Monitor Dutch **breast cancer** screening programme **2022**

Edition October 2023

1 Click for further explanation.

Key findings 2022

In 2022, **88.6%** of the target population was invited.

A total of **876,803** individuals participated. The participation rate was **70.7%**.

Of all participants, **8.9%** received their next routine invitation within the set standard of 24 +/- 2 months. For **12.9%**, the invitation interval exceeded 36 months.

Of all those who participated in a subsequent screening round, **22.0%** were rescreened within 30 months.

TARGET POPULATION
1,399,877
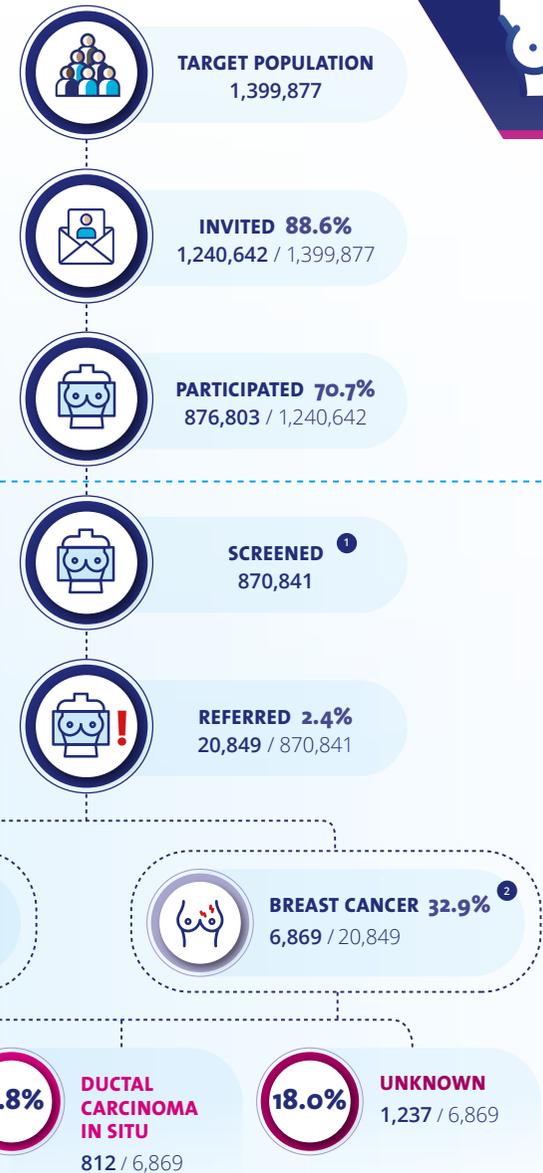
INVITED 88.6%
1,240,642 / 1,399,877

PARTICIPATED 70.7%
876,803 / 1,240,642

SCREENED [1]
870,841

REFERRED 2.4%
20,849 / 870,841

FALSE POSITIVE 67.1%
13,980 / 20,849

BREAST CANCER 32.9% [2]
6,869 / 20,849

70.2% INVASIVE BREAST CANCER
4,820 / 6,869

11.8% DUCTAL CARCINOMA IN SITU
812 / 6,869

18.0% UNKNOWN
1,237 / 6,869

Figure 1 / **1 Flowchart breast cancer screening programme process 2022** [3]
(Source: BVO NL and Palga)

Erasmus MC

Context

Introduction: **Breast cancer screening programme**

In the Netherlands, women aged 50 to 75 years are biennially invited to participate in the national breast cancer screening programme. The screening involves taking X-rays of the breasts (mammograms) in order to detect breast cancer at an early stage, before symptoms appear. This increases the chances of successful treatment and often requires less invasive treatment than when breast cancer is detected at a late stage. The ultimate goal of the screening programme is to reduce breast cancer mortality and disease burden for people with breast cancer.

Context 1: **Changes within the breast cancer screening programme**

In recent years, a few changes were made within the breast cancer screening programme. These are important when interpreting the monitoring figures.

