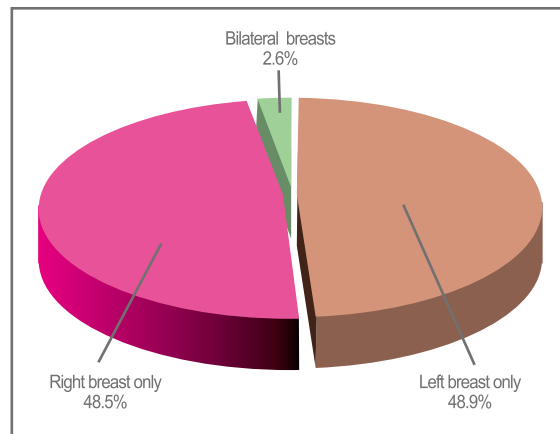


2.2 Characteristics of primary breast cancers

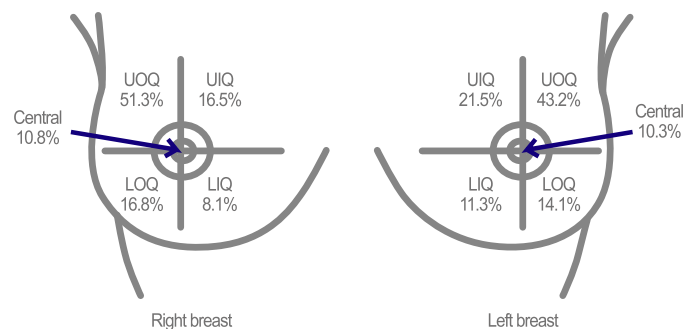
Primary breast cancers can occur in either breast or in both breasts. In the patient cohort, 48.5% of breast cancers occurred in the right breast only, 48.9% occurred in the left breast only and 2.6% occurred in both breasts (Figure 2.2.1). In bilateral breast cancers, 60.7% were synchronous cancers which occurred within 6 months of each other and 39.3% were metachronous cancers which occurred more than 6 months apart.

Figure 2.2.1 Laterality of 2,130 breast cancers



A tumour can be multifocal or multicentric, or it can occur in both forms. Regarding tumour locations in breasts, the majority originated from the upper-outer quadrant in the right breast (51.3%) and in the left breast (43.2%), while fewer originated from the lower inner quadrant in the right breast (8.1%) and from central in the left breast (10.3%) (Figure 2.2.2).

Figure 2.2.2 Locations of breast cancers in breasts (N=2,130)



UOQ: upper outer quadrant, UIQ: upper inner quadrant, LOQ: lower outer quadrant, LIQ: lower inner quadrant
*Figures included multicentric cancers

Diagnostic results of breast cancer

A number of diagnostic tests are used for the diagnosis of breast cancer. With the advancing state of medical technology, mammography is currently considered as the 'gold standard' for breast imaging tests. Breast ultrasound imaging and magnetic resonance imaging (MRI) are further breast imaging tools for the diagnosis of breast cancer. Fine needle aspiration (FNA) and core needle biopsy (CNB) are commonly used diagnostic methods to confirm malignancy of breast lesions.

About 90% of the patient cohort underwent mammography, 84.9% had breast ultrasound imaging and 5.4% had magnetic resonance imaging (MRI) as breast imaging examinations for breast cancer (Table 2.2.1). Among the three breast imaging examinations, the sensitivities of these tests ranged from 72.4% in mammography to 94.8% in MRI.

Table 2.2.1 Sensitivities and diagnostic results of mammography, breast ultrasound and magnetic resonance imaging (MRI)

	Mammogram (N=1,886)	Breast ultrasound (N=1,808)	MRI (N=116)
Proportion of subjects using the diagnostic test	1,886/2,130 (88.5%)	1,808/2,130 (84.9%)	116/2,130 (5.4%)
Overall sensitivity	72.4%	82.2%	94.8%
BIRADS category			
Incomplete (BIRADS 0)	3 (0.2%)	3 (0.2%)	0 (0%)
Normal (BIRADS 1)	153 (8.1%)	41 (2.3%)	1 (0.9%)
Benign (BIRADS 2)	145 (7.7%)	65 (3.6%)	3 (2.6%)
Probably benign (BIRADS 3)	219 (11.6%)	212 (11.7%)	2 (1.7%)
Indeterminate (BIRADS 4a)	767 (40.7%)	800 (44.2%)	34 (29.3%)
Suspicious (BIRADS 4b)	25 (1.3%)	24 (1.3%)	3 (2.6%)
Diagnostic/malignant (BIRADS 5)	574 (30.4%)	663 (36.7%)	73 (62.9%)

