COMMUNITY APPROACHES TO INCREASING COLORECTAL SCREENING UPTAKE: A REVIEW OF THE METHODOLOGICAL QUALITY AND STRENGTH OF CURRENT EVIDENCE

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Abstract
In Australia, colorectal cancer screening rates are sub-optimal and considerably lower than those of other countries. The purpose of the current review was to identify in relation to colorectal cancer screening: (i) the number of Australian and international community-based intervention studies published between 2002-2011; (ii) the proportion of intervention studies that had adopted a community-based approach and met the Cochrane Effective Practice and Organisation of Care study design criteria; and (iii) the effectiveness of community-based interventions with at least a moderate level of methodological rigour at increasing colorectal cancer screening rates. Electronic database searches identified 86 intervention studies, of which 21 used a community-based approach and 15 met Cochrane Effective Practice and Organisation of Care -accepted study designs was moderate. Only one methodologically robust Australian community-based study was identified. Based on findings from studies with moderate methodological rigour, a number of potential options which the National Bowel Cancer Screening Program might consider to increase screening rates are discussed. The current review highlights the urgent need for further methodologically rigorous, community-based colorectal cancer screening intervention research in the Australian setting.

Addressing colorectal cancer is essential to Australia’s health
Worldwide, colorectal cancer (CRC) accounts for 9.4% of all cancer diagnoses and ranks as the fourth leading cause of cancer-related deaths.1 Australia has one of the highest age-standardised rates for CRC in the world, with the crude incidence set to increase as a consequence of an ageing population.2 In Australia, as in other countries, fewer than 40% of cases are diagnosed at an early localised stage.3,6 CRC screening has demonstrated effectiveness in reducing the incidence of CRC through the identification and removal of precancerous adenomatous polyps,6,7 and increasing the rate of detection of early-stage disease.8,9

In Australia, the National Bowel Cancer Screening Program (NBCSP) takes a community-based approach by offering a mailed one-off Faecal Occult Blood Test (FOBT) to people turning 50, 55 and 65 years of age.10 Participation rates in Australia’s NBCSP have remained at a consistent rate of approximately 40 per cent.10-13 These rates, however, are only reflective of participation among the selected age brackets incorporated in the program. Australian community- and population-based assessments of people aged over 50 have consistently demonstrated low levels of CRC screening participation.14-18 Two population-based studies among at-risk persons (aged 50 and over) prior to the NBCSP indicated that less than 20% of the at-risk population undertook FOBT screening in the previous five years.15,18 A recent evaluation following the inception of NBCSP found that 20% of people aged above 55 years of age had undertaken FOBT screening within the guideline-recommended two-year period.19 The Australian CRC screening rate compares poorly with that of other countries. For example, FOBT screening rates in the UK and Finnish screening programs are currently 52% and 71% respectively.20,21

It is too early to identify the likely impact of the NBCSP program on mortality and incidence reduction in Australia. Nonetheless, the most recent data on a small number of histologically confirmed NBCSP cases suggests a high rate of early-staged CRC detection (58.3%).20 Further, an earlier review of CRC detection methods (ie. NBCSP-screened versus symptomatic presentation) across 19 Australian hospitals highlighted a significant downgrading in staging of disease among NBCSP-detected CRCs.22 While these results show promise, there is a need for expansion of this program (ie. extending the offer of FOBT screening to all people aged between 50 and 75 years biennially) if the high rate of mortality reduction (15-33%) reported in screening randomised control trials (RCT) is to be achieved.6,9,23,24
Effective interventions to increase CRC screening

The most comprehensive review of intervention studies aimed at increasing CRC screening was confined to studies conducted in the United States during 1998-2009. In Australia, relatively little is known about the effectiveness of methodologically robust community-based interventions, although the NBCSP has adopted a community-based approach. It is crucial to identify robust evidence of effective strategies for increasing screening rates at a community level in order to maximise the effectiveness of the program. The Cochrane Effective Practice and Organisation of Care Group (EPOC) checklist, which provides valuable criteria against which to judge the methodological rigour of intervention studies, has been used in this review. The purpose of this review was to identify, in relation to increasing CRC screening uptake: (i) the number of Australian and international community-based intervention studies published between 2002-2011; (ii) the proportion of intervention studies that had adopted a community-based approach and met EPOC study design criteria; and (iii) the effectiveness of community-based interventions with at least a moderate level of methodological rigour.

