NCIN national cancer intelligence network
Using information to improve quality & choice

THE NON-INVASIVE BREAST CANCER REPORT

An analysis of non-invasive breast cancers diagnosed in England from 1 January 2006 to 31 December 2007

West Midlands Cancer Intelligence Unit

BCCOM

NHS Cancer Screening Programmes

Acknowledgements

The authors of this report:

Dr Gill Lawrence	Director, West Midlands Cancer Intelligence Unit
Ms Olive Kearins	Deputy Director of Breast Screening Quality Assurance, West Midlands Breast Screening QA Reference Centre
Dr Jackie Walton	Breast Cancer Research Manager, West Midlands Breast Screening QA Reference Centre
Dr Catherine Lagord	Breast Cancer Audit Project Manager, West Midlands Cancer Intelligence Unit
Ms Shan Cheung	Breast Screening QA Senior Information Analyst, West Midlands Breast Screening QA Reference Centre

would like to express their thanks to the following organisations and individuals for their contributions to the 'Non-invasive Breast Cancers Report':

Regional cancer registries which provided the core 2006 and 2007 data on all breast cancers diagnosed in their populations.

Regional breast screening QA reference centres which provided the identifiers to enable the screen-detected cancers originally submitted to the NHS Breast Screening Programme and Association of Breast Surgery audit of screen-detected cancers to be matched to the cancer registry data.

Mr Mike Porter, Computer Information Systems Development Manager and Mr Alan MacDonald, Computer Information Systems Assistant at the West Midlands Cancer Intelligence Unit who undertook the matching of the various datasets.

Breast surgeons across the UK who checked and submitted data into the NHS Breast Screening Programme and Association of Breast Surgery audit of screen-detected cancers and to the Breast Cancer Clinical Outcome Measures (BCCOM) audit.

Foreword

Non-invasive breast cancer worries women, troubles the professionals treating patients and remains a clinical challenge. This timely report on the non-invasive breast cancers diagnosed in England in 2006 and 2007 describes the burden of non-invasive breast cancer, and how the disease is diagnosed and treated. It is published at a time when non-invasive breast cancer, particularly in the context of the NHS Breast Screening Programme, remains particularly newsworthy. To have this report auditing and educating us about the thousands of women diagnosed with non-invasive breast cancer each year is thus particularly welcome.

While the NHS Breast Screening Programme has undoubtedly driven improvements in multidisciplinary working, technical advances in mammography and assiduous pathology which have resulted in the increased diagnosis of non-invasive breast cancers, in 2006 and 2007 over 3,000 non-invasive breast cancers (38% of the total number) were detected outside the NHS Breast Screening Programme. Ductal carcinoma in situ (DCIS) is the predominant type of non-invasive breast cancer detected; with grade, size and receptor status recorded less frequently for cases diagnosed outside the NHS Breast Screening Programme. While, for lesions detected outside screening, the proportion of women undergoing mastectomy (47%) and the need for repeat surgery (27%) require further attention, the high use of reconstruction, particularly in women under 50 years of age, is a tribute to the teams involved.

Comparison of the routinely collected data in this report with the more detailed data available for the subset of cases included in the Sloane Project (a longitudinal audit of 10,000 women across the UK with non-invasive breast disease detected through the NHS Breast Screening Programme) confirms that we can still improve our understanding of non-invasive breast cancer.

Many organisations and multidisciplinary teams have contributed significantly to collating the data included in this report, and the audit team at the West Midlands Cancer Intelligence Unit has excelled in producing such detailed analyses. The report highlights that the detection and treatment of non-invasive breast cancers outside the NHS Breast Screening Programme remains particularly challenging. Questions remain about the “best” way to deal with these conditions and the individualisation of treatment. Due reflection on this report by individual clinicians, multidisciplinary teams and institutions should help improve further the treatment for women with non-invasive breast cancer.

Professor Alastair M Thompson
Chair, The Sloane Project and
Professor of Surgical Oncology,
Dundee Cancer Centre

Contents

Executive Summary

Patients with Non-invasive Breast Cancer

In the two-year period 1 January 2006 to 31 December 2007, 74,909 women were diagnosed with a new invasive breast cancer and 7,990 women were diagnosed with a new non-invasive breast cancer. Overall, 10% of all new breast cancers were non-invasive.

Although only 5% of breast cancers detected outside the NHS Breast Screening Programme (NHSBSP) were non-invasive compared with 19% of screen-detected breast cancers, 3,039 of the women with non-invasive breast cancer (38%) presented outside the NHSBSP. This demonstrates that non-invasive breast cancer is relevant to symptomatic breast services as it is a problem relating to the routine use of diagnostic radiology rather than screening *per se*.

The care of 79% of women with non-invasive breast cancer was audited in either the NHSBSP and Association of Breast Surgery (NHSBSP/ABS) screening audit or the Breast Cancer Clinical Outcome Measures (BCCOM) symptomatic audit. Screen-detected non-invasive breast cancers are also eligible for inclusion in the Sloane Project (see www.sloaneproject.org.uk).

Patient Characteristics

Although almost three quarters (74%) of non-invasive breast cancers were diagnosed in women aged 50-70 years, 35% of the non-invasive breast cancers presenting outside the NHSBSP were diagnosed in women aged under 50 and 25% in women aged 70 years or over. Of the 1,060 non-invasive breast cancers diagnosed in women aged under 50 years, 219 were diagnosed in women aged under 40.

The deprivation status and ethnicity profiles of non-invasive breast cancer patients were similar to the profiles of breast cancer patients as a whole. 25% of women with non-invasive breast cancer were in the least deprived quintile while only 13% were in the most deprived quintile. 94% of non-invasive breast cancer patients with known ethnicity were known to be White.

Morphology

87% of non-invasive breast cancers diagnosed outside the NHSBSP were ductal carcinoma in situ (DCIS) compared to 92% of screen-detected non-invasive breast cancers. The proportion of patients with lobular carcinoma in situ (LCIS) was higher in the non-screening cohort (11% v 4%). A total of 537 women with LCIS are included in this report.

