Breast cancer trends: opportunistic screening in Austria versus controlled screening in Finland and Sweden
Christian Vutuc, Thomas Waldhoer and Gerald Haidinger

The objective of the study was to compare the trends of incidence and of mortality of breast cancer in Austria, Finland and Sweden, where different mammography screening strategies (opportunistic versus controlled) are applied. Furthermore, to find out whether a change in screening strategies would be feasible for Austria. Age-standardized incidence rates (1983–2000) and mortality rates (1980–2001/2) were analysed. Furthermore, the annual per cent change and the annual rate change (annual rate change = ± n/100,000 per year) and the 95% confidence interval were calculated. In all three countries, incidence rates increased significantly (Austria +26.4%, Finland +86.7%, Sweden +38.8%) during the period analysed (P<0.01). The annual per cent change and the annual rate change in Austria (1.57 and 1.56, respectively) are below the annual per cent change and the annual rate change in Finland (−0.57 and −0.16, respectively) and in Sweden (−1.02 and −0.28, respectively) for the period analysed. In conclusion, despite its unsophisticated opportunistic screening, Austria does well in comparison with countries operating organized breast cancer screenings. European Journal of Cancer Prevention 15:343–346 © 2006 Lippincott Williams & Wilkins.


Keywords: Austria, breast cancer, Finland, incidence, mortality, screening, Sweden, trends

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Received 5 September 2005 Accepted 30 September 2006

Introduction
Breast cancer is the leading cause of cancer death in industrialized countries and, consequently, it is at the centre of activities in Europe against cancer (Vutuc et al., 1999; European Commission, 2001). The aim of this study was to compare the trends of incidence and of mortality of breast cancer in Austria, Finland and Sweden, where different mammography screening strategies (opportunistic versus controlled) are applied. Furthermore, to find out whether a change in screening strategies would be feasible for Austria.

In Austria, mammography screening guidelines supporting mass screening were first published in 1980 (Federal Ministry of Health, 1980). It was recommended that women aged 35–49 years obtain an initial screening mammography and women aged 50 years or more a regular screening mammography every 1–2 years, as well as women aged 40–49 years with a family history of breast cancer or other known risk factors. The type of screening in Austria is opportunistic and this service has been offered free of charge ever since (Vutuc et al., 1998). Screening is performed by non-dedicated mammography screening centres and has no active invitation system; a controlled screening programme was never established.

In Finland, pilot projects started in 1982 and a population-based screening programme was introduced in 1987, with a nationwide coverage in 1989 (Hakama et al., 1997; Shapiro et al., 1998). The programme covers women aged 50–59 years and can be continued up to age 64 years. Women are identified and screened every 2 years.

In Sweden, pilot projects were started in 1982, organized population-based screening was introduced in 1986 and by 1997 all counties offered screening to women aged 50–69 years, but some counties started screening at 40 or 45 years and/or ended it at 74 years (Shapiro et al., 1998; Olsson et al., 2000). In both countries, mammography screening is based on active invitation and is performed in dedicated screening centres (Hakama et al., 1997; Shapiro et al., 1998; Olsson et al., 2000).

Material and methods
All data were obtained from the European Health for All Database (http://www.euro.who.int/HAHADB), and the respective indicator numbers are given in parenthesis
(HFADB, 2005). Age-standardized incidence rates (all ages, indicator number 2350 100 601) and mortality rates (all ages, indicator number 1590 100 502; ≤ 64 years, indicator number 1580 100 502; and ≥ 65 years, indicator number: 1591 100 503) were used. Incidence rates were extracted for the period 1983 (first available year for Austria) to 2000 and mortality rates for the period 1980 to 2002 (in Sweden last available year 2001). The annual per cent change (APC), the 95% confidence intervals (95% CIs) for the APCs and the annual rate change (ARC = ± n/100 000 per year) were calculated for incidence for the period 1983 to the last available year and for mortality for the period of the most recent highest year and the last year available (Ries et al., 2000).

Results
The trends of the age-adjusted incidence rates (all ages) in Austria, Finland and Sweden from 1983 to 2000 are shown in Fig. 1; the mortality trends from 1980 on are shown for all ages together in Fig. 2, for the age group ≤ 64 years in Fig. 3, and for the age group ≥ 65 years in Fig. 4.

Table 1 shows (a) the difference of the incidence in the year 2000 to the year with the lowest rate (1983) in per cent and per 100 000 women, and (b) the difference of the mortality in 2002 to the most recent highest year in per cent and per 100 000 women. In addition, the APC (per cent change per year) and the ARC (rate change per year) are given, for all ages and for the age groups ≤ 64 and ≥ 65 years.

In all three countries (Fig. 1, Table 1), incidence rates increased significantly during the period analysed (P < 0.01).

Total breast cancer mortality (Fig. 2, Table 1) has decreased significantly in Sweden since 1980 (P < 0.01), in Finland since 1988 (P < 0.05) and in Austria since 1990 (P < 0.01). In the age group ≤ 64 years (Fig. 3, Table 1), mortality has decreased significantly in Sweden since 1984 (P < 0.01), and in Austria (P < 0.01) and in Finland (P < 0.05) since 1988.

In the age group ≥ 65 years (Fig. 4, Table 1), mortality has decreased significantly in Sweden since 1980
(P < 0.01), in Finland (non-significantly) since 1987 and in Austria since 1999 (P < 0.01).

