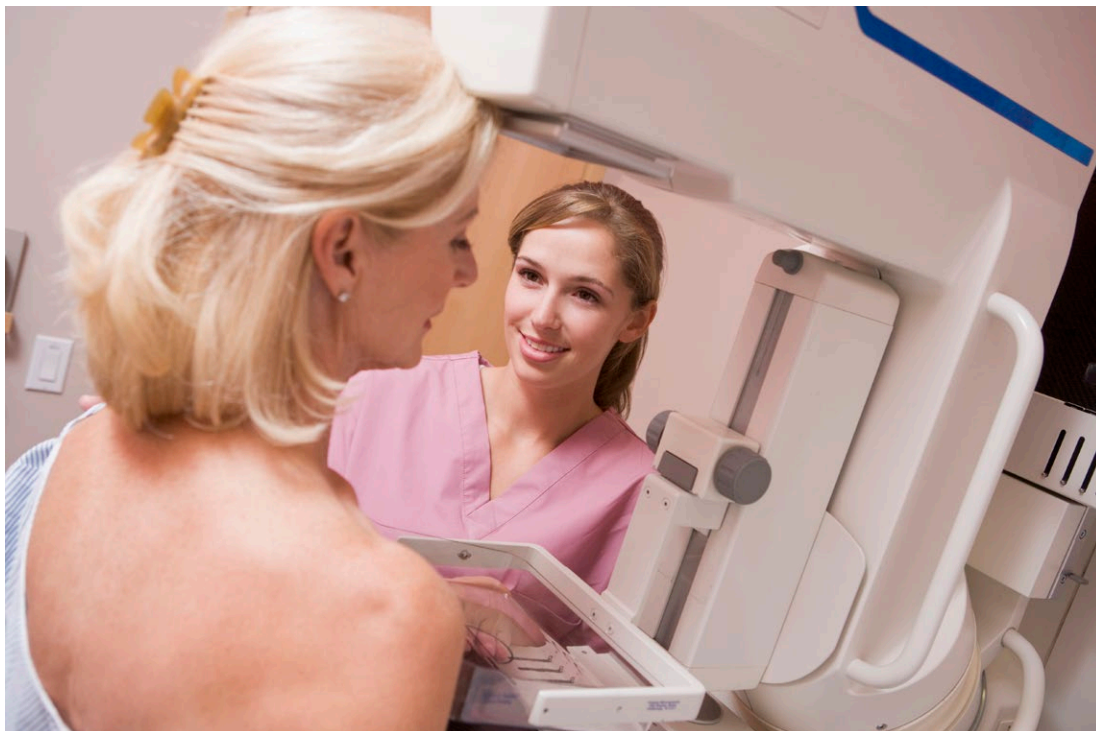BREAST CANCER SCREENING

ANNUAL REVIEW 2023

There have been no major changes in breast cancer screening programme indicators in the 2000s. There remains significant variation in the rates between regions and population groups. Changes in screening can be expected in the future, and screening guidance should also be prepared for them. The Quality Manual for Breast Cancer Screening, due to be published at the turn of the year 2023/2024, will be an important tool for the future national guidance of the screening programme.

SUMMARY

In 2021, the breast cancer screening programme sent out more than 356,000 invitations. Of the 293,000 women (82%) who participated in the programme, 2.8% were referred for confirmatory examination. A total of 1,760 breast cancers and breast cancer carcinomas in situ were detected, or six cases per 1,000 women screened. Screening uptake has gradually declined during the 2000s. There are still clear differences in participation rates and screening results between regions and population groups.

Finnish Cancer Registry

1. INTRODUCTION

The national breast cancer screening programme was launched in Finland in 1987. The expansion of the breast cancer screening target population to all 50–69-year-olds started in 2007. Invitation coverage increased in the female population over 60 years of age until 2016, since when virtually all of the target population have been invited for breast cancer screening every two years (Figure 1).