MRI: magnetic resonance imaging; BIRADS: Breast Imaging Reporting and Data System Sensitivity: Number of true positives divided by total number

FNA, CNB and excisional biopsy were performed in 56.0%, 40.2% and 11.2% of the 2,130 patients respectively (Table 2.2.2). The sensitivities of these diagnostic tests were high, ranging from 91.5% in FNA to 100% in excisional biopsy.

Table 2.2.2 Sensitivities and diagnostic results of fine needle aspiration (FNA), core needle biopsy (CNB) and excisional biopsy

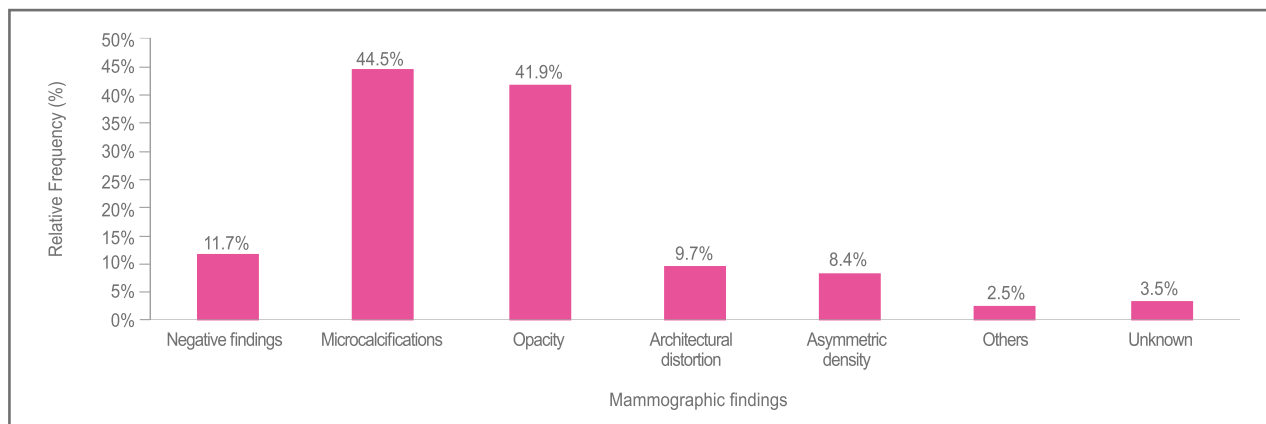
	FNA (N=1,193)	CNB (N=856)	Excisional biopsy (N=238)
Proportion of subjects using the diagnostic test	1,193/2,130 (56.0%)	856/2,130 (40.2%)	238/2,130 (11.2%)
Overall sensitivity	91.5%	98.7%	100%
Class			
Incomplete (Class 0)	16 (1.3%)	1 (0.1%)	--
Scanty benign (Class I)	29 (2.4%)	5 (0.6%)	--
Benign (Class II)	56 (4.7%)	5 (0.6%)	--
Atypical (Class III)	107 (9.0%)	12 (1.4%)	2 (0.8%)
Suspicious (Class IV)	265 (22.2%)	35 (4.1%)	--
Diagnostic/ malignant (Class V)	720 (60.4%)	798 (93.2%)	236 (99.2%)

FNA: fine needle aspiration; CNB: core needle biopsy Sensitivity: Number of true positives divided by total number

Mammography was one of the diagnostic modalities shown to reduce mortality in breast cancer patients and is used for early detection.¹³ It can detect micro-calcifications which are tiny deposits of calcium in the breast, which can cause cancer. Of those with diagnostic mammography, micro-calcifications were found in 44.5% of the patient cohort (Figure 2.2.3).

