national monitoring of the **breast cancer** screening programme in the Netherlands **2019**

	2017	2018	2019
invited	1,338,397	1,273,529	1,310,693
participated	1,029,097	978,833	996,447
participation rate	76.9%	76.9%	76.0%
mean individual screen interval (months)	23.8	24.1	25.1
next routine invitation within 24 (± 2) months	86%	78%	63%
screening interval < 2.5 years	95%	94%	93%
referral rate	2.30%	2.23%	2.39%
false positive results	1.62%	1.55%	1.70%
detection rate	0.67%	0.68%	0.69%
positive predictive value	29%	31%	29%

most important results

The participation rate continued to decrease slightly.

The mean individual screen interval increased to **25.1 months**.

The percentage of women invited for their next routine invitation within 24 ± 2 months decreased to **63%**.

The referral rate was **2.39%** and the percentage false positive results was **1.70%**

The detection rate was **0.69%**. The positive predictive value remained almost constant at **29%**.

Restructuring of the ICT-infrastructure had a temporary effect on the screeningcapacity and the logistic process. This resulted in less detailed information on false positive results.

Feedback on the final diagnosis from hospitals to the screening organsiation should be improved to maintain the quality of the screening programme.

IKNL Netherlands comprehensive cancer organisation

edition: September 2021

introduction

The main aim of the Netherlands breast cancer screening programme is to detect breast cancer in an early stage, which can lead to better prognosis. Women 50 to 75 years of age are invited biennially for a mammography. The breast cancer screening programme is coordinated by the National Institute of Public Health and the Environment (RIVM). The RIVM has commissioned the Netherlands Comprehensive Cancer Organisation (IKNL) to carry out an annual national monitoring of the breast cancer screening programme. Monitoring ensures the quality of the breast cancer screening programme and identifies trends and bottlenecks. Monitoring is conducted using data based on a predefined set of indicators from the datawarehouse breast cancer of IKNL (reference date 1 June 2021).
The current monitoring report presents the results regarding the participation to the national breast cancer screening programme and the results (until 2019), and the number of interval cancers (until 2017). Data on breast cancer incidence were derived from the Netherlands Cancer Registry, data on mortality from Statistics Netherlands (CBS, reference date 1 June 2021).

In 2019, the ICT-infrastructure of the breast cancer screening program was renewed on a large scale. This resulted in screening units being unavailable for screening for 2 weeks and a different method of data analysis to compose this monitoring report. Furthermore, due to an altered method of collecting follow-up data from the hospitals, some results regarding outcome are less complete. In 2019 the screening programme was based on a biennial screening interval.

table 1 **screening process**

	2018		2019	
net target population	1,348,986		1,349,710	
of which invited	1,273,529	(94.4%)	1,310,693	(97.1%)
of which participated[1]	978,833	(76.9%)	996,447	(76.0%)
screening examinations in year[2]	979,338		923,724	
of which referred	21,870	(2.23%)	22,079	(2.39%)
false positive	15,181	(69.4%)	15,717	(71.2%)
breast cancer	6,689	(30.6%)	6,362	(28.8%)
- of which invasive breast cancer	5,355	(80.1%)	5,043	(79.3%)
- of which DCIS	1,334	(19.9%)	1,319	(20.7%)

[1] Participation could have been in the following year. [2] The number screened in the reporting year.

terminology

• **BI-RADS** = Breast Imaging Reporting and Data System, radiological classification system. BI-RADS 0: incomplete, further imaging or information required; BI-RADS 4: suspicious abnormality; BI-RADS 5: highly suggestive of malignancy • **false positive results** = proportion of referred women not diagnosed with breast cancer • **final screening result known** = proportion of referred women whose final screening result is known within 6 months after the screening examination • **interval cancer** = breast cancer diagnosed within two years after a routine screening in which results were considered normal • **initial screen** = screening examination of a woman who attends the programme for the first time • **invited** = number of invited women from the target population • **mean individual screening interval** = mean screening interval in months between previous and current screening examination • **next routine invitation** = proportion of women invited for the current screening examination between 22-26 months after their previous screening examination • **non-participants** = invited women who actively opt out of screening • **non-responders** = invited women who did not respond • **overall participation** = proportion of women invited for screening who participated in the screening programme as a result of this invitation • **partially-assessable screening examination** = screening examination that does not meet the required quality for adequate diagnosis • **positive predictive value (PPV)** = proportion of women diagnosed with breast cancer after referral • **programme sensitivity** = proportion of screen-detected breast cancers (of all breast cancers, screen-detected and diagnosed within the first 2 years after a screening examination) • **programme specificity** = proportion of women with a negative screening examination who were correctly not referred (of all women without breast cancer within the first 2 years after a screen examination) • **re-participation** = proportion of participants in the current screening round of all women who participated in the previous screening round • **regular subsequent screen** = screening examination of a woman who attended the programme at least once before, and this examination takes place within 30 months after the previous examination • **response to referral** = proportion of referred women who followed their referral advice and had a clinical assessment in a hospital • **result of screening examination** = proportion of letters containing the result of the screening examination sent within 10 working days after the examination • **screening examinations** = number of women who underwent a screening examination in a specific year, irrespective of the year of invitation

