



# Theory-based modifications of an advanced notification letter improves screening for bowel cancer in men: A randomised controlled trial



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## ARTICLE INFO

### Article history:

Received 16 September 2015

Received in revised form

16 June 2016

Accepted 20 June 2016

Available online 1 July 2016

### Keywords:

Colorectal cancer

Screening

Randomised controlled trial

Intervention

Public health

Behavioural medicine

Men's health

Health psychology

## ABSTRACT

**Rationale:** Male participation in screening for bowel cancer is sub-optimal. Theory-based interventions provide a means of improving screening uptake.

**Objective:** To test the efficacy of modifying consumer invitation material in line with continuum and stage theories of health behaviour on screening participation.

**Methods:**  $N = 9216$  Australian men aged 50–74 years were randomised to one of four trial arms in a  $2 \times 2$  factorial design randomised controlled trial. Participants received either standard invitation material (control group), or combinations of modified advance-notification and invitation letters. A subsample completed baseline and endpoint behavioural surveys.

**Results:** Participants who received the modified advance notification letter were 12% more likely to screen than those who received the standard version ( $RR = 1.12$ ,  $\chi^2(1) = 10.38$ ,  $p = 0.001$ ). The modified invitation letter did not impact screening uptake ( $RR = 0.97$ ,  $\chi^2(1) = 0.63$ ,  $p = 0.424$ ). No significant changes in psychological variables due to the intervention were observed.

**Conclusion:** Modifications to advance notification letters in line with health behaviour theories significantly improves screening uptake in men.

**Trial registration:** Australian New Zealand Clinical Trials Registry: ACTRN12612001122842 <https://www.anzctr.org.au/Trial/Registration/TrialReview.aspx?id=362688>.

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## 1. Background

The Australian National Bowel Cancer Screening Program (NBCSP) offers free Faecal immunochemical test (FIT) screening to those aged 50 years and older at five year intervals with plans to reduce the interval to biennial screening by the year 2020. In order for this program to achieve its full public health benefit, high levels of screening participation are crucial. However, since the program's inception, participation has been low and it has decreased gradually from 41% in 2006–2007 (Australian Institute of Health and Welfare, 2008) to 35% in 2011–2012 (Australian Institute of

Health and Welfare, 2013). These rates are well below the screening participation rates observed for established breast (Australian Institute of Health and Welfare, 2014a) and cervical cancer (Australian Institute of Health and Welfare, 2014b) screening programs. Low colorectal cancer (CRC) screening rates have also been observed internationally (Swan et al., 2012). The low screening participation, and high incidence of CRC, particularly in Western countries (Jemal et al., 2011), makes the identification of simple and cost effective methods of improving participation an important public health initiative.

In the NBCSP, lower participation has been observed among specific demographic subgroups including men, adults in the 50–55 year age range and those living in lower socioeconomic areas or rural areas (Australian Institute of Health and Welfare,

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2014c). Of particular concern, given that men are at increased risk of CRC and represent approximately half of the population eligible for screening, is the fact that screening participation among men has been consistently and significantly lower than women (Australian Institute of Health and Welfare, 2013; 2014c). In 2012–2013 for example, participation in the program was 31.1% for men compared to 35.7% for women (Australian Institute of Health and Welfare, 2014c). Similar discrepancies have been observed in the United States, Europe, and Canada (Frederiksen et al., 2010; Ioannou et al., 2003; Ko et al., 2002; Salas et al., 2014; Singh et al., 2004).

Research suggests that inequalities in screening participation between demographic subgroups likely result from variations in attitudes and beliefs associated with screening (i.e., psychosocial variables). Past research has consistently highlighted discrepancies in the health beliefs of men and women in relation to help seeking behaviour and health service utilisation (Oster et al., 2015). In the context of colorectal cancer screening, studies comparing the screening beliefs of men and women have found men to report less: self-efficacy to complete screening (Vart, 2010), confidence in the ability of the test to detect CRC (response efficacy) (Vart, 2010), CRC related worries (Vart, 2010), social influence to screen (Wong et al., 2013), CRC specific knowledge (Ritvo et al., 2013) and more procrastination when considering test use (Ritvo et al., 2013). Studies comparing screening beliefs of people with varying socio-demographic (Quaife et al., 2015) or geographical (Davis et al., 2013) backgrounds similarly report variations in screening beliefs between population groups. Together, these studies suggest that the information needs of the population differ according to demographic characteristics, such as gender, and that interventions aiming to increase participation should target these needs. On the basis that screening interventions are likely to be most effective if targeted at the psychosocial variables pertinent to specific demographic groups, and that men represent approximately half of the screening eligible population, designing a screening intervention with the specific aim of improving participation in this group could have significant implications for men's CRC incidence and mortality, as well as the population as a whole.