Cytonuclear Grade (DCIS)

56% of non-screening and 61% of screen-detected DCIS patients with known cytonuclear grade had high grade DCIS. In the West Midlands, 9% of non-screening and 12% of screen-detected DCIS cases with known cytonuclear grade were low grade.

Tumour Size (DCIS)

Data completeness for DCIS tumour size was much lower for non-screening patients (31% v 93%). Overall, 46% of screen-detected DCIS cases with known tumour size had a maximum tumour diameter of less than 15mm.

Executive Summary

Mastectomy Rates

The majority of non-invasive breast cancers had some form of surgical intervention; with only 3% having no surgery. 6% of cases detected outside the NHSBSP were not surgically treated compared with only 1% of screening cases. For women in the screening age range, 4% of non-screening patients and 1% of screening patients had no surgery.

Non-invasive breast cancers detected outside the NHSBSP had a higher mastectomy rate than screen-detected non-invasive breast cancers (47% compared to 28%). The mastectomy rate for screen-detected non-invasive breast cancers (28%), although low when compared to those presenting outside the NHSBSP, was similar to the mastectomy rate for all screen-detected breast cancers (27%).

Mastectomy rates were highest for non-screening women aged under 50. For women aged under 50, the mastectomy rate was 51% in the non-screening cohort compared to 33% in the equivalent screening cohort.

Immediate Reconstruction after Mastectomy

Higher mastectomy rates in younger women may be due to the availability of immediate reconstruction. Overall, 26% of women treated for non-invasive breast cancer by mastectomy were known to have had immediate reconstruction. For women aged under 50, the proportion known to have had immediate reconstruction after mastectomy was 46%.

Number of Therapeutic Operations

Cases presenting outside the NHSBSP were more likely to have repeat therapeutic procedures. 27% of non-screening cases had two or more therapeutic operations compared with 19% of screening cases. 253 women had three or more therapeutic operations.

Nodal Surgery

Although nodal surgery is not usually indicated for non-invasive breast cancer, 6% of non-invasive breast cancers treated with breast conserving surgery were known to have had a sentinel lymph node biopsy (11% of non-screening cases, 4% of screen-detected cases). 310 surgically treated cases (4%) were known to have had eight or more nodes examined.

Introduction

The incidence of non-invasive breast cancer (ductal carcinoma in situ (DCIS) in particular) has risen sharply following the introduction of the NHS Breast Screening Programme (NHSBSP) because these cancers are identified through the presence of microcalcification which is readily detectable with mammography. This has given the erroneous impression that this type of breast cancer is not relevant to the symptomatic breast service.

The All Breast Cancer Reports which included breast cancers diagnosed in 2006 and 2007[1,2] showed that, although non-invasive breast cancers represent a small proportion of all the breast cancers presenting outside the NHSBSP, a significant proportion of cases were diagnosed via symptomatic breast clinics and through the NHSBSP. The aim of the current report is to estimate the burden on breast cancer services of patients diagnosed with non-invasive breast cancer alone.

The natural history of non-invasive breast cancer is, as yet, poorly understood and a topic of much debate. It is known that these tumours can progress into invasive cancer, and that the majority of recurrences are invasive in nature. However, it is as yet unclear which cases will progress, and this uncertainty affects clinical management decisions and leads to variation in management across the UK and internationally.

The Sloane Project[3], a UK wide audit, collects detailed data on the radiological and pathological characteristics of screen-detected non-invasive breast cancers and on the treatment that they have received, and aims to correlate this information with outcomes. Long-term follow up data for this cohort of over 10,000 patients should in future provide invaluable information to assist in this difficult clinical decision making process.

The current report examines and compares the features of non-invasive breast cancers presenting via the NHSBSP and outside the NHSBSP. Patient and tumour characteristics, and surgical treatment are examined.

For ease of presentation, the term 'symptomatic' non-invasive breast cancer has been applied to the latter, although it is recognised that the diagnosis of non-invasive breast cancer may have been an incidental finding during the investigation of symptoms unrelated to the non-invasive breast cancer or during routine follow up of patients with a previously diagnosed breast cancer.

Methodology

Cohort

This report includes women in England diagnosed with non-invasive breast cancer in 2006 and 2007. Non-invasive breast cancers were identified from the data used in the first and second All Breast Cancer Reports[1,2] which include one tumour per patient per year. If a woman had multiple primary breast cancers in one year, only the tumour with the worst prognosis is included.

Data Sources

For each year of data, the following sources were linked and amalgamated to produce a single record for each cancer patient.

Cancer registry data – Population based data on the diagnosis, treatment and survival of breast cancers are collected by eight English regional cancer registries which collect the Cancer Registration Minimum Data Set[4]. Data for breast cancers diagnosed in the UK in 2006 and 2007 were initially supplied to the West Midlands Cancer Intelligence Unit (WMCIU) as part of the BCCOM audit[5].

BCCOM audit validated data – Each year, to initiate the BCCOM audit, data for symptomatic breast cancers are downloaded from the UK cancer registries. Surgeons are asked to validate the data for their cases. The validated data are returned to the WMCIU for analysis. In this report, where altered data were returned by surgeons, these have been used in the analysis in preference to the original cancer registration data.

NHSBSP screening audit validated data – Data for the UK NHS Breast Screening Programme and Association of Breast Surgery (NHSBSP/ABS) audit of screen-detected breast cancers are initially downloaded from the National Breast Screening System (NBSS) or other breast screening computer systems. Data are then checked by the responsible surgeons and the regional breast screening QA reference centres and submitted for inclusion in the national screening audit[6,7,8].

HES data – The HES dataset[9] was used to supplement the cancer registry data, and was the only source of self-reported ethnicity.

ICD-03 Morphology Codes

Morphology is recorded at the regional cancer registries using ICD-O2 or ICD-O3 morphology codes. Where multiple ICD morphology codes are recorded, only the code with worst prognosis is given.

