Title: Exploring the validity of the Continuum of Resistance model for discriminating early from late and non-uptake of colorectal cancer screening: Implications for the design of invitation and reminder letters

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Abstract

Background: This continuum of resistance model contends that respondents lie at one end of a continuum and non-respondents at the other with respect to factors demonstrated to impact on screening participation.

Purpose: The aim of this study was to explore the validity of this model for prediction of participation in colorectal cancer screening.

Methods: People aged 50 to 74 years were asked to complete a survey (n=1250). Eligible respondents (n=376, 30%) were invited to complete a faecal occult blood test (FOBT). The cut-off period for determination of participation rates was 12 weeks, with a reminder sent at 6 weeks.

Results: FOBTs were returned by n=196 people (132 within 6 weeks, 64 following a reminder). Participation was generally influenced by the same variables in both the first 6 weeks and the second 6 weeks, consistent with the *continuum of resistance model*. These variables were having *known someone with bowel cancer*, and the social cognitive factor, *perceptions of barriers to screening*. There is a suggestion, however, that other factors may be differentially associated with early, late and non-participants.

Conclusions: Participation in screening appears somewhat consistent with the continuum of resistance model in that early and late participants respond to some of the same factors. This suggests that the same messages are relevant to early, late and non-screeners, but further consideration of what other factors may be influencing discrete stages of readiness to participate is necessary.

Keywords: Colorectal cancer, Screening, Intention, Health belief model, Social cognition, Social ecological models

Introduction

When developing content for invitations to screen for cancer, researchers often utilise findings from comparative studies on the psychological, cognitive and attitudinal differences between participants and non-participants. For example, studies have shown that people who perceive themselves as susceptible to cancer are most likely to participate in screening for the disease, so information about susceptibility may be included in the initial and reminder letters in an attempt to increase participation [1, 2]. This method is useful, but it is possible that rates might be further improved by considering the difference between *early participants* (those who respond after the initial invitation), *late participants* (those who respond after the reminder letter) and *non participants* (those who never respond). This paper explores the extent to which social cognitive, social ecological and demographic variables discriminate between these groups of participants in colorectal cancer (CRC) screening. Results are interpreted in terms of implications for the design of the initial invitation and reminder letters.

The possibility that readiness to act may differ between subgroups within the population of interest, and that communication designed to encourage engagement in health promoting behaviour needs to be developed in a way that is sensitive to these differences, has become an important part of the health promotion literature. It is evident in literature concerned with tailoring of health communication [e.g., 3] and studies examining targeting of messages on the basis of predictors of movement between different stages of change for a specific health behaviour [e.g., 4].

Results of studies that document the impact of screening technology on participation are consistent with the notion that health behaviours, including speed of return of FOBT, are predicted by specific variables. When comparing the impact of different FOBT technologies on participation rates in CRC screening Cole et al [5] found that removal of dietary restrictions and a simplified method of stool sampling led to a significant increase in participation rates (40% compared with 23%) at the 12-week cut-off point. The differences in participation rates between the groups, however, all occurred in the first six weeks (i.e., before a reminder letter was sent to non-participants), with comparable participation rates thereafter. They suggested that the new test technology was more acceptable, less embarrassing and easier, and proposed that these barriers may predict participation in the first 6 weeks but not the second 6 weeks of a screening offer. This finding challenges the general belief that the same factors influence participation regardless of when the participant completes the FOBT [e.g., 6], and has implications for the design of initial and reminder letters, as discussed below.

Studies of CRC screening behaviour following written invitation often utilise an initial invitation and a reminder letter [5, 7]. Cole et al.'s study [5] suggests that early respondents may have lower faecal aversion and consequent lower rates of procrastination. If this is the case, inclusion of information designed to mitigate aversion should improve rates of early participation. Cole et al. sent a reminder letter to the remaining non-participants six weeks after the initial invitation and return in this period was not related to faecal aversion, suggesting that "continuing" non-participants differed from late participants on some other variable, or constellation of variables. Thus, if different factors predict early and late participation, different information should be included in the initial invitation and reminder letters in order to boost participation.

