Appendix A: The screening pathway

The screening pathway has been taken from the Australian Government Department of Health and Ageing website. The screening pathway and other information about the NBCSP and Pilot Program can be found at <www.cancerscreening.gov.au>.

The total number of people invited to participate in the NBCSP and their progression through the pathway is given in Figure A.2.

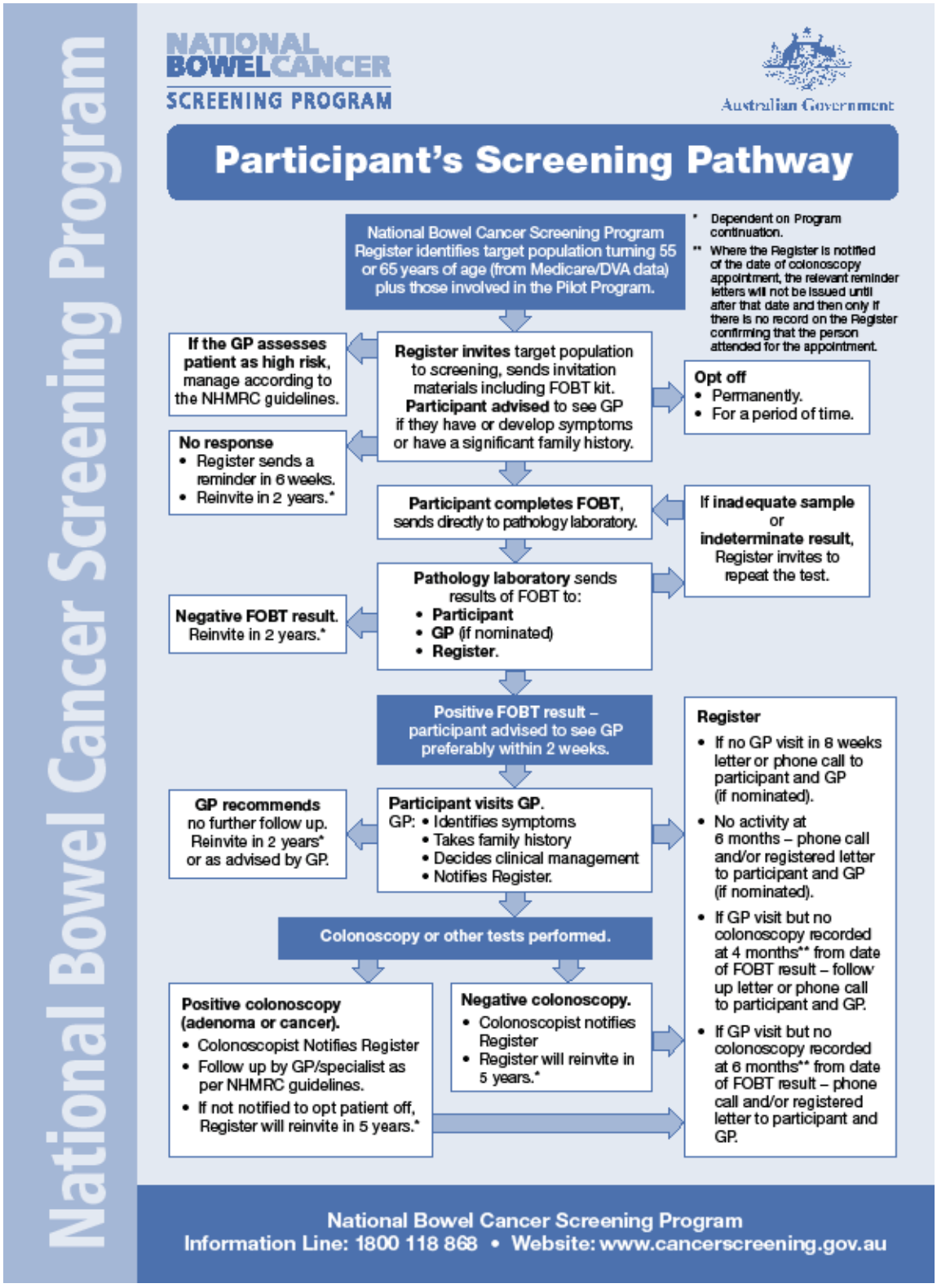

Figure A.1: Participant's screening pathway

