

All

BREAST CANCER *Report*

A UK analysis of
all symptomatic
and
screen-detected
breast cancers
diagnosed in
2006



West Midlands
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Acknowledgements

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I warmly welcome this *'All Breast Cancer Report'*, which is the first of its type. It marks a significant milestone in the collection, analysis and reporting of information on breast cancer in this country.

For more than a decade the NHS Breast Screening Programme, working with the West Midlands Cancer Intelligence Unit has published high quality audits of the treatment and outcomes for women presenting through the NHS Breast Screening Programme. More recently the Breast Cancer Clinical Outcome Measures (BCCOM) Project has started to do the same for patients presenting symptomatically.

This report brings together information on nearly 50,000 people diagnosed with breast cancer in the UK in 2006. It provides the opportunity to assess demographic characteristics (age, gender, ethnicity and deprivation) and route of presentation (screening or symptomatic), tumour characteristics (size, morphology, grade and receptor status) and one and five-year relative survival rates.

The quality of data for screen-detected patients was generally better than that for patients presenting symptomatically. This is perhaps to be expected given the attention that has been paid to validating data for screen-detected cases over many years. The challenge now is to bring data quality for symptomatic patients up to the same standard. This can and must be

done. Multidisciplinary breast cancer teams require this information for optimal patient care.

They should ensure that the relevant data items are recorded in every patient's notes and are transmitted to the relevant cancer registry.



Relative survival at one year is considered to be a good proxy measure for the early/late diagnosis of many cancers. The good news from this report is that one-year relative survival from breast cancer has improved from 94.6% in 2001/2 to 95.8% in 2006. However, there are no grounds for complacency. Around 20% of breast cancers have no surgical operation recorded (around 3% in screen-detected cases and 27% in symptomatic cases). An urgent priority is to ensure that all patients who can benefit from surgery receive this treatment and do have the procedure recorded.

Professor Mike Richards CBE
National Clinical Director for Cancer



Introduction

Introduction



I am delighted to be writing the introduction to the first *'All Breast Cancer Report'* for the UK. The NHS Breast Screening Programme began to produce audit reports on the breast cancers found in the screening programme over a decade ago, and these reports are now very high in quality and invaluable sources of information on breast cancer. Achieving a similar standard for breast cancers diagnosed outside the screening programme (symptomatic breast cancers) has proved a challenge, but with the commitment of breast teams around the country, a great improvement in these data is being observed year on year.

As part of the new National Cancer Intelligence Network, the West Midlands Cancer Intelligence Unit (WMCIU) has been appointed as the lead registry for breast cancer. This recognises and builds on its role in producing the reports on both screen-detected and symptomatic cancers. This report, which has been produced by the WMCIU and sponsored by the NHS Breast Screening Programme shows what can be achieved when the data are brought together and foreshadows future work.

Bringing all the breast cancers diagnosed in the UK into one analysis allows the examination of differences between screen-detected and symptomatic cancers in terms of both the prognosis and characteristics of the tumours themselves and the women they affect. We can look at how the ethnicity and socio-economic status of women influences the stage of cancer at diagnosis and how they influence their eventual outcome.

This document tells the story of the almost 50,000 breast cancers that were diagnosed in the UK in 2006. Just under a third of these were found by the screening programme. Some of the data presented in this report reinforce patterns that we already knew to exist. For example, affluent women are more likely to develop breast cancer than more deprived women, and amongst minority ethnic groups, a greater proportion of breast cancers are seen in the younger women who have spent a greater part, if not all of their lives, in the UK compared to older women who have generally grown up elsewhere. But this report has pulled some data together for the first time, so we can see details of the

prognosis of breast cancer by ethnic group and how ethnicity and deprivation appear to influence treatment. This report does not just contain data on surgery, but also contains information on adjuvant therapies. Again, we are able to see the interplay between different factors as prognosis is related to treatment given and age at diagnosis.

Survival is analysed, by whether the breast cancer was screen-detected or presented symptomatically, and also by age, deprivation and ethnicity. Significant differences in survival are evident when the data are analysed by degree of deprivation; with the most deprived patients doing particularly badly. However, the data for screen-detected cases are very encouraging to read as the differences due to deprivation are much smaller than those in symptomatic patients. It is very pleasing to find an improvement in one-year survival in women of 71 or older. These women are not invited for screening, although they are screened on request, and this improvement means that the importance of early presentation of breast changes is beginning to get through even in this oldest age group.

This is truly an *'All Breast Cancer Report'*. Therefore it includes the 334 breast cancers found in 2006 in men. This is a rare and, in many ways, a distressing disease for men who have to deal with the perception that this is a female only disease and who lack the obvious support networks which open automatically to women with breast cancer. However, the one-year survival data shows that for men who were diagnosed in 2006, there was no significant difference between their early outcome and that of women.

This report is the first of its kind. It sets a very fine start point on which to build. The interesting facts it contains only lead to more questions as we try to understand this disease which affected nearly 50,000 Britons in 2006. I am delighted to provide this introduction and invite you to read it, pore over it, think about the contents and demand more and better information about all breast cancers in the next few years.

Professor Julietta Patnick CBE
Director for the NHS Cancer Screening Programme

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Executive Summary

Data Availability, Quality and Completeness

If the comparative analyses included in this report are to be carried out at a truly UK level, the provision of patient identifiers for all screen-detected and symptomatic breast cancers, and access to data for the Celtic countries' equivalent to English HES and ID2007 Index of Multiple Deprivation data to allow comprehensive linkage of all the data potentially available will be essential. The lack of the latter for this report meant that analyses involving ethnicity and deprivation, number of operations, sentinel lymph node biopsy and immediate reconstruction had to be restricted to England. Similarly, as data for Northern Ireland, Wales and Scotland did not include patient identifiers, screen-detected and symptomatic cancers could not be identified reliably for the Celtic countries and comparisons of tumour characteristics, treatment patterns and survival in patients presenting by different routes were also only possible for England. In addition, the absence of patient identifiers from the data supplied to the BCCOM project by the Scottish Cancer Networks meant that these data could not be linked to those supplied by the Scottish Cancer Registry, and that these high quality, surgically validated data could not be used to enhance the registry data.

As the completeness of adjuvant therapy data was variable across English regions and Celtic countries, analyses were based on data only from those registries with the most complete data. On the basis of comparisons of the radiotherapy and chemotherapy data collected for screen-detected breast cancers in the NHSBSP adjuvant audit with the data for the same cases collected by cancer registries, it appeared that four English regions and two Celtic countries had complete radiotherapy data, and that six English regions and two Celtic countries had complete chemotherapy data. Only two English regions and two Celtic countries had good quality data, hormone therapy was not included in the report

In England, high quality radiotherapy data should be easier to obtain following the introduction in 2009 of the new National Radiotherapy Dataset. The introduction of an equivalent dataset for chemotherapy and the use of HES data to record the use of high cost drugs should also improve chemotherapy data availability. Initiatives which will allow the interrogation of primary care databases should mean that more detailed hormone therapy data, which include the type of drugs prescribed and details of tamoxifen to aromatase inhibitor switching may also become available to cancer registries. In the meantime, the valuable contribution made by breast surgeons as part of the BCCOM project in validating and enhancing the breast cancer data available at national level cannot be over emphasised.

Gender and Age

Of the 49,452 cases of breast cancer diagnosed in the UK in 2006, 334 were diagnosed in men. Men were more likely to have a mastectomy and less likely to receive chemotherapy, but their overall 1-year and 5-year relative survival rates were no different to those seen for women with breast cancer.

19% of breast cancers were diagnosed in patients aged less than 50, 52% in patients aged 50–70 and 29% in patients aged over 70. The invasive tumours diagnosed in the younger patients had a worse prognosis. They were more likely to be Grade 3 and node positive and less likely to be oestrogen receptor positive and thus less likely to respond to hormone therapy. Younger patients also had a higher proportion of very poor prognosis HER2 positive and triple negative (ER, PR and HER2) tumours.

Overall in England, 43% of surgically treated patients with an invasive breast cancer and 35% with a non-invasive breast cancer had a mastectomy. Patients aged less than 50 were more likely to have breast conserving surgery, and those who had a mastectomy were more likely to have immediate reconstruction. Younger patients were also more likely to have repeat operations. Younger patients who had breast conserving surgery generally had radiotherapy. Because of the poorer prognosis tumours diagnosed in younger patients, 72% also had chemotherapy. Despite the poorer prognostic characteristics of their breast cancers, 5-year relative survival in younger patients was only slightly worse than that of patients aged 50–70 (84.2% compared to 86.0%).

27% of patients aged over 70 did not have surgery, and those who did have surgery were more likely to have a mastectomy. Older patients were less likely to have radiotherapy and only 16% had chemotherapy. 5-year relative survival for patients aged over 70 was poorest compared to patients aged less than 70.

Ethnicity

Ethnicity was known for 68% of breast cancer patients diagnosed in England in 2006. 81% of breast cancer patients known to be Black and 63% of those known to be Asian were in the two most deprived quintiles compared to

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33–34% of patients known to be White or Chinese. In patients known to be Black, 49% of breast cancers were diagnosed under the age of 50. Tumours in patients known to be Black were significantly larger, of higher grade and more likely to be node positive than those diagnosed in patients known to be White. Consequently, 63% of breast cancers diagnosed in patients known to be Black were in the worst two NPI groups compared to only 36% in patients known to be White. Patients known to be Black were more likely to have a mastectomy with immediate reconstruction and, because of their poor prognostic tumours and their younger age, they were also more likely to have chemotherapy (65% compared to 41% in those known to be White). 17% of patients known to be Chinese had ductal carcinoma in situ compared to 9–10% of patients known to be Asian or White and those with invasive cancers were less likely to be node positive. 1-year relative survival for patients diagnosed in 2006 was slightly lower for those known to be Black (94.1%) compared to those known to be Asian (98.0%) and those known to be White (95.7%). 5-year relative survival rates did not differ significantly between ethnic groups, but patients known to be Asian had slightly higher 5-year relative survival (84.2%) compared to those known to be Black (79.6%) or White (80.9%).

Deprivation

Breast cancer was more common in the most affluent; with 23% of cancers being diagnosed in the most affluent quintile and only 15% in the most deprived quintile. In patients aged over 70, only 19% of cancers were diagnosed in the most affluent quintile. This may be because cancers in this group were detected by screening at an earlier age. Patients in the most deprived quintile had a slightly higher proportion of invasive cancers in the worst NPI group, and they were less likely to be ER or PR positive and more likely to be HER2 positive. Patients in the most deprived quintile were less likely to have surgery than those in the most affluent quintile, and those who did have surgery were more likely to have a mastectomy. 1-year and 5-year relative survival were strongly dependent on deprivation; with patients in the most deprived quintile having significantly lower survival than those in the most affluent quintile (91.8% compared to 96.1% at 1-year and 73.3% compared to 85.6% at 5-years for patients diagnosed in 2001/02).

Presentation Route

In the 50–70 age band, 54% of breast cancers were detected by screening. 20% of screen-detected cancers were non-invasive compared with 6% of symptomatic cancers. Only 19–23% of patients known to be Black or of Mixed ethnicity had screen-detected cancers compared to 31% of those known to be Chinese, Asian or White. This is due in part to the relatively high proportion of cancers diagnosed under the age of 50 in patients known to be Black. It may also be related to the relatively high proportion of these patients in the more deprived populations who are known to be less likely to attend for screening; although this uptake effect was less marked in Asians.

Screen-detected cancers were significantly smaller, of lower grade and less likely to be node positive. 59% were in the two best NPI groups compared to 23% of symptomatic cancers. 73% of patients with screen-detected cancer had breast conserving surgery compared to 48% of symptomatic patients, and more of the patients with screen-detected cancer who had a mastectomy had immediate reconstruction. Because their tumours were of a better prognostic type, patients with screen-detected cancer had less chemotherapy (23% compared to 49%). 25% of symptomatic patients aged 70–74 did not have surgery, compared to only 5% of those with a screen-detected breast cancer. For patients aged 50–70 years, 1-year and 5-year relative survival were significantly higher for those with screen-detected cancers (100% compared to 94.9% at 1 year, and 96.2% compared to 80.3% at 5 years).

For patients aged 50–70, screening reduced the differences in tumour characteristics seen between ethnic groups and deprivation quintiles, and the inequalities demonstrated between affluent and deprived communities. The marked differences in 1-year and 5-year relative survival seen for patients in the most deprived and most affluent quintiles were also reduced by screening. Thus, for patients diagnosed in 2001/02, whilst there was a significant 3.6% difference in 1-year relative survival between the most deprived and most affluent symptomatic patients, there was no significant difference in patients with screen-detected cancers. Screening had an even more marked effect on 5-year relative survival; with the 12.2% difference between the most deprived and most affluent quintiles seen for symptomatic cancers being reduced to only 6.6% for screen-detected cancers.

Breast Cancer and the History of the NHS Breast Screening Programme

Breast Cancer

Breast cancer is the most common cancer in the UK despite it being rare in men (334 cases were diagnosed in men in 2006)¹. A total of 49,452 cases of breast cancer diagnosed in the UK in 2006 are included in this report. Of these, 84% were diagnosed in England, 9% in Scotland, 5% in Wales and 2% in Northern Ireland. This equates to an average of 135 people being diagnosed with breast cancer in the UK every day. Breast cancer now accounts for 31% of all cancers diagnosed in women². The lifetime risk of developing breast cancer is 1 in 9 for women and 1 in 1,014 for men. Breast cancer incidence rates in women have increased by 51% since 1977 (from 75 per 100,000 women in 1977 to 122 per 100,000 women in 2006), whilst the low incidence rate in men has remained relatively constant³.

Breast cancer incidence is strongly related to age; with 81% of cases occurring in women aged 50 years and over². Although fewer cases occur in the younger age groups, breast cancer is still the most common cancer in women under 35. By the age of 35–49 over 6,700 women are diagnosed with breast cancer each year³.

A recent publication by the National Cancer Intelligence Network (NCIN) has shown that breast cancer incidence varies with ethnicity. Age standardised breast cancer

incidence rates are lower in minority ethnic groups (Black, Asian and Chinese) compared to the White ethnic group for all ages and in women aged under and over 65 years⁴. The incidence of breast cancer has also been shown to be higher in more affluent societies⁵. On a European level the incidence of breast cancer is lower in Eastern European countries than in Western European countries⁶.

