

Monitor Dutch breast cancer screening programme 2023

Edition november 2024



Key findings 2023



1,198,866 individuals were invited, of whom **70.3%** participated by having a mammogram.



In total, **28.5%** were re-invited within 24 +/- 2 months of the previous invitation. **93.7%** received their next invitation within 36 months.



Of all participants, **2.4%** were referred to the hospital due to an unfavourable mammogram.



Breast cancer was detected in **6,315** participants. The detection rate was **0.75%**.

Disclaimer: This monitor has been carefully compiled. Where possible, results from previous years have been recalculated using the most recent data. These may therefore differ from previously reported results.

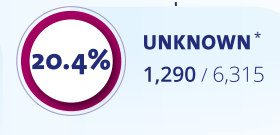


Figure 1 / Flowchart breast cancer screening programme in 2023 (source: BVO NL and Palga)

* Because outcome-related data is incomplete, percentages may be higher or lower than shown (see context 1). In addition, numbers (and percentages) for invasive breast cancer and ductal carcinoma in situ will actually be higher as the breast cancer type is unknown for a proportion of the detected breast cancers.

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1 / Invitations and participation

Introduction: **Breast cancer screening programme**

In the Netherlands, women aged 50 to 75 years are invited to participate in the breast cancer screening programme by having X-rays taken of the breasts (mammograms). The screening organization aims to invite individuals every two years (24 +/- 2 months). However, due to capacity issues, the invitation interval is temporarily extended to a maximum of three years (36 months) from 2020 onwards.

Through the screening programme, breast cancer can be detected at the earliest possible stage. This increases the chance of successful treatment and often requires less invasive treatment than if breast cancer is detected at a late stage. The ultimate goal of the screening programme is to reduce the breast cancer mortality and the disease burden for people with breast cancer.

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

	2019	2020	2021	2022	2023
Target population invitation	1,349,710	1,401,859	1,422,512	1,438,004	1,422,894
Invitations sent	1,310,693	752,540	1,221,410	1,221,754	1,198,866
Coverage rate	97.1%	53.7%	85.9%	85.0%	84.3%
Participants	996,447	534,196	887,302	864,357	842,256

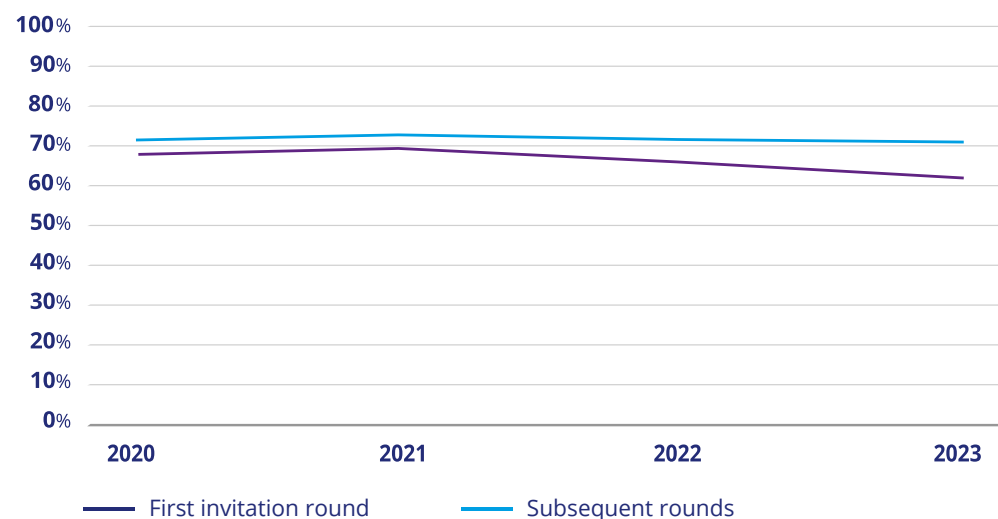
- In 2023, 842,256 individuals (70.3%) participated. A total of 74,816 individuals (6.2%) actively opted out (non-participants). The remaining 281,794 individuals (23.5%) did not respond to the invitation (non-respondents).



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Figure 2 / **Participation rate** by invitation round and year* (source: BVO NL)



* Data for 2019 is not available by invitation round (see context 2).