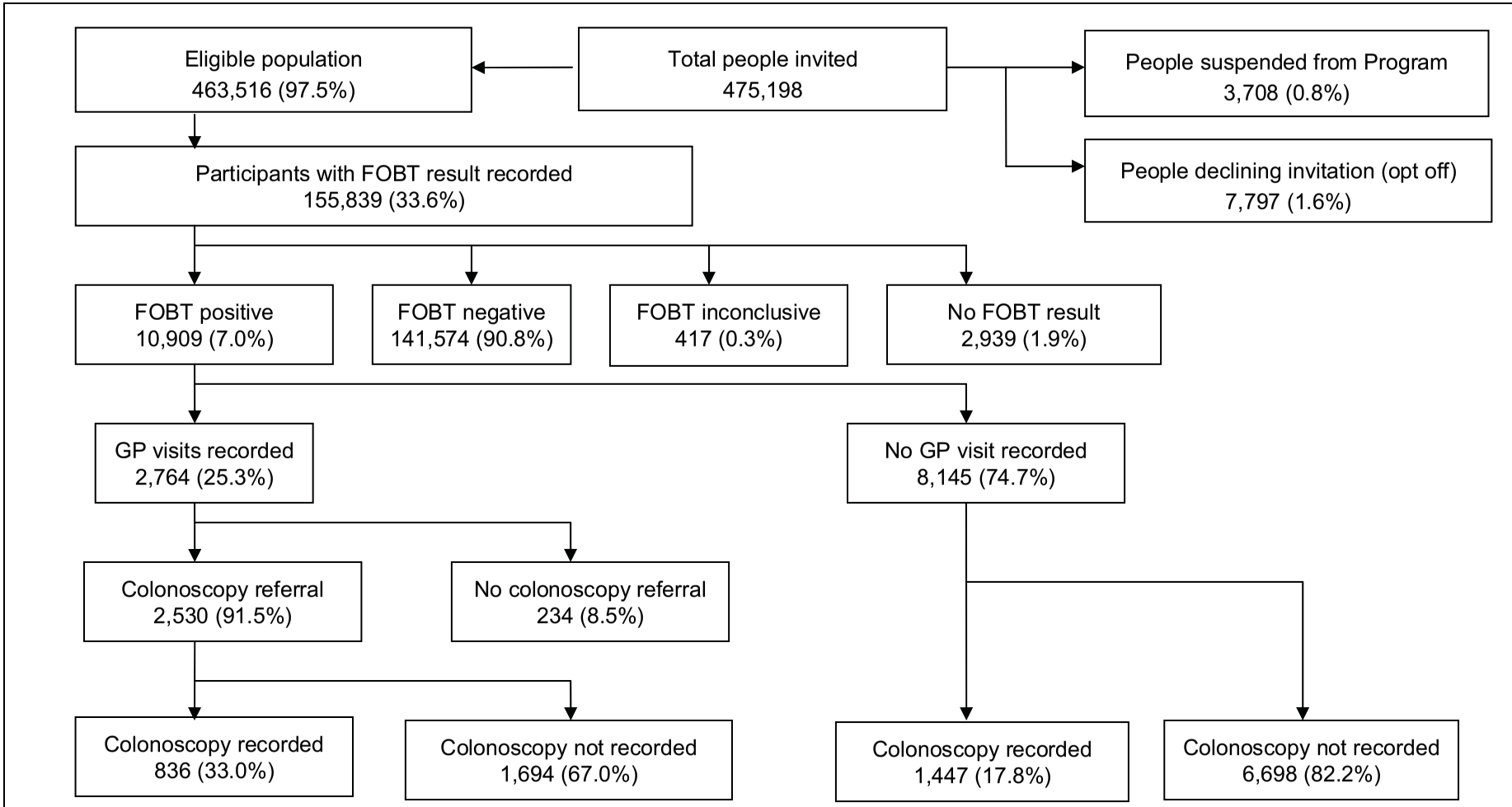

Figure A.2: Total number of people invited to participate in the NBCSP at key pathway points, 7 August 2006 to 31 July 2007

Appendix B: Definitions

Target population

Phase one of the NBCSP defines the eligible population as:

- Australians turning 55 or 65 years of age between 1 May 2006 and 30 June 2008; and
- those who were invited to participate in the Bowel Cancer Screening Pilot Program regardless of whether or not they participated in the Pilot Program.

