

**Retrospective cohort study of breast cancer incidence, health service use and outcomes in Europe:
a study of feasibility**

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Abstract

Background: Comparisons of outcomes of health care in different systems can be used to inform health policy. The EuroHOPE (European Healthcare Outcomes, Performance and Efficiency) project investigated the feasibility of comparing routine data on selected conditions including breast cancer across participating European countries.

Methods: Routine data on incidence, treatment and mortality by age and clinical characteristics for breast cancer in women over 24 years of age were obtained (for a calendar year) from linked hospital discharge records, cancer and death registers from Finland, the Turin metropolitan area, Scotland and Sweden (all 2005), Hungary (2006) and Norway (2009). Age-adjusted breast cancer incidence and one year survival were estimated for each country/region.

Results: 24,576 invasive breast cancer cases were identified from cancer registries from over 13 million women. Age adjusted incidence ranged from 151.1 (95%CI 147.2-155.0) in Hungary to 234.7 (95%CI 227.4-242.0) / 100,000 in Scotland. One-year survival ranged from 94.1% (95%CI 93.5-94.7%) in Scotland to 97.1% (95%CI 96.2-98.1%) in Italy. Scotland had the highest proportions of poor prognostic factors in terms of tumour size, nodal status and metastases. Significant variations in data completeness for prognostic factors prevented adjustment for case mix.

Conclusion: Incidence of and survival from breast cancer showed large differences between countries. Substantial improvements in the use of internationally recognised common terminology, standardised data coding and data completeness for prognostic indicators are required before international comparisons of routine data can be used to inform health policy.

Keywords

breast cancer

electronic health records

survival

health services evaluation

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1. Introduction

Breast cancer is the most common cancer in women and a significant cause of premature mortality with approximately 50% of cancers occurring in the under 65s.¹ Previous studies have identified significant variation in breast cancer incidence, mortality and survival between industrialised countries.²⁻⁷ Comparisons between countries (and regions) can be used to inform health policy to help identify which aspects of health systems improve outcomes. Analysis of outcomes between countries requires comparable data on patient characteristics (including age distribution, screen or symptomatic detection and pathological features) and health care characteristics. EuroCHIP⁸ (European Cancer Health Indicator Project) recently reported that, of the 86 European population-based cancer registries from 32 countries, only 15% recorded all three indicators of cancer burden, care and survival (stage at diagnosis, cancer treatment delay, and compliance with cancer guidelines). Tumour size, nodal status and metastases (TNM), were only available in 39% of the registries.

The aim of the EuroHOPE (European Healthcare Outcomes, Performance and Efficiency) project was to investigate the feasibility of comparing incidence, length of stay, treatment patterns, survival and cost for five health conditions including breast cancer using routine data within and across the seven participating European countries (Finland, Hungary, Italy (Turin metropolitan area), Netherlands, Norway, Scotland and Sweden).

2. Methods

Routinely collected breast cancer data from six countries/regions were used to identify a cohort of patients with a pre-defined set of variables (see www.eurohope.info for detailed study protocol).

This included all patients with a primary diagnosis of invasive breast cancer (ICD-9 code 174 and ICD-10 C50 codes) in a single calendar year (2006 for Hungary, 2009 for Norway and 2005 for the remainder), with a follow up period of at least two years (except for Norway, where only one-year follow up data for were available), using linked data from hospital discharge, cancer and death registers. The Netherlands could not contribute as it was not feasible to link records from their

national cancer register to the national hospital discharge register. The generation of the database is described in figure A (supplementary data). All cancer registries are maintained by mandatory reporting of cancers to a central database. At the time of this analysis, only Norway did not send data electronically, although that has now changed.

Patients were excluded from the dataset if they had a history of breast cancer, were under 25 years of age at presentation, or had missing identification numbers (tourists or other non-residents). Men with breast cancer were excluded due to the very small numbers of cases. The number of days spent in hospital for any reason during the previous year was used as a proxy for comorbidity. Missing data encompassed both empty cells (data not completed for available variables, hereafter described as 'missing') and unavailable variables (data not recorded for any patient, hereafter described as 'unavailable').

Only patients who have had surgery can be expected to have a pathological TNM staging, and sites were requested to supply the clinical TNM for those without pathological TNM data. To standardise for differing completion rates and to allow for comparability, any missing tumour size values (not known or null values) were assumed to be not known and Tis (tumour too small to be measured) was assigned to T0. Missing nodal status (not known or null) was classified as not known and NX (nodes cannot be evaluated) were classified as N0. Missing metastases values (not known, null and MX (unevaluable) were assigned to metastases not known.