Table 2 / **Participation rate** by age and year (source: BVO NL and IKNL)

	2019	2020	2021	2022	2023
<55 years	74.1%	69.9%	71.2%	68.3%	66.5%
55 – 59 years	75.6%	70.6%	72.0%	70.1%	69.8%
60 – 64 years	77.8%	72.3%	73.7%	71.9%	71.9%
65 – 69 years	78.8%	73.7%	75.5%	74.4%	74.2%
≥70 years	75.7%*	69.0%	71.6%	70.1%	70.5%
Total	76.0%	71.0%	72.6%	70.7%	70.3%

* In contrast to the other reporting years, data for the 70+ age group is limited to data from 70-74-year-olds for 2019.

Table 3 / **Participation patterns over two invitation rounds** by year (source: BVO NL)

	2019	2020	2021	2022	2023
Re-participation rate*	91.2%	85.3%	87.2%	87.2%	88.5%
Switch no participation to participation**	-	20.5%	21.8%	22.1%	22.2%

* Proportion of invitees who participated in the previous invitation round and participated again in the current invitation round (in the reporting year).

** Proportion of invitees who did not participate in the previous invitation round but did participate in the current invitation round (in the reporting year).

- Over the past several years, participation was consistently lower for first-time invitees than for those who had already been invited for a previous round (figure 2).
- The decrease in participation observed from 2021 to 2023 was significantly greater for the first invitation round (from 69.5% to 62.2%) compared to subsequent invitations rounds (from 73.1% to 71.2%).
- In 2023, the total participation rate was 70.3%. This is slightly lower than in 2022 (70.7%) (table 2).
- As in previous years, the total participation rate was highest for the 65-69-year-olds (74.2%) and lowest for the invitees under 55 years of age (66.5%).

- The biggest decrease in participation was observed for individuals aged under 55.
- Of those who participated in the previous invitation round and were re-invited in 2023, 88.5% participated again in 2023 (table 3).
- Similar to the participation rate, the re-participation rate was highest for those aged 65-69 (90.7%) and lowest for those aged under 55 (85.5%).
- Of those who did not participate in the previous round, 22.2% did participate in 2023 (table 3). This is similar to the results of 2022 (22.1%). No remarkable differences were observed between the different age groups.



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Table 4 / **Indicators regarding the invitation and screening intervals*** by year (source: BVO NL and IKNL)

	2019**	2020	2021	2022	2023
Individuals aged <52 years at first invitation	-	94.2%	90.3%	87.8%	89.5%
Average invitation interval (months)	-	30.5	33.5	32.9	29.1
Invitation interval <22 months	-	3.4%	1.3%	1.5%	4.2%
Invitation interval 24 +/- 2 months	62.6%	15.6%	1.4%	9.4%	28.5%
Invitation interval 27–29 months	-	32.9%	10.7%	14.1%	40.7%
Invitation interval 30–35 months	-	44.5%	82.3%	62.5%	20.3%
Invitation interval 36–41 months	-	2.8%	3.2%	11.2%	5.2%
Invitation interval ≥ 42 months	-	0.8%	1.1%	1.3%	1.1%
Average screening interval (months)	-	32.8	35.3	34.9	31.5
Screening interval <30 months	93.0%	43.6%	14.3%	27.6%	69.4%
Screening interval 30–35 months	-	47.4%	74.8%	54.1%	19.5%
Screening interval 36–41 months	-	3.6%	5.2%	11.5%	4.0%
Screening interval ≥ 42 months	-	5.3%	5.7%	6.8%	7.1%

* The invitation interval is influenced by the capacity within the screening programme. The screening interval is also influenced by the invitee's participation behaviour.

** A part of the data is not available for 2019 ([zie context 2](#)).

- In 2023, notably more individuals were invited within 24 +/- 2 months (28.5%) compared to 2022 (9.4%) (table 4). In addition, more individuals were invited within 36 months (93.7% vs. 87.5% in 2022). There is thus less and less delay in inviting individuals. This is observed for all geographical regions (not shown in the table).

- In 2023, 89.5% of individuals were younger than 52 years old when they were invited for the first time.
- The proportion of participants with a screening interval shorter than 30 months was higher in 2023 (69.4%) than in 2021 (27.6%), but still not at the pre-COVID 19 level (93.0%).

- At the same time, the number of participants with a screening interval longer than 42 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 in the screening interval. Some individuals, for example, wait a relatively long time to schedule an appointment after receiving the invitation.