As the incidence of breast cancer in women has increased in the UK, mortality rates have fallen dramatically. Between 1989 and 2006, age standardised breast cancer mortality rates fell by 36% from 42 to 27 per 100,000 women³. Survival rates at one, five, ten and twenty years have also been improving over the past twenty years in the UK³. However, the Eurocare study (a comparative epidemiological study of the survival of European cancer patients) has shown that although UK breast cancer survival rates are improving, they are still lower than those in Scandinavian and many other Western European countries including France, Italy and Switzerland⁶. As with incidence, breast cancer survival is influenced by age; with survival rates decreasing with increasing age⁷. Women who have had breast cancer now account for 28% of the 2 million cancer survivors in the UK⁸.

History of the NHS Breast Screening Programme

The NHS Breast Screening Programme was initiated as a result of the 'Forrest Report', published in 1986⁹. The 'Forrest Report' was commissioned because the UK had the highest mortality rate from breast cancer in Western Europe and North America, and because recent scientific publications had shown that mammographic screening might be an effective way of addressing the problem. The working group, chaired by Professor Sir Patrick Forrest reviewed the international literature on breast screening, evaluated the advantages and limitations and costs of screening and the various models for the organisation of a breast screening service. The 'Forrest Report' concluded that 'on the information available,

mammography alone is the preferred option for basic screening and has proven effectiveness in reducing breast cancer mortality in women aged 50 and over'. 'Women aged up to 65 should be positively encouraged to be regularly screened but after this age screening should be provided if requested'.

Several arguments were used to support an upper limit to screening of 65 years. Studies from the UK and abroad showed that screening was less acceptable to the older population with a rapid drop off seen in a UK trial. Older women had a greater chance of dying from other causes and the tumours that did develop appeared to run a less aggressive course.

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Breast Cancer and the History of the NHS Breast Screening Programme

Based on these findings, the NHS Breast Screening Programme was introduced between 1988 and 1991; initially offering 3-yearly mammography to women between the ages of 50 and 64. On the basis of evidence gained through pilot studies, in 2000 the Government announced in the *NHS Cancer Plan*¹⁰ an increase in the upper age limit from 64 to 70 to be implemented by 2004, and the introduction of two-view mammography at every screen which was expected to improve the small cancer detection rates. As a result of these changes, the number of women attending for mammography increased in England from 1.3 million in 2000/01 to

1.63 million in 2005/06 and the number of cancers detected rose from 8,345 in 2000/01 to 13,523 in 2005/06¹¹.

In 2007, the Cancer Reform Strategy¹² announced a further expansion of the NHS Breast Screening Programme to be completed by 2012. Over time it is proposed to *'extend the service to nine screening rounds between 47 and 73 years with a guarantee that woman will have their first screening before the age of 50'*. It is envisaged that as a result of this extension of the programme, a further 400,000 women will be screened each year.

Purpose of the 'All Breast Cancer Report'

The NHS Breast Screening Programme audit of screen-detected breast cancers and the Breast Cancer Clinical Outcome Measures (BCCOM) Project which audits symptomatic breast cancers are now well established national audits, but never before have the data included in these audits been analysed as a single cohort with screening and symptomatic breast cancers diagnosed in the UK compared directly.

The purpose of the 'All Breast Cancer Report' is to analyse the differences in prognosis and clinical outcomes of screen-detected and symptomatic breast cancers in relation to route of presentation (i.e. screening or symptomatic), age at diagnosis, invasive status, tumour characteristics, deprivation and ethnicity.

Methodology – Data Sources

Data Sources

The data for the 'All Breast Cancer Report' were taken from several sources. These are listed in Table 1.

Cancer registry data – The UK has one of the most comprehensive cancer registration systems in the world. There are currently 11 cancer registries in the UK, which each cover a population of between 1.76 and 11.84 million people. Population based data on the diagnosis, treatment and survival of breast cancer cases are collected by the registries. The data items collected can vary between registries, but all collect the Cancer Registration Minimum Data Set¹³. Data for breast cancers diagnosed in the UK in 2006 were initially supplied to the West Midlands Cancer Intelligence Unit (WMCIU) as part of the BCCOM Project.

ONS-HES linked data – The Office for National Statistics (ONS) collates data held by regional cancer registries to give aggregated data for England. The ONS cancer registration dataset contains patient demographics (including postcode which can be linked to census data to obtain an Index of Multiple Deprivation score), some tumour characteristics (histology, invasive breast cancer grade, stage at diagnosis) and treatment flags (indicating that the patient has had surgery, radiotherapy and/or chemotherapy).

Hospital Episode Statistics (HES)¹⁴ is a national dataset for England which records details of the care provided by NHS hospitals. HES data can be used to gather a wide range of information primarily relating to in-patient and day case care. The HES dataset contains information (e.g. self reported ethnicity) which is not collected effectively via other sources. It is also an excellent source of information on the type of surgical procedure undertaken. By linking the ONS and HES datasets, a database of all registered breast cancer patients, their demographics (including ethnicity and deprivation score) and their in-patient treatment can be obtained.

ID2007 – The Index of Multiple Deprivation 2007 (ID2007)¹⁵ combines a number of indicators, covering a range of economic, social and housing issues, into a single deprivation score for each small area in England. This allows each area to be ranked according to its level of deprivation. ID2007 scores are produced at Lower Super Output Area (LSOA) level, of which there are 32,482 in England¹⁵. Income domain score was used as the deprivation indicator in this report. ID2007 scores can be grouped into 5 ranges (quintiles), each containing one fifth of the English population. To obtain an indication of the deprivation status of each breast cancer patient, postcode of residence was linked to the ID2007 score for the small area in which the patient lived at the time of diagnosis. Patients were then allocated to a deprivation quintile based on their ID2007 score.

NSTS – The National Strategic Tracing Service (NSTS) is a database of people, places and NHS organisations in England and Wales. Breast cancer cases were sent to the NSTS to establish for the purposes of the survival analysis if the patient was alive or dead.

BCCOM Project validated data – Each year, to initiate the BCCOM Project, data for symptomatic breast cancers are downloaded from the UK cancer registries. The data are then sent to individual surgeons for validation. Validated data are returned to the WMCIU for analysis. In this report, where altered data were returned, these have been used in the analysis in preference to the original cancer registration data.

NHSBSP validated data – Data for the UK NHSBSP 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 QA reference centres and submitted for inclusion in the audit. National analyses are undertaken by the Breast Screening QA Reference Centre at the WMCIU.

Methodology – Data Sources

Amalgamating Data Sources

The data from different sources were linked using NHS number and amalgamated to produce a single record for each patient. During the amalgamation process, when data were available from more than one dataset for a particular data item, the guidelines in Table 1 were used to determine the hierarchy for inclusion.

For each data item, the dataset with the highest number of ✓ was used as it was thought to be of higher quality/reliability. For data relating to tumour characteristics and therapeutic treatment, BCCOM and NHSBSP audit data were selected preferentially because of their validation by clinicians. For patient demographics,

cancer registration data were taken to be the most accurate.

Some patients had conflicting data which could not be answered solely using Table 1. For example, if two surgeons validated data for the same patient, the decision as to which data item was used was based on the quality and completeness of their individual datasets. Similarly, in the rare occurrence when a patient was present in both the BCCOM and NHSBSP audit datasets, the NHSBSP audit data were used because each case included in that audit is known to be a validated screen-detected cancer rather than a symptomatic breast cancer.

Assumptions

Several assumptions were made to ensure consistency when producing the final dataset:

- Cancer registry boundaries rather than breast screening QA reference centre boundaries were used in the regional analysis
- Co-morbidity was not taken into account in investigating patterns of care
- Ethnicity was classified using the most commonly stated ethnicity in a patient's records
- For patients with bilateral or multiple tumours diagnosed in the audit period the worst tumour was recorded
- For invasive cancers, the worst tumour was taken to be the tumour with the highest Nottingham Prognostic Index score¹⁶
- In the absence of an invasive cancer, the non-invasive cancer with the worst prognosis was recorded.

Where did the data come from?	Cancer Registration data	HES data	NSTS	ID2007	BCCOM validated data (symptomatic)	NHSBSP validated data (screen-detected)
Patient demographics	✓✓				✓	✓
Deprivation				✓		
Ethnicity		✓				
Tumour characteristics	✓				✓✓	✓✓
Therapeutic treatment	✓✓	✓			✓✓✓	✓✓✓
Reconstructive surgery		✓				✓✓
Survival			✓			

Table 1: Hierarchy of data sources used to produce the final dataset. A full translation of the acronyms used is provided in Appendix 1

Methodology – Data Quality and Completeness

Data Quality and Completeness

After amalgamation of the various data sources, data completeness for breast cancers diagnosed in 2006 was good for many of the key data items. However, as HES and ID2007 Index of Multiple Deprivation data cover England only and equivalent data were not made available for the Celtic countries, analyses involving ethnicity and deprivation had to be restricted to England (Table 2). Data on number of operations, sentinel lymph node biopsy and immediate reconstruction were also obtained by matching NHSBSP audit data and cancer registration data to HES data. The Celtic countries therefore had to be excluded from the analyses covering these parameters.

NHSBSP audit data for Northern Ireland, Wales and Scotland could not be matched to cancer registration data because patient identifiers were not available. This meant that screen-detected and symptomatic cancers could not be identified reliably for the Celtic countries and that comparisons of the tumour characteristics in patients presenting by different routes was not possible. The Celtic countries were therefore excluded from analyses involving invasive cancer size,

grade, nodal status and Nottingham Prognostic Index. This is unfortunate as, for 30–35% of symptomatic breast cancer patients in Northern Ireland, Wales and Scotland, high quality surgically validated data for these parameters were available via the BCCOM audit. However, for Scotland these data could not be linked to cancer registration data as patient identifiers were not available.

If the comparative analyses included in this report are to be carried out at a truly UK level, the provision of patient identifiers for all screen-detected and symptomatic cancers and access to data for the Celtic countries' equivalent to English HES and ID2007 Index of Multiple Deprivation data to allow comprehensive linkage of all the data potentially available will be essential.

Because of the varying availability and quality of each data item, different numbers of cases could be included in each analysis. Table 3 shows for each data item, the number and proportion of cases in the UK and in England with a known value. For radiotherapy,

Data item	England	Northern Ireland	Scotland	Wales
Morphology	✓	✓	✓	✓
Invasive size, invasive grade, nodal status and Nottingham Prognostic Index for invasive cancers	✓			
Receptor status	✓			
Surgery	✓	✓	✓	✓
Number of operations	✓			
Final therapeutic operation type	✓	✓	✓	✓
Sentinel lymph node biopsy	✓			
Immediate reconstruction	✓			
Radiotherapy	✓*	✓	✓	
Chemotherapy	✓*	✓	✓	
Survival	✓			

Table 2: Data items in each country included in the analyses in the 'Tumour Characteristics and Treatment' sections of the report (*Selected English registries only based on data completeness)

Methodology – Data Quality and Completeness

Data item	Number of cases	% UK	% England
Deprivation score	41,412	84	100
Ethnicity	28,239	57	68
Surgical treatment (UK)	39,462	80	-
Surgical treatment (invasive cancers) UK	34,891	71	-
*Morphology (UK)	39,261	99	-
Surgical treatment (England)	33,717	-	81
Surgical treatment (invasive cancers) England	29,663	-	72
Morphology (England)	33,545	-	81
*Invasive tumour size (England)	25,350	-	85
*Invasive tumour grade (England)	28,462	-	96
*Nodal status (invasive cancers, England)	20,798	-	70
*NPI (invasive cancers, England)	19,832	-	67
*Oestrogen receptor status (invasive cancers, England)	14,330	-	48
*Progesterone receptor status (invasive cancers, England)	10,954	-	37
*HER2 status (invasive cancers, England)	10,487	-	35
*Number of operations (England)	31,145	-	92
Final therapeutic operation (England)	38,198	-	92
Sentinel lymph node biopsy (England)	18,155	-	44
Immediate reconstruction (England)	3,751	-	9
*Radiotherapy (invasive cancers, England)	19,217	-	65
*Chemotherapy (invasive cancers, England)	20,391	-	69
*Hormone therapy (invasive cancers, England)	17,103	-	58

Table 3: Number and proportion of data items with known values

*expressed as a proportion of surgically treated invasive cancers (except Number of operations, all cancers)

chemotherapy and hormone therapy, data completeness varied widely between the English registries. Therefore only data from selected registries were included in the adjuvant treatment analyses.

In general, the quality of the data for screen-detected breast cancers was superior to that for cancers presenting symptomatically. A summary of the proportions of screen-detected and symptomatic breast cancers with unknown data is given in Table 4. The high quality of the data recorded for screen-detected breast cancers is due to the NHSBSP audit of screen-detected breast cancers which is now in its 13th year.

