

**Interval cancers in  
*BreastScreen Aotearoa***

**1999–2007**

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**June 2012**

## EXECUTIVE SUMMARY

### *Introduction*

Interval breast cancers are cancers diagnosed after a mammographic screen with a normal result but before the next scheduled screen. This report presents information on 2-year interval breast cancers from the BreastScreen Aotearoa (BSA) mammographic screening programme for 1999–2007, and comparisons with a previous report (for 1999-2002) and published results from other services.

### *Methods*

Identification of interval breast cancers was carried out through the matching of BreastScreen Aotearoa data with New Zealand Cancer Registry (NZCR) data using the National Health Index (NHI) numbers of women screened by BSA from 1 January 1999 to 31 December 2007. Interval cancer rates are calculated as the number of cancers detected within 12, 12-24 and 0-24 months following negative screens. Interval breast cancer rates per 10,000 women screened were calculated for 45–49, 50–54, 55–59, 60–64, and  $\geq 65$  years. Programme sensitivity is defined as the number of screen-detected cancers expressed as a proportion of total cancer incidence (screen detected plus interval cancers) in women screened. Confidence intervals (95%) are provided.

### *Results*

**Interval cancers.** For 1999-2007, 678 interval cancers occurred in the first year following a negative mammogram, an interval cancer rate of 6.3 per 10,000 screens; 1,346 interval cancers were detected in the second year following a negative mammogram, an interval cancer rate of 12.6 per 10,000 screens. The trend in <12 month interval cancers declined from 7.3 in 1999 to ~6 per 10,000 screens in 2007. For 12-24 month and all interval cancers the secular trend showed a sharper decline from 1999 to 2002, and plateaued thereafter. Interval cancer rates are in line with comparable screening programmes internationally. For <12 month interval cancers, none of the BSA Lead Providers differed significantly from the NZ BSA programme overall; for 12-24 and 0-24 month interval cancers, BSC had significantly lower interval cancer rates.

**Programme sensitivity.** 4,979 breast cancers were detected by screening from 1,074,959 screens during 1999-2007. Programme sensitivity for <12 month interval cancers was 88%, and 79% for 12-24 month interval cancers which is in line with comparable screening programmes internationally. No Lead Provider differed significantly from NZ overall with regard to <12 month interval cancers. BSC had significantly higher programme sensitivity for 12-24 month interval cancers from initial and subsequent screens, and for 0-24 months for subsequent and all screens.

### *Conclusion*

BSA has achieved comparable interval cancer rates and programme sensitivity as comparable international programmes and there are minimal differences between Lead Providers, especially for the <12 months intervals which can reflect missed cancers.

## **1. INTRODUCTION**

Interval breast cancers are cancers diagnosed after a mammographic screen with a normal result but before the next scheduled screen. Consistently low interval cancer rates correlate with significant reductions in breast cancer mortality in screened populations<sup>1</sup>; consequently interval cancer rates are used as a key indicator of the effectiveness of screening programmes.

Interval breast cancers can be classified by diagnosis: after the initial (prevalent) or a subsequent (incident) screen; in the first or subsequent year after a normal mammogram; by age and period (both indexed to the date of the screen).

In some studies interval breast cancers have been categorised by characteristics of the mammographic process: missed (present but not recognised at a screen), occult (mammographically invisible) and true (those that developed to become mammographically visible after a screen). The distribution of cancers in these categories is reported to be about 30% missed, 10% occult and 60% true,<sup>1-3</sup> although the proportion of these vary with screening interval and method of mammogram review. BreastScreen Aotearoa Providers regularly categorise interval cancers in this way for radiologists' quality improvement and to provide objective information to women with interval cancers.

Stratification of interval breast cancers by occurrence in the first or second year after a normal mammogram is important. Those that occur in the first year are more likely to be cancers missed by the mammographic process, whereas those that occur in the second or subsequent year are more likely to be true interval cancers. This must be qualified by the rate at which the cancer progresses from incidence to clinical indication, which in the case of cancer of the breast is known to vary with age: breast cancers in the elderly progress at much slower rates than those in younger women, largely due to hormonal influences.<sup>1</sup>

Stratification of interval breast cancers by age at screen thus is also important. Rates of interval cancers in the first year after a normal mammogram are likely to decrease with increasing age, whereas in subsequent years after a normal mammogram the reverse is more likely.

The purpose of this report is to present information on 2-year interval breast cancers from the BreastScreen Aotearoa (BSA) mammographic screening programme for 1999–2007, and to compare this with a previous BSA interval cancer report (for 1999-2002) and published results from other services.

## **2. METHODS**

### ***2.1 Screening***

The study population consists of women who attended for mammography screening at BSA during 1999–2007. BSA has offered government funded biennial mammography screening for all New Zealand (NZ) women aged 50–64 years since 1999, and for women aged between 45 and 69 years since mid-2004. Women who attend for screening undergo bilateral two-view mammography and all films are read independently by two radiologists. If agreement cannot be reached concerning a recommendation of either routine re-screen or recall for assessment, a

final recommendation is made based on either a consensus opinion of two or more radiologists, or the recommendation of a third radiologist, or both.

## 2.2 Interval cancers

The definition of primary cancer of the breast used for this report includes invasive cancer, and excludes ductal carcinoma *in situ* (DCIS), lobular carcinoma *in situ* (LCIS) and Paget's disease of the nipple without an underlying invasive breast cancer (Table 1). Interval cancers are defined as cases of primary breast cancer diagnosed up to 24 months after a normal screening mammogram, or after an abnormal screening mammogram and a normal assessment by a BreastScreen Aotearoa provider. This definition includes invasive cancers diagnosed at early review (that is, at a repeat assessment 6 months or more after an equivocal assessment visit).

**Table 1.** Case definition for invasive breast cancer

<b>Histopathology</b>	<b>Included</b>
High-grade DCIS with or without necrosis	No
Invasive cribriform	Yes
Invasive duct not otherwise specified	Yes
Invasive lobular classical	Yes
Invasive lobular variant	Yes
Invasive medullary	Yes
Invasive mucinous	Yes
Invasive tubular	Yes
Lobular carcinoma in situ LCIS	No
Mixed Invasive ductal/lobular	Yes
Non-high grade DCIS with necrosis	No
Non-high grade DCIS without necrosis	No
Other DCIS	No
Other primary invasive malignancy	Yes

## 2.3 Matching of BSA and NZCR data

Identification of interval breast cancers was carried out through the matching of BreastScreen Aotearoa data with New Zealand Cancer Registry (NZCR) data. The National Screening Unit (NSU) provided NZ Ministry of Health Analytical Services an extract containing National Health Index (NHI) numbers of women who were screened by BSA from 1 January 1999 to 31 December 2007.

The NHI number is a unique 7-character identification number assigned to a healthcare user by the NHI database. NHI numbers uniquely identify healthcare users, and allow linking between

different data collections. The master NHI of each BSA-screened woman was matched by NZ Ministry of Health Analytical Services against the master NHI of all breast cancer registrations from the NZ Cancer Registry.

Following a positive match, Analytical Services then appended breast cancer registration data to the matched NHI. This data was returned to NSU and loaded into a database.

The number of months between the screen and diagnosis date was calculated and added to the database. All cancers that were detected outside of 25 months were automatically excluded later in the matching process and those diagnosed between 24 and 25 months after the index screen were manually checked then excluded.

Histopathology codes were mapped to DCIS, LCIS or Invasive morphological types.

In the data set returned by Analytical Services, BSA-detected cancers were identified and removed excluding those diagnosed by BSA on extended assessment (early review). Cancers detected after 31 December 2009 were also removed.

All fields from the Cancer Registry that were sent as alpha or numerical codes were mapped to the appropriate descriptions and loaded into the database.

Date-of-birth mismatches between the NSU BSA database and the NZCR data were identified and flagged in the database. Details of verified interval cancers previously identified by NZCR and BSA Lead Providers were also matched and entered in to the database.

A list of women with provisional interval cancers was created under the guidance of the Clinical Advisor. The Clinical Advisor then manually reviewed each record and excluded duplicated records, and data entry and matching errors. The remaining list, complete with all variables, was sent to the appropriate BSA Lead Providers.

BSA Lead Providers were asked to check the data contained in their spreadsheet against their own records and enter the following where required: (a) the final diagnosis for each screening record; (b) agree or disagree that a record was an interval cancer according to the rules in an accompanying “BSA interval cancer definitions” sheet; (c) provide reasons why a record was not an interval; and (d) the correct date of birth where there was a date-of-birth mismatch.

BSA Lead Providers were also able to send the NSU details of interval cancers that were not recorded by the NZCR.

The returned spreadsheets were then reviewed by the Clinical Advisor against the following definitions and either included or excluded as interval cancers:

Inclusions:

Women who were diagnosed with cancer up to 24 months after a normal BSA screen or normal BSA assessment.

Cancers in women placed on extended assessment (early recall), where the diagnosis by the BSA programme was delayed 6 months or more after an assessment recommendation (16 women).

Women with multiple synchronous or metachronous interval cancers, had only the cancer with the highest modified Nottingham Prognostic Index included (41 cases).

Exclusions:

Local recurrence or regional or systemic metastases from a previously treated cancer (4 women).

Cancers diagnosed outside the programme, after a correct recommendation by BSA for assessment. These included: 12 women who refused to return to BSA for assessment and 49 women who opted for private rather than BSA assessment. Cancers diagnosed as Paget's disease of the nipple without evidence of an underlying intra-mammary carcinoma (1 case).

Cancers from a non-breast primary metastatic to the breast (e.g. secondary lymphoma).

Cancers on the Cancer Registry diagnosed from cytology only with no recorded follow-up malignant histology. 15 cases were identified, of which 10 had subsequent benign surgical open biopsy of the purported malignant lesion performed by BSA providers.

Cancers on the Cancer Registry diagnosed by clinical examination alone with no histology (4 cases identified).

Cancers notified to the Cancer Registry from death certificate only with no definitive primary.

Cancer metastases from an unknown primary with indeterminate histology (13 women).

Because of inconsistent reporting and ascertainment of symptoms, the presence or absence of symptoms was not used as a criterion to determine whether a cancer diagnosed either within or outside the BSA programme was an interval cancer.

The BSA Lead Providers forwarded details of 62 additional cancers that were not already on the Lead Provider interval spreadsheets.

- 3 of these had been diagnosed overseas and were therefore not on the NZCR. In order to maintain consistency with the NZCR, these were not included as interval cancers.
- 7 were additional interval cancers and are included in the report
- 10 of the additional cancers were recurrences of previously treated cancers and were excluded
- 15 cancers were diagnosed more than 24 months after the index screen
- 1 cancer was in a woman screened after December 2007 and will be included in the next interval cancer report.

26 cancers reported by the BSA Lead Providers had no pathology information to allow accurate categorisation. Although these were excluded from the current analysis, the National Screening Unit is seeking further information to ensure improved accuracy of future interval cancer reports and to inform the Cancer Registry. The interval cancer dataset was sent in a secure file to the BSA Independent Monitoring Group for analysis and reporting.

**Table 2.** Exclusions from interval cancer

Reason Excluded	Number
Recurrence	4
Cancer diagnosed 24-25 months after normal screen	62
Cancer diagnosed >25 months after normal screen	18
Recalled by BSA but cancer diagnosed outside BSA	49
Recalled by BSA but refused assessment	12
Diagnosed by BSA but cancer diagnosis not recorded	14
Incorrect index screening date	3
Incorrect NHI	9
Paget's disease of the nipple	1
No (or indeterminate) histology	32

#### ***2.4 Interval Cancer Rates***

Interval cancer rates are calculated as the number of cancers detected within 12, 12-24 and 0-24 months following negative screens. As numbers of screen-detected cancers are known, the denominators for interval cancers are calculated as the number of screens minus the number of cancers detected through screening in a given screening year, age group or area. Numbers of screen-detected cancers make little difference to estimates if all screens are used instead as the denominator. In this report, interval cancers are reported as rates per 10,000 'women screened' but are calculated as above, and thus 'women screened' in this case is shorthand for 'women with a normal screen'.

Interval breast cancer rates per 10,000 women screened were calculated for the following age groups at the time of screening: 45–49, 50–54, 55–59, 60–64, and  $\geq 65$  years. Interval cancer rates are presented for the screening years 1999–2007, both as annual rates and as aggregate rates for this period. For age-group comparisons, interval cancer rates were aggregated for the most recent screening quinquennium (2003–07) in order to ensure sufficient numbers, and are shown graphically for comparison.

Interval cancer rates in this report are calculated as cohort rates. That is, interval cancers occurring in women with negative screening mammography in a given year are cumulated for the following 12 months, the subsequent year (12-24 months) and for the full 2-year interval (0-24 months) following the screening year. Consequently, the total interval cancer rates reported here are the sum of the first and second year rates, and are not the same measure as those reported in the previous BSA interval cancer report modelled on the BreastScreen monitoring reports from the Australian Institute of Health and Welfare (AIHW) which effectively use an average of annual rates for first and second year screens.

## ***2.5 Programme Sensitivity***

Programme sensitivity is defined as the number of screen-detected cancers expressed as a proportion of total cancer incidence (screen detected plus interval cancers) in women screened. Sensitivity was calculated for the BSA programme for each age group as specified above. Temporal trends are shown by initial, subsequent and all screens, but for BSA Lead Provider are shown only for all screens, because of small numbers.

## ***2.5 Statistical methods***

For age-specific interval cancer rates, confidence intervals were calculated as ‘score intervals’ according to a method developed by Vollset which addresses the issue of confidence intervals calculated by the exact method being too conservative (wide).<sup>5,6</sup>



### **3. RESULTS (MAIN FEATURES)**

#### **3.1 Interval cancers**

- For the screening years 1999-2007, 678 interval cancers occurred in the first year following a negative mammogram, representing an interval cancer rate of 6.3 per 10,000 screens (Table 3); 1,346 interval cancers were detected in the second year following a negative mammogram, representing an interval cancer rate of 12.6 per 10,000 screens (Table 4). The total interval cancers for 1999-2007 was 2,024.
- Interval cancers occurring in the first 12 months (aggregated for 2003-07) decrease with increasing age, from 7.5 in 45-49 year women to 5.0 per 10,000 screens in  $\geq 65$  year women for all screens (Figure 1). Interval cancer rates in the subsequent 12-24 months for all screens showed no significant age trend.
- The secular trend for screening years 1999 to 2007 for <12 month interval cancers declined from 7.3 to ~6 per 10,000 screens. For 12-24 month and all interval cancers the secular trend showed a sharper decline from 1999 to 2002, and plateaued thereafter (Figure 2).

#### **3.2 Programme sensitivity**

- 4,979 breast cancers were detected by screening from 1,074,959 screens during 1999-2007 (Tables 5 & 6).
- Programme sensitivity for <12 month interval cancers was 88% (Table 5), and 79% for 12-24 month interval cancers (Table 6).
- Programme sensitivity (aggregated for 2003-07) increases with age for <12, 12-24 and 0-24 months interval cancers (Figure 3).
- Programme sensitivity decreased somewhat after 2001 for initial screens, but this was counteracted to an extent by increased sensitivity for subsequent screens, leaving a slight decreasing trend overall (Figure 4).

#### **3.3 BSA Lead providers**

- For <12 month interval cancers, none of the BSA Lead Providers differed significantly from the NZ BSA programme overall (Figure 5); for 12-24 and 0-24 month interval cancers, BSC had significantly lower interval cancer rates.
- For programme sensitivity, no lead provider differed significantly from NZ overall with regard to <12 month interval cancers (Figure 6). Reflecting interval cancer differences, BSC had significantly higher programme sensitivity for 12-24 month interval cancers from initial and subsequent screens and 0-24 month interval cancers from subsequent and all screens.
- Two BSA Lead Providers, BSC and BSSL, showed decreasing secular trends in interval cancer rates, 2 others showed early decreases followed by an increase (BSCC, BSM), while BSHC and BSAL showed no discernible trends (Figure 7). Secular trends for BSWN and BSCM cannot be interpreted as these Lead Providers were recent additions to the screening programme.
- Secular trends in programme sensitivity by BSA Lead Provider appear to be decreasing for BSAL, BSCC, BSHC and BSM, and neutral for BSC, BSSL (Figure 8). While BSWN and BSCM are too recent for meaningful interpretation of trends, stochastic variation along with the small number of time points, warrants caution in interpreting secular trends in programme sensitivity by Lead Provider.