table 2 **main results until 2019 with regard to participation**

compared with previous years

	2015	2016	2017	2018	2019
target population per year [1]	1,368,422	1,388,080	1,408,655	1,428,692	1,431,368
net target population per year	1,302,071	1,317,396	1,333,197	1,348,986	1,349,710
screen examinations	1,023,449	1,021,388	1,029,097	978,833	996,447
invited	101.3%	100.2%	100.4%	94.4%	97.1%
participation rate	77.6%	77.4%	76.9%	76.9%	76.0%
- participation initial invitation	75.6%	75.4%	74.6%	74.6%	73.0%
- participation reminder	17.4%	16.5%	17.3%	17.2%	17.4%
re-participation [2]	91.1%	91.1%	91.4%	91.6%	91.2%
proportion women over 51 at first invitation	4.0%	4.1%	4.7%	5.6%	7.1%
referral rate	2.32%	2.43%	2.30%	2.23%	2.39%
- referral with BI-RADS 5	0.16%	0.16%	0.16%	0.15%	0.13%
- referral with BI-RADS 4	0.94%	1.04%	1.01%	0.98%	0.99%
- referral with BI-RADS 0	1.22%	1.23%	1.13%	1.10%	1.26%
mean individual screening interval (months)	24.0	23.9	23.8	24.1	25.1
next routine invitation within 24 ± 2 months	85%	85%	86%	78%	63%
screening interval < 2.5 years	95%	95%	95%	94%	93%
result of screening examination < 10 working days	98.5%	99.1%	99.7%	99.7%	99.8%
non-responders	14.0%	13.9%	14.6%	14.9%	16.8%
non-participants	8.5%	8.7%	8.6%	8.2%	7.2%

[1] Source: Municipal basic administration. [2] Calculated over the last two screening rounds.

- In 2019 the size of the target population was based on a biennial screening interval.
- The mean individual screening interval increased to 25.1 months in 2019.
- In 2019 the percentage of women with a screening interval < 2.5 years was 93% (exactly the target value). The percentage of women with their next routine invitation within 24 ± 2 months decreased to 63% (below the target value of 75%).
- The decrease in the percentage invited women and the longer screening intervals might be due to a shortage in the screening workforce, resulting in a lower screening capacity.
- The percentage of non-responders has increased, while the percentage of non-participants decreased. This might be partly due to the temporary change in the method of sending the invitations due to the new ICT-infrastructure, which resulted in a longer interval between the letter of invitation and the invitation date, which can connote more non-responders.

table 3 **referral rate** for initial and regular subsequent screens < 30 months and BI-RADS result

	2015	2016	2017	2018	2019
initial screen					
- referral rate	5.90%	6.28%	6.10%	5.73%	5.89%
- referral with BI-RADS 5	0.24%	0.20%	0.22%	0.19%	0.18%
- referral with BI-RADS 4	2.02%	2.38%	2.34%	2.20%	2.11%
- referral with BI-RADS 0	3.62%	3.69%	3.53%	3.32%	3.60%
regular subsequent screen					
- referral rate	1.82%	1.90%	1.79%	1.76%	1.85%
- referral with BI-RADS 5	0.14%	0.14%	0.14%	0.13%	0.12%
- referral with BI-RADS 4	0.78%	0.85%	0.81%	0.80%	0.81%
- referral with BI-RADS 0	0.91%	0.91%	0.83%	0.81%	0.92%

