colon* near neoplasm*) or (colon* near malignan*) or (colon* near oncolog*) or (colon* near tumor*) or (colon* near tumour*) or (colon* near carcinoma*) or (colon* near adenocarcinoma*))
#5 ((rectal* near cancer*) or (rectal* near neoplasm*) or (rectal* near malignan*) or (rectal* near oncolog*) or (rectal* near tumor*) or (rectal* near tumour*) or (rectal* near carcinoma*) or (rectal* near adenocarcinoma*))
#6 ((rectum* near cancer*) or (rectum* near neoplasm*) or (rectum* near malignan*) or (rectum* near oncolog*) or (rectum* near tumor*) or (rectum* near tumour*) or (rectum* near carcinoma*) or (rectum* near adenocarcinoma*))
#7 ((sigmoid* near cancer*) or (sigmoid* near neoplasm*) or (sigmoid* near malignan*) or (sigmoid* near oncolog*) or (sigmoid* near tumor*) or (sigmoid* near tumour*) or (sigmoid* near carcinoma*) or (sigmoid* near adenocarcinoma*))
#8 ((cecum* near cancer*) or (cecum* near neoplasm*) or (cecum* near malignan*) or (cecum* near oncolog*) or (cecum* near tumor*) or (cecum* near tumour*) or (cecum* near carcinoma*) or (cecum* near adenocarcinoma*))
#9 ((cecal* near cancer*) or (cecal* near neoplasm*) or (cecal* near malignan*) or (cecal* near oncolog*) or (cecal* near tumor*) or (cecal* near tumour*) or (cecal* near carcinoma*) or (cecal* near adenocarcinoma*))
#10 **((bowel* near cancer*) or (bowel* near neoplasm*) or (bowel* near malignan*) or (bowel* near oncolog*) or (bowel* near tumor*) or (bowel* near tumour*) or (bowel* near carcinoma*) or (bowel* near adenocarcinoma*))**
#11 (#1 OR #2 OR #3 OR #4 OR #5 OR #6 OR #7 OR #8 OR #9 or #10)
#12 MeSH descriptor Health Promotion explode all trees
#13 (health promotion):ti,ab,kw
#14 (promot* health):ti,ab,kw
#15 MeSH descriptor Health Education explode all trees
#16 (health education):ti,ab,kw
#17 MeSH descriptor Patient Education as Topic, this term only

#18 MeSH descriptor Mass Media, this term only
#19 MeSH descriptor Social Marketing, this term only
#20 (social marketing):ti,ab,kw
#21 (campaign*):ti,ab,kw
#22 (#12 OR #13 OR #14 OR #15 OR #16 OR #17 OR #18 OR #19 OR #20 OR #21)
#23 MeSH descriptor Awareness, this term only
#24 (aware* or knowledge* or attitude* or recogni*):ti,ab,kw
#25 (#23 OR #24)
#26 (delay* or late or later or early or earlier or postpone* or wait* or accept* or deny or denial or promot*):ti,ab,kw
#27 (helpseeking or diagnos* or present* or detect* or attend* or consult* or seek or sought or refer or treatment or care):ti,ab,kw
#28 (#26 AND #27)
#29 (symptom* and (detect* or identif*)):ti,ab,kw
#30 (#28 OR #29)
#31 (#11 AND #22 AND #25)
#32 (#11 AND #22 AND #30)
#33 (#31 OR #32)

Science Citation Index (SCI): Web of Science 1899-present
Social Science Citation Index (SSCI): Web of Science 1956-present
Conference Proceedings Index (CPI): Web of Science 1990-present
1st December 2011

11 #9 AND #6 AND #5
Refined by: Languages=(ENGLISH)
10 #9 AND #6 AND #5
9 #7 OR #8
8 Topic=(((delay* or late or later or early or earlier or postpone* or wait* or accept* or deny or denial or promot*) NEAR/20 (helpseeking or diagnos* or present* or detect* or attend* or consult* or seek or sought or refer or treatment or care)))
7 Topic=(aware* or knowledge* or attitude* or recogni*)
6 Topic=((“health promotion”) or (“promot* health”) or (“health education”) or (“patient education”) or media or (“social marketing”) or campaign*)
5 #4 OR #3 OR #2 OR #1
4 **Topic=(bowel* cancer* or bowel* neoplasm* or bowel* tumo*r* or bowel* adenocarcinoma or bowel* carcinoma)**
3 Topic=(colon* cancer* or colon* neoplasm* or colon* tumo*r* or colon* adenocarcinoma or colon* carcinoma)
2 Topic=(rectal cancer* or rectal neoplasm* or rectal tumo*r* or rectal adenocarcinoma or rectal carcinoma)
1 Topic=(colorectal cancer* or colorectal neoplasm* or colorectal tumo*r* or colorectal adenocarcinoma or colorectal carcinoma)

CINAHL: EBSCO.
1st December 2011

S33 S17 and S28 and S31 Limiters - English Language
S32 S17 and S28 and S31
S31 S29 or S30
S30 TI ((((delay* or late or later or early or earlier or postpone* or wait* or accept* or deny or denial or promot*) N20 (helpseeking or diagnos* or present* or detect* or attend* or consult*

or seek or sought or refer or treatment or care)))) OR AB ((((delay* or late or later or early or earlier or postpone* or wait* or accept* or deny or denial or promot*) N20 (helpseeking or diagnos* or present* or detect* or attend* or consult* or seek or sought or refer or treatment or care))))

S29 TI (aware* or knowledge* or attitude* or recogni*) OR AB (aware* or knowledge* or attitude* or recogni*)

S28 S18 or S19 or S20 or S21 or S22 or S23 or S24 or S25 or S26 or S27

S27 TI campaign* OR AB campaign*

S26 TI social marketing OR AB social marketing

S25 (MH "Social Marketing")

S24 (MH "Telecommunications+")

S23 TI patient education OR AB patient education

S22 TI health education OR AB health education

S21 (MH "Health Education+")

S20 TI promot* health OR AB promot* health

S19 TI health promotion OR AB health promotion

S18 (MH "Health Promotion+")

S17 S1 or S2 or S3 or S4 or S5 or S6 or S7 or S8 or S9 or S10 or S11 or S12 or S13 or S14 or S15 or S16

S16 TI (splenic flexur* cancer* or splenic flexur* neoplasm* or splenic flexur* tumo*r* or splenic flexur* adenocarcinoma or splenic flexur* carcinoma) OR AB (splenic flexur* cancer* or splenic flexur* neoplasm* or splenic flexur* tumo*r* or splenic flexur* adenocarcinoma or splenic flexur* carcinoma)

S15 TI (hepatic flexur* cancer* or hepatic flexur* neoplasm* or hepatic flexur* tumo*r* or hepatic flexur* adenocarcinoma or hepatic flexur* carcinoma) OR AB (hepatic flexur* cancer* or hepatic flexur* neoplasm* or hepatic flexur* tumo*r* or hepatic flexur* adenocarcinoma or hepatic flexur* carcinoma)

S14 TI ((large intestin* cancer* or large intestin* neoplasm* or large intestin* tumo*r* or large intestin* adenocarcinoma or large intestin* carcinoma)) OR AB ((large intestin* cancer* or large intestin* neoplasm* or large intestin* tumo*r* or large intestin* adenocarcinoma or large intestin* carcinoma))

S13 **TI ((bowel* cancer* or bowel* neoplasm* or bowel* tumo*r* or bowel* adenocarcinoma or bowel* carcinoma)) OR AB ((bowel* cancer* or bowel* neoplasm* or bowel* tumo*r* or bowel* adenocarcinoma or bowel* carcinoma))**

S12 TI ((il?eoc?ecum cancer* or il?eoc?ecum neoplasm* or il?eoc?ecum tumo*r* or il?eoc?ecum adenocarcinoma or il?eoc?ecum carcinoma)) OR AB ((il?eoc?ecum cancer* or il?eoc?ecum neoplasm* or il?eoc?ecum tumo*r* or il?eoc?ecum adenocarcinoma or il?eoc?ecum carcinoma))

S11 TI ((il?eoc?ecal cancer* or il?eoc?ecal neoplasm* or il?eoc?ecal tumo*r* or il?eoc?ecal adenocarcinoma or il?eoc?ecal carcinoma)) OR AB ((il?eoc?ecal cancer* or il?eoc?ecal neoplasm* or il?eoc?ecal tumo*r* or il?eoc?ecal adenocarcinoma or il?eoc?ecal carcinoma))

S10 TI ((caecum cancer* or caecum neoplasm* or caecum tumo*r* or caecum adenocarcinoma or caecum carcinoma)) OR AB ((caecum cancer* or caecum neoplasm* or caecum tumo*r* or caecum adenocarcinoma or caecum carcinoma))

S9 TI ((c?ecal cancer* or c?ecal neoplasm* or c?ecal tumo*r* or c?ecal adenocarcinoma or c?ecal carcinoma)) OR AB ((c?ecal cancer* or c?ecal neoplasm* or c?ecal tumo*r* or c?ecal adenocarcinoma or c?ecal carcinoma))

S8 TI ((c?ecum cancer* or c?ecum neoplasm* or c?ecum tumo*r* or c?ecum adenocarcinoma or c?ecum carcinoma)) OR AB ((c?ecum cancer* or c?ecum neoplasm* or c?ecum tumo*r* or c?ecum adenocarcinoma or c?ecum carcinoma))

S7 TI ((rectosigmoi* cancer* or rectosigmoi* neoplasm* or rectosigmoi* tumo*r* or rectosigmoi* adenocarcinoma or rectosigmoi* carcinoma)) OR AB ((rectosigmoi* cancer* or rectosigmoi*

neoplasm* or rectosigmoi* tumo*r* or rectosigmoi* adenocarcinoma or rectosigmoi* carcinoma))

S6 TI ((sigmoid cancer* or sigmoid neoplasm* or sigmoid tumo*r* or sigmoid adenocarcinoma or sigmoid carcinoma)) OR AB ((sigmoid cancer* or sigmoid neoplasm* or sigmoid tumo*r* or sigmoid adenocarcinoma or sigmoid carcinoma))

S5 TI ((colon* cancer* or colon* neoplasm* or colon* tumo*r* or colon* adenocarcinoma or colon* carcinoma)) OR AB ((colon* cancer* or colon* neoplasm* or colon* tumo*r* or colon* adenocarcinoma or colon* carcinoma))

S4 TI ((rectal cancer* or rectal neoplasm* or rectal tumo*r* or rectal adenocarcinoma or rectal carcinoma)) OR AB ((rectal cancer* or rectal neoplasm* or rectal tumo*r* or rectal adenocarcinoma or rectal carcinoma))

S3 TI (colorectal cancer* or colorectal neoplasm* or colorectal tumo*r* or colorectal adenocarcinoma or colorectal carcinoma) OR AB (colorectal cancer* or colorectal neoplasm* or colorectal tumo*r* or colorectal adenocarcinoma or colorectal carcinoma)

S2 (MH "Intestinal Neoplasms+")

S1 (MH "Colorectal Neoplasms+")

PsycINFO: Ovid. 1806 to November Week 4 2011
1st December 2011

1. ((colorect$ or colo rect$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
2. ((colon or colonic) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
3. ((rectal$ or rectum$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
4. ((sigmoid$ or rectosigmoi$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
5. ((cecum or cecal or caecum or caecal or il?eoc?ecal or il?eoc?ecum) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
6. (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
7. (large intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
8. (lower intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
9. (hepatic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
10. (splenic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
11. or/1-10
12. exp Health Promotion/
13. health promotion.tw.
14. promot$ health.tw.
15. Health Education/
16. health education.tw.
17. Mass Media/
18. Social Marketing/
19. social marketing.tw.
20. campaign$.tw.
21. or/12-20
22. Awareness/

23. (aware$ or knowledge$ or attitude$ or recogni$).tw.
24. 22 or 23
25. (delay$ or late or later or early or earlier or postpone$ or wait$ or accept$ or deny or denial or promot$).tw.
26. (helpseeking or diagnos$ or present$ or detect$ or attend$ or consult$ or seek or sought or refer or treatment or care).tw.
27. 25 and 26
28. (symptom$ and (detect$ or identif$)).tw.
29. 27 or 28
30. 11 and 21 and 24
31. 11 and 21 and 29
32. 30 or 31
33. limit 32 to English language

HMIC: Ovid. 1979 to September 2011
1st December 2011

1. exp Colorectal cancer/
2. ((colorect$ or colo rect$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
3. ((colon or colonic) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
4. ((rectal$ or rectum$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
5. ((sigmoid$ or rectosigmoi$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
6. ((cecum or cecal or caecum or caecal or il?eoc?ecal or il?eoc?ecum) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
7. (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
8. (large intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
9. (lower intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
10. (hepatic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
11. (splenic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
12. exp Health promotion/
13. health promotion.tw.
14. promot$ health.tw.
15. exp Health education/
16. health education.tw.
17. patient education/
18. Mass media/
19. social marketing/
20. social marketing.tw.
21. campaign$.tw.
22. or/12-21
23. or/1-11
24. 22 and 23

