Colorectal Cancer Screening Participation and Medical Advice Seeking for Symptoms in Australia

Ryan James Courtney B Psyc (Hons)

Submitted for fulfilment of the award of:
Doctor of Philosophy
(Behavioural Science in Relation to Medicine)

Submitted February, 2012

Priority Research Centre for Health Behaviour, School of Medicine and Public Health, University of Newcastle
Statement of originality

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text. I give consent to this copy of my thesis, when deposited in the University of Newcastle Library*, being made available for loan and photocopying subject to the provisions of the Copyright Act 1968.

*Unless an Embargo has been approved for a determined period.

Acknowledgement of authorship

I hereby certify that this thesis is in the form of a series of published papers of which I am a joint author. I have included as part of the thesis a written statement from each co-author, endorsed by the Faculty Assistant Dean, Research Training, attesting to my contribution to the joint publications.

________________________________________

RYAN J COURTNEY

Date
Supervisors

Associate Professor Christine Paul, PhD, Senior Research Academic, Priority Research Centre for Health Behaviour, School of Medicine and Public Health, University of Newcastle

Laureate Professor Rob Sanson-Fisher, AO, PhD, M Clin Psyc, Director, Priority Research Centre for Health Behaviour, School of Medicine and Public Health, University of Newcastle

Professor Finlay Macrae, MBBS, FRACP, MRCP, MD, FRCP, Head, Colorectal Medicine and Genetics Department, Royal Melbourne Hospital

Professor Catherine D’Este, PhD, Director, Centre for Clinical Epidemiology and Biostatistics, School of Medicine and Public Health, University of Newcastle
Acknowledgements

This thesis would not have eventuated without the kind and generous support provided by numerous persons. First, and foremost, I would like to thank my principal supervisors, Laureate Professor Rob Sanson-Fisher and Associate Professor Chris Paul. Both are inspirational mentors and insightful teachers. I feel very privileged and ever grateful for the opportunity to undertake studies underneath their supervision.

To Associate Professor Paul, your assistance, support and guidance throughout my candidature have been of the up-most quality. The patience and enthusiasm you exhibited during all phases of research were exemplary. I feel very privileged to have had such a hardworking, kind and dedicated supervisor. Your vision, passion, wisdom and expertise in research were truly inspiring. You are a shining example of someone I aspire to emulate in the future.

To Laureate Professor Sanson-Fisher, your direction and guidance throughout my candidature is greatly appreciated. Your vision and wisdom are inspiring. You are one of a kind. Your track record is a testimony to a hard-working man who has devoted himself to a life-long research endeavour to reduce the burden of illness associated with disease. You have left, and will surely continue to leave, an impressionable impact on myself and peers in the future! I feel privileged to have had the opportunity to undertake research under the direction of a researcher held in such high esteem.

To my associate supervisor, Professor Finlay Macrae: Thank you for generously providing your clinical expertise and feedback on all manuscripts. I greatly appreciate your input.
To my associate supervisor, Professor Cate D’Este: Thank you for your patience and assistance in the statistical analysis process.

To Dr Mariko Carey: Many thanks for your dedication to the Cancer Council Victoria colorectal cancer screening trial. This trial would not have been possible without your hard work and dedication.

Many thanks to co-investigators from the Hunter Community Study (Professor John Attia, Mark McEvoy, Roseanne Peel and Stephen Hancock) and research staff at the Cancer Council Victoria, in particular Jody Simmons. Your hard work and assistance throughout study development and manuscript preparation are much appreciated.

A very special thank you is extended to all those who participated in this research, including participants from The Hunter Community Study cohort and colorectal cancer patients and their first-degree relatives participating in the Cancer Council Victoria colorectal cancer screening trial.

I am very grateful to the National Health and Medical Research Council, Hunter Medical Research Institute, Lions Club of Adamstown and Australian Rotary Health. My heartfelt thanks and appreciation to Australian Rotary Health in conjunction with Rotary District 9650 and Chairman, Kevin Sharp, for their kind support of my research endeavour. I feel honoured and proud to have undertaken my studies as a Rotary Scholar.