Screening, or mammography, aims to detect breast cancer as early as possible, even at the asymptomatic stage. About six out of ten breast cancers in women of screening age are detected at screening (Figure 2). The main benefit of screening is a reduction in deaths from breast cancer. In Finland, screening has reduced mortality from breast cancer by about 20% among those invited compared to the situation without screening (Sarkeala et al. 2008). Breast cancer mortality among those who have received screening has been reduced by about one-third compared to those without screening (Heinävaara et al. 2016). Screening prevents about 100 breast cancer deaths a year, but it also detects small early-stage tumours, some of which would not have caused symptoms during a woman's lifetime. However, studies suggest that at most one-tenth of them are such (Puliti et al. 2012, Heinävaara et al. 2014).

The incidence of breast cancer has been on the rise since the 1950s and it is the most common cancer among Finnish women. Around one in eight women will develop breast cancer in their lifetime. Over the last decade, 2012-2021, the average risk of female breast cancer increased by 0.6% a year, making the role of a high-quality screening programme even more important. However, over the same period, the corresponding risk

of dying from breast cancer did not change in a statistically significant way (https://syopa-rekisteri.fi/tilastot/tautitilastot/)
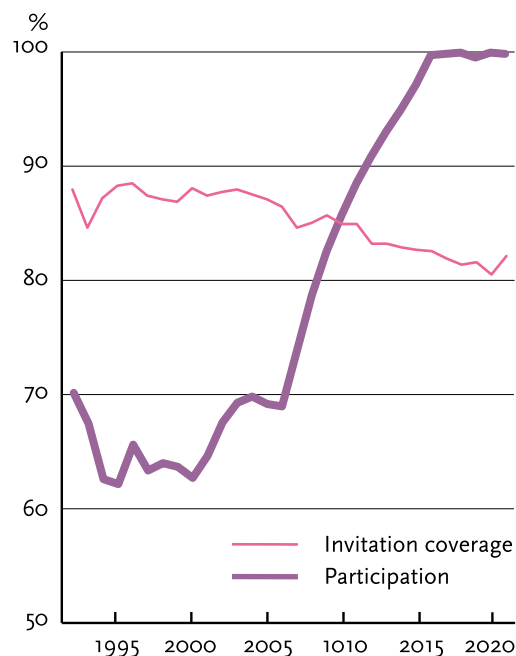

FIGURE 1: **Participation in breast cancer screening (%) and invitation coverage (%) 1992–2021.**

2. BREAST CANCER SCREENING IN FINLAND

The target population, women aged 50–69, are invited for screening every two years in accordance with a government decree. The screening protocol – screening interval, screening age groups and test – has been selected based on national and international research evidence.

This annual review of breast cancer screening includes results from the most recent screening statistics for 2021 when municipalities provided screening. They chose the screening provider, which could be the municipality itself or a private operator tendered by the municipality. In 2023, the responsibility for organising cancer screening was transferred to the wellbeing services counties.

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The units conducting the screening send out screening invitations and perform mammograms and, if necessary, confirmatory examinations. Diagnostic confirmation of breast cancer and surgical procedures are carried out under specialised medical care. Mammography and confirmatory examinations in the screening units are free of charge for those invited. Patient fees are charged for treatments and examinations performed under specialised medical care, and the municipality is charged for the costs in accordance with the hospital's tariffs.

As a primary screening test, direct digital mammography is the preferred option. Mammograms are taken in two directions on both breasts. The images are interpreted by two radiologists working independently. If cancer is suspected in either breast, a co-reading is performed. The results of the screening are communicated by personal letter. If necessary, a personal invitation is sent for a confirmatory examination (additional mammography, ultrasound, and needle biopsy). If necessary, the doctor who performed the confirmatory examinations will make an urgent referral for specialised medical care.