Comparisons of early and late participants in the cancer screening literature are rare although the issue of response bias is considered in the health survey literature. Survey data may be biased because people who complete surveys tend to be significantly different to those who do not, often on variables central to the study questions [e.g., 8, 9]. One method of dealing with this bias is to assume that late responders are similar to non-responders and make adjustments based on the attitudes or characteristics of late participants [10]. This method is consistent with the *continuum of resistance model* [11, 12], which suggests that people who respond in the first contact lie at one end of a continuum and non-respondents at the other end. With respect to CRC screening, this model might postulate that, if faecal aversion is a key predictor of screening participation, people with the lowest aversion will be at one end of the continuum (early participants) and people with the highest aversion will be at the other end (non-participants). Late participants are seen to be "more like" non participants in that they would never have participated had they not received a reminder [13]. However, a number of studies have thrown doubt on the continuum of resistance model, suggesting that non-participants are not more similar to late participants than they are to early participants [10, 12, 14, 13]. For example, Haring et al. [10] found that late respondents were generally younger, single, better educated, and employed than early respondents but found no support for the hypothesis that late respondents were similar to non-respondents. This result is consistent with the notion that rather than constituting a single continuum where people differ on overall readiness, speed of return of kit may reflect subgroup differences among those contemplating action (c.f., the transtheoretical model,[15]) with these differences potentially reflecting different scores on the social cognitive and other variables related to screening participation.

Vernon [16], in her systematic review, identified significant influence of a range of social cognitive and social ecological variables on adherence to FOBT utilisation. These consisted of perceived susceptibility, severity, perceived barriers and benefits, health motivation, self-efficacy, fatalism, locus of control, physician

advice, social support and knowledge of cancer or someone with cancer. The extent to which these variables impact differentially upon early versus late respondents to an offer is not clear.

The aim of the current study was to explore the validity of the *continuum of resistance model* for prediction of participation in CRC screening by comparing demographic, social cognitive and social ecological factors, previously demonstrated as influencing screening adherence, and comparing the extent to which they characterised early, late and non participants.   If participation is predicted by a *continuum of resistance*, then the initial invitation *and* the reminder letters should focus on the *same* messages, addressing the same variable, although perhaps more emphatically, when attempting to increase participation levels [c.f., 17]. If, however, the three groups do not lie on a continuum for key predictors, and predictors of participation vary across time, the content of the initial invitation and reminder letter also needs to vary. Specifically, the initial invitation should be informed by differences between people who do and do not participate in the first six weeks, and the reminder letter should be informed by differences between people who do and do not participate in the second six weeks.

Method

Population

A random sample of 1250 (602 males, 648 females) potential invitees for CRC screening aged 50 to 74 years, residing in southern urban Adelaide, South Australia, were provided by the Australian Electoral Commission (AEC). The Australian Government was conducting a pilot National Bowel Cancer Screening Program at the same time so areas outside the Federal screening program were chosen. The sample was representative of those South Australians aged 50 to 74 years [18].

Materials

The Bowel Cancer Screening Questionnaire (BCSQ)

The Bowel Cancer Screening Questionnaire (BCSQ) recorded stage of readiness to screen for CRC, demographic information, and responses on social cognitive (perceived susceptibility, barriers to and benefits of FOBT utilisation, health locus of control and CRC knowledge) and social ecological variables (barriers to accessing general practitioners, together with social support for decision making) associated with screening participation in previous research [19-21]. For the purposes of the current study social support for decision making was described as a social ecological rather than a social cognitive variable. This is consistent with the

research of Honda and Kagawa-Singer [22] who established that social support for CRC screening is a normative influence derived from social networks rather than arising from within the person. . The full BCSQ is available from the corresponding author.