Index of Multiple Deprivation 2007 (ID2007)

The Index of Multiple Deprivation 2007 (ID2007)[10] combines scores for a number of indicators covering a range of economic, social and housing issues, into a single deprivation score, produced at Lower Super Output Area (LSOA) level. The income domain score was used as the deprivation indicator in this report. To obtain an indication of the deprivation status of each breast cancer patient, postcode of residence was linked to the ID2007 income domain score for the LSOA in which the patient lived at the time of diagnosis. Since the publication of the All Breast Cancer Reports on which this report is based, there has been a change in convention to refer to the least deprived quintile as Quintile 1 and the most deprived quintile as Quintile 5.

Sloane Project

Screen-detected non-invasive breast cancers submitted to the Sloane Project[3] by November 2010 were flagged in the report dataset.

Results

Patients with Non-invasive Breast Cancer

There were 82,899 women diagnosed with primary breast cancer in England in the two-year period 1 January 2006 to 31 December 2007 (41,190 in 2006 and 41,709 in 2007)[1,2] Of these, 74,909 women were diagnosed with a new invasive breast cancer and 7,990 were diagnosed with a new non-invasive breast cancer (Table 1).

This report includes women in England confirmed to have non-invasive breast cancer alone.

- women with Paget's disease alone were excluded (523 women)
- non-invasive breast cancers with an invasive 5th digit of ICD morphology code or an invasive grade were excluded (382 women)
- non-invasive breast cancers with positive nodes recorded were excluded (29 women).

Overall, 10% of all new breast cancers were non-invasive. Although only 5% of symptomatic breast cancers were non-invasive compared with 19% of screen-detected breast cancers, 3,039 of women with non-invasive breast cancer (38%) presented outside the NHSBSP. This demonstrates that non-invasive breast cancer is relevant to symptomatic breast services as it is a problem relating to the routine use of diagnostic radiology rather than screening *per se*.

Table 1: Proportion of all female breast cancers confirmed to be non-invasive, by age at diagnosis and route of presentation

Age at Diagnosis (years)	Type of breast cancer	Symptomatic		Screen-detected		All cases	
		Number	%	Number	%	Number	%
less than 50	Non-invasive	1,060	7%	70	26%	1,130	7%
	All	15,322		267		15,589	
50-70	Non-invasive	1,241	6%	4,654		5,895	14%
	All	19,160		24,219		43,379	
greater than 70	Non-invasive	738	3%	227	15%	965	4%
	All	22,401		1,529		23,930	
All ages	Non-invasive	3,039	5%	4,951	19%	7,990	10%
	All	56,884		26,015		82,899	

NB. The age at diagnosis was not known for one symptomatic cancer

The data collected for 6,275 women with non-invasive breast cancer (79%) were validated by surgeons as part of national audits (Table 2).

Table 2: Route of presentation and entry into national audits

Route of presentation			Data validated by surgeons in a national audit?		
Route of presentation	**Number**	**%**	**Audit name**	**Number**	**%**
Screen-detected	4,951	62%	Yes, NHSBSP/ABS screening audit only	3,094	39%
			Yes, NHSBSP/ABS screening audit AND Sloane Project	1,857	23%
Symptomatic	3,039	38%	Yes, in BCCOM audit	1,324	17%
			Not validated in BCCOM audit	1,715	21%
Total	**7,990**	**100%**		**7,990**	**100%**

Results

Patient Characteristics

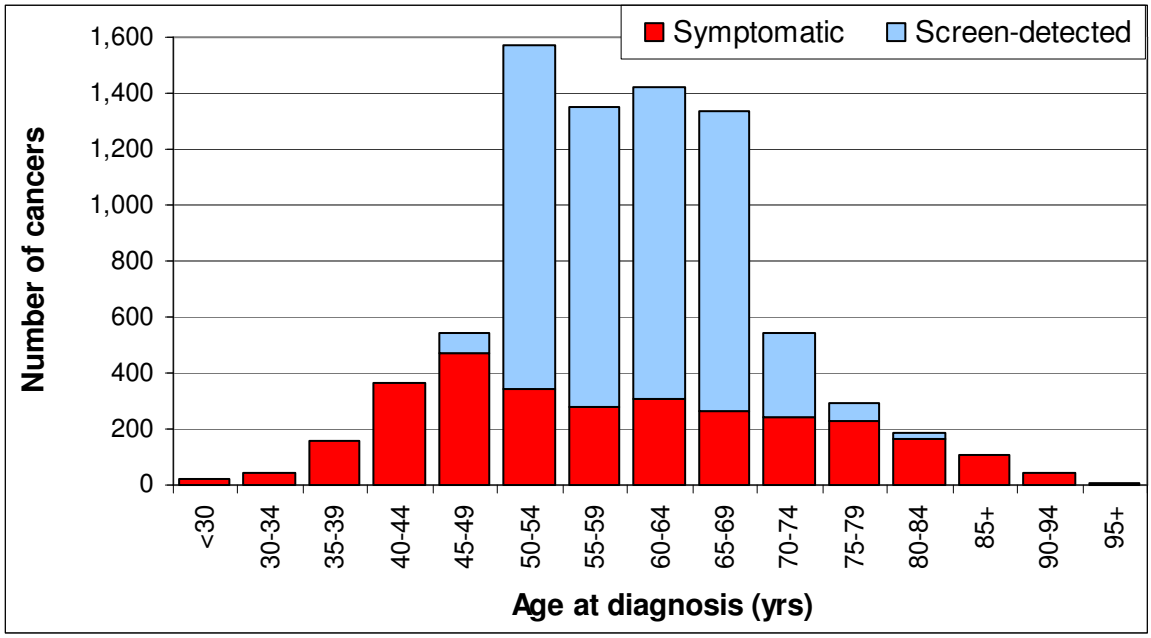
Table 3 shows the age profile of women diagnosed with non-invasive breast cancer by each route of presentation. Although almost three quarters (74%) of non-invasive breast cancers were diagnosed in women aged 50-70 years, 35% of symptomatic non-invasive breast cancer cases were diagnosed in women aged under 50 years and 25% in women aged 70 years or over. Of the 1,060 symptomatic non-invasive breast cancers diagnosed in women aged under 50 years, 219 were diagnosed in women aged under 40. 26% of the 267 screen-detected breast cancers in women aged under 50 were non-invasive.

