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## Factors associated with participation in colorectal cancer screening in Australia: Results from the 45 and Up Study cohort

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## ABSTRACT

The Australian Government's National Bowel Cancer Screening Program (NBCSP) was introduced in 2006 to provide free home-based immunochemical faecal occult blood test (iFOBT) to eligible Australians turning 55 and 65 years in that year. With the gradual inclusion of additional age cohorts, the rollout of the NBCSP is being implemented in the context of a degree of opportunistic or de facto screening.

This study investigated factors associated with self-reported ever-uptake of the NBCSP and of any CRC screening using follow-up questionnaire data from 105,897 Australians aged  $\geq 45$  years enrolled in the 45 and Up Study in New South Wales, Australia.

Of the 91,968 study participants with information on CRC screening behaviour, 70,444 (76.6%) reported ever-uptake of any CRC screening. 63,777 study participants were eligible for a NBCSP invitation, of these 33,148 (52.0%) reported ever-uptake of screening through the NBCSP. Current smoking (RR = 0.86, 0.83–0.90), non-participation in breast cancer screening (female) or PSA testing (male) (RR = 0.84, 0.81–0.86), poor self-reported health (RR = 0.89, 0.86–0.91), lower levels of education (RR = 0.91, 0.90–0.93), and not speaking English at home (RR = 0.88, 0.85–0.91) were associated with reduced ever-uptake of screening within the NBCSP and of any CRC screening. Individuals with a family history of CRC were less likely to screen through the NBCSP (RR = 0.71, 0.69–0.73), but more likely to participate in any CRC screening (RR = 1.18, 1.17–1.19).

Smokers, disadvantaged groups and those with non-English speaking backgrounds are less likely to have ever-participated in organised screening through the NBCSP or in any form of CRC screening, supporting efforts to improve participation in these groups.

### 1. Introduction

Colorectal cancer (CRC) is the second most common cancer in women and third most common cancer in men worldwide (Ferlay et al., 2013). Australia has one of the highest incidences of CRC worldwide, with age-standardised rates of 67.6 and 48.8 per 100,000 in men and women respectively in 2013 (Ferlay et al., 2013). Trials have shown that screening with faecal occult blood test (FOBT) is effective at reducing disease-related mortality (Heresbach et al., 2006).

In Australia, population-based CRC screening is provided through the Australian Government's National Bowel Cancer Screening Program (NBCSP). All citizens and permanent residents of Australia, as well as

some temporary residents and refugees, receive an invitation letter, free immunochemical FOBT (iFOBT) kit and instructions on how to use it soon after they reach an eligible age. Different ages were targeted during various phases of the program. Phase 1 of the program went from August 2006 to June 2008 and it targeted people turning 55 and 65 years. Phase 2 went from July 2008 to June 2013 and it targeted people turning 50, 55 and 65 years. Phase 3 went from July 2013 to July 2015 and it targeted people turning 50, 55, 60 and 65 years. After July 2015, progressively more age groups between 50 and 74 years were invited and by 2020, the fully rolled out NBCSP will invite all people aged 50–74 years to screen with iFOBT every two years.

Participation rates in the NBCSP for those age cohorts invited to

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Shaded box indicates age cohorts invited to participate in the NBCSP from 1 January in each year

Follow-up questionnaires were sent in 2012-2015. Responses received by Feb 2016 were used for this analysis.

Year of birth	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
1941	65	66	67	68	69	70	71	72	73	74	75
1942	64	65	66	67	68	69	70	71	72	73	74
1943	63	64	65	66	67	68	69	70	71	72	73
1944	62	63	64	65	66	67	68	69	70	71	72
1945	61	62	63	64	65	66	67	68	69	70	71
1946	60	61	62	63	64	65	66	67	68	69	70
1947	59	60	61	62	63	64	65	66	67	68	69
1948	58	59	60	61	62	63	64	65	66	67	68
1949	57	58	59	60	61	62	63	64	65	66	67
1950	56	57	58	59	60	61	62	63	64	65	66
1951	55	56	57	58	59	60	61	62	63	64	65
1952	54	55	56	57	58	59	60	61	62	63	64
1953	53	54	55	56	57	58	59	60	61	62	63
1954	52	53	54	55	56	57	58	59	60	61	62
1955	51	52	53	54	55	56	57	58	59	60	61
1956	50	51	52	53	54	55	56	57	58	59	60
1957	49	50	51	52	53	54	55	56	57	58	59
1958	48	49	50	51	52	53	54	55	56	57	58
1959	47	48	49	50	51	52	53	54	55	56	57
1960	46	47	48	49	50	51	52	53	54	55	56
1961	45	46	47	48	49	50	51	52	53	54	55
1962	44	45	46	47	48	49	50	51	52	53	54
1963	43	44	45	46	47	48	49	50	51	52	53
1964	42	43	44	45	46	47	48	49	50	51	52

Fig. 1. National Bowel Cancer Screening Program Age Eligibility by Year of Birth.

Fig. 1 shows the timing of the NBCSP rollout for specific age cohorts and timing of mailout of the follow-up questionnaire from the 45 and Up Study.

screen have remained at below 40% in the 10 years following commencement of rollout (Australian Institute of Health and Welfare (AIHW), 2016a; Australian Institute of Health and Welfare (AIHW), 2015). Analyses of the NBCSP produced by the Australian Institute of Health and Welfare (AIHW) have shown lower rates of participation in younger invitation age groups, in people from the lower socioeconomic groups and in people living in remote areas (Australian Institute of Health and Welfare (AIHW), 2016a; Australian Institute of Health and Welfare (AIHW), 2015).

The rollout of the NBCSP is being implemented in the context of some level of opportunistic or de facto screening. In Australia, FOBT can be accessed via primary care physicians or is available from pharmacies and non-government organisations. Colonoscopy is a procedure to visually examine the bowel and is commonly performed for follow-up of positive screening results, screening and surveillance of colorectal polyps and cancers, and diagnosis or treatment of gastrointestinal conditions. It is widely available throughout Australia's public and private hospitals, with fees for the provision of colonoscopy services subsidised by the Australian government through the Medicare Benefits Schedule (MBS). There has been a marked growth in the provision of colonoscopies in Australia in recent years, with demand for MBS-funded colonoscopy (28% increase between 2009 and 10 and 2014-15)

outstripping population growth (8% increase over the same period) (Gastroenterology Clinical Committee of the Medicare Benefits Schedule Review Taskforce, 2016). Although follow-up of positive results from the NBCSP can account for some of the increases in MBS-funded colonoscopy, it is possible that a substantial proportion of the procedures are being conducted as de facto screening tests, in addition to surveillance.

The extent of out-of-program screening and the influence of socio-demographic factors other than those collected by the NBCSP on screening uptake are largely unknown. Furthermore, screening behaviour in relation to risk factors for CRC has not been characterised. A family history of CRC, smoking (Botteri et al., 2008), obesity (Lauby-Secretan et al., 2016) and alcohol consumption (Fedirko et al., 2011) are associated with increased risk for CRC. Observational studies have also indicated that intake of red and processed meat increases the risk for CRC (Bouvard et al., 2015), while a diet high in fruits and vegetables is associated with protection from CRC (Terry et al., 2001).

In this context, therefore, the aim of the current analysis was to identify factors associated with CRC screening uptake using prospectively collected individual data in a large cohort study of people aged 45 years and over residing in Australia's most populous state (New South Wales, population 7.70 million).

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