BREAST CANCER SCREENING

ANNUAL REVIEW 2017



Attendance for breast cancer screening has remained stable. There are, however, regional differences in the nationwide Finnish organised screening programme for breast cancer. To unify the programme, the national and regional steering systems need to be restructured. Additionally, developing further quality assurance for testing outside the programme is needed. In the future, information on social inequalities with respect to screening outcomes should be collected.

SUMMARY

In 2015 381,000 women were invited to breast cancer screening in Finland and 315,000 of them attended, 83% of invited. Approximately 97% of the screened women tested negative, 3% were recalled for further assessment and 0.8% were referred to surgery. Around 9,300 women were recalled for further assessment and 2,000 were diagnosed and treated with invasive breast cancer or carcinoma in situ under the programme. Attendance for breast cancer screening reduces breast cancer mortality on average by 33% compared to the situation without screening.

1. INTRODUCTION

The Finnish breast cancer screening programme started in 1987 and became nationwide in 1992. The aim of the programme is to reduce breast cancer mortality by early detection.

The screening programme includes personal invitations, mammography as primary screening test and, if needed, further assessment (additional mammograms, ultrasound and biopsies) and surgery. Mammograms are taken from two directions for both breasts. Two independent radiologists read and interpret the images. If a tumour is suspected in either of the breasts, a consensus reading is performed.

The results of screening are notified by a personal letter. If further assessment are needed, the screened woman is personally recalled either by letter or phone.

The Finnish municipalities are responsible for organising the screening activities. They choose the screening performer, which can be the municipality itself or a private company. The screening tests are performed in screening units. The units send the screening invitations and perform mammograms and further assessment if needed. Diagnostic confirmation and surgery are performed in special health care. Mammograms and further assessment are free of charge for the screening target population, but an outpatient clinic co-payment is charged for treatments and examinations performed in specialised medical care.

Individual data from all phases of screening episodes are sent in electronic format to the Finnish Cancer Registry for monitoring and evaluation. Monitoring ensures the quality and effectiveness of the programme as well as identifies pertinent issues and bottlenecks in the screening performance.

The breast cancer screening programme's national target population consists of 50–69-year-old women who are invited to screening biennially. From 1992 until 2006, the national target population consisted of only women aged 50–59, and based on Government Decree on Screenings it widened up to 69 during 2007–2016.

The current monitoring report presents figures and tables on the coverage, attendance and results of the screening programme from the whole country and 21 hospital districts for the year 2015 and time series from 1992 onwards. These are based on individual screening invitations and visits derived from the data base of the Finnish Cancer Registry. The information on population counts stems from tabulations of the Population Register Centre.

2. BREAST CANCER SCREENING IN FINLAND

MAIN FINDINGS IN 2015

In 2015 altogether 381,000 invitations were sent and 315,000 women attended to screening (83%, Table 1). The invitational coverage in the national target age group, 50–69 years, was very close to 100% (Table 2). Approximately 97% of the screened women were tested negative and 3% were recalled for further assessment in the screening centre. Around 2,600 women (0.8% of screened) were referred to surgery and further assessment performed in specialised medical care (Table 3). The latter includes histological classification based on core needle biopsy or surgery and other specific examinations. Around 2,000 (0.7% of screened) invasive breast cancers and carcinomas in situ were detected within the programme.

All municipalities sent the screening data to the Finnish Cancer Registry. The histological response is missing for only about 3% of those referred to surgery.

COMPARISON TO EARLIER YEARS

The coverage of screening invitations has increased since 2007 due to the widened target population (Figure 1). Practically all municipalities invite the national target population, women aged 50–69, every two years. Furthermore, a part of municipalities widened the target population up to 69 ahead of time. Meanwhile the attendance for screening has started to decline slightly, from 87% in 2005 to 83% in 2015. The slope of decline has been similar in all age groups.

The average proportion of invitations to further assessment has remained similar over the years (Figure 2). The proportion is higher among the youngest age group of 50–54, partly because of no previous images to compare with. The proportion in this age group has also increased over the past decade (Figure 3). Women in this age group are however referred to surgery, as well as diagnosed with breast cancer, more unlikely than in older age groups (Figure 4, Figure 5). Breast cancer risk increases with age. As the target population widened, the amount of referrals to surgery and malignant findings have increased especially in the age group of 65–69. The increase is probably also due to the fact that this age group was invited to screening after a long break.

3. BREAST CANCER SCREENING BY HEALTH CARE DISTRICT

The invitational coverage and attendance rate vary between the health care districts. In 2011–2015 the range in attendance was 78–88% (Figure 6, Table 4). It is known that the attendance is lower in big cities than in other parts of Finland.

There has also been variation in the screening results (Figure 7, Figure 8, Figure 9, Table 5). The proportion of recalls varied between 1.4 and 4.4%, the proportion of referrals to surgery between 0.5 and 1.0% and the proportion of screen-detected cancers between 0.4% and 0.8%. The regional differences are due to differences in both the background risk and diagnostic criteria.

4. COSTS OF THE SCREENING PROGRAMME

According to the estimation of the Finnish Cancer Registry the average costs of the screening programme were approximately 30 euros per screened woman in 2015. These included e.g. invitations, mammograms, further assessment performed in the screening centres, archiving, and the costs of registration. However, there were regional variation in the screening prices. The total costs of the screening programme, regarding the before mentioned expenditures, is thus estimated to be 10 million euros yearly. The estimation does not include the costs of diagnostics and treatments after the referral.

More than 100,000 mammography examinations are performed outside the screening programme. Mammograms are performed because of a symptom or other indication, sometimes because of a benign transformation, as well as in the diagnostics and surveillance of breast cancer patients. Apparently, mammograms are also performed for symptomless women as a clinical or screening-like examination. The amount of these so called opportunistic tests is unknown. The unit costs of testing outside the programme are estimated to be considerably higher than within the programme.

