



Public Health
England

Protecting and improving the nation's health

The third all breast cancer report

Back to basics:

Breast cancer incidence and mortality

West Midlands Knowledge and Intelligence Team, Public Health England and the National Cancer Intelligence Network Breast Site Specific Clinical Reference Group

About Public Health England

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The intelligence networks

Public Health England operates a number of intelligence networks, which work with partners to develop world-class population health intelligence to help improve local, national and international public health systems.

National Cancer Intelligence Network

The National Cancer Intelligence Network (NCIN) is a UK-wide initiative, working to drive improvements in standards of cancer care and clinical outcomes by improving and using the information collected about cancer patients for analysis, publication and research.

National Cardiovascular Intelligence Network

The National Cardiovascular Intelligence Network (NCVIN) analyses information and data and turns it into meaningful timely health intelligence for commissioners, policy makers, clinicians and health professionals to improve services and outcomes.

National Child and Maternal Health Intelligence Network

The National Child and Maternal Health Intelligence Network provides information and intelligence to improve decision-making for high-quality, cost-effective services. Its work supports policy makers, commissioners, managers, regulators, and other health stakeholders working on children's, young people's and maternal health.

National Mental Health Intelligence Network

The National Mental Health Intelligence Network (NMHIN) is a single shared network in partnership with key stakeholder organisations. The network will seek to put information and intelligence into the hands of decision makers to improve mental health and wellbeing.

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The National End of Life Care Intelligence Network (NEoLCIN) aims to improve the collection and analysis of information related to the quality, volume and costs of care provided by the NHS, social services and the third sector to adults approaching the end of life. This intelligence will help drive improvements in the quality and productivity of services.

Foreword

In routinely published cancer incidence rates, the numerator is defined as the number of tumours registered rather than the number of people registered with a tumour. Because the majority of people have only one cancer registration for a particular cancer site, this does not normally cause any problems in interpretation.

However, if a breast cancer patient has cancers diagnosed in both breasts, each of these cancers will be included in the incidence data separately regardless of the time between diagnoses. People diagnosed with breast cancer may also have more than one morphological type of breast cancer diagnosed in the same breast on the same day or several weeks, months or years apart. Again, each of the tumours will be included separately in the incidence data.

The aim of the first section of this 'Back to Basics' report is to examine the proportion of people with multiple breast cancer registrations in one year and with multiple breast cancer registrations in more than one year, and the effect that this has on routinely published breast cancer incidence rates. It is suggested that both tumour-based and person-based statistics have their own individual informative uses and that it is essential to understand which method is being used in any given instance.

As cancer survival rates improve, people are living as cancer survivors for a long time after their diagnosis. People can survive for many years with multiple cancers of the same type or with more than one type of cancer. The second section of this 'Back to Basics' report examines the different experiences of breast cancer survivors who died in 2008 who were diagnosed with breast cancer alone or who had other invasive cancers diagnosed between 1985 and 2008. Breast cancer is the cause of death for approximately half of the patients diagnosed over that time period. Non-cancer related death is also common. A subgroup of patients diagnosed with breast cancer are also diagnosed with a different type of cancer which tends to behave more aggressively than the breast cancer.

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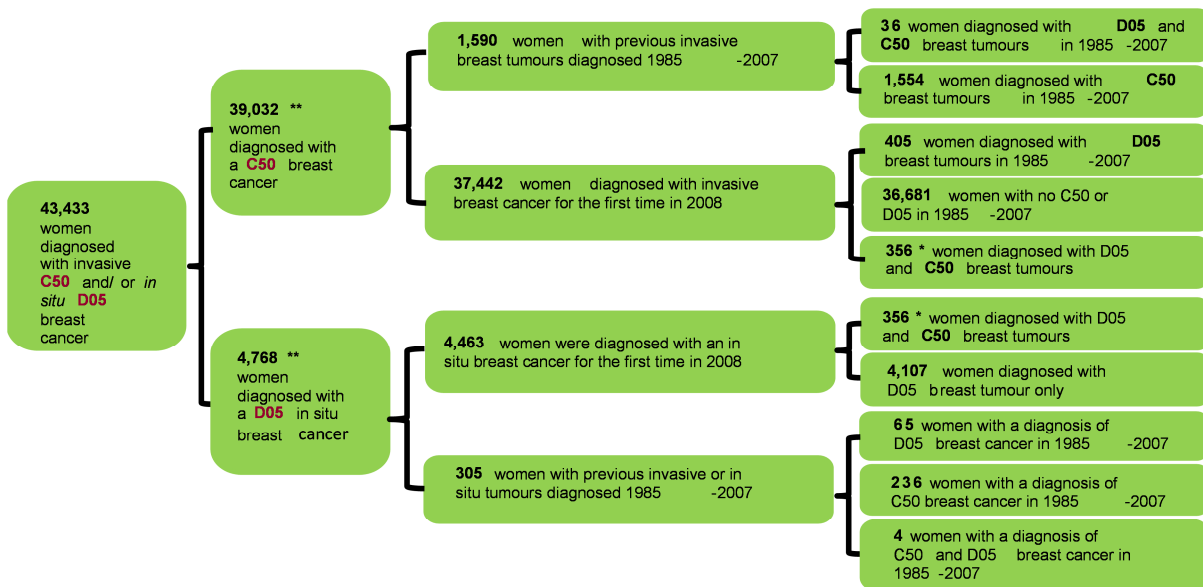
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Executive summary

How many women each year are diagnosed with breast cancer for the first time?