To my fellow colleagues at the Health Behaviour Research Group, in particular the PhD candidates (former and present) who have undertaken their studies in Room 269a: you have been a constant source of reassurance, and I could not have asked for a better
group of fellow candidates to work with, day in and day out. I would also like to thank Daniel Barker and Michael Fitzgerald from the Centre for Clinical Epidemiology and Biostatistics for their assistance throughout the statistical analysis process.

Finally, I am indebted to my Father, Mother and brother. Your love and support throughout my life have always been unwavering and a constant source of encouragement.
# Table of contents

Statement of originality .......................................................................................................................... ii
Acknowledgement of authorship .............................................................................................................. ii
Supervisors .................................................................................................................................................. iii
Acknowledgments ........................................................................................................................................ iv
Table of contents ........................................................................................................................................ vii
List of tables ............................................................................................................................................... xv
List of figures ............................................................................................................................................... xviii
List of appendices ...................................................................................................................................... xix
Synopsis ..................................................................................................................................................... xxi
Statement of contributions of others ....................................................................................................... xxviii

*Introduction - Colorectal cancer, its early detection and prevention: The clear need for adherence to screening guidelines and improved medical-advice-seeking behaviour for primary symptoms* ................................................................................................................................. 1

- Aetiology of colorectal cancer .............................................................................................................. 2
- Burden of illness associated with colorectal cancer .............................................................................. 2
- Economic cost of colorectal cancer .................................................................................................... 3
- Colorectal cancer staging and survival .................................................................................................. 4
- Efficacy and effectiveness of colorectal cancer screening in reducing incidence and mortality ................................................................. 7
  - Faecal occult blood test ..................................................................................................................... 7
  - Colonoscopy ....................................................................................................................................... 8
  - Sigmoidoscopy .................................................................................................................................... 9
- Colorectal cancer screening guidelines ............................................................................................... 9
- Colorectal cancer screening recommendations ............................................................................... 11
Australia’s National Bowel Cancer Screening Program and current screening rates...........................................................................................................12
Inequality in colorectal cancer screening participation............................................14
Impact of colorectal cancer screening on incidence and mortality reduction......15
Importance of early detection of colorectal cancer through prompt medical advice seeking when relevant symptoms appear ...........................................16
The paradoxical relationship among symptom duration, colorectal cancer staging and survival................................................................................................17
Theoretical framework: CRC screening and medical advice seeking behaviour ........................................................................................................18
Closing the knowledge gap: Existing challenges and research aims ............20
References .........................................................................................................23

Paper One – Community approaches to increasing colorectal cancer screening uptake:
A review of the methodological quality and strength of current evidence ........34
Abstract ..............................................................................................................36
Background.......................................................................................................37
Why addressing colorectal cancer is essential to Australia’s health .............37
Colorectal cancer screening participation in Australia ...................................37
Need to increase colorectal cancer screening participation rates in Australia ......................................................................................................38
Effective interventions to increase colorectal cancer screening .................38
Methods..........................................................................................................39
Results.............................................................................................................41
Discussion .......................................................................................................50
Number of community-based intervention studies .........................................50
Methodological rigour of community-based studies ......................................50
Increasing the effectiveness of community-based interventions..............50
Effectiveness of community-based strategies in improving screening rates
among population sub-groups experiencing inequality........................52
Limitations, future research and areas for improvement .....................52
References ..........................................................................................54

Paper Two – Colorectal (bowel) cancer screening in Australia: A community-level perspective .................................................................60
Introduction to Paper Two .....................................................................61
Aims and purpose ..................................................................................62
References ..........................................................................................63
Abstract ...............................................................................................65
Introduction ..........................................................................................66
Methods ...............................................................................................67
Results ....................................................................................................69
Discussion ............................................................................................74
Screening in accordance with national guidelines...............................75
Colonoscopy screening .........................................................................75
Study limitations ...................................................................................76
Conclusions and implications ...............................................................77
References ..........................................................................................78