- More detail on individual Lead Providers is in the Appendix.

**Table 3.** First-year (<12 months) interval breast cancers after an initial or subsequent screen by age-group and screening year, BSA programme, 1999–2007

Age group (yr)	Initial Screens			Subsequent Screens			All Screens			
	Interval cancers	Women screened	Rate/10,000 screened (95% CI)	Interval cancers	Women screened	Rate/10,000 screened (95% CI)	Interval cancers	Women screened	Rate/10,000 screened (95% CI)	
<i>1999</i>										
50-54	20	26,868	7.5 (4.8-11.5)	2	2,806	7.2 (2.0-26.0)	22	29,674	7.4 (4.9-11.3)	
55-59	15	19,817	7.6 (4.6-12.5)	5	4,678	10.7 (4.6-25.1)	20	24,495	8.2 (5.3-12.7)	
60-64	12	17,835	6.8 (3.9-11.8)	1	3,649	2.8 (0.5-15.6)	13	21,484	6.1 (3.6-10.4)	
65+	0	230	0.0 (0.0-165)	0	16	0.0 (0.0-1,936)	0	246	0.0 (0.0-154)	
All <sup>1</sup>	47	64,803	7.3 (5.5-9.7)	8	11,149	7.2 (3.7-14.2)	55	75,952	7.3 (5.6-9.5)	
<i>2000</i>										
50-54	20	31,078	6.5 (4.2-10.0)	4	3,342	12.0 (4.7-30.8)	24	34,420	7.0 (4.7-10.4)	
55-59	16	19,547	8.2 (5.1-13.4)	3	5,225	5.8 (2.0-16.9)	19	24,772	7.7 (4.9-12.1)	
60-64	9	15,204	6.0 (3.1-11.3)	4	4,924	8.2 (3.2-20.9)	13	20,128	6.5 (3.8-11.1)	
65+	0	165	0.0 (0.0-231)	0	15	0.0 (0.0-2,039)	0	180	0.0 (0.0-212)	
All <sup>1</sup>	45	66,068	6.9 (5.1-9.2)	11	13,507	8.2 (4.6-14.6)	56	79,575	7.1 (5.5-9.2)	
<i>2001</i>										
50-54	12	20,547	5.9 (3.4-10.2)	6	16,359	3.7 (1.7-8.0)	18	36,906	4.9 (3.1-7.7)	
55-59	2	7,814	2.6 (0.7-9.4)	17	21,915	7.8 (4.9-12.5)	19	29,729	6.4 (4.1-10.0)	
60-64	0	6,016	0.0 (0.0-6.4)	19	20,434	9.3 (6.0-14.6)	19	26,450	7.2 (4.6-11.3)	
65+	0	23	0.0 (0.0-1,431)	0	41	0.0 (0.0-857)	0	64	0.0 (0.0-566)	
All <sup>1</sup>	14	34,423	4.1 (2.4-6.9)	42	58,752	7.2 (5.3-9.7)	56	93,175	6.0 (4.7-7.8)	
<i>2002</i>										
50-54	14	18,954	7.4 (4.4-12.5)	17	20,887	8.2 (5.1-13.1)	31	39,841	7.8 (5.5-11.1)	
55-59	5	5,123	9.8 (4.2-23.0)	16	25,834	6.2 (3.8-10.1)	21	30,957	6.8 (4.5-10.4)	
60-64	1	3,734	2.7 (0.5-15.3)	10	22,310	4.5 (2.4-8.3)	11	26,044	4.2 (2.4-7.6)	
65+	0	4	0.0 (0.0-4,899)	0	18	0.0 (0.0-1,758)	0	22	0.0 (0.0-1,486)	
All <sup>1</sup>	20	27,825	7.2 (4.7-11.2)	43	69,050	6.3 (4.6-8.4)	63	96,875	6.5 (5.1-8.4)	
<i>2003</i>										
50-54	16	18,241	8.8 (5.4-14.3)	8	19,770	4.1 (2.1-8.0)	24	38,011	6.3 (4.3-9.4)	
55-59	1	3,952	2.6 (0.5-14.5)	22	30,991	7.1 (4.7-10.8)	23	34,943	6.6 (4.4-9.9)	
60-64	1	2,800	3.6 (0.6-20.4)	16	26,510	6.1 (3.7-9.9)	17	29,310	5.8 (3.6-9.3)	
65+	0	6	0.0 (0.0-3,903)	0	30	0.0 (0.0-1,135)	0	36	0.0 (0.0-964)	
All <sup>1</sup>	18	25,012	7.2 (4.6-11.4)	46	77,304	6.0 (4.5-8.0)	64	102,316	6.3 (4.9-8.0)	
<i>2004</i>										
45-49	1	722	13.9 (2.4-78.0)	0	2	0.0 (0.0-9,701)	1	724	13.8 (2.4-77.8)	
50-54	11	17,637	6.3 (3.5-11.2)	17	23,316	7.3 (4.6-11.7)	28	40,953	6.9 (4.7-9.9)	
55-59	4	3,233	12.5 (4.8-32.0)	21	33,709	6.2 (4.1-9.6)	25	36,942	6.8 (4.6-10.0)	
60-64	3	2,144	14.2 (4.8-41.5)	16	26,571	6.1 (3.7-9.8)	19	28,715	6.7 (4.3-10.4)	
65+	0	1,160	0.0 (0.0-33.2)	3	13,502	2.2 (0.8-6.6)	3	14,662	2.1 (0.7-6.1)	
All	19	24,896	7.7 (4.9-12.0)	57	97,100	5.9 (4.6-7.6)	76	121,996	6.3 (5.0-7.8)	
<i>2005</i>										
45-49	12	21,233	5.7 (3.2-9.9)	0	26	0.0 (0.0-1,287)	12	21,259	5.7 (3.2-9.9)	
50-54	9	15,988	5.7 (3.0-10.7)	10	21,395	4.7 (2.5-8.6)	19	37,383	5.1 (3.3-8.0)	
55-59	2	2,520	8.0 (2.2-29.1)	17	33,574	5.1 (3.2-8.1)	19	36,094	5.3 (3.4-8.3)	
60-64	2	1,627	12.4 (3.4-45.2)	19	28,437	6.7 (4.3-10.5)	21	30,064	7.0 (4.6-10.7)	
65+	0	1,734	0.0 (0.0-22.4)	12	21,714	5.6 (3.2-9.7)	12	23,448	5.2 (2.9-9.0)	
All	25	43,102	5.8 (3.9-8.6)	58	105,146	5.5 (4.3-7.2)	83	148,248	5.6 (4.5-7.0)	
<i>2006</i>										
45-49	27	34,241	7.9 (5.4-11.5)	1	495	20.2 (3.6-114)	28	34,736	8.1 (5.6-11.7)	
50-54	11	15,344	7.2 (4.0-12.9)	9	23,533	3.8 (2.0-7.3)	20	38,877	5.2 (3.3-8.0)	
55-59	0	3,012	0.0 (0.0-12.8)	20	38,892	5.2 (3.3-8.0)	20	41,904	4.8 (3.1-7.4)	
60-64	4	1,905	21.3 (8.3-54.7)	21	30,616	6.9 (4.5-10.5)	25	32,521	7.7 (5.2-11.4)	
65+	0	1,435	0.0 (0.0-27.1)	12	22,674	5.3 (3.0-9.3)	12	24,109	5.0 (2.9-8.7)	
All	42	55,937	7.5 (5.6-10.2)	63	116,210	5.4 (4.3-7.0)	105	172,147	6.1 (5.1-7.4)	
<i>2007</i>										
45-49	21	31,866	6.6 (4.3-10.1)	12	10,274	11.7 (6.7-20.5)	33	42,140	7.9 (5.6-11.0)	
50-54	11	13,134	8.4 (4.7-15.1)	18	29,243	6.2 (3.9-9.8)	29	42,377	6.9 (4.8-9.9)	
55-59	2	3,497	5.8 (1.6-21.0)	18	35,412	5.1 (3.2-8.0)	20	38,909	5.2 (3.3-8.0)	
60-64	1	2,164	4.7 (0.8-26.3)	22	31,638	7.0 (4.6-10.6)	23	33,802	6.8 (4.6-10.3)	
65+	0	1,517	0.0 (0.0-25.6)	15	25,930	5.8 (3.5-9.6)	15	27,447	5.5 (3.3-9.1)	
All	35	52,178	6.7 (4.8-9.4)	85	132,497	6.4 (5.2-8.0)	120	184,675	6.5 (5.5-7.8)	
<i>1999-2007</i>										
45-49	61	88,235	6.9 (5.4-8.9)	13	10,805	12.1 (7.0-20.6)	74	99,040	7.5 (6.0-9.4)	
50-54	124	177,791	7.0 (5.9-8.4)	91	160,651	5.7 (4.6-7.0)	215	338,442	6.4 (5.6-7.3)	
55-59	47	68,515	6.9 (5.2-9.2)	139	230,230	6.1 (5.1-7.2)	186	298,745	6.3 (5.4-7.2)	
60-64	33	53,429	6.2 (4.4-8.7)	128	195,089	6.6 (5.5-7.8)	161	248,518	6.5 (5.6-7.6)	
65+	0	6,274	0.0 (0.0-6.2)	42	83,940	5.0 (3.7-6.8)	42	90,214	4.7 (3.5-6.3)	
All	265	394,244	6.8 (6.0-7.6)	413	680,715	6.1 (5.5-6.7)	678	1,074,959	6.3 (5.9-6.8)	

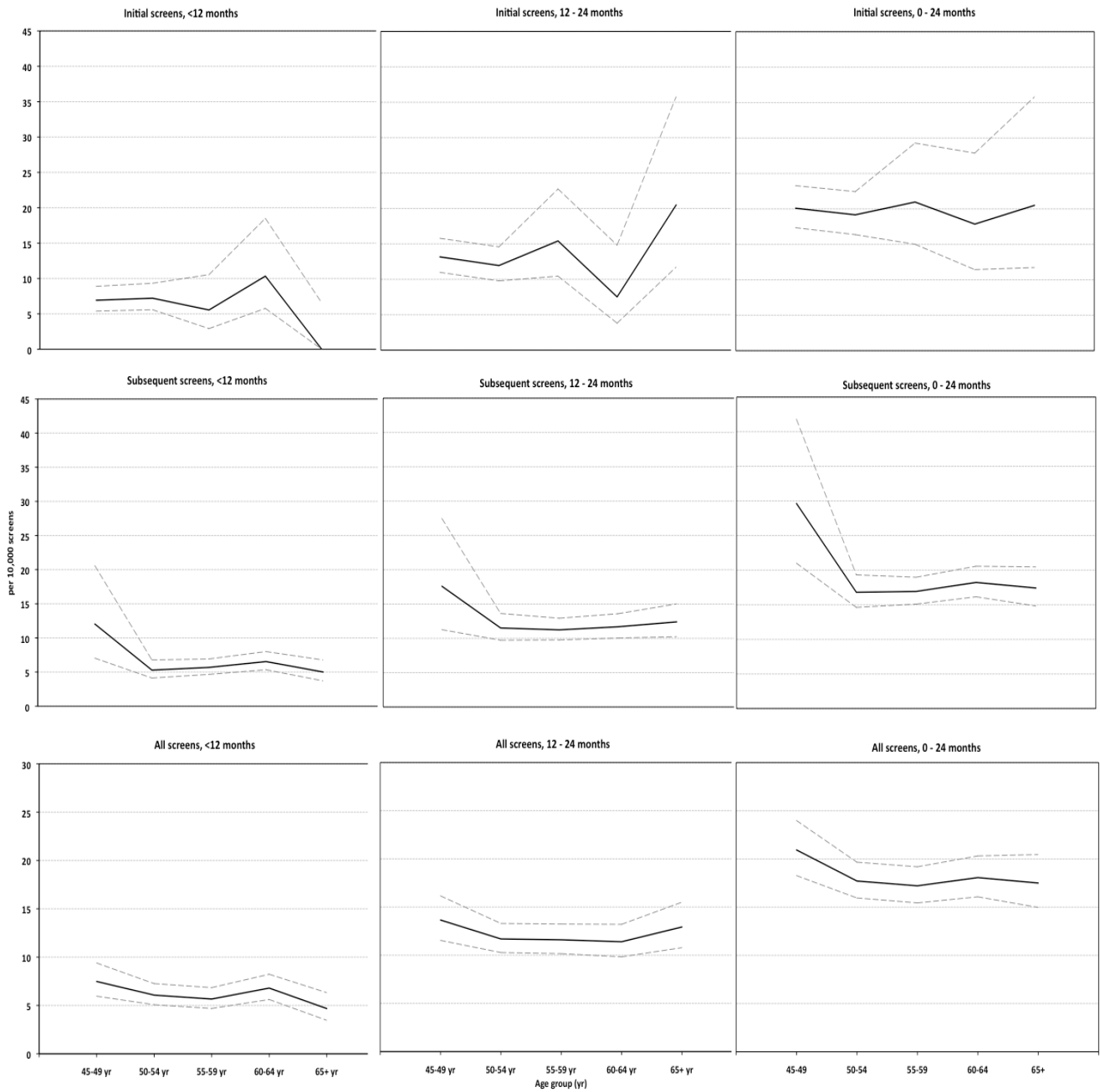
<sup>1</sup> Includes 45-49 year women who screened

**Table 4. Second-year (12 to <24 months) interval breast cancers after an initial or subsequent screen by age-group and screening year, BSA programme, 1999–2007**