In 2008, **43,433** women were diagnosed with an invasive **C50** or in situ **D05** breast cancer.

Figure 1. Women diagnosed with invasive and *in situ* breast cancer in 2008



*356 women had diagnoses of both invasive C50 and *in situ* D05 breast tumours in 2008. These women are represented twice in Figure 1.

** 39,032+4,768 = 43,800. The additional 367 women are a result of double counting of the women who had diagnoses of both invasive C50 and *in situ* D05 breast tumours between 1985 and 2008

39,032 of these women (**90%**) were diagnosed with an invasive **C50** breast cancer in 2008

- **37,442 (96%)** of those diagnosed with an invasive **C50** breast cancer were diagnosed with an invasive breast cancer for the **first time** in 2008
- **356** women were diagnosed with both an invasive **C50** breast cancer and an *in situ* **D05** breast cancer for the first time in 2008 - these women are included in the 37,442 figure (above)

4,768 (11%) women were diagnosed with an *in situ* **D05** breast cancer in 2008:

- **4,463 (94%)** of those diagnosed with an *in situ* **D05** breast cancer were diagnosed with an *in situ* **D05** breast cancer for the **first time** in 2008

- when reporting incidence figures, **4,107** women were diagnosed with an *in situ* **D05** breast cancer for the first time in 2008 and this was also their first breast tumour diagnosis (**Figure 1**)

Routine breast cancer incidence statistics

Routine breast cancer statistics are normally based on **tumours** (rather than **people**).

Calculating breast cancer age standardised incidence rates (ASR) based on tumours gives higher rates compared to ASRs based on women.

Invasive C50 breast cancer

Tumours: the ASR for new invasive **C50** breast cancers diagnosed in 2008 is **124** per 100,000 women.

Women: the ASR for women diagnosed with an invasive **C50** breast cancer in 2008 is **122** per 100,000 women.

Women: the ASR for women diagnosed with their **first** invasive **C50** breast cancer in 2008 is **116** per 100,000 women.

The ASR for invasive breast cancer diagnosed in 2008 is not significantly higher than the ASR based on women diagnosed with invasive breast cancer in 2008, but is significantly higher than the ASR for women diagnosed with their first invasive breast cancer

The ASR for women diagnosed with invasive breast cancer in 2008 is significantly higher than the ASR for women diagnosed with an invasive breast cancer for the first time in 2008.

In situ D05 breast cancer

Tumours: the ASR for new *in situ* **D05** breast tumours diagnosed in 2008 is 16.8 per 100,000 women.

Women: the ASR for women diagnosed with an *in situ* **D05** breast tumour in 2008 is **15.4** per 100,000 women.

Women: the ASR for women diagnosed with their first *in situ* **D05** breast tumour in 2008 is **14.5** per 100,000 women.

The ASR for *in situ* breast cancers diagnosed in 2008 is significantly higher than the ASR for women diagnosed with *in situ* breast cancer in 2008.

The ASR for women diagnosed with *in situ* breast cancer in 2008 is significantly higher than the ASR for women diagnosed with their first *in situ* breast cancer in 2008.

In instances where women are diagnosed with multiple tumours in the same anatomical location:

- for **invasive** breast cancer, the difference in ASRs based on tumours and women diagnosed in a given year are **not** significantly different from one another
 - however, each method for calculating ASRs has its own merits for inclusion (discussed on page 13)
- for ***in situ*** breast cancer, the difference in ASRs based on tumours and women diagnosed in a given year are significantly different.

As a result, breast cancer incidence statistics should be calculated and published based on people as well as tumours.

What do women diagnosed with breast cancer die from?

19,758 women diagnosed with an invasive **C50** or *in situ* **D05** breast cancer (between 1985 and 2008) died in 2008:

- **8,817 (44.6%)** died of breast cancer
- **8,054 (40.8%)** died of other non-cancer causes
- **2,012 (10.2%)** died of other invasive cancer
- **875 (4.4%)** died of unknown causes, or the actual cause of death could not be distinguished between breast cancer and other invasive cancer

3,475 of the **19,758 (17.6%)** women with invasive **C50** breast cancers and/or *in situ* **D05** breast carcinomas diagnosed in 1985 to 2008 who died in 2008 had additional cancer registrations for other invasive cancers at different anatomical sites also diagnosed between 1985 to 2008. These women were more likely to die from their other cancer than from their breast cancer.

Therefore, care should be taken when interpreting outcomes for people with breast cancer

Background

Breast cancer is the most common cancer in the UK with an incidence rate of approximately 125 per 100,000 females¹. Routinely published cancer statistics are normally based on tumours diagnosed (rather than people) over a given time period, however, people may be diagnosed with multiple tumours arising at the same anatomical location. Reporting only the number of tumours diagnosed, without reporting the number of women newly diagnosed with a particular type of cancer, does not provide a sufficient insight into the burden of a disease on a population and, therefore, may be misleading for commissioners and decision makers.