2.1. Episode of care and hospital resource use

The start of an episode of care for breast cancer was defined as the date of diagnosis. Treatment for breast cancer could include surgery, radiotherapy, chemotherapy and hormone therapy. The patient and tumour characteristics are described in table 1 and table A of supplementary data. The number of days in hospital related to breast cancer was calculated as the total number of days as an inpatient, day-case or outpatient, with diagnosis or primary procedure codes related to breast cancer. The first hospital episode is defined as the first hospital record with a relevant breast cancer code after diagnosis. A list of these codes is provided in the breast cancer work package protocol

(www.eurohope.info). The distribution of treatment and outcome variables for each country are described in table 2.

2.2. Statistical methods

Crude and age adjusted incidence of breast cancer and one, two and five (where available) year all-cause and breast cancer mortality were estimated for each country (tables 3 and 4). Age-adjusted incidence and mortality rates were calculated using the European Standard Population (2013) and indirect standardisation. Statistical analyses were performed using STATA v.12 (StataCorp, Texas, USA).

2.3. Role of the funding source

The study was conceived, designed and completed with no influence from the funding body.

3. Results

Table 1 describes the baseline (pre-treatment) characteristics of the patient population, comprising 24,576 cases of invasive breast cancer reported to cancer registries in a population of approximately 13 million women >24 years of age across six countries. The age-adjusted incidence of invasive breast cancer per 100,000 women aged >24 years varied from 151.1 in Hungary to 234.7 in Scotland, with the following incidence figures reported as per 100,000 women aged >24 years. Breast cancer incidence varies considerably between the three Scandinavian countries: age-adjusted incidence in Sweden was 29% higher than in Norway and 6% higher than Finland.

Table A of supplementary data illustrates marked differences between countries in completeness and availability of data on important clinical factors such as tumour size, nodal status and metastases (TNM) ($p < 0.0001$). The proportion of missing data for tumour size varied from 0% (Scotland) to 68.6% (Turin). Nodal involvement information was complete in Scotland but missing in 73.9% of records for Turin. The proportion of missing data for metastasis ranged from 19.6% (Norway 2009) to 99.4% (Turin 2005).

Numbers of days spent in hospital in the year prior to diagnosis also differed significantly across countries (figure B of supplementary data, $p < 0.0001$), with Hungary and Norway being particularly

high (52.9% and 42.9% respectively spent at least one day in hospital), as did the number of days spent in hospital during first hospital episode (figure C of supplementary data).

Tables 2 and 3 describe the treatment patterns and outcomes for breast cancer patients in each country. The proportions of patients with no record of breast cancer surgery varied from 12.5% in Norway (despite information only being available for one year post-diagnosis) to 43.7% for Hungary. At least 60% of women had a record of hormone therapy across all countries except Hungary (2.9%), with radiotherapy recorded for at least half of patients in most places except Sweden (17%).

Table 4 illustrates key age adjusted outcomes of invasive breast cancer. Age-adjusted all-cause mortality was highest in Hungary at one year, and in Scotland at five years (not all countries reported five year results). Both one and five year breast cancer mortality was highest in Scotland. The one year age-adjusted breast cancer mortality rate in Scotland was more than double that reported in Sweden and Hungary, although cause-specific mortality is only available for deaths in hospital in Hungary.

4. Discussion

This study reports findings from a comparison of national (and, for Italy, regional) routine health data from six European populations and demonstrates marked variations in breast cancer incidence and survival.

4.1. Incidence

Age-adjusted incidence of invasive breast cancer varied between countries. Detection by screening influences incidence, stage at diagnosis and outcome. Some differences can possibly be explained by the differing population age groups targeted by national breast cancer screening – up to 64 years in Hungary and up to 74 years in Sweden. Most of these programmes are well established (more than 20 years for Finland, Italy, Norway and Sweden, 19 years in Scotland and 15 years in Hungary), but the potential for overdiagnosis could be as high as 7.1%.⁹

4.2. Mortality

Crude 30 day breast cancer mortality rates varied from 0.3% in Sweden to 1.5% in Turin but are based on small numbers. However, there are marked differences in age-adjusted overall and breast cancer survival at one and five years with the worst outcomes in Scotland. Scotland reported the highest proportions of more advanced (i.e. grade 3, stage 4, T3+ tumours and metastatic) cancers, which is in accord with the latest findings from the EURO CARE-5 study.⁷ Only nodal involvement is slightly higher in Finland (due to the meticulous search for sentinel node metastases (personal communication with Finnish clinical expert)). Cause-specific mortality is only available for deaths in hospital in Hungary so breast cancer specific mortality is underestimated.