Eligible population

National Program invitees who turned 55 or 65 year before 1 May 2006 or after 30 June 2008 or Pilot Program participants and invitees who were outside the ages of 55–74 years as at 1 January 2003 are ineligible to participate and are excluded from the analyses.

In addition, a person may choose to opt off or suspend participation in the NBCSP, or their GP may recommend they opt off or suspend participation in the NBCSP (for example, because of a recent colonoscopy or previous diagnosis of bowel cancer). A person can opt off or suspend participation at various points along the pathway, for example, before completing an FOBT, or when following up a FOBT result with their doctor. People choosing to opt off or suspend participation are classified as ineligible and excluded from further analysis.

Geographic location classifications

This report uses the Australian Standard Geographical Classification (ASGC) which groups geographic areas into five classes. These classes are based on Census Collection Districts (CDs) and defined using the Accessibility/Remoteness Index for Australia (ARIA). ARIA is a measure of the remoteness of a location from the services provided by large towns or cities. Accessibility is judged purely on distance to one of the metropolitan centres. A higher ARIA score denotes a more remote location. The five classes of the ASGC, along with a sixth 'Migratory' class, are listed in Table B.1.

Table B.1: Remoteness areas for the ASGC

Region	Collection districts within region
Major cities of Australia	CDs with an average ARIA index value of 0 to 0.2
Inner regional Australia	CDs with an average ARIA index value greater than 0.2 and less than or equal to 2.4
Outer regional Australia	CDs with an average ARIA index value greater than 2.4 and less than or equal to 5.92
Remote Australia	CDs with an average ARIA index value greater than 5.92 and less than or equal to 10.53
Very remote Australia	CDs with an average ARIA index value greater than 10.53
Migratory	Areas composed of off-shore, shipping and migratory CDs

Socioeconomic classifications

Socioeconomic classifications are based on the Australian Bureau of Statistics Index of Relative Socioeconomic Disadvantage. Geographic areas are assigned a score based on attributes such as low income, low educational attainment, high unemployment and jobs in relatively unskilled occupations. It does not refer to the socioeconomic situation of a particular individual but instead refers to the area in which a person lives. A low score means an area has many low income families, people with little training and high unemployment, and may be considered disadvantaged relative to other areas. Areas with high index scores may be considered less disadvantaged relative to other areas. In this report, the index of relative socioeconomic disadvantage is determined using postcodes to define geographic areas, and analysed using quintiles (that is, five groups) which are based on the level of the index.

Adenoma classifications

Adenoma classifications are derived from information reported by colonoscopists and pathologists and are classified as listed below from highest risk (advanced) to lowest risk (diminutive). Where a person has multiple adenomas, he or she is classified according to the adenoma having the highest risk.

Advanced adenoma

If any of the indicators of higher risk listed below are present, the adenoma is classified as advanced.

Indicators of higher risk

- Adenoma multiplicity—three or more adenomas present at examination, regardless of histopathology or size.
- Adenoma size—a size of 10 mm or greater. The measurement of size is subject to certain problems with accuracy. Where colonoscopy and pathology reports differ in their recording of size, the larger size has been used.
- High-grade dysplasia.
- Significant villous change or serrated—adenomas recorded as serrated, tubulovillous or villous on pathology reports.

Small adenoma

A tubular or mixed adenoma between 5 mm and 9 mm in size.

Diminutive adenoma

A tubular or mixed adenoma smaller than 5 mm.

Appendix C: Data and statistical methods

Data sources

Multiple data sources were analysed to produce this report. These are summarised in Table C.1. All data used in this report are based on calendar years.