figure 1 **participation rate**

per age group for women invited in 2019

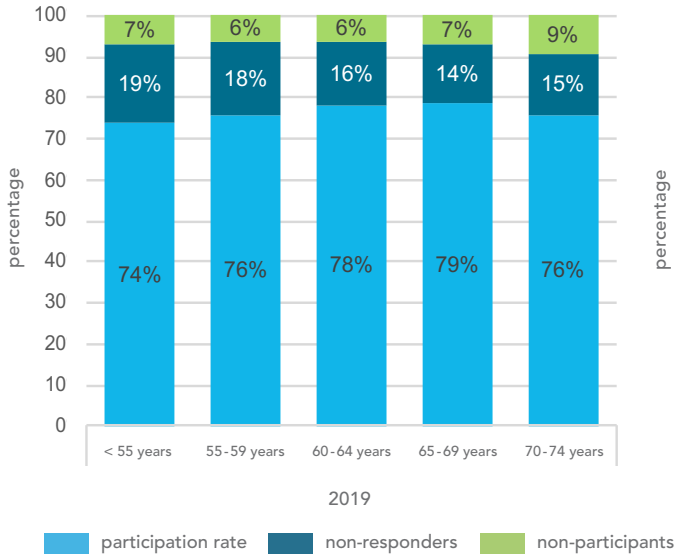
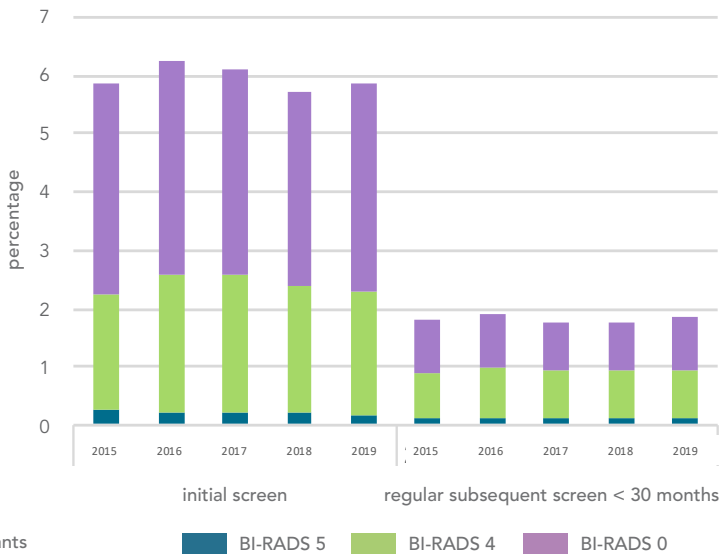


figure 2 **referral rate**

for initial and regular subsequent screens and BI-RADS result



- Figure 1 shows the participation rate per age group. The participation rate was the lowest in the youngest age group, and the highest in the age group 65-69 years.
- Figure 2 shows the referral rate for initial and regular subsequent screens < 30 months separately.
- In 2019, referral rate after initial screens was approximately 6%, which is higher than the target value of 5%. This might be caused by the fact that no previous images are available after initial screens that could be involved in the evaluation, or due to the fact that breast density is usually higher in younger women. This led to a higher number of BI-RADS 0, indicating additional imaging.
- Referral rate was stable after regular subsequent screens (and below the target value of 2.15%), as was the distribution of BI-RADS score.