Breast cancers that have been surgically treated, particularly in the NHS, have a more complete cancer

Data Item	Screen-detected	Symptomatic
Age	<1%	<1%
Ethnicity	28.6%	33.4%
Deprivation	<1%	<1%
Invasive size	1.1%	21.3%
Invasive grade	<1%	5.7%
Nodal status	2.4%	43.8%
Nottingham Prognostic Index	3.8%	48.0%
Surgery	1.1%	11.3%
Radiotherapy	13.4%	53.2%
Chemotherapy	13.7%	45.7%
Hormone therapy	12.6%	57.3%

Table 4: Proportions of unknown data items for screen-detected and symptomatic cancers

Methodology – Data Quality and Completeness

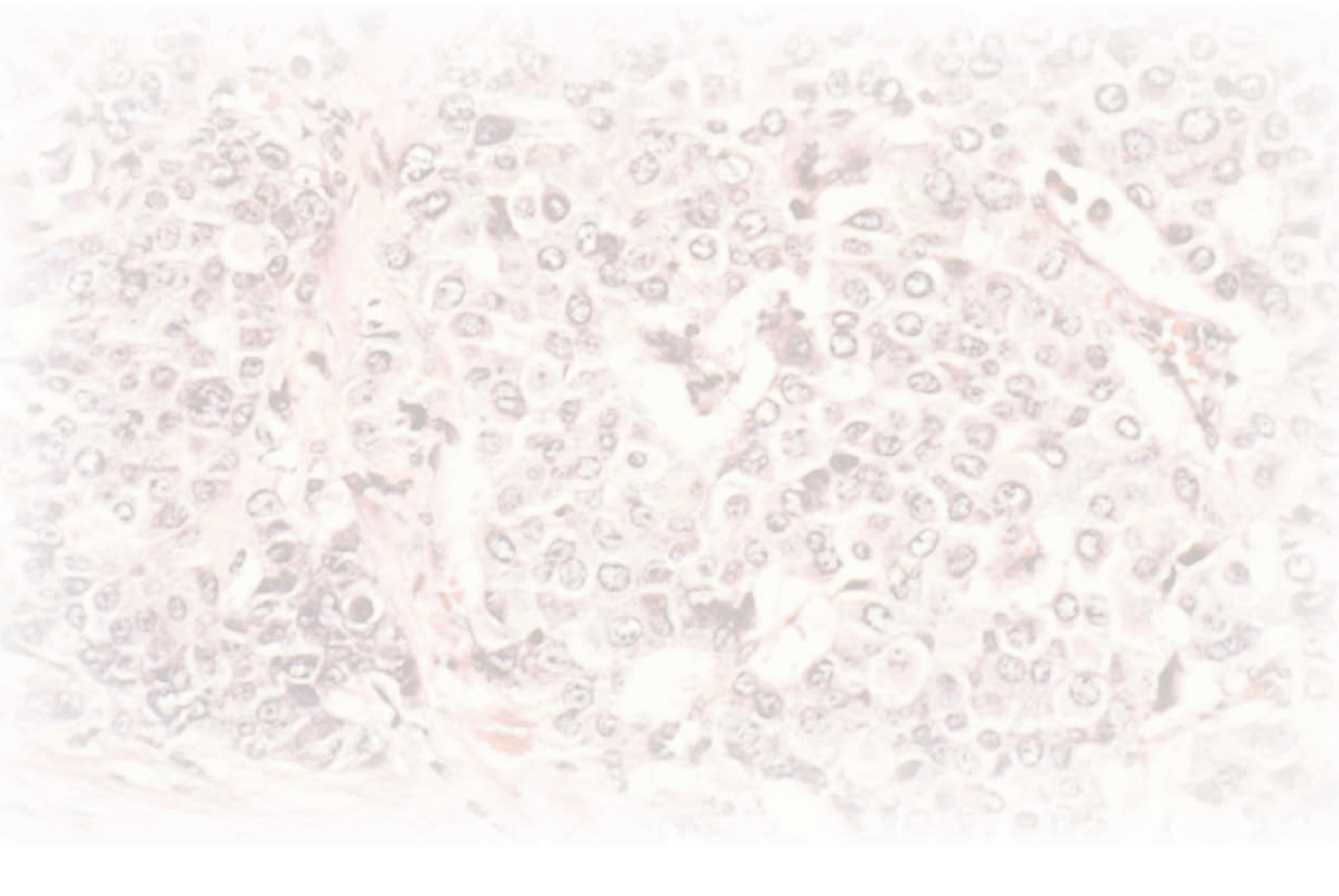
registration record than those which did not have any surgical intervention. This is because pathology reports are the major source of data for cancer registries. In this report, these data have been supplemented with further details of the operations undertaken which are held on the HES dataset. All cancer registries find it

difficult to access complete data on adjuvant treatment (in particular chemotherapy and hormone therapy) that has been delivered on an outpatient basis. The analyses in this report that relate to adjuvant treatment should thus be viewed with caution.

Survival Analyses

Relative survival analysis was performed to calculate survival rates. Relative survival is defined as the observed survival in the patient group divided by the expected survival of the general population, matched by age, sex and deprivation. The cumulative relative survival is interpreted as the proportion surviving a given interval

after diagnosis in the hypothetical situation that breast cancer is the only possible cause of death. Relative survival was calculated, using the statistical package STATA. Deprivation adjusted life tables were obtained from the Cancer Research UK Cancer Survival Group at the London School of Hygiene and Tropical Medicine.



Results – Cohort Characteristics

Key Findings

- 49,452 cases of breast cancer diagnosed in the UK in 2006 are included in this report. Of these, 84% were diagnosed in England, 9% in Scotland, 5% in Wales and 2% in Northern Ireland.
- 81% of breast cancers were diagnosed in patients aged 50 and over, 19% in patients aged less than 50 and 29% in patients aged over 70. Of the 52% of breast cancers diagnosed in patients between 50 and 70 years of age, 54% were screen-detected.
- 10% of breast cancers were non-invasive or micro-invasive. The proportion of non-invasive breast cancers was much higher in women aged 50–70 compared with women aged less than 50 and older than 70; mainly because 20% of screen-detected cancers were non-invasive compared with only 6% of symptomatic cancers.
- Overall there was a marked relationship between deprivation and breast cancer incidence, with only 15% of breast cancers being diagnosed in patients in the most deprived quintile compared with 23% in those in the most affluent quintile. For patients aged over 70 only 19% of breast cancers were diagnosed in those in the most affluent quintile. This could be because women in this group have more cancers detected by screening at a younger age. A relatively smaller proportion of breast cancers diagnosed in patients in the most deprived quintile were screen-detected compared with those in the most affluent quintile.
- Ethnicity was known for 68% of patients in England. In patients of known White ethnicity, only 19% of breast cancers were diagnosed under the age of 50, compared to 49% in those of known to be Black and 31–35% in those of known to be Chinese or Asian. Conversely, 27% of cancers in patients known to be White were diagnosed in those aged over 70 compared with only 7–10% of those known to be Asian, Black or Chinese.
- Only 19% of women known to be Black had screen-detected breast cancers compared with 31–33% of women known to be White, Asian or Chinese. This may in part be due to the relatively high proportion of cancers diagnosed under the age of 50 in patients known to be Black (49%), but 31–35% of breast cancer patients known to be Asian or Chinese were also diagnosed under the age of 50.
- 81% of breast cancer patients of known Black ethnicity were in the two most deprived quintiles compared with only 33–34% of breast cancer patients known to be White or Chinese. As 63% of breast cancer patients known to be Asian were in the two most deprived quintiles, and 31% of their cancers were screen-detected, it may be that the effect of deprivation on breast screening attendance is more marked in the Black than in the Asian population.

Country Profile

A total of 49,452 cases of breast cancer diagnosed in the UK in 2006 are included in this report. Of these, 84% were diagnosed in England, 9% in Scotland, 5% in Wales

and 2% in Northern Ireland. Details of the number of cases in each English region and Celtic country are given in Table 5.

Age Profile

The cohort of patients diagnosed with breast cancer in 2006 had an age distribution ranging from 18 to 106

years (Figure 1). 81% of breast cancers were diagnosed in patients aged 50 and over. This is similar to other

Results – Cohort Characteristics

Region/Celtic country	Total cases	Population covered (million)
Eastern	4,731	5.66
North West	5,260	6.58
Northern & Yorkshire	5,460	6.76
Oxford	2,138	2.86
South West	6,839	7.02
Thames	8,305	11.84
Trent	4,168	4.99
West Midlands	4,581	5.38
England	41,482	51.09
Northern Ireland	1,019	1.76
Scotland	4,392	5.14
Wales	2,559	2.98
UK	49,452	60.98

Table 5: Total number of breast cancer cases included in each region/Celtic country

studies which have demonstrated that the majority of breast cancers are diagnosed in the peri/post menopausal years.

14,365 (29%) breast cancers were diagnosed in patients aged over 70. Of the 52% of breast cancers diagnosed in patients between 50 and 70 years of age, 54% were screen-detected. Only 2% of breast cancers diagnosed

Proportion of Screen-Detected Breast Cancers

In England, Scotland and Wales, 29–32% of all breast cancers diagnosed in 2006 were screen-detected. In Northern Ireland, only 13% of breast cancers were recorded by the cancer registry as being screen-detected. In England, patient identifiable information from the cancer registries was provided to allow linkage

Invasive Status

Table 6 shows how the invasive status of the breast cancers diagnosed in 2006 varied with age at diagnosis. In this report the term non-invasive is used to cover non-invasive and micro-invasive cancers because of the small number of micro-invasive cancers (<0.5%). The proportion of non-invasive breast cancers was much higher in women aged 50–70 (15%) compared with women aged less than 50 (8%) and older than 70

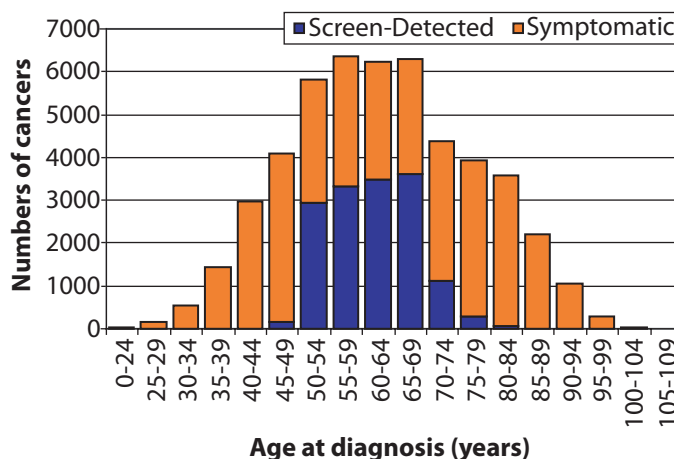


Figure 1: Age distribution and route of presentation of UK patients diagnosed with breast cancer in 2006

in women aged less than 50 and 6% of breast cancers diagnosed in women aged over 70 were screen-detected.

In England, 5% of breast cancer patients (2,149 women) were 47–49 years old at diagnosis and a further 5% (1,955 women) were 71–73 years old. These groups of patients are covered by the extension of the NHSBSP outlined in the Cancer Reform Strategy and therefore, in future, more breast cancers in these age groups may be screen-detected.

of cancer registry records to NHSBSP breast screening audit data. In some regions, this process markedly increased the number of screen-detected cancers. As patient identifiable data were not provided by the Northern Ireland cancer registry, this process could not be used to enhance the identification of screen-detected cancers in Northern Ireland.

(4%). This is mainly because 20% of screen-detected cancers were non-invasive compared with only 6% of symptomatic breast cancers. Interestingly, although the proportion of non-invasive cancers is much smaller for symptomatic breast cancers, 40% of these cancers (2,054) did present symptomatically in 2006. These cases may have presented as palpable masses or with nipple discharge¹⁷.

Results – Cohort Characteristics

Age (years)	Invasive (%)	Non-invasive (%)	Total cases
<50	92%	8%	9,226
50–70	85%	15%	25,856
>70	96%	4%	14,365
Unknown	80%	20%	5
Total	90%	10%	49,452

Table 6: Proportion of invasive and non-invasive breast cancers diagnosed in each age group

Deprivation

41,412 patients diagnosed with breast cancer in England in 2006 could be allocated one of five deprivation quintiles based on the ID2007 score for their area of residence. Overall, there was a marked relationship between deprivation and breast cancer

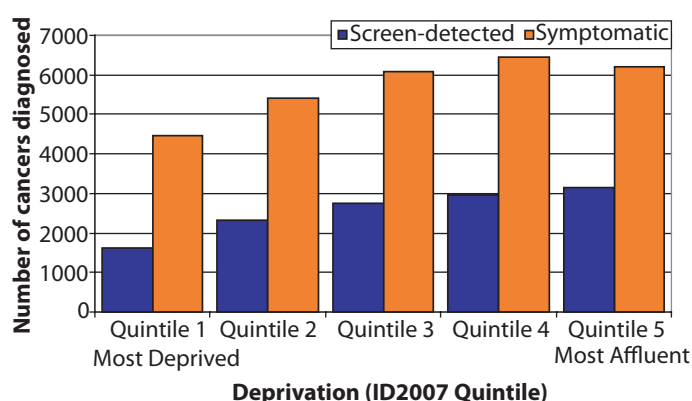


Figure 2: Number of screen-detected and symptomatic cancers diagnosed in patients in each deprivation quintile in England

Ethnicity

28,239 patients (68%) diagnosed with breast cancer in England in 2006 could be allocated to an ethnic group. In patients of known White ethnicity, only 19% of breast cancers were diagnosed under the age of 50, compared to 31% and 35% in those known to be Asian and Chinese respectively and 49% in those known to be Black. Conversely, 27% of cancers in patients known to be White were diagnosed in those aged 70 and over compared with 7–10% of those known to be Asian,

incidence, with only 15% of cancers being diagnosed in patients in the most deprived quintile compared with 23% in those in the most affluent quintile. A similar relationship with deprivation was apparent for patients aged less than 50 and for those in the 50–70 age group, but for patients aged over 70, only 19% of breast cancers were diagnosed in those in the most affluent quintile. This could be because women in this group have more cancers detected by screening at a younger age.

Figure 2 shows that the number of breast cancers diagnosed in patients in each deprivation quintile in England in 2006 increased with affluence for both screen-detected and symptomatic cancers. However, a relatively smaller proportion of breast cancers diagnosed in patients in the most deprived quintile were screen-detected (26%) compared with those in the most affluent quintile (34%). This is consistent with previous studies demonstrating that affluent women are more likely to accept their screening invitation¹⁸.

Black or Chinese. These differences may have arisen because of differences in age distribution in the minority ethnic groups compared to the White population. Migration and differing settlement patterns could both contribute to such differences. Without taking the age distribution of the minority ethnic groups into account, it cannot be determined whether age does affect the chances of developing breast cancer in these populations. However, the data do indicate that within the groups of

Results – Cohort Characteristics

Ethnic group	Screen-detected		Symptomatic		Total cases
	No.	%	No.	%	
White	8,746	33%	18,061	67%	26,807
Asian	191	31%	420	69%	611
Black	81	19%	347	81%	428
Chinese	23	31%	51	69%	74
Mixed	22	23%	75	77%	97
Other	72	32%	151	68%	222
Total	9,135	32%	19,104	68%	28,239

Table 7: Number and proportion of breast cancers diagnosed in England with known ethnicity in each presentation route

patients known to be Asian, Chinese and Black, a higher proportion are diagnosed in the younger age group compared to those patients known to be White.

Table 7 shows that only 19% of women known to be Black had screen-detected breast cancers compared with 31–33% of women known to be White, Asian or Chinese. The low proportion of women of known Black ethnicity with screen-detected breast cancers may in part be explained by the relatively high proportion of cancers (49%) diagnosed in these women under the age of 50. However there were also relatively high proportions of breast cancers diagnosed in patients under the age of 50 known to be Asian (31%) or Chinese (35%) and 31% of their cancers were screen-detected so this cannot be the only reason.

Male Breast Cancers

In 2006, 334 breast cancers were diagnosed in males who were aged between 20 and 96 years. Male breast cancers accounted for only 0.7% of the total number of breast cancers diagnosed in 2006 in the UK. 93% of the

Another possible explanation lies in the fact that a relatively high proportion of breast cancer patients of known Black ethnicity were in the two most deprived quintiles (81%) compared with only 33–34% of breast cancer patients known to be White or Chinese. Women in the most deprived populations are known to be less likely to accept their invitation to attend for screening¹⁸. However, as 63% of breast cancer patients known to be Asian were also in the two most deprived quintiles, and 31% of their cancers were screen-detected, it may be that the effect of deprivation on breast screening attendance is more marked in the Black than in the Asian population.

male breast cancers are recorded as being invasive and 74% had a record of a surgical procedure ostensibly to remove the tumour. These cancers have been included as part of the symptomatic cohort within this report.