ICD-10 cancer site codes

Tumours are classified by the 10th revision of the International Classification of Diseases (ICD-10) site code. Within the ICD-10 coding system, the prefix 'C' or 'D' locates the code within the 'neoplasm', or cancer subgroup, and the following numbers localise the tumour to a specific area of the body. For breast cancer, an ICD-10 code of 'C50' indicates 'malignant neoplasm of breast', which can also be referred to as 'invasive breast cancer'. An ICD-10 code of 'D05' indicates 'carcinoma *in situ* of breast' which can also be referred to as *in situ* breast carcinoma.

Routinely published national and international cancer incidence data^{2,3,4} normally comprise only invasive cancers (C codes in ICD-10), and incidence rates for *in situ* carcinomas are not included. For most cancer sites this does not pose a problem because the number of *in situ* carcinomas in a given population is relatively small compared to the number of invasive cancers, however, with the widespread use of imaging as a key part of the diagnostic process and as part of national screening programmes, the detection of *in situ* breast carcinoma (D05 in ICD-10) has increased markedly, and these tumours accounted for 10% of all breast cancer registrations in the UK in 2007⁴. In November 2012, Cancer Research UK (CRUK) published statistics on the incidence of *in situ* breast carcinoma in the UK⁵. for the first time.

This report aims to answer two simple questions:

1. Each year, how many women are diagnosed with breast cancer for the first time?
2. What do women diagnosed with breast cancer die from?

Although the first question seems simple it is complex to answer because of the rules that govern cancer registration in the UK. As routine cancer statistics are normally based on tumours, rather than people, the UK cancer registration rules for women with breast cancer mean that routine breast cancer incidence rates will be inflated with regards to the number of women affected when people are diagnosed with more than one breast tumour (Figure 2).

Key to Figure 2 and Figure 3







	Diagnosed with invasive C50 breast cancer		other illnesses
	Diagnosed with in situ D05 breast cancer		accidental causes
	Diagnosed with other invasive cancer		more than one tumour diagnosed

Figure 2. UK cancer registration rules for registering breast tumours

If a woman has one invasive **C50** breast cancer or one *in situ* **D05** carcinoma, she will appear once in the incidence rates for that type of breast tumour

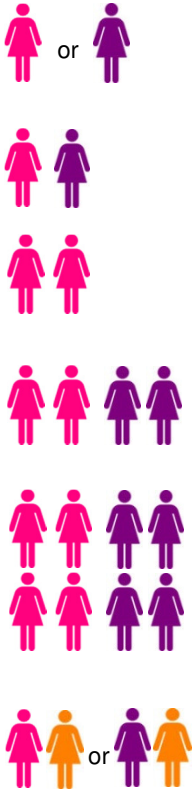
If a woman has an invasive **C50** breast cancer and an *in situ* **D05** breast carcinoma, she will appear in the incidence rates for both types of breast tumour

If a woman has an invasive **C50** breast cancer in both breasts, she will appear twice in the incidence rates for invasive breast cancer

If a woman has an invasive **C50** breast cancer and an *in situ* **D05** breast carcinoma in both breasts, she will appear twice in the incidence rates for each type of breast tumour

If a woman has two invasive **C50** breast cancers with a different morphology and two *in situ* **D05** breast carcinomas with a different morphology in both breasts, she will appear four times in the incidence rates for each type of breast tumour

If a woman is diagnosed with an invasive **C50** breast cancer or an *in situ* **D05** breast carcinoma and another invasive cancer or *in situ* carcinoma at a different anatomical site before or after her breast cancer diagnosis, she will appear in the incidence rates for both types of tumour



The answer to the second question will not be found in routine breast cancer statistics. These publications usually examine **breast cancer mortality** ie the number of women each year who are recorded on their death certificate as having died from breast cancer, or **breast cancer survival** ie the proportion of women who have survived for a given length of time after a diagnosis of breast cancer, however, because people with breast cancer have relatively good survival rates, they frequently die from causes unrelated to their breast cancer.

Figure 3. Potential causes of death for people with breast cancer



(For a detailed review of the methodology and statistics, please refer to the accompanying [Technical Supplement](#).)







Results

Q1 Each year, how many women are diagnosed with breast cancer and how many of these women are diagnosed with breast cancer for the first time?

In 2008, 43,433 women were diagnosed an invasive **C50** or *in situ* **D05** breast tumour. A total of 44,839 invasive and *in situ* tumours were diagnosed in 2008.

a) Women diagnosed with breast cancer in 2008

Table 1. Number of women and tumours diagnosed with breast tumours (invasive C50 and *in situ* D05). England (2008)

	C50 	D05 	D05 C50  	Total
Number of women with invasive breast cancers (C50)	38,665		367	39,032
Number of invasive breast cancers (C50)	39,637		380	40,017
Ratio C50: No. of cancers: No. of women 				1.025
Number of women with <i>in situ</i> breast tumours (D05)		4,401	367	4,768
Number of <i>in situ</i> breast tumours (D05)		4,449	373	4,822
Ratio D05: No. of tumours: No. of women 				1.011