Five forced-choice questions (e.g., "Have you ever thought about screening for colorectal cancer?"; "If you have thought about screening for colorectal cancer, have you made a decision?") were used to classify participants into one of six stages of readiness to screen, based on the Trans-Theoretical Model of behaviour change, TTM [23]. The six stages were (1) *Pre-contemplation;* have not considered screening for CRC, (2) *Contemplation*; have thought about screening for CRC but have not made a decision, (3) *Preparation*; have decided to screen with FOBT, (4) *Action*; have already screened for CRC using an FOBT, (5) *Rejection*; have thought about screening for CRC but have decided not to, and (6) *Colonoscopy intention*; have thought about screening with FOBT but instead will complete a colonoscopy. This study utilised participants in the earliest stages of readiness to screen for CRC (i.e., *pre-contemplation, contemplation* and *preparation*) because we were interested in a naive sample. People who were in the *action*, *rejection* or *colonoscopy intention* stage are excluded from analyses herein.

Eight demographic questions (age, gender, marital status, employment status, education, birth country, language spoken at home, private health insurance status) and two questions concerning previous experience with cancer were also included: (1) have you had any cancer screening tests in the past (yes/no), and (2) have you known someone who has had bowel cancer (yes/no). Invitees' postcodes were converted to a measure of socio-economic status (SES) using the Socio-Economic Indexes for Areas (SEIFA) Index of Relative Socio-economic Disadvantage and Advantage, which classifies postcodes into deciles from 1 (most disadvantaged) to 10 (most advantaged) based on household income, education, unemployment and unskilled occupations [24]. SES was split into three groups based on the deciles (low SES = 1–3, average SES = 4–6, and high SES= 7–10) for the statistical analyses.

A social cognition scale was created to measure social cognitive individual variables purported to influence intention to screen for CRC and/or screening behaviour (31 items). A social-ecological scale was created to measure the more distal, environmental and system-based influences on intention and screening behaviour (29 items).   All items were measured on 5-point Likert scales ranging from 'strongly disagree' to 'strongly agree'.

Exploratory factor analyses were previously undertaken to reduce social cognitive and social ecological questionnaire items to a smaller number of manageable latent factors (PASW Statistics v18). The 31 social

cognitive items were reduced to six factors and the 29 social ecological items were reduced to three factors. Full details of the factor analysis, factor loadings and items are reported elsewhere [25]. Given that the aim of the present analyses was to examine whether screening participants responded to the same factors (in line with the continuum of resistance model) or whether in fact different factors related to early, late or never participation, the barriers/benefits factor from the above-mentioned study [25] was split into two composite variables termed *barriers* and *facilitators*, respectively. The term *facilitators* replaced 'benefits' from the original paper [25] as the items representing this construct were not regarded as benefits but rather a positive attitude toward screening that enabled, or facilitated, uptake. These variables were calculated by averaging standardised scores across each of the items measuring these constructs. Table 1 lists the social cognitive and social ecological factors with example items for each.

Screening Offer

The screening package included (a) a bowel cancer screening information pamphlet; (b) an FOBT; (c) a combined Participant Details and Consent Form confirming personal details, nominating a preferred doctor for follow-up, and consent to obtain clinical follow-up reports if required; and (d) a reply-paid return envelope. The Bowel Health Service (BHS) received results from the analysing laboratory and informed the participant if the result was negative; if the result was positive, both the participant and their nominated doctor were advised.

Design

This study was approved by ethics committees at the University of Adelaide and the Repatriation General Hospital and conducted in early 2006 as part of a study of predictors of intention and participation in CRC screening [25]. All individuals were mailed an advance notification letter and accompanying study information, followed by a Bowel Cancer Screening Questionnaire (BCSQ) two weeks later. Non-respondents were followed up with reminder letters six weeks after the mailing of the BCSQ, and a reminder phone call two weeks after the reminder letter. Participants who returned the survey were deemed to have given their informed consent to participate in the study, and were then mailed an immunochemical FOBT four weeks after the completed BCSQ had been received. People who did not return FOBT samples after six weeks were sent a reminder letter. Participation was defined as a returned and completed FOBT within 12 weeks of the original offer. Participants were further classified into early participants (kit returned in weeks 1–6) and late participants (returned in weeks 7–12).