Table C.1: Sources for data presented in this report

Description	Data source
Participation	National Bowel Cancer Screening Register, MA
Cancer detection	National Bowel Cancer Screening Register, MA
Incidence (ICD-10 C18–20)	National Cancer Statistics Clearing House, AIHW
Mortality (ICD-9 153, 154.0–154.1, ICD-10 C18–20)	National Mortality Database, AIHW

NBCSP data

As data items are collected from a variety of sources, not all data items may be recorded in the Register in sequence. GP, colonoscopy and histopathology forms are received from different sources and there are both time lags in submitting forms and failure of clinicians to complete and submit forms to the Register. Hence there are data for colonoscopies without an associated GP Assessment form, and histopathology results without a completed Colonoscopy Report form. The effect of this under-reporting and lags in reporting is that the data on the actions resulting from a positive FOBT are significantly under-enumerated in this first report on the Program. Hence the data on colonoscopies undertaken and conditions found should be interpreted with great caution. Later monitoring reports will capture the lagged data and result in more reliable statistics for these aspects of the screening pathway.

In those states using geographic rollout outer regional, remote and very remote locations may be relatively more under-reported than major cities and inner regional areas due to the staggered rollout. Hence, the tables in this report by geographic location and socioeconomic status should be interpreted with caution.

Population data

ABS estimated resident population (ERP) data were used to calculate age-standardised screening, and cancer incidence and mortality rates.

As the ABS does not calculate ERP by socioeconomic status an alternative method was used to calculate the denominators for these rates. This involves applying an ABS concordance between postcode and statistical local area (SLA), and then SLA and socioeconomic status.

The most recent direct count of the Aboriginal and Torres Strait Islander population was carried out in the 2006 Census but only data from the 2001 Census and from more recent ABS estimates (ABS 2004) were available at the time of preparation of this report.

Geographic classification

The approach taken in this report to classify participants as belonging to a specific geographic location is based upon the postcode of the participant's residential address. Postcodes do not map directly to the ARIA classification system (see Appendix B for explanation of the ARIA system). ARIA classifications for postal areas (similar to postcodes) are determined by amalgamating component Collection Districts (CDs). Where postal areas have component CDs belonging to more than one remoteness area, the ARIA classification is apportioned. Participants with a postcode that spans ARIA classifications must be likewise apportioned. This results in non-integer counts for remoteness classifications. For example, the Northern Territory postal area 0822 is classified as 70.54% Very Remote, 6.64% Remote and 22.82% Outer Regional. Participants with postcode 0822 have their counts apportioned accordingly.

Tables in this report based on geographical location are rounded to integer values. Where figures are rounded, discrepancies may occur between totals and sums of the component items.

Comparisons and tests of statistical significance

This report includes statistical tests of the significance of comparisons of rates between population groups. Any statistical comparison applied to one variable must take account of any other potentially relevant variables. For example, any comparison of participation by state must also take account of differences in the distribution of age and sex between the states. These other variables are known as 'confounding' variables.

Crude rates

A crude rate is defined as the number of events over a specified period of time divided by the total population. The crude rate (for participation, attendance and follow-up) is the proportion of people who have proceeded to a key point on the screening pathway at the date of the data download out of those eligible to proceed to that point. For example, the crude FOBT participation is the proportion of the eligible people who return a completed FOBT kit by 31 July 2007. The crude colonoscopy follow-up is the proportion of people with a positive FOBT result who proceeded to colonoscopy by 31 July 2007.

The crude proportions will generally underestimate the true proportions of the population who participated in the NBCSP. This is because at any point in time there are members of the population who are eligible to proceed to the next point on the screening pathway but who have not yet had time to do so. For example, a person who has just received an invitation to screen may intend to participate in screening but may not have had time to do so. They will be counted in the denominator of the crude FOBT participation but not in the numerator. Similarly, there is a time lag between when a person with a positive FOBT result is referred for colonoscopy and when they can actually have the colonoscopy. A colonoscopy follow-up calculated during this lag includes them in the denominator but not in the numerator.

Kaplan-Meier estimates of participation, attendance or follow-up

The Pilot Program employed the use of Kaplan-Meier estimates of participation, attendance and follow-up. This statistical method calculates a modelled rate based on the time it takes each individual invited for screening to move between points on the screening pathway. For example, FOBT participation is calculated by following each invited person and, for those who respond, recording the time it takes them to respond. This allows the calculation of a response rate over time from the date of invitation. Kaplan-Meier methods are standard methods used to model the time to an event and the changes in the rates of an event over time. In this case, the event is a person's response (by returning a completed FOBT kit) and the time to the event is measured in weeks from the date the invitation was sent. These Kaplan-Meier estimates represent valid estimates of the true FOBT participation.