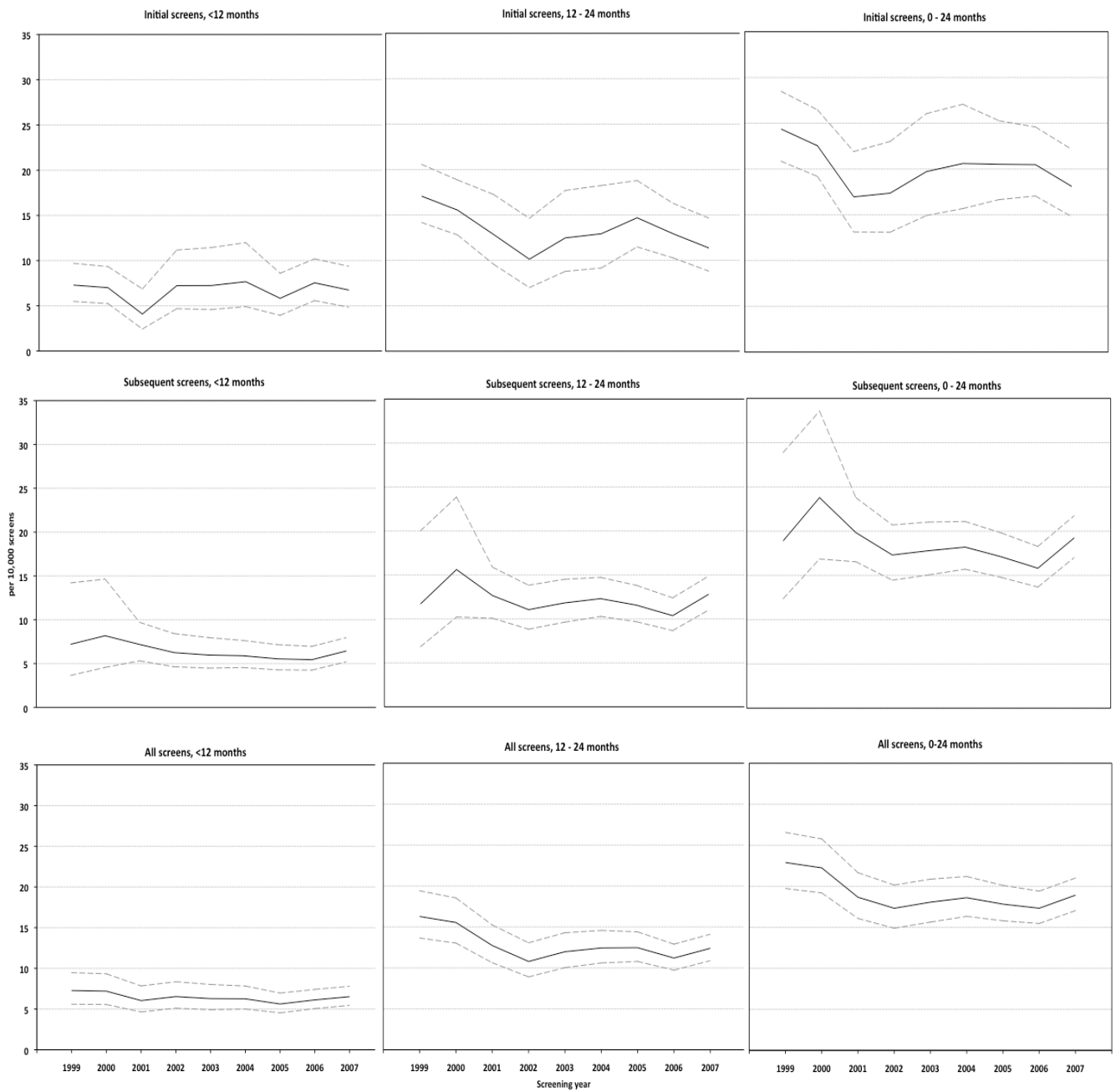
Age group (yr)	Initial Screens				Subsequent Screens				All Screens			
	Interval cancers	Women screened	Rate/10,000 screened (95% CI)		Interval cancers	Women screened	Rate/10,000 screened (95% CI)		Interval cancers	Women screened	Rate/10,000 screened (95% CI)	
<i>1999</i>												
50-54	46	26,868	17.2	(12.9-22.9)	6	2,806	21.4	(9.8-46.7)	52	29,674	17.6	(13.4-23.1)
55-59	37	19,817	18.8	(13.6-25.9)	5	4,678	10.7	(4.6-25.1)	42	24,495	17.2	(12.8-23.3)
60-64	27	17,835	15.2	(10.5-22.2)	2	3,649	5.5	(1.5-20.0)	29	21,484	13.6	(9.5-19.5)
65+	0	230	0.0	(0.0-165)	0	16	0.0	(0.0-1,936)	0	246	0.0	(0.0-154)
All <sup>1</sup>	110	64,803	17.1	(14.2-20.6)	13	11,149	11.7	(6.8-20.0)	123	75,952	16.3	(13.6-19.4)
<i>2000</i>												
50-54	47	31,078	15.2	(11.4-20.2)	5	3,342	15.0	(6.4-35.1)	52	34,420	15.2	(11.6-19.9)
55-59	31	19,547	16.0	(11.3-22.7)	8	5,225	15.4	(7.8-30.3)	39	24,772	15.8	(11.6-21.7)
60-64	25	15,204	16.6	(11.2-24.5)	8	4,924	16.3	(8.3-32.2)	33	20,128	16.5	(11.8-23.2)
65+	0	165	0.0	(0.0-232)	0	15	0.0	(0.0-2,039)	0	180	0.0	(0.0-212)
All <sup>1</sup>	103	66,068	15.7	(12.9-19.0)	21	13,507	15.6	(10.2-23.9)	124	79,575	15.7	(13.1-18.7)
<i>2001</i>												
50-54	25	20,547	12.2	(8.3-18.0)	17	16,359	10.4	(6.5-16.7)	42	36,906	11.4	(8.5-15.4)
55-59	11	7,814	14.2	(7.9-25.4)	29	21,915	13.3	(9.3-19.1)	40	29,729	13.5	(9.9-18.4)
60-64	8	6,016	13.4	(6.8-26.5)	28	20,434	13.8	(9.5-19.9)	36	26,450	13.7	(9.9-19.0)
65+	0	23	0.0	(0.0-1,431)	0	41	0.0	(0.0-858)	0	64	0.0	(0.0-566)
All <sup>1</sup>	44	34,423	12.9	(9.6-17.3)	74	58,752	12.7	(10.1-15.9)	118	93,175	12.7	(10.6-15.2)
<i>2002</i>												
50-54	16	18,954	8.5	(5.2-13.8)	19	20,887	9.1	(5.8-14.2)	35	39,841	8.8	(6.3-12.3)
55-59	9	5,123	17.7	(9.3-33.6)	30	25,834	11.7	(8.2-16.6)	39	30,957	12.7	(9.3-17.3)
60-64	3	3,734	8.1	(2.8-23.9)	27	22,310	12.2	(8.4-17.7)	30	26,044	11.6	(8.1-16.5)
65+	0	4	0.0	(0.0-4,899)	0	18	0.0	(0.0-1,759)	0	22	0.0	(0.0-1,486)
All <sup>1</sup>	28	27,825	10.1	(7.0-14.6)	76	69,050	11.1	(8.8-13.8)	104	96,875	10.8	(8.9-13.1)
<i>2003</i>												
50-54	20	18,241	11.0	(7.1-17.0)	23	19,770	11.7	(7.8-17.5)	43	38,011	11.3	(8.4-15.3)
55-59	8	3,952	20.4	(10.3-40.3)	35	30,991	11.3	(8.2-15.8)	43	34,943	12.4	(9.2-16.6)
60-64	3	2,800	10.8	(3.7-31.8)	33	26,510	12.5	(8.9-17.6)	36	29,310	12.4	(8.9-17.1)
65+	0	6	0.0	(0.0-3,903)	0	30	0.0	(0.0-1,135)	0	36	0.0	(0.0-946)
All <sup>1</sup>	31	25,012	12.5	(8.8-17.7)	91	77,304	11.8	(9.6-14.5)	122	102,316	12.0	(10.0-14.3)
<i>2004</i>												
45-49	2	722	27.7	(7.6-100)	0	2	0.0	(0.0-6,576)	2	724	27.6	(7.6-100)
50-54	24	17,637	13.7	(9.2-20.3)	36	23,316	15.5	(11.2-21.4)	60	40,953	14.7	(11.4-18.9)
55-59	3	3,233	9.3	(3.2-27.4)	36	33,709	10.7	(7.7-14.8)	39	36,942	10.6	(7.8-14.5)
60-64	1	2,144	4.7	(0.8-26.7)	33	26,571	12.5	(8.9-17.5)	34	28,715	11.9	(8.5-16.6)
65+	2	1,160	17.3	(4.8-63.0)	14	13,502	10.4	(6.2-17.5)	16	14,662	11.0	(6.8-17.8)
All	32	24,896	12.9	(9.2-18.2)	119	97,100	12.3	(10.3-14.7)	151	121,996	12.4	(10.6-14.6)
<i>2005</i>												
45-49	33	21,233	15.6	(11.1-21.9)	0	26	0.0	(0.0-1,287)	33	21,259	15.6	(11.1-21.9)
50-54	26	15,988	16.3	(11.2-23.9)	22	21,395	10.3	(6.8-15.6)	48	37,383	12.9	(9.7-17.1)
55-59	3	2,520	12.0	(4.1-35.2)	33	33,574	9.9	(7.0-13.8)	36	36,094	10.0	(7.2-13.9)
60-64	0	1,627	0.0	(0.0-23.8)	34	28,437	12.0	(8.6-16.8)	34	30,064	11.4	(8.1-15.9)
65+	1	1,734	5.8	(1.0-33.0)	32	21,714	14.8	(10.5-20.9)	33	23,448	14.2	(10.1-19.9)
All	63	43,102	14.7	(11.5-18.8)	121	105,146	11.6	(9.7-13.8)	184	148,248	12.5	(10.8-14.4)
<i>2006</i>												
45-49	50	34,241	14.6	(11.1-19.3)	2	495	40.4	(11.1-146)	52	34,736	15.0	(11.5-19.7)
50-54	11	15,344	7.2	(4.0-12.9)	19	23,533	8.1	(5.2-12.6)	30	38,877	7.7	(5.4-11.1)
55-59	6	3,012	20.1	(9.2-43.7)	45	38,892	11.6	(8.7-15.5)	51	41,904	12.2	(9.3-16.1)
60-64	2	1,905	10.7	(2.9-38.8)	36	30,616	11.8	(8.5-16.4)	38	32,521	11.8	(8.6-16.1)
65+	3	1,435	21.2	(7.2-62.1)	18	22,674	8.0	(5.0-12.6)	21	24,109	8.8	(5.7-13.4)
All	72	55,937	12.9	(10.3-16.3)	120	116,210	10.4	(8.7-12.4)	192	172,147	11.2	(9.7-12.9)
<i>2007</i>												
45-49	31	31,866	9.8	(6.9-13.8)	17	10,274	16.6	(10.4-26.5)	48	42,140	11.4	(8.6-15.1)
50-54	15	13,134	11.5	(7.0-18.9)	35	29,243	12.0	(8.6-16.7)	50	42,377	11.8	(9.0-15.6)
55-59	5	3,497	14.4	(6.2-33.7)	45	35,412	12.7	(9.5-17.1)	50	38,909	12.9	(9.8-17.0)
60-64	2	2,164	9.3	(2.6-33.9)	32	31,638	10.2	(7.2-14.3)	34	33,802	10.1	(7.2-14.1)
65+	6	1,517	40.2	(18.4-87.3)	40	25,930	15.5	(11.4-21.1)	46	27,447	16.9	(12.6-22.5)
All	59	52,178	11.4	(8.8-14.6)	169	132,497	12.8	(11.0-14.9)	228	184,675	12.4	(10.9-14.1)
<i>1999-2007</i>												
45-49	116	88,235	13.2	(11.0-15.8)	19	10,805	17.6	(11.3-27.5)	135	99,040	13.7	(11.6-16.2)
50-54	230	177,791	13.0	(11.4-14.8)	182	160,651	11.4	(9.8-13.1)	412	338,442	12.2	(11.1-13.5)
55-59	113	68,515	16.6	(13.8-20.0)	266	230,230	11.6	(10.3-13.1)	379	298,745	12.7	(11.5-14.1)
60-64	71	53,429	13.4	(10.6-16.9)	233	195,089	12.0	(10.6-13.6)	304	248,518	12.3	(11.0-13.8)
65+	12	6,274	19.4	(11.1-33.8)	104	83,940	12.5	(10.3-15.1)	116	90,214	12.9	(10.8-15.5)
All	542	394,244	13.8	(12.7-15.0)	804	680,715	11.9	(11.1-12.7)	1,346	1,074,959	12.6	(11.9-13.3)

<sup>1</sup> Includes 45-49 year women who screened

**Figure 1.** Interval cancers by 5-year age group 45-69 years, initial and subsequent screens, 2003-07 aggregated, with 95% confidence intervals



**Figure 2.** Interval cancers occurring in first year (<12 months) and second year (12 - 24 months) following initial or subsequent screens occurring in 1999-2007, women aged 45-69 years, with 95% confidence intervals



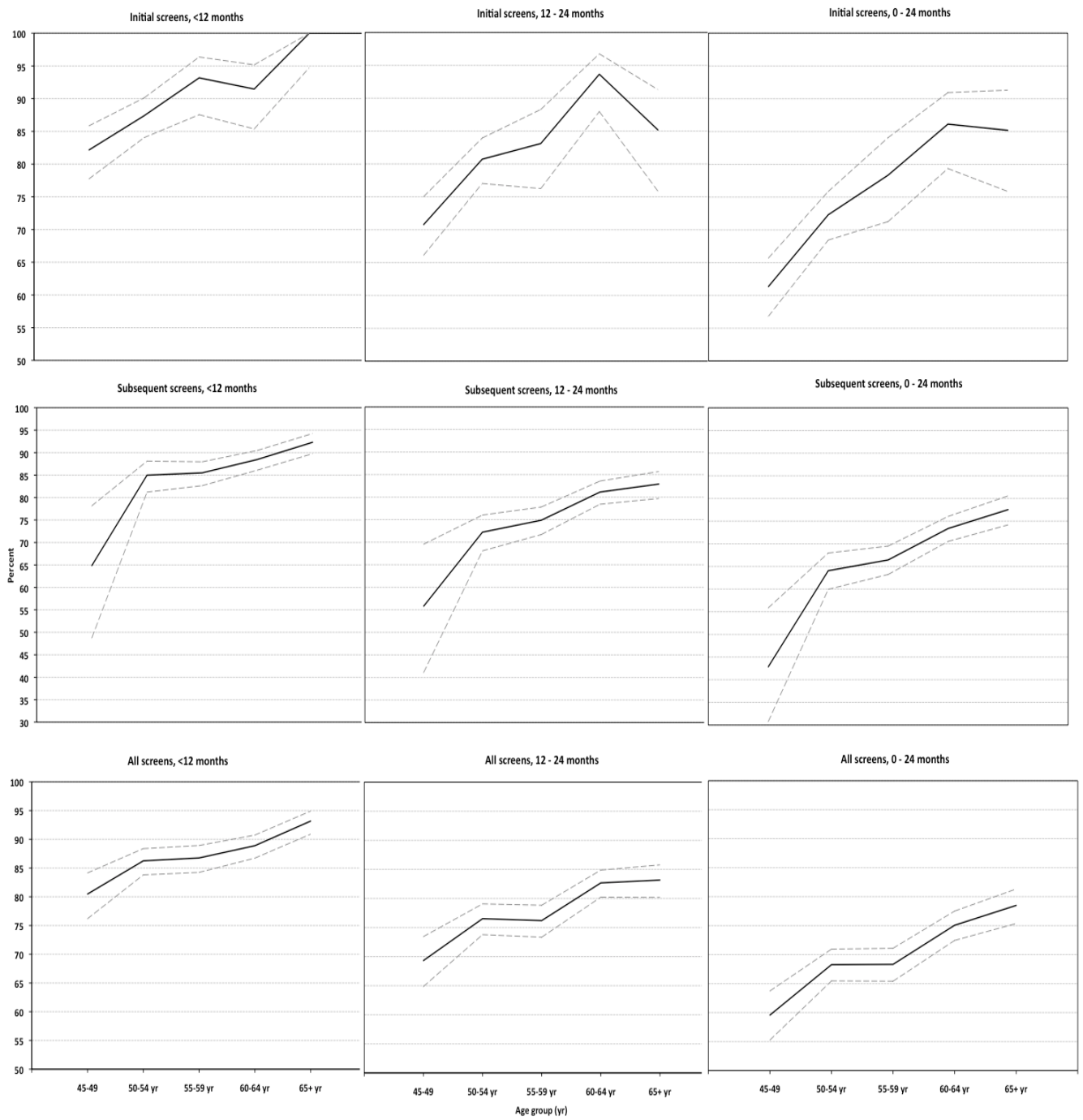
**Table 5.** First-year (<12 months) programme sensitivity (%) after an initial or subsequent screen by age-group and screening year, 1999–2007

