COLORECTAL CANCER IN AUSTRALIA

THE ONGOING NEED FOR COMMUNITY EDUCATION ABOUT THE BENEFITS OF EARLY DETECTION AND PREVENTATIVE MEASURES

Produced by the Cancer & Bowel Research Trust and

the Australian Cancer Education Prevention Fund

SUMMARY

Colorectal Cancer (CRC) is the cancer with the second highest incidence and is the second leading cause of cancer death in Australia. There is a 1 in 17 and a 1 in 26 lifetime risk of being diagnosed with CRC in Australia for men and women respectively. CRC costs the Australian government $235 million a year in direct costs and over 63,000 Disability-Adjusted Life Years.

Despite its long natural history, taking between 5 and 10 years to develop into cancer from its benign precursors, CRC is often not diagnosed until a later stage. CRC is largely clinically asymptomatic in its early stages, demonstrating the need for a screening program to detect CRC while it is still at an early stage, and more easily treatable. CRC that is treated at Stage A (confined to the bowel wall) has a 5-year survival rate of 88%, compared to a 5-year survival rate of 7% when treated at Stage D (when the cancer has spread outside the colon).

The Cancer and Bowel Research Trust Phone Survey found that there is a significant discrepancy between the true incidence and prevalence of different types of cancer and the public's perception of the situation**.** The Survey also found that the types of cancer that the respondents knew most about, had benefited from public awareness campaigns for many years.

CRC is a very good candidate for a screening program as it has a high prevalence, clear benefits for prognosis from early treatment, slow and predictable growth and effective treatment exists. However, no one screening test has proven to be conclusively better than any other, making it challenging to choose a screening modality.

The Australian Government trialled a CRC Screening Pilot Program in three diverse regions of Australia between November 2002 and July 2004. The Pilot found that bowel cancer screening using Faecal Occult Blood Test (FOBT) as the screening test, with colonoscopy as the follow-up procedure, is feasible, acceptable and cost-effective in an Australian context.

The National Bowel Screening Program commenced in May 2006 and is currently being phased in to ensure colonoscopy services can handle the increased demand. The ultimate goal of the Australian Government is to provide biennial screening for all Australians above the age of 50 by 2012, in line with the NHMRC guidelines. It is believed that this could save 30 Australian lives each week.

The Australian Government will continue to monitor the performance of the National Bowel Screening Program. In the meantime, public health campaigns can educate Australians on how to minimise modifiable risk factors for CRC. Such risk factors include obesity, alcohol consumption, smoking, low fruit, vegetable and dietary fibre consumption, high fat consumption and low physical activity.

The Cancer and Bowel Research Trust has been active in creating public awareness of CRC and advocating for early screening. Particularly successful has been the "Embarrassment can kill" slogan to highlight the importance of early detection. This program has been heavily promoted through the distribution of printed information and face to face and telephone consultation with members of the community, through our Doorknock, shopping centre and telephone campaigns. These campaigns have a direct and personal reach to the community promoting the benefits of early detection, increasing awareness of the disease and educating the public on lifestyle changes that may help prevent CRC.

Other initiatives such as an educational website and free call number have acted as information portals for Australians to access.

PART 1

What is Colorectal Cancer?

Colorectal Cancer (CRC) arises from abnormal malignant growth in either the colon or rectum.[1] 98% of these malignant growths are termed adenocarcinomas,[2] and arise from a benign growth known as an adenomatous polyp: a neoplastic mass that protrudes into the lumen of the gut.[3]

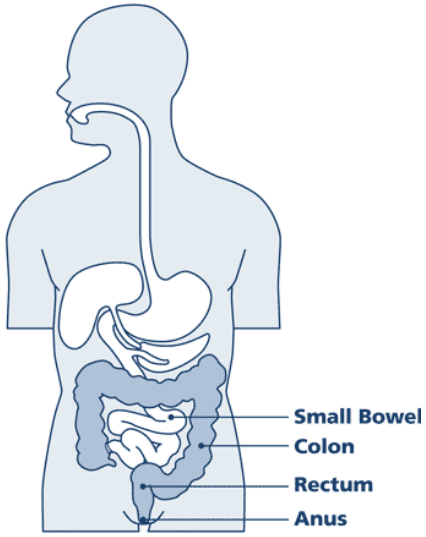

Figure 1: The large bowel [1]

The natural history of CRC is known as the adenoma-carcinoma sequence (Figure 2). An adenomatous polyp may gradually form from normal colonic tissue; however 90% of these polyps will never progress to cancer. However, a polyp cannot clinically be reliably identified as progressive, underlying the rationale for removing all identified polyps on colonoscopy.[4]

An accumulation of congenital or acquired genetic mutations will gradually cause the benign adenomatous polyp to become a malignant adenocarcinoma. Over time, these genetic mutations will also lead to disruption of both the normal cell architecture and cell appearance. Pathologists can study resected polyps and report on how aggressive the carcinoma is. This is known as grading the carcinoma.[5]

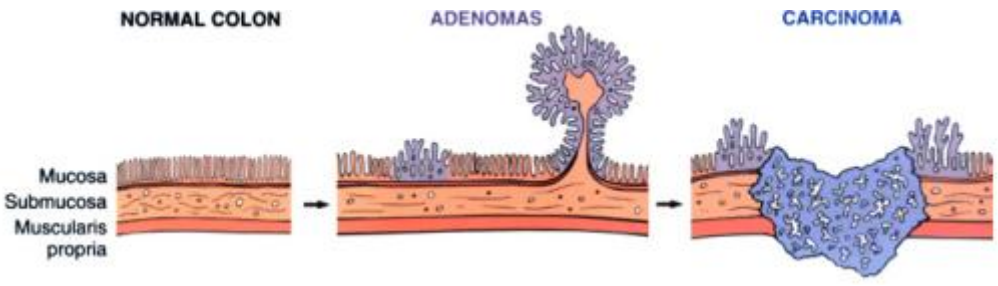

Figure 2: The adenoma-carcinoma sequence [modified from 3]