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2 / Referrals and outcomes

Table 5 / **Referral rates** by invitation round, BI-RADS classification and year
(source: BVO NL and IKNL)

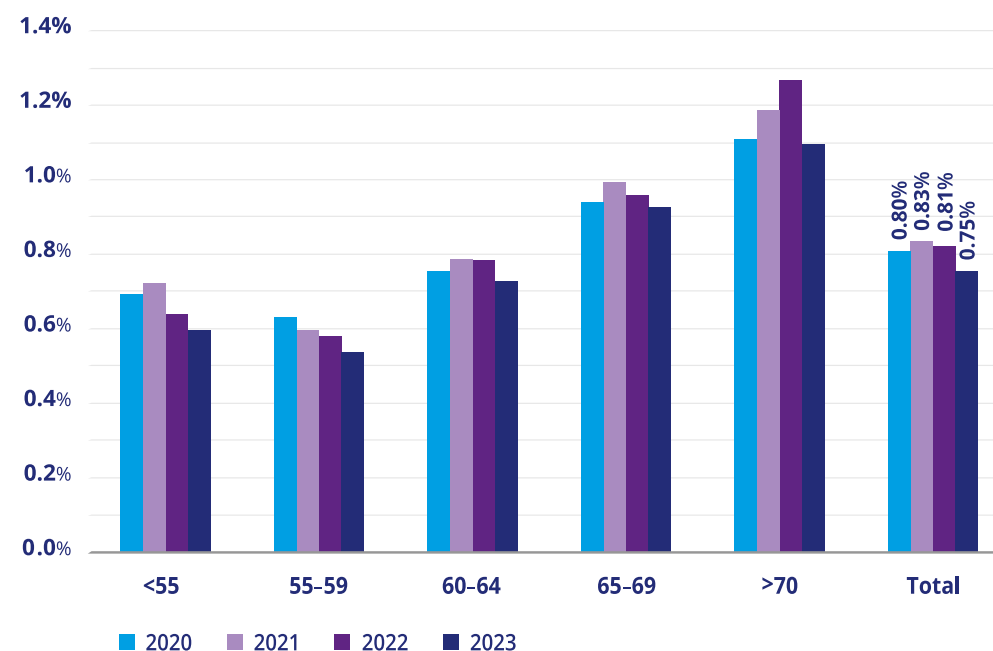
	2019*	2020	2021	2022	2023
First invitation round					
Referral rate	5.89%	6.66%	5.67%	5.42%	5.88%
Referred with BI-RADS 5	0.18%	0.17%	0.17%	0.16%	0.16%
Referred with BI-RADS 4	2.11%	2.29%	2.06%	2.02%	2.10%
Referred with BI-RADS 0	3.60%	4.20%	3.44%	3.24%	3.62%
Subsequent invitation rounds					
Referral rate	1.94%	2.28%	2.12%	2.03%	2.04%
Referred with BI-RADS 5	0.13%	0.17%	0.18%	0.18%	0.16%
Referred with BI-RADS 4	0.85%	0.97%	0.95%	0.94%	0.90%
Referred with BI-RADS 0	0.96%	1.14%	0.99%	0.91%	0.98%
Total					
Referral rate	2.39%	2.78%	2.55%	2.41%	2.40%
Referred with BI-RADS 5	0.13%	0.17%	0.18%	0.17%	0.16%
Referred with BI-RADS 4	0.99%	1.12%	1.09%	1.06%	1.01%
Referred with BI-RADS 0	1.26%	1.48%	1.29%	1.18%	1.23%

* Due to a difference in data sources, results for 2019 are shown by screening round instead of invitation round (see context 2).

- In total, 20,242 individuals were referred in 2023 (table 5). The total referral rate was 2.40%. Over the last few years, the referral rate seems to be stable.

- The referral rate was higher for individuals who were invited for the first time (5.88%) compared to individuals that had already been invited before (2.04%). This was also observed in prior years.

Figure 3 / **Detection rate breast cancer** by age and year* (source: Palga)



* The reference date for all findings is April 1st 2024. The reference period of 2023 is therefore shorter compared to the previous years. Results for 2023 are preliminary and are expected to be turned out higher as individuals have two years to participate. In addition, data for 2019 is not available (see context 2).

- In 2023, 6,315 participants were diagnosed with breast cancer. The detection rate was 0.75% (figure 3).