Open invitations
Since mid-2020, so-called 'open invitations' have been sent. Previously, the invitations stated a date and time when the screening examination would take place. This is not the case for the open invitations, in which individuals are asked to schedule an appointment themselves.

Extension invitation interval
Due to the shortage of mammography technicians and the reduced capacity during the COVID-19 pandemic, the invitation interval has temporarily be extended since 2020. The original aim was to invite individuals every 2 years (24 +/- 2 months). This has now been temporarily extended to a maximum of 3 years (36 months).

1 / **Invitations and participation**

Table 1 / **Target population, invitations and participation** by year (source: BVO NL and IKNL)

|	2018	2019	2020	2021	2022
Gross target population	1,428,692	1,431,368	1,459,077	1,474,325	1,472,500
Net target population	1,348,986	1,349,710	1,382,225	1,400,247	1,399,877
Invited (% of net target population)	1,273,529 94.4%	1,310,693 97.1%	757,520 54.8%	1,221,789 87.3%	1,240,642 88.6%
Participated (% of those invited)	978,833 76.9%	996,447 76.0%	537,592 71.0%	887,334 72.6%	876,803 70.7%
– after initial invitation	74.6%	73.0%	60.8%	60.0%	56.9%
– after reminder invitation	17.2%	17.4%	32.6%	36.2%	36.5%
Re-participation rate [4]	91.6%	91.2%	85.3%	87.1%	87.0%

- Since the introduction of 'open invitations' in 2020 (see context 1), participation rates after initial invitation have dropped substantially. This does not seem to be recovering, even after the COVID-19 period. While in 2019 73.0% participated after receiving their initial invitation, this was only 56.9% in 2022. At the same time, participation after the reminder invitation increased from 17.4% to 36.5%.

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Figure 2 / **Proportion of participants, non-respondents and non-participants** by year (source: BVO NL and IKNL)

Figure 3 / **Participation rate** by year and age (source: BVO NL and IKNL)
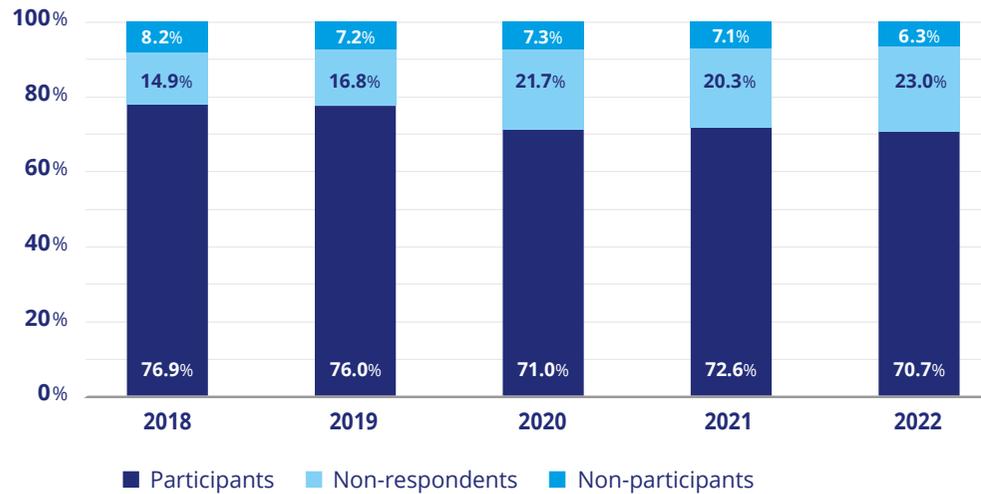
- In 2022, 70.7% of those invited participated in the screening programme. This is a decrease from 2021, when the participation rate was 72.6%. The decline in participation is accompanied by an increase in the percentage of non-respondents.
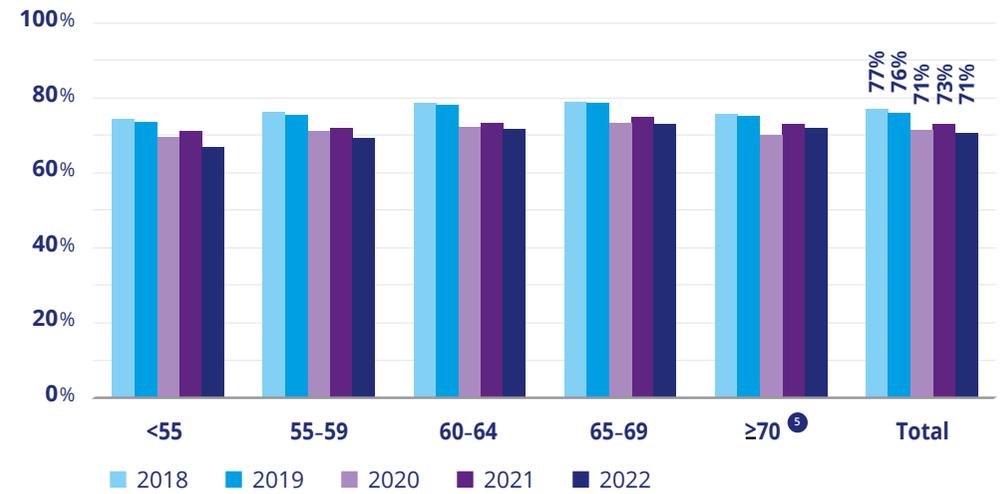
- As in previous years, the participation rate was highest among 65-69-year-olds and lowest among invitees under 55.