Paper Three – Individual- and provider-level factors associated with colorectal cancer screening in accordance with guideline recommendation: A community-level perspective across varying levels of risk .........................................................84
Introduction to Paper Three .................................................................85
Aims and purpose ..................................................................................85
Screening of first-degree relatives “at or slightly above average risk” in accordance with guidelines ................................................................. 143
Screening of first-degree relatives at elevated risk (“moderately increased risk” and “potentially high risk”) in accordance with guidelines ..................... 144
Factors associated with colorectal cancer testing and adherence to colorectal cancer screening guidelines ................................................................. 145
Strengths and limitations of the study ..................................................... 148
Implications and conclusions .................................................................. 150
References ............................................................................................... 151

Paper Five – The current rate of medical-advice-seeking behaviour for primary symptoms of colorectal cancer: Determinants of failure and delay in medical consultation ................................................................. 159

Introduction to Paper Five ....................................................................... 160
  Aims and purpose .................................................................................. 161
  References ............................................................................................. 162
Abstract .................................................................................................... 165
Introduction ............................................................................................... 166
  Colorectal cancer and primary symptom presentation ............................ 166
  Current debate: Symptom duration and staging of disease .................... 166
  A lack of knowledge about current symptom presentation ..................... 167
Methods .................................................................................................... 168
Results ..................................................................................................... 171
Discussion ................................................................................................. 178
  Comparison with other studies ............................................................... 178
  Limitations and strengths of study ......................................................... 179
  Conclusions and implications ................................................................. 180
References .................................................................................................................................................. 182

_Paper Six – Factors associated with consultation behaviour for primary symptoms that potentially indicate colorectal cancer: A cross-sectional study on response to symptoms_
.................................................................................................................................................................. 186

Introduction to Paper Six............................................................................................................................ 187

Aims and purpose........................................................................................................................................... 188

References .................................................................................................................................................... 189

Abstract ....................................................................................................................................................... 191

Background .................................................................................................................................................. 192

Colorectal cancer: The burden of illness...................................................................................................... 192

Primary symptoms and clinical presentation of colorectal cancer .............................................................. 192

The paradoxical relationship between symptom duration and earlier diagnosis
................................................................................................................................................................... 192

Bridging the evidence-practice gap............................................................................................................... 194

Methods....................................................................................................................................................... 196

Results......................................................................................................................................................... 198

Discussion .................................................................................................................................................... 203

Failure to seek medical advice..................................................................................................................... 204

Public health gain: Decreasing CRC patients admitted to acute settings ................................................. 204

Factors associated with ever seeking medical advice ................................................................................. 205

Factors associated with early medical advice seeking .............................................................................. 206

Triggers for early medical advice seeking.................................................................................................. 207

The need for improved medical advice seeking behaviour in the primary care setting
........................................................................................................................................................................... 208

Study limitations ......................................................................................................................................... 208

Conclusions................................................................................................................................................. 209
Discussion and implications for future research and practice ........................................... 225

Introduction ....................................................................................................................... 226

Colorectal cancer screening ............................................................................................ 226

Medical advice seeking for primary symptoms of colorectal cancer ....................... 227

Key thesis findings ........................................................................................................... 229

Discussion of methodological limitations ..................................................................... 229

Colorectal cancer screening behaviour ......................................................................... 229

Family history of colorectal cancer ............................................................................... 230

Medical-advice-seeking behaviour ................................................................................. 231

Discussion of key thesis findings .................................................................................... 231

Key thesis finding 1: Low rates of colorectal cancer screening in accordance with screening guidelines across varying levels of risk ........................................... 231

Proposed study 1: A randomised controlled trial to improve compliance with guideline-recommended colorectal cancer screening in the general practice setting .......................................................... 236

Background ..................................................................................................................... 236

Aim ................................................................................................................................. 238

Hypotheses ....................................................................................................................... 238

Research plan .................................................................................................................. 238

Significant and potential benefits .................................................................................... 241

Key thesis finding 2: A high rate of colonoscopy that may not be in accordance with guidelines among persons “at or slightly above average risk” ...................... 241