Social Policy and Practice: Ovid.
29th November 2011

1 ((colorect$ or colo rect$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
2 ((colon or colonic) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
3 ((rectal$ or rectum$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
4 ((sigmoid$ or rectosigmoi$) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
5 ((cecum or cecal or caecum or caecal or il?eoc?ecal or il?eoc?ecum) adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
6 (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
7 (large intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
8 (lower intestin$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
9 (hepatic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
10 (splenic flexur$ adj (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
11 or/1-10
12 (bowel$ adj3 (cancer$ or neoplas$ or oncolog$ or malignan$ or tumo?r$ or carcinoma$ or adenocarcinoma$)).ti,ab.
13 12 not 11

Dissertation and Theses A & I: ProQuest. 1861-present
30th November 2011

#3 #1 OR #2
#2 all("bowel cancer*" OR "bowel neoplasm*" OR "bowel tumo*r*" OR "bowel adenocarcinoma" OR "bowel carcinoma") AND all(((health promotion) OR (promot* health) OR (health education) OR (patient education) OR media OR (social marketing) OR campaign*)) AND all((aware* OR knowledge* OR attitude* OR recogni* OR (((delay* OR late OR later OR early OR earlier OR postpone* OR wait* OR accept* OR deny OR denial OR promot*) NEAR/20 (helpseeking OR diagnos* OR present* OR detect* OR attend* OR consult* OR seek OR sought OR refer OR treatment OR care)))))
#1 all("colorectal cancer*" OR "colorectal neoplasm*" OR "colorectal tumo*r*" OR "colorectal adenocarcinoma" OR "colorectal carcinoma" OR "colon* cancer*" OR "colon* neoplasm*" OR "colon* tumo*r*" OR "colon* adenocarcinoma" OR "colon* carcinoma" OR "rectal cancer*" OR "rectal neoplasm*" OR "rectal tumo*r*" OR "rectal adenocarcinoma" OR "rectal carcinoma") AND all(((health promotion) OR (promot* health) OR (health education) OR (patient education) OR media OR (social marketing) OR campaign*)) AND all((aware* OR knowledge* OR attitude* OR recogni* OR (((delay* OR late OR later OR early OR earlier OR postpone* OR wait* OR accept* OR deny OR denial OR promot*) NEAR/20 (helpseeking OR diagnos* OR present* OR detect* OR attend* OR consult* OR seek OR sought OR refer OR treatment OR care)))))

TRIALS REGISTERS

UK Clinical Research Network (UKCRN): NIHR.
http://public.ukcrn.org.uk/search/
9th December 2011
6 results

Title / Acronym : awareness: 6 results

1. Awareness AD / MIDAS - A comprehensive profile of awareness in early stage dementia
2. Awareness of illness following brain damage - Emotional biases in anosognosia following brain damage - awareness of illness following brain damage
3. RAW - Does Increasing Research Awareness Impact on Accrual? A Feasibility Study
4. Risk factor awareness in patients with coronary heart disease. - Risk factor awareness in patients with coronary heart disease.
5. Self awareness in autism - The psychological functioning of children and adolescents with autism
6. Upper Limb position awareness in Complex Regional Pain Syndrome (CRPS) and other rheumatological - Upper Limb position awareness in Complex Regional Pain Syndrome (CRPS) and other rheumatological pain conditions

Clinical Trials.gov: US NIH.
http://clinicaltrials.gov/ct2/search
9th December 2011

Found 8 studies with search of: (bowel cancer OR colorectal cancer) AND awareness
Found 8 studies with search of: (bowel or colorectal) AND (tumor OR tumour) AND awareness

1	Recruiting	Dignity Therapy in mCRC to Increase Peaceful Awareness & Impact Goals of Care Decision-Making **Conditions:** Stage IV Colorectal Cancer; Dignity Therapy **Intervention:** Behavioral: Dignity Therapy
2	Active, not recruiting	Family Colorectal Cancer Awareness and Risk Education Project (Family CARE Project) **Condition:** Colorectal Cancer **Interventions:** Behavioral: TELECARE; Behavioral: Pamphlet intervention
3	Completed	Colorectal Cancer Screening Intervention Trial **Conditions:** Colorectal Cancer; Colorectal Cancer Screening **Interventions:** Other: Control; Other: Reduced out of pocket expense; Behavioral: one on one education; Behavioral: Group education
4	Recruiting	Screening for Familial Colorectal Cancer (CRC) Patients **Condition:** Colorectal Cancer **Intervention:** Behavioral: Questionnaire
5	Recruiting	Using Effective Provider-Patient Communication to Improve Cancer Screening Among Low Literacy Patients

		Conditions: Cervical Cancer; Breast Cancer; Colorectal Cancer **Intervention:** Other: Cancer risk communication skills training
6	Completed Has Results	Men's Beliefs About Associations Between HPV, Cancers, and HPV Vaccination **Condition:** Anus Neoplasms **Intervention:**
7	Active, not recruiting	Study of Economic Circumstances, Service Utilization, and Service Needs Among Older Colon Cancer Patients **Condition:** Colon Cancer **Intervention:** Behavioral: Patient Interview
8	Available	Evaluation of the Proliferative Activities of Insulin Analogues in Primary Human Tumor Cells **Conditions:** Endometrial Cancer; Colon Cancer **Intervention:** Other: Tissue sample from tumor

metaRegister of Controlled Trials
12th December 2011

1 Results for "Colorectal cancer awareness"
http://www.controlled-trials.com/mrct/search.html

Family Colorectal Cancer Awareness and Risk Education Project (Family CARE Project) Status: Active, not recruiting Source of record: NIH ClinicalTrials.gov Register (International) - subset of randomised trial records

GREY LIT SEARCHING

Searched Open Grey
http://www.opengrey.eu/search/request?q=colon+cancer&b=20
9th December 2011
17 results

Searched for "cancer promotion" to give 17 results

Lifestyle and cancer A health promotion programme in the ...
Hope, A. ; Kelleher, C. ;
1995 ; I - Miscellaneous
Early cancer detection Possibilities of the systematic early ...
1983 ; I - Miscellaneous
The myth-makers in health promotion Is the randomised control ...
Weston, R. ;
1997 ; U - Thesis
Cancer control in practice A training and resource handbook for ...
Ulster Cancer Foundation, Belfast ; Spiers, A. ;
0000 ; I - Miscellaneous
Cancer in the workplace Health promotion and care programmes - a ...

Ulster Cancer Foundation, Belfast ;
0000 ; I - Miscellaneous
Young people's attitudes to sunbathing
Howard, W. ;
1997 ; I - Miscellaneous
Social representations of cancer and their role in health ...
Tanner, S.J. ;
1997 ; U - Thesis
Adolescent smoking cessation in schools A teachers guide on how ...
Ulster Cancer Foundation, Belfast ;
0000 ; I - Miscellaneous
Cancer research Interim statement of the research promotion
1984 ; I - Miscellaneous
Help your patient stop Smoking cessation in primary health care
Murphy, B. ; Ulster Cancer Foundation, Belfast ;
1990 ; I - Miscellaneous
Preventing skin cancer Guidance for local authorities
1998 ; I - Miscellaneous
The Yorkshire TV skin cancer campaign, developmental research ...
Tones, K. ;
1996 ; I - Miscellaneous
Raising Awareness of Grey Literature in an Academic Community ...
Lin, Yongtao (University of Calgary) ; Vaska, Marcus (University of Calgary) ;
2009 ; K - Conference [Text available online]
Investigation on carcinogenic responses of polychlorinated ...
Bock, K.W. ; Schwarz, M. ;
1999 ; I - Miscellaneous
Messages about breast screening Guidelines for health promotion ...
Austoker, J ;
1995 ; R - Report
Health promotion Social cognitions and testicular self ...
Pee, B.C.G. ;
1997 ; U - Thesis
Cancer mortality in Ireland 1976-1986
Seymour, C. ; Herity, B. ; Moriarty, M.J ;
1989 ; R - Report

American Society of Clinical Oncology (ASCO): http://www.asco.org/
9th December 2011
20 results

Title: awareness
Body Text: colorectal

The awareness and knowledge levels of colorectal cancer (CRC) patients and their first-degree relatives (FDR) for CRC screening.
C. Arslan
Abstract **2010 ASCO Annual Meeting - Category: Gastrointestinal (Colorectal) Cancer - Colorectal Cancer**
Background: We aimed to determine awareness and knowledge levels of CRC patients and FDR on CRC screening. Methods: Patients who were being treated or followed at our center and their

FDR were asked to complete a questionnaire on CRC screening with c... (More)
Home > Meetings > Abstracts
Awareness and penetration of KRAS mutation testing in the treatment of patients with metastatic colorectal cancer.
F. Ciardiello
Abstract **2010 ASCO Annual Meeting - Category: Gastrointestinal (Colorectal) Cancer - Colorectal Cancer**
Background: The tumor mutation status of codons 12 and 13 of the KRAS gene is a predictive biomarker in patients (pts) with metastatic colorectal cancer (mCRC). KRAS testing may be used to direct epidermal growth factor receptor (EGFR)-targeting mono... (More)
Home > Meetings > Abstracts
Community health attitude transformation through colon cancer prevention awareness campaign, Lubbock Colorectal Cancer Demonstration Project (LCCDP).
D. Vugrin
Abstract **2008 ASCO Annual Meeting - Category: Gastrointestinal (Colorectal) Cancer - Colorectal Cancer**
Background: Over 80% of colorectal cancer (CRC) can be prevented from occurring and most deaths could be avoided if the best currently available screening and treatment technology is applied to the entire population at risk according to the American ... (More)
Home > Meetings > Abstracts
The awareness and knowledge levels of colorectal cancer ...
Virtual Presentation **2010 2010 ASCO Annual Meeting - Track: Gastrointestinal (Colorectal) Cancer - Session: Gastrointestinal (Colorectal) Cancer (General Poster Session)**
Presenter: Cagatay Arslan
2010 ASCO Annual Meeting Presentation. Session: Gastrointestinal (Colorectal) Cancer (General Poster Session).
Home > MultiMedia > Virtual Meeting
Cancer Awareness Dates | Cancer.Net
Cancer Awareness Dates: March | Cancer.Net
Leadership Perspectives: ASCO Sets Standards for Quality Care in Oncology, Raises Awareness about Barriers to Quality at the National and International Levels
By Allen S. Lichter, MD ASCO Executive Vice President and Chief Executive Officer ASCO continues to be a leader in the national effort to encourage the development of guidelines and programs to safeguard patient access to high-quality...
Home > Meetings > Annual Meeting > Past Annual Meetings > 2007 Annual Meeting > 2007 ASCO Daily News > Monday, June 4, 2007 Section B
Cancer Awareness Dates: September | Cancer.Net
Cancer Awareness Dates: November | Cancer.Net
Cancer Awareness Dates: April | Cancer.Net
Cancer Awareness Dates: February | Cancer.Net
Cancer Awareness Dates: May | Cancer.Net
Cancer Awareness Dates: October | Cancer.Net
Cancer Awareness Dates: July | Cancer.Net
Cancer Awareness Dates: June | Cancer.Net
Cancer Awareness Dates: January | Cancer.Net
Cancer Awareness Dates: August | Cancer.Net
Cancer clinical trials (CCT) awareness and attitudes in cancer survivors (Ca surv).
R. L. Comis
Abstract **2006 ASCO Annual Meeting - Category: Health Services Research - Health Services Research**

Background: A web-based survey of attitudes and awareness of Ca surv towards CCT was performed from 3-4, 2005. The survey instrument was developed jointly by the Coalition of Cancer Cooperative Groups (CCCG) and Northwestern Univ (NU) and executed by... (More)
Cancer Awareness Dates: December | Cancer.Net
Cancer Awareness Dates: Introduction | Cancer.Net

European Society for Medical Oncology (ESMO): http://www.esmo.org/
12th December 2011
25 results

Results **1**-**3** of about **4** for **bowel cancer awareness campaigns**
Other Organizations - European Society for Medical Oncology (ESMO)
... of use; useful links: Anti-**cancer campaigns**; Associations of **...** presenter Lynn Faulds Wood, who beat advanced **bowel cancer**. **...** fourteen years to raise **awareness** of this **...**
www.esmo.org/footer-menu/useful-links/patients-support/other-organizations.html - 46k
Research on **cancer** prevention, detection and management in low **...**
... **cancer** downstaging. Improved **awareness** among the public and health care providers, supported by **...** of head and neck, breast, cervix and large-**bowel** cancers among **...**
annonc.oxfordjournals.org/content/21/10/1935.full
[PDF] Global status report
... approaches to **cancer** prevention and control: primary prevention, early detection, treatment and palliative care. Early diagnosis based on **awareness** of early **...**
www.esmo.org/fileadmin/media/pdf/2011/UN_summit/2010_WHO_Global_Status_Report_on_NCDs.pdf - 2011-07-27