Age group (yr)	Initial Screens			Subsequent Screens			All Screens		
	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)
<i>1999</i>									
50-54	20	121	85.8 (79.1-90.6)	2	10	83.3 (55.2-95.3)	22	131	85.6 (79.2-90.3)
55-59	15	108	87.8 (80.9-92.5)	5	19	79.2 (59.5-90.8)	20	127	86.4 (79.9-91.0)
60-64	12	130	91.5 (85.8-95.1)	1	13	92.9 (68.5-98.7)	13	143	91.7 (86.3-95.1)
65+	0	1	100.0 (20.7-100)	0	0	-	0	1	100.0 (20.7-100)
All	47	360	88.5 (85.0-91.2)	8	42	84.0 (71.5-91.7)	55	402	88.0 (84.7-90.6)
<i>2000</i>									
50-54	20	141	87.0 (81.0-91.4)	4	12	75.0 (50.5-89.8)	24	153	86.0 (80.1-90.3)
55-59	16	136	89.5 (83.6-93.4)	3	23	88.5 (71.0-96.0)	19	159	89.3 (83.9-93.1)
60-64	9	120	93.0 (87.3-96.3)	4	22	84.6 (66.5-93.9)	13	142	91.6 (86.2-95.0)
65+	0	3	100.0 (43.8-100)	0	0	-	0	3	100 (43.8-100)
All	45	402	89.7 (86.6-92.2)	11	57	83.8 (73.3-90.7)	56	459	89.0 (86.0-91.4)
<i>2001</i>									
50-54	12	83	87.4 (79.2-92.6)	6	75	92.6 (84.8-96.6)	18	158	89.8 (84.4-93.4)
55-59	2	69	97.2 (90.3-99.2)	17	87	83.7 (75.4-89.5)	19	156	89.1 (83.7-92.9)
60-64	0	61	100.0 (94.1-100)	19	106	84.8 (77.5-90.0)	19	167	89.8 (84.6-93.4)
65+	0	0	-	0	0	-	0	0	-
All	14	213	93.8 (90.7-97.1)	42	268	86.5 (82.2-89.8)	56	481	89.6 (86.7-91.9)
<i>2002</i>									
50-54	14	97	87.4 (79.9-92.3)	17	58	77.3 (66.7-85.3)	31	155	83.3 (77.3-88.0)
55-59	5	36	87.8 (74.5-94.7)	16	110	87.3 (80.4-92.0)	21	146	87.4 (81.5-91.6)
60-64	1	41	97.6 (87.7-99.6)	10	123	92.5 (86.7-95.9)	11	164	93.7 (89.1-96.5)
65+	0	0	-	0	0	-	0	0	-
All	20	174	89.7 (84.6-93.2)	43	291	87.1 (83.1-90.3)	63	465	88.1 (85.0-90.6)
<i>2003</i>									
50-54	16	90	84.9 (76.9-90.5)	8	62	88.6 (79.0-94.1)	24	152	86.4 (80.5-90.7)
55-59	1	36	97.3 (86.2-99.5)	22	116	84.1 (77.0-89.2)	23	152	86.9 (81.1-91.1)
60-64	1	29	96.7 (83.3-99.4)	16	136	89.5 (83.6-93.4)	17	165	90.7 (85.6-94.1)
65+	0	0	-	0	0	-	0	0	-
All	18	156	89.7 (84.2-93.4)	46	314	87.2 (83.4-90.3)	64	470	88.0 (85.0-90.5)
<i>2004</i>									
45-49	1	0	0.0 (0.0-79.3)	0	0	-	1	0	0.0 (0.0-79.3)
50-54	11	87	88.8 (81.0-93.6)	17	74	81.3 (72.1-88.0)	28	161	85.2 (79.4-89.5)
55-59	4	21	84.0 (65.3-93.6)	21	107	83.6 (76.2-89.0)	25	128	83.7 (77.0-88.7)
60-64	3	24	88.9 (71.9-96.1)	16	131	89.1 (83.1-93.2)	19	155	89.1 (83.6-92.9)
65+	0	6	100.0 (61.0-100)	3	96	97.0 (91.5-99.0)	3	102	97.1 (91.9-99.0)
All	19	138	87.9 (81.9-92.1)	57	408	87.7 (84.4-90.4)	76	546	87.8 (85.0-90.1)
<i>2005</i>									
45-49	12	76	86.4 (77.7-92.0)	0	0	-	12	76	86.4 (77.7-92.0)
50-54	9	73	89.0 (80.4-94.1)	10	72	87.8 (79.0-93.2)	19	145	88.4 (82.6-92.5)
55-59	2	17	90.5 (71.1-97.3)	17	114	87.0 (80.2-91.7)	19	133	87.5 (81.3-91.8)
60-64	2	19	90.5 (71.1-97.3)	19	146	88.5 (82.7-92.5)	21	165	88.7 (83.4-92.5)
65+	0	21	100.0 (84.5-100)	12	139	92.1 (86.6-95.4)	12	160	93.0 (88.2-96.0)
All	25	208	89.3 (84.6-92.6)	58	471	89.0 (86.1-91.4)	83	679	89.1 (86.7-91.1)
<i>2006</i>									
45-49	27	103	79.2 (71.5-85.3)	1	0	0.0 (0.0-79.3)	28	103	78.6 (70.8-84.8)
50-54	11	86	88.7 (80.8-93.5)	9	65	87.8 (78.5-93.5)	20	151	88.3 (82.6-92.3)
55-59	0	23	100.0 (85.7-100)	20	128	86.5 (80.0-91.1)	20	151	88.3 (82.6-92.3)
60-64	4	30	88.2 (73.4-95.3)	21	170	89.0 (83.8-92.7)	25	200	88.9 (84.1-92.4)
65+	0	19	100.0 (83.2-100)	12	117	90.7 (84.4-94.6)	12	136	91.9 (86.4-95.3)
All	42	261	86.1 (81.8-89.6)	63	480	88.4 (85.4-90.8)	105	741	87.6 (85.2-89.6)
<i>2007</i>									
45-49	21	101	82.8 (75.1-88.5)	12	24	66.7 (50.3-79.8)	33	125	79.1 (72.1-84.7)
50-54	11	66	85.7 (76.2-91.8)	18	78	81.3 (72.3-87.8)	29	144	83.2 (77.0-88.1)
55-59	2	24	92.3 (75.9-97.9)	18	113	86.3 (79.3-91.1)	20	137	87.3 (81.1-91.6)
60-64	1	16	94.1 (73.0-99.0)	22	139	86.3 (80.2-90.8)	23	155	87.1 (81.4-91.2)
65+	0	23	100.0 (85.7-100)	15	152	91.0 (85.7-94.5)	15	175	92.1 (87.4-95.2)
All	35	230	86.8 (82.2-90.3)	85	506	85.6 (82.6-88.2)	120	736	86.0 (83.5-88.1)
<i>1999-2007</i>									
45-49	61	283	82.3 (77.9-85.9)	13	24	64.9 (48.8-78.2)	74	307	80.6 (76.3-84.2)
50-54	124	844	87.1 (84.8-89.1)	91	506	84.8 (81.7-87.4)	215	1,350	86.2 (84.4-87.8)
55-59	47	472	90.9 (88.2-93.1)	139	817	85.5 (83.1-87.6)	186	1,289	87.4 (85.6-89.0)
60-64	33	470	93.4 (90.9-95.3)	128	986	88.5 (86.5-90.3)	161	1,456	90.0 (88.5-91.4)
65+	0	73	100.0 (95.0-100)	42	504	92.3 (89.8-94.3)	42	577	93.2 (91.0-94.9)
All	265	2142	89.0 (87.6-90.1)	413	2,837	87.3 (86.1-88.4)	678	4,979	88.0 (87.1-88.8)

**Table 6.** Second-year (12 to <24 months) programme sensitivity (%) after an initial or subsequent screen by age-group and screening year, 1999–2007

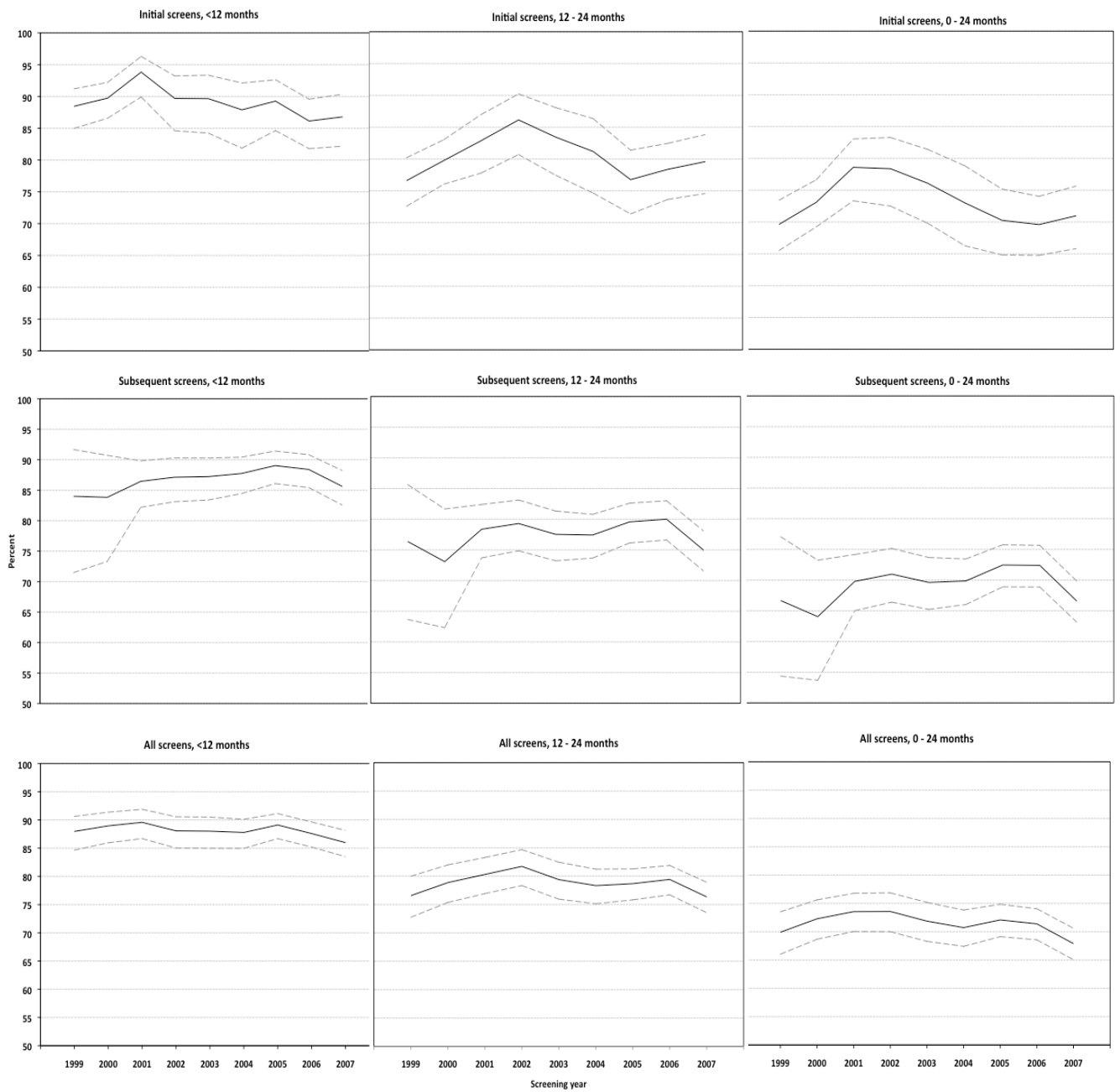
Age group (yr)	Initial Screens			Subsequent Screens			All Screens			
	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)	
<i>1999</i>										
50-54	46	121	72.5 (65.2-78.7)	6	10	62.5 (38.6-81.5)	52	131	71.6 (64.7-77.6)	
55-59	37	108	74.5 (66.8-80.9)	5	19	79.2 (59.5-90.8)	42	127	75.1 (68.1-81.1)	
60-64	27	130	82.8 (76.1-87.9)	2	13	86.7 (62.1-96.3)	29	143	83.1 (76.8-88.0)	
65+	0	1	100.0 (20.7-100)	0	0		0	1	100 (20.7-100)	
All	110	360	76.6 (72.6-80.2)	13	42	76.4 (63.7-85.6)	123	402	76.6 (72.8-80.0)	
<i>2000</i>										
50-54	47	141	75.4 (68.8-81.0)	5	12	70.6 (46.9-86.7)	52	153	75.0 (68.6-80.4)	
55-59	31	136	81.4 (74.9-86.6)	8	23	74.2 (56.8-86.3)	39	159	80.3 (74.2-85.2)	
60-64	25	120	82.8 (75.8-88.0)	8	22	73.3 (55.6-85.8)	33	142	81.1 (74.7-86.2)	
65+	0	3	100.0 (43.8-100)	0	0		0	3	100 (43.8-100)	
All	103	402	79.8 (76.0-83.0)	21	57	73.1 (62.3-81.7)	124	459	78.9 (75.4-82.0)	
<i>2001</i>										
50-54	25	83	76.9 (68.1-83.8)	17	75	81.5 (72.4-88.1)	42	158	79.0 (72.8-84.1)	
55-59	11	69	86.3 (77.0-92.1)	29	87	75.0 (66.4-82.0)	40	156	79.6 (73.4-84.6)	
60-64	8	61	88.4 (78.8-94.0)	28	106	79.1 (71.5-85.1)	36	167	82.3 (76.4-86.9)	
65+	0	0	-	0	0		0	0	-	
All	44	213	82.9 (77.8-87.0)	74	268	78.4 (73.7-82.4)	118	481	80.3 (76.9-83.3)	
<i>2002</i>										
50-54	16	97	85.8 (78.2-91.1)	19	58	75.3 (64.6-83.6)	35	155	81.6 (75.5-86.4)	
55-59	9	36	80.0 (66.2-89.1)	30	110	78.6 (71.1-84.6)	39	146	78.9 (72.5-84.2)	
60-64	3	41	93.2 (81.8-97.7)	27	123	82.0 (75.1-87.3)	30	164	84.5 (78.8-88.9)	
65+	0	0	-	0	0		0	0	-	
All	28	174	86.1 (80.7-90.2)	76	291	79.3 (74.9-83.1)	104	465	81.7 (78.3-84.7)	
<i>2003</i>										
50-54	20	90	81.8 (73.6-87.9)	23	62	72.9 (62.7-81.2)	43	152	77.9 (71.6-83.2)	
55-59	8	36	81.8 (68.0-90.5)	35	116	76.8 (69.5-82.8)	43	152	77.9 (71.6-83.2)	
60-64	3	29	90.6 (75.8-96.8)	33	136	80.5 (73.8-85.7)	36	165	82.1 (76.2-86.8)	
65+	0	0	-	0	0		0	0	-	
All	31	156	83.4 (77.4-88.1)	91	314	77.5 (73.2-81.3)	122	470	79.4 (75.9-82.5)	
<i>2004</i>										
45-49	2	0	0.0 (0.0-65.8)	0	0	-	-	2	0	0.0 (0.0-65.8)
50-54	24	87	78.4 (69.8-85.0)	36	74	67.3 (58.1-75.3)	60	161	72.9 (66.6-78.3)	
55-59	3	21	87.5 (69.0-95.7)	36	107	74.8 (67.1-81.2)	39	128	76.6 (69.7-82.4)	
60-64	1	24	96.0 (80.5-99.3)	33	131	79.9 (73.1-85.3)	34	155	82.0 (75.9-86.8)	
65+	2	6	75.0 (40.9-92.9)	14	96	87.3 (79.8-92.3)	16	102	86.4 (79.1-91.5)	
All	32	138	81.2 (74.6-86.3)	119	408	77.4 (73.7-80.8)	151	546	78.3 (75.1-81.2)	
<i>2005</i>										
45-49	33	76	69.7 (60.5-77.6)	0	0	-	-	33	76	69.7 (60.5-77.6)
50-54	26	73	73.7 (64.3-81.4)	22	72	76.6 (67.1-84.0)	48	145	75.1 (68.6-80.7)	
55-59	3	19	86.4 (66.7-95.3)	33	114	77.6 (70.2-83.5)	36	133	78.7 (71.9-84.2)	
60-64	0	19	100.0 (83.2-100)	34	146	81.1 (74.8-86.2)	34	165	82.9 (77.1-87.5)	
65+	1	21	95.5 (78.2-99.2)	32	139	81.3 (74.8-86.4)	33	160	82.9 (77.0-87.6)	
All	63	208	76.8 (71.4-81.4)	121	471	79.6 (76.1-82.6)	184	679	78.7 (75.8-81.3)	
<i>2006</i>										
45-49	50	103	67.3 (59.5-74.2)	2	0	0.0 (0.0-65.8)	52	103	66.5 (58.7-73.4)	
50-54	11	86	88.7 (80.8-93.5)	19	65	77.4 (67.4-85.0)	30	151	83.4 (77.3-88.1)	
55-59	6	23	79.3 (61.6-90.2)	45	128	74.0 (67.0-80.0)	51	151	74.8 (68.3-80.2)	
60-64	2	30	93.8 (79.9-98.3)	36	170	82.5 (76.8-87.1)	38	200	84.0 (78.8-88.1)	
65+	3	19	86.4 (66.7-95.3)	18	117	86.7 (79.9-91.4)	21	136	86.6 (80.4-91.1)	
All	72	261	78.4 (73.6-82.5)	120	480	80.0 (76.6-83.0)	192	741	79.4 (76.7-81.9)	
<i>2007</i>										
45-49	31	101	76.5 (68.6-82.9)	17	24	58.5 (43.4-72.2)	48	125	72.3 (65.2-78.4)	
50-54	15	66	81.5 (71.7-88.4)	35	78	69.0 (60.0-76.8)	50	144	74.2 (67.6-79.9)	
55-59	5	24	82.8 (65.5-92.4)	45	113	71.5 (64.0-78.0)	50	137	73.3 (66.5-79.1)	
60-64	2	16	88.9 (67.2-96.9)	32	139	81.3 (74.8-86.4)	34	155	82.0 (75.9-86.8)	
65+	6	23	79.3 (61.6-90.2)	40	152	79.2 (72.9-84.3)	46	175	79.2 (73.4-84.0)	
All	59	230	79.6 (74.6-83.8)	169	506	75.0 (71.6-78.1)	228	736	76.3 (73.6-78.9)	
<i>1999-2007</i>										
45-49	116	283	70.9 (66.3-75.2)	19	24	55.8 (41.1-69.6)	135	307	69.5 (65.0-73.6)	
50-54	230	844	78.7 (76.1-81.0)	182	506	73.5 (70.1-76.7)	412	1,350	76.7 (74.6-78.6)	
55-59	113	472	80.7 (77.3-83.7)	266	817	75.4 (72.8-77.9)	379	1,289	77.3 (75.2-79.2)	
60-64	71	470	86.9 (83.8-89.5)	233	986	80.9 (78.6-83.0)	304	1,456	82.7 (80.9-84.4)	
65+	12	73	85.9 (76.9-91.7)	104	504	82.9 (79.7-85.7)	116	577	83.3 (80.3-85.9)	
All	542	2142	79.8 (78.3-81.3)	804	2,837	77.9 (76.5-79.2)	1,346	4,979	78.7 (77.7-79.7)	

