



## A cross-sectional analysis of participation in National Bowel Cancer Screening Program in Adelaide by age, gender and geographical location of residence.

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### RESEARCH

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### Abstract

#### Background

The National Bowel Cancer Screening Program (NBCSP) is a population-based screening program based on a mailed screening invitation and immunochemical faecal occult blood test. Initial published evidence from the NBCSP concurs with international evidence on similar colorectal cancer screening programs about the unequal participation by different population sub-groups. The aim of the paper is to present a cross-sectional analysis of participation in the NBCSP for Adelaide, in order to identify geographical areas and population groups which may benefit from targeted approaches to increase participation rates in colorectal cancer screening.

#### Method

De-identified data from the NBCSP (February 2007 to July 2008) were provided by Medicare Australia. Mapping and analysis of the NBCSP data was performed using ESRI ArcGIS software, MapInfo, Microsoft Access and Microsoft Excel. Data was aggregated to postcode and participation was then mapped according to overall participation rates, sex and age.

#### Results

The overall participation rate was 46.9%, although this differed by age, gender and geographical location. Maps provided in the paper reveal a socio-economic patterning of participation in the NBCSP, whereby areas with higher participation rates are also more affluent, whereas areas with lower participation rates tend to be more disadvantaged.

#### Conclusion

Findings from this study suggest inequities in participation in the NBCSP on the basis of gender, geographical location, and socio-economic status.

#### Key Words

Bowel cancer screening; equity of participation; socio-economic status; gender; age; geographical location

#### Background

Colorectal cancer (CRC) is the second most common cancer in Australia, and has the second highest cancer mortality rate<sup>1</sup>. Around one in 19 men and one in 28 women will develop the disease before 75 years of age<sup>1</sup>. In 2005, there were 4165 deaths from colorectal cancer in Australia which accounted for almost 11% of all deaths from cancer<sup>1</sup>. In 2003, cancer was the largest contributor to the total burden of disease in Australia (19%) and colorectal cancer was amongst the top 20 diseases, ranking 10<sup>th</sup> in both males and females<sup>1</sup>. Survival is inversely related to degree of cancer progression, and up to 90% of all deaths from this cancer may be preventable with early detection<sup>2</sup>. The data from South Australia demonstrates that the five year survival rate for colorectal cancer declines significantly from 88% if detected in stage A, when the cancer is limited to within the bowel wall, to 7% in stage D when the cancer becomes surgically incurable or has spread to other areas of body<sup>3</sup>. Therefore early detection is paramount.

In 2001, colorectal cancer incurred a health expenditure of \$A235 million in Australia that included associated cost with: admitted patients, out of hospital medical expenses,



and pharmaceutical expenditures<sup>4</sup>. In the same year, the type of cancer that had the highest admitted patient expenditure was colorectal cancer (24%)<sup>4</sup>. Screening programs and earlier diagnosis could significantly reduce this level of expenditure, as well as reducing CRC morbidity and mortality.

The National Bowel Cancer Screening Pilot Program (NBCSPP) was implemented at three sites in Australia (Mackay, Adelaide and Melbourne) between 2002 and 2004. Evaluation of the Pilot confirmed the feasibility, acceptability and cost effectiveness of a national bowel cancer screening program in an Australian context. The National Bowel Cancer Screening Program (NBCSP) was launched in August 2006. The program was rolled-out across South Australia in January 2007. The first phase of the program (7 August 2006-30 June 2008) offered free screening by faecal occult blood test (FOBT) for: a) people recorded on the Medicare and Department of Veterans Affairs registers who turned 55 or 65 years of age between 1 May 2006 and 30 June 2008 (the NBCSP Register) and b) re-screening of those people who had been invited to screen in the earlier NBCSPP in 2003 and who were aged from 55 to 74 years on January 2003.