Results **1**-**10** of about **13** for **colorectal cancer awareness campaigns**
[PDF] Microsoft PowerPoint - El Saghir ESMO Stockholm 2008 Epidemiol **...**
... Anti-**Cancer** programs **Awareness Campaigns ...** Rectal, Breast **Cancer ...** Bladder (11.7%) Lymphoma (15.6%) **Colorectal** (11.2%) Lung (16%) Stomach (9.8%) Leukemia (9.5%) **...**
www.esmo.org/.../977/19/El%20Saghir%20ESMO%20Stockholm%202008%20Epidemiol%20Prev%20Final-2.ppt.pdf - 2008-10-07
Scaling up **cancer** diagnosis and treatment in developing countries **...**
... States, multidrug therapy for **colorectal cancer** costs up **...** as a result of community public **awareness campaigns** and the **...** staff in clinical breast **cancer** examination **...**
annonc.oxfordjournals.org/content/21/4/680.full
[PDF] Proposed Outcomes Document for the United Nations High-Level **...**
... and morbidity of gastric, **colorectal**, breast, cervical **...** policies and public **awarenes**
campaigns to reduce **...** to: o Diagnostic technologies, radiotherapy and **cancer** .
www.esmo.org/.../2010/un_summit/1_NCD_Alliance_Proposed_Outcomes_Document_for_UN_High_Level_Summit.pd - 2011-04-04
[PDF] COUNTRY COMMITMENTS MADE AT THE UN HIGH LEVEL MEETING ON THE **...**
... most common cancers in Serbia: cervical, breast, **colorectal ...** early screening and raising public **awareness** Target to establish 54 **cancer** treatment centres **...**
www.esmo.org/.../pdf/2011/UN_summit/Final_Country_Commitments_at_HLM_plenaries_and_round_tables.pdf - 2011-11-03
[More results fromwww.esmo.org/fileadmin/media/pdf]
International Organizations - European Society for Medical **...**
... support the development of new **colorectal cancer** groups **...** early detection of lung **cancer**; provides practical **...** to increase research funding, **awareness** and resources **...**
www.esmo.org/footer-menu/useful-links/patients-support/international-organizations.html - 44k
European Organizations - European Society for Medical Oncology **...**
... first European organisation dedicated to **colorectal cancer** (CRC) and **...** ED), the European

Breast **Cancer** Coalition, is **...** Coalition works to raise **awareness** of breast **...**
www.esmo.org/footer-menu/useful-links/patients-support/european-organizations.html - 46k

Research on **cancer** prevention, detection and management in low **...**
... misuse of very limited resources, eg in ineffective public education **campaigns**. **... cancer** downstaging. Improved **awareness** among the public and health care providers **...**
annonc.oxfordjournals.org/content/21/10/1935.full

Cancer initiatives in Sudan
... treatments are available; breast, cervical and oral **cancer**. This article describes some preventive approaches through public **awareness campaigns** and education **...**
annonc.oxfordjournals.org/content/17/suppl_8/viii32.abstract

The perspective and role of the medical oncologist in **cancer ...**
... in, **awareness campaigns** to inform the population about the importance of screening programs and disseminate information about how to prevent **cancer**. **...**
annonc.oxfordjournals.org/content/19/6/1033.full

[PDF] INESME MARZO 09-ING.indd, page 104 @ Preflight
... All of this would have repercussions on the **awareness** of politicians and policy **...** better health policies which improve all aspects of care for **cancer** patients in **...**
www.esmo.org/fileadmin/media/image/2010/news/INESME_report.pdf - 2010-01-21

Epidemiology of invasive cutaneous melanoma
... that, in contrast to squamous cell **cancer** of the **...** adjuvant therapy and greater public **awareness** leading to **...** that extensive public education **campaigns** have been **...**
annonc.oxfordjournals.org/content/20/suppl_6/vi1.full

Results **1**-**7** of about **8** for **colon cancer awareness campaigns**

International Organizations - European Society for Medical **...**
... creating such a platform Global **Colon Cancer** aims to **...** early detection of lung **cancer**; provides practical **...** to increase research funding, **awareness** and resources **...**
www.esmo.org/footer-menu/useful-links/patients-support/international-organizations.html - 44k

[PDF] mdn366 1033..1035
... the lungs, cervix, breast, prostate and **colon**. **...** to, and participate in, **awareness campaigns** to inform **...** and disseminate information about how to prevent **cancer**. **...**
www.esmo.org/fileadmin/media/pdf/policies/esmo_policy_aao.pdf - 2008-12-22

[PDF] Global status report
... breast and **colon cancer**, and depression **...** across the four broad approaches to **cancer** prevention and **...** Early diagnosis based on **awareness** of early signs and symptoms **...**
www.esmo.org/fileadmin/media/pdf/2011/UN_summit/2010_WHO_Global_Status_Report_on_NCDs.pdf - 2011-07-27

[More results fromwww.esmo.org/fileadmin/media/pdf]

[PDF] Microsoft PowerPoint - El Saghir ESMO Stockholm 2008 Epidemiol **...**
... Page 11. Colo-Rectal **Cancer** in Arab Countries **...** Surgery **colon** and liver; Radiation, Expensive **...** **Awareness campaigns** towards private physicians is recommended **...**
www.esmo.org/.../977/19/El%20Saghir%20ESMO%20Stockholm%202008%20Epidemiol%20Prev%20Final-2.ppt.pdf - 2008-10-07

[MS POWERPOINT] ESMO **CANCER** PATIENT ADVOCACY FORUM
... recommendation on screening for **colon**, cervical and **...** promote relevant information **campaigns** for the **...** Vigorously promote **cancer awareness** in the general public **...**
www.esmo.org/fileadmin/media/presentations/824/LCT10001657.ppt - 2007-12-12

The perspective and role of the medical oncologist in **cancer ...**

... the lungs, cervix, breast, prostate and **colon**. **...** to, and participate in, **awareness campaigns** to inform **...** and disseminate information about how to prevent **cancer**. **...**
annonc.oxfordjournals.org/content/19/6/1033.full
[PDF] INESME MARZO 09-ING.indd, page 104 @ Preflight

... All of this would have repercussions on the **awareness** of politicians and policy **...** better health policies which improve all aspects of care for **cancer** patients in **...**
www.esmo.org/fileadmin/media/image/2010/news/INESME_report.pdf - 2010-01-21

8.2. Appendix: Inclusion and exclusion criteria

Inclusion and exclusion criteria

The titles and abstracts of records identified by the search strategy will be examined for relevance by one reviewer. Full papers of any potentially relevant records will be obtained where possible and screened by one reviewer. The relevance of each study to the review and the decision to include/exclude studies will be made according to the inclusion criteria detailed below. Any studies which give rise to uncertainty will be reviewed by a second reviewer with involvement of a third reviewer when necessary.

- Population
    - Include:
        - General public
    - Exclude:
        - Populations at increased risk (family members, genetic predisposition) or previously treated patients.

- Intervention
    - Include:
        - Awareness campaigns or interventions aiming to increase early detection of CRC and **intended** for delivery to whole communities **where the recipients are not selected according to risk (familial risk, CRC history or screening status).**
            - This may include media campaigns, leaflets distributed in community settings, on-line websites, in-pharmacy or in-surgery interactive screens, interventions delivered by healthcare staff to patients and so on.
            - Campaigns may target a particular community, such as non-English language speakers or socioeconomically disadvantaged communities
            - Campaigns may aim to promote early presentation through
                - Awareness of symptoms
                - Increased up-take of existing screening programmes
            - Campaigns may be about “any cancer” but must include outcomes about colorectal cancer

    - Exclude:
        - Awareness campaigns or interventions intended for delivery to **selected individuals** (e.g. those who are not compliant with screening guidelines, those at increased risk)
        - Interventions which were delivered in full or in part through one-to-one contact with a professional or lay health worker
        - Studies which investigate the effects of new screening **programmes** with or without awareness campaigns
        - Prevention awareness campaigns (e.g. healthy eating)
        - Awareness campaigns targeting healthcare staff and which only report outcomes relating to them.

- Comparator
    - Include

        - Any
        - No intervention
        - No comparator (single arm before-after studies are to be included)

- Outcomes
    - Include if reports one or more of:
        - Additional GP visits
        - Additional referrals
        - Numbers entering screening programmes
        - Time from symptom discovery to diagnosis
        - Proportion at each stage at presentation
        - Survival/mortality
        - Data on patients hearing or seeing campaign material
        - Change in knowledge relating to colorectal cancer
        - Change in beliefs

    - Exclude:
        - Post-intervention measure taken on same day as intervention.
        - Where only outcomes relate to change in health behaviours (i.e. increased healthy eating, cessation of smoking...etc.)
        - Where only outcomes are qualitative

- Study design
    - Include:
        - Any. It is not always possible or appropriate to run RCTs, and alternative designs are not always robust.
        - Only include studies which
            - collected data on outcomes before and after the intervention (include sampling of populations before and after general population intervention, or same participants before and after tested intervention)
            - or where data is available before and after (i.e. numbers entering screening in X year, compared to after the campaign/programme)
            - or randomised trials with a comparison group (i.e. before and after data not reported, but where data after the intervention - which allow a comparison between the intervention group and the control/comparator group - are available)
    - Exclude:
        - Before and after studies for which post-intervention is measured on the same day as the intervention.

Also exclude abstracts, editorials, commentaries, reviews of primary papers (other than for reference to primary papers) and theses.

8.3. Appendix: Quality assessment scoring guidelines.

Score:
Y = bias/error avoided
N = bias/error not avoided
U = unclear

RCT studies

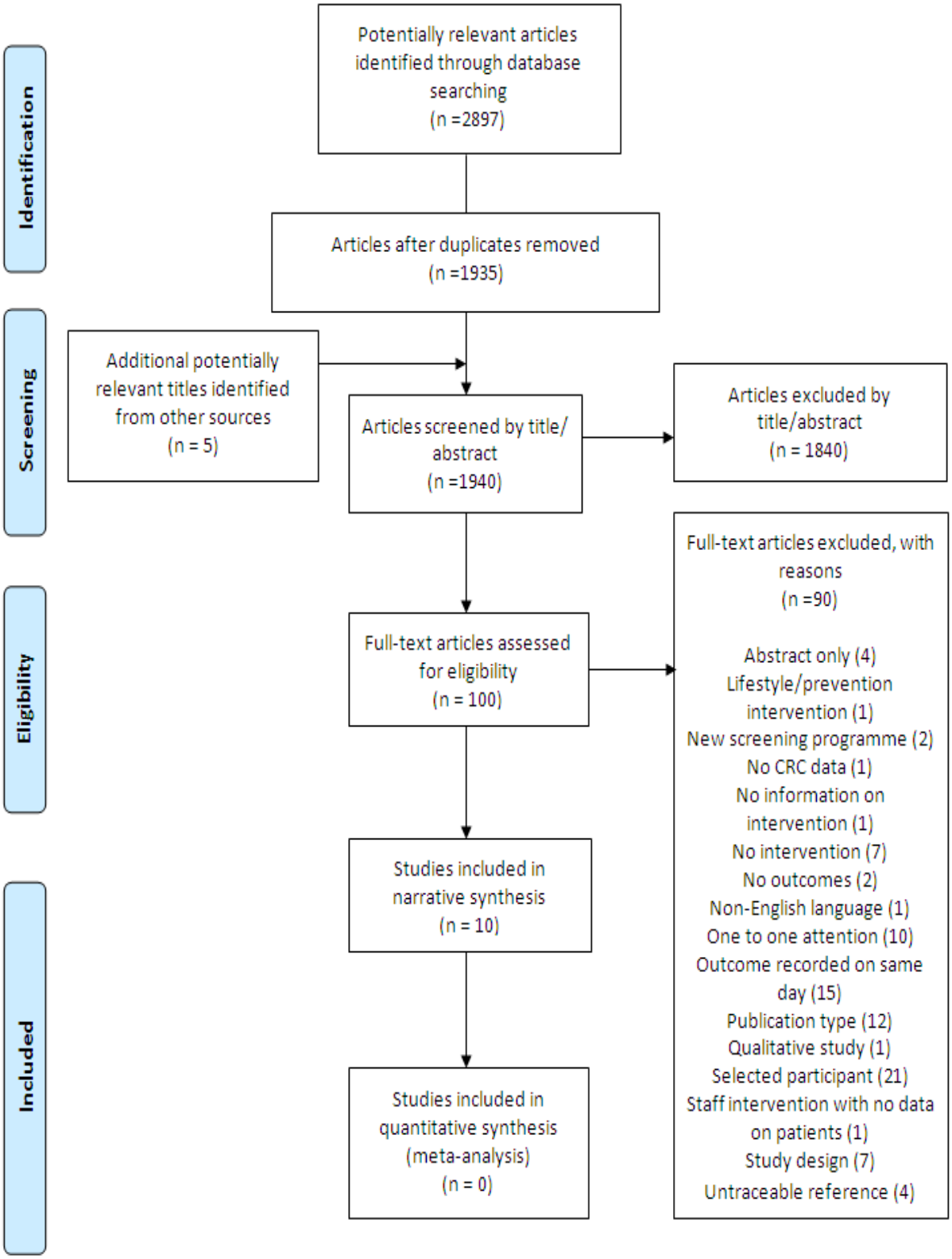
Bias	Item	Notes
Selection bias	Random sequence generation	Consider whether the method used to generate the allocation sequence should produce comparable groups.
	Allocation concealment	Consider whether the method used to conceal the allocation sequence meant intervention allocations could have been foreseen in advance of, or during, enrolment.
Performance bias	Blinding of participants and personnel	Consider whether measures were used to blind study participants and personnel from knowledge of which intervention a participant received. Note whether blinding was a) effective (score No if blinding broken) b) possible (score No if not possible) In cases where blinding not performed, consider whether this is likely to have introduced performance bias (e.g. were outcomes subjective?)
Detection bais	Blinding of outcome assessment	Consider whether measures were used to blind outcome assessors from knowledge of which intervention a participant received. Note whether blinding was a) effective b) possible In cases where blinding not performed, consider whether this is likely to have introduced detection bias (e.g. were outcomes subjective?)
Attrition bias	Incomplete outcome data	Attrition bias due to amount, nature or handling of incomplete outcome data. Yes: - no attrition, or small enough not to affect results - ITT with imputation No: - large losses with no imputation
Reporting bias	Selective reporting or outcomes	Bias due to selective reporting of outcomes Check if all outcomes listed in methods section are reported.