- In 2022, the participation rate was lower than in previous years for all age categories. The decrease from 2021 was greatest for the youngest age category (<55 years).

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Table 2 / **Indicators on invitation and screening interval** by year (source: BVO NL and IKNL) [6]

	2018	2019	2020	2021	2022
Individuals aged > 51 years at first invitation	**5.6%**	**7.1%**	**11.4%**	**23.3%**	**25.3%**
Average invitation interval	-	-	**29.7**	**32.7**	**32.1**
Invitation interval <22 months	-	-	3.5%	1.3%	1.5%
Invitation interval 24 +/- 2 months	78.0%	62.6%	15.2%	1.3%	8.9%
Invitation interval 26-30 months	-	-	32.8%	10.5%	14.2%
Invitation interval 30-36 months	-	-	45.1%	82.6%	62.6%
Invitation interval 36-42 months	-	-	2.8%	3.2%	11.5%
Invitation interval >42 months	-	-	0.8%	1.1%	1.4%
Screened in reporting year [7]	**979,338**	**923,724**	**530,720**	**878,566**	**870,841**
Screening interval <30 months	94.5%	93.0%	54.8%	15.2%	22.0%
Screening interval 30-36 months	-	-	38.7%	74.4%	60.9%
Screening interval 36-42 months	-	-	2.2%	5.3%	11.0%
Screening interval >42 months	-	-	4.4%	5.0%	6.1%
Results sent within 10 working days	**99.7%**	**99.8%**	**99.8%**	**99.8%**	**99.8%**

• In 2022, more people received their next routine invitation within 24 +/- 2 months (8.9%) than in 2021 (1.3%). The pre-2020 level (>60%) has however not yet been reached (see context 1).

• The percentage of invitees with an invitation interval longer than 36 months was higher than in previous years. This longer interval is especially common in the South-West region of the Netherlands, were 54.0% was invited after a period longer than 36 months. In other regions, this was only 3.3% on average. The longer interval in the South-West region is mainly due to the shortage of mammography technicians in this region and the high burden of training new staff on the available capacity.

• In 2022, 25.3% of individuals were older than 51 when they were first invited. This is more than in previous years.