It is also important to estimate the spread of cancer, known as staging. In Australia, the Australian clinicopathological system (ACPS) is used. Over time, an adenocarcinoma will spread deeper into the sublayers of the colon wall (Figure 3), then to local lymph nodes and finally metastasise to other parts of the body. Table 1 shows the inverse relationship between the degree of cancer spread at time of diagnosis and the 5 year survival relationship. It follows that an individual's chance of survival from CRC improves with earlier detection and removal of the adenocarcinoma. A South Australian study found that only 15% of CRC was being diagnosed at stage A, suggesting an opportunity for earlier detection and increased survival.[6]

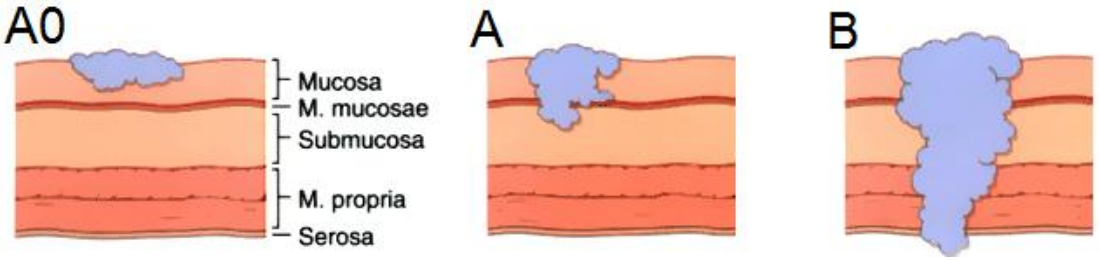

Figure 3: Pathologic staging of colorectal cancer. Staging is based on the depth of tumor invasion [modified from 3]

Table 1: The inverse relationship between ACPS Stage at diagnosis and 5-year prognosis

Maximum Spread	ACPS Stage[7]	Prognosis (5 year Survival, %)[8]
Mucosa	A0	Data not available
Submucosa	A	88
Beyond muscularis propria	B	70
Regional lymph node involvement	C	43
Distant metastases	D	7

Risk Factors for Colorectal Cancer

Individuals aged 50 years or over, with no personal history of adenoma or CRC and no first degree relative with CRC are at an average risk for CRC. 70% of patients who develop CRC are considered "average risk".[9] Other factors, such as a personal history of inflammatory bowel disease, or family history of genetic diseases such as FAP or HNPCC will also put an individual at higher risk of CRC. Almost all individuals at a higher-than-average risk should be following a separate colonic surveillance program and are excluded from a population screening program. Recently, people with just one first-degree relative with CRC have been advised to take part in the population screening program, provided their relative was diagnosed over the age of 55.[10]

Recognised modifiable risk factors for CRC include low fruit and vegetable consumption, obesity and living in industrialised nations. Controversial modifiable risk factors include physical inactivity, low dietary fibre, high fat and red meat intake. Older age is also an important recognised risk factor for CRC.[11] These risk factors are summarised in the table below. The high number of modifiable risk factors illustrates the importance of intervention to alter behaviours.

Table 2: Risk factors for Colorectal Cancer	
Non-Modifiable Risk Factors	**Modifiable Risk Factors**
Old age	Low fruit and vegetable consumption
	Obesity
Genetic disease: FAP, HNPCC, Peutz-Jeghers syndrome, Juvenile polyposis, Non-syndromic colon cancer, Hyperplastic polyposis	Smoking cigarettes
	Alcohol
	Living in industrialised nations
	Physical inactivity*
Inflammatory Bowel Disease: Ulcerative Colitis, Crohn's Disease	Low aspirin intake*
	Low calcium*
	High fat diet*
Personal history of CRC or Colonic Adenomatous Polyps	High red meat in diet*
	Low selenium*
	Low folate*
	Low carotenoid diet*
	Low fibre diet*
	Breast cancer*
	Diabetes Mellitus*
	Prior cholecystectomy*
* controversial risk factors[10-11]	

Clinical Presentation of Colorectal Cancer

CRC can remain clinically silent for years, especially if situated in the proximal colon. Non-specific symptoms such as fatigue and palpitations can arise secondarily to blood loss (which may be seen in a bowel motion). Only larger adenocarcinomas will cause bowel obstruction, with resulting cramping, a persistent feeling of fullness or an unexplained change in bowel habits.[2,12] The asymptomatic nature of early CRC underlines the need for a screening program to detect smaller polyps before they reach a more serious symptomatic stage.

PART 2

Epidemiology of Colorectal Cancer

CRC has the second highest incidence of all cancers in Australia (behind prostate and excluding non-melanocytic skin cancer) with 12,977 new cases being diagnosed in 2004.[13] There is currently a 1 in 17 lifetime risk for males of being diagnosed with colorectal cancer by the age of 75 years and a 1 in 26 risk for females.[14] CRC caused 4,068 deaths in 2004, the second leading cause of cancer death behind 7,258 deaths due to lung cancer. CRC was the third and second most prevalent form of cancer in males and females respectively in 2004. 5 year survival rate for CRC dropped as patients lived in increasingly remote locations and as patients were increasingly socioeconomically disadvantaged.[13] CRC evidently has a significant impact on health in Australia and is a priority for the Australian Government.