		This review will not go back to look at protocols.

Non-randomised controlled trials, before-after studies and interrupted time series.

Bias	Item	Notes
Selection bias	Representativeness of cohort/group to whole population of interest	Consider how the cohorts/study arm participants were recruited and whether exposed and non-exposed/before-after cohort/groups are likely to be: - representative of whole community targeted (as defined by the study authors, not in relation to this review) E.g. self-selection to participate? Where recruited from? Drawn from different cultural/ethnic groups? Different GP practices? Consecutive unselected sample of patients? Random sample?
	Comparativeness of cohort/groups to each other	Consider whether the groups are similar to each other in all but exposure to the intervention Consider whether the analysis has taken into account all baseline distributions of potential/known confounders through adjustment in analysis
Performance bias	Blinding of participants and personnel	Note whether blinding was a) effective (score No if blinding broken) b) possible (score No if not possible) Score Yes for participants if geographical blinding occurred (i.e. areas far enough apart to reasonably expect participants to be unlikely to have interaction with the other cohort/group) BA, IS: score Yes if participants unaware that questionnaire relates to evaluation of recent campaign and unaware whether they are pre or post intervention
Detection bais	Blinding of outcome assessment	Blinding of outcome assessors should be possible in most cases, though is rarely done! Where self-report and participants are aware of intervention, score No.
Attrition bias	Incomplete outcome data	If none or small number, score Yes BA, IS studies: if response rate poor or different between before and after surveys, score N. If missing responses not corrected for, and are large, score N
Reporting bias	Selective reporting or outcomes	Check if all outcomes listed in methods section are reported. Reviewer did not consult protocols.
Other bias	Temporal/other confounders	BA/ITS studies - were potential temporal trends/confounders identified and accounted for in the analysis?

8.4. Appendix : Prisma flow chart of study selection process



8.5. Appendix: Excluded studies

Studies excluded at full text, with reasons for exclusion.

Author and year	Study design	Primary reason for exclusion	Comments
Anonymous[48]	NR	Abstract only	
Anonymous[49]	NR	Untraceable reference	
Adams 1996[50]	Before-after	Publication type	
Aragones 2010[51]	RCT	Selected participants	Selected unscreened participants, involved appointment with GP
Bagai et al 2007[52]	Cross-sectional	Study design	
Bassett & Goulston 1978[53]	NR	Publication type	
Bayer 2008[54]	Before-after	Publication type	
Berkley 1992[55]	NA	Publication type	
Blumenthal et al 2010[56]	RCT	Selected participants	Selected unscreened participants
Brasca et al 1986[57]	NR	Abstract only	
Braun et al 2005[58]	RCT	One-to-one attention	
Brown & Potosky 1990[59]	NA	No intervention	
Causey & Greenwald 2011[60]	Before -after	Outcome recorded on the same day	
Centers for Disease Control and Prevention 2003[61]	NA	Study design	
Chan & Vernon 2008[62]	RCT	Selected participants	e-mail letters to unscreened patients
Connelly 2007[63]	NR	Untraceable reference	
Costanza et al 2007[64]	RCT	One-to-one attention	Mailed booklet and telephone counselling
Dietrich et al 2007[65]	RCT	One-to-one attention	Included telephone conversation
Eisinger et al 2011[66]	Cross-sectional	No intervention	
Emmons et al 2004[67]	RCT	Outcome recorded on same day	
Everett 1999[68]	RCT	Publication type	
Fenton 2011[69]	NA	Publication type	Comment
Fitzgibbon et al 2007[70] Wolf et al 2005[71]	RCT	Selected participants	Patients selected on basis of CRC status; one-on-one attention provided
Frazier et al 1987[72]	NR	Outcome recorded on same day	
Gimeno-Garcia et al	RCT	Outcome recorded on	

Author and year	Study design	Primary reason for exclusion	Comments
2009[73]		same day	
Gossey 2011[74]	RCT	Publication type	Thesis
Greenwald 2006[75]	Before-after	Outcome recorded on same day	
Greenwald & Edwards 2010[76]	Cross-sectional	Study design	
Hart et al 1997[77]	Before-after	Outcome recorded on same day	
Hoffman et al 1983[78]	NA	No intervention	
Holt et al 2011[79]	Before-after	One-to-one attention	
Jerant et al 2007[80]	RCT	Outcome recorded on same day	
Katz et al 2004[81]	Cross-sectional	No intervention	
Keighley 2004[82]	NR	Publication type	
Lasser et al 2011[83]	RCT	One-to-one attention	Involves patient navigator
Lawsin et al 2007[84]	Cross-sectional	No intervention	
Lee et al 2009[85]	Before-after	New programme	
Lopez et al 2010[86]	Case study	New programme	
Loss et al 2006[87]	Case study	Non-English language	
Ma et al 2009[88]	Quasi-experimental	One-to-one attention	Involves patient counsellor
Mahon 1995[89]	Case study	No outcomes of interest	
Makoul et al 2009[90]	Before-after	Outcome recorded on same day	
Marcus et al 2005[91]	RCT	One-to-one attention	Materials tailored to patient characteristics
Maxwell et al 2011[92]	RCT	Selected participants	Selected unscreened participants, small group sessions with a follow-up letter
Maxwell et al 2010[93]		Selected participants	Selected unscreened participants, small group sessions with a personalised follow-up letter
Mayer et al 2004[94]	NR	Untraceable reference	
Mazor et al 2010[95]	Qualitative	Qualitative study	
Meade et al 1994[96]	RCT	Outcome recorded on same day	
Menon et al 2008[97]	RCT and qualitative	Outcome recorded on same day	
Miesfeldt et al 2010[98]	Case study	Study design	
Morgan et al 2010[99]	RCT	Outcome recorded on same day	
Murff 2005[100]	NR	Publication type	
Myers et al 2007[101]	RCT	Selected participants	Selected unscreened participants, collected survey data, tailored print materials

Author and year	Study design	Primary reason for exclusion	Comments
			to characteristics
Myers et al 2008[102]	Prospective cohort study	Study design	
Nguyen et al 2010[103]	Before-after	Selected participants	Selected never screened participants, included one to one telephone back-up
O'Riordain & Gorey 1996[104]	NR	Publication type	
Pahil et al 2010[105]	RCT	Abstract only	
Parente et al 2011[106]	Before-after	Abstract only	
Paul et al 2003[107]	Before-after	No information on intervention	
Percac et al 2009[108]	RCT	One-to-one attention	Involved patient navigator
Philip et al 2010[109]	Before-after	Selected participants	Selected never screened participants, involved one to one attention from Doctor
Potter et al 2010[110]	RCT	Selected participants	Selected unscreened participants, involved one to one attention from patient educator
Powe & Weinrich 1999[111]	Before-after	Selected participants	Selected unscreened participants. Viewed video on colorectal screening depicting peers.
Power et al 2011[112]	NR	No intervention	
Provenzano 2007[113]	NR	Publication type	
Pullyblank et al 2002[114]	Cross-sectional	No intervention	
Reubsaet et al 2009[115]	Before-after	No data relating to colorectal cancer	
Robb et al 2006[116]	RCT	Outcome recorded on same day	
Royse & Dignan 2009[117]	Before-after	One-to-one attention	One-to-one telephone conversation
Ruffin et al 2007[118]	RCT	Selected participants	Selected participants who had never been screened to view website.
Rutledge et al 2006[119]	Quasi-experimental	Lifestyle prevention intervention	
Schroy et al 2008[120]	Cross-sectional	Study design	
Sequist et al 2009[121]	RCT	Selected participants	Selected unscreened participants.
Seeff et al 2008[122]	NR	Study design	
Shankaran et al	RCT	Staff intervention with no	

Author and year	Study design	Primary reason for exclusion	Comments
2009[123]		data on patient outcomes	
Smith et al 2010[124]	RCT	Selected participants	Selected unscreened participants. Viewed material designed for people with low literacy.
Strock et al 2008[125]	NR	Untraceable reference	
Subrahmanian et al 2011[126]	Before-after	Outcome recorded on same day	
Trevana et al 2008[127]	RCT	Selected participants	Selected unscreened participants
Tu et al 2006[128]	RCT	Selected participants	Selected unscreened participants, unclear whether patient educator delivered one-on-one sessions.
Ueland et al 2006[129]	Quasi experimental	Outcome recorded on same day	
Vernon et al 2011[130] Misra et al 2011[131]	RCT	Selected participants	Selected unscreened participants, involved printed letter for discussion with physician
Ward et al 2006[132]	Non-randomised Controlled trial	No outcome of interest	
Wardle et al 1999[133]	RCT	Outcome recorded on same day	
Wardle et al 2003[134]	RCT	Selected participants	Selected unscreened and “probably only get screened” participants, included posting psycho-educational material 2 weeks prior to screening invitation.
White et al 2006[135]	Case study	One-to-one attention	Involved one-to-one telephone conversations.
Williamson &Wardle 2002[136]	Case study	Publication type	
Wu et al 2010[137]	Before-after	Selected participants	Selected patients at high risk, involved patient navigators

8.6. Appendix: CRC survival data

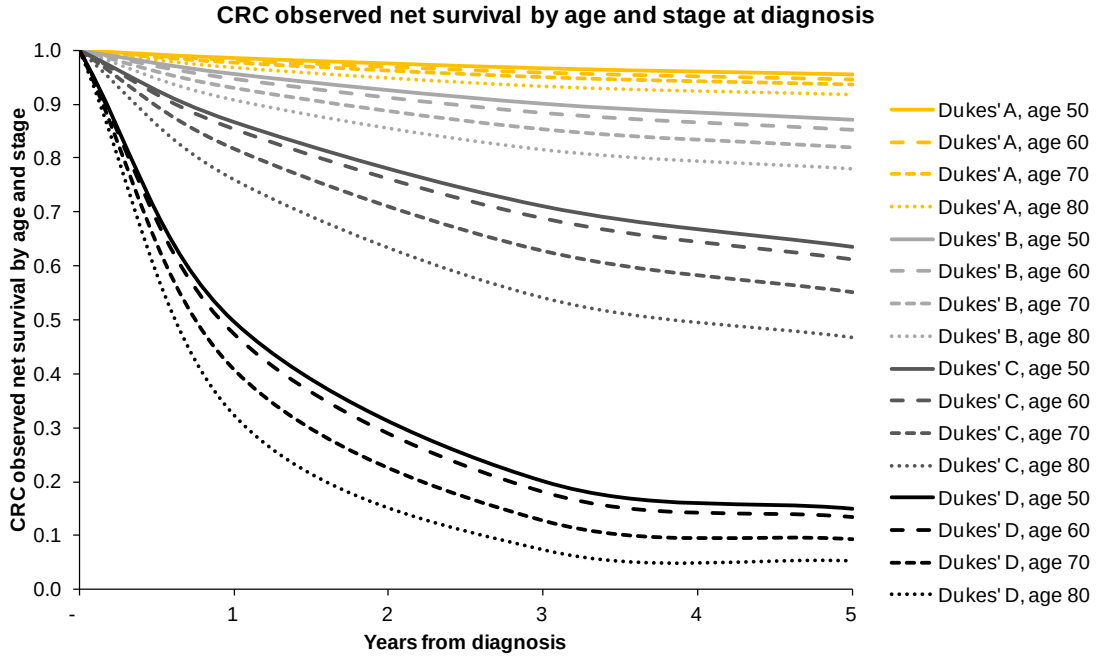
The CRC survival data within the model was updated. Data giving 'net survival' at 1 and 3 years by both age and stage at diagnosis from the International Cancer Benchmarking Partnership (ICBP) was used.[34] Net survival is the hypothetical survival you would expect to see assuming no other cause deaths occurred i.e. net survival is higher than overall survival. For long-term survival estimates (e.g. 5/10 year survival) a multivariable excess hazard model was used to obtain an unbiased estimation of 'net survival', by contrast to the conventional relative survival approaches.[138,139]

Estimates of cancer survival for colon (C18) and rectum (C19-C20,C218) were combined to provide an estimate of CRC survival. Data by 5-year age bands was converted to data by age using linear interpolation.