4.3. Missing data

The levels of missing or unavailable data for key prognostic factors prevented adequate adjustment for case mix. In general, treatment patterns appear to be broadly similar across countries, although incomplete data recording again limits the validity of comparisons. Co-morbidity influences breast cancer survival,¹⁰ and prevalence of co-morbidities identified from hospital data is very low in this population. Only some of the participating countries (Sweden, Finland and Norway) had access to prescription data that could be used as another proxy for comorbidity. Therefore, for consistency, we used “days in hospital over the past year” as an indicator of co-morbidity. Hungary’s remarkably high values may be related to greater remuneration for in-patient compared to out-patient care.¹¹ Alternatively, increased use of day surgery in other countries is likely to have reduced length of hospital stay.¹² The cancer survival differences reported here are analogous to those reported in the EURO CARE study.¹³ The authors suggested these differences were probably due to differences in “Cancer-service infrastructure, prevention and screening programmes, access to diagnostic and treatment facilities, tumour-site-specific protocols, multidisciplinary management, application of evidence-based clinical guidelines, and recruitment to clinical trials”. However, they noted that despite their best attempts to provide systematic, quality-controlled and robustly comparable estimates of population-based relative survival there was substantial missing information on key prognostic factors, as we have also found.

Key information for important prognostic factors such as tumour grade, nodal status and stage were often missing from routine data, although they may exist elsewhere (e.g. cancer audits or quality registers) in some countries. These data were requested, but could not be provided due to either linkage problems (e.g. no common patient identifier), or issues of 'ownership' of the datasets. Until these problems can be addressed, the data remain unavailable. Of the six countries in this study, only three could provide any data on tumour grade, with up to 36.4% missing. Similarly, between 31.7% (Norway) and 94.4% (Turin, Italy) of breast cancer stage data were missing and this problem could not be addressed using an algorithm.¹⁴ Nodal status was of particular interest, as the distribution appears to vary by population.^{15,16}

A recent EuroCARE report¹⁷ stated that it is crucial that completeness of data on stage should be improved in national registries. Other recognised predictors of survival, such as oestrogen receptor (ER), progesterone receptor (PgR) and human epidermal growth factor receptor 2 (HER2) status were unavailable from routine data in most countries, during the years of study. ER status is a significant factor in determining whether hormone therapy will be effective.¹⁸ Episodes of recurrence and metastases were also difficult to identify in most registries. The absence of these key data mean it is not possible to make valid inferences about potential national differences in effects of process on outcome.

EuroHOPE data appear to suggest limited use of some treatments (for example, sentinel node biopsy) in some or all countries/regions although this may reflect incomplete recording. Similarly, the low proportion of surgery (56.3%) and post-operative hormone therapy (2.9%) in Hungary is believed to reflect incomplete recording, not actual practice. Personal communications with the breast cancer clinical expert in Hungary suggest between 80 and 90% of patients receive some form of surgery rather than 56% as recorded. Incomplete recording of radiotherapy appears to have occurred in Sweden, where radiotherapy was recorded for only approximately 17% of breast cancer patients. Similarly, the recording of chemotherapy treatment in Finland is incomplete because

chemotherapy is delivered in the outpatient setting and not recorded in the databases utilised here (personal communication from the Finnish clinical expert).

4.4. Policy Implications

Despite extensive efforts we were unable to access and/or link data from some key relevant health databases, including prescription records (Scotland for which data are only available for more recent years), and national breast cancer data (Netherlands), within the four years of the study. Linkage of different databases was feasible in most countries but the quality, completeness and availability of the variables requested varied greatly (table B of supplementary data).