CRC is not evenly distributed along the colon, with 60% of cases occurring in the rectum and distal colon, and only 35% occurring in the proximal colon, as shown in the figure below. This is particularly important when choosing a screening method. It can be seen that choosing flexible sigmoidoscopy (which cannot visualise the proximal colon) will miss 35% of CRCs (Figure 4).[15]

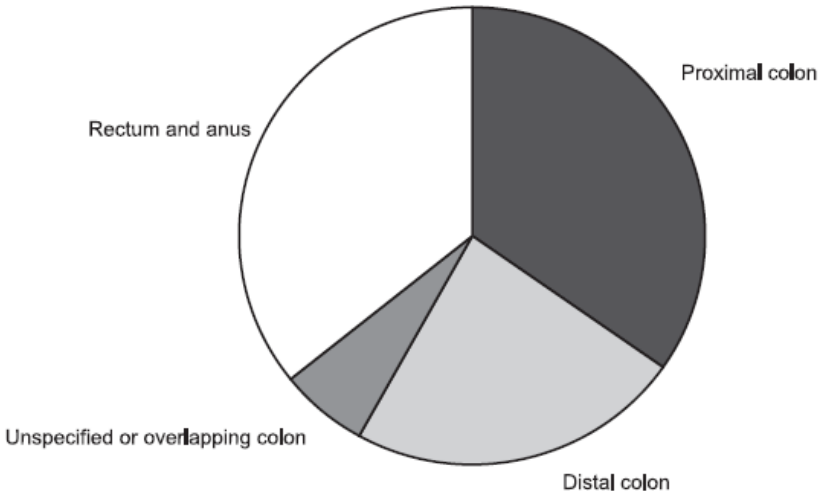

Figure 4: The Distribution of Colorectal Cancer along the Large Bowel [15]

Australia has the fifth highest incidence data for men, behind the Czech Republic, New Zealand, Hungary and Slovakia and the second highest incidence globally for women, behind New Zealand, in a study out of 173 countries. Australia fares better in terms of mortality from CRC, being fifteenth for males and seventeenth for females.[15]

CRC is the third most common cancer in both male and female Aboriginal and Torres Strait Islander (ATSI) people. Age standardised-incidence among ATSI people is lower than for non-ATSI people, and

is a smaller burden of cancer disease. CRC in ATSI males and females of accounts for 9.5% and 8.9% respectively, compared with 13.8% and 13.6% in non-ATSI Australians. It must be noted that incidence rates are believed to be under-recorded for ATSI Australians.[16] Despite being less common in ATSI people than other Australians, both incidence and mortality rate ratios are also higher in younger rather than older Indigenous people in the Northern Territory. These findings are consistent with generation-based increases in exposure to risk factors, such as smoking, diet and physical activity.[17]

The Cost of Colorectal Cancer to the Australian Economy

Colorectal cancer is the disease with the tenth highest burden in both genders accounting for a loss of 63,605 Disability-Adjusted Life Years (DALYs) in 2003. It also has the fifth highest mortality burden in both genders, accounting for 51,732 years of life lost through premature mortality (YLL).[18] In a 2005 study, CRC was estimated to be the third highest contributor to direct costs (an estimated $235 million). $188 million (80% of total expenditure) was spent solely on hospital treatment costs and only $34 million (14% of total expenditure) on other costs, including screening programs and disease education. This contrasts with cervical cancer and breast cancer, for which $88.2 million and $96 million were spent on the National Cervical Screening program and BreastScreen Australia respectively.[19]

The lifetime treatment cost per case of colorectal cancer was estimated at $18,246.[19] The cost of treating CRC increases dramatically with the stage of the cancer, varying from $1,250 for removal of non-cancerous polyps to over $23,400 for treatment of later stage CRC.[20] The benefits from early removal of pre-cancerous polyps are not only evident for the prognosis of the individual, but also make economic sense.

Continued campaigns may have a direct impact on reduction of CRC and reduce the overall cost of lifetime treatment.

PART 3

How much do Australians know about Colorectal cancer?

In July-August 2008, the Cancer and Bowel Research Trust conducted a significant phone survey of Australians to ascertain the level of knowledge of cancer. Interviewees were chosen at random from certain postcode areas in South Australia, Victoria, New South Wales and Queensland, representing a fair and comprehensive cross-section of people.

When asked to state the most prevalent cancer, 39% of respondents said breast, while only 15% said bowel. Alarmingly, the second most prevalent cancer, prostate cancer, was only chosen by 9% of respondents.

Table 3: Comparison of Australians' perceptions of the prevalence of common cancers and the prevalence of common cancers according the AIHW[19]

Type of Cancer	Percentage of Respondents	Rank	Rank according to [19]
Breast	39%	1	3
Skin	24%	2	1*
Bowel	15%	3	4
Lung	9%	4	5
Prostate	9%	5	2
Other	4%	6	-

*Non-melanocytic skin cancer data is no longer routinely collected due to its very high incidence. Estimates from national household surveys indicate that there were 374, 000 people diagnosed with the two most common types of NMSC in 2002, but only 390 deaths in 2003. Given its high incidence and low mortality, NMSC has very high prevalence rates. In the general population, skin cancer may be understood as including both melanocytic and non-melanocytic skin cancer.[19]

Similarly, 37% of respondents specified breast cancer as the cancer with the highest incidence, despite it only being ranked as the fourth highest incidence. All other respondents' rankings were in line with the true rankings.

Table 4: Comparison of Australians' perceptions of the incidence of common cancers and the incidence of common cancers according the AIHW[19]

Type of Cancer	Percentage of Respondents	Rank	Rank according to [19]
Breast	37%	1	4
Skin	25%	2	1
Prostate	16%	3	2
Bowel	9%	4	3
Lung	7%	5	5
Other	6%	6	-

Breast cancer was ranked as both the most prevalent and incident cancer by respondents despite this not being reflected in the true rankings according to the literature. It could be hypothesised that

the $96 million that is being spent on BreastScreen Australia[19] could be contributing to the increased awareness of the disease.

This was confirmed when interviewees were asked which cancer they considered to know most about. 35% of respondents stated breast cancer, and a further 15% stated skin cancer (also publicised widely through the "Slip, Slop, Slap" campaign).[21] Bowel, prostate and lung cancer were the least well understood with only 9%, 8% and 7% choosing each form of cancer. 26% specified another type of cancer.

Respondents were asked to give the primary reason for their superior knowledge of the form of cancer they specified. 16% of respondents stated their lifestyle choices (i.e. being in the sun for long periods of time, being a smoker), while a further 13% attributed their knowledge to television or media. 10% and 9% respectively attributed their knowledge to either a family member or friend's diagnosis with the disease, or their own diagnosis. Employment was the main factor for 7% of respondents, while 5% attributed their knowledge to awareness programs. The remaining 41% gave other reasons.