For each age and stage of diagnosis a different model of survival was applied. The models fitted were mixture models which assume that a fixed proportion of persons survive; this is a similar approach to the 'cure fraction model'.[140] The mortality of the non-surviving component was assumed to be exponential to allow for easy implementation within the markov model structure. The survival proportion was estimated using estimates of 5-year survival from England cancer registry data of diagnoses between 1997 and 2001.[33] This means we assume that the cohort of patients alive after 5 years do not experience higher mortality than the reference population. Further data on long-term survival by age and stage could improve the accuracy of these estimates in the future. The data used did not incorporate a survival projection to capture improvements in survival over time.

Generally the data shows lower net survival for CRC diagnosed in later stages and for older persons; the net survival for ages 50, 60, 70 and 80 is illustrated in Figure 12.

Figure12:



The cost-effectiveness model incorporates both deaths due to CRC and deaths due to other causes. Data on other cause mortality were taken from Interim Life Tables, United Kingdom, Office for National Statistics and adjusted to remove mortality from CRC.[141,142] The two mortality rates were applied within the model in the following way:

- Mortality from CRC = 1-Net survival
- Mortality from other causes = (1-Netsurvival)*(1-Other cause survival)
- Overall survival = Net survival - (1-Netsurvival)*(1-Other cause survival)

8.7. Appendix: Model parameter values

Awareness campaign parameters	mean	source
Increased presentation rates stage A	10%	Pilot campaign data
Increased presentation rates stage B	10%	Pilot campaign data
Increased presentation rates stage C	10%	Pilot campaign data
Increased presentation rates stage D	10%	Pilot campaign data
Duration of increase in presentation rates (months)	1	Pilot campaign data
Increased screening uptake rate	0	Personal communication, NHS cancer screening, 2012
Cost of campaign per person	£ 0.14	Personal communication, DoH, 2011
Cost of GP visit	£ 36	Curtis 2010
Cost of secondary care attendance for suspected lower GI cancer	£ 200	Tappenden et al 2011
Number of additional GP addendances pp	0.0014	Pilot campaign data
Number of additional sec. care appointments pp	1.526E-05	Pilot campaign data
Proportion of additional visits which are extra	0.5	Assumption
Cost of addition GP and sec. care attendances	£ 0.026	Calculated from other parameters

Natural history parameters	mean	source
Normal epithelium to LR adenomas - age 30	0.02	Model calibration
Normal epithelium to LR adenomas - age 50	0.02	Model calibration
Normal epithelium to LR adenomas - age 70	0.05	Model calibration
Normal epithelium to LR adenomas - age 100	0.01	Model calibration
LR adenomas to high risk adenomas - age 30	0.01	Model calibration
LR adenomas to high risk adenomas - age 50	0.01	Model calibration
LR adenomas to high risk adenomas - age 70	0.01	Model calibration
LR adenomas to HR adenomas - age 100	0.00	Model calibration
HR adenomas to Dukes A CRC - age 30	0.03	Model calibration
HR adenomas to Dukes A CRC - age 50	0.02	Model calibration
HR adenomas to Dukes A CRC - age 70	0.05	Model calibration
HR adenomas to Dukes A CRC - age 100	0.12	Model calibration
Normal epithelium to CRC Dukes A	0.00	Model calibration
Preclinical CRC: Dukes A to Dukes B	0.51	Model calibration
Preclinical CRC: Dukes B to Dukes' C	0.69	Model calibration
Preclinical CRC: Dukes C to Stage D	0.71	Model calibration
Symptomatic presentation with CRC Dukes A	0.04	Model calibration
Symptomatic presentation with CRC Dukes B	0.18	Model calibration
Symptomatic presentation with CRC Dukes C	0.37	Model calibration
Symptomatic presentation with CRC Dukes D	0.74	Model calibration
Proportion of cancer incidence classified as proximal	0.38	Cancer Registrations 2007, England
Average number of adenomas present in patient with at least one adenoma	1.90	Winawer et al 1993
Proportion of advanced adenomas classified as HR adenomas	0.75	FS trial data
Proportion of HR pp requiring annual surveillance	0.29	NHS BCSP data
LR polypectomy, transition probability LR	0.10	England BCSP data, Martinez et al 2009
LR polypectomy, transition probability HR	0.04	England BCSP data, Martinez et al 2009
LR polypectomy, transition probability CRC	0.00	England BCSP data, Martinez et al 2009
IR polypectomy, transition probability LR	0.16	England BCSP data, Martinez et al 2009
IR polypectomy, transition probability HR	0.09	England BCSP data, Martinez et al 2009
IR polypectomy, transition probability CRC	0.00	England BCSP data, Martinez et al 2009

Harm/complications parameters	mean	source
COL (without polypectomy) perforation rate	0.0%	FS UK screening trial data, Atkin et al 2002
COL (with polypectomy) perforation rate	0.3%	Bowel cancer screening pilot 2nd round evaluation, Table 5.2
COL Probability of death following perforation	5.2%	Gatto et al 2003
FS (without polypectomy) perforation rate	0.0%	FS UK screening trial data, Atkin et al 2002
FS (with polypectomy) perforation rate	0.01%	FS UK screening trial data, Atkin et al 2002
FS Probability of death following perforation	6.5%	Gatto et al 2003
FS probability of hospitalisation for bleeding	0.03%	FS UK screening trial data, Atkin et al 2002
COL probability of hospitalisation for bleeding	0.3%	FS UK screening trial data, Atkin et al 2002

Repeat rates	mean	source
gFOBT mean number of tests completed	1.08	Assumption based on number of gFOBTs returned within 7 days
iFOBT mean number of tests completed	1.01	NHS BCSP data, Italian iFOBT screening programme Zorzi et al 2009
FS Probability test repeated on a later day	0.02	FS UK screening trial data, Atkin et al 2002
COL repeat test rate	0.07	NHS BCSP data

Screening participation parameters	mean	source
FOBT participation for each screening round	0.54	NHS BCSP data
Proportion completing at least one FOBT screening round	0.63	NHS BCSP data
FOBT participation for a round for those who comply with at least one FOBT test	0.85	NHS BCSP data
COL follow-up compliance FOBT screening	0.79	NHS BCSP data
COL follow-up compliance FS screening	0.96	FS UK screening trial data, Atkin et al 2002
COL surveillance compliance	0.83	NHS BCSP data
FS screening compliance	0.85	Assumed same as for FOBT, Atkin et al 2010

Health-related quality of life parameters	*mean*	*source*
Utility value cancer free	0.80	Ara et al 2010
Utility value CRC	0.70	Ara et al 2010

Resource Use parameters		*mean*	*source*
Cost of gFOBT screen (non-compliers)	£	2.03	Southern Hub screening costings model
Cost of gFOBT screen (normal result)	£	3.36	Southern Hub screening costings model
Cost of gFOBT screen (positive result)	£	11.94	Southern Hub screening costings model
Cost of iFOBT screen (non-compliers)	£	6.43	Southern Hub screening costings model
Cost of iFOBT screen (normal result)	£	7.37	Southern Hub screening costings model
Cost of iFOBT screen (positive result)	£	16.20	Southern Hub screening costings model
Cost of FS screen excl. FS exam (non-compliers)	£	5.02	Southern Hub screening costings model
Cost of FS screen excl. FS exam (not referred to COL)	£	6.01	Southern Hub screening costings model
Cost of FS screen excl. FS exam (referred to COL)	£	14.84	Southern Hub screening costings model
Cost of FS (without polypectomy)	£	453	NHS reference costs, screening centre estimates
Cost of FS (with polypectomy)	£	453	NHS reference costs, screening centre estimates
Proportion of LR adenomas being referred for COL following FS		3%	FS trial data
Cost of COL (without polypectomy)	£	563	NHS reference costs and screening centre estimates
Cost of COL (with polypectomy)	£	563	NHS reference costs and screening centre estimates
Cost of treating bowel perforation (major surgery)	£	5,089	NHS reference costs
Cost of admittance for bleeding (overnight stay on medical ward)	£	278	NHS reference costs
Pathology cost for adenoma	£	26	NHS reference costs 08/09, histopathology
Pathology cost for cancer	£	26	NHS reference costs 08/09, histopathology
Discount rate for costs		3.5%	NICE methods of techonology appraisal 2008
Discount rate for health outcomes		3.5%	NICE methods of techonology appraisal 2008
Willingness to pay threshold	£	20,000	NICE methods of techonology appraisal 2008

Test Characteristics	*mean*	*source*
gFOBT Sensitivity for LR adenomas	0.01	Model calibration
gFOBT Sensitivity for HR adenomas	0.12	Model calibration
gFOBT Sensitivity for CRC	0.24	Model calibration
gFOBT Specificity age 50	0.99	Model calibration
gFOBT Specificity age 70	0.97	Model calibration
FS Sensitivity for LR adenomas	0.22	Model calibration
FS Sensitivity for HR adenomas	0.71	Model calibration
FS Sensitivity for CRC	0.62	Model calibration
FS Specificity	1.00	Assumption due to nature of the test
iFOBT Sensitivity for LR adenomas	0.05	Model calibration
iFOBT Sensitivity for HR adenomas	0.32	Model calibration
iFOBT Sensitivity for CRC	0.63	Model calibration
iFOBT Specificity age 50	0.98	Model calibration
iFOBT Specificity age 70	0.93	Model calibration
COL Sensitivity for LR adenomas	0.77	Van Rijn et al 2006
COL Sensitivity for HR adenomas	0.98	Van Rijn et al 2006
COL Sensitivity for CRC	0.98	Bressler et al 2007
COL Specificity	1.00	Assumption due to nature of the test

8.8. Appendix: Modelling technicalities

The awareness campaign resulted in an increase in the number of cases of CRC diagnosed during March 2011. Although data is currently somewhat incomplete due to reporting bias it looks like this is a short-term increase.

Adjusting annual transition probabilities for a short term increase in the transition rate
Consider a transition with a normal annual transition probability of p.
Consider an increased incidence, i (i=1.1 for a 10% increase) for x months of a 12-month period.

The normal x-months transition probability is 1-(1-p)^(x/12).