Table 3: Age at Diagnosis

Age at diagnosis (years)	Non-invasive breast cancers						Total breast cancers	
	Symptomatic		Screen-detected		Total non-invasive breast cancers			
	Number	%	Number	%	Number	%	Number	%
less than 50	1,060	35%	70	1%	1,130	14%	15,589	19%
50-70	1,241	41%	4,654	94%	5,895	74%	43,379	52%
greater than 70	738	24%	227	5%	965	12%	23,930	29%
All ages	**3,039**	**100%**	**4,951**	**100%**	**7,990**	**100%**	**82,899**	**100%**

The age of screen-detected non-invasive breast cancer cases is dictated by the eligible age range for the NHS Breast Screening Programme. 1,230 (25%) of the 4,951 screen-detected non-invasive breast cancers were diagnosed in women aged 50-54 years (Figure 1). The screening programme is expanding to invite women aged 47 to 49 and 71 to 73 years. This will result in a shift in the age at diagnosis in future years.

Figure 1 : Age distribution of women with non-invasive breast cancer



Ethnicity was unknown for 28% of non-invasive breast cancer patients (Table 4). Ethnicity was obtained from Hospital Episode Statistics data. Therefore women without a hospital admission

Results

record did not have ethnicity recorded. Of those non-invasive breast cancer patients with ethnicity recorded, 94% had White ethnicity. The ethnicity profile of non-invasive breast cancer patients was similar to the profile of breast cancer patients as a whole.

Table 4: Ethnicity

Ethnicity	Non-invasive breast cancers									Total breast cancers		
	Symptomatic			Screen-detected			Total non-invasive breast cancers					
	Number	%	% of known	Number	%	% of known	Number	%	% of known	Number	%	% of known
White	1,965	65%	93%	3,495	71%	95%	5,460	68%	94%	58,081	70%	95%
Asian	51	2%	2%	81	2%	2%	132	2%	2%	1,428	2%	2%
Black	59	2%	3%	44	1%	1%	103	1%	2%	928	1%	2%
Chinese	11	0%	1%	18	0%	0%	29	0%	1%	181	0%	0%
Mixed	6	0%	0%	10	0%	0%	16	0%	0%	188	0%	0%
Other	23	1%	1%	22	0%	1%	45	1%	1%	503	1%	1%
Unknown	924	30%		1,281	26%		2,205	28%		21,590	26%	
Total	**3,039**	**100%**		**4,951**	**100%**		**7,990**	**100%**		**82,899**	**100%**	

The deprivation profile of non-invasive breast cancer patients is similar to the deprivation profile of breast cancer patients as a whole (Table 5). A higher proportion of non-invasive breast cancers were diagnosed in patients in the least deprived quintiles regardless of presentation route. Only 14% of screen-detected patients and 12% of symptomatic patients were in the most deprived quintile.

Table 5: Deprivation

Deprivation Quintile	Non-invasive breast cancers						Total breast cancers	
	Symptomatic		Screen-detected		Total non-invasive breast cancers			
	Number	%	Number	%	Number	%	Number	%
1 = Least deprived	709	23%	1,268	26%	1,977	25%	18,733	23%
2	687	23%	1,221	25%	1,908	24%	18,908	23%
3	678	22%	1,076	22%	1,754	22%	17,649	21%
4	536	18%	795	16%	1,331	17%	15,346	19%
5 = Most deprived	414	14%	591	12%	1,005	13%	12,020	14%
Unknown	15	0%	0	0%	15	0%	243	0%
Total	**3,039**	**100%**	**4,951**	**100%**	**7,990**	**100%**	**82,899**	**100%**

Morphology

The morphology of a tumour refers to its histological classification and its behaviour (benign, uncertain or malignant [in situ or invasive]). The morphology is determined from a microscopic examination of tumour tissue by a histopathologist. Table 6 shows the morphology of non-invasive breast cancers for each route of presentation. 87% of symptomatic non-invasive breast cancers were ductal carcinoma in situ (DCIS) compared to 92% of screen-detected non-invasive breast cancers. The proportion of patients with lobular carcinoma in situ (LCIS) was higher in the symptomatic cohort than the screening cohort (11% v 4%). For women in the screening age range (50-70 years) diagnosed symptomatically, the proportion of patients with LCIS was 14% (Table 7).

Results

Table 6: Morphology
DCIS = ductal carcinoma in situ, LCIS = lobular carcinoma in situ, OIS = other in situ carcinoma

Morphology	Symptomatic		Screen-detected		Total non-invasive breast cancers	
	Number	%	Number	%	Number	%
DCIS	2,633	87%	4,553	92%	7,186	90%
LCIS	327	11%	210	4%	537	7%
OIS	60	2%	92	2%	152	2%
X	19	1%	96	2%	115	1%
Total	**3,039**	**100%**	**4,951**	**100%**	**7,990**	**100%**

Table 7: Morphology (age 50-70 years)

Morphology	Symptomatic		Screen-detected		Total non-invasive breast cancers (age 50-70 years)	
	Number	%	Number	%	Number	%
DCIS	1,043	84%	4,278	92%	5,321	90%
LCIS	169	14%	198	4%	367	6%
OIS	22	2%	89	2%	111	2%
X	7	1%	89	2%	96	2%
Total	**1,241**	**100%**	**4,654**	**100%**	**5,895**	**100%**