When ask to prioritise areas to direct cancer funding, research gained the approval of 57% of respondents, followed by public education of the benefits of early detection (25%), assisting patients in the cost of treatment (8%), purchasing equipment used at diagnostic and treatment levels (7%) and providing accommodation to patients needing to travel to receive treatment (3%).

Respondents clearly favoured TV as the best method of disseminating information about cancer prevention (54%), followed by doctors (13%), print media (11%), mail (8%) and pamphlets (3%). Other methods were preferred by 10% of respondents.

This survey shows that there is a significant discrepancy between the true incidence and prevalence of different types of cancer and the public's perception of the situation. By comparing this data with the allocation of health funds to areas other than treatment – i.e. screening programs and education – it may be hypothesised that this can raise awareness of a particular type of cancer. The survey highlights that personal experience of cancer or television exposure is important in raising the profile of a particular disease. Respondents also stated a preference for the use of cancer funding for research.

PART 4

Is Colorectal Cancer a suitable disease for a screening program?

Screening may be defined as "the presumptive identification of unrecognised disease or defects by the application of tests, examinations or other procedures which can be applied rapidly".[22] There are certain characteristics a disease must have to ensure its suitability for a screening program. To determine whether a new population screening program should be introduced, Australia uses criteria which have been adopted by the World Health Organization (WHO).[23] These criteria are listed below followed by discussion of their application to CRC.

The condition sought should be an important health problem.[23]

To be worthwhile, a disease must be very common, or have a clearly defined subgroup of the population where the disease is very prevalent. CRC was the third and second most prevalent form of cancer in males and females respectively in 2004,[13] and its peak incidence is in the 60-79 years age group.[2] Individuals with genetic diseases such as FAP or HNPCC, or a history of inflammatory bowel disease are defined subgroups who require increased levels of screenings.[11]

The natural history of the disease should be well understood and there should be a recognised early stage.[23]

The disease should have a natural history that is understood and of adequate length so that a positive result on a screening test will allow a change in the course of the disease. CRC is known to develop from benign adenomas to adenocarcinoma over a period of 5-10 years.[5,22]

Treatment of the disease at an early stage should be of more benefit than treatment started at a later stage.[23]

The disease should have serious implications in terms of morbidity and mortality when detected symptomatically, and evidence that treating patients early will lead to a good prognosis. Early CRC is either asymptomatic or presents with non specific symptoms such as fatigue and heart palpitations, whereas later stage (Stage C or Stage D) may present with more serious symptoms. However, as shown in Table 1 above, later stage CRC carries a much worse prognosis. Treating CRC at Stage A, leads to a five-year survival rate of 88%, whereas treating CRC at Stage D had a far worse prognosis – a five-year survival rate of 7%.[8] This underlines the need to detect CRC at an earlier, more treatable stage.

There should be adequate facilities for the diagnosis and treatment of abnormalities.[23]

In Australia, training for endoscopists (who perform colonoscopy – the modality used to definitively diagnose and treat CRC) is well developed and monitored by large training bodies to ensure a high standard of care.[24] Although the quality of colonoscopy is high, much debate exists around whether the quantity of colonoscopy services is adequate to meet the new demand created by a new screening program. It is recognised that a national screening program would eventually require

changes in the current workforce, and that a gradual approach to the implementation of a national screening program would minimise these difficulties.[25]

For diseases of insidious onset, screening should be repeated at intervals determined by the natural history of the disease.[23]

As previously stated, CRC is known to develop from benign adenomas to adenocarcinoma over a period of 5-10 years.[5,22] Although screening intervals differ depending on the modality, NHMRC guidelines[10] recommend screening biennially with FOBT or every five years with flexible sigmoidoscopy for people at average risk. The varying intervals between screening methods account for the differences in sensitivity between the tests and allow for detection on a subsequent screening test if CRC is wrongly undetected on one occasion.

The cost of a screening program should be balanced against the benefit it provides.[23]

The cost of treating CRC increases dramatically with the stage of the cancer, varying from $1,250 for removal of non-cancerous polyps to over $23,400 for treatment of later stage CRC.[20] Economic modelling or even a trial of a CRC screening program will evaluate whether the reduction in costs from early treatment is balanced by the cost of coordinating a screening program. In the Bowel Cancer Screening Pilot Program conducted in selected parts of Australia between November 2002 and July 2004, it was found that a bowel cancer screening program would be cost-effective in an Australian Context.[26]

There should be a suitable test.

The test should be acceptable to the population.

The chance of physical or psychological harm to those screened should be less than the natural history of the disease.[23]

These final three criteria pertain to the particular screening test chosen. There are many suitable tests to screen for CRC, however none has conclusively been shown to superior to any others. The tests vary in acceptability based on individual's preferences and their willingness to undergo an invasive test. Although the chance of physical harm is quite low from any test (i.e. bowel rupture during colonoscopy), psychological harm could exist in the form of a false positive or false negative results (causing undue anxiety or a sense of immunity respectively).[27] These psychological harms will be minimised as the specificity and sensitivity of the screening tests increase.

A selection of commonly used screening tests are compared in Table 5 and then discussed in terms of their suitability for a CRC screening program.

Table 5: A comparison of the relative benefits of the various screening tests for CRC and colonic polyps[28]						
Beneficial screening characteristics	Faecal Guaiac Test	Faecal Immunochemical Test	Flexible Sigmoidoscopy	Barium Enema	Colonoscopy	Virtual Colonoscopy
Low cost	++++	+++	++	++	+	+
Convenient	++++	++	++	+	+	+
Easily Accessible	++++	+++	+++	++	++	+
Noninvasive	++++	++++	++	++	+	++
Safe	++++	++++	++	++	+	++[a]
High Sensitivity	+	++	++	++	++++	+++
Relatively specific	+	++	+++	++	++++	++
Does not require a second (diagnostic)	+	+	++	+	++++	+
Therapeutic	+	+	++	+	++++	+
The above relative scale ranges from poor (–) to excellent (++++) [a]Serious concerns have been raised about radiation risks to asymptomatic patients from mass screening of the general population						

Faecal Guaiac Test (FGT)

Colonic polyps and CRCs often bleed[29] microscopic amounts of blood intermittently, due to badly formed leaky capillaries. When a stool sample containing blood undergoes the guaiac test, a reaction occurs with an enzyme called peroxidase in blood to give a positive result.[28] A positive FGT must be followed up with diagnostic colonoscopy.