The annual transition probability associated with an increase i for x months then the previous rate for the remaining 12-x months is:

p' =i*[1-(1-p)^(x/12)]+{1-(1-p)^((12-x)/12)} *{1-i*[1-(1-p)^(x/12)]}
=1-i+ip+(i-1)*(1-p)^((12-x)/12)

Example:

Normal annual transition probability	p	0.5
Increased incidence observed	i	1.2
Duration of increase (months)	x	6
New annual transition probability	p'	0.54

8.9. Appendix: Interventions included in the review

Study	Intervention	Local healthcare staff involvement	Method of design	Control	Topics covered (NB: not always well reported)
Aim to increase self-presentation					
De Nooijer 2004[11]	Targeted several common cancers. **Int 1:** Tailored letter* **Int 2:** Dutch Cancer Society leaflet	No	Theory-based	UC	Both covered "similar" topics: early detection, risk perception, symptoms, passive detection, seeking medical help, attitudes, social influences, self efficacy, information relating to self examination
WoSCAP[12]	Targeted CRC Focus on early detection due to signs and symptoms. High profile media campaign on television, ministerial launch, direct mailshot of leaflet, competition, work place initiatives, photographic exhibition, proactive stories in media, local events and initiatives with charities and voluntary organisations. Materials developed in response to research with members of the public.	Yes – Included accredited training programme for professionals, symposia, newsletters and blogs.	Concepts trialled with focus groups	UC	Signs and symptoms: recent change in bowel habit or going more often than normal, looser motions, or alternating with constipation, bleeding from your bottom, feeling bowel is not empty after "a number two". Who is most at risk (age, gender, family history, polyps, IBD, high fat diet with low intake of vegetables/fibre)
Lyon 2009[13]	Targeted breast, bowel and lung cancer. Highly varied intervention. Local teams made up of professionals and volunteer community members all involved in design. Awareness-raising measures aimed to be culturally appropriate and delivered in accessible and engaging way. Included plays, poems, bingo, games, songs, beer mats and media coverage of such activities. Multiple venues including doctors waiting rooms, out-patient departments, health clinics, pubs, bingo halls, community halls, mosques, faith groups etc.	No	Community involved in design and delivery	NA	Raise awareness of symptoms. Early presentation means better chance of cure. Reduce fear.
Ramsay YearNR[14]	Targeted CRC Ran for one month. Case study in local press, radio interviews with doctors, billboard, hit squads (face to face campaigning) and ad-vans on match day with press coverage. Targeted bookies,	Yes – Practice managers to brief GPs, to support campaign in surgery and provide data	Focus groups to identify needs and trial materials	NA	Signs and symptoms: "If you notice bleeding from the bottom or a lasting change in bowel habits, Play it safe - go to your doctor." "Most cases of bowel cancer occur

	pubs, DIY stores, barbers, local shops, social clubs. Beer mats, posters. Z-cards for use in shops. Stand-up performances at comedy events. Materials developed in response to research with members of the public.				in men over 50"
Aim to increase screening rates					
Blumenthal 2005[16]	Targeted several common cancers. Culturally sensitive. Community led. Attractive and colourful materials with representations of African-Americans. Brochure, a flyer, two posters and yard signs, bus adverts, newspapers, mass media. Activities (health fairs and educational programs, community presentations etc). Combination of delivery mechanisms via "gatekeeper" members of the community, including non-traditional channels such as hair styling establishments.	Yes – healthcare staff encouraged to disseminate, encourage lifestyle change and to follow-up referrals.	Community involved in design and delivery	UC	Lifestyle change, encourage screening, increase self efficacy, knowledge of risk and survivability,
Nguyen 2010[15]	CRC campaign. Vietnamese-language CRC screening media campaign (through Vietnamese-language media outlets including newspapers, radio, TV), distribution of health educational material (bilingual booklet, penlight. Distributed through businesses, health agencies, events, and organizations in the Vietnamese community), hotline.	Yes - medical education seminars, distribution of patient counselling materials, reminder items, training newsletter, DVDs.	Focus groups to identify needs, 23 individuals trialled materials	NR, assume UC	CRC screening knowledge, attitudes, beliefs.
Powe 2004[17]	CRC campaign. **Int 1:** Cultural and Self-empowerment Group. Centres received a video "Telling the story... To live is God's will" (culturally relevant with well-known community members and leaders), calendar, poster, brochure and flier **Int 2:** Modified cultural group. Centres received the video only	No	Unclear	ACS video	Knowledge, incidence, screening guidelines even in absence of symptoms, importance of early detection, risk factors, nutrition, attitudes, beliefs, preventive health care from spiritual perspective, Faecal occult blood test (FOBT) demonstration.
Katz 2007[18]	CRC campaign. Educational intervention to address barriers, culturally acceptable to all racial groups. Based on ACS screening guidelines. ACS coordinator trained ACS area coordinators who in turn trained the local ACS project volunteers (n =179) who delivered intervention.	No	Focus groups to identify needs and trial materials	NA	Knowledge, statistics, risk factors, diagnosis, treatment, self-efficacy, addresses barriers, readiness for change, and increase awareness of benefits of early detection.

	Messages to the public via educational classes, direct mailings, brochures, media campaigns by community newspapers and local radio stations. Messages to healthcare providers via waiting-room posters, monthly examination-room materials and chart reminders.				
Broadwater 2004[22]	Targeted CRC and skin cancer. Advertising/awareness campaign: television, radio, print, public relations, local media talent recruited as spokespeople, and physicians made public appearances. Local television broadcast a live colonoscopy.	Yes – physicians involved in delivery	Telephone survey to gauge current knowledge, attitudes and behaviours. Focus group trailed materials.	NA	Key messages "The fact is, there are no early warning signs of colon cancer." "If you're 50 or older, call your doctor to find out which colon cancer screening option is right for you." "A simple test saves lives."
Katz 2011[20]	CRC campaign. Culturally sensitive media campaign, based on social cognitive theory. Local cancer Initiative in partnership with academic researchers developed a media campaign. Campaign image and message was used in all campaign materials, including the billboard, posters, brochures, and newspaper ads.	Yes – Local agency included some local healthcare staff.	Community needs assessment used to gauge knowledge and behaviours. Local agency involved in design. Survey to use to get feedback on materials.	NA	"Get Behind Your Health! Talk to Your Doctor About Colon Cancer Screening." Information about CRC, CRC risk factors and symptoms, CRC screening, and the message that CRC screening saves lives.
Zhou 2011[21]	CRC, prostate and skin campaign. National multimedia "Screen for Life" campaign, regional and state campaigns. Included bilingual element to reach Hispanic Americans. Campaign materials, TV and radio announcements, newspaper articles, regional educational programmes.	No	Unclear	NA	NR
*This intervention is not within the inclusion criteria for this review Int, intervention; UC, usual care; sig, statistically significant; non-sig, not statistically significant; ACS, American Cancer Society, NR, not reported; NA, not applicable; CRC, colorectal cancer; FOBT, Faecal occult blood test; IBD, Inflammatory Bowel Disease					

8.9 Appendix: Summary of outcomes

Study	Time line	Campaign awareness	Knowledge	Attitudes	GP visits, GP referrals, Screening uptake, Diagnoses
Aim to increase self-presentation					
de Nooijer 2004[11]	T0 = baseline Int at 3 weeks T1 = 6 weeks T2 = 6 months	NR	T1 Pairwise comparison: **SIG** difference Int1:Int2:UC	T1 & T2 Passive detection and help seeking intention, Int 2 **SIG** at T1 only	NR
WoSCAP[12]	Delivered over several months T = NR	NRCT data Sig NR, ↑ in TV, radio, posters and leaflets	BA, IS data Sig NR, ↑ in knowledge of bleeding, ↓ or ↔ in change 6 other symptoms not covered by TV advert	Comparative data NR	GP referrals ↑, sig NR, **FV** NR
Lyon 2009[13]*	Baseline = 12 month retrospective chart review T0 = intervention commences T1 = 2 weeks T2 = 12 months	NR	NR	NR	T2 Referrals: **SIG** ↑in urgent referrals Diagnoses: **SIG** ↑ in diagnoses via urgent referral; **NON-SIG** ↑ in diagnoses with no spread**
Ramsay Date NR	Delivery length unclear Baseline = prior 3 months T0 = 1 month int starts T1 = 3 months post Int	Sig NR, ↑ in recall of a campaign	Sig NR, ↑ in awareness of all symptoms, bleeding most recognised, ↑ awareness of age risk and importance of early diagnosis	Sig NR, ↓ in personal concern, ↑in confidence in noticing symptoms	Sig NR, ↓ in GP consultations. **FV** NR
Aim to increase screening					
Blumenthal 2005[16]	T0 = 2 year int starts T1 = NR	Some **SIG** and some **NON-SIG** results across both Atlanta sites and Nashville sites	NR	NR	Screening (FOBT): **Altanta sites:** Int **SIG** ↑ than UC. **FV:** 56.6% screened **Nashville sites:** Non- sig ↓. **FV:** 51.9% screened
Nguyen 2010[15]	T0 = 3 year int starts T1 = approx. 2 years from T0	**SIG** ↑ in awareness of booklet, newspaper, radio and TV ads. **NON-SIG** ↑ for reading newspaper article	**SIG** ↑ in knowledge of FOBT and colon polyps. **NON-SIG** ↑ for sigmoidoscopy.	**SIG** ↑ belief that need screening s/c; ↓s/c is painful; ↑might get colon cancer; ↑need FOBT even if healthy; ↓ fear s/c will find cancer **NON-SIG** ↓ worry; fear FOBT will find cancer; ↔ expected troublesomeness of s/c	Screening**: SIG** ↑ ever had screening s/c, **FV:** 65%; Had screening s/c in last 5 years, **FV:**44% **NON-SIG** ↑ in ever had FOBT, **FV:** 71%; had FOBT in past year **FV:**36%
Powe 2004[17]	T0 = 12 month int start	NR	Repeated measures ANOVA to T2: Int	NR	Screening at T2: Sig NR, but Int1>Int2>UC **FV:**61%, 46%, 15%

	T1 = 1 week, T2 = 6 months T3 = 12 months		1 **SIG** greater ↑ (Int 2 & UC NR)		respectively
Katz 2007[18]	T0 = 6 to 8 month int starts T1 = 0 to 2 months	NR	Non-sig	**SIG** ↑ in positive beliefs about screening **NON-SIG** for perceived barriers to screening.	Screening: **NON-SIG** ↑. **FV:** 55.6% screened
Broadwater 2004[22]	T0 = 1 month int starts T1 = one month	↑ in number who saw, read or heard; sig NR	NR	↑ in number who reported changing behaviour; sig NR	Data unclear.
Katz 2011[20]	T0 = 3 months int starts T1 = 1 month	69% (42/61) reporting seeing a message. No comparator.	NR	NR	NR
Zhou 2011[21]	Baseline = 1 year after intervention started T1 = 6 years after intervention started	NR	NR	NR	Endoscopy or home FOBT **SIG** ↑ both groups **FV** Hispanics: 26.6% **FV** white non-Hispanics: 44.2%

*interim results – year one of two-year project. Project dissolved when Improvement Foundation ceased trading.

**No spread defined as Dukes' A or Dukes' B

GP, General practitioner/primary care physician; SIG or sig, statistically significant; NON-SIG, not statistically significant; Int, intervention; T0, baseline; T1, first follow-up; T2, second follow-up; T3, third follow-up; UC, usual care; NR, not reported; ↓, decreased; ↑, increased; ↔, no change; s/c, colonoscopy or sigmoidoscopy; FOBT, faecal occult blood test; FV, final value

References

[1] Berrino F, De Angelis R, Sant M. Survival for eight major cancers and all cancers combined for European adults diagnosed in 1995-99: results of the EUROCARE-4 study (vol 8, pg 773, 2007). *Lancet Oncology* 2007; **8**(10):868.

[2] Richards MA. The size of the prize for earlier diagnosis of cancer in England. *British Journal of Cancer* 2009; **101**:S125-S129.

[3] Richards MA. The National Awareness and Early Diagnosis Initiative in England: assembling the evidence Introduction. *British Journal of Cancer* 2009; **101**:S1-S4.

[4] Taylor M, Radford G. (2012) Evaluation of the Bowel Cancer Awareness Pilot in the South West and East of England: 31 January to 18 March 2011., http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_133106.

[5] Grant MJ, Booth A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Health Info Libr J* 2009; **26**(2):91-108.

[6] Critical Appraisal Skills Programme. (2010) 12 questions to help you make sense of cohort study.

[7] Downs SH, Black N. The feasibility of creating a checklist for the assessment of the methodological quality both of randomised and non-randomised studies of health care interventions. *J Epidemiol Community Health* 1998; **52**(6):377-84.

[8] Wells GA, Shea B, O'Connell D *et al.* (2000) The Newcastle-Ottawa Scale (NOS) for assessing the quality of nonrandomised studies in meta-analyses.

[9] Cochrane Collaboration. (2012) Cochrane Handbook for systematic reviews of interventions. (eds. Higgins JPT, Green S).

[10] Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Statement.(2012).

[11] de NJ, Lechner L, Candel M, de VH. Short- and long-term effects of tailored information versus general information on determinants and intentions related to early detection of cancer. *PREV MED* 2004; **38**(6):694-703.

[12] Unknown. (2005) West of Scotland Cancer Awareness Project Bowel Cancer Campaign.

[13] Lyon D, Knowles J, Slater B, Kennedy R. Improving the early presentation of cancer symptoms in disadvantaged communities: putting local people in control. *British Journal of Cancer* 2009; **101**:S49-S54.

[14] Ramsay D. (2012) Improving early detection of bowel cancer - a social marketing pilot in partnership with NHS Derby City. Cancer Research UK.

[15] Nguyen BH, McPhee SJ, Stewart SL, Doan HT. Effectiveness of a controlled trial to promote colorectal cancer screening in Vietnamese Americans. *AM J PUBLIC HEALTH* 2010; **100**(5):870-6.

[16] Blumenthal DS, Fort JG, Ahmed NU *et al.* Impact of a two-city community cancer prevention intervention on African Americans. *Journal of the National Medical Association* 2005; **97**(11):1479-88.

[17] Powe BD, Ntekop E, Barron M. An intervention study to increase colorectal cancer knowledge and screening among community elders. *PUBLIC HEALTH NURS* 2004; **21**(5):435-42.

[18] Katz ML, Tatum C, Dickinson SL *et al.* Improving colorectal cancer screening by using community volunteers: results of the Carolinas cancer education and screening (CARES) project. *Cancer* 2007; **110**(7):1602-10.