table 4 **main results until 2019 with regard to outcome**

compared with previous years

	2015	2016	2017	2018	2019
screen examinations	1,022,319	1,019,604	1,025,933	979,338	923,724
detection rate	0.69%	0.70%	0.67%	0.68%	0.69%
positive predictive value of referral	30%	29%	29%	31%	29%
false positive results	1.63%	1.73%	1.62%	1.55%	1.70%
- after non-invasive assessment	0.99%	1.06%	1.03%	1.01%	0.97%
- after invasive assessment	0.59%	0.62%	0.53%	0.49%	0.46%
- after unknown type of assessment	0.05%	0.05%	0.06%	0.05%	0.27%
false positive results after BI-RADS 5	4%	4%	5%	3%	5%
- after non-invasive assessment	1%	1%	2%	1%	1%
- after invasive assessment	3%	3%	3%	2%	2%
- after unknown type of assessment	0%	1%	0%	0%	1%
false positive results after BI-RADS 4	58%	60%	59%	57%	57%
- after non-invasive assessment	17%	20%	22%	21%	18%
- after invasive assessment	39%	38%	36%	34%	31%
- after unknown type of assessment	2%	2%	2%	2%	8%
no signs of breast cancer after BI-RADS 0	88%	89%	90%	90%	89%
- after non-invasive assessment	67%	69%	72%	73%	63%
- after invasive assessment	18%	18%	15%	13%	11%
- after unknown type of assessment	3%	2%	3%	3%	15%
screen-detected cancers	7,081	7,141	6,919	6,689	6,362
ductal carcinoma in situ (DCIS)	22.0%	21.5%	20.5%	19.9%	20.7%
invasive breast cancers	78.0%	78.5%	79.5%	80.1%	79.3%
response to referral [1]	99.7%	99.6%	99.2%	99.4%	92.3%
final screening result available < 6 months after screening [1]	99.4%	99.3%	98.9%	99.1%	91.6%
partially-assessable screening examinations	0.1%	0.1%	0.1%	0.1%	0.0%

[1] Data of 2019 are incomplete due to the renewal of the ICT-infrastructure.

- Table 4 shows the results of the screening programme with regard to the final results until 2019. Due to an altered method of collecting follow-up data from the hospitals, detailed data regarding false positive results is incomplete.
- In 2019 the detection rate was 0.69% and the positive predictive value of recall was 29%.
- In total 6,362 screen-detected cancers were diagnosed, of which 20.7% were DCIS. This distribution was comparable with previous years.
- The percentages response to referral and the percentage final screening result available < 6 months after screening were lower than previous years. This is mainly caused due to missing information.

figure 3 **findings** per 100 women referred in 2019

- breast cancer, invasive
- breast cancer, in situ
- no signs of breast cancer, after non-invasive assessment
- no signs of breast cancer, after invasive assessment
- no signs of breast cancer, unknown type of assessment

after initial screens

10 | 4 | 27 | 45 | 14

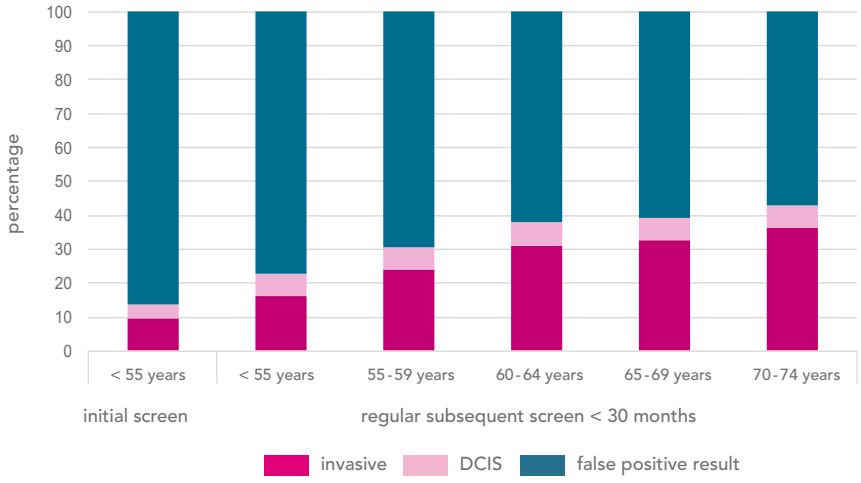
after regular subsequent screens < 30 months

28 | 7 | 16 | 39 | 10

[1] Due to missing data the percentage 'no signs of breast cancer, unknown type of assessment' is higher than in previous years (< 5%).

figure 4 **distribution of invasive breast cancer, DCIS and false positive results**