**Figure 3.** Programme sensitivity by age 45-69 years, by interval cancers in first and second year following initial or subsequent screen, with 95% confidence intervals, 1999–2007

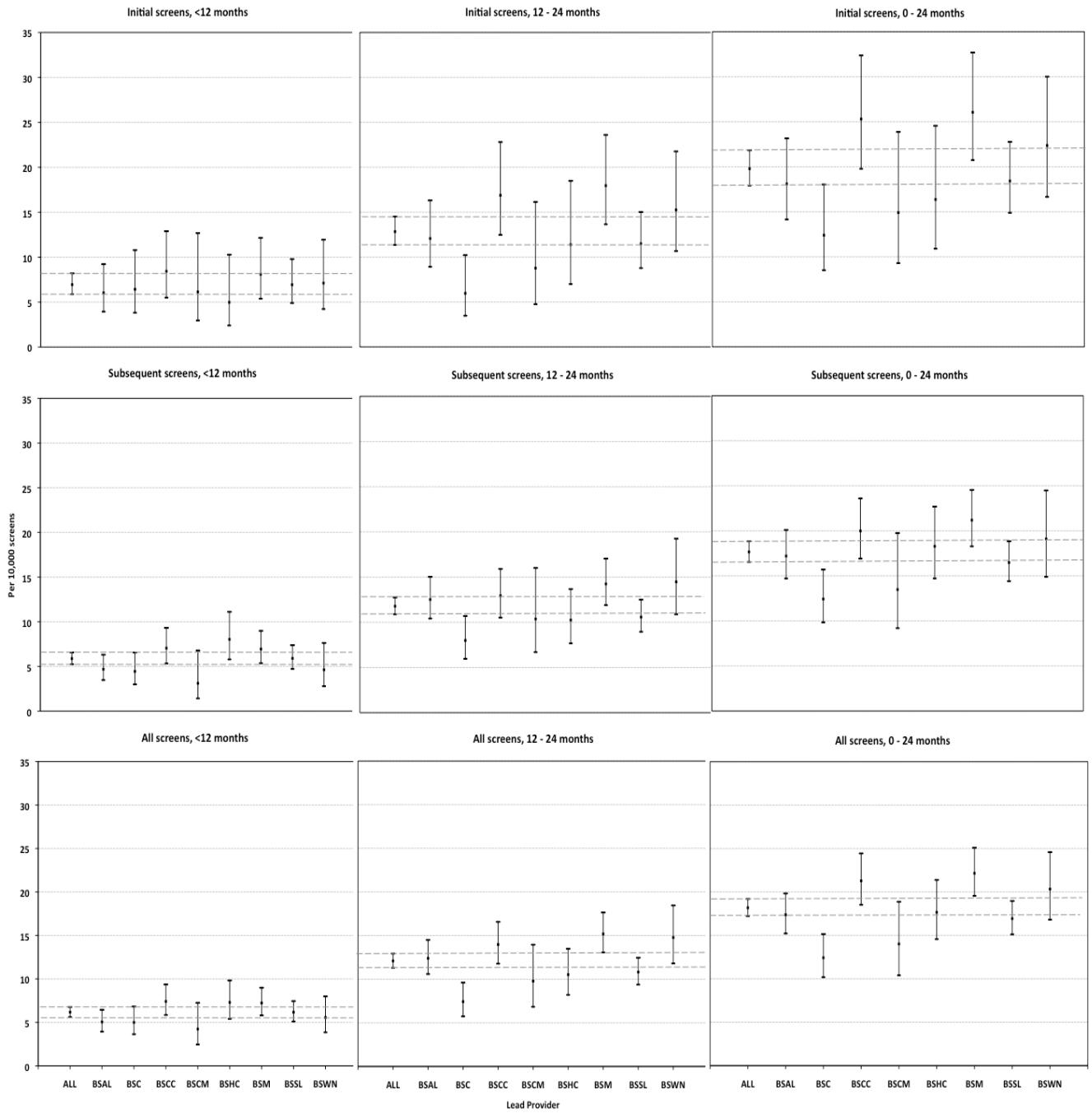




**Figure 4.** Programme sensitivity (%) by first and subsequent screens in relation to interval cancers in the first year (<12 months) and second year (12 - 24 months) following screens occurring in 1999-2007, with 95% confidence intervals

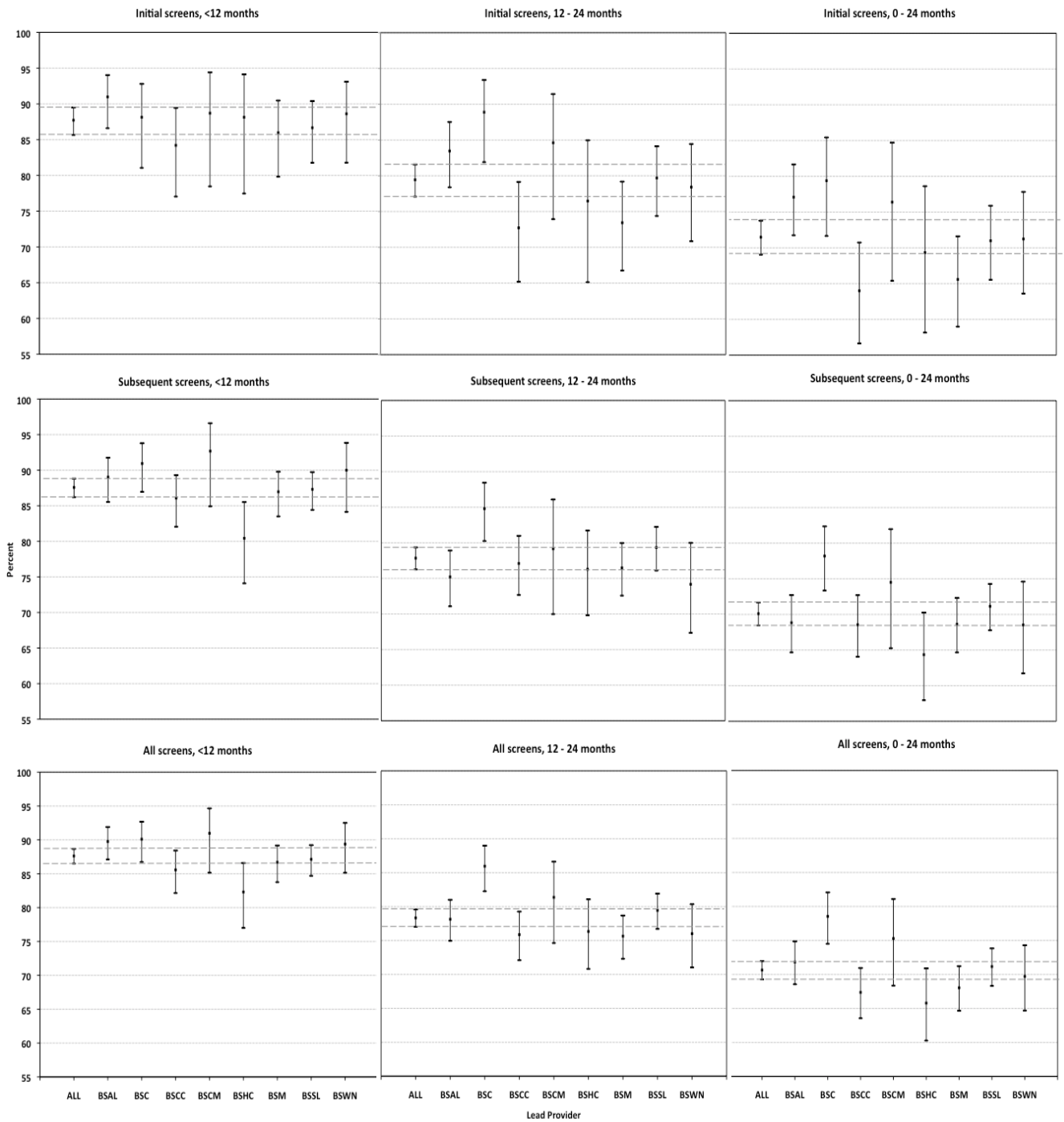


**Figure 5.** Interval cancer rates by BSA Lead Provider, by first and second year interval cancers and by initial and subsequent screens, with 95% confidence intervals, 1999–2007



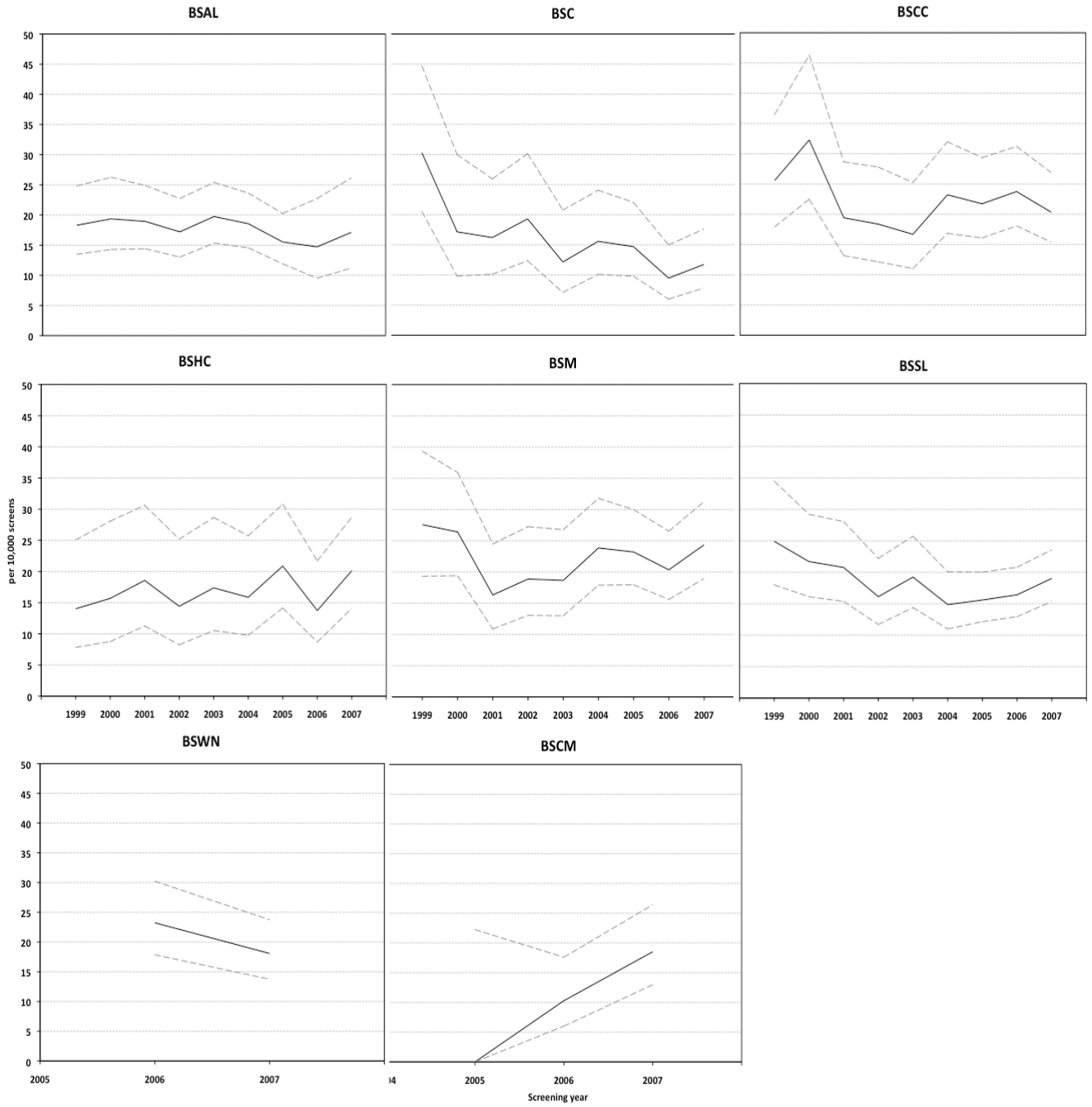
----- 95% CI for BSA (all Lead Providers)

**Figure 6.** Programme sensitivity by BSA Lead Provider, by first and second year interval cancers and by initial and subsequent screens, with 95% confidence intervals, 1999–2007