[19] Broadwater C, Heins J, Hoelscher C, Mangone A, Rozanas C. Skin and colon cancer media campaigns in Utah. *Preventing Chronic Disease* 2004; **1**(4):A18.

[20] Katz ML, Reiter P, Fickle D *et al.* Community involvement in the development and feedback about a colorectal cancer screening media campaign in Ohio Appalachia. *Health Promotion Practice* 2011; **12**(4):589-99.

[21] Zhou J, Enewold L, Peoples GE *et al.* Colorectal, prostate, and skin cancer screening among Hispanic and White non-Hispanic men, 2000-2005. *Journal of the National Medical Association* 2011; **103**(4):343-50.

[22] Broadwater C, Heins J, Hoelscher C, Mangone A, Rozanas C. Skin and colon cancer media campaigns in Utah. *Preventing Chronic Disease* 2004; **1**(4):A18.

[23] Vernon S. (2012) Colorectal Cancer Incidence data update: East of England Region., Eastern Cancer Registration and Information Centre.

[24] Morris D. (2012) Colorectal Cancer Incidence data update: South West Region., South West Public Health Observatory.

[25] South West Public Health Observatory. (2011) **Bowel Cancer Pilot Campaign: Stage presentation in the South West, 2010-2011** .

[26] South West Public Health Observatory. (2011) Bowel Cancer Pilot Campaign: Newly diagnosed cases in the East of England and the South West, 2010-2011, **Strategic Health Authorities, by month, Jan 2010-Jun 2011** .

[27] Claire Nickerson. (2012) Data from the Bowel Cancer Screening Programme (screening uptake and screen detected CRC cases).

[28] CatherineGoodall, JemRashbass, Eastern Cancer Registration and Information Centre (ECRIC). (2011) An analysis of the impact of the Department of Health publicity campaign in the East of England to increase awareness of the signs and symptoms of bowel cancer.

[29] Mayden. (2011) Bowel cancer awareness campaign evaluation: Impact on patients attending GP appointments.

[30] Midthune DN, Fay MP, Clegg LX, Feuer EJ. Modeling reporting delays and reporting corrections in cancer registry data. *Journal of the American Statistical Association* 2005; **100**(469):61-70.

[31] Whyte S, Chilcott J, Essat M *et al.* (2011) Reappraisal of the options for colorectal cancer screening., http://www.screening.nhs.uk/policydb_download.php?doc=130.

[32] National Institute for Health and Clinical Excellence. Updated guide to the methods of technology appraisal - June 2008. *NICE* 2008.

[33] Northern & Yorkshire Cancer Registry & Information Service and the National Cancer Intelligence Network.Aravani A TJDM&ME. (2009) Incidence data and relative survival rates calculated from the National Cancer Data Repository.

[34] Rachet B. (2012) Net survival data for cancer of the Colon and Rectum, Internation Cancer Benchmarking Partnership (ICBP).

[35] Logan RF, Patnick J, Nickerson C *et al.* Outcomes of the Bowel Cancer Screening Programme (BCSP) in England after the first 1 million tests. *Gut* 2012; **61**(10):1439-46.

[36] Atkin WS, Edwards R, Kralj-Hans I *et al.* Once-only flexible sigmoidoscopy screening in prevention of colorectal cancer: a multicentre randomised controlled trial. *Lancet* 2010; **375**(9726):1624-33.

[37] Dr.Manuel Zorzi RTdV. (2010) Italian iFOBT screening programme data.

[38] Brenner H, Altenhofen L, Hoffmeister M. Sex, age, and birth cohort effects in colorectal neoplasms: a cohort analysis. *Ann Intern Med* 2010; **152**(11):697-703.

[39] Chung SJ, Kim YS, Yang SY *et al.* Prevalence and risk of colorectal adenoma in asymptomatic Koreans aged 40-49 years undergoing screening colonoscopy. *J Gastroenterol Hepatol* 2010; **25**(3):519-25.

[40] Whyte S, Walsh C, Chilcott J. Bayesian Calibration of a Natural History Model with Application to a Population Model for Colorectal Cancer. *Medical Decision Making* 2011; **31**(4):625-41.

[41] Whyte S, Chilcott J, halloran S. Re-appraisal of the options for colorectal cancer screening in England. *Colorectal Disease* 2012.

[42] Jacobsen GD, Jacobsen KH. Health awareness campaigns and diagnosis rates: Evidence from National Breast Cancer Awareness Month. *Journal of Health Economics* 2011; **30**(1):55-61.

[43] Office for National Statisitcs. (2011) Estimated resident population mid-2010 by single year of age and sex., www.ons.gov.uk/ons/rel/pop-estimate/population-estimates-for-uk--england-and-wales--scotland-and-northern-ireland/mid-2010-population-estimates/annual-mid-year-population-estimates--2010.pdf-Accessed January 2012.

[44] Curtis L. (2010) Unit Costs of Health and Social Care 2010. PSSRU.

[45] Tappenden P. (2011) A methodological framework for developing Whole Disease Models to inform resource allocation decisions:
An application in colorectal cancer, University of Sheffield, PhD thesis.

[46] Ara R, Brazier JE. (2010) Using health state utility values from the general population to approximate baselines in decision analytic models when condition specific data are not available.

[47] National Cancer Intelligence Network. (2008) NCIN Cancer Incidence by deprivation, England 1995-2004.

[48] Community health attitude transformation through colon cancer prevention awareness campaign, Lubbock Colorectal Cancer Demonstration Project (LCCDP). ASCO(1 A.D.).

[49] Launch of a new programme of work to tackle bowel cancer *x* 1 A.D..

[50] Adams J. (1996) The effect of a health information intervention on knowledge and health practices regarding colorectal cancer in African-Americans., -161. Texas Woman's University, United States -- Texas.

[51] Aragones A, Schwartz MD, Shah NR, Gany FM. A randomized controlled trial of a multilevel intervention to increase colorectal cancer screening among Latino immigrants in a primary care facility. *Journal of General Internal Medicine* 2010; **25**:564-7.

[52] Bagai A, Parsons K, Malone B *et al.* Workplace colorectal cancer-screening awareness programs: an adjunct to primary care practice? *J COMMUNITY HEALTH* 2007; **32**(3):157-67.

[53] Bassett ML, Goulston KJ. Colorectal cancer: the challenge of early detection. *Medical Journal of Australia* 1978; **1**(9):489-93.

[54] Bayer TL. (2008) The effect of a health information intervention on perceptions regarding colorectal cancer., -49. North Dakota State University.

[55] Berkley S. Early detection of colorectal cancer. *ONCOL NURS FORUM* 1992; **19**(1):92-3.

[56] Blumenthal DS, Smith SA, Majett CD, Alema-Mensah E. A trial of 3 interventions to promote colorectal cancer screening in African Americans. *Cancer* 2010; **116**(4):922-9.

[57] Brasca A, Pigliacampo J, Pollastri E *et al.* Public Awareness Campaign in Diagnosis and Prevention of Cancer of the Colon and Rectum - Planning and Evaluation of Results. *Digestive Diseases and Sciences* 1986; **31**(10):S317.

[58] Braun KL, Fong M, Kaanoi ME, Kamaka ML, Gotay CC. Testing a culturally appropriate, theory-based intervention to improve colorectal cancer screening among Native Hawaiians. *PREV MED* 2005; **40**(6):619-27.

[59] Brown ML, Potosky AL. The presidential effect: the public health response to media coverage about Ronald Reagan's colon cancer episode. *Public Opinion Quarterly* 1990; **54**(3):317-29.

[60] Causey C, Greenwald B. Promoting community awareness of the need for colorectal cancer prevention and screening: a replication study. *GASTROENTEROL NURS* 2011; **34**(1):34-40.

[61] Centers for Disease Control and Prevention (CDC). Donated television airplay of colorectal cancer education public service announcements--United States, 1999-2002. *MMWR - Morbidity & Mortality Weekly Report* 2003; **52**(10):196-9.

[62] Chan EC, Vernon SW. Implementing an intervention to promote colon cancer screening through e-mail over the Internet: lessons learned from a pilot study. *MED CARE* 2008; **46**(9 Suppl 1):S117-S122.

[63] Connelly D. (2007) Community pharmacists can play a key role raising awareness of bowel cancer., 580.

[64] Costanza ME, Luckmann R, Stoddard AM *et al.* Using tailored telephone counseling to accelerate the adoption of colorectal cancer screening. *Cancer Detection & Prevention* 2007; **31**(3):191-8.

[65] Dietrich AJ, Tobin JN, Cassells A *et al.* Translation of an efficacious cancer-screening intervention to women enrolled in a Medicaid managed care organization. *ANN FAM MED* 2007; **5**(4):320-7.

[66] Eisinger F, Blay JY, Morere JF *et al.* Impact of awareness of cancer among acquaintances on cancer screening attendance. *European Journal of Cancer Prevention* 2011; **20**:S36-S38.

[67] Emmons KM, Wong M, Puleo E *et al.* Tailored computer-based cancer risk communication: correcting colorectal cancer risk perception. *Journal of Health Communication* 2004; **9**:127-41.

[68] Everett T. (1999) The effectiveness of a brief videotaped intervention on colorectal cancer screening using peer educators., -92. University of South Carolina, United States -- South Carolina.

[69] Fenton JJ. (2011) A decision aid to enhance informed decision making about bowel cancer screening improved knowledge but reduced screening uptake., 78-9. BMJ Publishing Group (Tavistock Square, London WC1H 9JR, United Kingdom).

[70] Fitzgibbon ML, Ferreira MR, Dolan NC *et al.* Process evaluation in an intervention designed to improve rates of colorectal cancer screening in a VA medical center. *Health Promotion Practice* 2007; **8**:273-81.

[71] Wolf MS, Fitzner KA, Powell EF *et al.* Costs and cost effectiveness of a health care provider-directed intervention to promote colorectal cancer screening among Veterans. *J CLIN ONCOL* 2005; **23**(34):8877-83.

[72] Frazier TG, Bassett JG, Weiss SM, Zimmelman S. Mass screening for colorectal cancer--the Philadelphia experience. *J CANCER EDUC* 1987; **2**(1):31-3.

[73] Gimeno-Garcia AZ, Quintero E, Nicolas-Perez D, Parra-Blanco A, Jimenez-Sosa A. Impact of an educational video-based strategy on the behavior process associated with colorectal cancer screening: a randomized controlled study. *Cancer Epidemiology* 2009; **33**(3-4):216-22.

[74] Gossey J. (2011) Increasing awareness of colorectal cancer screening through targeted exam room based video messages. The University of Texas School of Public Health, United States -- Texas.

[75] Greenwald B. Promoting community awareness of the need for colorectal cancer screening: a pilot study. *Cancer Nursing* 2006; **29**(2):134-41.

[76] Greenwald BJ, Edwards JU. Worksite education programs by county extension agents to promote colorectal cancer prevention and screening. *Gastroenterology Nursing* 2010; **33**(5):348-52.

[77] Hart AR, Barone TL, Mayberry JF. Increasing compliance with colorectal cancer screening: the development of effective health education. *HEALTH EDUC RES* 1997; **12**(2):171-80.

[78] Hoffman A, Young Q, Bright-Asare P *et al.* Early detection of bowel cancer at an urban public hospital: demonstration project. *CA: a Cancer Journal for Clinicians* 1983; **33**(6):344-58.

[79] Holt CL, Shipp M, Eloubeidi M *et al.* (2011) Your body is the temple: Impact of a spiritually based colorectal cancer educational intervention delivered through community health advisors. [References]., 577-88.

[80] Jerant A, Kravitz RL, Rooney M *et al.* Effects of a tailored interactive multimedia computer program on determinants of colorectal cancer screening: a randomized controlled pilot study in physician offices. *PATIENT EDUC COUNS* 2007; **66**(1):67-74.

[81] Katz ML, James AS, Pignone MP *et al.* Colorectal cancer screening among African American church members: a qualitative and quantitative study of patient-provider communication. *BMC Public Health* 2004; **4**:62.

[82] Keighley MRB. Screening for colorectal cancer in Europe. *Scandinavian Journal of Gastroenterology 39 (9) (pp 805-806), 2004 Date of Publication: Sep 2004* 2004; **39**(9):Sep.

[83] Lasser KE, Murillo J, Lisboa S *et al.* Colorectal cancer screening among ethnically diverse, low-income patients: a randomized controlled trial. *ARCH INTERN MED* 2011; **171**:906-12.

[84] Lawsin C, DuHamel K, Weiss A, Rakowski W, Jandorf L. Colorectal cancer screening among low-income African Americans in East Harlem: a theoretical approach to understanding barriers and promoters to screening. *Journal of Urban Health* 2007; **84**(1):32-44.

[85] Lee TJW, Zwart C, Rees C, Rutter M. Has the introduction of the bowel cancer screening programme led to an early change in the stage of colorectal cancer at diagnosis? *Gut Conference: Annual Meeting of the British Society of Gastroenterology Glasgow United Kingdom Conference Start: 20090323 Conference End: 20090326 Conference Publication: (var pagings) 58 (pp A93-A94), 2009 Date of Publication: April 2009* 2009;(var.pagings):April.