Results – Tumour Characteristics

Key Findings

- 68% of breast cancers were invasive ductal carcinomas (59% of screen-detected and 73% of symptomatic cancers), 10% were ductal carcinomas in situ and 10% lobular carcinomas.
- Lymph node status was poorly recorded for symptomatic breast cancers; with only 66% known to have had nodal assessment compared to 98% of screen-detected cancers. Of the patients with known nodal status, 38% of invasive and 3% of non-invasive breast cancers were node positive; the latter suggesting that small foci of undetected invasive disease may have been present. A higher proportion of patients aged less than 50 had lymph node positive tumours.
- Breast cancers in younger patients had a relatively worse prognosis; 53% of patients aged less than 50 had tumours in the two worst prognostic groups (MPG2 and PGP), compared to 28% for patients aged 50–70 and 45% for patients aged over 70.
- Screen-detected invasive breast cancers generally had better prognostic characteristics than symptomatic invasive breast cancers. They were smaller, of lower grade, less likely to be node positive and had better NPI scores.
- Patients known to be Black had breast cancers with worse prognosis than those in other ethnic groups. Their tumours were significantly larger, of higher grade, more likely to be node positive and had worse NPI scores.
- Route of presentation reduced the differences between the most affluent and deprived groups. Only 22% of screen-detected cancers in the most deprived quintile were Grade 3 compared to 47% of symptomatic cancers, and, while patients with screen-detected cancers in the most deprived group had similar proportions of node positive cancers to those in the most affluent group, 55% of symptomatic breast cancers in the most deprived group were node positive compared to 51% in all other groups.
- 85% of invasive surgically treated breast cancers were oestrogen receptor (ER) positive, 69% were progesterone receptor (PR) positive and 16% were HER2 receptor positive. Younger patients were more likely to have ER negative breast cancers and had a higher proportion of HER2 positive breast cancers.
- Breast cancers in patients known to be Black were less likely to be ER positive or PR positive and more likely to be HER2 positive. Breast cancers in patients in the most deprived quintile were also less likely to be ER positive or PR positive and more likely to be HER2 positive than those in the most affluent patients.
- Breast cancer patients aged less than 50 and older than 70 were more likely to have triple negative tumours. The proportions of triple negative tumours were also higher in the most deprived quintile and in patients known to be Black.

Morphology

The morphology of a tumour refers to its histological classification and its behaviour (benign or malignant [in situ or invasive]). The morphology is determined from a microscopic examination of tumour tissue by a histopathologist.

Tumour morphology was known for 33,545 surgically treated breast cancers diagnosed in England. As

expected, the majority (68%) of these cancers were invasive ductal carcinomas (59% of screen-detected and 73% of symptomatic cancers) and there were equal proportions of ductal carcinoma in situ (DCIS) and lobular cancers (each 10%). 4% of cancers were of mixed type. 19% of screen-detected breast cancers were DCIS and 3% were tubular cancers (both of which have

Results – Tumour Characteristics

Ethnic group	Morphology					
	Ductal carcinoma in situ (DCIS)		Ductal carcinoma		Lobular carcinoma	
	No.	%	No.	%	No.	%
White	2,364	10%	15,906	68%	2,319	10%
Asian	49	9%	411	74%	29	5%
Black	41	10%	293	74%	20	5%
Chinese	12	17%	50	71%	2	3%
Mixed	2	2%	71	78%	8	9%
Other	15	8%	139	73%	19	10%

Table 8: Variation in morphology with ethnicity for surgically treated breast cancer cases in England

excellent prognosis) compared to only 6% and 1% respectively of symptomatic breast cancers. 4% of cancers detected in the over 70 age group were mucinous carcinomas compared to 1% in the under 50 and 50–70 age groups. This is likely to reflect the slow growing nature of this form of breast cancer.

The variation of the three most common morphology types in each ethnic group for breast cancers diagnosed

Invasive Tumour Size

Of the 29,663 surgically treated invasive breast cancers diagnosed in England, 4,313 (15%) had no invasive tumour size recorded. If cancer patients receive neo-adjuvant therapy or if a pathology report indicates that a tumour has involved margins, most cancer registries will not record the size of the tumour. This may in part account for the relatively high proportion of symptomatic breast cancers without an invasive tumour size recorded (21%) compared with screen-detected breast cancers (1%).

The NHSBSP is designed to detect early stage breast cancers. Therefore it is unsurprising that the screen-detected surgically treated breast cancers had a relatively small invasive tumour size compared with symptomatic breast cancers (Table 9). 78% of screen-detected breast cancers were 20mm in diameter or smaller compared with only 48% of symptomatic breast cancers.

in England in 2006 is shown in Table 8. The proportion of lobular cancers was highest in the White and Other ethnic groups (10%) and lowest in the Chinese (3%) ethnic group. Breast cancer patients known to be Chinese had the highest proportion of DCIS (17%). There was no significant variation in morphology with deprivation.

Patients aged 50–70 years who were surgically treated had breast cancers with relatively smaller invasive tumour size compared with those patients aged less than 50 and older than 70. In the 50–70 age group, 42% of breast cancers with known invasive tumour size were less than 15mm in diameter, compared to 25% in

Invasive tumour size	Screen-detected	Symptomatic
<15mm	54%	22%
15–≤20mm	24%	26%
>20mm–≤35mm	17%	36%
>35mm–≤50mm	3%	10%
>50mm	1%	7%
Total cases	9855	15495

Table 9: Variation in invasive tumour size for screen-detected and symptomatic cancers in England

Results – Tumour Characteristics

patients aged less than 50 and 20% in patients older than 70. When the data for cases in the 50–70 age group were split by route of presentation, 78% of these small cancers were detected through screening. This clearly demonstrates the influence of the NHSBSP on tumour size at diagnosis.

Breast cancers diagnosed in patients known to be Black were significantly larger than those in other ethnic groups. 20% of the cancers in the Black ethnic group were larger than 35mm in diameter compared with 12% of all cancers. These larger cancers may explain the multiple operations carried out on patients in the Black ethnic group mentioned later in this report.

Screen-detected breast cancers in women with known Black ethnicity aged 50–70 years were generally smaller; with 39% being less than 15mm in diameter and only 7% being larger than 35mm. In contrast, 24% of symptomatic breast cancers in women with known Black ethnicity aged 50–70 years, were larger than

35mm. Breast cancer patients known to be Chinese had a relatively high proportion (37%) of cancers which were less than 15mm in diameter and 59% of these were screen-detected.

Breast cancers diagnosed in patients in the most deprived quintile were generally larger than those diagnosed in patients in the most affluent quintile. In the former, only 30% of breast cancers with known invasive tumour size were less than 15mm in diameter compared with 36% of those in the most affluent patients. When these data are viewed by route of presentation for the 50–70 age group, they show that there is a relatively equal distribution of small, less than 15mm invasive cancers across all the deprivation quintiles for screen-detected cancers (54%), but that the 5% difference between the most deprived and affluent groups persists in the symptomatic cohort. This is further evidence that the NHSBSP is reducing health inequalities.

Invasive Tumour Grade

The Bloom and Richardson tumour grading system classifies cancer cells in terms of how abnormal they look microscopically and gives an indication of how quickly the tumour is likely to grow¹⁹. Grade 1 tumours are slower growing and are less likely to have spread beyond the breast and may not need to be treated as aggressively as Grade 3 tumours. The definitive tumour grade is reported from the excised surgical specimen.

Of the surgically treated invasive breast cancers diagnosed in England, 4% had no tumour grade recorded. Of the 28,462 breast cancers with known grade, 17% were Grade 1, 47% were Grade 2 and 35% were Grade 3.

A higher proportion of screen-detected breast cancers had a low grade (28% were Grade 1 compared to 12% in the symptomatic group). Younger patients had more

Ethnic group	Grade 1	Grade 2	Grade 3	Not applicable	Total cases
White	17%	47%	36%	0%	19,982
Asian	14%	41%	44%	0%	470
Black	9%	34%	56%	1%	328
Chinese	11%	48%	41%	0%	54
Mixed	11%	56%	33%	0%	81
Other	12%	50%	38%	0%	164
Unknown	19%	48%	32%	0%	7,383
Total cases	4,968	13,346	10,070	78	28,462

Table 10: Variation in invasive tumour grade with ethnic group in England

Results – Tumour Characteristics

aggressive breast cancers; 48% of patients aged less than 50 had Grade 3 tumours compared to 31% of patients aged 50–70 and 35% of patients aged over 70. When the data for cases in the 50–70 age group were split by route of presentation, 75% of the Grade 1 cancers were detected through screening and 63% of the Grade 3 cancers presented symptomatically. This clearly demonstrates the influence of the NHSBSP on grade at diagnosis.

Table 10 shows that patients known to be Black had a higher proportion of Grade 3 cancers compared to patients known to be White. 17% of patients known to be White and 14% of patients known to be Asian had a Grade 1 cancer compared to only 9% of patients known to be Black. When the cases in the 50–70 age group

Nodal Status

Lymph node assessment is important because it indicates if a breast cancer had spread beyond the breast and whether the disease may be systemic rather than localised to the breast. 75% of the 29,663 patients with surgically treated invasive breast cancers diagnosed in England in 2006 were known to have had their axillary lymph nodes assessed. For 2% of patients, the lymph nodes were known not to have been assessed. 27% of patients with non-invasive breast cancers were known to have had lymph node assessment.

In the 50–70 age group, 98% of patients with invasive screen-detected breast cancers were known to have had their lymph nodes assessed, compared with only 64% of patients with symptomatic breast cancers. Although the cases were matched to HES data in order to increase surgical data completeness, the differences between patients with symptomatic and screen-detected tumours are most likely to be due to missing data and this problem requires further investigation.

Nodal status was positive for 3% of the non-invasive breast cancers and 4% of the micro-invasive breast cancers with nodal status recorded. The former has been noted previously in NHSBSP audits and could

were split by route of presentation, the differences between ethnic groups became smaller for patients with screen-detected cancers. In contrast, in those presenting symptomatically, patients known to be Black still had a relatively higher proportion of Grade 3 tumours compared with patients known to be White.

Overall, patients in the most deprived group had significantly more Grade 3 cancers (39% compared with 35% overall). Within the 50–70 age group this variation with deprivation quintile was reduced considerably in the screen-detected cases; with only 22% of the most deprived group having a Grade 3 tumour compared with 47% of the most deprived symptomatic patients.

suggest that small foci of undetected invasive disease were present.

Nodal status was positive for 38% of the 20,798 invasive breast cancers with a nodal status recorded. Younger patients were more likely to have a positive nodal status indicating that their breast tumours were more aggressive. Thus, 53% of patients aged less than 50 were lymph node positive compared with 32% aged 50–70 and 44% aged over 70. For invasive breast cancers, 51%

Ethnic group	Positive	Negative	Total cases
White	38%	62%	14,627
Asian	43%	57%	308
Black	64%	36%	221
Chinese	29%	71%	35
Mixed	47%	53%	49
Other	48%	52%	115
Unknown	36%	64%	5,443
Total cases	7,922	12,876	20,798

Table 11: Variation in invasive tumour nodal status with ethnic group in England

Results – Tumour Characteristics

of symptomatic cases had a positive nodal status, compared to 23% of screen-detected cases.

Table 11 shows that patients known to be Black with nodal status recorded were more likely to have a positive nodal status compared to those known to be White (64% versus 38%). This statistically significant difference probably mainly reflects the younger age of diagnosis in these patients. Patients known to be Chinese with nodal status recorded had a lower proportion of node positive cancers (29%) compared to patients known to be White, but this difference is not significantly different.

As with invasive tumour size and grade, the differences between ethnic groups diminished when cases in the 50–70 age group were split by route of presentation. Thus, for cases with nodal status recorded, 71% of screen-detected cancers in women known to be Black

were lymph node negative (39 cases) compared to 23% (11 cases) for symptomatic patients.

There was also a significant difference for cases with nodal status recorded between patients in the most deprived group and all other groups; with 41% in the most deprived group being lymph node positive compared to 38% overall. Route of presentation not only had a major impact in itself on lymph node status, it also reduced the differences in lymph node status between the most affluent and deprived groups. Thus, for cases with nodal status recorded, while patients aged 50–70 with screen-detected cancers in the most deprived group had similar proportions of node positive cancers to those in the most affluent group (24% and 23% respectively), 55% of symptomatic breast cancers in the most deprived group were node positive compared with 51% in all other groups.

Nottingham Prognostic Index (NPI)

The Nottingham Prognostic Index¹⁶ is an indicator that utilises and weights different tumour characteristics (size, grade and nodal status) to produce a score which can be indicative of prognosis. This score is used widely across the UK to assess the need for adjuvant treatment. The scores can be clustered into five distinct groups; Excellent (EPG), Good (GPG), Moderate 1 (MPG1), Moderate 2 (MPG2) and Poor (PGP) Prognostic Groups.

Of the 19,832 surgically treated invasive cancers diagnosed in England which had an NPI recorded (67%

of all surgically treated invasive cases), screen-detected cancers had a much better prognostic profile (Figure 3). 59% of screen-detected breast cancers fell into the two best prognostic groups (EPG and GPG) compared with only 23% of symptomatic breast cancers. In contrast, 17% of screen-detected cancers falling into the two worst prognostic groups compared with 52% of the symptomatic cancers in this age group.

Younger patients had a relatively worse prognosis; 53% of the patients aged less than 50 were in the two worst prognostic groups (MPG2 and PGP), compared to 45% for patients aged over 70. Patients aged 50–70 had the best prognostic profile with only 28% of their breast cancers falling into the two worst prognostic groups, this is because of the high proportion of good prognosis screen-detected cases.

Table 12 shows that breast cancer patients known to be Black had a worse prognosis; 63% of the breast cancers in the Black ethnic group were in the worst two prognostic groups (MPG2 and PGP) compared to 36% of patients known to be White, 40% of patients known to be Asian and 36% of patients known to be Chinese.