Table 1: Search terms used for MEDLINE search.

<table>
<thead>
<tr>
<th>Type of Search Term</th>
<th>Mesh headings/ keywords</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colorectal cancer terms</td>
<td>colorectal neoplasms colorectal cancer bowel cancer colonic neoplasms colon cancer rectal cancer</td>
</tr>
<tr>
<td>Screening terms</td>
<td>mass screening faecal occult blood test fecal immunochemical testing stool test fobt occult blood DNA stool colonoscopy sigmoidoscopy sigmoidoscopes</td>
</tr>
<tr>
<td>Intervention terms</td>
<td>intervention studies evaluation studies randomized control trial as Topic / randomised control trial controlled clinical trial clinical trial random$ intervention$</td>
</tr>
</tbody>
</table>

* Limited to English language, humans, period 2002-2011.

Method

Inclusion criteria

Intervention studies published in English aimed at increasing rates of CRC screening (eg. by FOBT, colonoscopy or sigmoidoscopy) were included in this review. Studies that examined solely knowledge or intention to screen, or compared compliance rates across CRC testing modalities were excluded. Studies that evaluated CRC testing solely among the following population groups were excluded: CRC patients; people with advanced adenoma or bowel-related disease; and those at high risk due to familial predisposition to CRC.

Literature searches

An electronic database search of Medline was conducted to identify relevant intervention studies published between 1 January 2002 and 11 October, 2011. This time period was considered appropriate, given that the National Health and Medical Research Council CRC screening guidelines were established in 1999 and that the wider adoption of supporting programs and interventions would take time to evolve. The Medline search included three search themes (colorectal cancer, screening and interventions) combined using the Boolean operator, “AND”. For a complete list of MeSH headings and search
terms see Table 1. The cochrane clinical trial database was also searched for relevant intervention studies using the following search terms, “colorectal neoplasms AND mass screening”.

**Data extraction and coding for design and methodological rigour**

All abstracts were reviewed by authors RJC and CLP to determine whether studies met the eligibility criteria. All relevant intervention studies were categorised based on the setting for recruitment or sampling: (i) primary care; (ii) community; or (iii) other. Intervention studies conducted in the primary care setting or recruiting persons directly from general practice registers were coded as “primary care”. Intervention studies sampling participants from an electoral roll/population register, using a broad sampling technique, eg. state Driver’s licence databases, or directly recruiting participants from a community-setting, eg. seniors’ centres, were coded as “community”. Each intervention study coded as “community” was assessed against basic EPOC study design criteria: randomised control trial (RCT); controlled clinical trial (CCT); controlled before and after study (CBA); and interrupted time series (ITS). Intervention studies not meeting the above study designs were excluded.

Intervention studies coded as “community” and meeting EPOC-specified study design criteria (ie. RCT, CCT, CBA or ITS) were evaluated for methodological strength using the following EPOC criteria. For each criterion, a score of “yes” was assigned if the study met the criterion, “no” if it did not and “unclear” if there was insufficient information in the paper. For RCT, CCT, and CBA, these criteria included the following: 1) whether the allocation sequence was adequately generated (ie. the random component in the sequence generation process was described); 2) whether there was concealment of allocation (eg. unit of allocation by institution or team, a centralised randomisation scheme, an on-site computer system or sealed opaque envelopes); 3) whether baseline outcome measurements were similar in intervention and control groups (ie. the study reported whether baseline measurement was similar and, if not, whether appropriate adjusted analysis was performed); 4) whether baseline characteristics of study participants were reported and did not differ between experimental groups; 5) whether incomplete outcome data were adequately addressed (ie. missing data was unlikely to bias the results and the proportion of missing data was less than the effect size); 6) whether there was blinded allocation of intervention and control groups (ie. the primary outcome assessed blindly or by using an objective outcome); 7) whether the study was adequately protected against contamination (ie. it randomised by practice or institution, or it was unlikely for the control group to receive the intervention); 8) whether the study was free from selective reporting (ie. all relevant outcomes were reported); 9) whether the study was free from other risks of bias (ie. no evidence of other risk of bias). As a quality assurance measure, independent coding of intervention studies was conducted by two reviewers (RJC and CLP). All differences were resolved by mutual discussion between coders and with a third-party (CLP), where necessary.