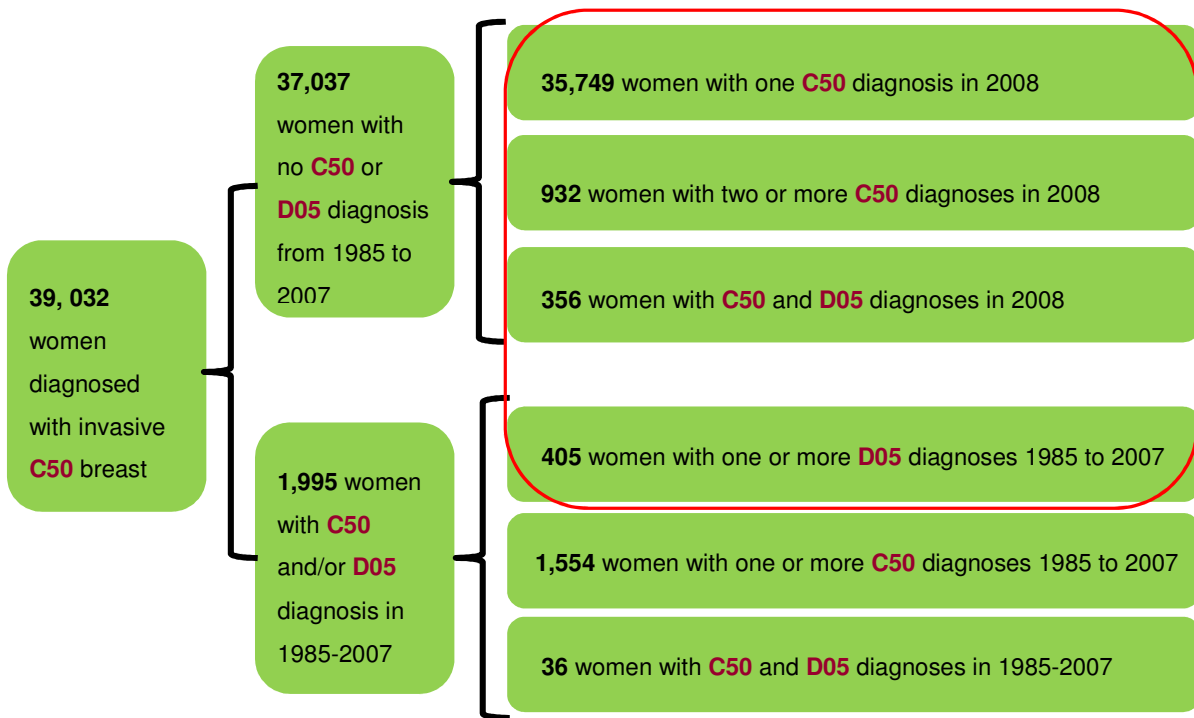
In 2008, **38,665** women were diagnosed with invasive breast cancer alone, **4,401** were diagnosed with an *in situ* breast tumour alone and **367** were diagnosed with at least one invasive **and** one *in situ* breast tumour (and the **367** women also had a diagnosis of invasive or *in-situ* breast tumour prior to 2008) [Table 1].

The number of invasive breast cancers diagnosed in 2008 (40,017) is **2.5%** higher than the number of **women** diagnosed in 2008 with an invasive breast cancer (**39,032**). The number of *in situ* breast **tumours** diagnosed in 2008 (4,822) is **1.1%** higher than number of **women** diagnosed in 2008 with an *in situ* breast tumour (**4,768**).

Because of this the age-standardised incidence rates (ASRs) based on **tumours** will be higher than the ASRs based on **women**. The magnitude of these differences is considered in **Section d**).

b) Women diagnosed with their first breast cancer in 2008

Figure 4. Number of women diagnosed with invasive C50 breast cancer and the number of women diagnosed with their first invasive C50 breast tumour. England (2008)



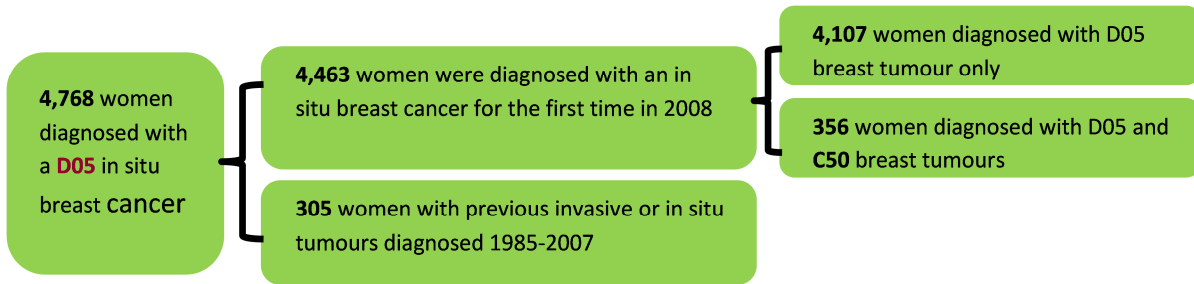
Key to Figure 4

Women diagnosed with their first invasive breast cancer

Of the 39,032 women diagnosed with an invasive breast cancer in 2008, **94.9% (37,037)** were diagnosed with their **first** breast tumour in 2008 and **95.9% (37,442, [37,037+405])** were diagnosed with their **first** invasive breast cancer [Figure 4].

If the cancer registration database is interrogated for all invasive breast cancers diagnosed between 1985 to 2008, the number of **women** with an invasive breast cancer registration in 2008 (39,032) is **4.2%** higher than the number of **women** diagnosed with an invasive breast cancer for the **first** time in 2008 (37,442). The magnitude of these differences is discussed in **Section d**).