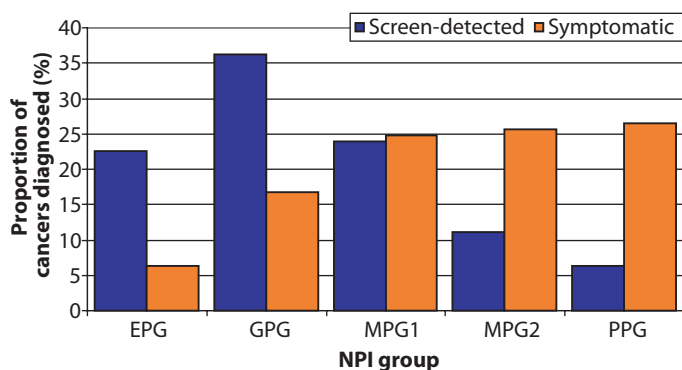


Figure 3: Proportion of cancers diagnosed in each NPI group for each presentation route in England

Results – Tumour Characteristics

Ethnic group	Nottingham Prognostic Index					Total Cases cases
	EPG	GPG	MPG1	MPG2	PGP	
White	14%	26%	25%	19%	17%	14,035
Asian	11%	24%	24%	22%	18%	287
Black	5%	13%	20%	28%	35%	189
Chinese	9%	33%	21%	27%	9%	33
Mixed	6%	19%	36%	19%	19%	47
Other	9%	27%	22%	21%	21%	109
Unknown	17%	27%	23%	17%	15%	5,132
Total cases	2,807	5,200	4,833	3,684	3,308	19,832

Table 12: Variation in Nottingham Prognostic Index with ethnic group in England

However, as demonstrated previously for all the relevant factors used to calculate an NPI (invasive tumour size and grade, and nodal status), differences between ethnic groups were affected by route of presentation and age at diagnosis.

There were no significant differences between NPI distributions for patients in different deprivation groups, although breast cancer patients in the most deprived group had a slightly higher proportion of cancers in the poor prognostic group (18%) compared with those in the most affluent group (16%).

Receptor Status

Oestrogen, progesterone and HER2 status were known for 48%, 37% and 35% respectively of surgically treated invasive breast cancers diagnosed in England in 2006. Table 13 shows that 85% of the surgically treated invasive breast cancers with known oestrogen receptor status, 69% of breast cancers with known progesterone receptor status and 16% of breast cancers with known HER2 receptor status were positive.

Younger patients were more likely to have breast cancers which were ER negative (23% compared with 15% overall). They also had a higher proportion of HER2 positive breast cancers (23% compared to 16% overall). The latter may in part explain the relatively poor prognosis seen in these patients. Patients aged 50–70 had a relatively higher proportion of ER positive breast cancers (87% compared with 77% in patients aged less

Receptor	Positive	Negative	Number of cases with known receptor status
Oestrogen Receptor (ER)	85%	15%	14,330
Progesterone Receptor (PR)	69%	31%	10,954
Human Epidermal growth factor Receptor 2 (HER2)	16%	84%	10,487

Table 13: Receptor status of surgically treated invasive cancers diagnosed in England

Results – Tumour Characteristics

Ethnic group	ER positive		PR positive		HER2 positive	
	No.	%	No.	%	No.	%
White	8,681	84%	5,334	68%	1,289	17%
Asian	187	80%	146	71%	41	21%
Black	84	71%	58	57%	21	22%
Chinese	19	86%	14	70%	4	27%
Mixed	26	90%	20	74%	8	33%
Other	65	84%	40	75%	9	16%
Unknown	3,065	87%	1,994	73%	345	13%
Total cases	12,127		7,606		1,717	

Table 14: Variation in receptor status with ethnic group in England

than 50 and 81% in those aged over 70), and a higher proportion of PR positive breast cancers (72% compared with 65% in patients aged less than 50 and 63% in those aged over 70). ER and PR positivity were higher for screen-detected breast cancers than for symptomatic breast cancers (90% compared with 76% and 76% compared with 60% respectively). In contrast, HER2 positivity was higher in symptomatic cancers (20% compared to 14%) and this may again be a factor contributing to the relatively poorer prognosis of patients with symptomatic breast cancer.

Table 14 shows that patients in the Black ethnic group were less likely to have ER positive and/or PR positive breast cancers, and were more likely to have HER2 positive breast cancers than those known to be White. These differences mean that patients in the Black ethnic group have the worst prognosis cancers and that they will be less likely to respond to hormone therapy and more likely to require Herceptin.

Patients in the most deprived group were less likely to have ER positive breast cancers (82% compared with 85% overall). Their cancers were also less likely to be PR positive and more likely to be HER2 positive than those diagnosed in the most affluent patients (67% compared with 72% and 17% compared to 15% respectively). These differences may again explain the poorer prognosis for patients in the most deprived group.

Triple negative breast cancers (ER, PR and HER2 negative) are known to have a particularly poor prognosis²⁰. Breast cancer patients aged less than 50 and older than 70 were more likely to have triple negative tumours (20% and 15% respectively compared with 10% in patients aged 50–70). This difference appears to be related to route of presentation since the proportion of triple negative tumours in symptomatic patients aged 50–70 was 21%. The proportions of triple negative tumours were also higher in the most deprived group and in patients known to be Black (15% and 23% respectively compared with 12% overall); the latter being consistent with other studies in America²¹.

Results – Surgical Treatment

Key Findings

- In the UK in 2006, 64% of non-surgically treated breast cancers were diagnosed in patients aged over 70. 20% of patients aged 70–74, 30% of patients aged 75–79 and 62% of patients aged 80 and over did not have surgery. 97% of patients with screen-detected breast cancer had a surgical operation compared with 73% of patients with a symptomatic breast cancer. Only 5% of the patients aged 70–74 who had a screen-detected breast cancer did not have surgery compared with 25% of patients with symptomatic breast cancer.
- In England, a higher proportion of patients from the most affluent group underwent surgery compared with patients from the most deprived group. Patients known to be Black or Asian were more likely to have a surgical operation than White patients. This may be related to the relatively poor prognosis of the cancers diagnosed in younger patients, but may also reflect the relatively older age of the patients known to be White.
- 19% of breast cancer patients had at least one repeat operation. Patients aged less than 50 were more likely to have repeat operations compared to those aged 50–70 or over 70. A higher proportion of patients with non-invasive cancers had repeat operations. Patients in the Black or Chinese ethnic groups were more likely to have repeat operations. This is probably due to the younger age of these patients and the relatively high proportion of non-invasive cancers in patients known to be Chinese.
- Overall, in England in 2006, 43% of surgically treated patients with an invasive breast cancer and 35% with a non-invasive breast cancer underwent a mastectomy. 27% of surgically treated patients with a screen-detected breast cancer and 52% with a symptomatic breast cancer had a mastectomy. After adjusting for route of presentation, older patients and patients from the most deprived group were more likely to undergo a mastectomy. In general, ethnic group did not affect the final operation type after adjusting for deprivation.
- 27% of invasive and 28% of non-invasive breast cancers known to have had axillary node assessment had a SLNB. 21% of symptomatic and 34% of screen-detected breast cancers with nodal assessment had a SLNB recorded. Patients were more likely to undergo a SLNB if they had an invasive cancer, had breast conserving surgery, or were in the most affluent group.
- 10% of the breast cancer patients treated with mastectomy in England in 2006 had an immediate reconstruction. 8% of patients with invasive breast cancer and 23% with non-invasive breast cancer had a mastectomy with immediate reconstruction. Younger patients were more likely to have immediate reconstruction, as were those with screen-detected cancers, and more affluent patients. Patients known to be Black were twice as likely to have immediate reconstruction as those known to be White. This is probably due to the younger age of these patients.

Surgical Treatment

39,466 breast cancers diagnosed in the UK in 2006 were recorded as having been treated surgically. Of the 9,986 breast cancers without a surgical operation recorded, 95% were diagnosed non-operatively as invasive cancers. Figure 4 shows that the proportion of breast cancer patients who had surgical treatment varied markedly with age. 64% of the non-surgically treated cancers were diagnosed in patients aged over 70, and

20% of patients aged 70–74, 30% of patients aged 75–79 and 62% of patients aged 80 and over did not have surgery.

The relatively high proportion of patients in these older age groups who did not have surgery may reflect the presence of co-morbidity, an assessment of which has not been included in this report. However, only 5% of

Results – Surgical Treatment

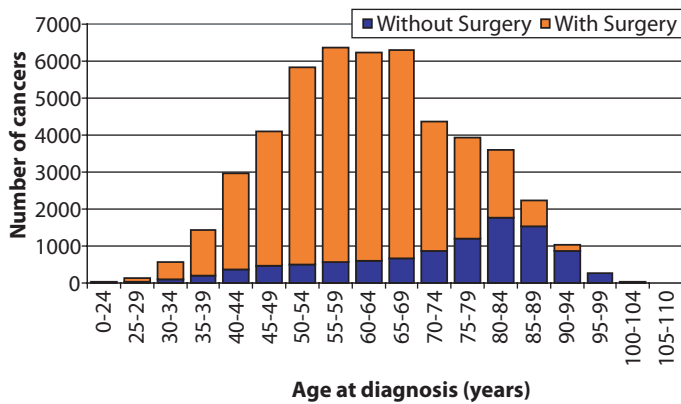


Figure 4: Variation with age group in the number of breast cancers treated with surgery in the UK

the patients aged 70–74 who had a screen-detected breast cancer did not have surgery compared with 25% of patients with symptomatic breast cancer in this age group. This may indicate that older women who attend for screening are relatively healthier or it could suggest that presentation route influences the likelihood of surgical intervention. Overall, in the UK, 97% of patients with screen-detected breast cancer had a surgical

Number of Operations

In England, 73% of the 33,717 surgically treated breast cancers were known to have had one operation and 19% to have had repeat operations (two or more operations). Of those patients known to have had surgery, patients aged less than 50 were more likely to have repeat operations (28%) compared with those aged 50–70 (21%) and those aged over 70 (13%).

Invasive status was also a contributing factor to the number of operations. A smaller proportion of patients with non-invasive cancers did not have surgery (8% compared with 20% of invasive cancers) and a higher proportion with non-invasive cancers known to have had surgery had repeat operations (29% compared with 20% of invasive cancers). These results are consistent with data from the NHSBSP audit of screen-detected breast cancers which indicate that the inability to get a non-operative diagnosis (which is more common for

operation compared with 73% of patients with a symptomatic breast cancer.

In England for which deprivation and ethnicity data were available 33,717 breast cancers diagnosed in 2006 were recorded as having been treated surgically. 7,765 cases (19% of all breast cancers) had no surgery recorded. Surgical treatment was related to deprivation status; with a higher proportion of patients from the most affluent group undergoing surgery (84%) compared with patients from the most deprived group (78%).

Although patients known to be Black or Asian were more likely to have a surgical operation (93% and 92% respectively) than White patients (88%) and all except 4 patients known to be Chinese had surgery (95%), these differences were not statistically significant. For the patients known to be Black or Asian, the differences noted may reflect the fact that a greater proportion of the cases were diagnosed at a younger age. It might also be because breast cancers in patients in the Black ethnic group have a worse prognosis compared to other ethnic groups (see Tumour Characteristics section).

non-invasive cancers), or an inaccurate diagnosis (e.g. a non-invasive core biopsy which is found to be invasive after surgery) result in patients having more than one operation²².

The proportion of patients having only one operation was similar for patients with screen-detected and symptomatic breast cancers (80% and 79% respectively).

Table 15 shows that in England, patients known to be in the Black and Chinese ethnic groups who were known to have had surgery were more likely to undergo repeat operations compared to those known to be White (31% and 29% compared with 22%). This is most probably due to the younger age of these patients. Patients known to be Asian had a similar number of operations to the White patients.

Results – Surgical Treatment

Ethnic group	1 operation	2 operations	3 or more operations	Total cases
White	78%	19%	3%	23,033
Asian	80%	18%	2%	545
Black	69%	27%	4%	376
Chinese	71%	24%	5%	70
Mixed	68%	31%	1%	88
Other	77%	22%	1%	185
Unknown	84%	15%	1%	6,848
Total	79%	19%	2%	31,145

Table 15: Variation with ethnicity in the number of operations for surgically treated cases (England only)

In general, breast cancer patients who were more affluent were more likely to have repeat operations than the most deprived patients (22% compared with 19%). For patients with invasive breast cancer, this was true regardless of route of presentation. However, whilst patients aged 50–70 with screen-detected non-invasive breast cancer in the most affluent group were more likely to have repeat operations (26% compared with

Final Therapeutic Operation

27% of surgically treated screen-detected breast cancers and 52% of symptomatic breast cancers diagnosed in England had a mastectomy. The lower mastectomy rate for screen-detected cancers is due to these cancers tending to be smaller and therefore more suited to being treated effectively using a breast conserving technique.

Final operation type also varied with invasive status. 43% of patients with an invasive breast cancer and 35% of patients with a non-invasive breast cancer underwent a mastectomy. Whilst patients with non-invasive breast cancer were less likely to undergo a mastectomy, 10% of all mastectomies undertaken in England in 2006 were for non-invasive disease. Although this reflects the presence of widespread disease which precludes a conservative approach, it must be difficult for clinicians to counsel patients with a non-invasive disease to

21%), for symptomatic non-invasive breast cancers, patients in the most deprived group were more likely to have repeat operations (39% compared with 35%). These data also demonstrate the relatively high repeat operation rate in the small number of patients (466) diagnosed with symptomatic non-invasive breast cancer, 38% compared with 26% for screen-detected cancers.

consider a mastectomy, when patients with invasive breast cancer are being treated using less radical breast conserving surgery. The relatively high mastectomy rate in these patients may also be related to the higher use of immediate reconstruction in this group.

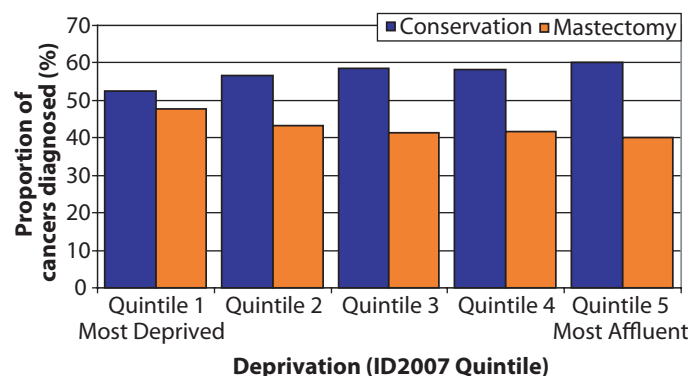


Figure 5: Variation in final therapeutic operation with deprivation (England only)

Results – Surgical Treatment

The optimal management of screen-detected non-invasive breast cancers is currently being investigated by a national audit; the Sloane Project²³.