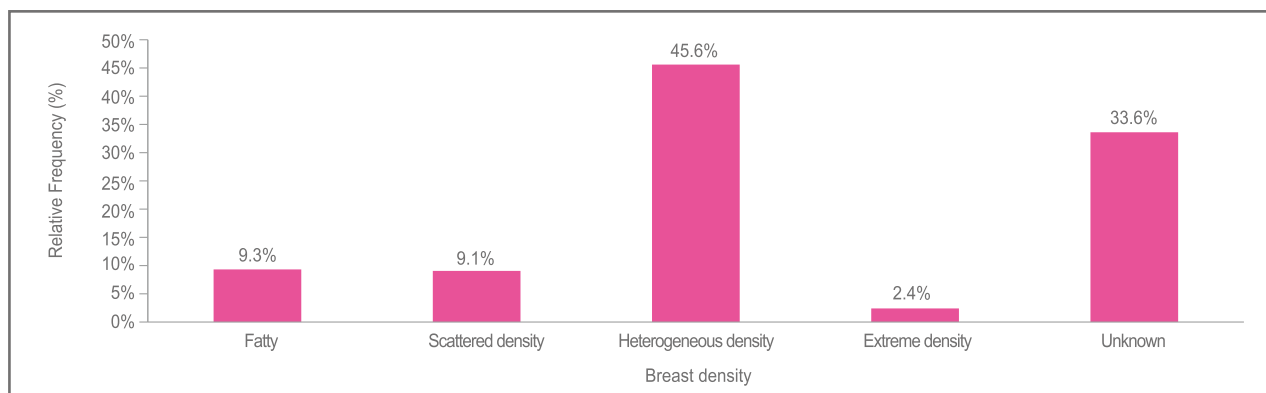
Dense breasts are associated with an increased risk of breast cancer. Of those who had diagnostic mammography, about 50% of the patients whose breasts were categorised as heterogeneous or extremely dense (Figure 2.2.4).

Figure 2.2.3 Mammographic findings of breast cancer patients with diagnostic mammography (N=1,886)



Note: Percentage might exceed 100% as multiple options could be applied

Figure 2.2.4 Mammographic density of breasts of breast cancer patients with diagnostic mammography (N=1,886)



Types of cancer staging methods

Chest X-ray, ultrasound abdomen, PET scan, MRI, bone scan and CT scan are common types of cancer staging methods to determine the extent of cancer spreads.

Of the 2,130 patients, 11.7% did not receive any type of cancer staging method and 88.3% received at least one type of cancer staging methods. For those who used cancer staging method, 67.4% had chest x-ray with or without abdominal ultrasound imaging which is the most common method used. PET scan as the second most common method for evaluation of the extent of cancer spreads was used in 18.9%, CT thorax, CT abdomen and bone scan were used in 2.1% and MRI in 0.1% of 1,880 patients (Table 2.2.3).

Table 2.2.3 Types of cancer staging methods in 1880 breast cancer patients

Type of cancer staging methods	Number (%)
CXR +/- USG abd	1,267 (67.4%)
PET scan	355 (18.9%)
MRI only	2 (0.1%)
CTT + CTA + bone scan	39 (2.1%)
Unknown	216 (11.5%)

CXR +/- USG abd: Chest X-ray with ultrasound abdomen or chest X-ray without ultrasound abdomen