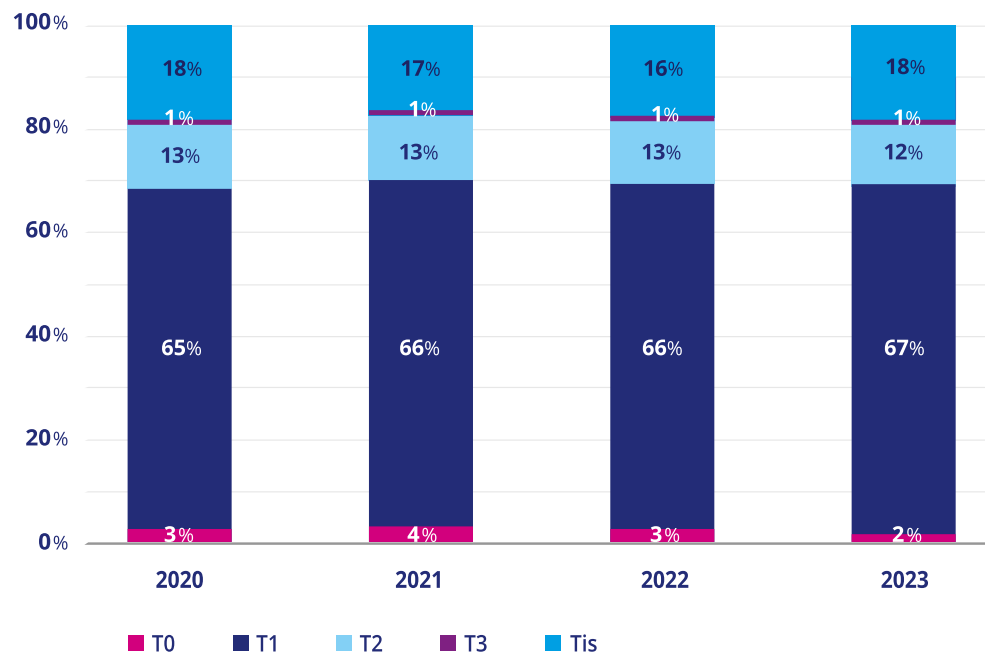
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Figure 4 / **Stage distribution detected breast cancers** by T-stage and year* (source: Palga)



* Stages are based on pathological T-values. For all years, the detection rate of T4 was lower than 0.1% and is therefore not visible in the figure. Besides, data for 2019 is not available (see context 2) and results are only shown for breast cancers with a known stage.

- As in previous years, the majority of cancers was found in T-stage 1 (67%) (figure 4).

Context 1: **Completeness of outcomes**

As a result of a large-scale renewal of the ICT infrastructure at the screening organization and the partial absence of feedback from hospitals, outcome-related data from 2020 onwards is less complete than before. In analysing the data, it was assumed that of all referrals, the number of breast cancer detections and false-positive results after invasive diagnostics are known, as these are included in Palga. Based on this assumption, the remaining values regarding false positives were calculated (shown in blue in table 6). It was not possible to distinguish between false positive results after non-invasive diagnostics, unknown method of diagnostics and referral advice not followed. Results may therefore differ from reality.



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Table 6 / **Indicators related to outcomes*** (source: BVO NL, Palga and IKNL)

	2019	2020	2021	2022	2023
Positive predictive value referral advice	29%	29%	32%	34%	31%
False positive results in screened individuals	1.7%	2.0%	1.7%	1.6%	1.7%
– After non-invasive/unknown type diagnostics	1.2%	1.4%	1.1%	1.0%	1.1%
– After invasive diagnostics	0.5%	0.6%	0.6%	0.6%	0.5%
Proportion of false positive results after BI-RADS 5	5%	3%	3%	3%	5%
– After non-invasive/unknown type diagnostics	2%	1%	1%	1%	3%
– After invasive diagnostics	2%	2%	1%	2%	2%
Proportion of false positive results after BI-RADS 4	57%	57%	55%	53%	54%
– After non-invasive/unknown type diagnostics	26%	22%	18%	18%	20%
– After invasive diagnostics	31%	35%	36%	35%	35%
Proportion of false positive results after BI-RADS 0	89%	90%	88%	87%	89%
– After non-invasive/unknown type diagnostics	78%	77%	72%	72%	74%
– After invasive diagnostics	11%	13%	16%	16%	15%
Screen-detected cancers**	6,362	4,275	7,354	7,043	6,315
– Invasive breast cancer	79%	69%	70%	70%	65%
– Ductal carcinoma in situ	21%	16%	15%	14%	14%
– Unknown	0%	15%	15%	15%	20%

* Due to incomplete data regarding outcomes, percentages may be higher or lower than shown. Blue numbers are calculated based on assumptions. They may therefore differ from reality (see context 1).