After adjusting for route of presentation, older patients and patients from the most deprived group were more likely to undergo a mastectomy. Figure 5 shows a 20% difference between the proportion of the most affluent patients who underwent breast conserving surgery rather than mastectomy. In the most deprived patients this difference was only 5%. The higher mastectomy rates in older and more deprived patients may be

Sentinel Lymph Node Biopsy

Sentinel lymph node biopsy (SLNB) is a new procedure which is being introduced to reduce the morbidity associated with axillary clearance (e.g. lymphoedema). The sentinel lymph node is the first lymph node in the axilla to which cancer is likely to spread from the breast. Therefore, if an assessment of the sentinel lymph node shows that it is tumour free, it is unlikely that the cancer has spread any further.

Of the 23,390 breast cancers in England known to have had axillary nodal assessment, 18% of mastectomy cases had a SLNB compared to 33% of cases treated with breast conserving surgery. Invasive status and tumour prognosis (NPI), alongside operation type affected the use of SLNB. 27% of invasive cancers known to have had axillary nodal assessment had a SLNB compared to 28%

Immediate Reconstruction

10% of the 14,267 breast cancers treated with mastectomy in England in 2006 had an immediate reconstruction. 8% of patients with invasive breast cancer had a mastectomy with immediate reconstruction and 23% of patients with non-invasive cancer. This difference is possibly due to patients with invasive breast cancers needing adjuvant radiotherapy where this is considered to be a contraindication to immediate reconstruction. Some cases not having an immediate reconstruction may have gone on to have a delayed

explained, in part, by the presence of pre-existing medical conditions which might make a single operation approach preferable.

In general, ethnic group did not affect the final operation type after adjusting for deprivation, but patients known to be Chinese did have a slightly higher overall mastectomy rate (49% compared with 44% in those patients known to be White, 45% in those known to be Asian and 46% in those known to be Black). These patients also had relatively higher levels of non-invasive disease.

of non-invasive cancers. Patients with good prognosis cancers were more likely to undergo SLNB because this technique is most appropriate for patients who are likely to be lymph node negative, as in the case for 78% of screen-detected cancers. Thus, 34% of patients with screen-detected breast cancer who had nodal assessment had a SLNB recorded compared to 21% of symptomatic patients. When adjusted for operation type and cancer prognosis, the use of SLNB was lower in patients aged over 80.

After adjusting for operation type, invasive status and tumour prognosis (NPI), there was no difference in the use of SLNB across ethnic groups. However, patients in the most affluent quintile were more likely to undergo SLNB.

reconstruction; data on such interventions are not included in this report.

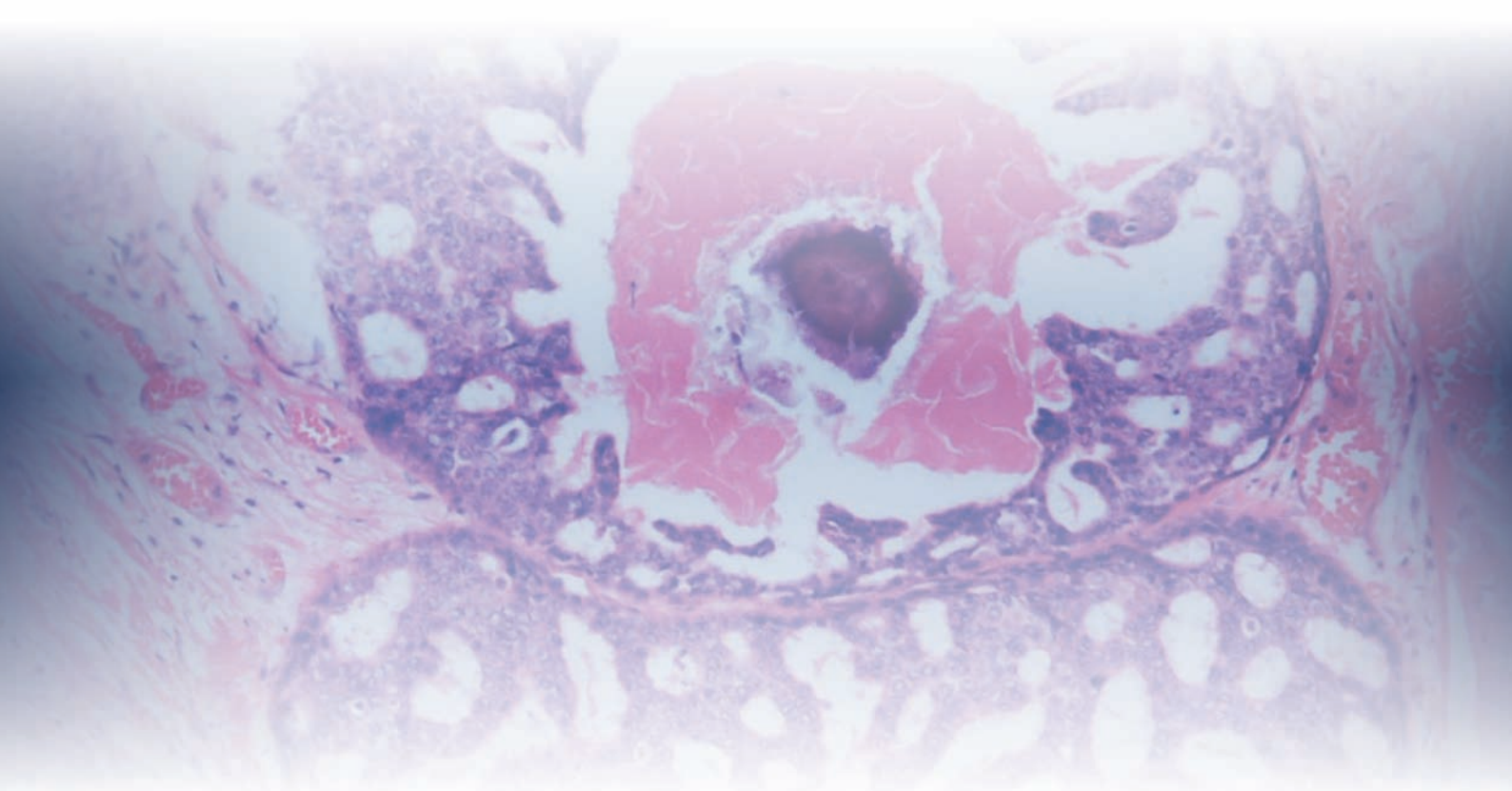
Patients who presented with a screen-detected breast cancer were more likely to have an immediate reconstruction, after adjustment for invasive status (13% compared with 9% of patients with symptomatic breast cancer). This could be because screen-detected cancers have a better prognosis in general and therefore are less likely to require extensive adjuvant therapy. Younger patients were also more likely to have immediate

Results – Surgical Treatment

reconstruction; 19% of patients aged less than 50 had immediate reconstruction compared to only 1% of patients over 70. More affluent patients were also more likely to have immediate reconstruction; 12% of patients in the most affluent group had an immediate reconstruction compared with 7% in the most deprived group. Patients known to be Black were twice as likely to receive immediate reconstruction as patients in the

White ethnic group (22% compared with 10%). This may be a reflection of the relatively young age of many of these patients. Only 6% of patients known to be Asian had an immediate reconstruction recorded.

The use of immediate reconstruction is being studied in detail in the National Breast Mastectomy and Reconstruction Audit²⁴.



Results – Adjuvant Treatment

Key Findings

- As the completeness of adjuvant therapy data was variable across English regions and Celtic countries, analyses were based on data only from those registries with the most complete data. Also, whilst it is difficult to capture data to confirm that some adjuvant treatments have taken place, it is even harder to be sure that the treatment has definitively not been given. Therefore, comparisons focus on differences in the proportions of patients in various cohorts who did have a particular type of treatment recorded.
- In the six UK regions believed to have complete radiotherapy data, 66% of the 16,133 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received radiotherapy treatment, and in the eight UK regions which appeared to have good chemotherapy data collection, 41% of the 26,198 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received chemotherapy treatment.
- In England, patients who had a mastectomy were less likely to have radiotherapy and more likely to have chemotherapy recorded than those treated with breast conserving surgery (45% compared to 82% for radiotherapy and 48% compared to 34% for chemotherapy). The former is consistent with clinical guidelines recommending the use of radiotherapy for patients treated with breast conserving surgery, and the latter is consistent with the use of breast conserving surgery for cancers with better prognosis.
- Patients aged over 70 were less likely to have radiotherapy or chemotherapy recorded than those in younger age groups (53% compared to 69–70% for radiotherapy, and 16% compared to 38% in those aged 50–70 and 72% in those aged less than 50 for chemotherapy). For chemotherapy this difference in part reflects the greater proportion of Grade 3, node positive cancers in the younger patients.
- 23% of patients with screen-detected breast cancer had chemotherapy recorded compared with 49% of those presenting symptomatically.
- 31% of male patients were recorded as having received chemotherapy compared to 41% of female patients. This may be due to differences in the tumour characteristics. Male patients were also less likely to have radiotherapy treatment recorded. The latter may reflect the higher use of mastectomy in this group.
- Tumour prognosis (NPI) significantly affected the level of radiotherapy and chemotherapy recorded; with patients who had a Poor Prognostic Group cancer being six times more likely to have radiotherapy and 89 times more likely to have chemotherapy recorded than those who had an Excellent Prognostic Group cancer.
- Patients with a known Black or Other ethnicity were more likely to have radiotherapy recorded (71% and 81% respectively compared with 65% overall) and significantly more patients known to be Black had chemotherapy recorded (65% compared with 40% overall).
- Whilst there was little variation in radiotherapy treatment between deprivation groups, 44% of patients in the most deprived group had chemotherapy recorded compared with 38% of those in the most affluent group. These differences were due to the poorer prognostic characteristics of the breast cancers diagnosed in the most deprived patients.

In order to ensure that a breast cancer has been fully treated, patients may be offered one or more adjuvant therapies which may include chemotherapy, radiotherapy and/or hormone therapy. The need for,

and effectiveness of, the different types of adjuvant treatment for the management of individual cases is dependent on the tumour's characteristics.

Results – Adjuvant Treatment

Radiotherapy is a localised treatment and therefore may not be required if the surgeon has completely removed the tumour and a significant margin of normal tissue, or if the patient has had a mastectomy. Radiotherapy is, however, frequently given to patients who have breast conserving surgery for a non-invasive or invasive breast cancer in order to ensure that any small foci of disease which may occur some distance from the main tumour site are treated.

Data Completeness

Radiotherapy is always given in an oncology centre. Data confirming that radiotherapy treatment has been given should therefore be relatively easy to collect on a routine basis. With the introduction of the new National Radiotherapy Dataset in England as from 1 April 2009, this process should become even more straightforward.

As chemotherapy and biological therapies such as Herceptin are generally given in an outpatient setting, it is more difficult to capture these data. The use of HES dataset to record the use of high cost drugs and the development of a National Chemotherapy Dataset should mean that collection of these data will become easier in future. Hormone therapy is frequently given within a primary care setting and data for this treatment are therefore the most challenging to collect. Various initiatives are being developed to allow the interrogation

Radiotherapy Treatment

The Sloane Project, a UK prospective audit of the management of non-invasive disease, has shown that the use of radiotherapy in the treatment of non-invasive cancers varies widely between breast units with on average 57% of cases treated with breast conserving surgery being referred for radiotherapy²⁵. Because of this wide variation in clinical practice, the following analyses have been restricted to invasive breast cancers. Also, as neither the site nor the clinical intent of the radiotherapy treatment is known, the analyses have been restricted to surgically treated, invasive breast cancers.

Chemotherapy is a form of systemic treatment and therefore is not indicated in the treatment of non-invasive cancer which is a localised disease. Patients who are HER2 positive should also be offered the biological therapy Herceptin after they have received chemotherapy. Hormone therapy such as Tamoxifen or an Aromatase Inhibitor is only effective in tumours in which the cells are positive for oestrogen and/or progesterone receptors.

of general practice databases. In the meantime, information from surgeons who validate their BCCOM data is proving to be the most reliable mechanism for obtaining these data.

The collection of adjuvant therapy data is variable across cancer registries and data for some English regions and Celtic countries are very incomplete. Therefore, in some analyses within this section of the report, treatment data were included only from those registries with the most complete data. Also, whilst it is difficult to capture data to confirm that some adjuvant treatments have taken place, it is even harder to be sure that the treatment has definitively not been given. Therefore, comparisons focus on differences in the proportions of patients in various cohorts who did have a particular type of treatment recorded.

Comparisons of the radiotherapy data collected for screen-detected breast cancers included in the NHSBSP adjuvant audit with the radiotherapy data collected by cancer registries for the same cases indicated that only four of the English regions and two of the Celtic countries had complete radiotherapy data for breast cancers diagnosed in 2006. In these six UK regions, 66% of the 16,133 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received radiotherapy treatment. In England, where deprivation and ethnicity data and data on operation type were available, in the four regions with good radiotherapy

Results – Adjuvant Treatment

Cohort	With radiotherapy recorded	Total cases
All invasive breast cancers	66%	16,133
Female	66%	16,030
Male	45%	103
Screen-detected	69%	5,207
Symptomatic	64%	10,926
Aged <50	70%	3,642
Aged 50–70	69%	9,080
Aged >70	53%	3,408
Breast conserving surgery (England only)	82%	6,944
Mastectomy (England only)	45%	5,573

Table 16: Variation with gender, route of presentation and age in the radiotherapy treatment recorded by the six UK regions with the most complete radiotherapy data

data, 65% of the 12,517 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received radiotherapy.

Table 16 shows how the proportion patients with surgically treated invasive breast cancer with radiotherapy recorded varied with gender, presentation route and age in the four English regions and two Celtic countries with good radiotherapy data. Data showing the variation in radiotherapy treatment recorded with type of surgery are shown only for the four English regions. The data indicate that less than half of the male breast cancers had radiotherapy recorded. This may be because the majority of male breast cancers are treated with mastectomy (66%) and is consistent with the finding that in England mastectomy cases had lower levels of radiotherapy recorded compared to cases treated with breast conserving surgery (45% compared to 82%).

Marginally more younger patients (aged less than 50 years) had radiotherapy recorded compared with patients aged 50–70 (70% compared to 69%). Patients aged over 70 years were less likely to have radiotherapy recorded (53%). This may be related to the preferential use of mastectomy in this cohort and to the presence of co-morbidity of the older patients. Tumour prognosis (NPI) also significantly affected the level of radiotherapy recorded; with patients who had a Poor Prognostic Group (PPG) cancer being six times more likely to have radiotherapy recorded than those who had an Excellent Prognostic Group (EPG) cancer.