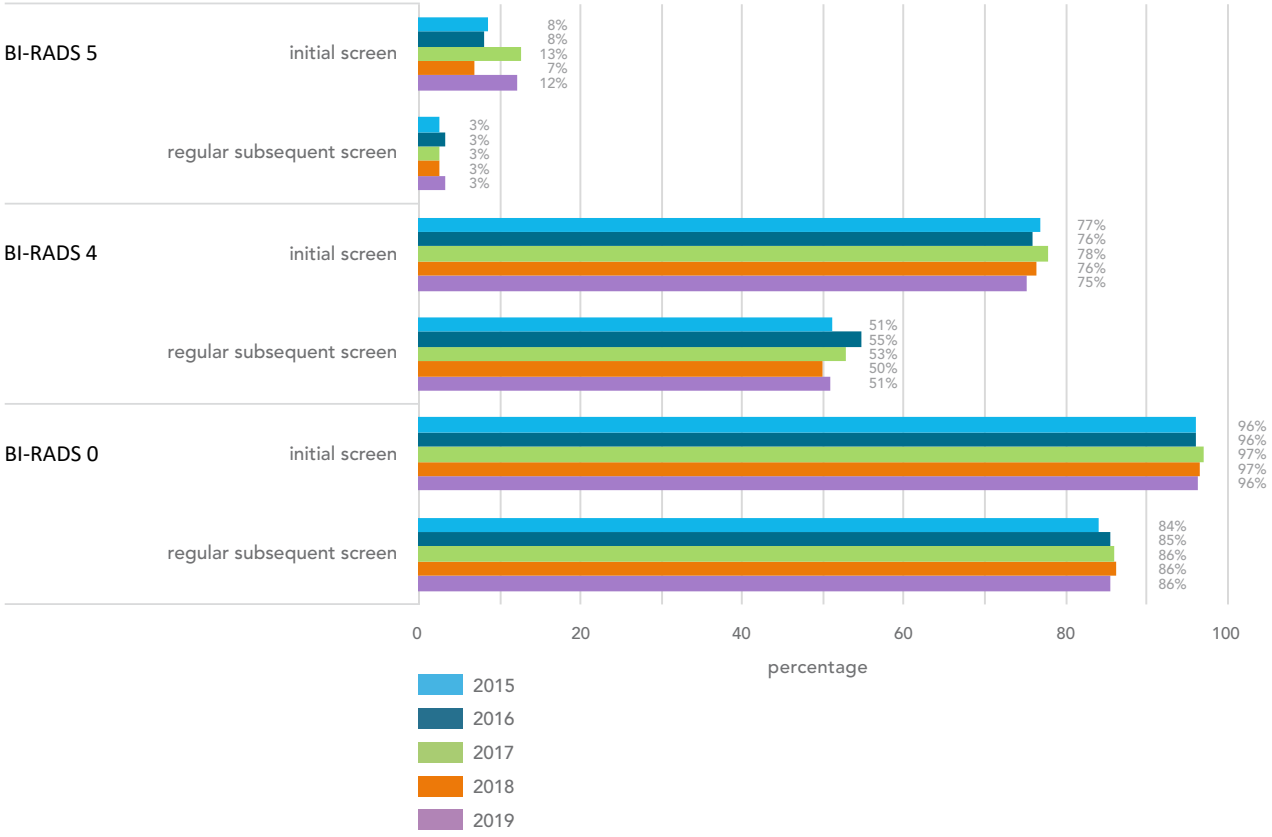
per age group, and for initial and regular subsequent screens < 30 months in 2019, separately (denominator: number of referred women)



- The percentage false positive results was higher after initial screens (86%) compared to regular subsequent screens (65%) and decreased with increasing age.
- The proportion invasive breast cancer (diagnosed in women referred after regular subsequent screens) increased with increasing age from 16% to 36%.
- The proportion DCIS was 4% in women <55 years after initial screens and fluctuated between 6%-7% in older age groups.

figure 5 **percentage of false positive results / no signs of breast cancer**

per BI-RADS, and for initial and regular subsequent screens < 30 months, separately



- The percentage false-positive results after referral with a BI-RADS 4 or BI-RADS 5 was higher in women referred after an initial screen compared with regular subsequent screens.
- After referral with BI-RADS 0 and clinical assessment in the hospital, most women had no signs of breast cancer.

table 5 **detection rate and percentage DCIS and invasive breast cancers**

per initial and regular subsequent screens < 30 months

	2015	2016	2017	2018	2019
initial screen					
- detection rate	0.83%	0.90%	0.82%	0.81%	0.81%
- ductal carcinoma in situ (DCIS) [1]	30.7%	30.0%	31.6%	29.1%	29.2%
- invasive breast cancers [1]	69.3%	70.0%	68.4%	70.9%	70.8%
regular subsequent screen					
- detection rate	0.66%	0.65%	0.64%	0.65%	0.65%
- ductal carcinoma in situ (DCIS) [1]	21.0%	20.2%	19.0%	18.8%	19.3%
- invasive breast cancers [1]	79.0%	79.8%	81.0%	81.2%	80.7%

[1] Percentage of the number of screen-detected cancers.