Figure 5. Number of women diagnosed with their first breast in situ D05 tumour. England (2008)








Of the 4,768 **women** diagnosed with an *in situ* **D05** breast tumour in 2008, **93.6%** (4,463) were diagnosed with their **first** breast tumour in 2008 and **6.4%** (305) had previous *in situ* or invasive breast cancer registrations between 1985 and 2007 [Figure 5].

The number of **women** with an *in situ* breast tumour registration in 2008 (4,768) is at least **6.8%** higher than the number of **women** diagnosed with an *in situ* breast tumour for the first time in 2008 (4,463).

However, for calculating routine statistics, the 356 people with a **D05** and a **C50** breast cancer diagnosis should be omitted as these women would be included in the **C50** incidence statistics. Therefore, for calculating **D05** breast cancer incidence, the number of tumours to include would be $4463 - 356 = 4107$. The magnitude in the differences for calculating incidence based on tumours and women is discussed in **Section d**).

c) Other invasive cancers diagnosed in women diagnosed with breast tumours in 2008

Table 2: Number of women diagnosed with breast tumours (invasive C50 and *in situ* D05) and other invasive cancers. England (2008)

	C50 	D05 	D05 C50  	Other invasive cancers 	% with other invasive cancers
Number of women with invasive breast cancers alone in 2008 (C50)	38,665			1,635	4.2%
Number of women with <i>in situ</i> breast tumours alone in 2008 (D05)		4,401		150	3.4%
Number of women with <i>in situ</i> (D05) and invasive (C50) breast tumours in 2008			367	14	3.8%
Total	38,665	4,401	367	1,799	4.1%

Of the 43,433 women diagnosed with an invasive or *in situ* breast tumour in 2008, only **4.1%** (1,799) had another type of primary invasive cancer diagnosed between 1985 and 2008 [Table 2]. **20.5%** (369) of these other invasive cancers were diagnosed in 2008 (the same year as their breast cancer diagnosis. Gynaecological cancer was the most common ‘other cancer’ diagnosed between 1985 and 2008 accounting for 29% (530) of the ‘other’ cancers diagnosed [Table 3]. The reasons for this high apparent temporal association between the diagnosis of a breast cancer and the diagnosis of a cancer at a different anatomical site may include the clinical assessment and staging investigations performed at the time of a breast cancer diagnosis.

Table 3. Number of women diagnosed with breast tumours (invasive C50 and in situ D05) and other invasive cancers. England (2008)

Invasive cancer groupings	Number of women	
	No.	%
Gynaecological	530	1.2%
Bowel	408	0.9%
Haematological	212	0.5%
Skin - malignant melanoma	200	0.5%
Urological	137	0.3%
Lung	119	0.3%
Head & Neck	88	0.2%
Upper Gastro-intestinal	54	0.1%
Hepatobiliary & Pancreas	28	0.1%
Brain & Central Nervous System	26	0.1%
Other	61	0.1%
Non-breast invasive cancers (excluding nmsc) by cancer grouping	1,863	-
Women with breast cancer and non-breast invasive cancer (excluding nmsc)	1,799	4.1%
Women with breast cancer in 2008	43,433	100%

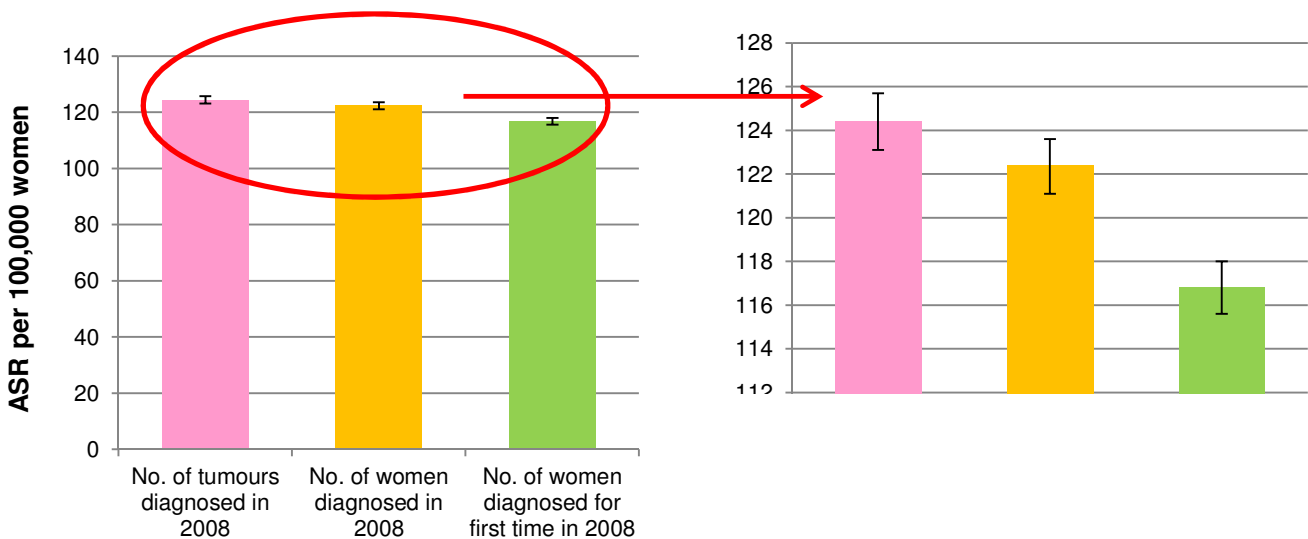
“nmsc” = non melanoma skin cancer

d) Breast cancer age standardised incidence rates

When calculating ASRs in cancer statistics, the number of tumours diagnosed in a given period are normally considered, rather than the number of people.