5. THE BURDEN OF BREAST CANCER AND THE DETECTION MODE

Every year around 5,000 Finnish women are diagnosed with an invasive breast cancer and 400 with carcinoma in situ. The prognosis of breast cancer is good: the 5-year relative survival is as high as 91%. Deaths caused by breast cancer–the prevention of which the screening programme specifically aims to–is slightly over 800 a year. Cancer cases registered as carcinoma in situ cause only a couple of deaths yearly.

All breast cancers diagnosed in 2010–2014 were classified with respect to organized mammography screening. Invitation to organized mammography screening is currently sent to all 50–69-year old women every 20–26 months. The data has been limited to

those municipalities that sent their screening information to the Finnish Cancer Registry.

- "Under target age" have not yet been invited to screening. Most women in this category are under 50 years old.
- "Above target age" have never been invited to screening due to their old age or time since the last invitation exceeds 26 months.
- "Non-participants" have received an invitation within 26 prior to their diagnosis but they had not attended screening.
- "Screen-detected" breast cancers are diagnosed within 6 months of the screening attendance after a positive mammography, referral examination and surgery.
- "Interval cancer" is diagnosed after negative mammography or negative further assessment within 26 months after attendance to screening before next screening, or after negative surgery within 6–26 months after attendance to screening before next screening.
- "Non-registered" breast cancers are diagnosed in women who should have received an invitation to screening but it has not been registered.

About 34% of invasive breast cancers and carcinomas in situ were diagnosed within the screening programme (Figure 10, Figure 11). The proportion will probably continue rising when all women aged 50–69 have entered the programme. About 50% of carcinomas in situ were diagnosed within the programme. This suggests that mammograms are common also outside the programme.

6. THE EFFECT OF ESTABLISHED SCREENING ON BREAST CANCER MORTALITY

In a follow-up study regarding years 1992–2003, organized breast cancer screening decreased breast cancer mortality by 22% compared to a situation without the programme. Breast cancer treatments have improved with time and breast cancer patients survive well. When coming to 2010s, it's therefore essential to evaluate whether screening still decreases breast cancer mortality.

In a study published in 2016, attendance for breast cancer screening between cases and their comparable controls was compared. Cases were due to women aged 50–84 years who had died from their breast cancer. This large and long-term registry study included 1,907 cases and 18,978 controls in 1992–2011. All women in the data had been invited to screening at least once during their life.

Attendance for screening decreased breast cancer mortality by 33% compared to situation without screening (Table 6). Thus, the impact of screening on breast cancer mortality has not changed with time.

7. BENEFITS AND HARMS OF SCREENING

The Finnish breast cancer screening programme reduces mortality from breast cancer among the screening participants (see section 6. The effect of established screening on breast cancer mortality). The coverage of the programme has increased significantly in the past years due to the widening to women aged 60–69 years. Based on this,the decline in breast cancer mortality can be expected also among the older women. A screen-detected tumour is found at an early stage which enables a good response to treatment and that lowers the aggressiveness and harms of the treatments.

Besides these major benefits, screening may also cause harm. In Finland, approxi-

mately one out of six screening participants is needlessly sent for further assessment if they attend screening regularly at ages 50–69 years. Additionally, approximately three out of one thousand women will develop a breast cancer after negative screening test before the next screen. Most of these so called interval cancers develop after the screening so these women were not recalled for further assessment. However, interval cancers are diagnosed also for women who were recalled.

Screen-detected breast cancers tend to be slow-growing and a proportion of them would not have surfaced clinically in the lifetime of an individual without screening. Based on several studies, these so called overdiagnosed carcinomas constitute, however, at maximum 10% of all carcinomas detected by screening.

8. CONCLUSIONS AND RECOMMENDATIONS

Finnish breast cancer screening programme has been effective and the key performance and outcome figures are in line with other countries. However, there are significant differences between different organising units in the quality of diagnostics and the practices used. Thus, the balance between benefits and harms may differ among the screening performers. To unify the programme, the national and regional steering boards need to be restructured. The objective of the steering board could be both to improve the screening programme and also to perform quality assurance for the opportunistic and other testing activity outside the programme.

The quality indicators of service use, diagnostics and screening results should be improved and followed, also taking into account the use of opportunistic services and chains of care. Also, effectiveness and cost-effectiveness of screening should be regularly evaluated.

Screening attendance should also be improved. Invitational practices have a great impact on the attendance rates. Time and place for the screening visit should be indicated in the invitation letter, alternative appointment times should be available, and a reminder letter should be sent to non-attenders.

Quality indicators and effectiveness should be evaluated for the organized screening programme as well as services outside it with respect to socioeconomic status and other variables measuring social inequality. Interesting key performance figures are e.g. coverage, attendance, discoveries, and the integrity of screening and diagnostic episodes. Residential area, municipality type, and distance to health care services could be basis for developing indicators of regional inequality.

Information on prices of screening contracts in organized screening and of mammography used outside the screening programme would be useful for the future evaluation of costs and cost-effectiveness. Chain costs of patient care should also be collected. All opportunistic tests, further assessment and diagnostic confirmation should also be registered to the Finnish Cancer Registry congruently. Data systems in health services should be able to record entire chain of care without any gaps. This would make it possible to trace and report pathways all the way from routine testing until treatment and follow-up.