Recruitment, survey response and screening participation rates are shown in Figure 1. From 1250 people notified that they would be invited to participate, 579 (46%) completed the subsequent survey and also were eligible to complete an FOBT. Of those, n=203 were excluded based on the fact that they were not in the earliest stages of readiness to screen. The final sample consisted of 376 eligible people who had supplied full survey data and were in the early stages of readiness to screen. The data collection process ensured that no-one was truly in the precontemplation stage of the TTM *after* baseline survey completion although our data indicated that, before survey completion, a significant proportion (n=215) had never contemplated CRC screening [25]. Of these participants, 196 completed the FOBT (52%) and 180 did not. Of those who did participate, 132 (67%) completed the FOBT in the first six weeks (early participants) and 64 completed the FOBT in the second six weeks after the reminder letter (late participants).

Statistical Analysis

In order to examine the predictors of screening behaviour, univariate analyses compared the early, late and non-participant screening groups on categorical background variables using chi-squared (χ2) tests and on the continuous social cognitive and ecological factors using one way Analysis of Variance (ANOVA). A multivariate generalised linear model was subsequently run to determine joint predictors of screening behaviour and included the variables that were significant at the $p \leq .05$ level in the univariate analyses. Following this multivariate model, three post-hoc models were conducted using only the significant multivariate predictors. These models compared *early participation* with *late participation*; *early participation* with *never participants*; and *late participation* with *never participants*.

Results

Demographic characteristics

Table 2 provides a description of each of the three groups (early, late and non participants) on the demographic measures. This table also presents the results of the χ^2 tests examining the difference between these groups for these variables. The significant univariate demographic predictors included gender, being born in Australia, previous screening behaviour, and knowing someone with bowel cancer. The nature of these effects is explored in more detail in the multivariate analysis reported below.

Social cognitive and social ecological predictors of outcomes

Table 3 examines the social cognitive and social ecological predictors of early and late participation. As can be seen, only barriers, facilitators and chance Health Locus of Control (HLC) scores varied significantly across participation groups. Tukey HSD post-hoc tests showed that early participants had significantly lower barriers scores ($p<.001$) than never participants; late participants had significantly higher facilitators scores than never participants ($p=.03$); and late participants reported lower chance HLC ($p=.05$, i.e., did not believe their good health was due to chance).

Multivariate models

Table 4 presents results of the initial multivariate analyses. This model included all significant univariate predictors of participation. Only two of these variables emerged as statistically significant multivariate predictors of screening behaviour. These variables were "knowing someone with CRC" and the social cognitive factor "barriers to screening"; interestingly, the facilitators construct did not predict screening behaviour in this multivariate model. To explore these effects with regard to participation groups, post-hoc models were conducted which included only these two significant multivariate predictors and the results are presented as Table 5. According to these post-hoc analyses knowing someone with CRC was not statistically significantly related to participation in any of the three comparisons. However, the general trend in terms of Risk Ratios (RR) suggested participants – either early or late – were somewhat more likely than never participants to have known someone with CRC. In regards to the social/cognitive factor perception of barriers, there appeared only to be a significant difference when early participants were compared with never participants. Again, however, the general trend in terms of RRs was for participants (either early or late) to perceive fewer barriers than never participants.

Limitations

The representativeness of our sample is a possible limit upon the generalisability of the study. Duncan et al [26], in an earlier analysis of the current sample, established that respondents did not differ from non-respondents on the variables gender and socioeconomic status. While we acknowledge that they may have differed on other variables, it is not possible to measure the extent of any potential bias without having detailed information on those who did not complete the survey, which is inherently unavailable.