• The percentage of participants with a screening interval shorter than 30 months was higher in 2022 (22.0%) than in 2021 (15.2%), but not yet at pre-COVID-19 pandemic levels (93.0%).

• At the same time, the number of participants with a screening interval longer than 36 months increased compared to previous years. Like the invitation interval, this is influenced by the screening capacity within the screening programme. The participation behaviour of the invitees does however also play a role. Some participants, for example, wait a relatively long time to schedule an appointment after receiving the invitation.

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2 / **Referral rates and outcomes**

Table 3 / **Referral rate** by year, invitation round and BI-RADS classification
(source: BVO NL and IKNL)

	2018	2019	2020	2021	2022
Initial screening					
Referral rate	5.73%	5.89%	6.84%	5.94%	5.41%
Referred with BI-RADS 5	0.19%	0.18%	0.19%	0.20%	0.19%
Referred with BI-RADS 4	2.20%	2.11%	2.38%	2.13%	1.97%
Referred with BI-RADS 0	3.32%	3.60%	4.26%	3.60%	3.25%
Subsequent screening					
Referral rate	1.76%	1.94%	2.18%	2.06%	1.95%
Referred with BI-RADS 5	0.13%	0.13%	0.16%	0.18%	0.18%
Referred with BI-RADS 4	0.80%	0.85%	0.93%	0.94%	0.91%
Referred with BI-RADS 0	0.81%	0.96%	1.09%	0.95%	0.86%
Total					
Referral rate	2.23%	2.39%	2.74%	2.60%	2.40%
Referred with BI-RADS 5	0.15%	0.13%	0.17%	0.18%	0.18%
Referred with BI-RADS 4	0.98%	0.99%	1.10%	1.10%	1.05%
Referred with BI-RADS 0	1.10%	1.26%	1.47%	1.32%	1.17%

Context 2: **Completeness of outcomes**

Due to a large-scale renewal of the ICT infrastructure and the partial lack of follow-up data from hospitals, data regarding outcomes from 2020 onwards is less complete than before. When analysing the data, it was assumed that the number of breast cancers detected and false positive results after invasive diagnostics are known from all referrals, as these are registered in Palga. Based on this assumption, the remaining values concerning false positive results were calculated (shown in **blue** in table 4). In doing so, it was not possible to distinguish between false positive results after non-invasive diagnostics, unknown method of diagnostics and referral advice not followed.

- A total of 20,849 individuals were referred in 2022, leading to an overall referral rate of 2.40%.

- The referral rate was higher for those participating for the first time (5.41%) than for those participating in subsequent screening round (1.95%).

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Table 4 / **Indicators related to outcomes** by year (source: BVO NL, Palga and IKNL) [8]

	2018	2019	2020	2021	2022
Number of screening tests	979,338	923,724	530,720	878,566	870,841
Breast cancer detection	0.68%	0.69%	0.77%	0.81%	0.79%
Positive predictive value	31%	29%	28%	31%	33%
Proportion of false-positive results	1.6%	1.7%	2.0%	1.8%	1.6%
– after non-invasive/unknown type diagnostics	1.1%	1.2%	1.4%	1.2%	1.1%
– after invasive diagnostics	0.5%	0.5%	0.6%	0.6%	0.5%
Proportion of false-positives after BI-RADS 5	3%	5%	3%	5%	6%
– after non-invasive/unknown type diagnostics	1%	2%	2%	3%	4%
– after invasive diagnostics	2%	2%	2%	1%	2%
Proportion of false-positives after BI-RADS 4	57%	57%	58%	56%	54%
– after non-invasive/unknown type diagnostics	23%	26%	24%	21%	22%
– after invasive diagnostics	34%	31%	34%	35%	32%
Proportion of false-positives after BI-RADS 0	90%	89%	90%	88%	88%
– after non-invasive/unknown type diagnostics	76%	78%	77%	73%	73%
– after invasive diagnostics	13%	11%	13%	15%	15%
Screen-detected cancers [9]	6,689	6,362	4,085	7,084	6,869
– invasive breast cancer	80%	79%	67%	73%	70%
– ductal carcinoma in situ	20%	21%	13%	12%	12%
– unknown	0%	0%	19%	15%	18%

- In 2022, 6,869 (0.79%) of screened individuals were diagnosed with breast cancer.