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LINKS AND PUBLICATIONS

FINNISH CANCER REGISTRY

www.cancer.fi/syoparekisteri

INTERACTIVE SCREENING STATISTICS, 1992–2015

http://tilastot.syoparekisteri.fi/seulonta

ANNUAL STATISTICS

http://www.cancer.fi/syoparekisteri/joukkotarkastusrekisteri/tilastot

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TERMINOLOGY

BIOPSY	Sampling of cells (fine needle aspiration biopsy, involves cytopathology) or a tissue sample (core needle biopsy, involves histopathology) removed from the living body.
CANCER INCIDENCE	The number of new cancer cases per population at risk during a given period.
COVERAGE	Proportion of those invited to screening (invitational coverage) or those attending (screening coverage) of the whole target population.
FALSE POSITIVE SCREENING RESULT	Woman is recalled for further assessment. or referred to surgery but the result is negative (no invasive breast cancer or carcinoma in situ of the breast).
FURTHER ASSESSMENT	E.g. additional mammograms, ultrasound, pneumocystography, galactography, fine needle aspiration biopsy and core needle biopsy, or the combination of some of these.
MALIGNANT FINDING	
CARCINOMA IN SITU	Precancerous tumour of the breast (ICD-10: D05).
INVASIVE CANCER	Breast cancer (ICD-10: C50).
METASTATIC TUMOUR	Breast tumour caused by a cancer that has spread from a different part of the body.
MAMMOGRAPHY EXAM (MAMMOGRAM)	An x-ray of the breast.
MORTALITY	The number of deaths per population at risk during a given period.
OPPORTUNISTIC TESTING	The testing of nonsymptomatic persons outside the organised screening programme (in private or public health care services). Also symptom related testing and patient follow-up is performed outside the screening programme.
OVERDIAGNOSIS	The diagnosis of a cancer or a precancerous tumour that would not affect the person's health during her lifetime.
SCREENING PROCESS	The progression of the screening episode from the definition of the target population and sending invitations all the way to testing, possibly further assessment, treatments and patient follow-up.

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TABLE 1 Invitations and screenings within breast cancer screening programme in 2015.

Age group	Invitations	Screenings	Attendance (%)
50–54	110,797	90,624	82
55–59	76,093	62,812	83
60–64	111,420	92,580	83
65–69	82,975	69,269	83
All	381, 285	315,285	83

TABLE 2 Invitational coverage of breast cancer screening programme in 2014–2015.

Age group	Target population	Invited with the screening round	Invitational coverage (%)
50–54	186,576	185,550	99
55–59	186,161	185,898	100
60–64	191,166	191,176	100
65–69	199,588	181,436	91
All	763,491	744,060	97

TABLE 3 Breast cancer screening results in 2015.

Age group	Screenings	Recall		Core needle biopsy		Referral		Malignant finding	
		n	%	n	%	n	%	n	%
50–54	90,624	3,659	4.0	959	1.1	644	0.7	432	0.5
55–59	62,812	1,531	2.4	471	0.7	442	0.7	359	0.6
60–64	92,580	2,304	2.5	842	0.9	792	0.9	674	0.7
65–69	69,269	1,782	2.6	722	1.0	703	1.0	605	0.9
All	315,285	9,276	2.9	2,994	0.9	2,581	0.8	2,070	0.7

TABLE 4 Invitations and screenings within breast cancer screening programme by health care district in 2011–2015.

Health care district	Invitations	Screening	Attendance (%)
Åland	10,158	8,921	88
Etelä-Karjala	43,730	37,813	86
Etelä-Pohjanmaa	56,718	48,683	86
Etelä-Savo	37,003	31,844	86
Uusimaa	500,795	389,851	78
Itä-Savo	16,196	13,455	83
Kainuu	27,328	23,589	86
Kanta-Häme	51,796	43,394	84
Keski-Pohjanmaa	20,195	16,573	82
Keski-Suomi	76,414	66,390	87
Kymenlaakso	53,438	45,875	86
Lappi	42,929	36,488	85
Länsi-Pohja	22,203	18,732	84
Pirkanmaa	165,493	139,222	84
Pohjois-Karjala	58,552	50,453	86
Pohjois-Pohjanmaa	109,117	93,356	86
Pohjois-Savo	72,049	61,818	86
Päijät-Häme	79,169	66,509	84
Satakunta	74,199	65,168	88
Vaasa	50,087	43,091	86
Varsinais-Suomi	163,503	139,548	85

TABLE 5 Breast cancer screening results by health care district in 2011–2015.

Health care district	Screenings	Recall		Referral		Malignant finding	
		n	%	n	%	n	%
Åland	8,921	163	1.8	47	0.5	44	0.5
Etelä-Karjala	37,813	1,215	3.2	394	1.0	250	0.7
Etelä-Pohjanmaa	48,683	1,458	3.0	328	0.7	261	0.5
Etelä-Savo	31,844	588	1.8	251	0.8	172	0.5
Uusimaa	389,851	10,002	2.6	2,768	0.7	2,494	0.6
Itä-Savo	13,455	260	1.9	100	0.7	77	0.6
Kainuu	23,589	923	3.9	165	0.7	120	0.5
Kanta-Häme	43,394	1,076	2.5	260	0.6	223	0.5
Keski-Pohjanmaa	16,573	367	2.2	109	0.7	68	0.4
Keski-Suomi	66,390	1,285	1.9	382	0.6	299	0.5
Kymenlaakso	45,875	1,470	3.2	447	1.0	329	0.7
Lappi	36,488	1,442	4.0	359	1.0	200	0.5
Länsi-Pohja	18,732	424	2.3	123	0.7	103	0.5
Pirkanmaa	139,222	4,261	3.1	1,273	0.9	1,088	0.8
Pohjois-Karjala	50,453	1,303	2.6	293	0.6	237	0.5
Pohjois-Pohjanmaa	93,356	3,145	3.4	684	0.7	503	0.5
Pohjois-Savo	61,818	2,690	4.4	500	0.8	338	0.5
Päijät-Häme	66,509	1,447	2.2	453	0.7	394	0.6
Satakunta	65,168	895	1.4	436	0.7	325	0.5
Vaasa	43,091	1,027	2.4	306	0.7	227	0.5
Varsinais-Suomi	139,548	4,503	3.2	1,270	0.9	959	0.7

TABLE 6 Effect of attendance for breast cancer screening among invited on breast cancer mortality in 1992–2011. Breast cancers diagnosed after first screening invitation are taken into account.