There was little evidence of a “core” common dataset of essential parameters required for such comparisons. The routine collection of a standard dataset, including prognostic indicators such as ER and PgR, as well as pathology data, such as nodal status and tumour size, would greatly improve the ability to compare treatments and outcomes across a range of countries. The EUROCHIP-3 study found that comparable information on costs and cost-effectiveness of treatment for breast cancer was not available across the EU.⁸

Valid comparisons of national, routinely collected, individual-level breast cancer process and outcome data across countries will be difficult to achieve until there is concerted action and investment to improve data quality and completeness. Advocacy for, and requirement of, the universal use of standardised terminology, such as ICD-10 codes, and standard codes for clinical/surgical procedures is urgently required. Scottish data indicates that socio-economic deprivation has a significant impact on breast cancer incidence and mortality, with deprivation being associated with lower incidence but higher mortality rates.¹⁹ Thus, adoption of a set of deprivation or social class indices that are inter-operable or at least interpretable across countries would also be helpful.²⁰

4.5. Limitations

A major limitation to our study was the low levels of data completeness for many important variables (table A of supplementary data) necessary to interpret between country differences in

breast cancer incidence and prognosis. Furthermore, we have reported absolute survival and were unable to report relative survival which would allow us to take into consideration differences in all-cause mortality rates.²¹ There are also known limitations of cause-specific mortality data in terms of accuracy and variability.^{22,23} Behavioural factors associated with development of breast cancer, such as obesity, smoking, diet etc., also adversely affect survival, and are known to vary across countries but are not widely available from routine data.²⁴

We were unable to access any data earlier than 2009 in Norway because hospital information could not be linked to data from other registries before then. Thus, caution is required when comparing the Norwegian results with other countries' data for 2005/6 (selected to allow calculation of five year mortality) since it is possible that improvements to treatment and detection may have influenced overall and breast cancer mortality over this period. Verdecchia, for example, reported an improvement in five year breast cancer survival from 74% to 83% over the period 1988 to 1999.² These countries were chosen to be approximately representative of Europe as a whole, both geographically and in health systems in which data linkage is feasible, but it is not appropriate to extrapolate the findings to other countries. However, our data show a similar pattern of incidence and mortality to that seen in the recent review of European screening programmes.²⁵

5. Conclusions

EuroHOPE aimed to compare breast cancer survival and mortality rates between participating countries/regions across Europe using data linkage. Large differences were found in incidence of and survival from breast cancer between countries but it is not clear to what extent these could be explained by differences in tumour grade, tumour size, nodal status, metastasis and comorbidity. Although the current situation is improving, the historic data remain poor and thus render it difficult to make any assessment of changes over time.

Substantial improvements in the use of internationally recognised and universally applied common terminology, in harmonisation of data collection and in data completeness on prognostic indicators

and pathological results are evidently warranted. In our opinion the benefit to public health and breast cancer patients clearly outweighs the potential disadvantages of data collection, linkage and analysis.

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Conflict of interest statement

The authors declare no conflicts of interest.

Authors' contribution

LJ Williams wrote the first draft and edited subsequent drafts to incorporate comments from the co-authors, and analysed the data output. E Fletcher extracted the data in Scotland, co-wrote the STATA code for each country to analyse their own data and co-authored the paper. A Douglas co-authored the paper. EDC Anderson, A McCallum, CR Simpson and J Smith commented on drafts of the paper from the early stages. TA Moger, M Peltola, P Mihalicza, S Sveréus and N Zengarini commented on the paper, particularly aspects that affected their country. H Campbell and SH Wild were the co-PIs and commented on all drafts of the paper. All authors commented on the implications of the study.

Key points

- We examined the availability of routine hospital data on breast cancer specific treatments and outcomes and discovered significant variations in data completeness for prognostic factors.
- 24,576 invasive breast cancer cases were identified from cancer registries from over 13 million women.
- Age adjusted incidence ranged from 151.1 (95%CI 147.2-155.0) in Hungary to 234.7 (95%CI 227.4-242.0) / 100,000 in Scotland.
- One-year survival ranged from 94.1% (95%CI 93.5-94.7%) in Scotland to 97.1% (95%CI 96.2-98.1%) in Italy.
- Better collection of important factors would allow comparisons between countries to be adjusted for case-mix, thus uncovering true differences between practices that affect outcomes.

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Table 1 Population size, patient and tumour characteristics by participating country/region for women >24 years of age diagnosed with breast cancer in a single calendar year (2005 unless otherwise stated) N/K indicates not known/ not available