### Table 2: Methodological rigour assessment of community- and population-based intervention studies using accepted EPOC study designs.

<table>
<thead>
<tr>
<th>First author</th>
<th>Year</th>
<th>Allocation sequence adequately generated</th>
<th>Concealment of allocation</th>
<th>Baseline outcome measurements similar*</th>
<th>Baseline characteristics similar</th>
<th>Incomplete data addressed</th>
<th>Knowledge of interventions prevented</th>
<th>Selective outcome reporting</th>
<th>Protection against contamination</th>
<th>Other risk of bias</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Braun, 2005</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>8/9</td>
</tr>
<tr>
<td>Marcus, 2005</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>4/9</td>
</tr>
<tr>
<td>Basch, 2006</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>6/9</td>
</tr>
<tr>
<td>Ruffin, 2007</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>8/9</td>
</tr>
<tr>
<td>Gimeno-Garcia, 2009</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
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<td>8/9</td>
</tr>
<tr>
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<td>?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>×</td>
<td>✓</td>
<td>4/9</td>
</tr>
<tr>
<td>Morgan, 2010</td>
<td>?</td>
<td>✓</td>
<td>✗</td>
<td>✓</td>
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<td>3/9</td>
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<td>Simon, 2010</td>
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<td>✓</td>
<td>✗</td>
<td>✓</td>
<td>?</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>6/9</td>
</tr>
<tr>
<td>Smith, 2010</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>8/9</td>
</tr>
<tr>
<td>Libby, 2011</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>7/9</td>
</tr>
<tr>
<td>Van roon, 2011</td>
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<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>✓</td>
<td>7/9</td>
</tr>
</tbody>
</table>

**Key:** ✓ = Yes; ? = Unclear; ✗ = No.

* Studies specifying strict CRC screening eligibility criteria for participation scored ✓.
###Table 3: Characteristics of mail-based interventions with at least moderate methodological rigour.