Table 17 shows how the proportion of patients with surgically treated invasive cancer with radiotherapy recorded varied with ethnicity and deprivation status in the four English regions with good radiotherapy data. Ethnicity and deprivation data were not available for the

Cohort	With radiotherapy recorded	Total cases
Ethnic group		
White	67%	8,990
Asian	69%	174
Black	71%	83
Chinese	58%	24
Mixed	58%	24
Other	81%	27
Unknown	62%	3,195
Deprivation group		
Most deprived	67%	1,639
Quintile 2	64%	2,133
Quintile 3	66%	2,563
Quintile 4	65%	2,957
Most affluent	66%	3,222

Table 17: Variation with ethnic group and deprivation quintile in the radiotherapy treatment recorded by the four regions in England with the most complete radiotherapy data

Results – Adjuvant Treatment

Celtic countries. The data indicate that patients with a known Black or Other ethnicity were more likely to have radiotherapy recorded than the other groups (71% and 81% respectively compared with 65% overall). However, the small numbers used in these analyses mean that

Chemotherapy Treatment

An evaluation of the data completeness for chemotherapy showed that two English regions and one Celtic country had low levels of chemotherapy data recorded. This is probably due to incomplete data collection rather than being an indication of differences in clinical practice. Thus, data for six English regions and two Celtic countries only are included in this section.

In the eight UK regions which appeared to have good chemotherapy data collection, 41% of the 26,198 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received chemotherapy. In England, where deprivation and ethnicity data were

the data should be interpreted with caution. There was little variation in radiotherapy treatment between the deprivation groups; with equivalent proportions of patients in the most deprived and the most affluent quintiles having radiotherapy recorded.

available, in the six regions with good chemotherapy data, 40% of the 22,582 surgically treated invasive breast cancers diagnosed in 2006 were recorded as having received chemotherapy.

Table 18 shows how the proportion of patients with surgically treated invasive breast cancer with chemotherapy recorded varied with gender, presentation route and age in the six English regions and two Celtic countries with good chemotherapy data. Data showing the variation in chemotherapy treatment recorded with type of surgery are shown only for the six English regions. Only 31% of male patients were recorded as having received chemotherapy compared to 41% of female patients. This may be due to differences in tumour characteristics which influence the need for chemotherapy.

As expected, a smaller proportion of patients with screen-detected breast cancer had chemotherapy recorded compared to patients presenting symptomatically (23% compared to 49%). Age also appeared to be a factor; with significantly more patients aged less than 50 having chemotherapy recorded compared with patients aged over 70 (72% compared to 16%). This difference may be attributable, in part, to the greater proportion of Grade 3 (England; 48% compared to 35%) and node positive (England: 53% compared to 44%) cancers found in the younger patients relative to those aged 70 and over at diagnosis. However, patient choice and/or the presence of co-morbidities in the older patients may also have affected chemotherapy provision.

Tumour prognosis in terms of NPI score also had a significant influence on recorded chemotherapy prescribing patterns. Patients with a Poor Prognostic

Cohort	With chemotherapy recorded	Total cases
All invasive breast cancers	41%	26,198
Female	41%	26,032
Male	31%	166
Screen-detected	23%	8,563
Symptomatic	49%	17,635
Aged <50	72%	5,729
Aged 50–70	38%	14,857
Aged >70	16%	5,608
Breast conserving surgery (England only)	34%	12,995
Mastectomy (England only)	48%	9,587

Table 18: Variation with gender, route of presentation and age in the chemotherapy treatment recorded by the eight UK regions with the most complete chemotherapy data

Results – Adjuvant Treatment

Group (PPG) cancer were 89 times more likely to have chemotherapy recorded than those with an Excellent Prognostic Group (EPG) cancer. For the cases within the English regions, it was possible to ascertain the chemotherapy recorded for patients receiving different types of surgical treatment. 48% of the patients treated with mastectomy had chemotherapy recorded compared with 34% of patients treated with breast conserving surgery. This is consistent with the preferential use of breast conserving surgery for good prognosis cancers.

Table 19 shows how the proportion of patients with surgically treated invasive breast cancer with chemotherapy recorded varied with ethnic group and deprivation status in the six English regions with good chemotherapy data. Significantly more patients known to be Black had chemotherapy recorded (65% compared with 40% overall). In terms of variation between deprivation quintiles, 44% of patients in the most deprived group had chemotherapy recorded compared with 38% of those in the most affluent group. Further analysis revealed that these patterns were due to the poorer prognostic characteristics of the breast cancers diagnosed in these groups of patients, and ethnicity and deprivation did not appear to be independent factors determining the prescribing of chemotherapy.

Hormone Therapy

Comparisons of the hormone therapy data collected for screen-detected breast cancers included in the NHSBSP adjuvant audit with the hormone therapy data collected by cancer registries for the same cases indicated that only two of the English cancer registries and two of

Cohort	With chemotherapy recorded	Total cases
Ethnic group		
White	41%	15,763
Asian	48%	439
Black	65%	327
Chinese	45%	33
Mixed	53%	76
Other	44%	149
Unknown	35%	5,795
Deprivation group		
Most deprived	44%	3,204
Quintile 2	40%	4,201
Quintile 3	40%	4,779
Quintile 4	39%	5,112
Most affluent	38%	5,283

Table 19: Variation with ethnic group and deprivation group in the chemotherapy treatment recorded by the six regions in England with the most complete chemotherapy data

the registries in the Celtic countries had good quality hormone therapy data for breast cancers diagnosed in 2006. Hormone therapy was therefore not included in this report.

Results – Relative Survival

Key Findings

- 1-year relative survival was significantly higher for breast cancer patients diagnosed in 2006 compared with those diagnosed in 2001/02 (95.8% and 94.6% respectively). 5-year relative survival for breast cancer patients diagnosed in 2001/02 was 82.0%. There was no difference in overall relative survival in males and females.
- 1-year relative survival was significantly better for breast cancer patients diagnosed in 2006 who were surgically treated (99.7% compared to 77.0%). 1-year relative survival for patients aged over 70 who had a surgery was 99.6%, whilst that for older patients who did not have surgery was 76.2%.
- 1-year and 5-year relative survival for patients with screen-detected breast cancer were significantly higher than for symptomatic patients; with 1-year relative survival for women with screen-detected breast cancer being no different to that of the general population.
- 1-year and 5-year relative survival was strongly dependent on deprivation; with patients in the most affluent quintile diagnosed in 2001/02 having significantly higher 1-year and 5-year relative survival than those in the most deprived quintile (96.1% compared to 91.8% at 1 year and 85.6% compared to 73.3% at 5 years).
- These inequalities were reduced by screening. Thus, for patients diagnosed in 2001/02, screening had a marked effect on 5-year relative survival; with the 12.2% difference between the most deprived and most affluent quintiles seen for symptomatic cancers being reduced to only 6.6% for screen-detected cancers.
- For patients with screen-detected breast cancer, 1-year relative survival in all ethnic groups was generally no different to that of the general population. There were ethnic differences in 1-year relative survival for symptomatic patients diagnosed in 2006, with 1-year relative survival for those known to be Black and those known to be Asian being 92.0% and 96.1% respectively. These differences were, however, not apparent in the 5-year survival data, where the benefits of screen-detection were evident for all ethnic groups.

Relative survival analysis was performed on breast cancer patients who were diagnosed in England between 1 April 2001 and 31 March 2002 (1-year and 5-year survival) and between 1 January 2006 and 31 December 2006 (1-year survival). 37,511 patients diagnosed with breast cancer in 2001/02 and 41,409 patients diagnosed with breast cancer in 2006 in England were included in the survival analyses. Relative survival can be interpreted as the ratio between the

survival in the patient group examined and that in the general population. Thus, if the 1-year relative survival of a cancer patient group is 90%, it means that the patients are 10% more likely to die within one year compared with the general population. If the relative survival rate is 100%, it means the survival of the patient group is the same as that of the general population. The proportion of patients dying of breast cancer was not determined in the present analyses.

1-year and 5-year Relative Survival

Within one year from their breast cancer diagnosis, 10% and 7% of patients in the 2001/02 and 2006 cohorts respectively had died. 26% of the 2001/02 cohort had died within five years of their initial breast cancer diagnosis.

For all breast cancer patients, 1-year relative survival was significantly higher for those diagnosed in 2006

compared with those diagnosed in 2001/02 (95.8% and 94.6% respectively (Table 20). This may reflect improvements in treatment protocols and in the organisation of cancer services, and the expansion of the NHS Breast Screening Programme following publication of the NHS Cancer Plan in September 2000. 5-year relative survival for breast cancer patients

Results – Relative Survival

Cohort	1-year relative survival (%)	1-year relative survival (%)	5-year relative survival (%)
	2006	2001/02	2001/02
All breast cancers	95.8	94.6	82.0
Female	95.8	94.6	82.0
Male	94.6	90.9	81.2
Non-invasive	100.4	100.3	100.2
Invasive	95.3	94.0	80.3
Surgically treated	99.7	-	-
No surgery recorded	77.0	-	-
Invasive breast cancers			
Aged <50	98.4	97.7	84.2
Aged 50–70	97.7	96.8	86.0
Aged >70	88.7	87.2	67.6

Table 20: 1-year and 5-year relative survival for cohorts of breast cancer patients diagnosed in 2006 and 2001/02 (England only)

diagnosed in 2001/02 was 82.0%. There was no significant difference in 1-year or 5-year relative survival for males and females diagnosed with breast cancer. One-year relative survival for males improved from 90.9% in 2001 to 94.6% in 2006, but the improvement is not statistically significant.

Relative survival rates for patients with non-invasive breast cancers (at 1 and 5 years) were no worse than those of the general population. 1-year relative survival was significantly better for breast cancer patients diagnosed in 2006 who were surgically treated (99.7% compared with 77.0% for cases with no surgery recorded).

Table 20 and Figure 6 show that, for patients diagnosed with invasive breast cancer, younger patients had significantly better 1-year relative survival than older patients. 1-year relative survival for patients aged over 70 who had a surgery was 99.6%, whilst that for older patients who did not have surgery was 76.2%. This implies that the steep drop in survival of older patients apparent in Figure 6 is mainly because they did not

receive equivalent types of interventions compared to younger patients. As discussed in the adjuvant treatment section of this report, older patients were less likely to undergo surgical treatment and/or receive to receive radiotherapy or chemotherapy. There is thus increasing concern that relatively fit older patients may not be being offered optimal treatment because clinical decisions are being taken on the grounds of chronological rather than biological age.

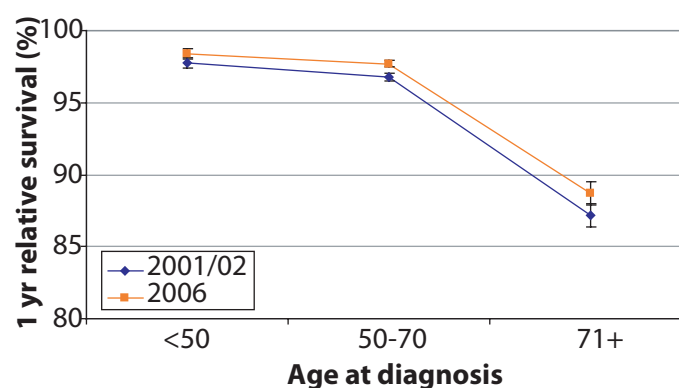


Figure 6: Variation with age at diagnosis in 1-year relative survival for patients with invasive cancer diagnosed in 2001/02 and 2006

Results – Relative Survival

Presentation Route

Between 2001/02 and 2006, the NHS Breast Screening Programme in England expanded its invitation age range from 50–64 to 50–70 years. This resulted in a 10% shift of breast cancers from the symptomatic to the screening cohort. Thus, in 2001/02, 20% of all the screen-detected breast cancers were in the 65–70 age group and in 2006 this had risen to 58%.

Relative survival varied greatly between patient cohorts with screen-detected and symptomatic invasive breast cancers. For breast cancer patients diagnosed in England in 2006, 9% of the symptomatic patients died within 1 year of diagnosis, compared to less than 1% of patients with screen-detected cancers. Table 21 shows that

1-year and 5-year relative survival for patients with screen-detected breast cancer were significantly higher than those for symptomatic patients. 1-year relative survival for women with screen-detected breast cancers diagnosed in 2001/02 and 2006 was no different to that of the general population.

In previous sections of this report, screen-detected invasive breast cancers were shown to have characteristics that are associated with a better prognosis and were more likely to be surgically treated. Such positive factors are borne out in the superior 1-year and 5-year relative survival seen for patients with screen-detected breast cancer.

Cohort	1-year relative survival (%)	1-year relative survival (%)	5-year relative survival (%)
	2006	2001/02	2001/02
All breast cancers	95.8	94.6	82.0
Screen-detected	100.2	100.1	97.4
Symptomatic	93.7	93.0	77.6
Aged 50–70 all invasive breast cancers	97.7	96.8	86.0
Aged 50–70 invasive screen-detected	100.1	100.0	96.2
Aged 50–70 invasive symptomatic	95.2	94.9	80.3

Table 21: 1-year and 5-year relative survival rates; breast cancer patients diagnosed in 2006 and 2001/02 (England only)

Nottingham Prognostic Index (NPI)

Variations in relative survival with NPI group are informative as they take into account the most significant proven factors affecting prognosis. In these analyses caution should be exercised as the NPI score was not known for 48% of the symptomatic surgically treated breast cancers but for only 4% of screen-detected breast cancers. Figure 7 shows that for patients with surgically treated symptomatic or screen-detected invasive breast cancers, the numbers of deaths in the Excellent Prognostic Group (EPG) and Good Prognostic Group (GPG) within one year of diagnosis were minimal, and that their 1-year relative survival was no different

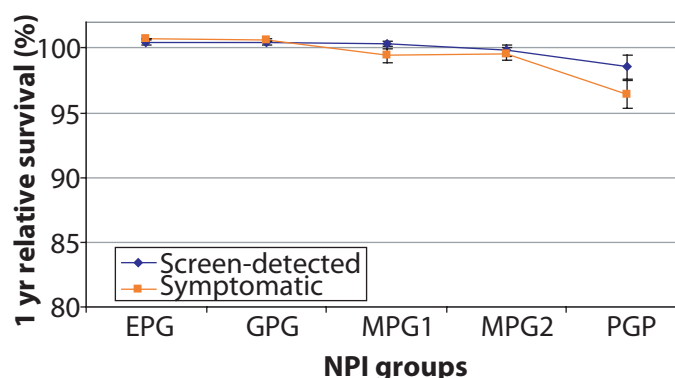


Figure 7: Variation with NPI group in 1-year relative survival for patients aged 50–70 diagnosed with invasive breast cancer in 2006, symptomatically or via screening (England only)

Results – Relative Survival

to that of the general population. This was true for all patients with surgically treated invasive breast cancers, except for those with cancers in the Poor Prognostic

Group (PGP) where 1-year survival for patients with screen-detected breast cancers was 98.6% and that for symptomatic patients was 96.5%.

