MAPPING THE DIAGNOSTIC PATHWAY FOR BREAST CANCER IN ENGLAND AND COMPARISON TO REST OF EUROPE

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BACKGROUND

Breast cancer is the most common cancer in women in England (40,000 new cases in 2011), and the second most common cause of cancer death (more than 10,000 deaths) (1–3). Delay to diagnosis is thought to contribute to mortality (1). England has a national screening programme, but many symptomatic women are diagnosed through GP visits, and these data are scarce so the true burden on diagnostic services is unclear (4–6).

AIMS

- To map out the breast cancer diagnostic pathway in England and rest of Europe
- To estimate the number of women transitioning through each step of the pathway, and estimate the number of symptomatic women
- To explore available data for England and rest of Europe

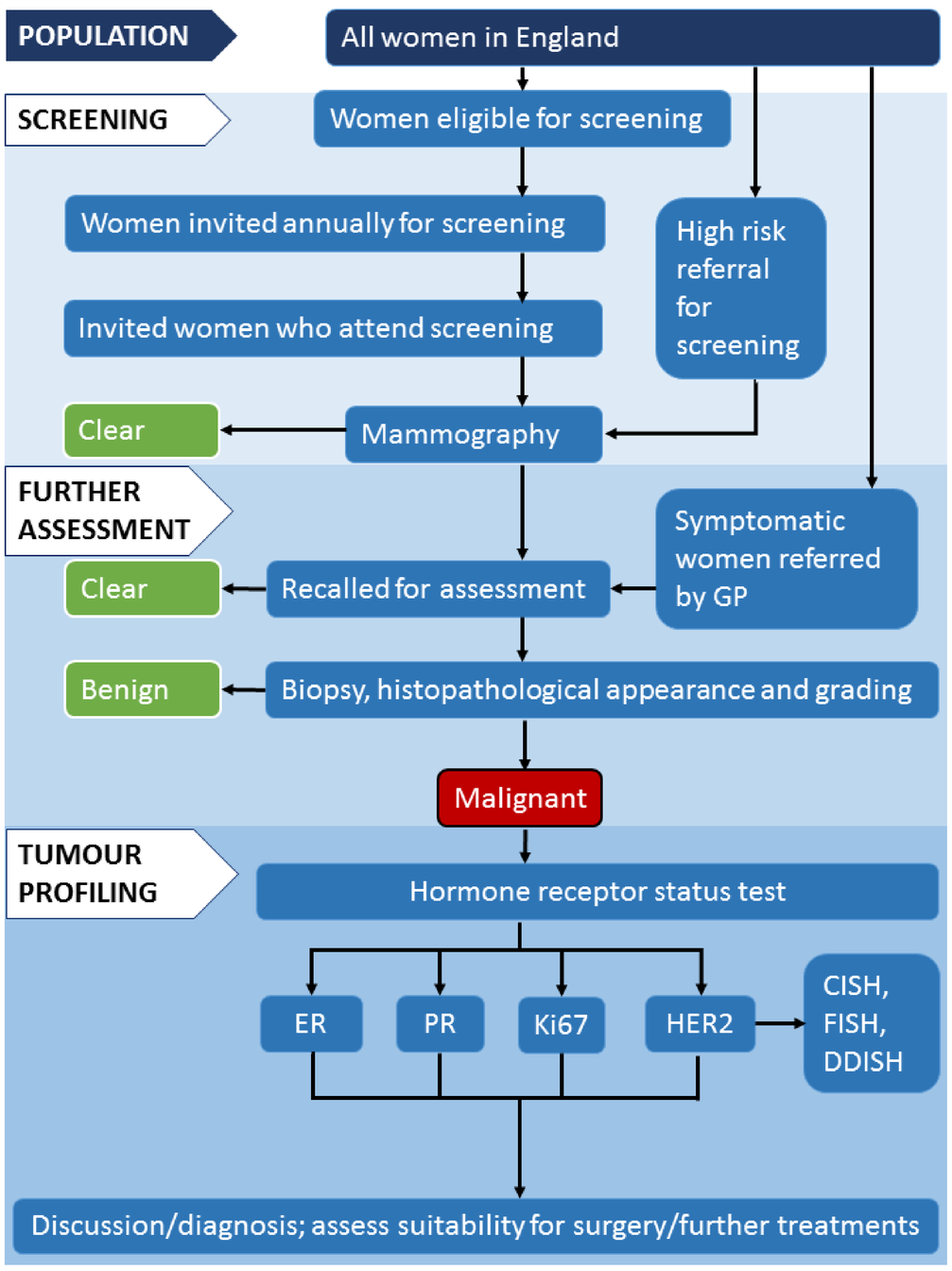
METHODS

- Searched the literature on breast cancer screening and diagnosis in England.
- Interviewed cancer experts to understand the diagnostic pathway and validate the parameters.
- Built diagnostic pathway framework in Excel allowing for input of baseline or user data (**Figure 1**).
- Extracted parameter values from published data (**Table 1**).
- An estimated 24,528 women were diagnosed due to symptoms in 2013, excluding those diagnosed though screening, similar to prior findings in the literature (5,2).
- An audit of cancer patients presenting with symptoms showed 74% were associated with lumps (7); therefore we estimated 18,151 women with symptoms presented with lumps. The remainder presented with breast pain, nipple discharge and other abnormalities.