A total of 537 women with LCIS are included in this report. Lobular carcinoma in situ (LCIS) was discussed by Professor Sarah Pinder in the 2006/07 Sloane Project annual report[11]. The term lobular in situ neoplasia (LISN) has been applied more widely in recent times to incorporate the spectrum of disease from lesser degrees of abnormality, i.e. atypical lobular hyperplasia (ALH), through to established lobular carcinoma in situ (LCIS). There are uncertainties regarding the clinical behaviour and optimum management of this disease. It is clear that LCIS confers an increased risk of development of invasive carcinoma of 1-2% per year, with a 10-year risk of 7-8%, a lifetime risk of 30-40% and a relative risk of breast cancer of 8-10. However, it is also now evident that the risk of development of subsequent invasive carcinoma is not the same in both breasts. The risk is higher in the ipsilateral breast, mainly at the site of the previously biopsied disease, and the subsequent invasive tumour is most frequently of lobular type. Such data indicate that LCIS can behave as a precursor of invasive breast cancer.

Cytonuclear Grade (DCIS)

Table 8 shows that data completeness for cytonuclear grade was much lower for symptomatic patients with DCIS compared to screening patients (54% v 98%). 56% of symptomatic and 61% of screen-detected DCIS patients with known cytonuclear grade had high grade DCIS. In the screening age range, 57% of symptomatic DCIS patients and 61% of screen-detected DCIS patients with known cytonuclear grade had high grade DCIS (Table 9).

Results

Table 8: Cytonuclear grade of DCIS

DCIS grade	Symptomatic			Screen-detected			Total non-invasive breast cancers		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
High	803	30%	56%	2,712	60%	61%	3,515	49%	60%
Intermediate/Low	623	24%	44%	1,718	38%	39%	2,341	33%	40%
Not assessable	8	0%		30	1%		38	1%	
Unknown	1,199	46%		93	2%		1,292	18%	
Total	**2,633**	**100%**		**4,553**	**100%**		**7,186**	**100%**	

Table 9: Cytonuclear grade of DCIS (Age 50-70 years)

DCIS grade	Symptomatic			Screen-detected			Total non-invasive breast cancers (age 50-70 years)		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
High	330	32%	57%	2,558	60%	61%	2,888	54%	61%
Intermediate/Low	245	23%	43%	1,606	38%	39%	1,851	35%	39%
Not assessable	1	0%		29	1%		30	1%	
Unknown	467	45%		85	2%		552	10%	
Total	**1,043**	**100%**		**4,278**	**100%**		**5,321**	**100%**	

It was not possible to separate out the intermediate and low grade DCIS cases in the national data without further work. However, data for the West Midlands alone (Table 10) show that 9% of symptomatic and 12% of screen-detected DCIS cases with known cytonuclear grade were low grade. Low grade cases are an interesting category of non-invasive breast cancer that may not need surgical intervention. A clinical trial is being designed to address the question of which types of non-invasive breast cancer, if any, may not require surgical intervention[12].

Table 10: Cytonuclear grade of DCIS (West Midlands)

DCIS grade	Symptomatic			Screen-detected			Total non-invasive breast cancers		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
High	148	56%	60%	304	67%	67%	452	63%	65%
Intermediate	75	28%	31%	92	20%	20%	167	23%	24%
Low	22	8%	9%	55	12%	12%	77	11%	11%
Unknown	19	7%		3	1%		22	3%	
Total	**264**	**100%**		**454**	**100%**		**718**	**100%**	

Table 11: Cytonuclear grade of DCIS (West Midlands, Age 50-70 years)

DCIS grade	Symptomatic			Screen-detected			Total non-invasive breast cancers (age 50-70 years)		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
High	57	56%	59%	288	67%	68%	345	65%	66%
Intermediate	34	34%	35%	86	20%	20%	120	23%	23%
Low	6	6%	6%	51	12%	12%	57	11%	11%
Unknown	4	4%		2	0%		6	1%	
Total	**101**	**100%**		**427**	**100%**		**528**	**100%**	

Results

Tumour Size (DCIS)

Data completeness for DCIS tumour size was much lower for symptomatic patients compared to screening patients (31% v 93%). 46% of screen-detected and 33% of symptomatic DCIS cases with known tumour size had a maximum tumour diameter of less than 15mm (Table 12). 11% of screen-detected and 22% of symptomatic DCIS cases with known tumour size had a maximum tumour diameter greater than 40mm.

Table 12: Tumour size (DCIS)

DCIS size (maximum diameter)	Symptomatic			Screen-detected			Total non-invasive breast cancers		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
Less than 15mm	264	10%	33%	1,957	43%	46%	2,221	31%	44%
15-40mm	369	14%	46%	1,812	40%	43%	2,181	30%	43%
Greater than 40mm	176	7%	22%	487	11%	11%	663	9%	13%
Unknown	1,824	69%		297	7%		2,121	30%	
Total	**2,633**	**100%**		**4,553**	**100%**		**7,186**	**100%**	

Table 13: Tumour size (DCIS, Age 50-70 years)

DCIS size (maximum diameter)	Symptomatic			Screen-detected			Total non-invasive breast cancers (age 50-70 years)		
	Number	%	% of known	Number	%	% of known	Number	%	% of known
Less than 15mm	116	11%	34%	1,840	43%	46%	1,956	37%	45%
15-40mm	161	15%	47%	1,695	40%	42%	1,856	35%	43%
Greater than 40mm	63	6%	19%	463	11%	12%	526	10%	12%
Unknown	703	67%		280	7%		983	18%	
Total	**1,043**	**100%**		**4,278**	**100%**		**5,321**	**100%**	

Mastectomy Rates

The majority of non-invasive breast cancers had some form of surgical intervention; with only 3% of cases having no surgery (Table 14). The proportion of cases with no surgery varied with the route of presentation. 6% of symptomatic cases were not surgically treated compared with only 1% of screening cases. The odds of having no surgical intervention were around seven times higher in the symptomatic cohort (odds ratio: 6.78 [95%CI 4.88 - 9.44]).