Proposed study 2: A randomised controlled trial of a decision-making aid to facilitate risk-appropriate general practice triage for colonoscopy screening in the general practice setting ......................................................... 243
Key thesis finding 3: Inequality in colorectal cancer screening participation and level of screening in accordance with guideline recommendations across population groups ............................................ 247

Proposed study 3: A descriptive study to identify the facilitating enablers of and barriers to colorectal cancer screening participation among lower socio-economic persons experiencing inequality ........................................... 250

Key thesis finding 4: Low rates of medical consultation and prompt medical-advice-seeking for primary symptoms potentially indicating colorectal cancer ........................................................................................................... 255

Improving medical-advice-seeking behaviour for symptoms of colorectal cancer .......................................................................................................................... 258

Conclusion and way forward ......................................................................................................................... 262

References .................................................................................................................................................. 264

Appendices ............................................................................................................................................. 277
List of Tables

Introduction

Table 1.1: Age-standardised incidence and mortality rates (per 100,000) for colorectal cancer by selected countries

Table 1.2: Tumour Node Metastasis colorectal cancer staging system

Table 1.3: Tumour Node Metastasis stage groupings, Duke’s stage, and degree of spread

Table 1.4: Levels of risk in accordance with National Health and Medical Research Council colorectal cancer screening guidelines

Table 1.5: Australian colorectal cancer screening guideline recommendations across varying levels of risk

Paper One

Table 2.1: Methodological rigour assessment of community- and population-based intervention studies using accepted EPOC study designs

Table 2.2: Characteristics of mail-based interventions with at least moderate methodological rigour

Table 2.3: Characteristics of non-mail-based interventions with at least moderate methodological rigour

Table 2.4: Characteristics of multi-component-based interventions with at least moderate methodological rigour

Paper Two

Table 3.1: Respondents’ risk allocation in accordance with national screening guidelines

Table 3.2: Socio-demographic characteristics of the asymptomatic study population (n = 777)
Table 3.3: Timing of most recent faecal occult blood test by risk category

Table 3.4: Timing of most recent colonoscopy by risk category (n/%)

Table 3.5: Proportion of respondents screened in accordance with national screening guidelines (n/%)

Paper Three

Table 4.1: Respondents’ risk allocation in accordance with colorectal cancer screening guidelines

Table 4.2: Socio-demographic, clinical and psychosocial characteristics of the asymptomatic study population (n = 777)

Table 4.3: Multiple logistic regression analysis of factors associated with ever receiving colorectal cancer screening

Table 4.4: Multiple logistic regression model (n = 586) of factors associated with screening in accordance with guidelines for persons “at or slightly above average risk”

Table 4.5: Multiple logistic regression model (n = 50) of factors associated with screening in accordance with guidelines for persons at “moderately increased risk/potentially high risk”

Table 4.6: Multiple logistic regression model (n = 659) for colonoscopy screening (within 5 years) irrespective of level of risk.

Paper Four

Table 5.1: Description of risk categories and their respective screening recommendations in accordance with National Health and Medical Research Council colorectal cancer screening guidelines

Table 5.2: Characteristics of asymptomatic first-degree relatives of colorectal cancer patients (n = 405)

Table 5.3: Multiple logistic regression analysis of factors associated with ever receiving colorectal cancer screening
Table 5.4: Multiple logistic regression model of factors associated with first-degree relatives’ screening in accordance with guidelines

Paper Five

Table 6.1: Demographic characteristics of study respondents (n = 1085)

Table 6.2: Respondents’ reasons for never seeking medical advice following primary symptom episode

Table 6.3: Respondents’ reasons for delay (> one week) in seeking medical advice following the first primary symptom episode in the previous five years

Paper Six

Table 7.1: Demographic characteristics of study respondents (n = 1085)

Table 7.2: Multiple logistic regression analysis of factors associated with ever seeking medical advice for rectal bleeding

Table 7.3: Multiple logistic regression analysis of factors associated with early medical advice seeking for rectal bleeding

Table 7.4: Multiple logistic regression analysis of factors associated with ever seeking medical advice for change in bowel habit

Table 7.5: Multiple logistic regression analysis of factors associated with early medical advice seeking for change in bowel habit
List of Figures

Introduction

Figure 1.1: Theory of Planned Behaviour framework. Adapted from Azjen 1991.