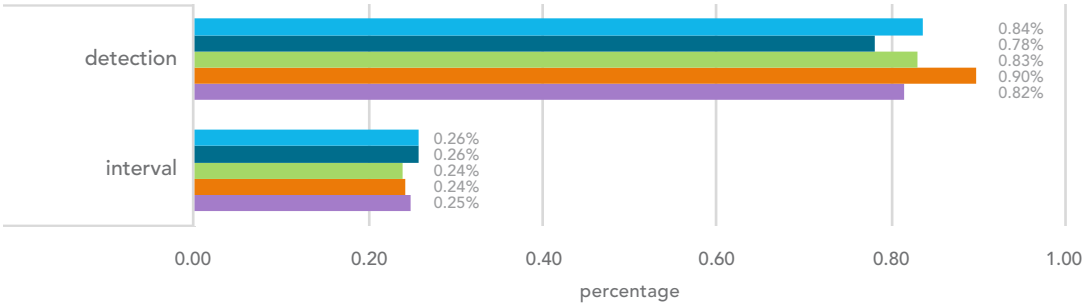
table 6 **interval cancers 2013 - 2017**

	2013	2014	2015	2016	2017
screening examinations	1,017,317	995,367	1,022,319	1,019,604	1,025,933
screen-detected breast cancer	7,011	6,849	7,081	7,141	6,919
- detection rate	0.69%	0.69%	0.69%	0.70%	0.67%
interval cancers	2,140	2,224	2,222	2,215	2,252
- interval cancer rate	0.21%	0.22%	0.22%	0.22%	0.22%
programme sensitivity	76.6%	75.5%	76.1%	76.3%	75.4%
programme specificity	98.1%	98.2%	98.4%	98.3%	98.4%

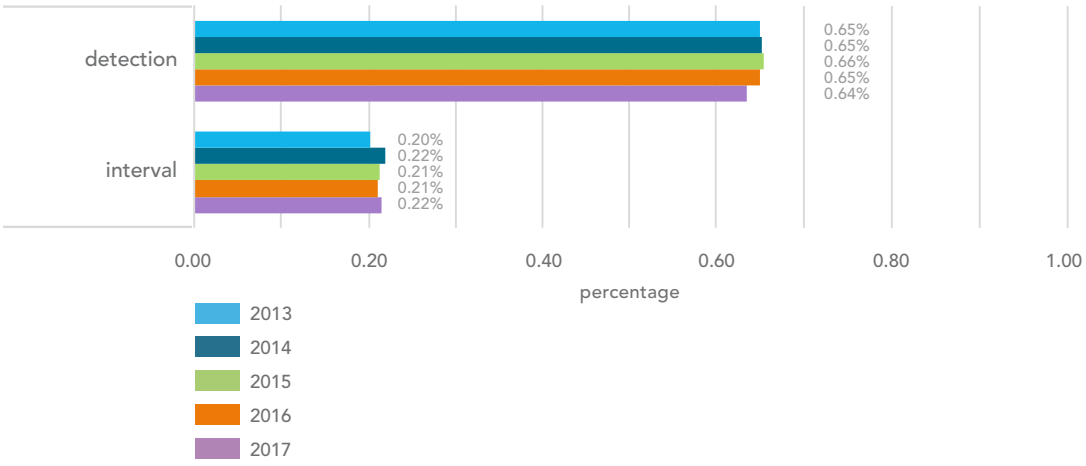
figure 6 **detection rate and interval cancers**

as percentage of the number of women screened, for initial and regular subsequent screens < 30 months, separately