Age at death	Decrease in breast cancer mortality	95% Confidence interval
50–69	39 %	16–55 %
50–84	33 %	10–51 %

FIGURE 1 Invitational coverage (%) of and attendance (%) at breast cancer screening among women aged 50–69 in 1992-2015.

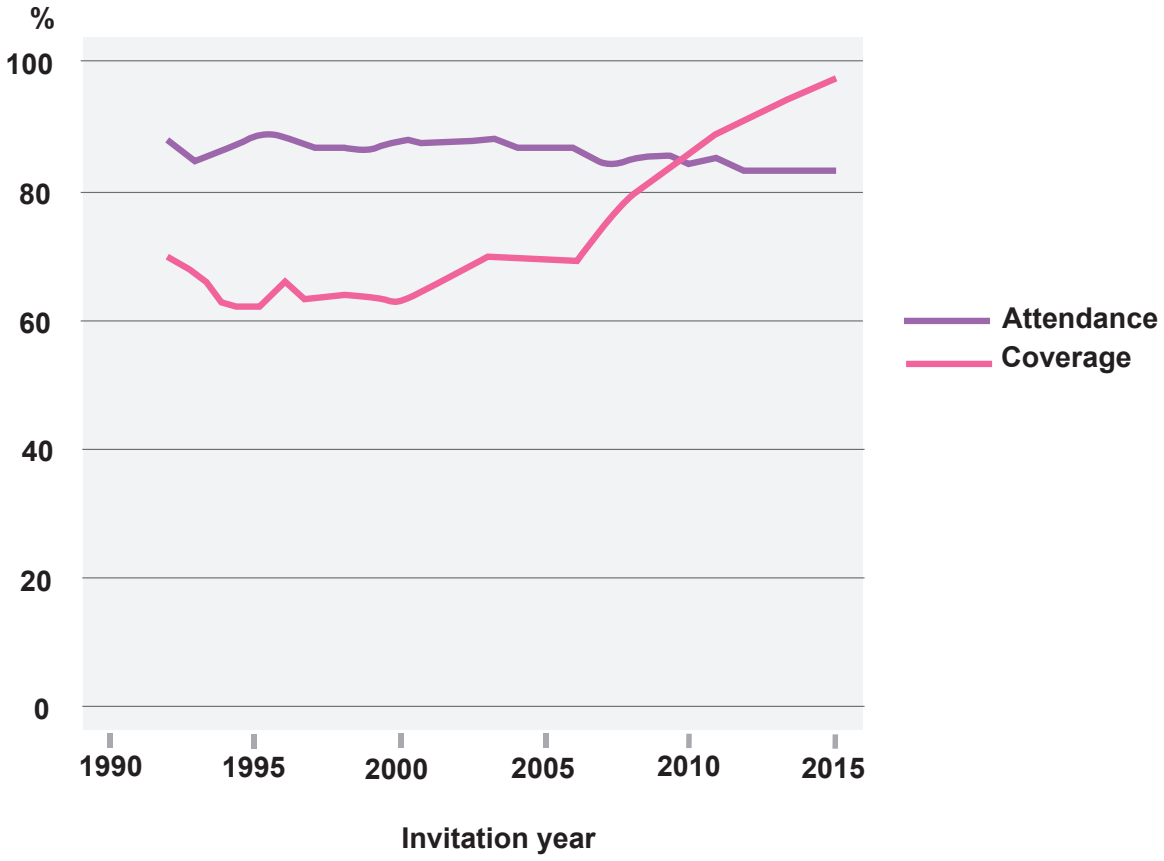


FIGURE 2 Breast cancer screening results for women aged 50–69 in 1992–2015.