| Characteristics | Value | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|--|-------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|---------------------------------|
| Number of women in research data with invasive BC (ICD10 C50)/ <i>in population</i> > 24 <i>years of age</i> | | 3,943/1,909,239 | 5,914/3,896,609 | 778/386,661 | 2,816/1,677,7 79 | 3,963/1,885,239 | 7,164/ 3,251,850 |
| Age adjusted incidence of BC per 100,000 women (95% confidence intervals) | | 203.9 (197.5, 210.3) | 151.1 (147.2, 155.0) | 193.5 (179.9, 207.1) | 176.0 (169.5, 182.5) | 234.7 (227.4, 242.0) | 217.2 (212.8, 222.2) |
| Screening programme age range (years), screening frequency | | 50-69, every 2 years | 45-64, every 2 years | 50-69, every 2 years | 50-69, every 2 years | 50-69, every 3 years | 40-74, every 18-24 months |
| Age (median, IQR) | | 60 (52-71) | 62 (53-72) | 63 (53-75) | 61 (52-72) | 63 (52-74) | 62 (53-73) |
| Length of stay in hospital in previous year (mean, sd) | | 0.4 (3.3) | 6.2 (12.2) | 0.1 (0.8) | 2.9 (9.2) | 1.8 (10.6) | 0.2 (1.4) |
| Tumour grade (%) | 1 | 12.5 | N/K | N/K | 26.4 | 12.1 | N/K |
| | 2 | 31.9 | N/K | N/K | 44.3 | 38.6 | N/K |

| Characteristics | Value | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|---|-------|---------|----------------|---------------|---------------|----------|--------|
| | 3 | 19.3 | N/K | N/K | 17.6 | 32.9 | N/K |
| <i>Revised stage (%)</i> (see text for details) | 1 | 33.1 | 14.0 | 15.9 | 39.6 | 34.9 | 28.6 |
| | 2 | 35.9 | 15.8 | 11.2 | 35.2 | 40.7 | 32.0 |
| | 3 | 7.6 | 4.6 | 3.7 | 8.8 | 10.2 | 4.2 |
| | 4 | 1.9 | 4.5 | 0.3 | 3.1 | 4.7 | 2.1 |
| Tumour size ¹ (%) | T0 | 3.3 | 7.0 | 0.5 | 0.7 | 11.1 | 13.8 |
| | T1 | 45.8 | 17.5 | 19.4 | 50.7 | 42.2 | 35.9 |
| | T2 | 25.1 | 13.7 | 9.4 | 26.0 | 35.4 | 23.7 |
| | T3 | 5.7 | 5.4 | 2.1 | 3.9 | 11.3 | 6.3 |
| Nodal involvement ¹ (%) | No | 45.5 | 33.6 | 16.5 | 61.2 | 72.5 | 49.7 |
| | Yes | 32.6 | 14.1 | 9.7 | 30.2 | 27.5 | 20.0 |
| Metastasis ¹ (%) | No | 46.1 | 28.5 | 0.4 | 77.4 | 60.7 | 56.6 |
| | Yes | 1.9 | 3.7 | 0.3 | 3.1 | 4.7 | 2.1 |

* data not recorded

¹ Pathological TNM where available, clinical TNM where not. T0=unmeasurable, T1<20mm, T220-50mm, T3>50mm

Table 2 Distribution of recorded treatment and outcomes among breast cancer cohorts by country

| | Value | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|--|---------------------------|-------------|----------------|---------------|---------------|-------------|-------------|
| Length of first hospital episode in days (mean, sd) | | 6.1 (19.8) | 6.6 (11.8) | 4.7 (7.3) | 2.9 (4.6) | 6.3 (14.0) | 4.0 (6.1) |
| Number of days in hospital during first year (mean, sd) | | 29.3 (24.4) | 63.1 (32.9) | 24.6 (16.9) | 37.6 (23.3) | 21.3 (20.9) | 12.2 (13.4) |
| Number of days in hospital during first year with BC main diagnosis (mean, sd) | | 21.6 (18.5) | Not available | 11.4 (13.1) | 10.9 (9.0) | 12.2 (13.2) | 8.9 (9.7) |
| Aspiration of lesion (%) | | 0.0 | 44.6 | 0.1 | 0.0 | 3.6 | 3.6 |
| Biopsy of lesion (%) | | 0.0 | 25.6 | 46.1 | 2.4 | 6.7 | 0.3 |
| Pre-operative treatment | Radiotherapy (% yes) | 0.0 | Not available | 1.2 | 0.1 | 0.4 | 0.1 |
| | Chemotherapy (% yes) | 0.0 | Not available | 5.9 | 0.3 | 5.7 | 1.7 |
| | Hormone (% yes) | 0.6 | Not available | 0.8 | 0.4 | 5.3 | 1.3 |
| Surgical treatment | Mastectomy (%) | 43.9 | 23.0 | 24.6 | 48.0 | 39.6 | 41.4 |
| | Other than mastectomy (%) | 31.9 | 33.3 | 56.0 | 39.5 | 40.6 | 37.5 |
| | None (%) | 24.2 | 43.7 | 19.4 | 12.5 | 19.8 | 21.1 |