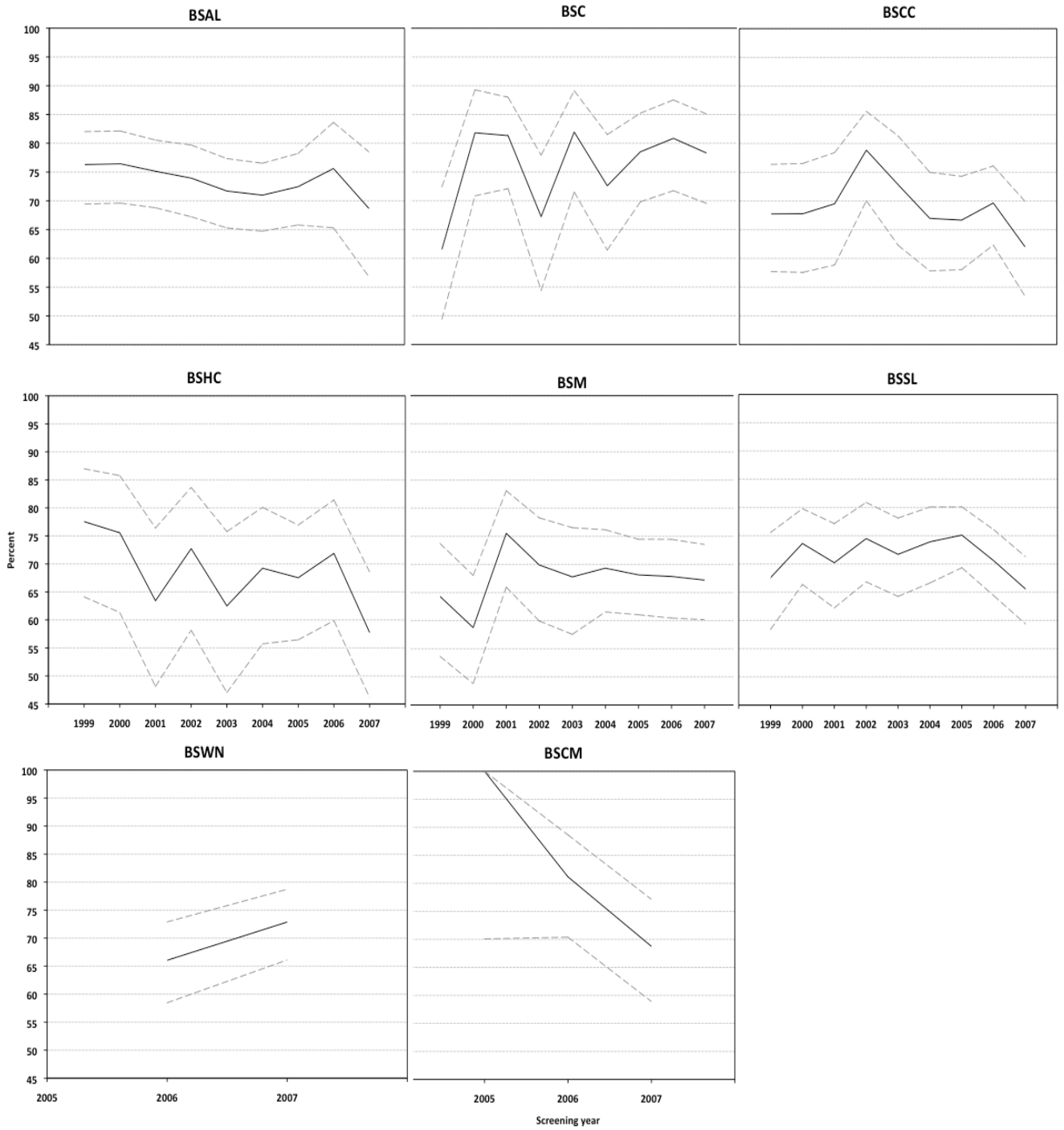


----- 95% CI for BSA (all Lead Providers)

**Figure 7.** Trends in interval cancer rates by BSA Lead Provider, 1999-2007, with 95% confidence intervals



**Figure 8.** Trends in programme sensitivity by BSA Lead Provider, 1999-2007, with 95% confidence intervals



#### **4. COMPARISONS WITH PREVIOUS INTERVAL CANCER REPORT**

Estimates of interval cancer rates are slightly higher in the present report than those reported previously for the years 1999-2002, and programme sensitivity estimates correspondingly are lower. For instance, in the first BSA interval cancer report,<sup>4</sup> 45 interval cancers for the screening year 1999 were reported occurring 12 months subsequently, compared to 55 interval cancers in the present report. Interval cancers occurring in the second year following screening in 1999 were reported originally as 114, compared to 123 in this report.

For 1999-2002, 198 first year (<12 months) and 419 second year (12 - 24 months) interval cancers were recorded in the first BSA interval cancer report,<sup>4</sup> compared with 241 first year (<12 months) and 469 second year (12 - 24 months) intervals for the same period in this report.

The higher numbers in the present report are due to the more exhaustive process in ascertaining interval cancers. For 1999-2002, the additional 33 first year (0-12 months) interval cancers found represented a 17% increase, and the 49 second year (12-24 months) interval cancers a 12% increase. The total of 82 extra interval cancers found for 1999-2002 represented a 13% increase overall.

## 5. INTERNATIONAL COMPARISONS

Interval cancer rates reported from trials and by various population based mammography screening programmes enable comparison and assessment of BSA in relation to trial conditions and to programmes operating as part of routine health services. Interval cancer rates for BSA are not significantly different to those of comparable programmes in the UK, the Netherlands and Australia (Table 7).

**Table 7.** BSA interval cancer rates (per 10,000) compared with other national mammography screening programmes, by first year (<12 months) and second year (12-<24 months) interval cancers

Programme/trial	Target age-group (yr)	Period (Index screening year)	Interval cancer rate <12 months	Interval cancer rate 12-<24 months
NZ	45-69	1999-2007	Initial: 6.8 (6.0-7.6) Subsequent: 6.1 (5.5-6.7) All: 6.3 (5.9-6.8)	Initial: 13.8 (12.7-15.0) Subsequent: 11.9 (11.1-12.7) All: 12.6 (11.9-13.3)
		2003-07	Initial: 6.9 (5.9-8.2) Subsequent: 5.9 (5.3-6.6) All: 6.2 (5.6-6.8)	Initial: 12.8 (11.4-14.5) Subsequent: 11.8 (10.9-12.7) All: 12.1 (11.3-12.9)
<i>Screening Programme</i>				
NHS (UK) <sup>7</sup>	50-64	April 1997- March 2003	All: 5.5 (4.3-7.6)	All: 11.3 (9.2-14.7)
East Anglia (UK) <sup>8</sup>	50-64	1994	Subsequent: 5.2 (3.8-7.0)	Subsequent: 12.8 (9.8-16.5)
Scotland <sup>9</sup>	50-64	1991-95	Initial: 4.8 (4.0-5.6)	Initial: 12.1 (10.6-13.8)
Dublin (Ireland) <sup>10</sup>	50-64	1989-92	Initial: 10.1 (6.1-15.7) Subsequent: 6.8 (3.4-12.1)	Initial: 10.6 (6.5-16.3) Subsequent: 11.1 (6.6-17.5)
Turin (Italy) <sup>10</sup>	50-69	1992-93	Initial: 5.6 (1.8-13.0)	Initial: 10.0 (4.6-19.1)
Netherlands <sup>11</sup>	50-69	1990-93	Initial: 6.6 (5.7-7.6) Subsequent: 5.9 (4.5-7.5) All: 6.4 (5.7-7.2)	Initial: 11.3 (10.1-12.5) Subsequent: 12.0 (10.0-14.3) All: 11.5 (10.5-12.6)
		2001-03	Initial: 6.9 (5.7-8.2) Subsequent: 7.0 (6.6-7.4)	Initial: 11.9 (10.3-13.6) Subsequent: 12.5 (11.9-13.1)
Australia <sup>12</sup>	50-69	2004-06	Initial: 5.5 (4.4-6.7) Subsequent: 6.7 (6.3-7.1)	Initial: 13.3 (11.3-15.6) Subsequent: 12.5 (11.9-13.1)
		1995-98 <sup>13</sup>	Initial: 7.2 (5.9-8.7) Subsequent: 9.6 (8.2-11.1)	Initial: 12.8 (11.0-14.9) Subsequent: 14.3 (12.6-16.2)
NSW <sup>12,13</sup>	50-69	2001-03	Initial: 6.4 (4.6-8.6) Subsequent: 7.3 (6.5-8.1)	Initial: 9.9 (7.7-12.6) Subsequent: 11.5 (10.5-12.5)
		2004-06	Initial: 5.9 (4.1-8.1) Subsequent: 6.6 (5.9-7.3)	Initial: 12.0 (9.0-15.6) Subsequent: 12.2 (11.2-13.3)
Victoria <sup>12,14</sup>	50-69	1994 <sup>14</sup>	Initial: 6.5 (4.9-8.4)	Initial: 12.8 (9.9-16.3)
		2001-03 <sup>12</sup>	Initial: 7.2 (4.9-10.0) Subsequent: 6.9 (6.1-7.8)	Initial: 10.0 (7.3-13.3) Subsequent: 13.5 (12.3-14.7)
Queensland <sup>12</sup>	50-69	2004-06 <sup>13</sup>	Initial: 5.6 (3.3-8.6) Subsequent: 7.0 (6.2-7.8)	Initial: 19.0 (13.3-25.7) Subsequent: 12.7 (11.6-13.9)
		2001-03	Initial: 7.5 (4.8-11.1) Subsequent: 7.1 (6.2-8.2)	Initial: 17.4 (13.0-22.8) Subsequent: 14.0 (12.6-15.4)
South Australia <sup>12</sup>	50-69	2004-06	Initial: 5.9 (3.6-9.2) Subsequent: 7.1 (6.2-8.1)	Initial: 11.9 (7.8-17.2) Subsequent: 14.2 (12.6-15.9)
		2001-03	Initial: 3.5 (1.6-6.6) Subsequent: 6.7 (5.5-8.2)	Initial: 9.4 (4.0-17.1) Subsequent: 12.0 (10.2-14.0)
Western Australia <sup>12</sup>	50-69	2004-06	Initial: 4.0 (1.8-7.6) Subsequent: 5.9 (4.7-7.2)	Initial: 4.6 (2.2-8.4) Subsequent: 12.9 (11.0-14.9)
		2001-03	Initial: 4.8 (2.2-8.8) Subsequent: 6.6 (5.3-8.1)	Initial: 14.2 (7.8-22.7) Subsequent: 11.3 (9.5-13.5)
		2004-06	Initial: 2.4 (1.0-4.7) Subsequent: 5.9 (4.8-7.1)	Initial: 19.1 (10.6-30.3) Subsequent: 10.8 (9.2-12.6)
<i>Trial</i>				
Sweden (Two County) <sup>1</sup>	50-69	1990	All: 3.2 (2.0-5.0)	All: 6.4 (4.6-8.9)
Edinburgh <sup>15</sup>	45-64	1978-81	Subsequent: 2.0 (0.2-7.2)	Subsequent: 7.1 (2.9-14.6)

BSA programme sensitivity is also similar to other programmes, with estimates close to those for Australia (Table 8).

**Table 8.** BSA programme sensitivity (%) compared with other national mammography screening programmes, by first year (<12 months), second year (12-<24 months) interval cancers

Programme/trial	Target age-group (yr)	Period (index screening year)	Sensitivity <12 months	Sensitivity 12-<24 months
NZ	45-69	1999-2007	Initial: 89.0 (87.6-90.1)	Initial: 79.8 (78.3-81.3)
			Subsequent: 87.3 (86.1-88.4)	Subsequent: 77.9 (76.5-79.2)
		2003-07	All: 88.0 (87.1-88.8)	All: 78.7 (77.7-79.7)
			Initial: 87.7 (85.7-89.5)	Initial: 79.4 (77.1-81.6)
		Subsequent: 87.6 (86.2-88.8)	Subsequent: 77.8 (76.3-79.3)	
		All: 87.6 (86.5-88.7)	All: 78.3 (77.0-79.6)	
<i>Screening Programme</i>				
Dublin (Ireland) <sup>10</sup>	50-64	1989-92	Initial: 74.7 (62.3-83.1)	Initial: 73.8 (62.3-83.1)
			Subsequent: 64.4 (45.4-80.8)	Subsequent: 52.6 (35.8-69.0)
Turin (Italy) <sup>10</sup>	50-69	1992-93	Initial: 84.9 (68.1-94.9)	Initial: 75.8 (58.8-88.2)
Netherlands <sup>11</sup>	50-69	1990-93	Initial: 88.2 (86.6-89.7)	Initial: 81.4 (79.6-83.1)
			Subsequent: 83.6 (79.4-87.2)	Subsequent: 71.3 (66.8-75.5)
			All: 87.4 (85.9-88.8)	All: 79.5 (77.8-81.1)
Australia <sup>12</sup>	50-69	2001-03	Initial: 90.4 (85.6-95.5)	Initial: 78.2 (74.0-82.7)
			Subsequent: 86.0 (83.9-88.1)	Subsequent: 69.9 (68.2-71.6)
		2004-06	Initial: 92.5 (87.3-97.9)	Initial: 79.9 (75.2-84.7)
			Subsequent: 86.3 (84.3-88.3)	Subsequent: 70.2 (68.5-71.9)
NSW <sup>12,13</sup>	50-69	1995-98 <sup>13</sup>	Initial: 86.3 (83.7-88.7)	Initial: 78.9 (76.0-81.7)
			Subsequent: 78.5 (75.5-81.3)	Subsequent: 70.7 (67.6-73.7)
		2001-03 <sup>12</sup>	Initial: 90.8 (82.5-99.6)	Initial: 79.6 (72.3-87.4)
			Subsequent: 85.6 (81.9-89.4)	Subsequent: 71.1 (68.1-74.3)
		2004-06 <sup>12</sup>	Initial: 91.4 (82.9-100.0)	Initial: 80.6 (73.2-88.6)
			Subsequent: 86.5 (82.9-90.1)	Subsequent: 72.4 (69.4-75.4)
Victoria <sup>12,14</sup>	50-69	1994 <sup>14</sup>	Initial: 85.9 (82.1-89.2)	Initial: 68.6 (61.8-74.8)
			Initial: 89.4 (79.6-100.0)	Initial: 78.3 (69.6-87.7)
			Subsequent: 84.2 (79.8-88.7)	Subsequent: 64.7 (61.4-68.2)
		2004-06 <sup>12</sup>	Initial: 91.8 (80.0-100.0)	Initial: 74.6 (65.0-85.1)
			Subsequent: 85.1 (81.0-89.4)	Subsequent: 67.0 (63.7-70.3)
Queensland <sup>12</sup>	50-69	2001-03	Initial: 92.2 (79.6-100.0)	Initial: 74.8 (65.9-84.4)
			Subsequent: 86.6 (82.1-91.4)	Subsequent: 69.6 (66.0-73.5)
		2004-06	Initial: 92.7 (81.9-100.0)	Initial: 80.2 (69.1-92.6)
			Subsequent: 86.1 (81.7-90.6)	Subsequent: 66.9 (62.6-71.3)
South Australia <sup>12</sup>	50-69	2001-03	Initial: 94.7 (76.0-100.0)	Initial: 85.4 (68.0-100.0)
			Subsequent: 87.4 (81.0-94.2)	Subsequent: 72.7 (67.3-78.3)
		2004-06	Initial: 94.0 (71.8-100.0)	Initial: 88.6 (67.0-100.0)
			Subsequent: 88.7 (82.0-95.8)	Subsequent: 71.6 (66.2-77.3)
Western Australia <sup>12</sup>	50-69	2001-03	Initial: 92.7 (75.7-100.0)	Initial: 78.9 (64.6-95.0)
			Subsequent: 87.3 (80.9-94.0)	Subsequent: 74.0 (68.6-79.7)
		2004-06	Initial: 96.6 (77.7-100.0)	Initial: 79.3 (64.2-96.4)
			Subsequent: 87.9 (81.7-94.5)	Subsequent: 74.2 (68.9-79.7)
<i>Trial</i>				
Sweden (Two County) <sup>1</sup>	50-69	1990	All: 82.1 (74.8-88.1)	All: 79.9 (74.8-84.3)