Paper Two

Figure 2.1: Flowchart representing selection of asymptomatic respondents

Paper Four

Figure 3.1: Flowchart representing selection and recruitment of asymptomatic first-degree relatives of colorectal cancer patients

Figure 3.2: First-degree relatives’ colorectal cancer screening status in accordance with guidelines by level of risk

Paper Five

Figure 4.1: Rectal bleeding: Time taken to seek medical advice following first symptom episode in previous five years

Figure 4.2: Change in bowel habit: Time taken to seek medical advice following first symptom episode in last five years
List of Appendices

Paper One
Appendix 1A: Search items used for Medline search

Paper Two
Appendix 2A: Items and response items (verbatim) for colorectal cancer test items
Appendix 2B: Items and response items (verbatim) used to assess respondents’ family histories

Paper Three
Appendix 3A: Wording of questionnaire items
Appendix 3B: Simple logistic regression analysis of study outcomes

Paper Four
Appendix 4.A: Simple logistic regression analysis of study outcomes

Paper Six
Appendix 5A: Results of simple logistic regression analyses

Hunter Community Study (study materials for Papers Two, Three, Five and Six)
Appendix A: Ethics approval, University of Newcastle
Appendix B: Ethics approval, Hunter New England Population Health
Appendix C: Invitation letter
Appendix D: Information statement
Appendix E: Pen and paper questionnaire

Victorian Cancer Registry Study (study materials for Paper Four)
Appendix F: Ethics approval, University of Newcastle
Appendix G: Ethics approval, Cancer Council Victoria
Appendix H: Invitation letters
Appendix I: Information statement
Appendix J: Consent form

Appendix K: Computer-assisted telephone interview script

Proposed study

Appendix L: How accurate is self-reported family history for categorising level of risk among first-degree relatives of colorectal cancer patients?
Synopsis

The contents of this thesis by publication include an introduction, a critical review, five data-based manuscripts and a general discussion providing implications and conclusions. The papers examined the early detection and prevention of colorectal cancer (CRC) in the community-based setting and among first-degree relatives of CRC patients. At timing of thesis submission, three papers (two data-based and one review paper) had been accepted for publication. The remaining three are under editorial review.

The burden of disease, early detection and prevention of colorectal cancer (CRC) is presented in the **Introduction**. It provides a general overview of CRC-related global burden of disease, its aetiology and the efficacy of screening in reducing incidence and mortality. It also examines current levels of CRC screening uptake and the populations currently experiencing inequality in CRC screening. This chapter also provides an overview of the current state of medical consultation and delay in seeking medical advice for primary symptoms of CRC (i.e. rectal bleeding and change in bowel habit).

**Paper One (accepted for publication, Cancer Forum):** "Community approaches to increasing colorectal screening uptake: A review of the methodological quality and strength of current evidence" provides a critical review of methodically sound community-based approaches to increasing CRC screening levels. This review identified (i) the number of community-based interventions published between 2002 and 2011, (ii) the proportion of intervention studies that had adopted a community-based approach and met basic Cochrane Effective Practice and Organisation (EPOC) study design criteria and (iii) the effectiveness of community-based studies with at least a moderate level of methodological rigour at increasing
CRC screening rates. Eighty-six intervention studies were identified, 21 of which adopted a community- or population-based approach to increasing CRC screening levels. Overall, the methodological rigour of such studies was moderate. Of the 21 intervention studies, 15 had used an accepted EPOC study design. 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 may consider using to increase screening rates are discussed. This review highlighted the urgent need for further methodologically rigorous community-based CRC screening intervention research in Australia.