Specificity is increased by avoiding ingestion of broccoli, cauliflower, red meats and discontinuing aspirin and iron therapy for three days before the test. False positives and unnecessary follow-up can result if these guidelines are not followed.[28] Sensitivity of FGT for detection of CRC is at best 85%, and specificity is less than 50%.[28] RCTs have found that FOBT can decrease mortality by 15-33%.[30-32]

However, FGT is noninvasive, safe and convenient, making it a relatively acceptable test and a test that is likely to have a relatively higher compliance rate.

Faecal Immunochemical Test (FIT)

As with the FGT, FIT aims to detect blood in stool. The FIT works by detecting a protein present in human haemoglobin (the main constituent of human red blood cells) in the sample.[28] The sample is easier to collect for the FIT as compared to the FGT, because sample collection only requires swishing a brush over the stool rather than collecting an actual stool sample.[29] As with the FGT, a positive FIT result must be followed up with diagnostic colonoscopy.

The FIT has been found to be more sensitive than the FGT.[33] In a prospective cohort study, FIT was found to reduce colon cancer mortality by almost 70% compared with unscreened controls.[34]

Advantages of the FIT include being non-invasive, safe and convenient and as opposed to the FGT, does not require any dietary or medication restrictions. However, FIT is a more expensive test than the FGT.

Barium enema

A Barium enema is a procedure to identify abnormalities in the lining of the colon and rectum. A liquid known as barium sulphate is swallowed and a series of X-rays is taken as the liquid moves through the bowel.[35] Historically, this has been an important screening test, but now is being replaced by virtual colonoscopy (see below). A positive finding will mostly be followed up on diagnostic colonoscopy, depending on the size of the polyp.[28]

No RCTs of its efficacy have been conducted; most available information is derived from observational studies.[29] Rex et al. found that barium enema had a sensitivity of 80% for the detection of CRC, but was far less sensitive at detecting colonic polyps.[36] In a study comparing double contrast barium enema (DCBE – when air is inserted into the bowel in addition to the barium sulphate for better visualisation) to colonoscopy, DCBE had a sensitivity of 48% (polyps >1 cm) and a 85% specificity.[37] DCBE is contraindicated because of its poor performance unless colonoscopy is not available.

There is a low level of risk associated with barium enema: the risk of bowel perforation (1:25,000) and risk of death (1:55,000).[38] Compliance rates may be decreased because of the need for bowel preparation.

Flexible sigmoidoscopy

A flexible sigmoidoscope is a colonic probe that is inserted into the rectum and visualises the distal bowel. It is unable to visualise the proximal colon, where 35% of CRC occurs.[15] It is an invasive test that requires bowel preparation,therefore healthy people may be unwilling to undergo this when they perceive themselves as asymptomatic.[9] Furthermore, the test is performed without sedation and many patients experience some discomfort.[9] Other barriers to the use of flexible sigmoidoscopy as a screening method is the high level of training required to administer the test, and the need for diagnostic colonoscopy (and a second bowel preparation) for follow-up – only biopsy is possible using a sigmoidoscope.[9]

No RCTs have been conducted to show the effectiveness of flexible sigmoidoscopy. A case-control study reported a reduction of 70% in the incidence of distal cancers in patients reporting a single flexible sigmoidoscopy.[39]

Colonoscopy

Colonoscopy is the gold standard for diagnosing and removing polyps and CRC. However, as a screening tool, colonoscopy is resource intensive, expensive, invasive and uncomfortable.[28] The risk of bowel perforation and death are 1:1,000 and 1:10,000 respectively.[40] It has the advantage

of being both a screening and diagnostic test, so that a polyp can be removed as soon as it is detected.

It is a very sensitive test with one study[36] finding a miss rate of only 6% for large colonic polyps and a miss rate of 27% for small (<0.6cm) colonic polyps. Colonoscopy is also a highly specific test.[28] No RCTs or meta-analyses of screening using colonoscopy have been conducted.[41]

Virtual Colonoscopy

CT colonography is a non-invasive imaging procedure that creates a three-dimensional image of the colon by combining multiple helical CT scans with the help of a computer program.[42] It requires high level of skill to interpret CT images, a bowel preparation to minimise false positives, and a positive result will require diagnostic colonoscopy and a second bowel preparation. However as a screening tool it is less invasive than colonoscopy, so patients may be more willing to comply.[43] The risk of radiation-induced cancer is similar to the risk of bowel perforation on colonoscopy.[44]

Sensitivity for detecting a polyp greater than 10mm was found to be 55%-94% in three recent large studies.[45-47] However, virtual colonoscopy is still regarded as an evolving technique and is not currently recommended as the primary method of screening for CRC.[48]

The above discussion shows that globally, CRC is a very good candidate for a screening program. Its high prevalence, the clear benefits for prognosis from early treatment, its slow and predictable growth and the existence of effective treatment are key characteristics that show that earlier detection would be a cost-effective goal.

The inconclusive evidence comparing the variety of screening tests, each with its own benefits and challenges, leads to difficulties for policy makers in designing a screening program. The next section explores the Australian trial of a CRC screening program, and how the trial's outcomes have influenced the design of the newly-implemented National Bowel Cancer Screening Program.

PART 6

What is Australia currently doing?

In the 2000-01 Budget, the Australian Government announced an investment of $7.2 million over four years to assess the acceptability, feasibility and cost-effectiveness of CRC screening through a Bowel Cancer Screening Pilot Program (the Pilot).