Table 14: Variation in no surgery rate with route of presentation and age group

Age group	Number with no surgery, and no surgery rate						Odds ratio (95%CI)
	Symptomatic		Screen-detected		Total non-invasive breast cancers		
	Number	%	Number	%	Number	%	
less than 50	30	3%	1	1%	31	3%	2.01 (0.27 - 14.96)
50-70	52	4%	41	1%	93	2%	4.92 (3.25 - 7.45)
greater than 70	96	13%	3	1%	99	10%	11.17 (3.50 - 35.59)
All ages	**178**	**6%**	**45**	**1%**	**223**	**3%**	**6.78 (4.88 - 9.44)**

For women in the screening age range, 4% of symptomatic patients and 1% of screening patients had no surgery (odds ratio: 4.92 [95%CI 3.25 - 7.45]). Within the symptomatic cohort, patients aged 70 years and older were the most likely not to have surgery (13% compared to 6% overall).

Results

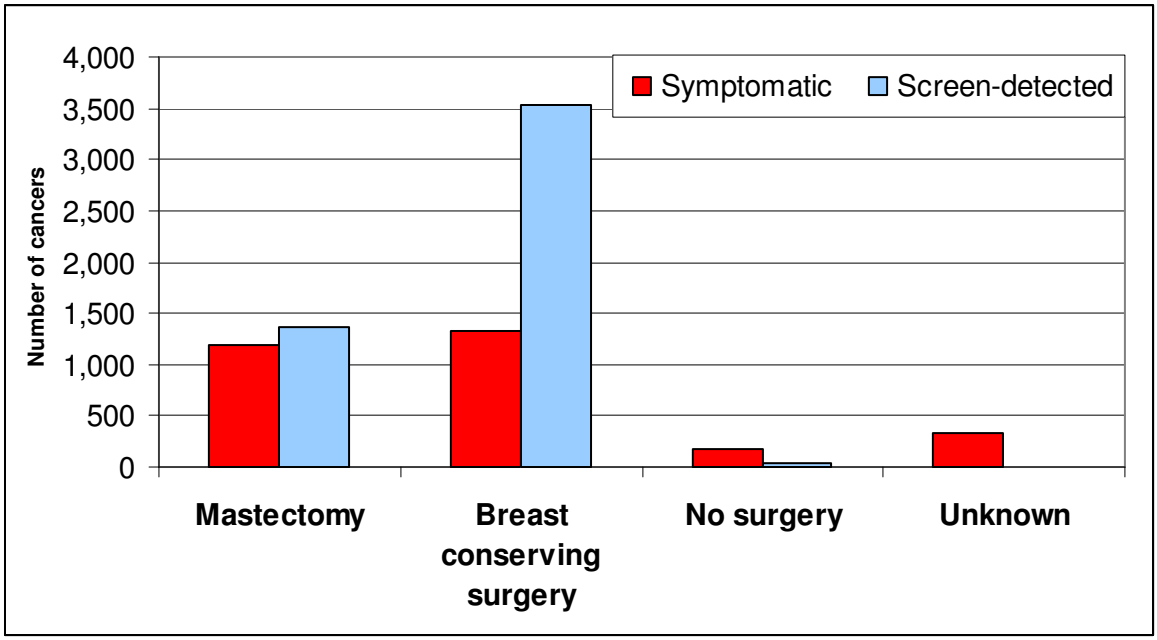
The variation by route of presentation in the no surgery rate may be explained by the older age group included in the symptomatic cohort who are more likely to have pre-existing medical conditions which contraindicate surgery. The higher proportion of patients in deprived areas in the symptomatic cohort (Table 5) may also add to this comorbidity effect.

Table 15: Final therapeutic operation

Final therapeutic operation	Symptomatic			Screen-detected			Total non-invasive breast cancers		
	Number	%	% of surgically treated	Number	%	% of surgically treated	Number	%	% of surgically treated
Mastectomy	1,187	39%	47%	1,368	28%	28%	2,555	32%	34%
Breast conserving surgery	1,335	44%	53%	3,530	71%	72%	4,865	61%	66%
No surgery	178	6%		45	1%		223	3%	
Unknown	339	11%		8	0%		347	4%	
Total	**3,039**	**100%**		**4,951**	**100%**		**7,990**	**100%**	

The final therapeutic operation was unknown for only eight screen-detected non-invasive breast cancers but for 11% of symptomatic cancers (Table 15). Although the overall numbers were similar (1,187 symptomatic and 1,368 screen-detected), symptomatically diagnosed non-invasive breast cancers had a significantly higher mastectomy rate than screen-detected non-invasive breast cancers (47% compared to 28%). The odds of having a mastectomy were more than two times higher in the symptomatic cohort (odds ratio: 2.29 [95%CI 2.08 - 2.54]).

Figure 2 : Final therapeutic operation for women with non-invasive breast cancer



Whilst 174 (78%) of the 223 cases with no surgery were DCIS, only 2% of DCIS cases had no surgery compared with 8% of LCIS cases (Table 16). Of the cases known to be surgically treated, 16% of LCIS cases were treated with mastectomy compared to 36% of DCIS cases.

Results

Table 16: Final therapeutic operation (DCIS, LCIS)

Final therapeutic operation	DCIS			LCIS		
	Number	%	% of surgically treated	Number	%	% of surgically treated
Mastectomy	2,396	33%	36%	68	13%	16%
Breast conserving surgery	4,343	60%	64%	361	67%	84%
No surgery	174	2%		41	8%	
Unknown	273	4%		67	12%	
Total	**7,186**	**100%**		**537**	**100%**	

The mastectomy rate for screen-detected non-invasive breast cancers, although low when compared to those presenting symptomatically (28% vs 47%; Table 15), was similar to the mastectomy rate for all screen-detected breast cancers (27%) recorded in the first and second All Breast Cancer Reports[1,2]. In the National Mastectomy and Breast Reconstruction Audit[13] and the first and second All Breast Cancer Reports[1,2], a higher proportion of women with DCIS had immediate reconstruction (38%) compared to women with invasive disease (17%). Patients with a diagnosis of non-invasive breast cancer can find it difficult to comprehend why they are offered as radical a procedure as a mastectomy[14].