Paper Two (accepted for publication, Medical Journal of Australia): “Colorectal (bowel) cancer screening in Australia: A community-level perspective” is a cross-sectional study which identified the current levels of CRC screening uptake and screening in accordance with National Health and Medical Research Council (NHMRC) screening guidelines among an at-risk community cohort of persons aged 56-88 years. A total of 1592 participants were selected from the Hunter Community Study (HCS), Hunter Region, New South Wales, Australia. Of these, 1117 respondents returned a completed questionnaire (response rate, 70%). Of this group, 777 persons were deemed asymptomatic and eligible for analysis. Overall, 63% of respondents had ever received any CRC testing in their lifetime. Forty-three percent of respondents had ever had a faecal occult blood test (FOBT), with a screening rate of 20% in the previous two years. Thirty percent of respondents had ever had a colonoscopy, with 16% screened in the previous five years. Seven percent of respondents had ever had a sigmoidoscopy, with a screening rate of 1% in the previous five years. Rates of adherence to screening guidelines were 21% for respondents “at or slightly above average risk” and 45% for respondents at “moderately
increased risk” or “potentially high risk”. This study indicated that rates of CRC screening in Australia remain low. The screening rate for colonoscopy was high among persons “at or slightly above average risk”, despite such screening not being endorsed in the NHMRC guidelines. Effective strategies to improve rates of CRC screening and appropriate use of colonoscopy are required across the entire at-risk population.

**Paper Three (under editorial review, *BMC Public Health*):** “Individual- and provider-level factors associated with colorectal cancer screening in accordance with guideline recommendation: A community-level perspective across varying levels of risk” is a cross-sectional cohort study using the aforementioned sampled population which assessed the socio-demographic and provider-level factors associated with ever receiving CRC testing and CRC screening in accordance with guideline recommendations. A secondary analysis was conducted to examine National Bowel Cancer Screening Program eligibility on each aforementioned outcome. Ever receiving CRC testing was significantly more likely for persons aged 65-74 years and for those who had discussed their family history of CRC with a doctor or had ever received screening advice from a doctor. For respondents “at or slightly above average risk”, screening in accordance with guideline recommendation was significantly more likely for persons aged 65-74 years, those with higher household income and those who had ever received screening advice. For respondents at “moderately increased risk” or “potentially high risk”, screening in accordance with guideline recommendations was significantly more likely for persons with private health insurance and for those who had discussed their family history of CRC with a doctor. Colonoscopy screening in the previous five years was significantly more likely for persons who had ever smoked, those who had discussed their family history of CRC with a doctor and those who had ever received screening advice. Public education programs that target population
groups less likely to engage in CRC screening are pivotal for decreasing screening inequalities. Interventions are also required to increase CRC screening rates.

**Paper Four:** (Under editorial review, *British Medical Journal*): “A population-based examination of colorectal cancer screening practices of first-degree relatives of colorectal cancer patients” is a population-based study among first-degree relatives (FDRs) of CRC patients examining across varying levels of risk, the proportion of FDRs (i) ever receiving any CRC testing in their lifetime and (ii) screened in accordance with NHMRC screening guidelines. Socio-demographic and provider-level predictors of (i) and (ii) were also evaluated. Index case patients were selected from the Victorian Cancer Registry, Victoria, Australia. Seven hundred and seven first-degree relatives completed telephone interviews. Of these, 405 FDRs were deemed asymptomatic and eligible for analysis. Sixty-nine percent of FDRs had ever received any CRC testing in their lifetime. This rate did not differ statistically across level of risk. Older FDRs, those with private health insurance, siblings and those who had ever been asked about their family history of CRC by a doctor were significantly more likely to have ever received CRC testing. Twenty-five percent of FDRs “at or slightly above average risk” were screened in accordance with screening guidelines. For this group, male FDRs and those with a higher level of education were significantly more likely to have been screened in accordance with guidelines. For persons at “moderately increased risk” or “potentially high risk”, 47% and 49% respectively, were screened in accordance with screening guidelines. For this group, FDRs living in major cities or metropolitan areas, siblings, those married or partnered and those who were ever asked about family history of CRC by a doctor were significantly more likely to be screened in accordance with guideline recommendations. A significant level of non-compliance to screening guidelines among a population at elevated relative risk was evident. There is substantial room for improved screening of FDRs of CRC patients.
and an urgent need to address individual- and provider-level barriers to screening. Effective systematic interventions that reach this vulnerable population group are needed.