<table>
<thead>
<tr>
<th>First Author, Year, County</th>
<th>Design and Intervention description</th>
<th>Participants (sample size (n), sex and age)</th>
<th>Primary outcome</th>
<th>Results for primary outcome</th>
<th>Differences among population sub-groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Marcus, 2005 United States</td>
<td>RCT Control: Single untailored (SU) print material. Interventions: (i) Single tailored mail-out (ST) (ii) Four multiple tailored (MT) mail-outs (tailored based on baseline) (iii) Four re-tailored multiple mail-outs (MRT) (tailored based on updated information at 6-month follow-up)</td>
<td>4014 callers to the Cancer Information Service (CIS) over 50 years of age, eligible for CRC screening and not calling the CIS about CRC or CRC screening.</td>
<td>Self reported FOBT, sigmoidoscopy or colonoscopy at 6- (short-term) and 14-month (long-term) follow-up.</td>
<td>6-month follow-up: SU = 22% compared to combined intervention groups (ST, MT, MRT) = 26%. No statistically significant difference. 14 month follow-up: SU group doubled CRC screening rate (20% baseline to 42% at 14-month follow-up). Overall, significant* trend across groups, suggesting higher rates of CRC screening associated with tailoring. Nested comparison: SU (42%) v MT (51%) significant**; SU (42%) v MRT (48%) not significant</td>
<td>Test for moderator variables at 14-month follow-up Age: Among participants aged 50-59 years, all three tailored interventions showed significant improvement compared with SU (SU v ST*, SU v MT and SU v MRT***). Gender: Female participants. Significant trend in prediction for females*** (SU v MT **, SU v MRT **). No statistically significant difference between (SU v MT and MT v MRT)</td>
</tr>
<tr>
<td>Libby, 2011 Scotland</td>
<td>RCT Control: Usual invitation. Two intervention groups: (i) pre-notification only (ii) pre-notification + information booklet. Intervention groups received pre-notification two weeks prior to invitation date</td>
<td>n=59,953, aged 50-74 years, randomly selected from population register. Randomisation produced comparable baseline characteristics and equivalent n across groups. Intervention (i) = 19,975, (ii) = 19,991, (iii) = 19,987.</td>
<td>Return of FOBT kit.</td>
<td>Uptake significantly higher in both pre-notification (59%) and letter + booklet (58.5%) interventions, compared with usual method of invitation (53.9%)***</td>
<td>Significant trend found across all ages, gender, and deprivation categories.***</td>
</tr>
<tr>
<td>Van roon, 2011 Netherlands</td>
<td>RCT Control: Standard invitation. Intervention: Standard invitation + advanced notification letter sent two weeks beforehand</td>
<td>n=4784, aged 50-74 years, randomly selected from population registers; (i) = 2507 (ii) = 2493.</td>
<td>Return of FIT kit.</td>
<td>Advanced notification letter (58%) was significantly associated with higher adherence compared to invitation letter (52%) ***</td>
<td>Age (less than 60 years) and gender (male), SES (low) independent predictors of non-adherence. No significant interactions between groups.</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
### Table 4: Characteristics of non-mail based interventions with at least moderate methodological rigour.

<table>
<thead>
<tr>
<th>First Author, Year, County</th>
<th>Design and Intervention description</th>
<th>Participants (sample size (n), sex and age)</th>
<th>Primary outcome</th>
<th>Results for primary outcome</th>
<th>Differences among population sub-groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basch, 2006 United States</td>
<td>RCT (i) Intervention: telephone outreach approach (tailored telephone education based on several behavioural and educational theories) (ii) Control: mailed printed materials</td>
<td>Members of a health benefit fund; Persons aged over 52 years, no recent CRC screening (n=456). (i) = 226, (ii)= 230. Males: (i) = 30%, (ii) = 28% Age: (i) 52-54 = 19.5%, 55-59 = 47.8%, ≥60 = 32.7%, (ii) 52-54=25.7%, 55-59=43.5%, ≥60 = 30.9%</td>
<td>Receipt of CRC screening within 6 months of randomisation (FOBT, sigmoidoscopy, colonoscopy or barium enema). Medical claims and records reviewed</td>
<td>Percentage screened for CRC at 6-month follow-up: Intervention = 27% vs control 6% Screening rates were 4.4 times higher for the intervention group</td>
<td>Intervention effect found within each of the following characteristics: gender, age, race, education, marital status and income.</td>
</tr>
<tr>
<td>Ruffin, 2007 United States</td>
<td>RCT (i) Intervention: interactive electronic tool (Colorectal Web) (ii) Control: standard website</td>
<td>n = 174 (equal groups control and intervention) aged between 50-70 years Male: (i) = 48%, (ii) = 43% Age (mean): 57 years (equal across groups)</td>
<td>Self reported CRC screening (FOBT/ endoscopy) Participants contacted 2, 8 and 24 weeks post-intervention.</td>
<td>89/174 (51%) of participants received CRC screening: 55/89 (63%) intervention group v 33/89 (37%) control group. Participants in intervention group significantly more likely to be screened than control group*</td>
<td>No significant result for age, gender, race or geographical residence in logistic model</td>
</tr>
<tr>
<td>Gimeno-Garcia, 2009 Spain</td>
<td>RCT (i) Intervention: brief educational video (3.5 mins) providing overview of CRC prevention (ii) Control: non-medical documentary. Following video participants in each group met with gastroenterologist and were given FOBT kit with explanatory flyer requesting return.</td>
<td>n = 158 (control and intervention equal), aged 50-79 years Male: (i) = 23% (ii) = 27% Age (mean): 63 years (equal across groups)</td>
<td>Return of FOBT.</td>
<td>Significantly higher rate of FOBT return (within 2 weeks) in the intervention group (70%) compared with control group (54%)*</td>
<td>Participants returning FOBT were older than non-compliant individuals.* Elderly age independent factor significantly associated with FOBT return*</td>
</tr>
<tr>
<td>Simon, 2010 United States</td>
<td>RCT (i) Intervention: automated telephone outreach with speech recognition (ATO-SR), including targeting knowledge deficits, addressing attitudes and self-efficacy, and emphasising importance of screening; Control: (ii) usual care.</td>
<td>N = 20, 938, aged 50-64 years, randomly selected from the Harvard Pilgrim Health Care (i) = 10, 432, (ii) = 10, 506 Males: (i) 46.7% (ii) = 67.6% Age (mean): 57 years equal across both groups.</td>
<td>Self reported CRC screening in the year following intervention (FOBT, double-contrast barium enema, flexible sigmoidoscopy, colonoscopy).</td>
<td>No significant difference in CRC screening (intervention = 30.6%; control = 30.4%) No intervention effect after adjustment for covariates Time to colonoscopy in the intervention group slightly less*</td>
<td>Not assessed</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
Table 5: Characteristics of multi-component based interventions with at least moderate methodological rigour.