- 10% of women presenting with lumps are diagnosed with breast cancer (8,9); hence an estimated 180,000 women present at the GP with lumps (lower bound).
- UK estimates show 9% of women presenting with symptoms have breast cancer (10,11); therefore we estimate 280,000 women were referred to breast services (upper bound).

TABLE 1: BREAST CANCER SCREENING AND DIAGNOSIS IN ENGLAND

	Value	Year	Source
Number of women in England	27,331,848	2013	(13)
Number of women aged 47-73 years eligible for screening	7,951,323	2013	(13)
Number of eligible women invited for screening annually	2,399,319	2013	(5)
Number of women who attend following invitation	2,079,271	2013	(5)
- Women attending first routine screen	378,165	2013	(5)
- Prevalent screens for women invited but never attended	51,394	2013	(5)
- Incident screens for women who were screened <5 years ago	1,433,462	2013	(5)
- Prevalent screens for women with a previous screen 5+ years ago	100,335	2013	(5)
- Self/GP referral for screening (asymptomatic)	115,915	2013	(5)
Number of women screened who are recalled for assessment	88,676	2013	(5)
Number of symptomatic women who are recalled for assessment	230,000		Estimate
Number of women screened with suspicious findings who have a biopsy	43,091		(5)
Number of symptomatic women with suspicious findings who have a biopsy	46,000		Estimate
Total number of women who have a biopsy	89,091		Estimate
Number of screened women with malignant biopsies requiring HER2+/ER tests	17,961		(5)
Number of symptomatic women with malignant biopsies needing HER2+/ER tests	24,528		Estimate
Total number of positive biopsies that require HER2+ & ER tests	42,489	2012	(14)