The use of Kaplan-Meier estimates in the NBCSP was endorsed by the Implementation Advisory Group and allows direct comparison of participation, attendance and follow-up rates with the Pilot Program. Due to the staggered rollout of the NBCSP, Kaplan-Meier estimates in this report were only calculated for participation at 16 weeks as some states had not had sufficient time for attendance and follow-up data to be returned to the Register.

In principle, the Kaplan-Meier estimate only gives a result at a specific point in time. The estimate is likely to grow for later points in time. However, inspection of these estimates shows that they reach a plateau after which they have only a negligible increase. Further, preliminary analyses based on modelling the survival time with both a Weibull and an exponential distribution shows that the latest observed Kaplan-Meier estimate differs from the long-term modelled estimate by less than 1 percentage point. Hence the latest Kaplan-Meier estimate can be taken as an approximate estimate of the overall rate.

The Kaplan-Meier estimates require that classifying variables be known for the population. Hence they can be calculated for FOBT participation classified by age, sex and state. However, they cannot be used for FOBT participation classified by Aboriginal and Torres Strait Islander status or language group which are not known for all the invited population. These variables are only known for those participants who identify themselves as a member of these groups on their returned Participant Details form. In these cases, a crude participation can be calculated by using known population counts (from the Australian Bureau of Statistics Census data) in the denominator. However, the Kaplan-Meier estimates cannot be applied in this situation. In these cases, all analyses will be based solely on the crude participation. This does mean the FOBT participation presented in this report for Aboriginal and Torres Strait Islander people, people with a disability and people with a language other than English may represent under-estimates of the true proportions.

Aboriginal and Torres Strait Islander and disability status and language group will be known for all people completing FOBT kits (at least to the extent that people self-identify as members of these groups). Hence in principle Kaplan-Meier estimates can be calculated for these groups for participation at subsequent points on the screening pathway. In practice, these calculations depend on sufficient numbers of people self-identifying as group members to allow the calculation of reliable estimates.

Age-specific rates

Age-specific rates are calculated by dividing the number of cases occurring in each specified age group by the corresponding population in the same age group expressed as a rate per 100,000 persons. This rate may be calculated for particular age and sex groupings, for example:

Age-specific bowel cancer incidence rates in males aged 75–79 years

$$= \frac{\text{New cases for this age}}{\text{Population for this age}} \times 100{,}000$$

$$= \frac{1{,}147}{245{,}032} \times 100{,}000$$

$$= 468.1 \text{ per } 100{,}000$$

Age-standardised rates (ASRs)

Rates are adjusted for age to facilitate comparisons between populations that have different age structures, for example, between youthful and ageing communities. There are two different methods commonly used to adjust for age. In this publication direct standardisation is used, in which age-specific rates are multiplied against a constant population (the Australian 2001 Population Standard). This effectively removes the influence of age structure on the summary rate and is described as the age-standardised rate. The method may be used for both incidence and mortality calculations. The method used for this calculation comprises three steps:

1. Calculate the age-specific rate (as shown above) for each age group.
2. Calculate the expected number of cases in each five-year age group by multiplying the age-specific rates by the corresponding standard population and dividing by 100,000, giving you the expected number of cases.
3. To give the age-standardised rate, sum the expected number of cases in each age group. Divide this sum by the total of the standard population used in the calculation and multiply by 100,000.

Confidence intervals (CI)

The age-standardised incidence and mortality rates presented in the body of this report also show 95% confidence intervals. These confidence intervals indicate the variation that might be expected in such estimates purely by chance. The confidence intervals are calculated using the methods presented by Holman et al. (1987).

A relatively simple approximation of the confidence limits that readers might use when examining state and territory age-standardised rates is as set out below:

$$95\%\ \text{CI approximation} = \text{AS rate} \pm 1.96 \times \frac{\text{AS rate}}{\sqrt{\text{Number of cases}}}$$

Glossary of terms

Age-standardised rate: see Appendix C for definition.