<table>
<thead>
<tr>
<th>First Author, Year, Country</th>
<th>Design and Intervention description</th>
<th>Participants (sample size (n), sex and age)</th>
<th>Primary outcome</th>
<th>Results for primary outcome</th>
<th>Differences among population sub-groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powe, 2004 United States</td>
<td>RCT Intervention: (i) Cultural and self-empowerment group (video, calendar, poster, brochure and flier) (ii) Modified cultural group (video) Control: (iii) Traditional group (usual care).</td>
<td>n = 134, aged 50 and over recruited from 15 senior centres (i) n = 54, (ii) n = 39, (iii) n = 41 Males: (i) = 18%, (ii) = 8%, (iii) = 7% Age (mean): (i-ii) = 75, (iii) = 73</td>
<td>Return of FOBT kit.</td>
<td>Return of FOBT kit: (i) = 61%, (ii) 46% (iii) 15% Significant differences not reported</td>
<td>Group membership and knowledge of CRC** reported as significant predictors of FOBT return N.B. p-value for group membership higher than arbitrary .05 cut-point (p = .13)</td>
</tr>
<tr>
<td>Braun, 2005 United States</td>
<td>RCT (i) Control group: Culturally targeted educational presentation, free FOBT kit, and reminder call (ii) Intervention group: receiving above in line with social learning theory + education delivered by Native Hawaiian physician and CRC survivor, FOBT demonstration, and multiple telephone calls to address change-related emotions and barriers</td>
<td>121 persons aged 50 and over recruited via 16 Hawaiian Clubs (i) = 52, (ii) = 69 Males: (i) = 25%, (ii) = 30% Age (mean): 66 years across both groups</td>
<td>Return of FOBT kit.</td>
<td>Return of FOBT: (i) = 40%, (ii) = 33% No significant difference between groups.</td>
<td>Not assessed</td>
</tr>
<tr>
<td>Smith, 2010 Australia</td>
<td>RCT (i) Intervention 1: patient decision aid comprising paper based interactive booklet and DVD, presenting risk information on outcomes of FOBT screening, and a question prompt list (ii) Intervention 2: patient decision aid comprising paper based interactive booklet and DVD, presenting risk information on outcomes of FOBT screening, without a question prompt list (iii) Control: standard NBCSP consumer information booklet. FOBT kits mailed to each group.</td>
<td>572 participants aged 55-64 randomly selected from the NSW electoral register using the Australian Bureau of Statistics codes to target socio-economically disadvantaged persons. (i) = 196, (ii) = 188, (iii) = 188. Male: (i) = 51%, (ii) = 51%, (iii) = 50% Age: 55-64 = 100%</td>
<td>Return of FOBT (up to 3 months post intervention)</td>
<td>Significant difference in return of FOBT between interventions (59%) and control (75%)***</td>
<td>Not assessed</td>
</tr>
</tbody>
</table>