In the NBCSP people are invited to screen via a staged invitation process. Firstly, participants are mailed an advance notification letter informing them of the upcoming offer. An invitation letter inclusive of the screening test and information brochure is mailed in the second stage approximately two weeks later. This two stage invitation process has been found to increase screening participation by as much as 8.9% (Cole et al., 2007) compared to a single invitation letter. It is hypothesised that, consistent with theories of health behaviour change, these letters are effective because they encourage consideration of screening (i.e., increase intention to screen) prior to the arrival of the screening offer. The importance of encouraging behavioural intention, prior to action, is central to a number of theories of behaviour change including continuum theories (e.g., Theory of Planned Behaviour; Ajzen, 1991), and stage theories (e.g., Transtheoretical Model of Behaviour Change; TTM; Prochaska and DiClemente, 1983; Precaution Adoption Process Model; Weinstein, 1988). The staging component of stage theories specifically provides a particularly useful framework for explaining the efficacy of this two-part invitation approach. These theories postulate that people progress through a number of sequential stages of readiness prior to participating in new health behaviours and that the processes required for movement from one stage to the next should form the focus of interventions (Janz and Becker, 1984). In the TTM, for example, participants are theorised to progress from not considering the behaviour (precontemplation stage), to considering the behaviour (contemplation, intending to screen) to finally participating (action) and maintaining this

behaviour over time, with movement from precontemplation to contemplation, for example, best addressed through a process like consciousness raising. As suggested by this theory, advance notification letters effectively increase screening by encouraging stage progression from precontemplation (not thinking about screening) to contemplation (considering screening). The invitation letter that arrives two weeks later along with the screening test is theoretically more effective in encouraging screening participation (e.g., progression from contemplation to action) due to the shift in readiness of the population achieved by the advance notification. In addition to the targeted process of change response advocated by stage theorists, other research has explored how movement between stages is predicted by changes in important health beliefs and attitudes. For example, research utilising the Health Belief Model (HBM) (Janz and Becker, 1984) has shown that the different stages of readiness to screen are associated with different health beliefs (Duncan et al., 2012; Manne et al., 2002; Menon et al., 2007; Paddison and Yip, 2010; Spencer et al., 2005). For example, those in the precontemplation stage have been found to report greater perceived barriers to screening, whilst those in the later stages (e.g., contemplation, action) report greater perceived benefits of participation (Menon et al., 2007; Spencer et al., 2005). Similar results have been observed in studies utilising the Preventive Health Model (Gregory et al., 2011). The utility of these results is however limited by the failure to establish the moderating impact of gender on the efficacy of interventions based on these variables. Screening participation could theoretically be improved, therefore, by modifying the content of these letters (both the advanced notification and invitation letters) in a manner consistent with barriers and facilitators of men's screening behaviour.

This study aimed to explore the extent to which knowledge gained from stage theories of behaviour and associated research showing qualitative differences between behavioural stages and salient psychosocial variables could be applied to the bowel cancer screening invitation process. It examines the efficacy of focussing the content of advance notification and invitation letters to be consistent with psychosocial variables pertinent to both pre-action stages—namely, precontemplation (advance notification) and contemplation (invitation)—for improving participation in FIT screening in men compared to the current approach, which does not tailor the content of these invitation letters. Specifically, this trial aimed to determine: (1) Whether invitational letter-based strategies that targeted psychosocial variables found to be associated with male participation in screening increased participation compared to current practice. (2) Which letter, or combination of letters, were most effective in increasing participation. And (3), whether modified letters changed attitudes towards and beliefs about screening in a sub-sample of men.

## 2. Methods

### 2.1. Trial design and setting

The present study was a  $2 \times 2$  factorial design randomised controlled trial conducted in Australia from 2012 to 2014. Full details of the methods for this randomised controlled trial are reported in the published protocol (Duncan et al., 2013) and the study was registered with the Australian New Zealand Clinical Trials Registry (ACTRN12612001122842). Approval for this research was granted by the University of Adelaide's Human Research Ethics Committee (ref. no. H-2012-040). A CONSORT flow chart showing the intervention arms and study procedures is provided as Fig. 1.

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