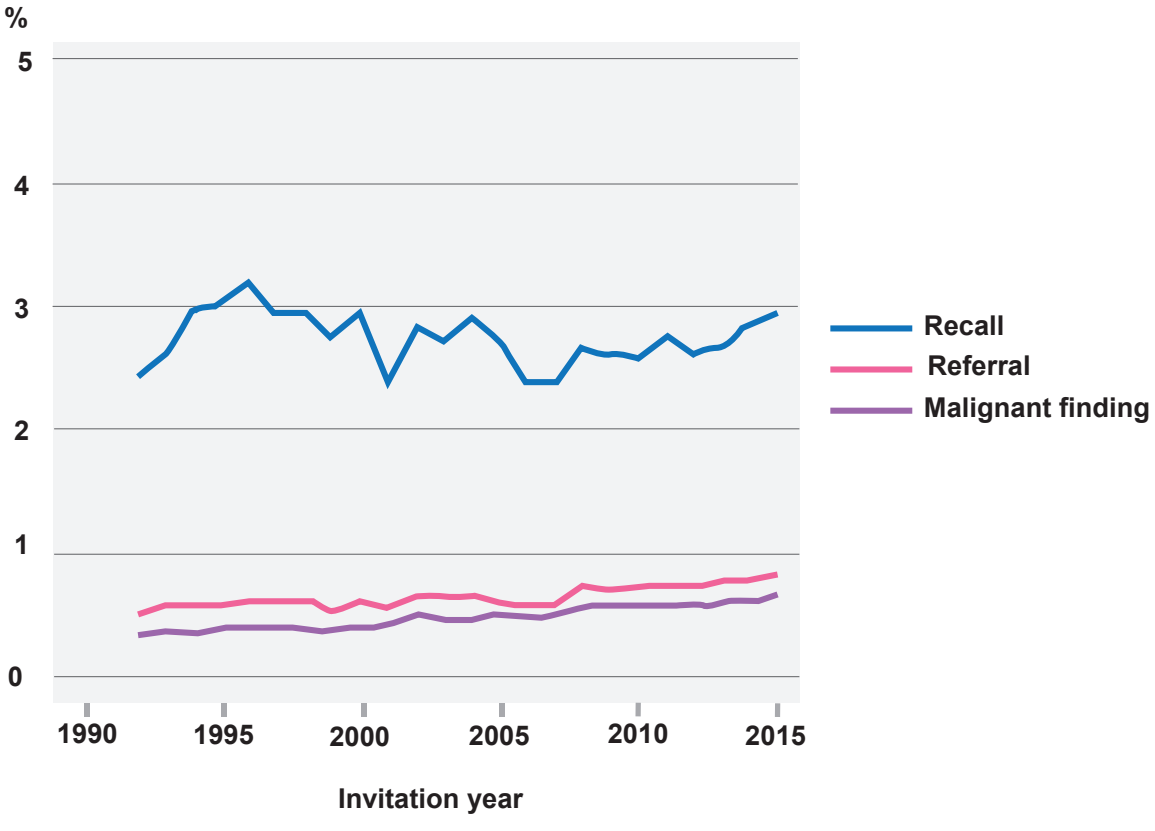


FIGURE 3 Breast cancer screening recalls (%) by age group in 1992–2015.



FIGURE 4 Breast cancer screening referrals (%) by age group in 1992–2015.

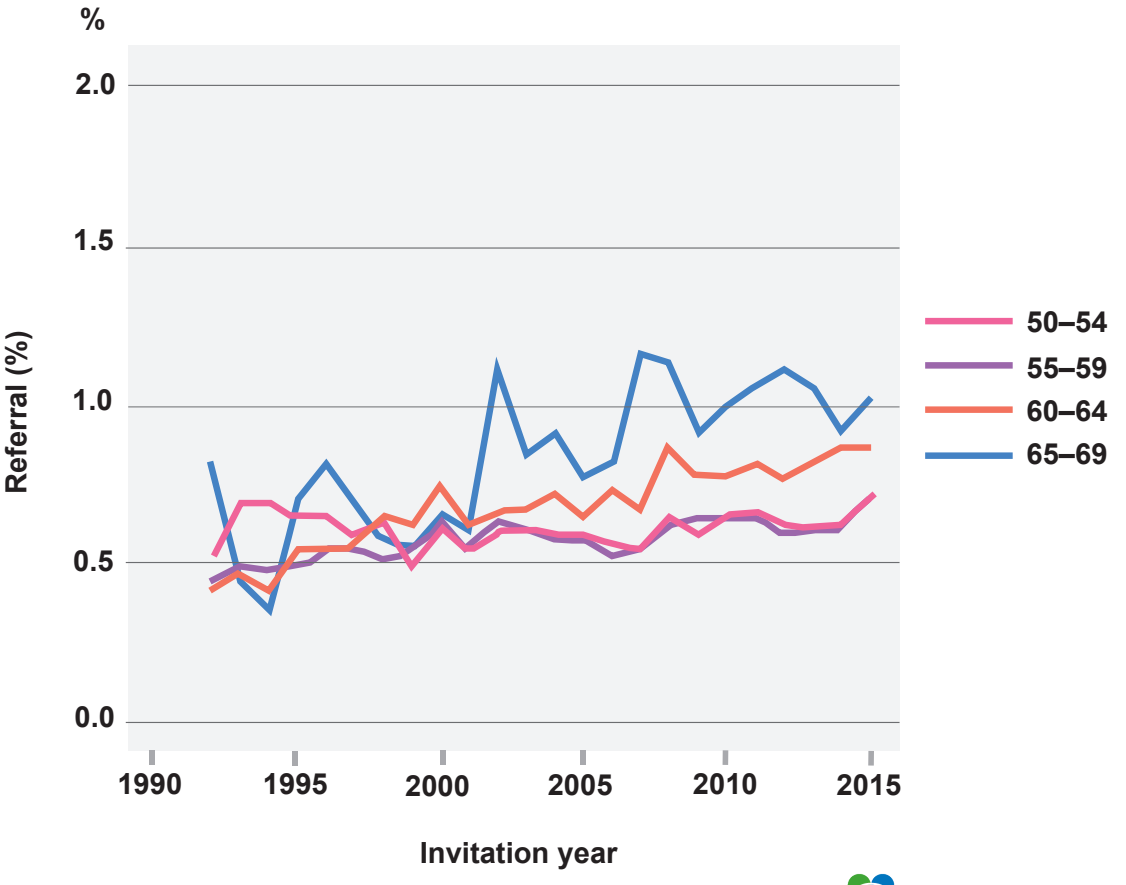


FIGURE 5 Malignant breast cancer screening discoveries (%) by age group in 1992–2015.