Discussion

The aim of this study was to examine whether participation in colorectal cancer screening was consistent with the *continuum of resistance model* (i.e., the same factors influence early and late participation, albeit with varying emphasis). These results *were* generally compatible with the continuum of resistance model; that is, they did not support Cole et al's [5] suggestion that the predictors of early and late participation are different. Rather, we found that the trend was for early and late participants to differ from never participants along a continuum in terms of strength of perception of barriers to FOBT use. It follows, from this finding, that if initial and reminder letters are constructed with increasing emphasis on this factor, screening participation rates might be improved. People who completed the FOBT generally perceived lower barriers to screening compared to those who did not participate; they disagreed with statements such as "Screening for bowel cancer is time consuming", and agreed with statements such as "It is quite convenient that I can screen myself for bowel cancer at home" (Table 1). Perceived barriers to screening is a measure of underlying cognitions that are amenable to modification. For example, Cole et al [5] reported that reducing dietary restrictions and introducing a simplified sampling method significantly enhanced participation. Increasing the percentage of participants in any screening offer requires addressing barriers to screening, like faecal aversion, at the outset. These will likely include advances in test technology but might also include initiatives aimed at improving attitudes towards faecal testing at the population level. Messages that successfully challenge the perception of FOBT as 'unpleasant' or 'inconvenient' [27] could improve CRC participation rates. An example of a message emphasis that might be included with an invitation is detailed below[1].

> *Many people think that collecting faecal samples for testing is distasteful or inconvenient.*
> *However, you don't have to touch your faeces to use the kit. The test can be done in the privacy*
> *of your own home, and then all you need do is post the completed kit to the laboratory for*
> *analysis. Recognising that there is nothing wrong with testing faeces for cancer and completing*
> *the kit could save your life.*

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[1] This message forms part of a Personalised Decision Support tool that the authors are involved in evaluating [28]

A message accompanying the reminder letter needs to increasingly confront barriers to screening. For example, the reminder letter could emphasise the fact that using the FOBT is not time consuming. An example of an additive message emphasis that might be included with the reminder is detailed below[1].

Screening is easy to do; the kit isn't difficult to use, doesn't take much time, and can be done in the privacy of your home at your own convenience.

The study attests to the usefulness of the Transtheoretical model for understanding participation in CRC screening utilising an FOBT. Results that highlight any underlying differences in cognitions and attitudes between participants and non-participants are consistent with studies that identify differences in the variables that predict intention to screen versus action, suggesting the existence of underlying stages of readiness [e.g., 25, 29]. Whilst the analysis did not specifically examine the strength of barriers associated with a particular decision stage, it could be surmised that those who perceived the barriers to be less significant were nearer the action phase and were earlier participants; certainly, a review of the relationship of the TTM to breast cancer screening behaviour found, that perceived barriers decreased as stage progressed from pre-contemplation to action [30].. These outcomes highlight the important place stage theories like TTM play in helping understand barriers to the implementation of behaviour and how communication must be targeted to address these. Thus, the literature attests to the utility of a theory that emerged from models of addiction to the description and prediction of spasmodic but recurring health promoting behaviours such as cancer screening.

The results also show that participation in CRC screening with FOBT appears generally consistent with a *continuum of resistance model* in that some of the same factors predicting participation (knowing someone with CRC, lower perceived barriers to screening) generally apply to both early and late participants. A continuum is suggested, however, as early participants, compared to never participants, perceived significantly less barriers. This observation suggests that both the initial and reminder letters should focus on this factor in an attempt to increase participation, but with increasing emphasis. There is a suggestion, however, from univariate analyses that other factors may differentially predict early, late and non-participation in screening. Future research is necessary to identify what these may be and the nature of their relationship to decision stage for screening.

Grant support

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Table 1. Social cognitive and social ecological factors from the Bowel Cancer Screening Questionnaire (BCSQ)

	Number of items in the scale	Example Items
Social cognitive factors		
1. Barriers	5	I think that giving a sample of faeces to another person for bowel cancer screening is embarrassing
		Screening for bowel cancer is time consuming
2. Facilitators	5	I feel confident that I would be able to find time in the day to complete the test
		It is quite convenient that I can screen myself for bowel cancer at home
3. Chance HLC	5	No matter what I do, if I'm going to get sick, I will get sick
		My good health is largely a matter of good fortune
4. Powerful others HLC	7	Having regular contact with my doctor is the best way for me to avoid illness
		Regarding my health, I can only do what my doctor tells me to do
5. Internal HLC	5	I am in control of my health
		If I take the right actions, I can stay healthy
6. Perceived susceptibility	5	There is a good chance that I will get bowel cancer
		My chance of getting bowel cancer is high