PET scan: Positron emission tomography scan

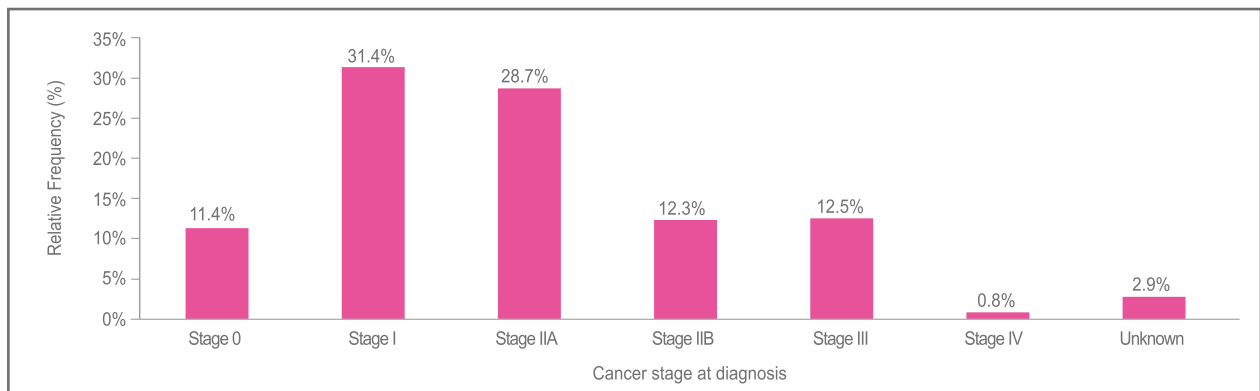
MRI: Magnetic resonance imaging

CTT + CTA + bone scan: Computed tomography thorax, computed tomography abdomen and bone scan

Cancer stage

According to AJCC Cancer Staging Classification¹⁴, the distribution of cancer stages 0, I, IIA, IIB, III, IV and unstaged at diagnosis among this cohort were 11.4%, 31.4%, 28.7%, 12.3%, 12.5%, 0.8% and 2.9% respectively (Figure 2.2.5). About 84% were early stage (stages 0-II) and 13.4% advanced stage (stages III-IV).

Figure 2.2.5 Cancer stage at diagnosis in breast cancer patients (N=2,130)



Early stage breast cancer patients in the “total public medical care” group accounted for 79.3%, the lowest proportion among the three groups by type of medical care, whereas the percentages of early stage cases in the total private medical care group and in the mixed private / public medical care group were 84.4% and 87.1% respectively (Table 2.2.4).

Table 2.2.4 Cancer stage at diagnosis by type of medical care

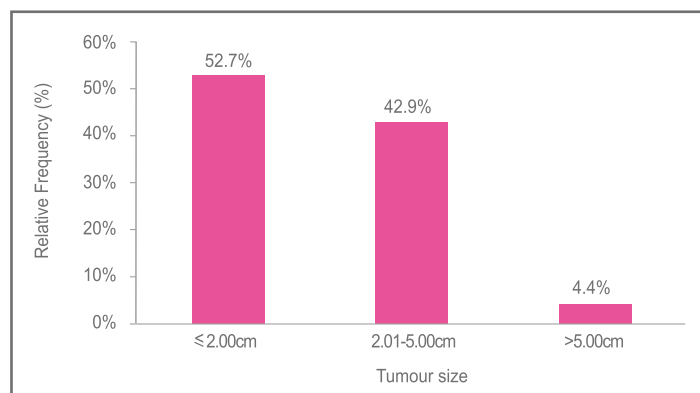
	Total private medical care (N=492)	Mixed private / public medical care (N=869)	Total public medical care (N=511)
Stage 0	67 (13.6%)	85 (9.8%)	29 (5.7%)
Stage I	138 (28.0%)	303 (34.9%)	138 (27.0%)
Stage IIA	144 (29.4%)	260 (29.9%)	165 (32.3%)
Stage IIB	66 (13.4%)	109 (12.5%)	73 (14.3%)
Stage III	60 (12.2%)	98 (11.3%)	87 (17.0%)
Stage IV	5 (1.0%)	4 (0.5%)	6 (1.2%)
Unstaged	12 (2.4%)	10 (1.1%)	13 (2.5%)

Characteristics of invasive breast cancer

Of the 2,130 breast cancer patients, invasive breast cancer accounted for 87.0% of all cases. Over 70% of invasive breast cancers were of early stage and 13.4% were advanced stage.

52.7% had invasive breast tumour smaller than 2.00cm. About 42.9% had invasive breast tumour between 2.01-5.00cm and 4.4% had invasive breast tumour larger than 5.00cm (Figure 2.2.6).

Figure 2.2.6 Distribution of tumour size of invasive breast cancers



The mean and median tumour size of invasive breast cancers was 2.2 cm and 1.9 cm respectively (range: 0.01 cm - 22.0 cm). The median tumour size of invasive breast cancers was 0.6 cm larger in self-detected breast cancers than screen-detected breast cancers (self-detected vs. screen-detected: 2.0 cm vs. 1.4 cm).