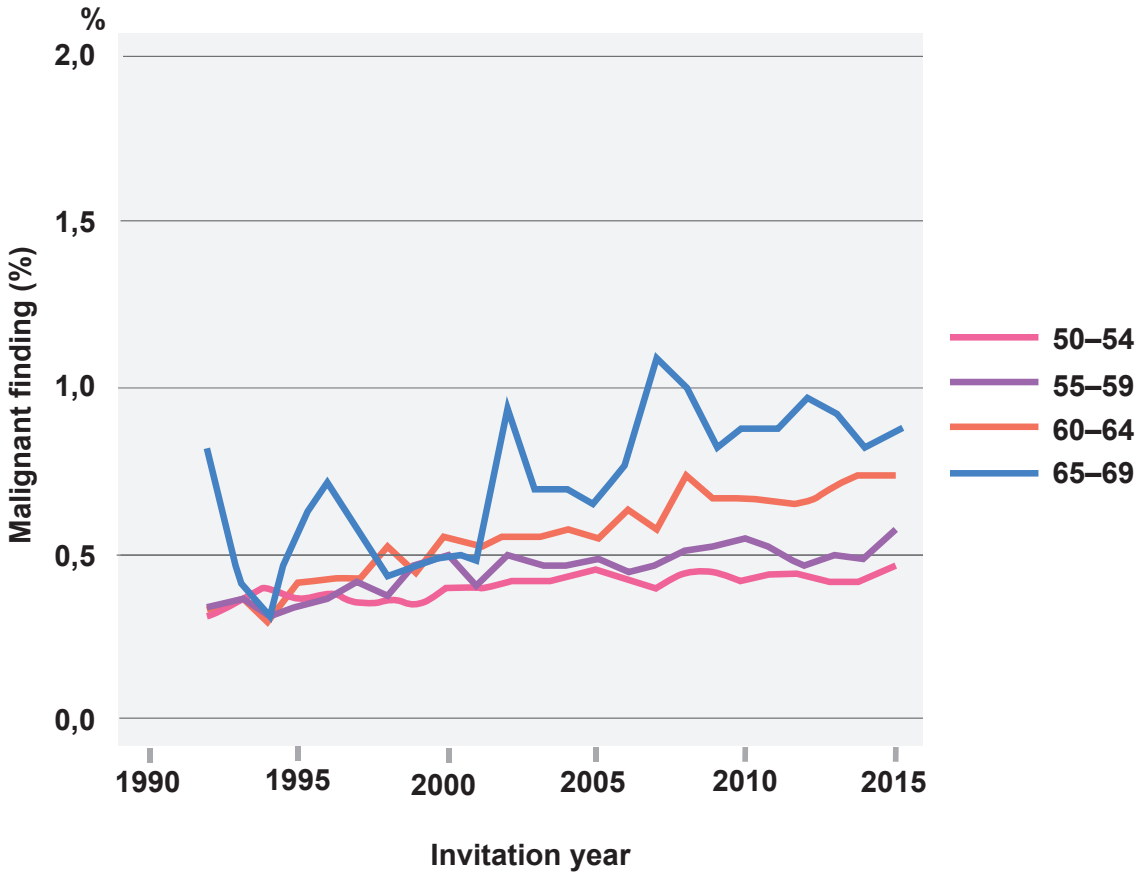


FIGURE 6 Breast cancer screening attendance (%) by health care district in 2011–2015.

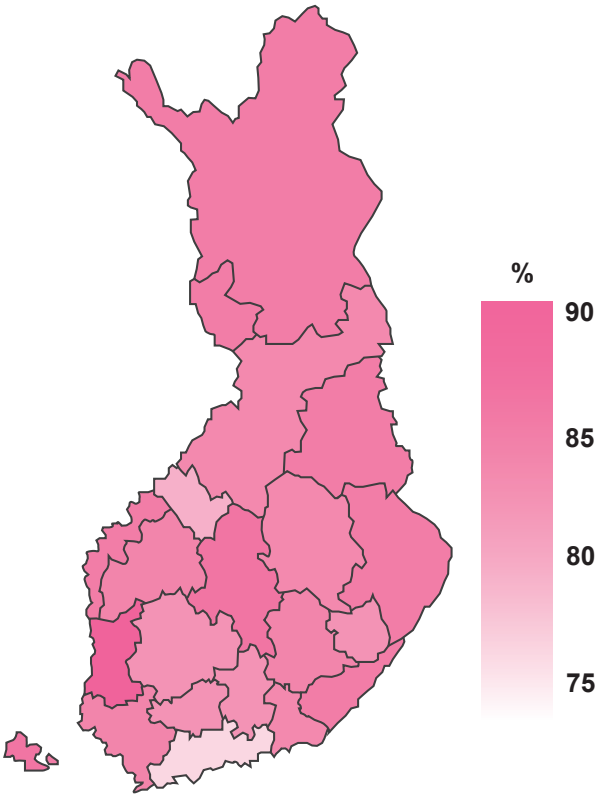


FIGURE 7 Breast cancer screening recalls (%) by health care district in 2011–2015.