Individual data on all stages of screening is submitted electronically to the Finnish Cancer Registry's Mass Screening Registry for quality and effectiveness evaluation. Comprehensive data capture also allows for the detection and rectification of programme deficiencies and problems.

3. OPERATION OF THE SCREENING PROGRAMME IN 2021

3.1 SCREENING INVITATIONS AND PARTICIPATION

Age group	Target population	Invited during the screening round	Population coverage	Invited	Screened	% screened of those invited
50–54	167 321	167 190	99.9	99 721	82 062	82.3
55–59	183 739	183 437	99.8	73 625	60 191	81.8
60–64	181 527	181 213	99.8	109 577	90 423	82.5
65–69	185 592	185 312	99.8	73 581	60 370	82.0
Total	718 179	717 152	99.9	356 504	293 046	82.2

TABLE 1: **Breast cancer screening target population and women invited and screened in 2021.**

The coverage of screening invitations in the target population was 100% in the age group 50–69 years, as defined by the screening regulation, meaning that in practice everyone in this age group was invited for screening. A total of 356,504 invitations were sent out in 2021 under the screening programme. Of those invited, 82% attended the screening and participation was fairly even between age groups (Table 1).

Participation in screening has gradually declined, falling from around 87% in 1992 to 81% in 2020 (Figure 1). There are no precise data on the reasons for this decline in participation. However, the decline in participation rates has been similar across all age groups. In 2021, participation in breast cancer screening increased slightly from the previous year, returning to pre-Covid 19 pandemic levels.

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3.2 SCREENING RESULTS NATIONALLY

TABLE 2: **Screening results by age group in 2021.**

Age group	Screened	Recall		Referral for surgery		Malignant finding	
	n	n	%	n	%	n	%
50–54	82 062	3 247	4.0	527	0.6	345	0.4
55–59	60 191	1 327	2.2	358	0.6	296	0.5
60–64	90 423	2 078	2.3	718	0.8	610	0.7
65–69	60 370	1 410	2.3	589	1.0	523	0.9
Total	293 046	8 062	2.8	2 192	0.7	1 774	0.6

Of those screened, 97.2% had a normal screening result and 2.8% were recommended for confirmatory examinations. Referrals for surgery or another procedure in specialised medical care were about 2,200 (0.7% of those screened) (Table 2).
In total, 1,760 cases of breast cancer or breast carcinoma in situ were detected in the programme, about 6 cases per 1,000 women screened, slightly less than in the previous year. In addition, 14 other cancers were found during screening. Around 2% of those referred for surgery lacked a definitive, histologically confirmed diagnosis (n = 50), of whom the majority (n = 40) were found to have no malignancy on further investigation. In addition, there were eight cases with missing data.

The proportions of confirmatory examinations and cancer diagnoses remained at the same level in the 2010s. In 2021, however, there was a slight drop in both over the previous year: in 2020, 3.0% of participants were referred for further examination, 0.8% were referred to specialist medical care and 0.7% received a malignant diagnosis.

3.3 SCREENING RESULTS BY WELLBEING SERVICES COUNTY

The wellbeing services counties have been responsible for organizing screening from the beginning of 2023. In this review, regional differences between 2017 and 2021 are already analysed according to the wellbeing services county division. Participation in screening varied by wellbeing services county. For 2017–2021, the age-standardised participation rate ranged from 73% to 86% (Table 3). Participation is known to be lower in large cities than elsewhere in Finland. As in previous years, the lowest participation rate was in Helsinki, where only 73% of those invited to screening attended. Participation was also lower in the rest of Uusimaa than in the rest of Finland. The highest age-standardised participation rate was in Åland (86%), but also a few of the wellbeing services counties of mainland Finland (South Karelia, South Ostrobothnia, Kainuu, Central Finland, Ostrobothnia, North Karelia, North Savo and Satakunta) achieved at least 85% participation.