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## APPENDIX

**Table A1.** First-year (<12 months) interval breast cancers after an initial or subsequent screen by age-group and BreastScreen Lead Provider, BSA programme, 1999–2007

Age group (yr)	Initial Screens				Subsequent Screens				All Screens			
	Interval cancers	Women screened	Rate/10,000 screened (95% CI)		Interval cancers	Women screened	Rate/10,000 screened (95% CI)		Interval cancers	Women screened	Rate/10,000 screened (95% CI)	
<i>BSAL</i>												
45-49	6	7,987	7.6	(3.5-16.5)	0	283	0.0	(0.0-134)	6	8,270	7.3	(3.3-15.9)
50-54	37	48,792	7.6	(5.5-10.5)	19	32,008	6.0	(3.8-9.3)	56	80,800	7.0	(5.4-9.0)
55-59	12	22,690	5.3	(3.0-9.3)	26	46,653	5.6	(3.8-8.2)	38	69,343	5.5	(4.0-7.6)
60-64	8	17,537	4.6	(2.3-9.1)	18	37,564	4.8	(3.0-7.6)	26	55,101	4.7	(3.2-7.0)
65+	0	1,626	0.0	(0.0-23.8)	2	11,041	1.8	(0.5-6.6)	2	12,667	1.6	(0.4-5.8)
All <sup>1</sup>	63	98,632	6.4	(5.0-8.2)	65	127,549	5.1	(4.0-6.50)	128	226,181	5.7	(4.8-6.8)
<i>BSC</i>												
45-49	6	8,740	6.9	(3.2-15.0)	1	1,435	7.0	(1.2-39.6)	7	10,175	6.9	(3.3-14.2)
50-54	19	19,654	9.7	(6.2-15.2)	6	16,167	3.7	(1.7-8.1)	25	35,821	7.0	(4.7-10.3)
55-59	6	8,665	7.0	(3.2-15.2)	15	23,853	6.3	(3.8-10.4)	21	32,518	6.5	(4.2-9.9)
60-64	1	6,430	1.6	(0.3-8.9)	12	19,248	6.3	(3.6-11.0)	13	25,678	5.1	(3.0-8.7)
65+	0	657	0.0	(0.0-59.0)	4	9,004	4.5	(1.7-11.5)	4	9,661	4.2	(1.6-10.7)
All <sup>1</sup>	32	44,146	7.3	(5.2-10.3)	38	69,707	5.5	(4.0-7.5)	70	113,853	6.2	(4.9-7.8)
<i>BSCC</i>												
45-49	7	10,510	6.7	(3.2-13.8)	2	1,662	12.1	(3.3-43.9)	9	12,172	7.4	(3.9-14.1)
50-54	16	23,722	6.8	(4.2-11.0)	11	19,674	5.6	(3.1-10.0)	27	43,396	6.2	(4.3-9.1)
55-59	6	10,228	5.9	(2.7-12.9)	22	28,850	7.7	(5.1-11.6)	28	39,078	7.2	(5.0-10.4)
60-64	10	8,501	11.9	(6.5-21.9)	17	24,718	6.9	(4.3-11.1)	27	33,219	8.2	(5.6-11.9)
65+	0	828	0.0	(0.0-46.6)	4	11,573	3.5	(1.4-8.9)	4	12,401	3.2	(1.3-8.3)
All <sup>1</sup>	39	53,789	7.3	(5.3-10.0)	56	86,477	6.5	(5.0-8.4)	95	140,266	6.8	(5.6-8.3)
<i>BSCM</i>												
45-49	3	5,706	5.3	(1.8-15.5)	0	241	0.0	(0.0-158)	3	5,947	5.1	(1.7-14.9)
50-54	2	3,780	5.3	(1.5-19.4)	1	3,623	2.8	(0.5-15.7)	3	7,403	4.1	(1.4-12.0)
55-59	1	899	11.2	(2.0-63.1)	2	6,235	3.2	(0.9-11.7)	3	7,134	4.2	(1.4-12.4)
60-64	1	609	16.5	(2.9-92.9)	2	5,365	3.7	(1.0-13.6)	3	5,974	5.0	(1.7-14.8)
65+	0	405	0.0	(0.0-95.6)	1	3,823	2.6	(0.5-14.9)	1	4,228	2.4	(0.4-13.5)
All <sup>1</sup>	7	11,399	6.2	(3.0-12.7)	6	19,287	3.1	(1.4-6.8)	13	30,686	4.3	(2.5-7.3)
<i>BSHC</i>												
45-49	5	6,865	7.3	(3.1-17.1)	2	1,337	15.0	(4.1-54.5)	7	8,202	8.6	(4.1-17.7)
50-54	3	12,140	2.5	(0.8-7.3)	8	16,587	4.8	(2.4-9.5)	11	28,727	3.8	(2.1-6.9)
55-59	1	1,324	7.6	(1.3-42.9)	14	23,725	5.9	(3.5-9.9)	15	25,049	6.0	(3.6-9.9)
60-64	0	693	0.0	(0.0-55.9)	20	20,818	9.6	(6.2-14.9)	20	21,511	9.3	(6.0-14.4)
65+	0	113	0.0	(0.0-335)	5	6,693	7.5	(3.2-17.6)	5	6,806	7.4	(3.2-17.3)
All <sup>1</sup>	9	21,135	4.3	(2.2-8.1)	49	69,160	7.1	(5.4-9.4)	58	90,295	6.4	(5.0-8.3)
<i>BSM</i>												
45-49	8	13,101	6.1	(3.1-12.1)	4	2,163	18.5	(7.2-47.5)	12	15,264	7.9	(4.5-13.8)
50-54	18	23,681	7.6	(4.8-12.1)	18	24,329	7.4	(4.7-11.7)	36	48,010	7.5	(5.4-10.4)
55-59	9	7,524	12.0	(6.3-22.8)	33	38,338	8.6	(6.2-12.1)	42	45,862	9.2	(6.8-12.4)
60-64	3	5,761	5.2	(1.8-15.4)	27	36,180	7.5	(5.2-10.9)	30	41,941	7.2	(5.0-10.3)
65+	0	653	0.0	(0.0-58.8)	6	15,405	3.9	(1.8-8.6)	6	16,058	3.8	(1.7-8.2)
All <sup>1</sup>	38	50,720	7.5	(5.5-10.3)	88	116,415	7.6	(6.2-9.4)	126	167,135	7.6	(6.4-9.0)
<i>BSSL</i>												
45-49	20	24,269	8.3	(5.3-12.8)	4	2,941	13.6	(5.3-35.0)	24	27,210	8.8	(5.9-13.2)
50-54	23	40,642	5.7	(3.8-8.5)	25	42,104	6.0	(4.0-8.8)	48	82,746	5.8	(4.4-7.7)
55-59	12	15,709	7.7	(4.4-13.4)	25	52,354	4.8	(3.2-7.1)	37	68,063	5.5	(4.0-7.5)
60-64	9	12,920	7.0	(3.7-13.3)	26	42,336	6.2	(4.2-9.0)	35	55,256	6.4	(4.6-8.9)
65+	0	1,212	0.0	(0.0-32.1)	16	19,925	8.1	(5.0-13.1)	16	21,137	7.6	(4.7-12.4)
All	64	94,752	6.8	(5.3-8.7)	96	159,660	6.0	(4.9-7.4)	160	254,412	6.3	(5.4-7.4)
<i>BSWN</i>												
45-49	6	11,057	5.4	(2.5-11.9)	0	743	0.0	(0.0-51.5)	6	11,800	5.1	(2.3-11.1)
50-54	7	5,380	13.1	(6.3-27.0)	3	6,159	4.9	(1.7-14.4)	10	11,539	8.7	(4.7-16.0)
55-59	0	1,476	0.0	(0.0-26.2)	2	10,222	2.0	(0.5-7.2)	2	11,698	1.7	(0.5-6.3)
60-64	1	978	10.4	(1.8-58.8)	6	8,860	6.8	(3.1-14.9)	7	9,838	7.2	(3.5-14.8)
65+	0	780	0.0	(0.0-49.4)	4	6,476	6.2	(2.4-15.9)	4	7,256	5.5	(2.2-14.2)
All	14	19,671	15.3	(4.3-12.0)	15	32,460	4.6	(2.8-7.7)	29	52,131	5.6	(3.9-8.0)

<sup>1</sup> Includes 45-49 year women who screened

**Table A2.** Second-year (12-24 months) interval breast cancers after an initial or subsequent screen by age-group and BreastScreen Lead Provider, BSA programme, 1999–2007

Age group (yr)	Initial Screens			Subsequent Screens			All Screens					
	Interval cancers	Women screened	Rate/10,000 screened (95% CI)	Interval cancers	Women screened	Rate/10,000 screened (95% CI)	Interval cancers	Women screened	Rate/10,000 screened (95% CI)			
<i>BSAL</i>												
45-49	10	7,987	12.6 (6.8-23.2)	0	283	0.0 (0.0-134)	10	8,270	12.2 (6.6-22.4)			
50-54	59	48,792	12.2 (9.4-15.7)	41	32,008	12.8 (9.5-17.4)	100	80,800	12.4 (10.2-15.1)			
55-59	38	22,690	16.9 (12.3-23.1)	54	46,653	11.6 (8.9-15.2)	92	69,343	13.3 (10.9-16.3)			
60-64	18	17,537	10.4 (6.5-16.4)	47	37,564	12.6 (9.5-16.7)	65	55,101	11.9 (9.3-15.1)			
65+	2	1,626	12.4 (3.4-45.2)	13	11,041	11.8 (6.9-20.3)	15	12,667	11.9 (7.2-19.7)			
All <sup>1</sup>	127	98,632	13.0 (10.9-15.4)	155	127,549	12.2 (10.4-14.3)	282	226,181	12.5 (11.2-14.1)			
<i>BSC</i>												
45-49	4	8,740	4.6 (1.8-11.8)	2	1,435	14.0 (3.8-51.0)	6	10,175	5.9 (2.7-12.9)			
50-54	20	19,654	10.2 (6.6-15.8)	9	16,167	5.6 (2.9-10.6)	29	35,821	8.1 (5.7-11.7)			
55-59	10	8,665	11.6 (6.3-21.4)	27	23,853	11.4 (7.8-16.5)	37	32,518	11.4 (8.3-15.8)			
60-64	7	6,430	11.0 (5.3-22.7)	12	19,248	6.3 (3.6-11.0)	19	25,678	7.4 (4.8-11.6)			
65+	2	657	30.9 (8.5-112)	8	9,004	8.9 (4.5-17.6)	10	9,661	10.4 (5.7-19.2)			
All <sup>1</sup>	43	44,146	9.8 (7.3-13.2)	58	69,707	8.4 (6.5-10.8)	101	113,853	8.9 (7.3-10.8)			
<i>BSCC</i>												
45-49	17	10,510	16.2 (10.1-26.0)	3	1,662	18.1 (6.2-53.1)	20	12,172	16.5 (10.7-25.4)			
50-54	42	23,722	17.8 (13.2-24.0)	22	19,674	11.2 (7.4-17.0)	64	43,396	14.8 (11.6-18.9)			
55-59	17	10,228	16.8 (10.5-26.8)	36	28,850	12.5 (9.1-17.3)	53	39,078	13.6 (10.4-17.8)			
60-64	17	8,501	20.2 (12.6-32.3)	38	24,718	15.5 (11.3-21.2)	55	33,219	16.7 (12.8-21.7)			
65+	3	828	36.5 (12.4-107)	18	11,573	15.6 (9.9-24.7)	21	12,401	17.0 (11.1-26.0)			
All <sup>1</sup>	96	53,789	17.9 (14.7-21.9)	117	86,477	13.6 (11.3-16.3)	213	140,266	15.3 (13.3-17.4)			
<i>BSCM</i>												
45-49	6	5,706	10.5 (4.8-23.9)	0	241	0.0 (0.0-158)	6	5,947	10.1 (4.6-22.1)			
50-54	3	3,780	8.0 (2.7-23.4)	5	3,623	13.8 (5.9-32.4)	8	7,403	10.9 (5.5-21.4)			
55-59	0	899	0.0 (0.0-42.8)	4	6,235	6.4 (2.5-16.5)	4	7,134	5.6 (2.2-14.5)			
60-64	1	609	16.5 (2.9-92.9)	3	5,365	5.6 (1.9-16.5)	4	5,974	6.7 (2.6-17.3)			
65+	0	405	0.0 (0.0-95.6)	8	3,823	21.1 (10.7-41.5)	8	4,228	19.1 (9.7-37.6)			
All <sup>1</sup>	10	11,399	8.8 (4.8-16.2)	20	19,287	10.4 (6.7-16.1)	30	30,686	9.8 (6.9-14.0)			
<i>BSHC</i>												
45-49	8	6,865	11.7 (5.9-23.0)	2	1,337	15.0 (4.1-54.5)	10	8,202	12.2 (6.6-22.5)			
50-54	9	12,140	7.4 (3.9-14.1)	17	16,587	10.3 (6.4-16.4)	26	28,727	9.1 (6.2-13.3)			
55-59	3	1,324	22.8 (7.7-66.8)	24	23,725	10.2 (6.8-15.1)	27	25,049	10.8 (7.4-15.7)			
60-64	0	693	0.0 (0.0-55.9)	23	20,818	11.1 (7.4-16.6)	23	21,511	10.7 (7.2-16.1)			
65+	0	113	0.0 (0.0-335)	10	6,693	15.0 (8.2-27.6)	10	6,806	14.8 (8.0-27.2)			
All <sup>1</sup>	20	21,135	9.5 (6.2-14.7)	76	69,160	11.0 (8.8-13.8)	96	90,295	10.7 (8.7-13.0)			
<i>BSM</i>												
45-49	25	13,101	19.1 (13.0-28.3)	5	2,163	23.1 (9.9-54.1)	30	15,264	19.7 (13.8-28.1)			
50-54	44	23,681	18.7 (13.9-25.1)	33	24,329	13.6 (9.7-19.1)	77	48,010	16.1 (12.9-20.1)			
55-59	16	7,524	21.4 (13.2-34.7)	53	38,338	13.9 (10.6-18.1)	69	45,862	15.1 (11.9-19.1)			
60-64	6	5,761	10.5 (4.8-22.9)	44	36,180	12.2 (9.1-16.4)	50	41,941	12.0 (9.1-15.8)			
65+	0	653	0.0 (0.0-58.8)	21	15,405	13.7 (9.0-21.0)	21	16,058	13.2 (8.6-20.1)			
All <sup>1</sup>	91	50,720	18.0 (14.7-22.1)	156	116,415	13.5 (11.5-15.7)	247	167,135	14.8 (13.1-16.8)			
<i>BSSL</i>												
45-49	29	24,269	12.0 (8.3-17.2)	4	2,941	13.6 (5.3-35.0)	33	27,210	12.2 (8.7-17.1)			
50-54	48	40,642	11.9 (9.0-15.7)	46	42,104	11.0 (8.2-14.6)	94	82,746	11.4 (9.3-14.0)			
55-59	24	15,709	15.4 (10.3-22.9)	53	52,354	10.2 (7.8-13.3)	77	68,063	11.4 (9.1-14.2)			
60-64	22	12,920	17.2 (11.3-26.0)	53	42,336	12.6 (9.6-16.5)	75	55,256	13.7 (10.9-17.1)			
65+	1	1,212	8.4 (1.5-47.4)	19	19,925	9.6 (6.1-15.0)	20	21,137	9.5 (6.2-14.7)			
All	124	94,752	13.2 (11.0-15.7)	175	159,660	11.0 (9.5-12.8)	299	254,412	11.8 (10.5-13.2)			
<i>BSWN</i>												
45-49	17	11,057	15.4 (9.6-24.7)	3	743	40.4 (13.8-118)	20	11,800	17.0 (11.0-26.3)			
50-54	4	5,380	7.5 (2.9-19.2)	9	6,159	14.7 (7.7-27.8)	13	11,539	11.3 (6.6-19.3)			
55-59	5	1,476	34.1 (14.6-79.6)	15	10,222	14.7 (8.9-24.3)	20	11,698	17.2 (11.1-26.5)			
60-64	0	978	0.0 (0.0-39.9)	13	8,860	14.8 (8.6-25.2)	13	9,838	13.3 (7.8-22.8)			
65+	4	780	51.7 (20.1-132)	7	6,476	10.9 (5.3-22.4)	11	7,256	15.2 (8.5-27.3)			
All	30	19,671	15.3 (10.7-21.9)	47	32,460	14.5 (10.9-19.3)	77	52,131	14.8 (11.9-18.5)			