The following principles were integral to the design of the Pilot:[26]

- **An age range of 55-74.** The risk of bowel cancer increases from the age of 40 years onwards, rising sharply from the age of 50.[15] NHMRC guidelines recommend screening from the age of 50 years.[10] To maximise detection of cancer and its precursors, the Implementation Committee recommended an age range of 55-74 years.
- **A biennial screening interval.** NHMRC guidelines recommend that the minimum effective program is screening at least every second year, but preferably annually. The Implementation Committee decided that a biennial screening interval would be more cost-effective.
- **The preferred use of immunochemical FOBT**. Immunochemical FOBTs were seen to have an advantage over more commonly used guaiac FOBTs. These advantages include higher sensitivity, no dietary or medication restrictions[29] and the potential for automated analysis of immunochemical FOBTs.
- **Using the Health Insurance Commission (HIC) to develop the Bowel Cancer Screening Pilot Register.** To ensure nationally consistent data collection and definitions, a register was developed. Medicare enrolment files were used to identify and invite the target population to take part in the screening program.

Three sites from around Australia were chosen to include a mix of men and women, urban and rural residents, and diverse socioeconomic and ethnic groups. General practice divisions in Mackay, Adelaide and Melbourne were chosen, with 11,045, 18,431 and 27,431 eligible participants in each.[26]

Invitations to participate in the Pilot were sent alphabetically and staggered over a period between November 2002 and July 2004, so that demand on service providers was spread evenly over time. Each eligible person was sent an invitation pack, including a FOBT by mail, that could then be mailed back to a specified pathology laboratory for analysis after self-completion. There was a dedicated telephone helpline for assistance with understanding or completing the test. Pathology laboratories then sent results of the test to the participant, the participant's nominated GP and the Register within two weeks of receiving the FOBT. Participants who returned a positive FOBT were advised to visit their GP to discuss the result of their FOBT. GPs were responsible for referring participants for further investigation (colonoscopy) following a positive FOBT result. Additionally, GPs were requested to provide information of Pilot participants to the Register by returning a GP Assessment form, for which they were remunerated. Histopathologists and colonoscopists were also encouraged to provide information to the Register about procedures and results for Pilot participants.[26]

Evaluation of the Pilot

The overall participation rate was 45.4%. This is lower than a recently completed Pilot test of FOBT screening in the United Kingdom (UK)[49] and three randomised control trials (RCT) of population screening for CRC.[30-32] However, if the UK trial and the RCTs participation rates were adjusted to exclude people in the target age group who were judged unsuitable for screening, their participation rates would be comparable to the Australian Pilot rates. Therefore, similar mortality reductions to those achieved in the RCTs can therefore be expected.[30-32]

Pilot participation was higher for the two least disadvantaged quartiles, and lower for the ATSI population and lower for people who spoke a language other than English. This highlights the need to facilitate screening for those with financial, cultural or language barriers in a national program. Areas of concern include practical barriers (i.e. difficulties posting the invitation kit to people with no fixed address), cultural barriers (i.e. feeling uncomfortable with tests involving the bowel region) and language barriers (i.e. difficulty understanding instruction on FOBT test, or access to a GP with a translator).[26]

Cost-effectiveness of implementing a national screening program was calculated based on the preliminary data of the Pilot, and a Pilot participation rate of 45.4%. For a target population rate of 50-74 years and 55-74 years, the conservative estimated cost per additional life year saved was $20,000 and $24,000 respectively. The cost-effectiveness figures for the BreastScreen Australia and the National Cervical Screening have been reported as approximately $9,500 to $16,000 and $44,500 per life-year saved respectively, showing that a National Screening Program for CRC would be comparably cost-effective.[26]

Of the correctly completed FOBTs, there was an overall positivity rate of 9.0%. The positive predictive value for suspected cancer or advanced adenomas was 19.2% (out of all people with a positive FOBT, 19.2% were found to have suspected cancer or advanced adenoma on colonoscopy).[26]

An education booklet on bowel cancer and leaflet on healthy eating by the NHMRC were also included in the screening invitation pack. Feedback indicated that for this education material to be effective, it must be written in simple and concise language. Also, it was found that written material is more effective if supplemented by a public awareness campaign in the local press, radio and TV (including local distribution channels).[26]

The existence of a Pilot helpline was a success with 11,242 calls received during the Pilot, with one in five calls seeking general information about CRC. Although the objectives of the Pilot apply mainly to the practical application of a screening program, research conducted before and after the Pilot showed a substantial increase in the public's knowledge of CRC following the Pilot. Out of those interviewed, only 43% reported having heard of an FOBT before the Pilot, compared to 85% of interviewees following the Pilot. General practitioners (GPs) and specialists were also able to increase their knowledge through the provision of detailed information kits about the screening program.[26]

The major reasons given for participating in the Pilot were 'precaution/prevention/early detection/health check important' and 'wanted to know whether had bowel cancer/peace of mind'. The major reasons reported for not taking part in bowel cancer screening were 'having already had other bowel tests' and having a 'lack of symptoms' or 'feeling well'. Non-participants were usually less aware of the screening process and, therefore, less likely to consider participating. It can be seen that education is desperately needed to inform the public that bowel cancer has a long asymptomatic natural history[2] and also to increase awareness of the screening process to promote participation.[26]

GPs were satisfied with the screening program and viewed the workload arising from the Pilot to be minimal. However, the waiting times for colonoscopy (median time = 30 days) were viewed by many to be excessive. This was confirmed by specialist services who reported a substantial increase in staff workload as a result of the Pilot. These workload changes were seen as a priority for management in a national program.[26]

Outcomes of the Australian CRC Screening Program Pilot

Overall, the Pilot found that bowel cancer screening using FOBTs as the screening test, with colonoscopy as the follow-up procedure, is feasible, acceptable and cost-effective in an Australian context.[26] However, many areas of further work were identified before developing a national bowel cancer screening program.