*p<0.05; **p<0.01; ***p<0.001
Results

The Medline search found 1436 separate articles. Of these, 1350 articles were excluded as they were either descriptive studies or not relevant to increasing CRC screening. Of the remaining articles, 86 were intervention studies aimed at increasing CRC screening rates. A search of the Cochrane Clinical Trial database (n = 195) between 2002 and October 20, 2011 found no further intervention studies. The majority of intervention studies were conducted in the US (75%, 69/86). Few studies (9%, 8/86) had been undertaken in Australia, with the remainder of interventions (12%, 10/86) from the UK, Canada, Europe or Asia. Most studies (70%, 60/86) had sampled participants from either general practice registers or directly through primary care sites. Of the remaining interventions, participants were either recruited using a community or population-based sampling technique (24%, 21/86) or “other” sampling method (6%, 5/86). Of the eight studies conducted in Australia, only four had adopted a community or population-based sampling approach.

Of the 21 community-based intervention studies,28-48 only 15 (71%) met EPOC criteria relating to research design; all of these studies were RCT.29,31-35,37,39-42,44, 45,47,48 The remaining six articles did not use an accepted EPOC study design.28,30,36,38,43,46 Overall, 10 out of 15 (66%) RCT scored at least five points or higher on methodological rigour (see Table 2). These studies were deemed to be of at least moderate methodological rigour and were evaluated for effectiveness at increasing CRC screening.

Effectiveness of strategies trialled in methodologically rigorous studies (n = 10)

An overview of the intervention studies scoring five or more on the EPOC criteria for methodological rigour were grouped by intervention type: mail, non-mail (e.g. telephone, audiovisual, computer); and multiple component strategies. Findings are presented in tables 3, 4, and 5, respectively. As shown in Table 3, mail-based strategies with FOBT invitation can achieve participation rates of 51 to 59%.34,47,48 with increased participation evident in two studies that had adopted pre-notification prior to the screening invitation.47,48 Tailoring of the screening invitations appeared to have a modest effect on screening participation.34 As described in Table 4, non-mail-based strategies, including the use of an interactive electronic tool or video education, appeared to increase the rate of CRC screening significantly, compared to the usual care or standard condition.39,46 Studies of telephone-based outreach had mixed findings with samples drawn from private healthcare funds.39,44 Multiple-component interventions (see Table 5) that involved education or self-empowerment of cultural groups showed modest improvements in CRC screening.31,32 An Australian study among lower socio-economically disadvantaged persons, contrary to expectation, indicated that the adoption of a decision making aid (i.e. booklet and DVD) significantly decreased FOBT completion, compared to controls who received a standard NBCSP information package.45 Study findings from Powe et al.’s intervention should be considered with caution, given substantial limitations related to sample size and an under-representation of males. Further, the authors report the primary outcome (return of FOBT) as significant across group membership, despite not meeting the widely accepted statistically significant cut-point of p < .05.

Discussion

The review indicated that most CRC screening intervention studies occurred in the US. Given the Australian setting differs from the US in terms of health system and population sub-groups, US findings may not generalise to the Australian setting. Only eight intervention studies were conducted in Australia, four of which adopted a community-based approach,28,30,37,45 Of these studies, only two used an EPOC-accepted study design.37,45 The lack of robust research with relevance to the community-based approach taken by the NBCSP is surprising.

The degree to which study findings are indicative of a high level of evidence is dependent on methodological rigour.49,50 Of the 21 intervention studies in this review adopting a community-based approach, 15 had used EPOC-accepted study designs, and 10 had at least moderate methodological rigour. However, only one methodologically robust community-based study was undertaken in Australia,45 providing scant evidence to base decisions on how to approach the crucial issue of maximising screening rates for CRC in Australia.