7.	CRC Knowledge	3	I believe I know a lot about bowel cancer
			I know a lot about screening for bowel cancer

Social ecological factors

1.	Social Support	9	I can talk about my problems with my family
			My family is willing to help me make decisions
2.	Barriers to accessing GPs	13	It is difficult for me to visit my GP because I do not speak English very well
			My GP lives very far from me so I cannot see him as often as I need
3.	Trust in GPs	6	I generally trust doctors
			I do not often visit doctors because they make me anxious

Note. HLC = Health Locus of Control, CRC = Colorectal Cancer, GP = general practitioner/physician.

Table 2. Demographic associations with participation in screening offer

		1. Early (n = 132)		2. Late (n = 64)		3. Non (n = 180)		χ^2 (*df*)
		n	%	n	%	n	%	
Age	50–54	29	22.0	18	28.6	61	33.9	11.24 (8)
	55–59	37	28.0	18	28.6	55	30.6	
	60–64	28	21.2	12	19.0	37	20.6	
	65-69	19	14.4	8	12.7	15	8.3	
	70–74	19	14.4	7	11.1	12	6.7	
Gender	Male	64	48.5	22	34.9	95	52.8	5.96 (2)*
	Female	68	51.5	41	65.1	85	47.2	
Marital status	Married/de-facto	98	75.4	47	77.0	133	73.9	0.26 (2)
	Non-married[a]	32	24.6	14	23.0	47	26.1	
Employment status	Full-time	38	29.2	27	42.9	80	44.4	11.78 (6)
	Part-time	22	16.9	13	20.6	35	19.4	
	Home duties/ unemployed	13	10.0	3	4.8	11	6.1	
	Retired/Semi-retired	57	43.8	20	31.7	54	30.0	
Education	Primary school	9	6.9	6	9.5	12	6.7	5.41 (8)
	High school	67	51.1	27	42.9	82	45.8	
	Technical certificate	37	28.2	15	23.8	46	25.7	
	Uni degree	10	7.6	10	15.9	24	13.4	
	Post-graduate degree	8	6.1	5	7.9	15	8.4	
Born in Australia	Yes	90	68.2	54	85.7	131	72.8	6.75 (2)*
	No	42	31.8	9	14.3	49	27.2	
Language spoken at home	English	116	87.9	60	95.2	160	90.4	2.64 (2)
	Non-English	16	12.1	3	4.8	17	9.6	
Private health	Yes	90	68.2	51	81.0	128	72.3	3.47 (2)

Participation status for screening offer

insurance

		n	%	n	%	n	%	χ² (df)
	No	42	31.8	12	19.0	49	27.7	
SES	Low	17	12.9	6	9.4	21	11.8	5.60 (4)
	Medium	58	43.9	23	35.9	58	32.6	
	High	57	43.2	35	54.7	99	55.6	
Past screening for cancer	Yes	84	64.1	46	73.0	98	54.7	7.30 (2)*
	No	47	35.9	17	27.0	81	45.3	
Known someone with bowel cancer	Yes	90	68.7	45	70.3	98	55.4	7.66 (2)*
	No	41	31.3	19	29.7	79	44.6	

Note. SES = socio-economic status

[a] Widowed, single, divorced and separated groups were combined into a non-married group due to low cell counts

* $p < .05$

Table 3. Social cognitive and social ecological predictors of participation (univariate analyses)

	Early participant (N=132)		Late participant (N=64)		Non participant (N=180)		F-test[a]
	M	SD	M	SD	M	SD	
Social Cognitive							
Facilitators	0.07	0.69	0.15	0.63	-0.10	0.60	4.81*
Barriers	-.21	0.83	0.02	0.80	0.14	0.80	7.16**
Chance HLC	0.07	1.08	-0.28	0.93	0.05	0.95	3.16*
Powerful Others HLC	0.13	0.95	-0.12	0.93	-0.05	1.05	1.85
Internal HLC	0.04	1.02	-0.26	1.14	0.06	0.92	2.66
Susceptibility	0.03	1.06	0.20	0.85	-0.10	1.00	2.27
Knowledge	-0.01	0.98	-0.07	0.99	0.03	1.02	0.21
Social Ecological							
Social Support	0.11	0.98	-0.03	1.00	-0.07	1.01	1.19
Barriers to accessing GP	0.05	0.93	-0.26	0.90	0.06	1.07	2.66
Trust in GPs	0.06	0.94	0.06	0.91	-0.07	1.07	0.76