Invasive breast cancer

Figure 6. Age standardised incidence rates for invasive breast tumours diagnosed and ASRs for women diagnosed with invasive breast cancer. England (2008)

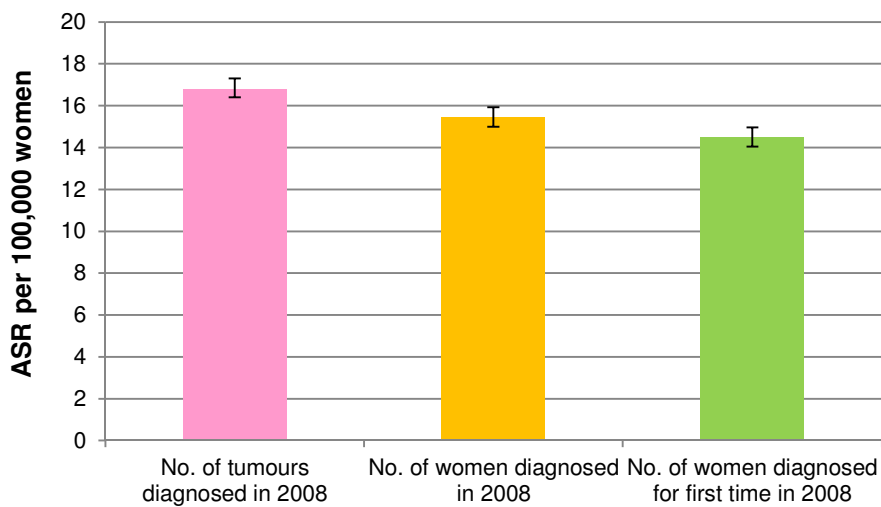


The ASR for invasive breast **tumours** diagnosed in 2008, based on 40,017 tumours diagnosed, is 124.4 per 100,000 women which is not significantly different to the ASR for women diagnosed with breast cancer in 2008 (122 per 100,000). However, if the ASR is based on **women** diagnosed with invasive breast cancer for the first time in 2008, then the ASR is 116.8 per 100,000 women which is significantly lower than the ASRs for tumours and women diagnosed with invasive breast cancer in 2008 (Figure 6). The incidence of tumours diagnosed in 2008 is not directly comparable with the incidence of women diagnosed for the first time in 2008 as they are measuring different incidence rates.

These results demonstrate that the difference in ASR based on invasive breast **tumours** diagnosed is not significantly different to the ASR for **women** diagnosed with invasive breast cancer, however, each method for calculating breast cancer incidence has its own merits (discussed on page 13) which should be taken into consideration.

In situ breast cancer

Figure 7. Age standardised incidence rates for in situ D05 breast tumours diagnosed and ASRs for women diagnosed with in situ D05 breast cancer. England (2008)



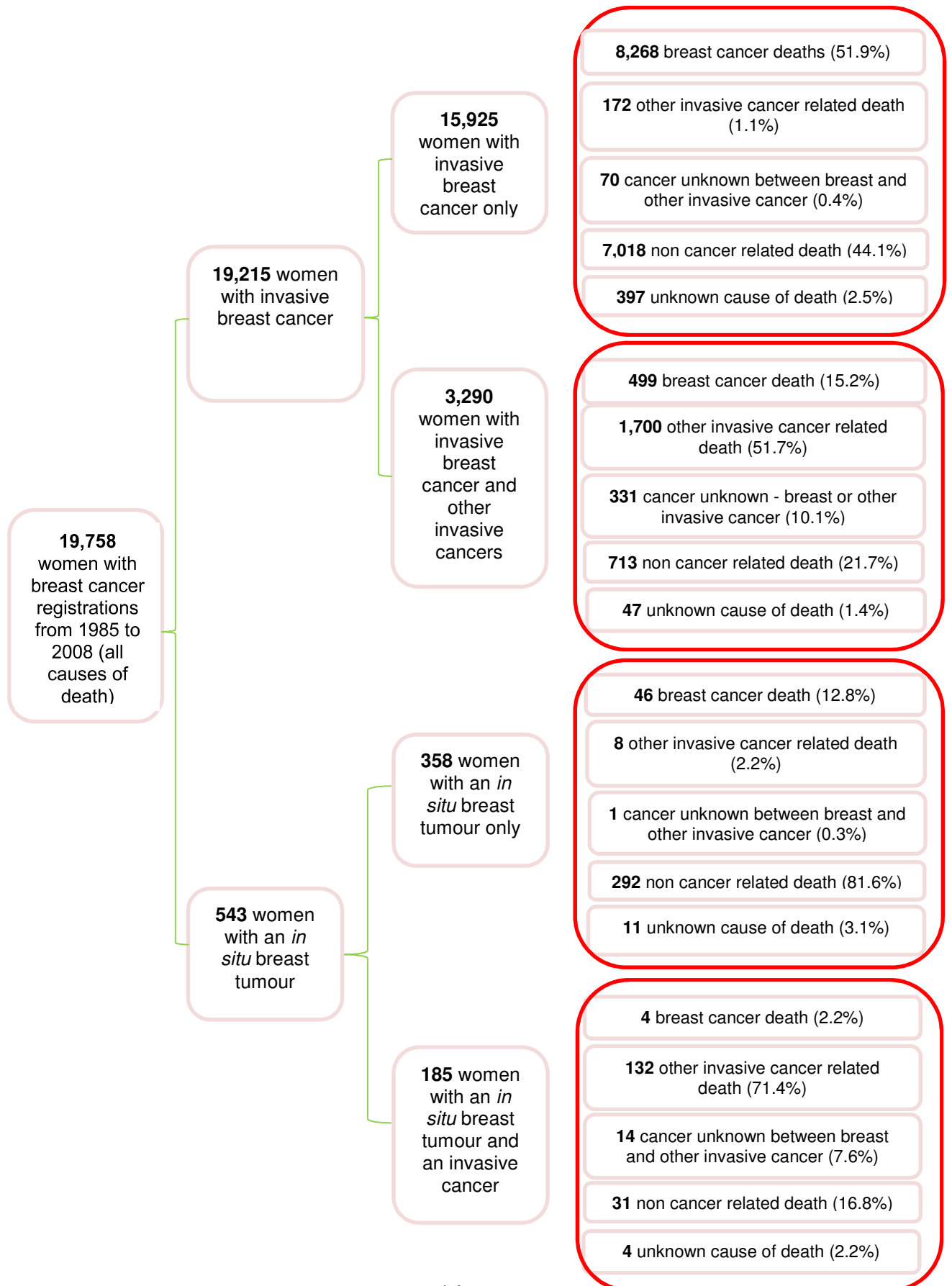
The ASR for *in situ* breast **tumours** diagnosed in 2008 is 16.8 per 100,000, which is significantly higher than the ASR for **women** diagnosed with an *in situ* breast tumour in 2008 (15.4 per 100,000). The difference between the number of women diagnosed with an *in situ* breast tumour is also significantly higher than the ASR for women diagnosed with an *in situ* breast tumour for the first time in 2008 (14.5 per 100,000).