[86] Lopez AM, Trejo DS, Felis TS *et al.* Programme of Screening for Colorrectal Cancer in the Community Valenciana, Spain. Results of the First Round (2005-2008). *Revista Espanola de Salud Publica* 2010; **84**(6):731-43.

[87] Loss J, Eichhorn C, Nagel E. The effects of promoting colorectal cancer screening on screening utilisation: evaluation of the German Campaign "Aktiv gegen Darmkrebs" (Action against Colorectal Cancer). *Zeitschrift fur Gastroenterologie* 2006; **44**(11):1127-34.

[88] Ma GX, Shive S, Tan Y *et al.* Community-based colorectal cancer intervention in underserved Korean Americans. *Cancer Epidemiology* 2009; **33**(5):381-6.

[89] Mahon SM. Using brochures to educate the public about the early detection of prostate and colorectal cancer. *ONCOL NURS FORUM* 1995; **22**(9):1413-20.

[90] Makoul G, Cameron KA, Baker DW *et al.* A multimedia patient education program on colorectal cancer screening increases knowledge and willingness to consider screening among Hispanic/Latino patients. *Patient Education and Counseling* 2009; **76**(2):220-6.

[91] Marcus AC, Mason M, Wolfe P *et al.* The efficacy of tailored print materials in promoting colorectal cancer screening: results from a randomized trial involving callers to the National Cancer Institute's Cancer Information Service. *Journal of Health Communication* 2005; **10 Suppl 1**:83-104.

[92] Maxwell AE, Bastani R, Crespi CM, Danao LL, Cayetano RT. Behavioral mediators of colorectal cancer screening in a randomized controlled intervention trial. *PREV MED* 2011; **52**(2):167-73.

[93] Maxwell AE, Bastani R, Danao LL *et al.* Results of a community-based randomized trial to increase colorectal cancer screening among Filipino Americans. *AM J PUBLIC HEALTH* 2010; **100**:2228-34.

[94] Mayer J, Eichhorn C, Nagel E. (2004) Promoting colorectal cancer screening could increase utilization: assessment of a local campaign in Germany., 2.

[95] Mazor KM, Calvi J, Cowan R *et al.* Media Messages About Cancer: What Do People Understand? *Journal of Health Communication* 2010; **15**:126-45.

[96] Meade CD, McKinney WP, Barnas GP. Educating patients with limited literacy skills: the effectiveness of printed and videotaped materials about colon cancer. *AM J PUBLIC HEALTH* 1994; **84**(1):119-21.

[97] Menon U, Szalacha LA, Belue R *et al.* Interactive, culturally sensitive education on colorectal cancer screening. *MED CARE* 2008; **46**(9:Suppl 1):Suppl-50.

[98] Miesfeldt S, Hayden C, Apedoe N, Jerome S, Fletcher A. (2010) Colorectal cancer screening pilot program for underserved women in Cumberland County, Maine. [References]., 109-14.

[99] Morgan PD, Fogel J, Tyler ID, Jones JR. Culturally targeted educational intervention to increase colorectal health awareness among African Americans. *J HEALTH CARE POOR UNDERSERV* 2010; **21**(3 Suppl):132-47.

[100] Murff HJ. Intensive patient education improves colorectal cancer screening rates. *Journal of Clinical Outcomes Management 12 (7) (pp 341-342), 2005 Date of Publication: Jul 2005* 2005;(7):Jul.

[101] Myers RE, Sifri R, Hyslop T *et al.* A randomized controlled trial of the impact of targeted and tailored interventions on colorectal cancer screening. *Cancer* 2007; **110**(9):2083-91.

[102] Myers RE, Hyslop T, Sifri R *et al.* Tailored navigation in colorectal cancer screening. *MED CARE* 2008; **46**(9:Suppl 1):Suppl-31.

[103] Nguyen TT, Love MB, Liang C *et al.* A pilot study of lay health worker outreach and colorectal cancer screening among Chinese Americans. *J CANCER EDUC* 2010; **25**(3):405-12.

[104] O'Riordain MG, Gorey TF. Towards earlier detection of colorectal cancer. *Leukemia 10 (SUPPL* 1996; **2)**(pp 141-142):1996.

[105] Pahil RS, Rankin E, MacCormick RE *et al.* Impact of education on colorectal cancer screening. *Annals of Oncology Conference: 12th World Congress on Gastrointestinal Cancer, ESMO Conference Barcelona Spain Conference Start: 20100630 Conference End: 20100703 Conference Publication: (var pagings) 21 (pp vi76), 2010 Date of Publication: July 2010* 2010;(var.pagings):July.

[106] Parente F, Marino B, Armellino A *et al.* Impact of a population-based colorectal cancer screening programme on local health services demand in Italy. A five-year survey in a northern province. *Digestive and Liver Disease Conference: 17th National Congress of Digestive Diseases - Italian Federation of Societies of Digestive Diseases, FISMAD Turin Italy Conference Start: 20110305 Conference End: 20110309 Conference Publication: (var pagings)* 2011;(var.pagings):March.

[107] Paul C, Tzelepis F, Walsh RA *et al.* Has the investment in public cancer education delivered observable changes in knowledge over the past 10 years? *Cancer 97 (12) (pp 2931-2939), 2003 Date of Publication: 15 Jun 2003* 2003;(12):15.

[108] Percac LS, Grant RW, Green AR *et al.* A culturally tailored navigator program for colorectal cancer screening in a community health center: a randomized, controlled trial. *Journal of General Internal Medicine* 2009; **24**:211-7.

[109] Philip EJ, DuHamel K, Jandorf L. Evaluating the impact of an educational intervention to increase CRC screening rates in the African American community: a preliminary study. *Cancer Causes & Control* 2010; **21**(10):1685-91.

[110] Potter MB, Gildengorin G, Wang Y, Wu M, Kroon L. Comparative effectiveness of two pharmacy-based colorectal cancer screening interventions during an annual influenza vaccination campaign. *Journal of the American Pharmacists Association: JAPhA* 2010; **50**(2):181-7.

[111] Powe BD, Weinrich S. An intervention to decrease cancer fatalism among rural elders. *ONCOL NURS FORUM* 1999; **26**(3):583-8.

[112] Power E, Simon A, Juszczyk D, Hiom S, Wardle J. Assessing awareness of colorectal cancer symptoms: Measure development and results from a population survey in the UK. *BMC Cancer 11 , 2011 Article Number: 366 Date of Publication: 23 Aug 2011* 2011;366.

[113] Provenzano J. Step up to the plate: making a difference in colorectal cancer awareness. *GASTROENTEROL NURS* 2007; **30**(2):161.

[114] Pullyblank AM, Dixon N, Dixon AR. The impact of bowel cancer awareness week. *Colorectal Disease 4 (6) (pp 483-485), 2002 Date of Publication: Nov 2002* 2002;(6):Nov.

[115] Reubsaet A, van Osch LADM, de Vries H, Op de Coul MR, Lechner L. Some signals cannot wait: Effects of a national campaign on early detection of cancer among Dutch adults (>55 years). *Cancer Epidemiology* 2009; **33**(3-4):194-200.

[116] Robb KA, Miles A, Campbell J *et al.* Can cancer risk information raise awareness without increasing anxiety? A randomized trial. *Preventive Medicine* 2006; **43**(3):187-90.

[117] Royse D, Dignan M. Improving cancer knowledge and screening awareness: test of a telephone interviewer intervention. *J CANCER EDUC* 2009; **24**(4):315-8.

[118] Ruffin MT, Fetters MD, Jimbo M. Preference-based electronic decision aid to promote colorectal cancer screening: results of a randomized controlled trial. *PREV MED* 2007; **45**:267-73.

[119] Rutledge W, Gibson R, Siegel E *et al.* Arkansas Special Populations Access Network perception versus reality--cancer screening in primary care clinics. *Cancer* 2006; **107**(8 Suppl):2052-60.

[120] Schroy PC, III, Glick JT, Robinson PA *et al.* Has the surge in media attention increased public awareness about colorectal cancer and screening? *J COMMUNITY HEALTH* 2008; **33**(1):1-9.

[121] Sequist TD, Zaslavsky AM, Marshall R, Fletcher RH, Ayanian JZ. Patient and physician reminders to promote colorectal cancer screening: a randomized controlled trial. *ARCH INTERN MED* 2009; **169**(4):364-71.

[122] Seeff LC, DeGroff A, Tangka F *et al.* Development of a federally funded demonstration colorectal cancer screening program. *Preventing Chronic Disease* 2008; **5**(2):A64.

[123] Shankaran V, Luu TH, Nonzee N *et al.* Costs and cost effectiveness of a health care provider-directed intervention to promote colorectal cancer screening. *J CLIN ONCOL* 2009; **27**(32):5370-5.

[124] Smith SK, Trevena L, Simpson JM *et al.* (2010) A decision aid to support informed choices about bowel cancer screening among adults with low education: Randomised controlled trial., 977. BMJ Publishing Group (Tavistock Square, London WC1H 9JR, United Kingdom).

[125] Strock P, Mossong J, Weber J, Pfitzner V, Kerschen A. Hospital physicians and national awareness campaigns alone are not effective at increasing colorectal cancer screening rates in a sustainable manner. *Annals of Oncology* 2008; **19**:83.

[126] Subrahmanian K, Petereit DG, Kanekar S *et al.* Community-Based Participatory Development, Implementation, and Evaluation of a Cancer Screening Educational Intervention among American Indians in the Northern Plains. *J CANCER EDUC* 2011; **26**(3):530-9.

[127] Trevena LJ, Irwig L, Barratt A. Randomized trial of a self-administered decision aid for colorectal cancer screening. *J MED SCREEN* 2008; **15**(2):76-82.

[128] Tu SP, Taylor V, Yasui Y *et al.* Promoting culturally appropriate colorectal cancer screening through a health educator: a randomized controlled trial. *Cancer* 2006; **107**(5):959-66.

[129] Ueland AS, Hornung PA, Greenwald B. Colorectal cancer prevention and screening: a Health Belief Model-based research study to increase disease awareness. *GASTROENTEROL NURS* 2006; **29**(5):357-63.

[130] Vernon SW, Bartholomew LK, McQueen A *et al.* A randomized controlled trial of a tailored interactive computer-delivered intervention to promote colorectal cancer screening: sometimes more is just the same. *Annals of Behavioral Medicine* 2011; **41**(3):284-99.

[131] Misra S, Lairson DR, Chan W *et al.* Cost effectiveness of interventions to promote screening for colorectal cancer: a randomized trial. *Journal of Preventive Medicine & Public Health / Yebang Uihakhoe Chi* 2011; **44**(3):101-10.

[132] Ward AJ, Coffey KB, Lengerich EJ, Piccinin AM. The impact of cancer coalitions on the dissemination of colorectal cancer materials to community organizations in rural Appalachia. *Preventing Chronic Disease* 2006; **3**(2):A55.

[133] Wardle J. Does publicity about cancer screening raise fear of cancer? : randomised trial of the psychological effect of information about cancer screening. *BMJ 1999; 319 (7216): 1037-1038 (16 October 1999)* 1999;(7216):1037-8.

[134] Wardle J, Williamson S, McCaffery K *et al.* Increasing attendance at colorectal cancer screening: testing the efficacy of a mailed, psychoeducational intervention in a community sample of older adults. *Health Psychology* 2003; **22**(1):99-105.

[135] White MJ, Stark JR, Luckmann R *et al.* Implementing a computer-assisted telephone interview (CATI) system to increase colorectal cancer screening: a process evaluation. *PATIENT EDUC COUNS* 2006; **61**(3):419-28.

[136] Williamson S, Wardle J. (2002) Increasing participation with colorectal cancer screening: The development of a psycho-educational intervention. [References]., 105-22.

[137] Wu TY, Kao JY, Hsieh HF *et al.* Effective colorectal cancer education for Asian Americans: a Michigan program. *J CANCER EDUC* 2010; **25**(2):146-52.

[138] Danieli C, Remontet L, Bossard N, Roche L, Belot A. Estimating net survival: the importance of allowing for informative censoring. *Statistics in Medicine* 2012; **31**(8):775-86.

[139] Stare J, Perme MP, Henderson R. A Measure of Explained Variation for Event History Data. *Biometrics* 2011; **67**(3):750-9.

[140] Lambert PC, Thompson JR, Weston CL, Dickman PW. Estimating and modeling the cure fraction in population-based cancer survival analysis. *Biostatistics* 2007; **8**(3):576-94.

[141] Office of National Statisitcs. (2011) Interim Life Tables, United Kingdom, based on data for the years 2008-2010.

[142] Office of National Statisitcs. (2011) Death registration summary statistics, England and Wales 2010.