| | Value | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|---|-----------------------------|---------|----------------|---------------|---------------|----------|--------|
| | Axillary node sample (%) | 10.6 | 0.0 | 0.6 | 66.1 | 29.4 | 22.8 |
| | Axillary node clearance (%) | 30.4 | 0.0 | 59.5 | 25.0 | 43.2 | 2.5 |
| | Sentinel Node Biopsy (%) | 23.2 | 18.1 | 44.0 | 0.4 | 10.0 | 37.1 |
| | Reconstructive surgery (%) | 11.9 | 1.5 | 9.9 | 1.8 | 10.8 | 6.1 |
| 'Post-operative' treatment ¹ | Radiotherapy (% yes) | 65.9 | 57.8 | 64.0 | 58.3 | 51.2 | 17.1 |
| | Chemotherapy (% yes) | 2.0 | 44.7 | 44.1 | 40.6 | 39.7 | 9.7 |
| | Hormone therapy (%) | 62.9 | 2.9 | 79.6 | 60.8 | 59.9 | 64.3 |
| | Radiotherapy (% yes) | | | | | | |
| Complications following mastectomy (%) | | 4.5 | 0.4 | 2.8 | 8.5 | 7.0 | 6.6 |
| Complications following other surgery (%) | | 5.5 | 0.4 | 5.2 | 13.7 | 8.2 | 9.1 |

¹ Radiotherapy etc may be given without surgical treatment where patients are too frail for surgery or choose not to accept surgery

Table 3 Crude mortality and survival following invasive breast cancer by country

| | Value | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|--|------------------------------|---------|----------------|---------------|---------------|----------|--------|
| 30-day post-operative mortality (all causes) (%) | | 0.2 | 0.1 | 0.0 | 0.1 | 0.3 | 0.3 |
| Overall survival (%) | At 30 days | | 99.0 | 98.9 | 98.3 | 98.8 | 98.3 |
| | At 1 year | 95.3 | 93.9 | 95.2 | 94.6 | 91.5 | 95.2 |
| | At 2 years | 91.3 | 88.4 | 91.8 | ‡ | 85.3 | 90.8 |
| | At 5 years (where available) | 81.2 | ¥ | 82.0 | ‡ | 72.2 | 79.5 |
| Breast cancer mortality (%) | At 30 days | 0.7 | 0.3 | 1.5 | 0.9 | 1.2 | 0.3 |
| | At 1 year | 2.9 | 1.6 | 4.2 | 3.7 | 5.3 | 2.5 |
| | At 2 years | 5.2 | 2.9 | 7.1 | ‡ | 9.3 | 4.9 |
| | At 5 years (where available) | 10.3 | ¥ | 14.1 | ‡ | 16.6 | 10.5 |

‡ Data from Norway does not extend beyond 1 year of follow up

¥ Data from Hungary does not extend to full five years of follow up.

Table 4 Age adjusted outcomes of invasive breast cancer by country, mean (95% CI) (2005 cohorts of women with breast cancer unless otherwise stated)

| | Finland | Hungary (2006) | Italy (Turin) | Norway (2009) | Scotland | Sweden |
|--------------------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| Survival at 1 year (%) | 96.6 (96.1, 97.1) | 93.6 (93.0, 94.2) | 97.1 (96.2, 98.1) | 96.4 (95.9, 97.0) | 94.1 (93.5, 94.7) | 96.9 (96.5, 97.2) |
| Survival at 5 years (%) | 84.7 (83.6, 85.8) | ¥ | 86.2 (83.9, 88.5) | ‡ | 77.8 (76.5, 79.1) | 84.8 (84.0, 85.6) |
| BC mortality at 1 year (%) | 2.3 (1.9, 2.7) | 1.9 (1.6, 2.3) | 2.6 (1.7, 3.5) | 2.5 (2.0, 3.0) | 4.0 (3.4, 4.5) | 1.8 (1.6, 2.1) |
| BC mortality at 5 years (%) | 9.6 (8.7, 10.6) | ¥ | 11.7 (9.5, 13.9) | ‡ | 15.4 (14.2, 16.5) | 9.6 (9.0, 10.3) |

‡ Data from Norway does not extend beyond 1 year of follow up

¥ Data from Hungary does not extend to full five years of follow up and only deaths that occur in hospital are given a cause of death in Hungary