[a] df = 2, 373

* $p<.05$; ** $p<.001$

Note. HLC = Health Locus of Control, GP = General practitioner/physician

Table 4. Multivariate predictors of participation

	Multivariate Full-Model		
	Risk Ratio	p-value	95% CI
Background variables			
Gender			
Male[a]	1.00	-	-
Female	1.01	*.96*	0.90, 1.11
Born in Australia			
Yes[a]	1.00	-	-
	1.06	*.31*	0.95, 1.18
Screened for cancer in past			
No[a]	1.00	-	-
Yes	1.07	*.24*	0.96, 1.20
Known someone with CRC			
No[a]	1.00	-	-
Yes	1.12	*.04*	1.01, 1.24
Social Cognitive			
Barriers	0.88	*.01*	0.80, 0.97
Facilitators	1.02	*.70*	0.92, 1.12
Chance HLC	1.01	*.60*	0.96, 1.07

[a] Comparison Category

Table 5. Post-hoc analysis of multivariate predictors of participation

	Early vs. Late[a]			Early vs. Never[a]			Late vs. Never[a]		
	Risk Ratio	p-value	95% CI	Risk Ratio	p-value	95% CI	Risk Ratio	p-value	95% CI
Background variables									
Known someone with CRC									
No[a]	1.00	-	-	1.00	-	-	1.00	-	-
Yes	1.05	.67	0.85, 1.29	1.30	.07	0.97, 1.73	1.59	.06	0.99, 2.56
Social Cognitive									
Barriers	0.88	.06	0.78, 1.00	.76	.001	0.64, 0.89	0.90	.42	0.70, 1.16

[a] Comparison Category

Figure 1. Survey response and FOBT participation rates

```
┌──────────────────────┐
│ 1250 sent advance    │
│ notification letter  │───────────► 28 declined
└──────────────────────┘
          │
          ▼
┌──────────────────────┐
│ 1222 sent survey     │
│                      │
└──────────────────────┘
          │
          │───────────► 41 eliminated- deceased, changed address, overseas, or
          │              limited English and unable to complete
          │
          │───────────► 517 non responders after wk 6 reminders
          │              and wk 8 reminder phone call
          ▼
┌──────────────────────┐
│ 664 survey respondents│
│ 56.22%               │
└──────────────────────┘
          │
          │───────────► 21 excluded from FOBT offer- either up to date with
          │              screening or did not wish to participate (respondents who
          │              had contacted the researchers during the survey period)
          ▼
┌──────────────────────┐
│ FOBT offered to      │
│ 643 survey           │
│ respondents          │
└──────────────────────┘
          │
          │───────────► 64 unable to complete FOBT due to health restrictions or prior
          │              involvement in a continuous screening program.
          ▼
┌──────────────────┐   ┌──────────────────────┐
│ 579 eligible to  │──►│ 333 returned FOBT     │
│ complete FOBT    │   │ (57.51%)              │──┐
│                  │   └──────────────────────┘  │   203 excluded based on not
│                  │──►┌──────────────────────┐  │──► being in earliest stages of
│                  │   │ 246 did not return    │  │   readiness to screen
└──────────────────┘   │ FOBT (42.49%)         │  │
                       └──────────────────────┘  │
                                  │               │
                                  ▼               │
┌────────────────────────────────────────────────┐
│ 376 with full survey data, eligible to complete │
│ FOBT and in pre-contemplation, contemplation or │
│ preparation stage of TTM                         │
│                                                  │
│   ➔ 196 completed FOBT (132 early, 64 late)     │
│   ➔ 180 did not complete FOBT                    │
└──────────────────────────────────────────────────┘
```