Therefore, both methods for calculating *in situ* breast carcinoma incidence rates should be taken into consideration although this will depend on the purpose of the analyses.

Q2 what do women diagnosed with breast cancer die from?

Outcomes for people with breast cancer have improved considerably with 1, 5 and 10-year relative survival rates of 96%, 87% and 78% respectively⁵, however, for people with breast cancer who die, the cause of death could be from many different factors (see Figure 8).

Figure 8: Cause of death for patients with a breast cancer registration between 1985 and 2008 who died in 2008



19,758 women with invasive and/or *in situ* breast cancer registrations between 1985 and 2008 died in 2008. **44.6%** (8,817) of these women died of breast cancer, **40.8%** (8,054, [7,731+323]) died of other non-cancer causes, **10.2%** (2,012) died of another invasive cancer and the remaining **4.4%** had an unknown cause of death, or the cause of death could not be established between breast cancer and another invasive cancer.

Of the 15,925 women with an invasive breast cancer and no other invasive cancer who died in 2008, breast cancer was the most common cause of death accounting for 8,268 (**51.9%**) deaths, however, a further 7,018 women (**44.1%**) died from non-cancer related causes. 172 (**1.1%**) women in this cohort died from another invasive cancer although the other invasive cancer was not registered in the cancer registry office. A specific cause of death could not be ascertained for the other 467 women (**3.6%**) in this cohort.

Of the 358 women who had an *in situ* breast tumour who died in 2008, 46 (**12.8%**) died from breast cancer. The 46 patients who died of *in situ* breast cancer require further investigation. It is possible that invasive elements of the tumour were not detected on pathology.

Of the 19,758 women with invasive and/or *in situ* breast cancer registrations between 1985 to 2008 who died in 2008, **3,475** ([3,290+185], **17.6%**) had additional cancer registrations for other invasive cancers at different anatomical sites of which **1,832** (53%) died as a cause result of their other cancer diagnosis.

Of the 3,290 women with an invasive breast cancer and another invasive cancer who died in 2008, only **15.2%** (499) died from breast cancer. The most common cause of death for this group of women related to other invasive cancers (1,700, **51.7%**).

Therefore, death data for breast cancer patients should be interpreted with care, especially when women have other invasive cancer diagnoses, as the underlying cause of death may not be related to their breast cancer diagnosis.

Implications

When calculating ASRs in cancer statistics, the number of tumours diagnosed in a given period are normally considered, rather than the number of people. The ASR for new invasive **breast cancers** diagnosed in 2008 is **124** per 100,000 women, however, the ASR for **women** diagnosed with an invasive breast cancer in 2008 is **122** per 100,000 women, and the ASR for **women** diagnosed with their **first invasive** breast tumour in 2008 is **116** per 100,000 women. Therefore, the ASR for invasive breast cancers is 1.6% higher than for women diagnosed with an invasive C50 breast cancer. The ASR for women diagnosed with an invasive breast tumour is 5.2% higher than the ASR for women diagnosed with an invasive breast cancer for the first time.

The ASR for new *in situ* breast tumours diagnosed in 2008 is 16.8 per 100,000 women. The ASR for the number of women diagnosed with an *in situ* tumour in 2008 is 15.4 per 100,000 women, and 14.5 per 100,000 for women diagnosed with their first *in situ* D05 breast tumour in 2008. Therefore, the ASR for *in situ* breast tumours is 9.1% higher than the ASR for women diagnosed with an *in situ* tumour in 2008. The ASR for women diagnosed with an *in situ* breast tumour is 6.2% higher than the ASR for women diagnosed with their first *in situ* breast tumour in 2008.