Phase 2 of the program (1 July 2008-30 June 2010) offers a free FOBT test to people turning 50, 55 and 65 years of age in any given year. Eligible participants are sent a pre-invitation information sheet alerting them to the arrival of a test kit. Subsequently, they receive an invitation package that includes an FOBT test kit, sent by the NBCSP Register. Invitees are requested to mail their FOBT sample kit to a central pathology service for analysis. The Australian program is supported by a tracking system that sends out reminder letters. Participants who return a positive result are advised by mail to visit a General Practitioner (GP) with the purpose of arranging a colonoscopic examination.

Several studies have examined disparity in CRC screening test participation amongst different population sub-groups. Rates of participation in CRC screening have been shown to be associated with socio-economic status<sup>5-7</sup>, ethnicity<sup>8-10</sup>, age and gender<sup>11-13</sup>. In Australia, the Australian Institute for Health and Welfare (AIHW) have produced two monitoring reports which also show socio-economic, gender and age differences in screening patterns<sup>14 15</sup>. However, whilst these reports are extremely useful for health care planners and policy makers at both National and State based levels, they do not provide the necessary detail at local levels to enable targeted interventions or programs aimed at increasing participation rates in particular geographical areas. Therefore, the main aim of this paper is to explore inequities in participation in the NBCSP in Adelaide, with a particular focus on analysing patterns on the basis of gender, age and geographical location.

## Method

### Data source

Our analysis was based on a de-identified, South Australian, Medicare Australia extract for the period of January 2007 to July 2008, of people who had been invited to participate in

Phase 1 of the NBCSP. In total there were 92,279 people in the dataset which included two groups of invitees: a) 17,479 people who had been involved in the pilot study of the NBCSP in 2003; b) 74,782 people who were invited to undertake CRC screening for the first time by NBCSP. The dataset contained information on age, gender and postcode for those people sent the FOBT (i.e. invitees) and age, gender, postcode, Indigenous status and language spoken at home for those who completed the FOBT and returned the Participant Information Form (i.e. participants). Ethics approval was granted by the Departmental Ethics Committee of the Commonwealth Department for Health and Ageing and by the Social and Behavioural Research Ethics Committee of Flinders University.

### Data analysis

Medicare data was transferred to the Statistical Package for the Social Sciences (SPSS) version 17.0 for analysis. Bivariate analyses using  $\chi^2$  tests were undertaken to investigate the influence of age group and gender on bowel cancer screening rates.

Mapping and analysis of the NBCSP data was performed by placing Australian Bureau of Statistics (ABS) Census of Population and Housing Data and NBCSP data for Adelaide into a Geographic Information System (GIS) using ESRI ArcGIS software, MapInfo, Microsoft Access and Microsoft Excel. Data was aggregated to postcode and participation was then mapped according to overall participation rates, sex and age.

The postcode variable was converted into a new separate variable for use in the analysis, relating to the socio-economic status of the postcodes. Firstly, each postcode was coded according to the Socio-Economic Indicator for Areas - Index of Relative Social Disadvantage (SEIFA-IRSD),<sup>16</sup> a composite measure based on selected census variables such as income, educational attainment and employment status. The SEIFA-IRSD scores for each postcode were then grouped into quintiles for analysis, where the highest quintile comprises the 20% of postcodes with the highest IRSD scores (most advantaged areas).

## Results

### Overall participation in NBCSP in Adelaide

Of the 92,279 invitees, 46.9% (n=43,323) participated in the NBCSP. A participant was defined as someone who undertook a FOBT, returned the Participant Information Form and had a positive or negative test result in the dataset. Table 1 demonstrates overall rate of participation in South Australia.