Confidence interval: see Appendix C for definition.

Colonoscopy: procedure to examine the bowel usually carried out in a hospital or day clinic.

Colonoscopy depth of insertion: abbreviations for depth of insertion of colonoscope are:

TI	terminal ileum
CAEC	caecum
ASC	ascending colon
HEP	hepatic flexure
TRAN	transverse colon
SPLN	splenic flexure
DESC	descending colon
SIG	sigmoid colon
RECT	rectum

Colonoscopy follow-up rate: the proportion of people with a positive FOBT who were referred by a GP for a colonoscopy and who subsequently had a colonoscopy.

Eligible population: Australians turning 55 and 65 years of age between 1 May 2006 and 30 June 2008, and those invited to participate in the Bowel Cancer Screening Pilot Program who have not opted off or suspended participation in the Program.

FOBT: immunochemical faecal occult blood test—a self-administered test to detect blood in bowel motions, but not bowel cancer itself. The FOBT is analysed by a pathology laboratory and results forwarded to the Program participant and primary health carer (if nominated). Pathologists categorise the returned FOBT into one of four groups: correctly completed, incorrectly completed, damaged and unsatisfactory. Participants are provided with specific instructions on how to complete the FOBT. Any tests not completed according to these instructions are classified as incorrectly completed. Damaged FOBTs are any tests that have arrived spoiled or damaged and unsatisfactory tests refer to those tests that could not be processed due to an inadequate sample (for example, too much or too little faecal matter). Participants with FOBTs that are not correctly completed are requested to complete a subsequent FOBT.

FOBT result: FOBT results are classified by pathologists as either positive (blood is detected in at least one of two samples), negative (blood is not detected) or inconclusive.

GP attendance rate: the proportion of people who were sent a positive FOBT result and who subsequently visit a GP.

Invitee: a person who has been invited to participate in the National Bowel Cancer Screening Program.

MA: Medicare Australia—responsible for managing the National Bowel Cancer Screening Register.

National Program: national participants in the NBCSP. Excludes participants and invitees from the Pilot Program.

NBCSP: National Bowel Cancer Screening Program, including both National Program participants and Pilot Program participants and invitees.

Opt off: invitees who do not wish to participate in the National Bowel Cancer Screening Program now or in the future. Invitees will not be contacted again. Invitees may elect to opt back on at a later date before 30 June 2008.

Participant: a person who has agreed to participate in the National Bowel Cancer Screening Program by returning either a completed FOBT kit and/or a Participant Details form.

Pilot Invitee: invitees from the Pilot Program who did not participate in the Pilot Program but were reinvited to participate in the NBCSP.

Pilot Participant: participants from the Pilot Program who were reinvited to participate in the NBCSP.

Pilot Program: participants and invitees from the Bowel Cancer Screening Pilot Program (a study by the Australian Government from November 2002 to June 2004 in Mackay, Adelaide and Melbourne to assess the effectiveness of a National Bowel Cancer Screening Program) reinvited to participate in the NBCSP.

Positivity rate: number of positive FOBT results as a percentage of the total number of valid FOBT results.

Primary health care practitioner: classified by Medicare Australia as a general practitioner or other primary health care provider. This may include remote health clinics or other specialists providing GP services.

Register: National Bowel Cancer Screening Program Register maintained by Medicare Australia.

Respondent: a person who has responded to an invitation to participate in the National Bowel Cancer Screening Program by returning a Participant Details form.

Screening: the performance of tests on apparently well people in order to detect a medical condition at an earlier stage than would otherwise be the case.

Socioeconomic status: see Appendix B for details.

Suspend: invitees who would like to participate in the National Bowel Cancer Screening Program but are unable to do so at this time. Invitees will be contacted once the nominated suspension period has elapsed.

Target population: Australians turning 55 and 65 years of age between 1 May 2006 and 30 June 2008, and those invited to participate in the Bowel Cancer Screening Pilot Program.

Valid results: only FOBT results that are either positive or negative are classified as valid results. Inconclusive results are excluded.

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List of tables

List of figures