**Paper Five: (Accepted for publication, *Colorectal Disease*):** “The current state of medical-advice-seeking behaviour for primary symptoms of colorectal cancer: Determinants of failure and delay in medical consultation” reports on a cross-sectional study examining, for two primary symptoms of colorectal cancer (i.e. rectal bleeding and change in bowel habit), rates of (i) non-consultation and (ii) delay in seeking medical advice for both symptoms. Additionally, the reasons for non-consultation and delay in seeking medical advice for each symptom as well as the triggers for consulting a doctor following symptom episode were investigated. A total of 1592 persons aged 56-88 years were randomly selected from the Hunter Community Study and sent a questionnaire. Of these, 1117 persons returned completed questionnaires (response rate, 70%). Eighteen percent (60/332) of respondents experiencing rectal bleeding and 20% (39/195) of those reporting change in bowel habit had never consulted a doctor for the symptom. Rates of delay (> one month) for each symptom were 18% and 37% respectively. Reasons for delay included assumptions about symptom seriousness and benign nature. Various triggers for seeking medical advice were identified. Healthcare-seeking behaviour for rectal bleeding had not significantly improved, compared with a previous community-based data set. The seriousness of symptoms, importance of early detection, and prompt medical consultation must be articulated in health messages to at-risk persons.

**Paper Six: (Under editorial review, *BMC Gastroenterology*):** “Factors associated with consultation behaviour for primary symptoms that potentially indicate colorectal cancer: A cross-sectional study on response to symptoms”.
The purpose of this study using the aforementioned Hunter Community Study cohort was to identify the socio-demographic and provider-related characteristics associated with (i) ever seeking medical advice for primary symptoms of CRC and (ii) early medical-advice-seeking behaviour for primary symptoms of CRC. Males and those who had received screening advice from a doctor were significantly more likely to ever seek medical advice for rectal bleeding. Persons who had private health coverage, those who consulted a doctor because the “symptom was serious” or who did not wait to consult a doctor for another reason were significantly more likely to seek early medical advice. Persons with lower income, those within the healthy weight range and those who had discussed their family history of CRC, irrespective of whether they were informed of “increased risk”, were significantly more likely to ever seek medical advice for change in bowel habit. Persons frequenting their general practitioners less often and those seeing their doctors because the symptoms persisted were significantly more likely to seek early medical advice. This study identified modifiable factors at individual and provider levels related to consultation behaviour and delay. Effective health promotion efforts must heed these factors and target sub-groups less likely to seek early medical advice.

**Discussion and implications for future research and practice**

In conclusion, this dissertation has provided insight into the current levels of CRC screening in compliance with NHMRC screening guideline recommendations at a community level and among an increased-risk population (i.e. first-degree relatives of CRC patients). Previously, little was known about community CRC screening levels across varying levels of risk. The low rates of screening in accordance with guidelines and the identified screening inequalities across individual and socio-demographic characteristics highlights the need for systematic population-based approaches to increase the rate of risk-appropriate CRC screening. This thesis also highlighted the
poor receptivity of community members to prompt medical advice seeking for potential symptoms of CRC. Both high rates of delay and non-consultation for primary symptoms were evident, with little appreciable improvements indicated through a direct comparison with an earlier at-risk community data set. The current work highlights the need for systematic population-based approaches that are tested in methodically rigorous interventions, if improvements in the earlier presentation of primary symptoms and the level of risk-appropriate CRC screening are to occur. The direction of future research stemming from this dissertation and the possible pathways for future research initiatives are discussed.
Statement of Contributions of Others
Statement of contribution
I, Associate Professor Christine Paul, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet British Medical Journal authorship guidelines for the following manuscripts:
A population-based examination of colorectal screening practices of first-degree relatives of colorectal cancer patients. Ryan J Courtney, Christine L Paul, Mariko L Carey, Robert W Sanson-Fisher, Finlay Macrae, Catherine D'Este, David Hill, Daniel Barker, Jody Simmons.
Statement of contribution

I, Laureate Professor Robert Sanson-Fisher, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet *British Medical Journal* authorship guidelines for the following manuscripts:


A population-based examination of colorectal screening practices of first-degree relatives of colorectal cancer patients. Ryan J Courtney, Christine L Paul, Mariko L Carey, Robert W Sanson-Fisher, Finlay Macrae, Catherine D'Este, David Hill, Daniel Barker, Jody Simmons.