There was also variation in screening results between hospital districts (Table 3). From 2017 to 2021, the proportion of people referred for confirmatory examinations ranged from 1.7 to 4.5%, the proportion of referrals for specialised medical care from 0.4 to 1.0%, and the proportion of cancer and in situ findings from 0.3 to 0.8%.

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TABLE 3: Invitations, examinations and screening results for women aged 50–69 in 2017–2021 by wellbeing services county.

Wellbeing services county	Invited	Screened		Recall		Referral to specialised medical care		Malignant finding	
	n	n	%*	n	%*	n	%*	n	%*
Åland	10 877	9 387	86.4	164	1.7	41	0.4	31	0.3
South Karelia	46 986	40 061	85.3	1 009	2.5	373	0.9	266	0.7
South Ostrobothnia	65 699	56 145	85.4	1 372	2.4	435	0.8	365	0.7
South Savo	52 486	44 076	83.9	1 213	2.8	357	0.8	268	0.6
City of Helsinki	198 844	145 663	73.4	4 551	3.0	1 023	0.7	874	0.6
East Uusimaa	35 640	29 216	82.1	1 355	4.5	172	0.6	136	0.5
Kainuu	27 850	23 664	85.0	982	4.2	145	0.6	110	0.5
Kanta-Häme	61 418	50 842	82.8	1 989	3.8	394	0.8	331	0.6
Central Ostrobothnia	21 747	18 458	84.9	473	2.5	162	0.9	100	0.5
Central Finland	88 576	75 604	85.3	1 900	2.5	616	0.8	458	0.6
Central Uusimaa	67 883	52 787	77.7	1 490	2.7	357	0.7	327	0.6
Kymenlaakso	61 690	51 866	84.0	1 659	3.2	530	1.0	380	0.7
Lapland	64 839	53 573	82.5	1 911	3.6	532	1.0	337	0.6
West Uusimaa	147 940	112 150	75.9	3 220	2.7	801	0.7	722	0.7
Pirkanmaa	162 344	133 624	82.3	3 324	2.4	1 160	0.9	1 002	0.8
Ostrobothnia	53 155	45 312	85.2	1 032	2.2	395	0.9	293	0.7
North Karelia	59 726	50 783	85.0	1 430	2.8	378	0.7	338	0.7
North Ostrobothnia	124 145	105 278	84.7	2 435	2.3	678	0.7	537	0.5
North Savo	89 163	76 040	85.2	3 456	4.5	801	1.0	551	0.7
Päijät-Häme	74 895	61 702	82.4	1 176	1.9	469	0.8	419	0.7
Satakunta	76 908	65 737	85.5	1 501	2.3	679	1.0	475	0.7
Vantaa and Kerava	81 418	61 123	75.1	1 605	2.6	419	0.7	380	0.7
South-west Finland	161 846	134 070	82.8	4 648	3.4	1 190	0.9	954	0.7

* age-standardised (Finland 2014)

3.4 SCREENING RESULTS BY POPULATION GROUP

The age-standardised participation rate in screening was clearly lower in the non-domestic language population group (63%) than in the domestic language group (82%) (Table 4). In this language group, referral rates for follow-up (2.6% vs. 2.8% of participants) and specialised medical care (0.7% vs. 0.8%) and cancer diagnoses (0.5% vs. 0.7%) were also slightly lower than in the domestic language group.

Significant differences in participation rates were found between women not in employ-ment (students, long-term unemployed, pensioners, socio-economic status unknown) and women in employment (entrepreneurs, white-collar employees, employees) (60-87%), Table 5). There was also considerable variation between population groups in the proportions of those referred for further examination (2.5–3.8%), those referred to specialist medical care (0.7–1.1%) and those diagnosed with cancer (0.6–1.0%). However, the numbers of cases in some subgroups are so small that it is difficult to draw conclu-sions from the figures.