** Because the breast cancer type for a proportion of detected breast cancers in 2023 is unknown, numbers (and rates) for invasive mammary carcinoma and ductal carcinoma in situ will actually be higher.

• The positive predictive value of the referral advice, the proportion of individuals who were diagnosed with breast cancer after referral, was 31% in 2023 (table 6). This is in alignment with earlier years.

• Of all screened women, 1.7% received a false-positive test result. In these women, no breast cancer was detected after referral. This is also in line with earlier years.



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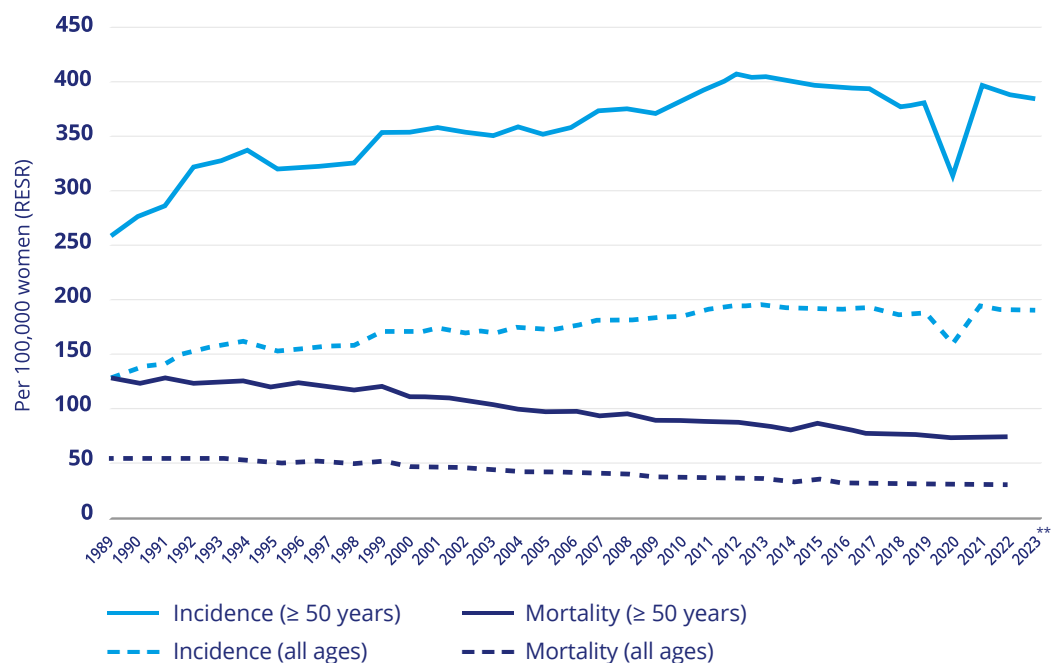
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3 / Incidence and mortality

Figure 5 / Incidence and mortality breast cancer in the Netherlands from the year before the national implementation of the screening programme in 1990*

(source: NCR (incidence rates) and CBS (mortality rates))



* Incidence is only shown for ductal carcinoma in situ and invasive breast cancer.

** Data for 2023 is preliminary (incidence) or not yet available (mortality).

Table 7 / Incidence and mortality breast cancer in the Netherlands by year

(source: NCR (incidence) and CBS (mortality))

	2019	2020	2021	2022	2023*
Incidence / 100,000 women (≥50 years, RESR)					
Invasive breast cancer	326.93	276.80	343.53	337.01	331.65
Ductal carcinoma in situ	53.41	38.87	54.54	53.42	54.27
Incidence / 100,000 women (all ages, RESR)					
Invasief mammacarcinoom	164.91	142.67	170.66	167.98	165.74
Ductaal carcinoma in situ	24.60	15.55	24.86	24.33	25.34
Breast cancer mortality / 100,000 women (≥50 years, RESR)					
	76.96	74.88	76.15	75.17	-
Breast cancer mortality / 100,000 women (all ages, RESR)					
	33.06	32.64	32.73	32.28	-
Breast cancer mortality relative to 1989**					
≥50 years	-41.0%	-42.6%	-41.6%	-42.4%	-
All ages	-42.2%	-42.9%	-42.8%	-43.6%	-

* Data for 2023 is preliminary (incidence) or not yet available (mortality).