Numerous modifications to the Pilot's design were suggested. The Pilot yielded a FOBT positivity rate of 9.0%. There is a trade-off in determining the positivity rate. Too high a positivity rate leads to increased number of follow-up appointments and increased waiting times for colonoscopy. Too low a positivity rate leads to inadequate detection of cancers or adenomas. For the national program, it was decided that the positivity rate should not exceed 8.0%.[26]

The need for a public awareness campaign to coincide with the phasing in of the screening program was identified. This would promote positive community responses to the program and increase participation, and thus cost-effectiveness of the program. The public awareness campaign would target all sectors of the community, including the Aboriginal and Torres Strait Islander population. People outside of the age range would also be informed how they can reduce their risk of CRC, identify symptoms, and informed why they have not been included in the target age group. GPs were identified as central in the educative process, and powerful vectors for informing patients about the national CRC screening program.[26]

The distribution of FOBT via mail was judged to be a successful method of test distribution, however for those with no fixed address, GPs or health workers could distribute FOBTs via community health services or Aboriginal Medical centres. It was decided that invitation packages, including education material, and public awareness campaigns must be tailored to those speaking languages other than English.[26]

The limited colonoscopy services was identified as a potential problem. Mobile colonoscopy services and training health professionals other than specialised doctors to perform colonoscopy were viewed as potential solutions to this problem.[26]

The National Bowel Cancer Screening Program

Phase One of the National Bowel Cancer Screening Program (NBCSP) was carried out between May 2006 and the 30th of June 2008, and all Australians turning 55 and 65 over this time period were invited to participate.[50]

The second phase of the NBCSP commenced on 1 July 2008 and offers testing to people turning 50, 55 or 65 years of age between January 2008 and December 2010. As with the Pilot, eligible Medicare card holders will be mailed an immunochemical FOBT in the mail.[51] Rescreening is not being offered in this phase of the screening program as it is being introduced slowly to ensure colonoscopy services can handle the increased demand. This is a step towards the Australian Government's goal of providing biennial screening for all Australians above the age of 50[52] by 2012[53], in line with the NHMRC guidelines.[10] An immunochemical FOBT called '*Detect*™'will be used during this phase of the program.[54] Participants will be required to take samples from two separate bowel motions, as this is recommended from the viewpoint of cost-effectiveness and diagnostic accuracy.[55]

As with the Pilot, a positive FOBT will lead to follow-up with colonoscopy. Based on the result on colonoscopy, intervention or surveillance may be indicated. At all stages of the screening program, information will be collected for epidemiological purposes via the Register.[54]

The Cancer and Bowel Research Trust

The Cancer and Bowel Research Trust (CBRT) is a non-profit organisation which raises funds to support both external and internal cancer research projects, fund the purchase of equipment used at both treatment and diagnostic levels, provide patient accommodation and manage and conduct ongoing awareness and prevention campaigns into bowel cancer. [56]

CRBT has implemented a number of measures destined to raise awareness of CRC and provide public access to educational material on CRC. [57]

- Bowel Cancer Awareness Week
  Bowel Cancer Awareness Week is typically in the first week of December involving New South Wales, Victoria, South Australia, Northern Territory and the Australian Capital Territory. CBRT have established prominent positions in capital city malls, railway stations and regional shopping centres in order to spread the message to as many Australians as possible in the community about CRC, preventative measures and the benefits of early detection.

  The "embarrassment can kill" slogan is used to provoke attention in regards to the benefits of early detection. The orange wristbands are distributed during the week with brochures for further information on CRC. CBRT also places prominent advertisements in national newspapers to assist with the campaign. Approximately one million people are directly targeted during this awareness and prevention period.

The main goals of the campaign are to highlight the incidence and mortality rates of CRC, the different-types of screening tests available and to recommend maintaining a healthy lifestyle through diet and exercise. Additionally, it is aimed to educate the public about the NBCSP, and their eligibility to participate.

Feedback from the campaign was very positive. CBRT representatives said the public was relieved that that CRC 'is finally being acknowledged and noticed' [58], noted the importance of 'inform[ing] people of bowel cancer in order to save lives'.[59] The campaign was particularly of 'great interest' [60] to those with a family history of the disease who were 'glad [the CBRT is] doing [the] awareness week'.[61] The normalisation of the feeling of embarrassment was effective, and CBRT representatives were able to underline how important checkups and early detection was in comparison with these initial feelings of embarrassment. [62]

- Retail Program
  Throughout South Australia, Victoria, New South Wales and Queensland, CBRT regularly has information stalls set up in shopping centres, supermarkets and other retail outlets distributing information about cancer prevention. This also provides an opportunity for CBRT advocates to talk to members of the community on a face-to-face basis about preventative measures, educating the community of the benefits of early detection.

- Door Knock
  CBRT nationally knocks on over 1 million doors per annum. Their advocates discuss and distribute printed information to both residences and businesses. This information details the benefits of cancer preventative measures such as diet and exercise and also the benefits of screening for early detection.

- Call Centre
  CBRT speaks to many hundreds and thousands of businesses and household individuals on an annual basis conveying educational information about CRC prevention. When requested, telemarketers send out further information via either post or email on preventative measures and information concerning regular screening and the benefits of early detection.

- Website and Freecall number
  CRBT has a website (www.cancerresearch.org.au) which provides extensive information on CRC, research projects, equipment funding and the patient accommodation program. Additionally, CBRT provides a freecall number which can be rung during office hours (9am-5pm EST) to answer any questions in regards to bowel cancer.

Professional opinion estimates that the NBCSP will save more than 30 Australian lives per week through prevention (polyp removal) and detection (successful treatment of early stage cancer).[53] This screening program, coupled with the CRBT's efforts to educate the public about the benefits of early detection, and the ways to lower risk-taking behaviours will hopefully make these estimates become a reality.

PART 6

Where Australia should be going

CRC has been recognised as a health priority for the Australian Government with the implementation of the National Bowel Cancer Screening Program in May 2006. The Pilot identified issues that must be addressed to maximise the efficacy of the screening program and early detection of CRC.