- The positive predictive value, the percentage of people diagnosed with breast cancer after referral, was 33%.

- Of all women screened, 1.6% received a false-positive result.

- Compared to previous years, all outcome-related results seem to be comparable with 2022.

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3 / **Incidence and mortality**

Figure 4 / **Incidence and mortality of breast cancer in the Netherlands** by year (source: NCR (incidence rates) and CBS (mortality rates))
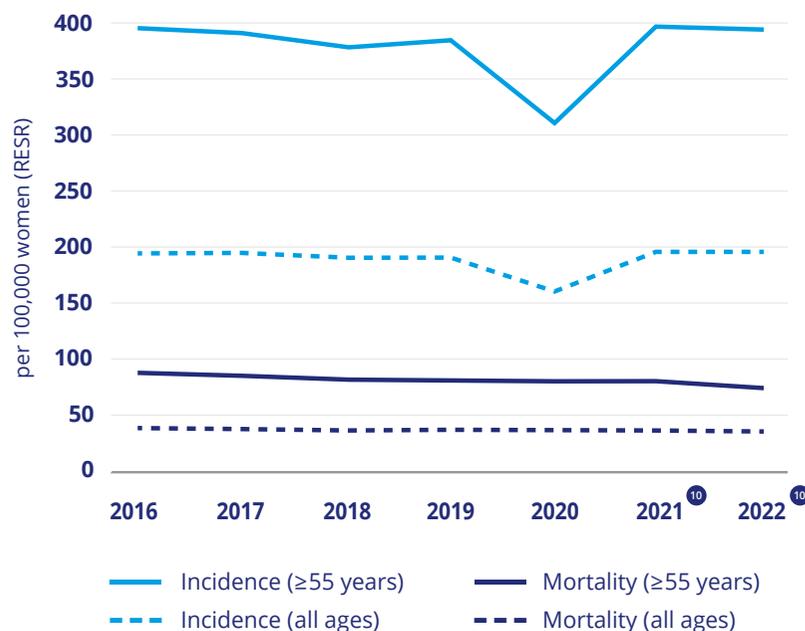

Legend:
- Incidence (≥55 years)
- Incidence (all ages)
- Mortality (≥55 years)
- Mortality (all ages)

Table 5 / **Incidence and mortality of breast cancer in the Netherlands** by year (source: NCR (incidence rates) and CBS (mortality rates)) [11]

	2016	2017	2018	2019	2020	2021	2022
Incidence/100,000 women (≥50 years, RESR)							
Invasive breast cancer	338.08	338.31	327.45	326.96	276.72	*343.70*	*340.06*
Ductal carcinoma in situ	58.07	55.26	52.37	53.39	38.82	*54.46*	*55.38*
Incidence / 100,000 women (all ages, RESR)							
Invasive breast cancer	166.62	168.43	163.97	164.91	142.62	*170,70*	*169.52*
Ductal carcinoma in situ	26.89	25.52	24.21	24.59	18.53	*24.80*	*25.39*
Breast cancer mortality / 100,000 women (≥50 years, RESR)	82.85	80.71	78.96	76.96	74.88	76.15	*75.24*
Breast cancer mortality / 100,000 women (all ages, RESR)	35.51	34.56	33.55	33.06	32.64	32.73	*32.29*
Breast cancer mortality vs 1989 (RESR)							
≥50 years old	-36.5%	-38.1%	-39.5%	-41.0%	-42.6%	-41.6%	*-42.3%*
All ages	-37.9%	-39.6%	-41.4%	-42.2%	-42.9%	-42.8%	*-43.6%*

- Due to the COVID-19 pandemic, the breast cancer screening programme was temporarily paused and individuals generally visited their GPs less frequently. This could explain the lower incidence rates in 2020. Although the incidence rates in 2022 were lower than in 2021, they were higher in both years than before the pandemic. This might be a compensation for the lower incidence rates in 2020.