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There were also differences in age-standardised screening uptake by level of education: the higher the level of education, the higher the participation rate (66–85%), Table 6). Similar differences were not observed in the referral rate for follow-up (2.8–2.9%) and specialised medical care (0.8%) or in the detection rate (0.6–0.7%).

TABLE 4: Breast cancer screening participation and results by mother tongue in the 2020–2021 screening round.

Mother tongue	Invited	Screened		Recall		Referral to specialised medical care		Malignant finding	
	n	n	%*	n	%*	n	%*	n	%*
Domestic	677 092	558 325	82.4	16 013	2.8	4 461	0.8	3 612	0.7
Other	39 022	24 666	62.6	718	2.6	151	0.7	106	0.5

* age-standardised (Finland 2014)

TABLE 5: Invitations and examinations and screening results by socio-economic status in the screening cycle 2020–2021.

Socio-economic status	Invited	Screened		Recall		Referral to specialised medical care		Malignant finding	
	n	n	%*	n	%*	n	%*	n	%*
Entrepreneurs	38 580	31 647	81.5	948	3.0	210	1.0	165	0.8
Lower level white collar	221 941	192 481	86.7	5 718	2.8	1 386	0.8	1 073	0.7
Upper level white collar	109 386	94 016	85.5	2 961	3.0	695	0.8	555	0.7
Employees	76 083	61 830	81.5	1 696	2.5	408	0.7	312	0.6
Students	5 372	3 871	73.1	152	3.8	27	1.1	23	1.0
Retired	199 890	154 200	70.2	3 928	2.9	1 513	0.9	1 304	0.7
Unemployed	51 180	37 092	71.9**	1 103	3.0**	301	0.8**	235	0.6**
Other/data missing	15 975	9 273	60.4	274	2.9	81	0.9	58	0.6

* age-standardised (Finland 2014) ** 65–69 age group removed from age-standardisation due to small numbers

TABLE 6: Breast cancer screening participation and results by level of education in 2020–2021.

Educational level	Invited	Screened		Recall		Referral to specialised medical care		Malignant finding	
	n	n	%*	n	%*	n	%*	n	%*
Primary or data missing	96 709	65 649	66.3	1 769	2.8	528	0.8	450	0.6
Secondary	297 412	242 930	81.6	6 691	2.8	1 890	0.8	1 483	0.6
Higher	324 307	275 831	84.9	8 320	2.9	2 203	0.8	1 792	0.7

* age-standardised (Finland 2014)

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4. BREAST CANCER DETECTION

Between 2017 and 2021, around 12% of cancers were detected before the screening age, 52% in people of screening age and 36% in people above screening age (Figure 2).

Of cancers in screening age, the screening programme detected 62%, 13% in screening non-participants and 25% in periods between screenings.
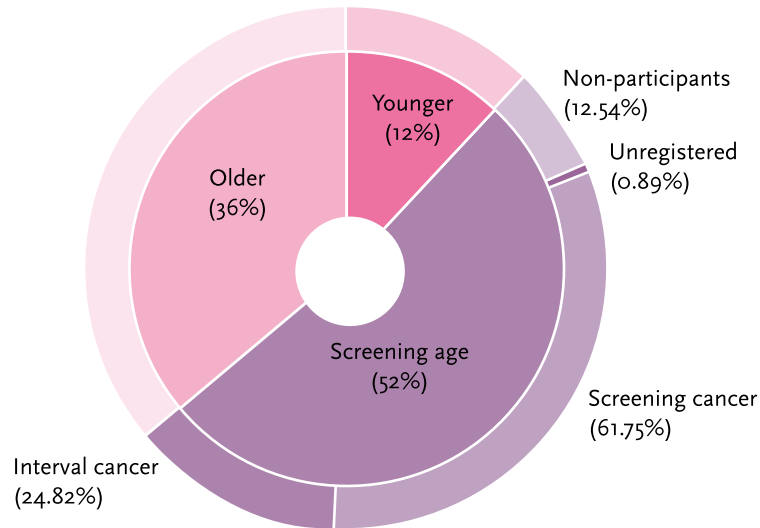

FIGURE 2: Breast cancer detection method 2017–2021 (percentages separately for screening age).