Figure 3 : Variation in final therapeutic operation for symptomatic non-invasive breast cancers with age

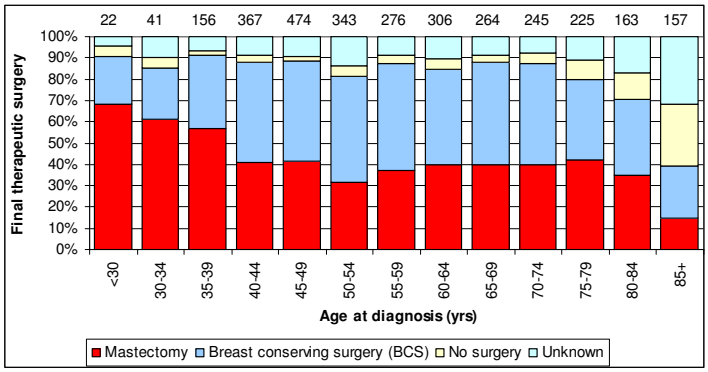
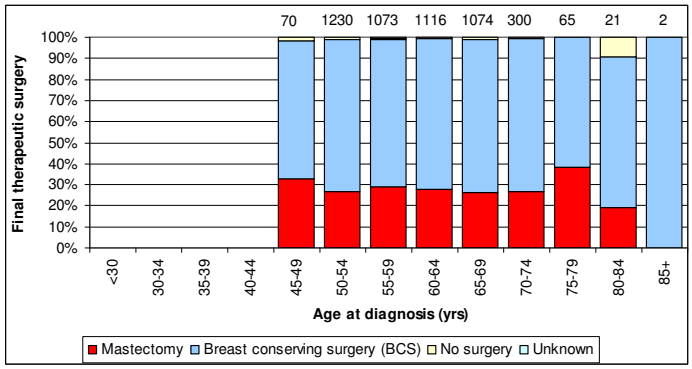


Figure 4 : Variation in final therapeutic operation for screen-detected non-invasive breast cancers with age



The variation in final therapeutic operation with five-year age group is shown for symptomatic non-invasive breast cancers in Figure 3 and for screen-detected non-invasive breast cancers in Figure 4. The numbers of cancers in each age group are given at the top of each column. Mastectomy rates were highest for symptomatic women aged under 50 years (Figure 3, Table 17). For these women, the mastectomy rate was 51% in the symptomatic cohort compared to 33% in the screening cohort.

Results

Table 17: Variation in mastectomy rate with age group

Age group	Number of mastectomies, and mastectomy rate						Odds ratio (95%CI)
	Symptomatic		Screen-detected		Total non-invasive breast cancers		
	Number	%	Number	%	Number	%	
less than 50	477	51%	23	33%	500	50%	2.06 (1.23 - 3.46)
50-70	451	43%	1,278	28%	1,729	31%	1.94 (1.69 - 2.22)
greater than 70	259	49%	67	30%	326	43%	2.27 (1.63 - 3.17)
All ages	**1,187**	**47%**	**1,368**	**28%**	**2,555**	**34%**	**2.29 (2.08 - 2.54)**

Immediate Reconstruction after Mastectomy

The highest mastectomy rates were seen in symptomatic women aged under 50 (Figure 3, Table 17). This may be due to the increasing availability of immediate reconstruction which may mean that these women may choose to have a mastectomy rather than breast conserving surgery. Table 18 shows that 26% of women treated for non-invasive breast cancer by mastectomy were known to have had immediate reconstruction. For women aged under 50 the proportion having immediate reconstruction after mastectomy was 46% (Table 19). Table 20 shows that a higher proportion of women with LCIS had immediate reconstruction (35%) compared to women with DCIS (26%), but this difference was not statistically significant.

Table 18: Immediate reconstruction after mastectomy

Immediate reconstruction	Symptomatic		Screen-detected		Total non-invasive breast cancers	
	Number	%	Number	%	Number	%
Yes	318	27%	352	26%	670	26%
No	0	0%	825	60%	825	32%
Unknown	869	73%	191	14%	1,060	41%
Total mastectomy	**1,187**	**100%**	**1,368**	**100%**	**2,555**	**100%**

Table 19: Immediate reconstruction after mastectomy (age less than 50 years)

Immediate reconstruction	Symptomatic		Screen-detected		Total non-invasive breast cancers (age <50 years)	
	Number	%	Number	%	Number	%
Yes	221	46%	7	30%	228	46%
No	0	0%	11	48%	11	2%
Unknown	256	54%	5	22%	261	52%
Total mastectomy	**477**	**100%**	**23**	**100%**	**500**	**100%**

Table 20: Immediate reconstruction after mastectomy (DCIS, LCIS)

Immediate reconstruction	DCIS		LCIS	
	Number	%	Number	%
Yes	624	26%	24	35%
No	773	32%	16	24%
Unknown	999	42%	28	41%
Total mastectomy	**2,396**	**100%**	**68**	**100%**

Results

Number of Therapeutic Operations

Table 21 examines the number of therapeutic operations for surgically treated cases with known therapeutic surgery type (mastectomy or breast conserving surgery). The diagnostic operation for cases without a pre-operative diagnosis is not counted in these data. Cases listed as having zero therapeutic operations are those where the initial operation was diagnostic in intent but was considered to be sufficient for therapeutic purposes.

Non-invasive breast cancers presenting symptomatically were more likely to require repeat therapeutic procedures. 27% of symptomatic cases had two or more therapeutic operations compared with 19% of screening cases. It is likely that the majority of repeat operations are due to attempts to gain an acceptable, clear surgical margin. 253 women had three or more therapeutic operations.