** Year prior to the national implementation of the breast cancer screening programme in 1990.

- As a result of the COVID-19 pandemic, the screening programme was temporarily halted in 2020. Moreover, individuals visited their GP less frequently during this time. This could explain the lower incidence rate in 2020 (Figure 5). After a small spike in 2021, possibly compensating for the low rates in 2020, the incidence in 2023 is similar to pre-pandemic rates.

- The mortality rate for breast cancer in individuals aged 50 and over decreased from 130.46 per 100,000 people in 1989 to 75.17 per 100,000 individuals in 2022 (Figure 5). This is a relative decline of 42.4%.



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Context 2: Data and monitoring

The National Institute for Public Health and the Environment (RIVM) is responsible for the coordination of the national cancer screening programmes in the Netherlands on behalf of the Ministry of Health, Welfare and Sport. 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 the Pathological-anatomical national automated archive (Palga)

and the Dutch screening organisation (BVO-NL). These data were measured on 1 April 2024. Information regarding incidence and mortality are derived from the Netherlands Cancer Registry (NCR) and Statistics Netherlands (CBS), respectively, and were measured on 15 February 2024 and 18 January 2023. Because results from past years have been recalculated based on the most recent data, results may differ from previous publications. In addition, due to a large-scale renewal ICT infrastructure at the screening programme, data are reported from a different data source from 2020 onwards. Because data for 2019 are not available from this new source, data already published in previous

monitors by the Netherlands Comprehensive Cancer Organisation (IKNL) are shown for this reporting year (if possible). For the screening outcomes, data for 2019 is shown for individuals who were screened in 2019 (regardless of in which reporting year they were invited), while for the other years data is shown for individuals who were invited in the reporting year (regardless of in which year they were screened). The differences in sources may have led to a break in trends for some indicators. Besides, this is the reason why data relating to screening outcomes from 2020 onwards are delayed and not yet fully available.

Glossary

BI-RADS: Breast Imaging Reporting and Data System; radiological classification system to assess mammograms. BI-RADS 0: images contain insufficient information to be properly assessed; BI-RADS 4: suspicious abnormality; BI-RADS 5: highly suggestive of malignancy.

BVO-NL: Bevolkingsonderzoek Nederland; Dutch screening organisation.

CBS: Statistics Netherlands.

Coverage rate: Percentage of individuals from the target invitation group invited to the breast cancer population screening programme.

Detection rate: Proportion of participants diagnosed with breast cancer.

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.

IKNL: Netherlands Comprehensive Cancer Organisation.

Invasive breast cancer: form of breast cancer in which abnormal cells grow into surrounding tissues and metastasis to other organs is possible.

Invitation interval: time in between two subsequent invitations of an individual.

Invitation round: round in which an individual is invited for screening. This distinguishes between the round in which a person is invited for the first time (first round) and the subsequent rounds (follow-up rounds).

NCR: Netherlands Cancer Registry

Non-participants: proportion of invited individuals who actively opted out of participation.

Non-respondents: proportion of invited individuals 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.

Positive predictive value referral advice: proportion of referred individuals in whom breast cancer is detected.

Referral rate: proportion of participants referred to the hospital due to their screening test result.

Re-participation rate: percentage of invitees who participated in the previous invitation round and participated again in the current invitation round (in the reporting year).

RESR: Revised European Standardised Rate; revised measure used to present incidence and mortality rates, standardized for the European standard population.

RIVM: National Institute of Public Health and the Environment.

Screen-detected cancers: cancers detected through the screening programme.

Screening interval: time between two consecutive screening examinations of a participant.

Screening round: round in which an individual participated in the screening programme. This distinguishes between the round in which a person participates for the first time (first round) and the subsequent rounds (subsequent rounds).

Switch participation to non-participation: proportion of invitees who did not participate in the previous invitation round but did participate in the current invitation round (in the reporting year).

Target population invitation: total number of individuals who should receive an invitation to the screening examination in the reporting year according to program guidelines and who did not definitively opt out.

T-stage: pathological T stage according to the TNM classification, based on tumour size and growth into surrounding tissue. T0: no evidence of tumour; Tis: carcinoma in situ; T1: tumour is ≤2 cm in size; T2: tumour is 2-5cm in size; T3: tumour is >5 cm in size; T4: tumour has grown through into surrounding tissue (regardless of tumour size).

VWS: ministry of Health, Welfare and Sport.