5. BREAST CANCER INCIDENCE AND MORTALITY

The age-standardised incidence of breast cancer (ICD-10: C50) has increased significantly over the decades, but during the 2010s, the incidence started to level off (Figure 3). Mortality increased slowly until the early 1990s but has since declined to near the starting point of the Cancer Registry's history. In 2021, a total of 5,105 breast cancers and 914 breast cancer deaths were diagnosed. Improved early diagnostics and more effective treatment methods have contributed to the improvement in breast cancer prognosis (Steward et al. 2014). Therefore, breast cancer screening must also be improved, and the effectiveness of the screening programme must be regularly evaluated.
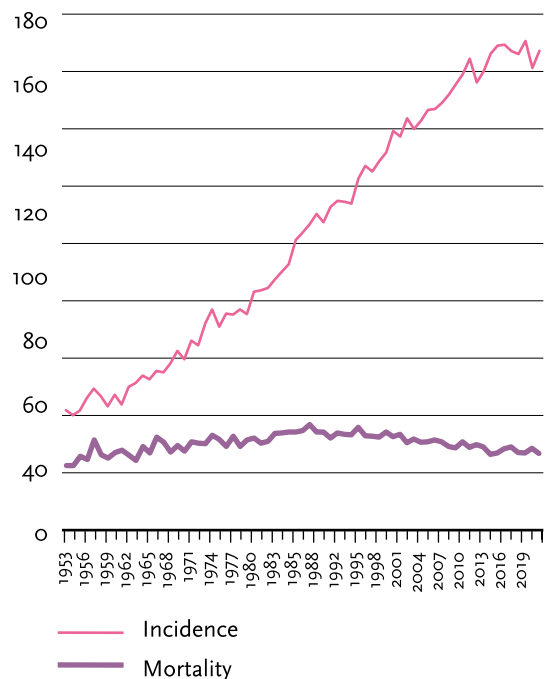

FIGURE 3: Age-standardised breast cancer incidence and mortality in women in Finland 1953–2021.

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6. CONCLUSIONS

The breast cancer screening programme in 2021 largely corresponded to that of previous years. Participation rates increased from the previous year in all age groups, returning to pre-Covid-19 pandemic levels. On the other hand, the absolute number of malignant tumours decreased by 185 cases compared to 2020. One reason for the decrease is the changing age structure and, thus, the diminishing target population, with the larger age groups already past screening age. In the Cancer Registry statistics, the number of breast cancer cases increased from the previous year, and it is among women older than screening age that there has been an increase in the number of cancer cases.

Our screening programme has been shown to be effective (Heinävaara et al. 2016). Finland has one of the highest screening participation rates in Europe (Villanueva et al. 2014), but there are still variations in participation and screening results between regions and population groups. Regional differences may be due to variations in the background risk of breast cancer and differences in practices and quality of diagnostics. Differences between language groups are likely to be due to differences in breast cancer risk factors between population groups.

The expert group on breast cancer screening, established within the National Steering Group for Cancer Screening, has been working on a quality manual that will be published at the turn of the year 2023/2024. The quality manual will outline the breast cancer screening protocol and provide guidance on national best practices for quality screening. This will allow screening to be carried out consistently and effectively across the country, thus levelling out differences in participation and screening outcomes, at least at a regional level.