The NBCSP adopts a pre-notification strategy shown to be effective at increasing FOBT participation rates.37,47,48 Based on the studies with at least moderate experimental rigour, it would appear that there are a number of additional potential options which the NBCSP might consider to increase screening rates for the age groups included in the program. First, the relative value of co-ordinated advocacy from other respected organisations, including Cancer Council and other public health organisations, should be further examined.46 In addition, it should be noted that Australian studies, although not using an EPOC-accepted study design, have indicated that FOBT participation is improved one-off and over time if a letter of invitation includes general practitioner endorsement.45,46 Further, in the UK, for non-responders to CRC screening invitations, a final letter is sent to non-responders’ general practitioners.51 Given that direct linkage of the patient to his or her general practitioner is not easily attainable in Australia for community-based recruitment approaches, it is important to consider how the active endorsement of the NBCSP by general practitioners may be co-ordinated with NBCSP initiatives. In addition, the timing of reminder letters following non-response in the Australian screening program is at eight weeks, much longer than that adopted in the UK screening program, which is achieving higher rates of participation.25 Therefore, it is worthwhile to explore whether a shorter follow-up interval may increase participation rates.

It is important to consider the unexpected study findings found among an Australian cohort of lower socio-economic people aged between 55-64 years of age sent FOBT kits, where a particularly high rate of FOBT test return was identified among the control group (75% of
those receiving standard NBCSP booklets), a rate higher than that in the intervention group (59% of those receiving a decision aid and accompanying DVD). It is noteworthy that two weeks following mail-out, participants received a follow-up telephone interview assessing other primary outcomes, ie. knowledge, attitudes and informed choice. It is possible that this follow-up call lifted participation rates across both groups. The incorporation of a telephone-based reminder system may be worth consideration in the NBCSP. Additionally, for the control group the FOBT return rate of 75% among a wide age-bracket (55-64 years) was achieved, much higher than the consistent return rate of approximately 40% achieved in the NBCSP. Overall, in addition to the above opportunities for increasing screening rates among those invited into the NBCSP, it should also be noted that a dominant rate-limiting factor for population-based screening uptake in Australia appears to be the limited age-brackets invited to screen in the NBCSP. The greatest opportunity for future increases in FOBT screening participation largely relies on opening the program to the entire at-risk population (all those aged between 50-74 years) for repeated screening.

With the exception of age and gender, there were relatively little data in this review about responses to interventions among population groups known to experience lower rates of CRC screening participation eg. Indigenous people from non-English speaking backgrounds and those from lower socio-economic backgrounds. Some studies indicated that younger people in the at-risk group had a considerably lower rate of screening participation compared to older age groups. A few studies used targeted approaches for certain cultural groups, eg. African Americans. However, findings for socio-cultural groups in the US may not generalise to the Australian context. In Australia, relatively little robust research has been directed towards population sub-groups less likely to participate in CRC screening, although the NBCSP has focused efforts towards reaching these groups, particularly through state-based initiatives. The present review identified only one Australian intervention that targeted CRC screening among lower socio-economic groups. It is important that future interventions pay close attention to population groups experiencing lower rates of CRC screening, to maximise broad participation and avoid increasing screening inequality.

Searching grey literature and non-English language studies was beyond the scope of the current review. Therefore, it is possible that some studies were missed. The ability to generalise international study findings to the Australian-setting should be considered with caution, given differing health care systems and CRC screening provisions across countries. The NBCSP currently offers one-off FOBT screening to just three selected age groups. This is in contrast to the evidence base for the benefits and cost-effectiveness of CRC screening, based on biennial screening from 50-74 years. In addition, it is important to monitor CRC screening rates across the entire at-risk population, as NBCSP monitoring reports are only reflective of participation among the selected age brackets. Unfortunately, given the low number of Australian community-based intervention studies identified in this review, few data are available to indicate the most effective approach for improving population-level CRC screening participation rates to an optimal level. The current review highlights the urgent need for more methodologically rigorous community-based CRC screening intervention research in the Australian-setting.

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