Table 1: Participation in NBCSP

	Frequency	Percent
Participant	43323	46.9
Non-participant	48956	53.1
Total	92279	100.0

Figures 1 and 2 are maps of the Adelaide Metropolitan Region – Figure 1 is a map of participation rates in the NBCSP and Figure 2 is a map of SEIFA-IRSD quintiles. Figure 1 reveals a pattern of participation whereby screening rates are higher in eastern and south-eastern areas of Adelaide and lower in northern and north-western areas. Some postcodes have screening rates as high as 60-100%, whereas others have screening rates as low as 0-30%. When comparing Figures 1 and 2, there appears to be a pattern, whereby areas of higher participation are less disadvantaged, and areas of lower participation are more disadvantaged. This fits with the notion of the inverse care law.<sup>17 18</sup>

Figure 1 - Bowel Cancer Screening Participation Rates by Postcode

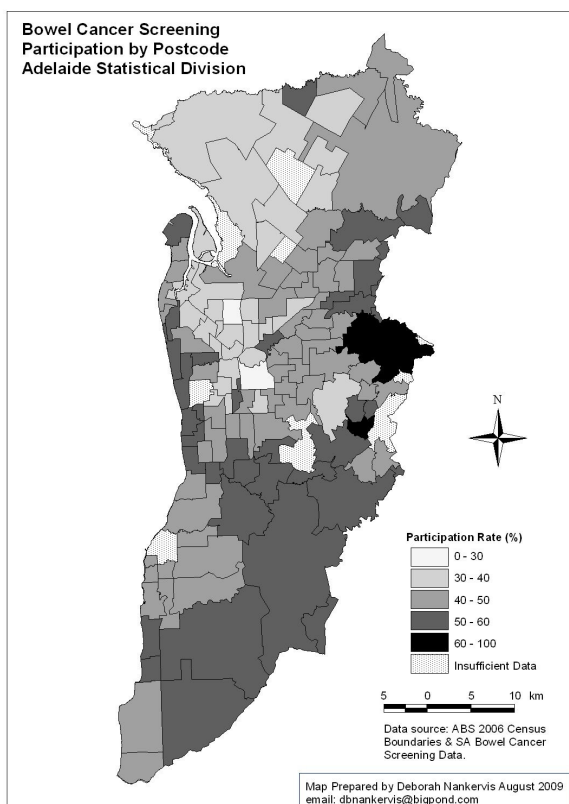
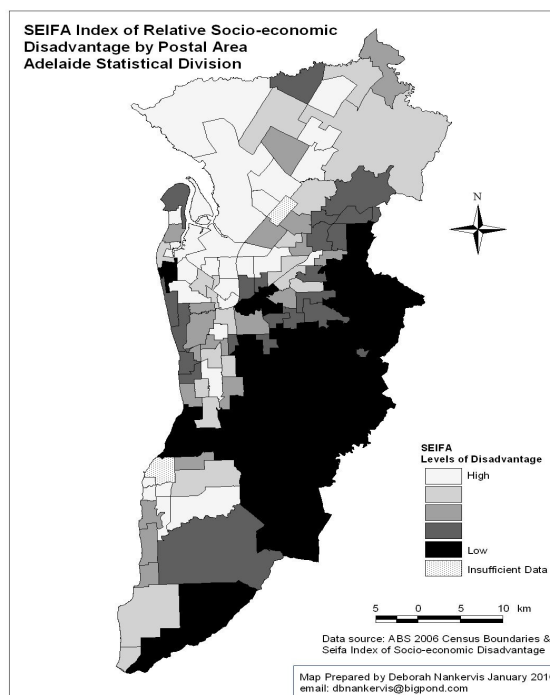


Figure 2 – SEIFA-IRSD score by Postcode



**NBCSP participation and gender**

In the full sample, the FOBT participation rate was statistically significantly higher among women than men ( $p < 0.0001$ ), see Table 2.

Table 2: Participation in NBCSP by gender

	Frequency	Percent
Male participation	44920	48.7
Female Participation	47359	51.3
Total	92279	100.0

\* Participation rates are statistically significantly different ( $\chi^2$  test,  $p < 0.0001$ )

Figures 3 and 4 reveal gender inequity in CRC cancer screening in Adelaide Metropolitan area.