The breast cancer screening programme must remain effective in the future and respond to the changing operational environment. The European Commission has recognised the need to improve cancer screening by updating its cancer screening recommendation in late 2022 (European Commission 2022). According to the recommendation, consideration should be given to expanding the target population for screening from 50-69 years to 45-74 years. However, each country should assess the benefits, disadvantages and cost-effectiveness of such an extension at the national level. A recent modelling study in the Finnish population supports expanding the target population from the current one, especially to younger women aged 45-49 (Shafik et al. 2023). An ongoing study at the Finnish Cancer Registry is currently assessing in more detail the cost-effectiveness of age group expansion of breast cancer screening. The preliminary results will be available in early 2024 and will be used to initiate discussion on age group expansion in the National Steering Group for Cancer Screening and the Breast Cancer Screening Expert Group. Åland has already extended screening to 74 years in 2022 and further to 45 years in 2023.

In addition, the European Commission recommendation calls for the development of screening based on individualised breast cancer risk assessment, which is influenced by factors such as breast density and previous screening results (Mann et al. 2022). Based on risk, an appropriate screening interval and test could be tailored. Breast density assessment is not yet routine in screening, and its distribution in Finnish

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women of screening age is unknown. It is therefore important to find out in a comparable way how many Finnish women have dense breasts and how to screen them in an appropriate and cost-effective way.

Furthermore, the potential of artificial intelligence (AI) for population-level breast cancer screening is a subject of intensive and ongoing research. AI could potentially reduce workload by selecting low-risk cases to be read by, for example, only one radiologist (Vachon et al. 2023, Lång et al. 2023). The use of AI for breast cancer screening will be explored also in Finland. The Finnish Cancer Registry is involved in an EU Joint Action project to develop cancer screening, which will assess, among other things, the need for and operating mechanisms of risk-based screening.

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Finnish Cancer Registry

LINKS AND PUBLICATIONS

FINNISH CANCER REGISTRY
syoparekisteri.fi

INTERACTIVE SCREENING STATISTICS
syoparekisteri.fi/tilastot/seulontatilastot

SECREENING STATISTICS
syoparekisteri.fi/tilastot/seulontatilastot

CANCER STATISTICS
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TERMINOLOGY

BIOPSY

Tissue sample (core needle or open biopsy) or cell sample (fine needle aspiration biopsy). Histological confirmation of the diagnosis is always made from a tissue sample. Surgical referral is usually based on a core-needle biopsy, but the final diagnosis of breast cancer is usually made by open biopsy.

CANCER INCIDENCE

The number of new cancer cases in relation to the population over a given period.

CONFIRMATORY TESTS

Breast cancer screening follow-up tests include additional mammography, ultrasound, pneumocystography, ductography, and fineneedle (cell sample) and core-needle (tissue sample) examination or a combination of these.

FALSE POSITIVE MAMMOGRAPHY RESULT

A false positive mammography test result is a result (usually after a co-reading) in which a woman is invited to a screening centre for confirmatory tests, but the result of confirmatory and other follow-up examinations is negative (no breast cancer or breast carcinoma in situ).

MALIGNANT FINDINGS IN BREAST CANCER SCREENING

CARCINOMA *IN SITU*

A tumour in which malignant cells have not penetrated deeper into the breast tissue but occur within the duct or lobule (ICD-10: D05).

INVASIVE BREAST CANCER

Breast cancer (ICD-10: C50).

MAMMOGRAPHY

X-ray imaging of the breasts.

MORTALITY

The number of deaths in a given period relative to the population.

OPPORTUNISTIC TESTING

Testing of asymptomatic persons outside an organised screening programme, in a private or public health care setting. Outside the screening programme, testing is also performed for symptomatic and follow-up testing. In most cases, the reason for testing outside the programme is not known.

OVERDIAGNOSIS OF BREAST CANCER SCREENING

Diagnosis of latent breast cancer or carcinoma in situ that untreated would not affect the person's health during her lifetime.

SCREENING CHAIN

The progress of the screening process from the identification of the target population and the sending of invitations to testing and possible follow-up examinations, treatments and post-treatment follow-up.

SCREENING COVERAGE

Proportion of the target population invited for screening (invitation coverage) or percentage of the target population screened (inspection coverage).

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