initial screen



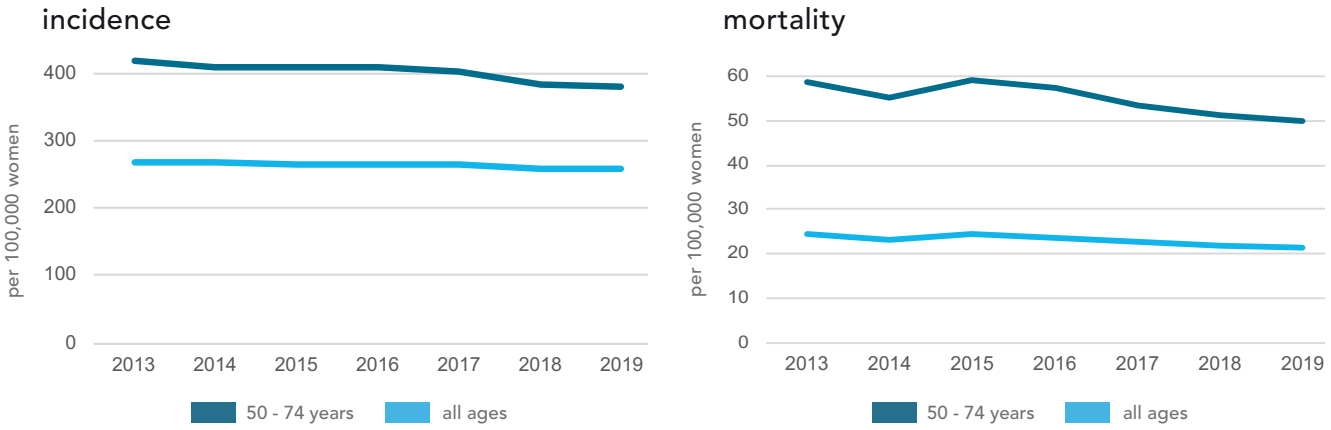
regular subsequent screen



- An interval cancer is defined as a breast cancer diagnosed within 2 years after a negative screen examination.
- In 2017 detection rate was 0.67% and slightly lower than in previous years. The proportion interval cancers remained constant with 0.22%
- The programme sensitivity and specificity also remained stable and met the target values of >70% and >98% respectively.
- The detection rate and the proportion interval cancers were both higher after an initial screen compared with a regular subsequent screen.

figure 7 **incidence and mortality rates**

by year (source: Netherlands Cancer Registry (incidence rates) and CBS (mortality rates)



- The incidence and mortality rates of breast cancer were calculated for the total female population and for women 50-74 years of age.
- The incidence in women 50-74 is higher compared to the total female population, because breast cancer occurs more often in this age group.
- The mortality rate in women 50-74 is higher as well. This is caused by the higher incidence, causing more women to be at risk of dying from breast cancer.
- The incidence of invasive breast cancer and the incidence of in situ breast cancer (DCIS) both decreased slightly in women 50-74 years of age.
- In 2019 breast cancer mortality in women 50-74 years of age decreased compared to previous years.

table 7 **incidence and mortality rates**

by year (source: Netherlands Cancer Registry (incidence rates) and CBS (mortality rates)

	2013	2014	2015	2016	2017	2018	2019
incidence of breast cancer/100,000 (ESR) 50-74 years							
invasive breast cancer	342.7	341.7	335.9	336.6	335.1	319.0	316.2
in situ breast cancer	75.7	67.6	72.4	71.1	67.6	62.9	63.4
incidence of breast cancer/100,000 (ESR) all ages							
invasive breast cancer	133.4	133.5	132.0	131.7	133.1	129.3	129.9
in situ breast cancer	23.8	21.4	22.7	23.0	21.8	20.5	20.8
breast cancer mortality/100,000 (ESR) 50-74 years	58.6	55.2	59.2	57.4	53.3	51.3	49.7
breast cancer mortality/100,000 (ESR) all ages	24.7	23.0	24.7	23.7	22.8	21.9	21.6
breast cancer mortality compared with 1986/1988							
50-74 years	-37.7%	-41.4%	-37.2%	-39.0%	-43.4%	-45.5%	-47.2%
55-79 years [1]	-37.3%	-40.7%	-34.0%	-39.0%	-40.1%	-42.8%	-43.5%

[1] Taking lag time into account. ESR = European Standardized Rate.

This monitor is available on: www.iknl.nl/en/screening and on: www.rivm.nl/en/breast-cancer-screening-programme

Disclaimer: the information in this monitor has been carefully compiled. Results of previous years have been updated with the most recent data (1 June 2021) and might differ from previous results.