Practical issues include the gradual roll-out of the NBCSP so that colonoscopy services are not overwhelmed, and the distribution of FOBT packs to those with no fixed address via community health centres.

However, the desperate need for education about CRC and the NBCSP is of pivotal importance to the success of the screening program. Firstly, Australians need to understand more about CRC. Only 9% of respondents in the Cancer and Bowel Research Trust Phone Survey nominated CRC as the cancer they knew the most about. This lack of knowledge about the disease can lead to lower compliance rates in a screening program. Although CRC is generally an asymptomatic disease until its later stages,[2] major reasons for not participating in the Pilot were cited as 'feeling well' and having a 'lack of symptoms'.[26] To allow this information to be understood by those with lower levels of literacy or those who speak languages other than English, information must be written in simple and concise language, or accessible in languages other than English.[26]

Secondly, Australians need to know more about the screening process. The FOBT may be a culturally sensitive topic as many may feel uncomfortable discussing the bowel region. Public awareness campaigns can aid in the normalisation of the test, as the BreastScreen program may have achieved for mammography. Television was found to be the preferred communication medium both in the Cancer and Bowel Research Trust Phone Survey and the Final Evaluation Report of the Pilot.[26] As the NBCSP continues to be phased-in, professional evaluations will continue to monitor its successes and areas of potential improvement.

CBRT is actively involved in increasing the public awareness and understanding of CRC. Its annual Bowel Cancer Awareness Week uses the "Embarrassment can kill" slogan to provoke attention in regards to the benefits of early detection. This is complimented by CBRT's website and call centre that act as portal for Australians to access information about CRC. CRBT actively educates the public via its information stalls that are regularly set up in shopping centres, supermarkets and other retail outlets. Another form of active education conducted by CBRT is the door-knocking campaign, during which CBRT representatives deliver educational material to both residences and businesses advising of effective preventative measures against CRC.

The educative role of CBRT is expected to become increasingly important as the phasing-in of the NBCSP continues, as Australians seek out information about Australia's second deadliest cancer.[13] As CBRT grows, it is expected that more funding will be sought from the Australian community to finance its expanding operations.

Ultimately, primary prevention may be the key to lowering the incidence of CRC. As outlined in Part 1, modifiable risk factors include obesity, alcohol consumption, smoking, low fruit, vegetable and dietary fibre consumption, high fat consumption and low physical activity. The "How do you measure up?" campaign commenced in February 2006 and targets obesity, low fruit and vegetable consumption, unhealthy drinking and low levels of physical activity.[63] It builds on the "Go for 2 and 5" campaign that ran from April to July 2005, that targeted adequate fruit and vegetable consumption.[64] The National Tobacco Campaign, "Every cigarette is doing you damage"[65] aims to decrease nicotine consumption and was launched in mid-1997.[66] The continuation of these public health campaigns into the future will aim to modify the risk factors present in individuals, hopefully resulting in lower incidence rates of CRC.

The relationship between CRC and dietary fibre is subject to ongoing investigation.[67] The National Heart Foundation allows food companies to display the Heart Foundation 'Tick' on their products' packaging if the product meets the strict nutritional standards classifying the food as a healthy food.[68] If conclusive evidence was found showing low dietary fibre is a risk factor for CRC, a similar form of branding could be displayed on food products containing high levels of dietary fibre. This could work as both a reward for food companies who produce high-fibre foods, and as an incentive for other food companies to follow suit. It could also direct consumers towards making healthier food choices.

Cancer and Bowel Research Trust Recommendations

CBRT hopes to encourage all Australians to alter their lifestyle choices to lower their risk of being diagnosed with CRC. Dietary suggestions include:[57]

- Five or more portions of fruit and vegetables a day
- Regular servings of wholegrain cereal fibres and wheat bran
- Drinking two litres (eight glasses) of water a day
- A diet consisting of low-fat, high-fibre whole foods such as leafy green vegetables, wholemeal products and pulses
- Calcium intake of approximately 1000-1200mg per day
- Limited red meat, full-fat dairy products, sugar, salt and spicy foods
- Control of alcohol consumption
- Maintaining a healthy weight
- Avoid charred meats (which contain carcinogenic compounds)

CBRT also recommends thirty minutes of aerobic exercise at least three times a week.[57]

CRBT also recommends taking part in a screening regime. Recommendations include:[57]

- A digital rectal examination as part of each regular physical check-up, particularly if there is a family history of the disease
- From the age of 40, an individual should undergo an FOBT annually
- From the age of 50, an individual should undergo flexible sigmoidoscopy every 3-5 years

Australia has made substantial progress in the past few years with the implementation of the NBCSP and public health campaigns including the “Measure up” campaign. However, with CRC having the second highest incidence of all cancers in Australia and costing the Government $235 million a year, there is still progress to be made. As the CBRT continues to expand its operations, so should the level of public awareness and understanding of CRC. With increase awareness and understanding, Australians will be more likely to take part in screening, and therefore more likely to detect CRC at an early stage. Earlier treatment will lead to healthcare savings and decreased mortality. Hopefully the NBSCP will follow through on predictions of saving 30 Australian lives each week.

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APPENDIX 1: ABBREVIATIONS

ACPS: Australian Clinicopathological Staging

ATSI: Aboriginal and Torres Strait Islander

CBRT: Cancer and Bowel Research Trust

CRC: Colorectal Cancer

CT: Computed Tomography

DALY: Disability Adjusted Life Year

DCBE: Double Contrast Barium Enema

EST: Eastern Standard Time

FAP: Familial Adenomatous Polyposis

FGT: Faecal Guaiac Test

FIT: Faecal Immunochemical Test

FOBT: Faecal Occult Blood Test

GP: General Practitioner

HNPCC: Hereditary Nonpolyposis Colorectal Cancer

NBCSP: National Bowel Cancer Screening Program

NHMRC: National Health and Medical Research Council

NMSC: Non-melanocytic Skin Cancer

RCT: Randomised Controlled Trial

WHO: World Health Organisation

YLL: Years of Life Lost through premature mortality