Context 3: **Data and monitoring**

The National Institute for Public Health and the Environment (RIVM) is responsible for the national coordination of cancer screening programmes in the Netherlands on behalf of the Ministry of Health, Welfare and Sport (VWS). Monitoring of the screening programmes is carried out by the Erasmus University Medical Centre (Erasmus MC). The aim of this monitoring is to provide an overview of the screening programmes and identify important trends.

The data presented in this monitor are derived from Bevolkingsonderzoek Nederland (BVO NL) and the Pathological-Anatomical National Automated Archive (Palga). These data were retrieved on 2 August 2023. Besides, data already published in previous monitors by the Netherlands Comprehensive Cancer Organisation (IKNL) are presented for the reporting years 2018 and 2019. Information on incidence and mortality is retrieved from the Dutch Cancer Registry (NCR) and Statistics Netherlands (CBS), respectively. Because data from previous years have been recalculated based on the most recent data, data may differ from previous publications.

Due to a large-scale renewal of the ICT infrastructure within the screening programme, a different data source is used from 2019 onwards. For some indicators, this may have led to a break in trends. Besides, this is the reason why data relating to outcomes from 2020 are delayed and not yet fully available.

Disclaimer: This monitor has been carefully compiled. For parts 1 and 2, results from 2018 and 2019 are based on data from IKNL's breast cancer data warehouse. Outcomes from 2020 onwards are based on data from BVO NL and Palga. This might have caused a break in trends.

Glossary

Breast cancer detection: proportion of participants diagnosed with breast cancer.
Breast Imaging Reporting and Data System (BI-RADS): radio-logical classification system to assess mammograms. BI-RADS 0: images contain insufficient information to properly assess; BI-RADS 4: suspicious abnormality; BI-RADS 5: highly suggestive of malignancy.
BVO NL: Bevolkingsonderzoek Nederland; Dutch screening organisation
CBS: Statistics Netherlands
Ductal carcinoma in situ: possible preliminary stage of breast cancer in which abnormal cells do not progress to surrounding tissues and metastasis to other organs is not possible.
Gross target population: individuals eligible to participate in the screening programme in the reporting year in question based on the biennial invitation interval.
IKNL: Netherlands Comprehensive Cancer Organisation
Initial screening: screening examination of individuals participating in the screening programme for the first time.

Invasive breast cancer: form of breast cancer in which abnormal cells grow into surrounding tissues and metastasis to other organs is possible.
Invited: number of invited individuals from the target population.
NCR: Netherlands Cancer Registry
Net target population: individuals who are eligible to participate in the screening programme in the reporting year in question based on the biennial invitation interval who did not opt out during a previous round.
Non-participants: proportion of invited participants who actively opted out.
Non-respondents: proportion of invited participants who did not participate without actively opting out.
Palga: Pathological-Anatomical National Automated Archive
Participation rate: proportion of individuals who participated in the screening programme in response to an invitation in the reporting year. This does not require the screening examination to have taken place in the reporting year.
Positive predictive value: proportion of referred individuals diagnosed with breast cancer.

Referral rate: proportion of participants referred to the hospital due to their screening test result.
Re-participation rate: proportion of participants that participated both in the current screening round and the previous screening round of those invited that participated in the previous round.
RESR: Revised European Standardised Rate; revised measure used to present incidence and mortality rates, standardized for the European standard population based on data on the European population in 2010.
Results sent within 10 working days: proportion of letters containing the screening examination result sent within 10 working days of the examination.
RIVM: National Institute of Public Health and the Environment
Subsequent screening: screening examination of a participant who has participated in population screening at least once before.