Figure 3: Male participation rates

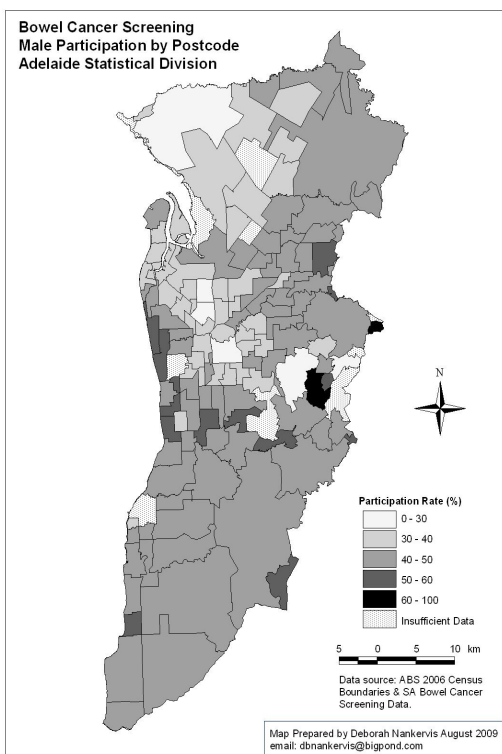
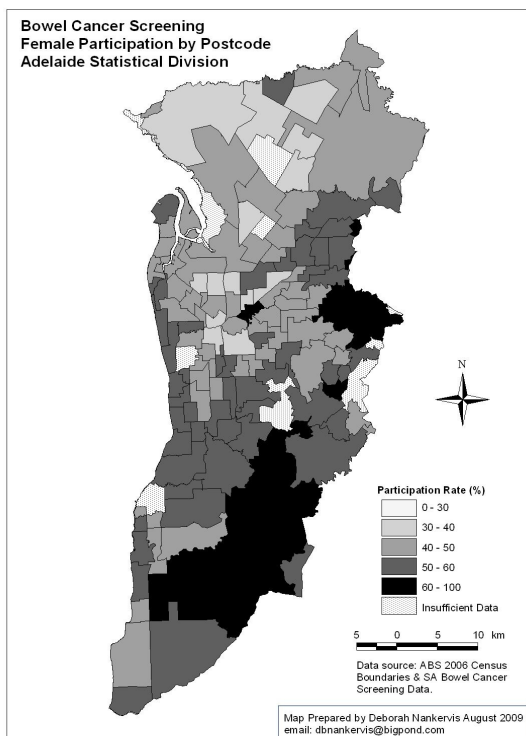


Figure 4: Female participation rates



In both genders, participation varied by postcode which reflects geographical inequity in screening participation. There were generally higher participation rates in south and south-east, and lower participation rates in centre, north and north-west of the Adelaide metropolitan area.

### NBCSP participation and age

This study compared screening participation between 55 and 65 years old as these age groups were the target groups for phase 1 of the NBCSP. Among the full sample (n=92279), 45,334 (49.1%) and 31,721 (34.3%) of participants were 55 and 65 years old respectively. There was a statistically significant difference in participation rates on the basis of age ( $p < 0.0001$ ). Figure 5 and 6 compare rate of screening participation between these two age groups in Adelaide metropolitan area.