10.1.2012

Laureate Professor Rob Sanson-Fisher (Co-author)       Date

10.1.2012

Ryan Courtney (Candidate)       Date

Professor John Rostas (Assistant Dean, Research Training)       Date
Statement of contribution

I, Professor Finlay Macrae, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet British Medical Journal authorship guidelines for the following manuscripts:


Statement of contribution
I, Dr Mariko Carey, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet British Medical Journal authorship guidelines for the following manuscripts:


10.1.2012

_____________________________________________________
Dr Mariko Carey (Co-author) Date

10.1.2012

_____________________________________________________
Ryan Courtney (Candidate) Date
Professor John Rostas (Assistant Dean, Research Training)  Date
Statement of contribution

I, Professor John Attia, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet British Medical Journal authorship guidelines for the following manuscripts:


10.1.2012

Professor John Attia (Co-author) Date
10.1.2012

Ryan Courtney (Candidate)       Date

Professor John Rostas (Assistant Dean, Research Training)       Date
Statement of contribution

I, Mark McEvoy, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscripts to meet British Medical Journal authorship guidelines for the following manuscripts:


10.1.2012

Mark McEvoy (Co-author)       Date
Ryan Courtney (Candidate)  

Professor John Rostas (Assistant Dean, Research Training)  

10.1.2012
Statement of contribution
I, Professor David Hill, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscript to meet British Medical Journal authorship guidelines for the following manuscript:
A population-based examination of colorectal screening practices of first-degree relatives of colorectal cancer patients. Ryan J Courtney, Christine L Paul, Mariko L Carey, Robert W Sanson-Fisher, Finlay Macrae, Catherine D'Este, David Hill, Daniel Barker, Jody Simmons.

10.1.2012

Professor David Hill (Co-author) Date

10.1.2012

Ryan Courtney (Candidate) Date

Professor John Rostas (Assistant Dean, Research Training) Date
Statement of contribution
I, Professor Catherine D’Este, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscript to meet British Medical Journal authorship guidelines for the following manuscript:
Statement of contribution

I, Jody Simmons, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscript to meet *British Medical Journal* authorship guidelines for the following manuscript:

A population-based examination of colorectal screening practices of first-degree relatives of colorectal cancer patients. Ryan J Courtney, Christine L Paul, Mariko L Carey, Robert W Sanson-Fisher, Finlay Macrae, Catherine D'Este, David Hill, Daniel Barker, Jody Simmons.

10.1.2012

__________________________________________________________________

Jody Simmons (Co-author)       Date

10.1.2012

__________________________________________________________________

Ryan Courtney (Candidate)       Date

__________________________________________________________________

Professor John Rostas (Assistant Dean, Research Training)       Date
Statement of contribution
I, Daniel Barker, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscript to meet British Medical Journal authorship guidelines for the following manuscript:
A population-based examination of colorectal screening practices of first-degree relatives of colorectal cancer patients. Ryan J Courtney, Christine L Paul, Mariko L Carey, Robert W Sanson-Fisher, Finlay Macrae, Catherine D'Este, David Hill, Daniel Barker, Jody Simmons.

10.1.2012

Daniel Barker (Co-author) Date

10.1.2012

Ryan Courtney (Candidate) Date

Professor John Rostas (Assistant Dean, Research Training) Date
Statement of contribution

I, Sze Lin Yoong, attest that Research Higher Degree candidate, Ryan Courtney, contributed substantially in terms of study concept and design, data collection and analysis, and preparation of the manuscript to meet British Medical Journal authorship guidelines for the following manuscript:

10.1.2012

Sze Lin Yoong (Co-author)       Date

10.1.2012

Ryan Courtney (Candidate)       Date

Professor John Rostas (Assistant Dean, Research Training)       Date