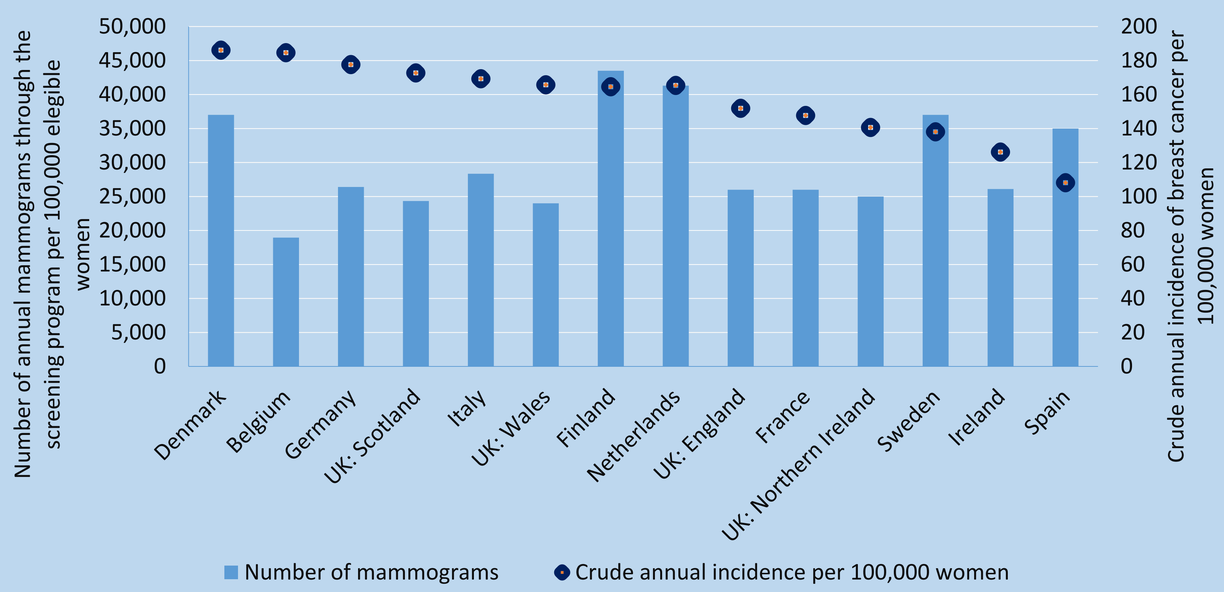
FIGURE 1: DIAGNOSTIC PATHWAY FOR BREAST CANCER DIAGNOSIS IN ENGLAND



RESULTS 1

- We estimate that 40% of all malignancies are identified through screening in England; the remainder present to their general practitioner with symptoms and are referred to breast services.
- We estimate **230,000 symptomatic women** attend breast services annually.
- This was validated using data from Pedamallu et al (12), who found that 20% of symptomatic women have a biopsy, of whom 50% have breast cancer.
- Extrapolating to the results of this small study, we assumed: **46,000 symptomatic women** undergo biopsies and **23,000** are likely to be **positive for malignancy**; this is similar to the 24,528 symptomatic cancers found in 2013 (5).
- When we validated our methods for estimating the number of symptomatic cases, we found the number of women diagnosed through screening was ~30% in France and 24% in Germany (unpublished data). The rest of the pathway steps were similar.

FIGURE 2: IMPACT OF BREAST CANCER SCREENING SERVICES



RESULTS 2

- Published data on breast cancer screening incidence shows no correlation with breast cancer incidence. Therefore, it is important to know how many women are being diagnosed through other routes (i.e. symptomatic women) in order to better understand the whole diagnostic pathway.
- The annual effective screening rate of England is over 25,000 per 100,000 eligible women. Other countries are summarised in **Figure 2**.

DISCUSSION

- Most women are diagnosed in the breast cancer pathway because they present with symptoms, but sparse data exist on these numbers across the rest of Europe.
- We propose a different metric to discuss breast cancer screening - annual effective screening rate (**Figure 2**). This allows us to compare countries' screening performance, unlike the coverage (proportion of women screened), which is linked to screening frequency.
- With advances in rapid diagnostics for breast cancer biopsies, the breast cancer diagnostic pathway will continue to evolve. Better diagnostics and staging could lead to improved outcomes, and a reduced burden to health care services.

FURTHER STEPS

- In order to understand the differences in adherence and success – or lack thereof – of screening programmes, more research is needed. How many women develop symptoms and present in general practice between screens? Why were their tumours not identified during their previous screen? Clarity is needed on whether breast screening promotes self-examination and early diagnoses between screens.
- A central repository of data would be useful for anyone considering the comparative efficacy of different breast cancer interventions across Europe. Whilst this information is available from different sources, it would be useful to compile this in one place and ensure it is updated and standardised as changes in screening implementation occurs.
- Additional research is needed to understand the logistics, costs, and benefits of incorporating new diagnostic methods into the current screening and diagnostic pathways.

The information presented here is based on the authors' independent views

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REFERENCES

1. Willett AM et al. Best practice diagnostic guidelines for patients presenting with breast symptoms, 2012.
2. Office for National Statistics. Breast Cancer: Incidence, Mortality and Survival, 2010. 2012.
3. Cancer Research UK. Breast Cancer-Key Stats. November 2014.
4. Pittathankal A et al. Care pathways for patients with breast cancer. Trends Urol Gynaecol Sex Health. 2010.
5. Health and Social Care Information Centre. Breast Screening Programme, England - 2013-14. 2015.
6. NHS Cancer Screening Programmes, Surgery A of B. An Audit of screen detected breast cancers for the year of screening April 2010 to March 2011. 2012.
7. Royal College of General Practitioners. National Audit of Cancer Diagnosis in Primary Care. 2011.
8. NHS Choices. Breast cancer (female) - Symptoms - NHS Choices. 2015. http://www.nhs.uk/Conditions/Cancer-of-the-breast-female/Pages/Symptoms.aspx
9. Cancer Research UK. Breast cancer symptoms. 2015. http://www.cancerresearchuk.org/about-cancer/type/breast-cancer/about/breast-cancer-symptoms
10. Britton P et al. One-stop diagnostic breast clinics: how often are breast cancers missed? Br J Cancer. 2009 Jun 16;100(12):1873–8.
11. Britton P et al. Measuring the accuracy of diagnostic imaging in symptomatic breast patients: team and individual performance. Br J Radiol. 2012 Apr;85(1012):415–22.
12. Pedamallu S et al. Clinical Audit of a Symptomatic Breast Clinic In North Wales District General Hospital. Internet J Surg. 2012;28(2). Available from: https://ispub.com/IJS/28/2/14000
13. Office for National Statistics. Population estimates by age and sex. Office for National Statistics. 2010.
14. Cancer Statistics Registrations, England (Series MB1), No. 43, 2012. Office for National Statistics; 2013.