<sup>1</sup> Includes 45-49 year women who screened

**Table A3.** First-year (<12 months) programme sensitivity (%) after an initial or subsequent screen by age-group and BreastScreen Lead Provider, BSA Programme, 1999–2007

Age group (yr)	Initial Screens			Subsequent Screens			All Screens					
	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)			
<i>BSAL</i>												
45-49	6	43	87.8 (75.8-94.3)	0	0	-	-	6	43	87.8 (75.8-94.3)		
50-54	37	248	87.0 (82.6-90.4)	19	87	82.1 (73.7-88.2)		56	335	85.7 (81.9-88.8)		
55-59	12	164	93.2 (88.5-96.1)	26	166	86.5 (80.9-90.6)		38	330	89.7 (86.1-92.4)		
60-64	8	149	94.9 (90.3-97.4)	18	180	90.9 (86.1-94.2)		26	329	92.7 (89.5-95.0)		
65+	0	17	100.0 (81.6-100)	2	65	97.0 (89.8-99.2)		2	82	97.6 (91.7-99.3)		
All <sup>1</sup>	63	621	90.8 (88.4-92.7)	65	498	88.5 (85.6-90.8)		128	1119	89.7 (87.9-91.3)		
<i>BSC</i>												
45-49	6	30	83.3 (68.1-92.1)	1	8	88.9 (56.5-98.0)		7	38	84.4 (71.2-92.3)		
50-54	19	85	81.7 (73.2-88.0)	6	56	90.3 (80.5-95.5)		25	141	84.9 (78.7-89.6)		
55-59	6	60	90.9 (81.6-95.8)	15	88	85.4 (77.4-91.0)		21	148	87.6 (81.8-91.7)		
60-64	1	58	98.3 (91.0-99.7)	12	114	90.5 (84.1-94.5)		13	172	93.0 (88.3-95.8)		
65+	0	10	100.0 (72.2-100)	4	53	93.0 (83.3-97.2)		4	63	94.0 (85.6-97.7)		
All <sup>1</sup>	32	243	88.4 (84.0-91.6)	38	319	89.4 (85.7-92.1)		70	562	88.9 (86.2-91.1)		
<i>BSCC</i>												
45-49	7	28	80.0 (64.1-90.0)	2	4	66.7 (30.0-90.3)		9	32	78.0 (63.3-88.0)		
50-54	16	97	85.8 (78.2-91.1)	11	60	84.5 (74.3-91.1)		27	157	85.3 (79.5-89.7)		
55-59	6	80	93.0 (85.6-96.8)	22	113	83.7 (76.6-89.0)		28	193	87.3 (82.3-91.1)		
60-64	10	82	89.1 (81.1-94.0)	17	138	89.0 (83.1-93.0)		27	220	89.1 (84.6-92.4)		
65+	0	7	100.0 (64.6-100)	4	69	94.5 (86.7-97.8)		4	76	95.0 (87.8-98.0)		
All <sup>1</sup>	39	294	88.3 (84.4-91.3)	56	384	87.3 (83.8-90.1)		95	678	87.7 (85.2-89.8)		
<i>BSCM</i>												
45-49	3	18	85.7 (65.4-95.0)	0	2	100.0 (34.2-100)		3	20	87.0 (67.9-95.5)		
50-54	2	22	91.7 (74.2-97.7)	1	11	91.7 (64.6-98.5)		3	33	91.7 (78.2-97.1)		
55-59	1	5	83.3 (43.6-97.0)	2	16	88.9 (67.2-96.9)		3	21	87.5 (69.0-95.7)		
60-64	1	3	75.0 (30.1-95.4)	2	24	92.3 (75.9-97.9)		3	27	90.0 (74.4-96.5)		
65+	0	7	100.0 (64.6-100)	1	23	95.8 (79.8-99.3)		1	30	96.8 (83.8-99.4)		
All <sup>1</sup>	7	55	88.7 (78.5-94.4)	6	76	92.7 (84.9-96.6)		13	131	91.0 (85.2-94.6)		
<i>BSHC</i>												
45-49	5	19	79.2 (59.5-90.8)	2	2	50.0 (15.0-85.0)		7	21	75.0 (56.6-87.3)		
50-54	3	50	94.3 (84.6-98.1)	8	39	83.0 (69.9-91.1)		11	89	89.0 (81.4-93.7)		
55-59	1	7	87.5 (52.9-97.8)	14	86	86.0 (77.9-91.5)		15	93	86.1 (78.3-91.4)		
60-64	0	10	100.0 (72.2-100)	20	82	80.4 (71.6-86.9)		20	92	82.1 (74.0-88.1)		
65+	0	2	100.0 (34.2-100)	5	33	86.8 (72.7-94.2)		5	35	87.5 (73.9-94.5)		
All <sup>1</sup>	9	88	90.7 (83.3-95.0)	49	242	83.2 (78.4-87.0)		58	330	85.1 (81.2-88.3)		
<i>BSM</i>												
45-49	8	46	85.2 (73.4-92.3)	4	3	42.9 (15.8-75.0)		12	49	80.3 (68.7-88.4)		
50-54	18	126	87.5 (81.1-91.9)	18	96	84.2 (76.4-89.8)		36	222	86.0 (81.3-89.7)		
55-59	9	38	80.9 (67.5-89.6)	33	139	80.8 (74.3-86.0)		42	177	80.8 (75.1-85.5)		
60-64	3	43	93.5 (82.5-97.8)	27	176	86.7 (81.3-90.7)		30	219	88.0 (83.3-91.4)		
65+	0	4	100.0 (51.0-100)	6	104	94.5 (88.6-97.5)		6	108	94.7 (89.0-97.6)		
All <sup>1</sup>	38	257	87.1 (82.8-90.5)	88	518	85.5 (82.4-88.1)		126	775	86.0 (83.6-88.1)		
<i>BSSL</i>												
45-49	20	55	73.3 (62.4-82.0)	4	4	50.0 (21.5-78.5)		24	59	71.1 (60.6-79.7)		
50-54	23	186	89.0 (84.0-92.6)	25	140	84.8 (78.6-89.5)		48	326	87.2 (83.4-90.2)		
55-59	12	107	89.9 (83.2-94.1)	25	174	87.4 (82.1-91.3)		37	281	88.4 (84.4-91.4)		
60-64	9	107	92.2 (85.9-95.9)	26	217	89.3 (84.8-92.6)		35	324	90.3 (86.7-92.9)		
65+	0	20	100.0 (83.9-100)	16	130	89.0 (82.9-93.1)		16	150	90.4 (84.9-94.0)		
All	64	475	88.1 (85.1-90.6)	96	665	87.4 (84.8-89.6)		160	1140	87.7 (85.8-89.4)		
<i>BSWN</i>												
45-49	6	44	88.0 (76.2-94.4)	0	1	100.0 (20.7-100)		6	45	88.2 (76.6-94.5)		
50-54	7	30	81.1 (65.8-90.5)	3	17	85.0 (64.0-94.8)		10	47	82.5 (70.6-90.2)		
55-59	0	11	100.0 (74.1-100)	2	35	94.6 (82.3-98.5)		2	46	95.8 (86.0-98.8)		
60-64	1	18	94.7 (75.4-99.1)	6	55	90.2 (80.2-95.4)		7	73	91.3 (83.0-95.7)		
65+	0	6	100.0 (61.0-100)	4	27	87.1 (71.1-94.9)		4	33	89.2 (75.3-95.7)		
All	14	109	88.6 (81.8-93.1)	15	135	90.0 (84.2-93.8)		29	244	89.4 (85.2-92.5)		

**Table A4.** Second-year (12-24 months) programme sensitivity (%) after an initial or subsequent screen by age-group and BreastScreen Lead Provider, BSA Programme, 1999–2007

Age group (yr)	Initial Screens			Subsequent Screens			All Screens					
	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)	Inter-val cancers	Screen detected	Sensitivity (95% CI)			
<i>BSAL</i>												
45-49	10	43	81.1 (68.6-89.4)	0	0	-	10	43	81.1 (68.6-89.4)			
50-54	59	248	80.8 (76.0-84.8)	41	87	68.0 (59.5-75.4)	100	335	77.0 (72.8-80.7)			
55-59	38	164	81.2 (75.2-86.0)	54	166	75.5 (69.4-80.7)	92	330	78.2 (74.0-81.9)			
60-64	18	149	89.2 (83.6-93.1)	47	180	79.3 (73.6-84.1)	65	329	83.5 (79.5-86.8)			
65+	2	17	89.5 (68.6-97.1)	13	65	83.3 (73.5-90.0)	15	82	84.5 (76.0-90.4)			
All <sup>1</sup>	127	621	83.0 (80.2-85.5)	155	498	76.3 (72.9-79.4)	282	1119	79.9 (77.7-81.9)			
<i>BSC</i>												
45-49	4	30	88.2 (73.4-95.3)	2	8	80.0 (49.0-94.3)	6	38	86.4 (73.3-93.6)			
50-54	20	85	81.0 (72.4-87.3)	9	56	86.2 (75.7-92.5)	29	141	82.9 (76.6-87.9)			
55-59	10	60	85.7 (75.7-92.1)	27	88	76.5 (68.0-83.3)	37	148	80.0 (73.7-85.1)			
60-64	7	58	89.2 (79.4-94.7)	12	114	90.5 (84.1-94.5)	19	172	90.1 (85.0-93.5)			
65+	2	10	83.3 (55.2-95.3)	8	53	86.9 (76.2-93.2)	10	63	86.3 (76.6-92.4)			
All <sup>1</sup>	43	243	85.0 (80.4-88.6)	58	319	84.6 (80.6-87.9)	101	562	84.8 (81.8-87.3)			
<i>BSCC</i>												
45-49	17	28	62.2 (47.6-74.9)	3	4	57.1 (25.0-84.2)	20	32	61.5 (48.0-73.5)			
50-54	42	97	69.8 (61.7-76.8)	22	60	73.2 (62.7-81.6)	64	157	71.0 (64.7-76.6)			
55-59	17	80	82.5 (73.7-88.8)	36	113	75.8 (68.4-82.0)	53	193	78.5 (72.9-83.1)			
60-64	17	82	82.8 (74.2-89.0)	38	138	78.4 (71.8-83.8)	55	220	80.0 (74.9-84.3)			
65+	3	7	70.0 (39.7-89.2)	18	69	79.3 (69.6-86.5)	21	76	78.4 (69.2-85.4)			
All <sup>1</sup>	96	294	75.4 (70.9-79.4)	117	384	76.6 (72.7-80.1)	213	678	76.1 (73.2-78.8)			
<i>BSCM</i>												
45-49	6	18	75.0 (55.1-88.0)	0	2	100.0 (34.2-100)	6	20	76.9 (57.9-89.0)			
50-54	3	22	88.0 (70.0-95.8)	5	11	68.8 (44.4-85.8)	8	33	80.5 (66.0-89.8)			
55-59	0	5	100.0 (56.6-100)	4	16	80.0 (58.4-91.9)	4	21	84.0 (65.3-93.6)			
60-64	1	3	75.0 (30.1-95.4)	3	24	88.9 (71.9-96.1)	4	27	87.1 (71.1-94.9)			
65+	0	7	100.0 (64.6-100)	8	23	74.2 (56.8-86.3)	8	30	78.9 (63.7-88.9)			
All <sup>1</sup>	10	55	84.6 (73.9-91.4)	20	76	79.2 (70.0-86.1)	30	131	81.4 (74.6-86.6)			
<i>BSHC</i>												
45-49	8	19	70.4 (51.5-84.1)	2	2	50.0 (15.0-85.0)	10	21	67.7 (50.1-81.4)			
50-54	9	50	84.7 (73.5-91.8)	17	39	69.6 (56.7-80.1)	26	89	77.4 (68.9-84.1)			
55-59	3	7	70.0 (39.7-89.2)	24	86	78.2 (69.6-84.9)	27	93	77.5 (69.2-84.1)			
60-64	0	10	100.0 (72.2-100)	23	82	78.1 (69.3-84.9)	23	92	80.0 (71.8-86.3)			
65+	0	2	100.0 (34.2-100)	10	33	76.7 (62.3-86.8)	10	35	77.8 (63.7-87.5)			
All <sup>1</sup>	20	88	81.5 (73.1-87.7)	76	242	76.1 (71.1-80.5)	96	330	77.5 (73.3-81.2)			
<i>BSM</i>												
45-49	25	46	64.8 (53.2-74.9)	5	3	37.5 (13.7-69.4)	30	49	62.0 (51.0-71.9)			
50-54	44	126	74.1 (67.1-80.1)	33	96	74.4 (66.3-81.2)	77	222	74.2 (69.0-78.9)			
55-59	16	38	70.4 (57.2-80.9)	53	139	72.4 (65.7-78.2)	69	177	72.0 (66.0-77.2)			
60-64	6	43	87.8 (75.8-94.3)	44	176	80.0 (74.2-84.8)	50	219	81.4 (76.3-85.6)			
65+	0	4	100.0 (51.0-100)	21	104	83.2 (75.7-88.7)	21	108	83.7 (76.4-89.1)			
All <sup>1</sup>	91	257	73.9 (69.0-78.2)	156	518	76.9 (73.5-79.9)	247	775	75.8 (73.1-78.4)			
<i>BSSL</i>												
45-49	29	55	65.5 (54.8-74.8)	4	4	50.0 (21.5-78.5)	33	59	64.1 (53.9-73.2)			
50-54	48	186	79.5 (73.9-84.2)	46	140	75.3 (68.6-80.9)	94	326	77.6 (73.4-81.3)			
55-59	24	107	81.7 (74.2-87.4)	53	174	76.7 (70.7-81.7)	77	281	78.5 (73.9-82.4)			
60-64	22	107	82.9 (75.5-88.5)	53	217	80.4 (75.2-84.7)	75	324	81.2 (77.1-84.7)			
65+	1	20	95.2 (77.3-99.2)	19	130	87.2 (80.9-91.7)	20	150	88.2 (82.5-92.3)			
All	124	475	79.3 (75.9-82.4)	175	665	79.2 (76.3-81.8)	299	1140	79.2 (77.0-81.2)			
<i>BSWN</i>												
45-49	17	44	72.1 (59.8-81.8)	3	1	25.0 (4.6-69.9)	20	45	69.2 (57.2-79.1)			
50-54	4	30	88.2 (73.4-95.3)	9	17	65.4 (46.2-80.6)	13	47	78.3 (66.4-86.9)			
55-59	5	11	68.8 (44.4-85.8)	15	35	70.0 (56.2-80.9)	20	46	69.7 (57.8-79.4)			
60-64	0	18	100.0 (82.4-100)	13	55	80.9 (70.0-88.5)	13	73	84.9 (75.8-90.9)			
65+	4	6	60.0 (31.3-83.2)	7	27	79.4 (63.2-89.7)	11	33	75.0 (60.6-85.4)			
All	30	109	78.4 (70.9-84.4)	47	135	74.2 (67.4-80.0)	77	244	76.0 (71.1-80.4)			