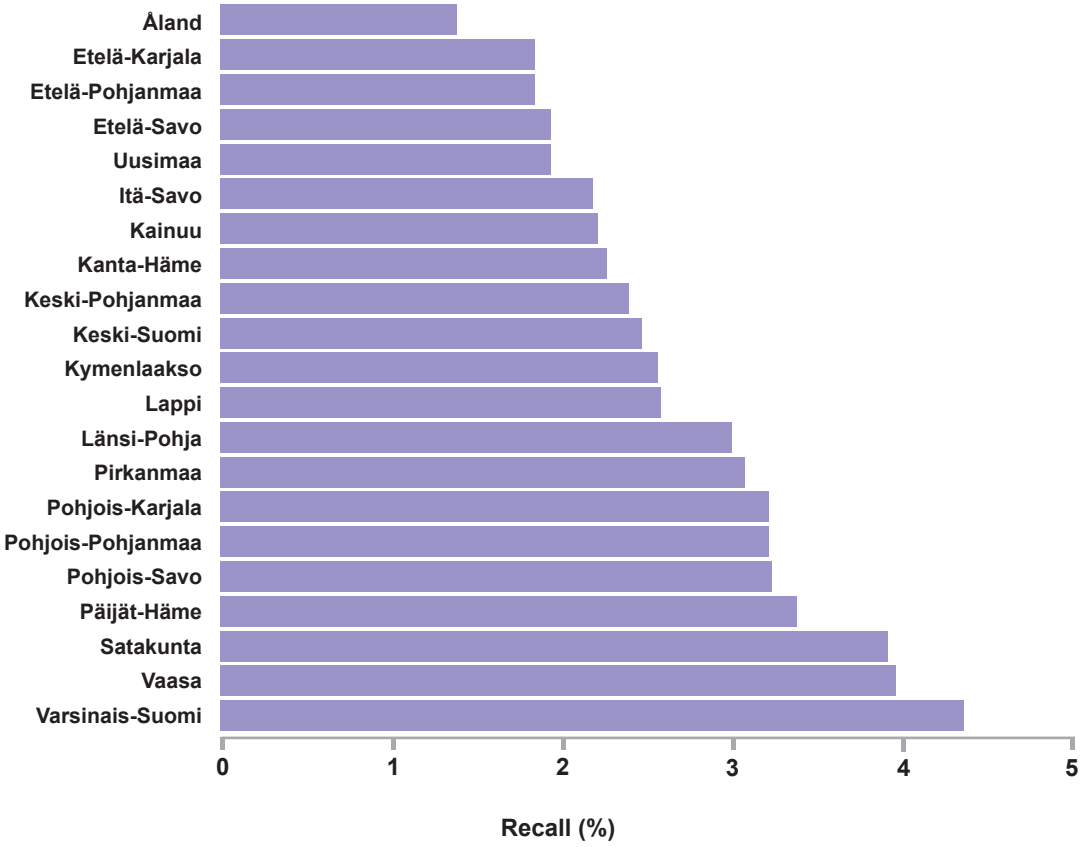


FIGURE 8 Breast cancer screening referrals (%) by health care district in 2011–2015.

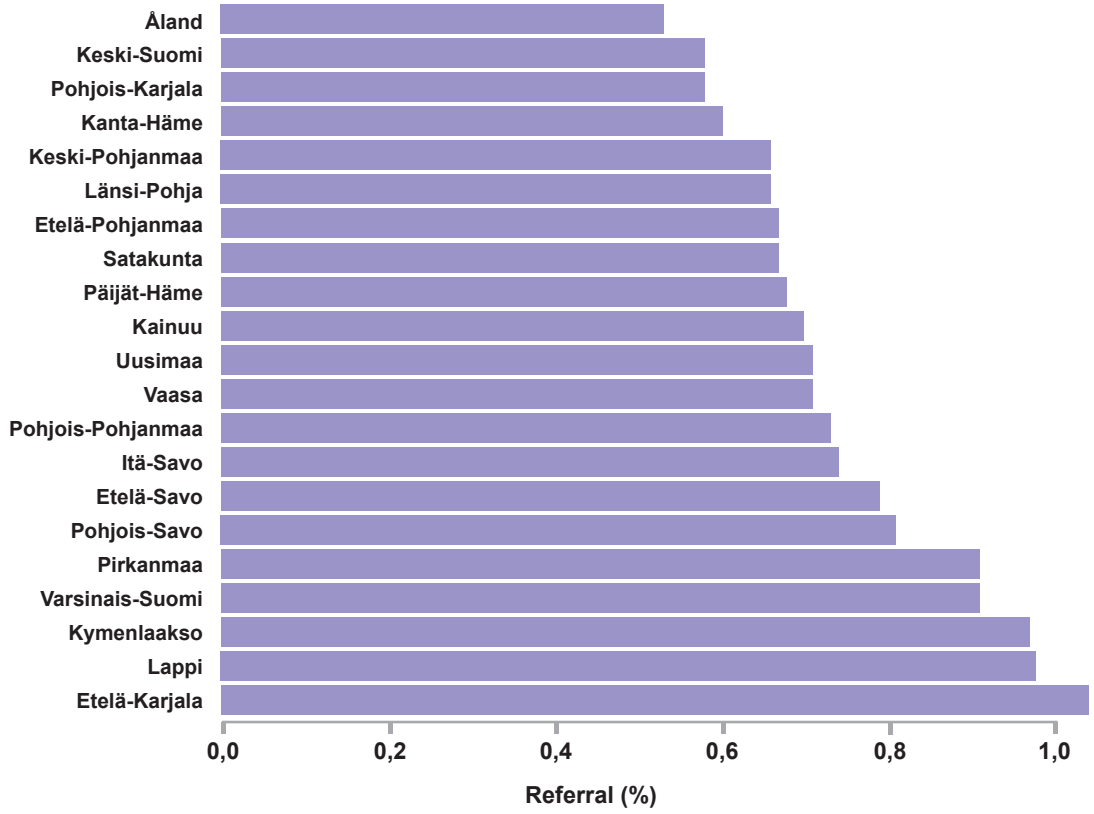


FIGURE 9 **Malignant breast cancer screening discoveries (%) by health care district in 2011–2015.**