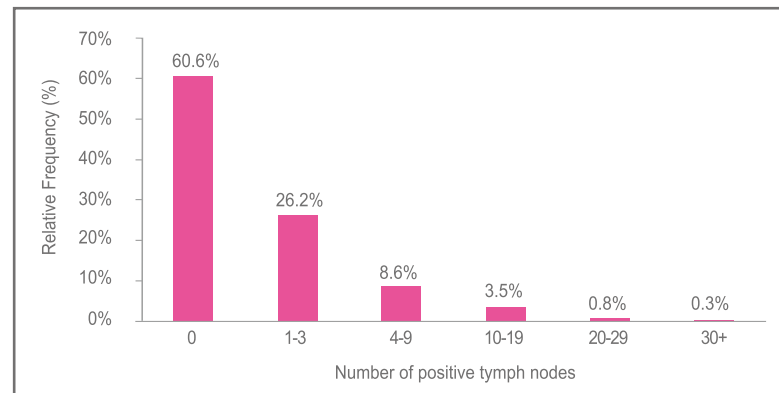
Tumour size of invasive breast cancers in the patients receiving total public medical care was generally larger than that in those patients receiving total private medical care, and those with mixed private / public medical care. The percentages of tumour larger than 2 cm were found in 48.9% of the patients with total private medical care, 56% of the patients with total public medical care and 43.9% of the patients with mixed type of medical care (Table 2.2.5).

Table 2.2.5 Tumour size of invasive breast cancers by type of medical care

Tumour size	Total private medical care (N=411)	Mixed private / public medical care (N=766)	Total public medical care (N=459)
≤ 2.00 cm	210 (51.1%)	430 (56.1%)	202 (44.0%)
2.01-5.00 cm	187 (45.5%)	308 (40.2%)	227 (49.5%)
> 5.00 cm	14 (3.4%)	28 (3.7%)	30 (6.5%)

The number of positive lymph nodes reveals the extent of cancer spreads to armpits and other regions. About 60% had no lymph node involvement, 26.2% had 1-3 positive lymph nodes, 8.6% had 4-9 positive lymph nodes and 4.6% had more than 10 positive lymph nodes (Figure 2.2.7).

Figure 2.2.7 Number of positive lymph nodes in invasive breast cancers



The percentage of patients with lymph node involvement in the total public medical care group was 4.9-7.7% higher compared to the patients with total private medical care and the patients with mixed private/ public medical care (Table 2.2.6).

Table 2.2.6. Number of lymph nodes positives by type of medical care

Number of lymph node positives	Total private medical care (N=413)	Mixed private / public medical care (N=746)	Total public medical care (N=444)
0	245 (59.4%)	464 (62.2%)	242 (54.5%)
1 - 3	117 (28.3%)	203 (27.2%)	121 (27.3%)
4 - 9	34 (8.2%)	59 (7.9%)	47 (10.6%)
10+	17 (4.1%)	20 (2.7%)	34 (7.6%)

Characteristics of in situ breast cancer

Of all breast cancer cases, 252 (11.8%) were in situ breast cancers which were non-invasive in nature. In situ breast cancers were usually classified as stage 0 with no lymph node involvement. Among 252 in situ breast cancers, there was just one case with a cancer stage grading of stage IIA with TNM cancer staging of Tis, N1, and M0.

The mean and median tumour size of in situ breast cancers was 2.4 cm and 2.0 cm respectively (range: 0.2 cm- 0.9 cm).

Over 50% of tumours were smaller than 2.00 cm, 41.6% were 2.01-5.00 cm and only 4.8% were larger than 5.00 cm (Figure 2.2.8). The percentage of tumours with size smaller than 2.00 cm in the patients with total public medical care was 2.7-12.7% higher compared to the patients with total private medical care, and the patients with mixed private / public medical care respectively (Table 2.2.7).

Table 2.2.7 Tumour sizes of in situ breast cancers by type of medical care

Tumour size	Total private medical care (N=66)	Mixed private/ public medical care (N=83)	Total public medical care (N=30)
≤ 2.00 cm	40 (60.6%)	42 (50.6%)	19 (63.3%)
2.01-5.00 cm	25 (37.9%)	36 (43.4%)	11 (36.7%)
> 5.00 cm	1 (1.5%)	5 (6.0%)	0 (0.0%)

Figure 2.2.8 Distribution of tumour size of in situ breast cancers (N=233)