Figure 5: Participation rates by age 55

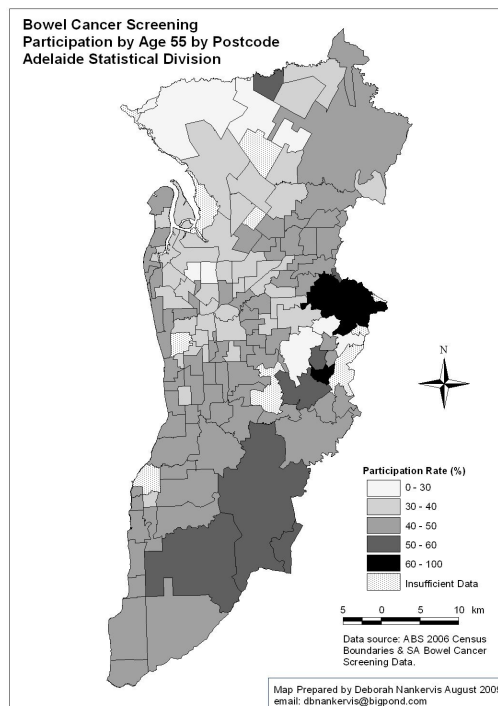
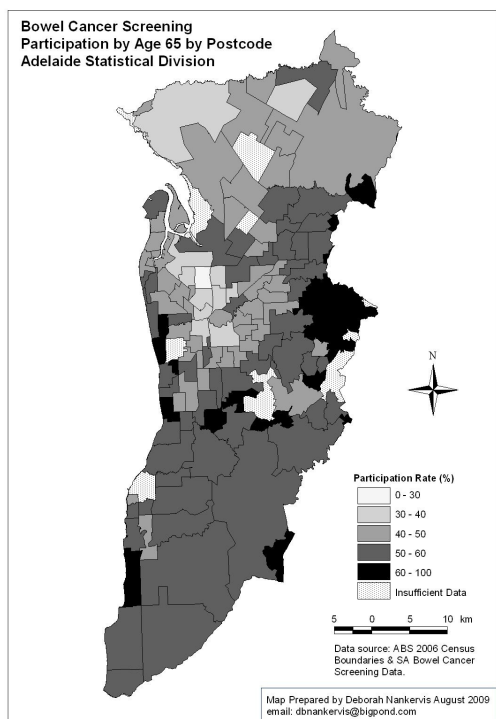


Figure 6: Participation rates by age 65



Figures demonstrate that people age 65 years old were more likely to respond to screening invitation by undertaking FOBT. Similar pattern of geographical disparity exists with south and south-eastern suburbs having higher rates of participation in both age groups.

### Conclusion and Discussion

Overall, the analysis of the NBCSP in South Australia revealed lower rates of screening test participation for men compared to women, and 55 years old compared to 65 years old. The findings of our study are consistent with the results from other studies that highlighted a higher rate of screening participation among women compared to men.<sup>7 11 19 20</sup> This finding is very important, given the epidemiological literature showing that CRC risk and incidence is higher in men – this suggests an inequitable pattern of NBCSP screening on the basis of gender. It may be the case that women have higher screening rates for CRC due to their involvement in, or at least awareness of, other population-based screening programs. Therefore, it may not be the case that women view themselves at higher risk of CRC, but that they perceive the potential benefits of screening for a whole range of illnesses and risk factors. Policy makers and health planners may therefore want to focus attention on increasing awareness of the benefits of illness prevention and health promotion, in addition to the usual focus on the risks of CRC. In this way, a higher proportion of men may be likely to view themselves at a higher risk of CRC in addition to understanding the benefits of illness prevention through screening.

With respect to the relationship between age and participation, most studies exploring the association between age and CRC screening participation indicated an inverted “U”

shaped function with lowest rates of participation in 50-55 years old and those 70-80<sup>11 12 19-21</sup>. The finding of this study which compared two age groups of 55 and 65 also demonstrated an increasing trend of participation from 55 to 65 years old.

Furthermore, our findings indicated a general pattern of lower bowel cancer screening test participation in more socioeconomic disadvantaged groups in Adelaide. Both men and women from the more disadvantaged areas (north and north-west) of Adelaide were less likely to return an initial home test kit than are southern areas.

The findings reported in this paper add to the developing evidence on inequity in bowel cancer screening by age and gender. It is also invaluable to identify areas with lowest rate of participation. Specific interventions need to be designed and targeted towards specific population sub-groups to increase screening uptake. To do so further research is needed to investigate in detail the attitudes and perceptions of the members of these groups toward CRC screening if equity in CRC screening is to be achieved.

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#### **PEER REVIEW**

Not commissioned, externally peer reviewed.

#### **CONFLICTS OF INTEREST**

The authors declare that they have no competing interests.