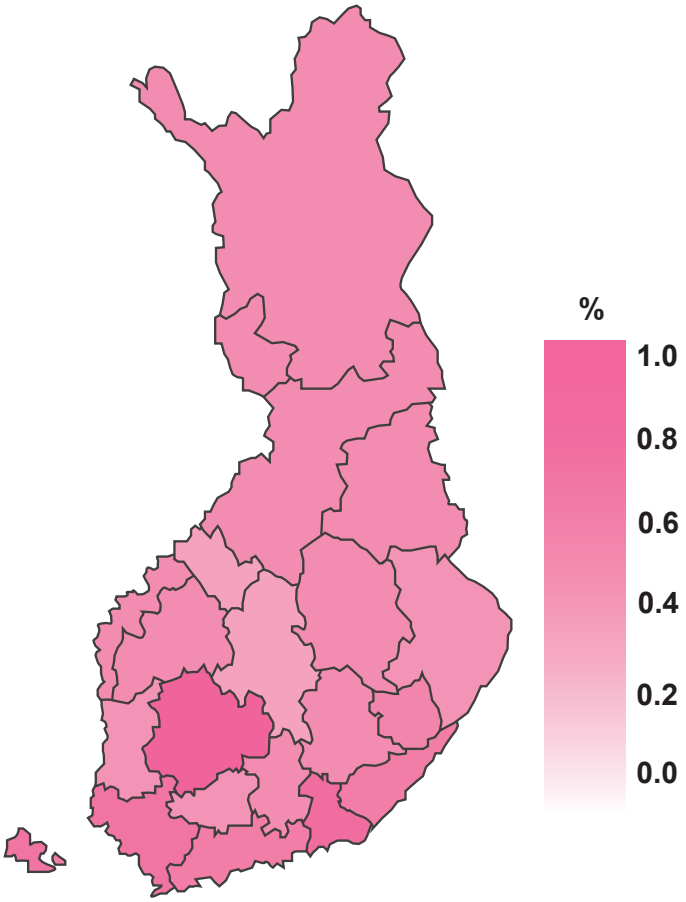
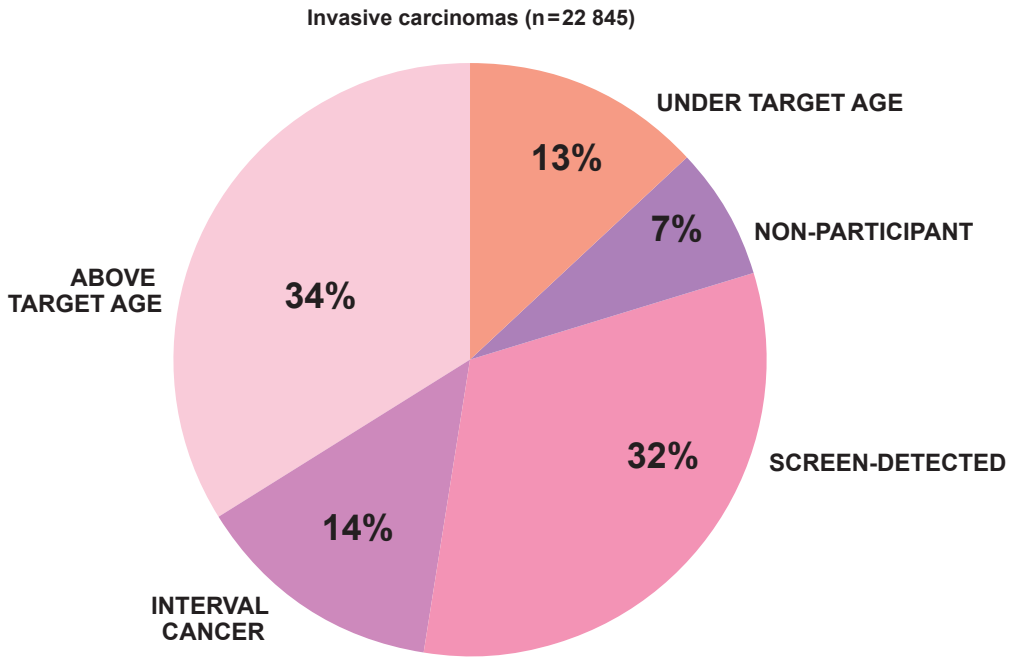
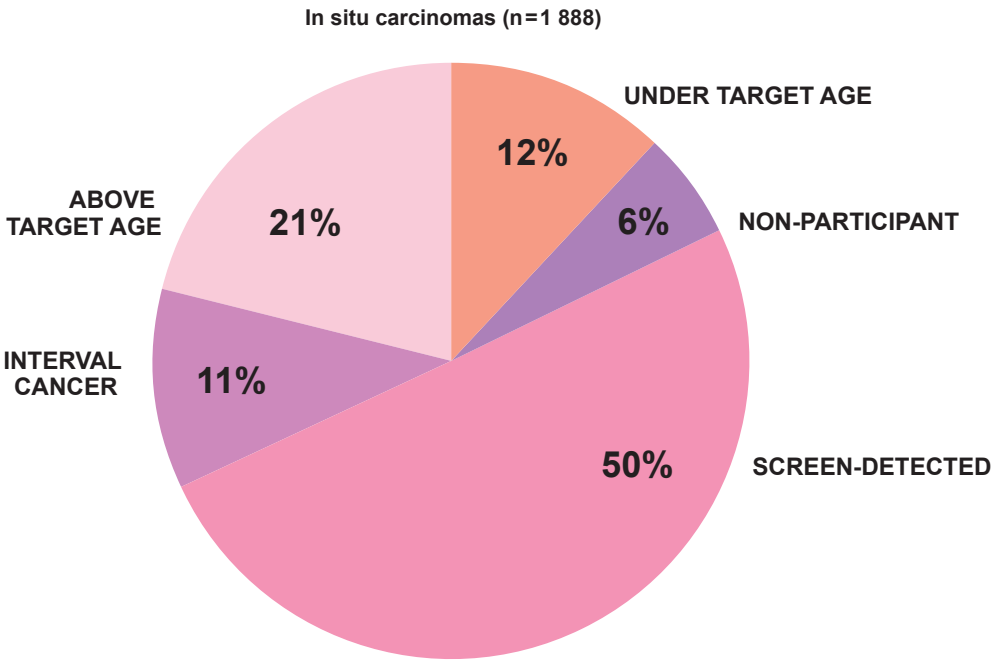


FIGURE 10 **Detection mode of invasive breast cancers diagnosed in 2010–2014.**



Non-registered 29 (0,1% of all) are excluded.

FIGURE 11 **Detection mode of carcinomas in situ of the breast diagnosed in 2010–2014.**



Non-registered 3 (0,2% of all) are excluded.