Therefore, when deciding on the appropriate method for calculating breast cancer incidence rates, when a patient has multiple breast cancers, it must be established whether the number of tumours or the number of people diagnosed is of interest. Each method will have its merits and particular uses and these are discussed in the following section.

For the 19,215 women who had invasive breast cancer registrations between 1985 and 2008, the median time between invasive breast cancer diagnosis and death from any cause was 5.6 years. The median time between invasive breast cancer diagnosis and death from breast cancer was 4 years.

Of the women who died in 2008 who had a previous registration of breast cancer between 1985 and 2008, approximately half had breast cancer listed as their cause of death. 40% died of non-cancer causes and approximately 10% from other invasive cancers. For the 4% of women diagnosed with breast cancer between 1985 and 2008 who also had another invasive cancer diagnosed during that time, approximately half died from that other cancer.

Why are the results important?

In routinely published cancer incidence rates, the numerator is defined as the number of tumours registered, rather than the number of people registered with a particular tumour. Conversely, in routinely published cancer mortality rates, the number is defined as the number of people who have died. As the majority of people usually have only one cancer registration for a particular cancer site, the issue of multiple tumours does not normally cause substantial problems, however, in situations where people have more than one diagnosis of a particular type of cancer in a given year, or over a lifetime (as for breast cancer), then incidence and mortality rates will not be commensurate.

These results are also important when assessing the treatment aspects of a breast cancer patients pathway. For example, radiotherapy cannot usually be delivered to the same breast twice.

When would we want to publish incidence rates based on tumours?

It is important to calculate the incidence rates based on the number of tumours as this is the norm for calculating incidence rates and allows international comparisons of incidence rates to be made where appropriate. Tumour incidence rates can allow assessment if a given tumour type is occurring more frequently over a time period. National programmes such as the NHS breast screening programme closely monitor rates of diagnosis. Commissioners require information on all diagnosed tumours as most will require individual resource allocation for their management.

When would we want to publish incidence rates based on people?

It is important to understand the number of 'new' people diagnosed with a particular cancer so that the true burden of the disease in a particular population may be assessed. Cancer incidence rates are popularly presented as a ratio such as '1 in 10 of the population will develop a certain cancer' which requires knowledge of the number of people rather than tumours. True comparisons of outcome after treatment need to include person-based data to inform the reader, particularly if an individual is registered with a number of tumours with different prognoses.

This is an important issue especially where commissioning and decision making are concerned. Screening programmes in particular may be interested in the number of new people diagnosed in a given time period. This is important when assessing the value of screening for a population. Those tackling the underlying causes of cancer would also want to know the number of people diagnosed with breast cancer in a given timeframe. These statistics could also be used when comparing breast cancer incidence with other cancer sites where multiple diagnoses are uncommon.

It is important to acknowledge that no particular method for calculating incidence rates should be solely preferred, but that each method has its own uses and requires understanding. Therefore, the recommendation is that routine cancer incidence rates where people may have multiple tumours diagnosed in a particular year, or over their lifetime, should be clearly defined in any usage and should include both the number of people diagnosed as well as the number of tumours registered.

References

1. Cancer Research UK, *Breast Cancer Key Facts*, 2014. [Online] Available at www.cancerresearchuk.org/cancer-info/cancerstats/keyfacts/breast-cancer [Accessed 13th October 2014]
2. Cancer statistics registrations: Registrations of cancer diagnosed in 2011 in England. Office for National Statistics Series MB1 No.42 www.ons.gov.uk/ons/rel/vsob1/cancer-statistics-registrations-england-series-mb1-no-42-2011/stb-cancer-statistics-registrations-2011.html
3. Cancer Incidence in Five Continents Vol. IX. IARC Scientific Publication No. 160 Edited by M. P. Curado, B. Edwards, H. R. Shin, H. Storm, J. Ferlay, M. Heanue and P. Boyle www.iarc.fr/en/publications/pdfs-online/epi/sp160/
5. Cancer Research UK, *Breast cancer survival statistics*. [Online] Available at www.cancerresearchuk.org/cancer-info/cancerstats/types/breast/survival/breast-cancer-survival-statistics#One [Accessed 3rd November 2014]

Abbreviations

Abbreviation	Full Text
ABCR	All Breast Cancer Report
ABS	Association of Breast Surgery
BCCOM	Breast Cancer Clinical Outcome Measures
BRAC1 And BRAC2	Human genes that produce tumour suppressor proteins which repair DNA. Specific inherited mutations in these genes increase the risk of female breast and ovarian cancer
CRUK	Cancer Research UK
DCIS	Ductal Carcinoma <i>In Situ</i>
ICD-10	International Statistical Classification of Diseases and Related Health Problems 10th Revision
ICD-O-2	International Classification of Diseases for Oncology, 2nd Edition
ICD-O-3	International Classification of Diseases for Oncology, 3rd Edition
NCDR	National Cancer Data Repository
NCIN	National Cancer Intelligence Network
NHSBSP	National Health Service Breast Screening Programme
NMSC	Non-melanoma skin cancer
ONS	Office for National Statistics
UKACR	United Kingdom Association of Cancer Registries