Table 21: Number of therapeutic operations for surgically treated non-invasive breast cancer

Number of therapeutic operations	Symptomatic		Screen-detected		Total non-invasive breast cancers	
	Number	%	Number	%	Number	%
0	443	18%	672	14%	1,115	15%
1	1,399	55%	3,290	67%	4,689	63%
2	550	22%	811	17%	1,361	18%
3	113	4%	114	2%	227	3%
4	13	1%	11	0%	24	0%
5	1	0%	0	0%	1	0%
6	1	0%	0	0%	1	0%
Unknown	2	0%	0	0%	2	0%
Total	**2,522**	**100%**	**4,898**	**100%**	**7,420**	**100%**

Nodal Surgery

Nodal surgery is not usually indicated for non-invasive breast cancer[15]. Nodes can be removed if the case is treated by mastectomy as these can be removed in the same operation. This can reduce the need for patients to have a repeat operation if invasive cancer is found when the surgical specimen is examined. Incidental nodes can sometimes be removed from the axillary tail if the case is treated with breast conserving surgery.

Table 22 shows the number of nodes examined for surgically treated cases with known therapeutic surgery type (mastectomy or breast conserving surgery). Overall 310 surgically treated cases (4%) were known to have had eight or more nodes examined (111 symptomatic, 199 screen-detected).

Table 22: Number of nodes examined for surgically treated non-invasive breast cancer

Number of nodes examined	Symptomatic		Screen-detected		Total non-invasive breast cancers	
	Number	%	Number	%	Number	%
0	338	13%	3,606	74%	3,944	53%
1-7	497	20%	1,064	22%	1,561	21%
8+	111	4%	199	4%	310	4%
Unknown	1,576	62%	29	1%	1,605	22%
Total	**2,522**	**100%**	**4,898**	**100%**	**7,420**	**100%**

Results

The NICE Guidelines on Early and Locally Advanced Breast Cancer (February 2009)[15] state that women with non-invasive breast cancer having breast conserving surgery and not considered at high risk of invasive breast cancer should not have nodal surgery (including sentinel lymph node biopsy (SLNB)). Patients at high risk of invasive cancer are defined as those with a palpable mass or extensive micro-calcifications. 6% of non-invasive breast cancers treated with breast conserving surgery were known to have had a SLNB (Table 23). This was higher in the symptomatic cohort than the screening cohort (11% v 4%).

Table 23: Sentinel lymph node biopsy (SLNB) for non-invasive breast cancer treated with breast conserving surgery

SLNB	Symptomatic		Screen-detected		Total non-invasive breast cancers	
	Number	%	Number	%	Number	%
Yes	151	11%	142	4%	293	6%
No	101	8%	3,132	89%	3,233	66%
Unknown	1,083	81%	256	7%	1,339	28%
Total BCS	**1,335**	**100%**	**3,530**	**100%**	**4,865**	**100%**

References

1. All Breast Cancer Report : A UK analysis of all symptomatic and screen-detected cancers diagnosed in 2006. WMCIU, NCIN, NHSBSP www.ncin.org.uk
2. All Breast Cancer Report : A UK analysis of all symptomatic and screen-detected cancers diagnosed in 2007. WMCIU, NCIN, NHSBSP www.ncin.org.uk
3. www.sloaneproject.co.uk
4. NHS Connecting for Health. Data Standards: Cancer Registration Data Set. June 2005 http://www.isb.nhs.uk/documents/isb-0056/dscn-09-2005
5. www.wmpho.nhs.uk/wmciu BCCOM project
6. An audit of screen-detected breast cancers for the year of screening April 2005 to March 2006 (2007) NHS Breast Screening Programme and Association of Breast Surgery at BASO.
7. An audit of screen-detected breast cancers for the year of screening April 2006 to March 2007 (2008) NHS Breast Screening Programme and Association of Breast Surgery at BASO.
8. An audit of screen-detected breast cancers for the year of screening April 2007 to March 2008 (2009) NHS Breast Screening Programme and Association of Breast Surgery at BASO.
9. NHS Connecting for Health. Hospital Episodes Statistics www.connectingforhealth.nhs.uk/systemsandservices/sus/delivery/hes.
10. Communities and Local Government (2008). The English Indices of Deprivation 2007, Communities and Local Government: London. March 2008
11. Sarah Pinder, Lobular Carcinoma In Situ and the Sloane Project. The Sloane Project Progress Report 2006/07–2007/08
12. A Francis et al. Plans for a Clinical Trial Addressing Possible Over-treatment of DCIS. The Sloane Project Progress Report 2008/09–2009/10
13. Third annual report of the National Mastectomy and Breast Reconstruction Audit, 2010
14. S Prinjha et al. 'A mastectomy for something that wasn't even truly invasive cancer.' Women's understandings of having a mastectomy for screen-detected DCIS: a qualitative study. J Med Screen 2011; 18: 34-40
15. NICE Guidelines on Early and Locally Advanced Breast Cancer (February 2009)

Abbreviations

Abbreviation	Full Text
ABCR	All Breast Cancer Report
ABS	Association of Breast Surgery
ALH	Atypical Lobular Hyperplasia
BCCOM	Breast Cancer Clinical Outcome Measures
BCS	Breast Conserving Surgery
DCIS	Ductal Carcinoma In Situ
HES	Hospital Episode Statistics
ICD-O2	International Classification of Diseases version 2
ICD-O3	International Classification of Diseases version 3
ID2007	Index of Multiple Deprivation 2007
LCIS	Lobular Carcinoma In Situ
LISN	Lobular In Situ Neoplasia
LSOA	Lower Super Output Area
MDT	Multidisciplinary Team
NBSS	National Breast Screening System
NCIN	National Cancer Intelligence Network
NHS	National Health Service
NHSBSP	National Health Service Breast Screening Programme
ONS	Office for National Statistics
QA	Quality Assurance
SLNB	Sentinel Lymph Node Biopsy
WMCIU	West Midlands Cancer Intelligence Unit