Ethnicity and Deprivation

Table 22 shows, for patients of all ages diagnosed with invasive breast cancer in 2001/02 and 2006, how 1-year and 5-year relative survival varied with deprivation and ethnicity. Some caution should be exercised when viewing these data because of the small numbers of patients in the minority ethnic groups. In order to minimise the effects of small numbers the Chinese, Mixed and Other ethnic groups were combined into a single Other Ethnic group.

1-year and 5-year relative survival were strongly dependent on deprivation; with patients in the most affluent quintile having significantly higher 1-year and 5-year relative survival than those in the most deprived quintile (97.1% compared to 92.1% at 1 year for patients diagnosed in 2006 and 96.1% compared to 91.8% at

1 year for patients diagnosed in 2001/02 and 85.6% compared to 73.3% at 5 years for patients diagnosed in 2001/02).

1-year relative survival increased across all the deprivation quintiles between 2001/02 and 2006; with the two most affluent quintiles showing the greatest improvements. 1-year relative survival also increased for all ethnic groups between the two time periods, except for patients known to be Black. Although not statistically significant, for patients diagnosed in 2006, 1-year relative survival was higher in patients known to be Asian and lower in those known to be Black. These results echo those in other published studies which demonstrate that patients known to be Asian have a superior survival to other ethnic groups²⁶ and that breast

Cohort	1-year relative survival (%)	1-year relative survival (%)	5-year relative survival (%)
	2006	2001/02	2001/02
All invasive breast cancers	95.3	94.0	80.3
Ethnic group			
White	95.7	95.4	80.9
Black	94.1	97.3	79.6
Asian	98.0	96.6	84.2
Other (Chinese, Mixed and other)	96.7	94.5	80.1
Unknown	94.2	91.8	79.3
Deprivation group			
Most deprived	92.1	91.8	73.3
Quintile 2	94.1	92.5	77.0
Quintile 3	95.5	93.9	79.6
Quintile 4	96.2	94.9	83.3
Most affluent	97.1	96.1	85.6

Table 22: Variation in 1-year and 5-year relative survival with ethnic group and deprivation quintile for breast cancer patients diagnosed with invasive breast cancer (England only)

Results – Relative Survival

Cohort	1-year relative survival 2006 (%)		1-year relative survival 2001/02 (%)		5-year relative survival 2001/02 (%)	
	Screen-detected	Symptomatic	Screen-detected	Symptomatic	Screen-detected	Symptomatic
All invasive breast cancers	100.1	95.2	100.0	94.9	96.2	80.3
Ethnic group						
White	100.0	95.3	100.0	95.6	95.4	79.6
Black	100.8	92.0	97.3	96.5	99.7	78.0
Asian	100.7	96.1	100.5	94.6	93.7	75.7
Other (Chinese, Mixed and other)	98.4	95.2	100.7	98.0	100.1	88.9
Unknown	100.1	93.2	100.1	93.8	97.3	81.3
Deprivation group						
Most deprived	99.5	91.6	99.5	92.4	92.8	73.2
Quintile 2	100.1	93.1	99.7	95.3	95.1	78.3
Quintile 3	100.0	95.2	99.9	94.9	94.6	80.4
Quintile 4	100.0	95.7	100.2	95.1	97.1	81.1
Most affluent	100.3	96.2	100.6	96.0	99.4	85.4

Table 23: Variation in 1-year and 5-year relative survival with ethnic group, deprivation quintile and route of presentation for breast cancer patients aged 50–70 diagnosed with invasive breast cancer (England only)

cancer patients known to be Black have the poorest survival^{27, 28}.

Table 23 shows for patients aged 50–70 diagnosed with invasive breast cancer in England in 2001/02 and 2006, how variations in 1-year and 5-year relative survival between deprivation quintiles and ethnic groups were affected by route of presentation. The variation in the relative survival of symptomatic cancer patients with ethnic group was larger than that seen in screen-detected cancer patients. However, this variation is not statistically significant at the 95% confidence intervals.

A much more marked effect of screening was seen in the deprivation analyses; with 1-year relative survival for patients with screen-detected cancers in all deprivation quintiles diagnosed in 2001/02 and 2006 being no different to that of the general population, whilst the

overall differences for patients of all ages seen between deprivation quintiles in Table 22 were just as marked in symptomatic patients aged 50–70.

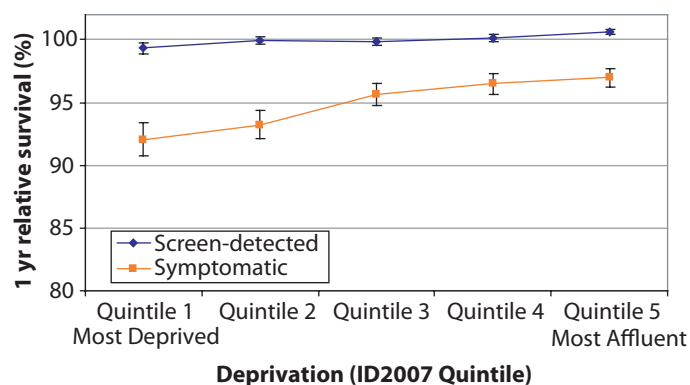
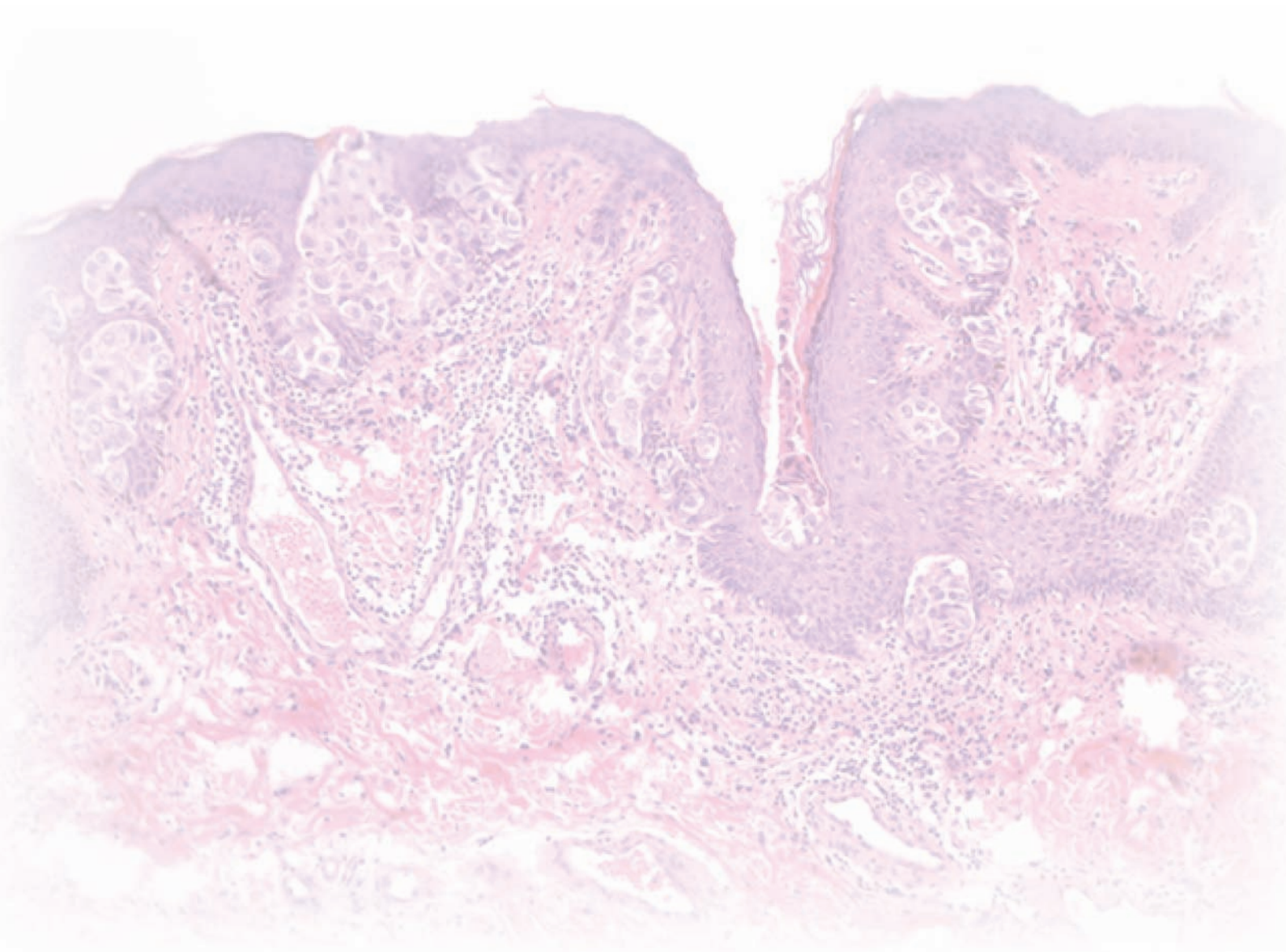


Figure 8: Variation with deprivation status in 1-year relative survival for patients aged 50–70 diagnosed with invasive breast cancer in 2006, symptomatically or via screening (England only)

Results – Relative Survival

Table 23 shows that screening also had a very marked effect on the differences in 5-year relative survival between deprivation quintiles. Thus, for patients diagnosed in 2001/02, whilst there was a significant 12.2% difference in 5-year relative survival between the most deprived and most affluent symptomatic patients, there was only a 6.6% difference in patients with screen-detected cancers.

The positive effect of screening is clearly illustrated in Figure 8 which shows that for 2006 cases, whilst there was a 4.6% difference in 1-year relative survival between symptomatic patients in the most affluent and most deprived quintiles, the differences in survival for patients with screen-detected cancers were very small.

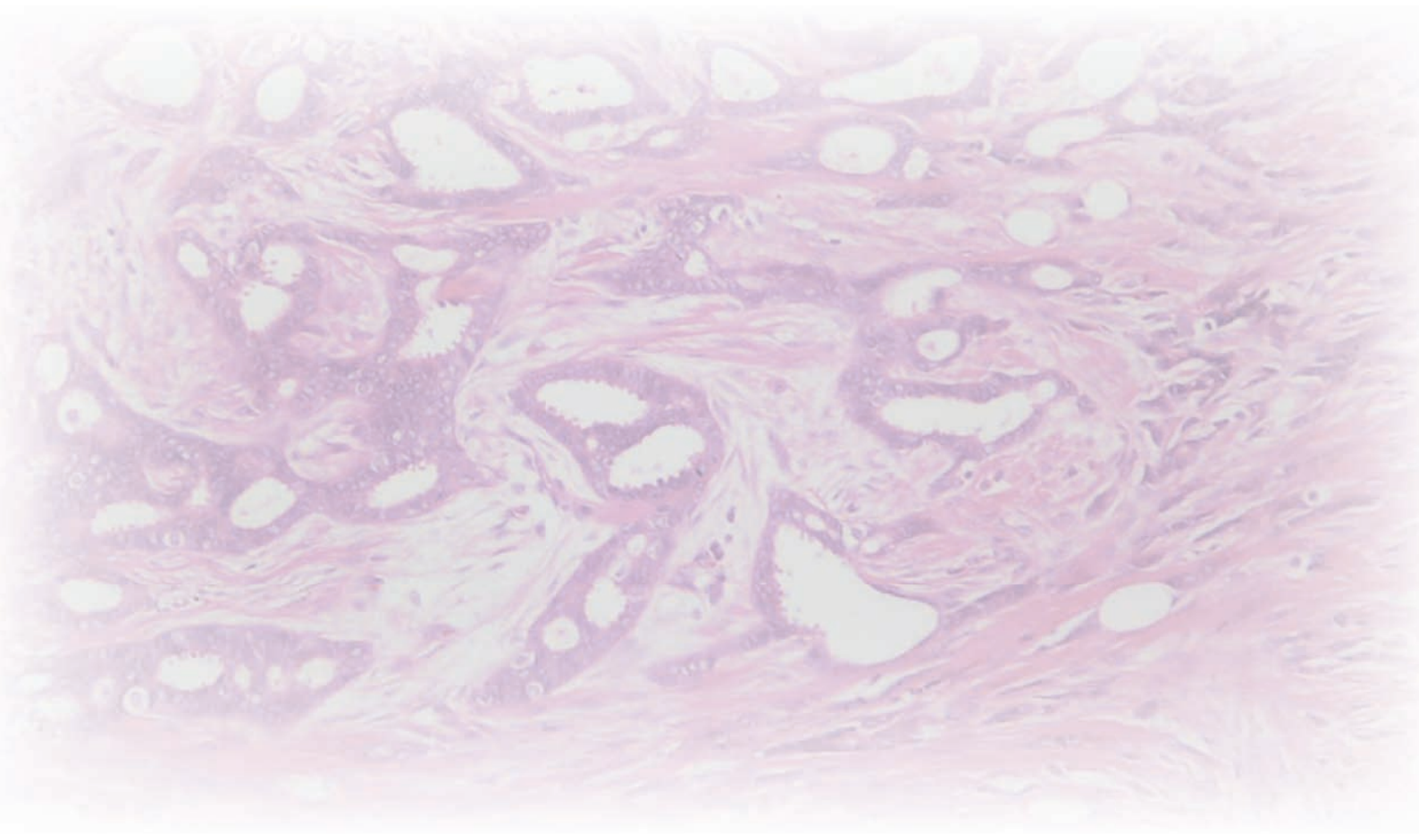


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Appendix 1 – Acronyms

Abbreviation	Full text
ABS at BASO	Association of Breast Surgery at BASO
BCCOM	Breast Cancer Clinical Outcome Measures
DCIS	Ductal Carcinoma In Situ
EPG	Excellent Prognostic Group
ER	Oestrogen Receptor
GPG	Good Prognostic Group
HER2	Human Epidermal Growth Factor 2
HES	Hospital Episode Statistics
ID2007	Index of Multiple Deprivation 2007
LSOA	Lower Super Output Area
MPG1	Moderate Prognostic Group 1
MPG2	Moderate Prognostic Group 2
NBSS	National Breast Screening System
NCIN	National Cancer Intelligence Network
NHS	National Health Service
NHSBSP	National Health Service Breast Screening Programme
NPI	Nottingham Prognostic Index
NSTS	NHS Strategic Tracing Service
ONS	Office for National Statistics
PR	Progesterone Receptor
PPG	Poor Prognostic Group
QA	Quality Assurance
SLNB	Sentinel Lymph Node Biopsy
WMCIU	West Midlands Cancer Intelligence Unit

NHS