Discussion

Incidence rates do not necessarily reflect the real breast cancer risk in a population when screening mammography is used extensively. In 1983, however, screening mammography was not used widely in Austria and Finland and only in Sweden was a pilot study started in 1974. Several randomized trials followed later in the 1970s as well as pilot projects in 1982 (Olsson et al., 2000). Thus, the differences in the year 1983 (Fig. 1) quite closely reflect the real differences in breast cancer risks between these countries. In all three countries, however, incidence rates increased significantly thereafter (P < 0.01), although by different magnitudes (Austria + 26.4%, Finland + 86.7% and Sweden + 38.8%). The APC and the ARC in Austria (1.57 and 1.56, respectively) are below the APC and the ARC in Finland (3.38 and 3.49, respectively) and in Sweden (1.80 and 2.19, respectively) for the period analysed (Table 1). These changes within 17 years can hardly be explained by an increase of risk and should be related to the introduction of screening mammography. The increase is less pronounced in Austria and could reflect the different qualities of screening – opportunistic versus organized on the basis of active invitation of women – and, consequently, different participation rates. In Finland and Sweden, the participation rates are above 80% of the target population (Olsson et al., 2000; Anttila et al., 2002). In Austria, the attendance rate is not known but in a population survey in 1995 (most recent data available) 65% of women in the age group of 50–64 years reported having had one or more screening mammograms (Vutuc et al., 1998).

The end point of screening has to be the reduction of breast cancer mortality preceded by changes in the stage distribution and by a reduction of the absolute rate of advanced cancers (Day et al., 1989). In a previous analysis, we were able to show that the absolute rate of advanced tumours decreased significantly in all age groups in Austria with its opportunistic screening since the end of the 1980s (Vutuc et al., 1998). The effects of improved treatment and of screening, however, cannot clearly be separated when analysing official statistics.

Mortality decreased significantly (P < 0.01, Finland age group ≤ 64 years P < 0.05) in all age categories analysed in all three countries except in Finland in the age group ≥ 65 years where the decrease is non-significant (Table 1). In Austria and in Finland, the decline in mortality did not start before screening became widely

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**Table 1**  Per cent difference between the lowest year in incidence and the most recent highest year in mortality, respectively, and the annual per cent change (APC) and the annual rate change (ARC = ± n/100 000 per year)

<table>
<thead>
<tr>
<th>Incidence, all ages</th>
<th>% (n/100 000) difference 2000 to lowest year 1983</th>
<th>APC (%/year); 95% CI</th>
<th>ARC (n/100 000 per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria</td>
<td>26.4 (22.51)</td>
<td>1.57; 1.16/1.97</td>
<td>1.56</td>
</tr>
<tr>
<td>Finland</td>
<td>86.7 (64.55)</td>
<td>3.38; 3.06/3.69</td>
<td>3.49</td>
</tr>
<tr>
<td>Sweden</td>
<td>38.76 (39.93)</td>
<td>1.80; 1.46/2.14</td>
<td>2.19</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Mortality</th>
<th>% (n/100 000) difference 2002b to most recent highest [year]</th>
<th>APC (%/year); 95% CI</th>
<th>ARC (n/100 000 per year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria all ages</td>
<td>-19.8 (-6.4) [1990]</td>
<td>-1.90; -2.42/-1.55</td>
<td>-0.59</td>
</tr>
<tr>
<td>Finland all ages</td>
<td>-18.3 (-4.7) [1988]</td>
<td>-0.67; -1.15/-0.18</td>
<td>-0.16</td>
</tr>
<tr>
<td>Sweden all ages</td>
<td>-20.50 (-5.69) [1980]</td>
<td>-1.15; -1.53/-0.76</td>
<td>-0.28</td>
</tr>
<tr>
<td>Austria ≤ 64 years</td>
<td>-29.92 (-6.02) [1988]</td>
<td>-2.19; -2.66/-1.72</td>
<td>-0.39</td>
</tr>
<tr>
<td>Finland ≤ 64 years</td>
<td>-21.56 (-3.6) [1988]</td>
<td>-1.16; -1.71/-0.61</td>
<td>-0.18</td>
</tr>
<tr>
<td>Sweden ≤ 64 years</td>
<td>-18.44 (-3.09) [1984]</td>
<td>-0.76; -1.07/-0.49</td>
<td>-0.12</td>
</tr>
<tr>
<td>Austria ≥ 66 years</td>
<td>-12.23 (-16.97) [1990]</td>
<td>-1.39; -1.83/-0.82</td>
<td>-1.77</td>
</tr>
<tr>
<td>Finland ≥ 66 years</td>
<td>-15.49 (-15.7) [1987]</td>
<td>-0.48; -1.03/-0.08</td>
<td>-0.44</td>
</tr>
<tr>
<td>Sweden ≥ 66 years</td>
<td>-21.27 (-18.72) [1980]</td>
<td>-1.04; -1.54/-0.52</td>
<td>-1.02</td>
</tr>
</tbody>
</table>

bSweden 2001 last available year.

<0.05, CI, confidence interval.
used (Figs 2–4). As incidence was still going up at this time, the fall in mortality has to be related to screening and to better therapeutic regimes (Wenzel et al., 2001) but a sole therapeutic effect is not plausible. In Sweden, the decrease of mortality rates started after 1972, the year with the highest mortality rate ever observed (all ages 30.03, ≤ 64 years 17.7, ≥ 65 years 129.76) (http://www.euro.who.int/HFADB). Such an early impact of screening cannot be expected in Sweden and thus a change in risk pattern may have had some positive effect on the declining mortality, too. This effect, however, cannot be completely excluded for Austria and Finland, too.

In all three countries, mammography was introduced as a screening tool at about the same time, but was organized in a different way in Finland and Sweden. Assuming that a controlled programme – with personal invitation, quality standards and documentation of mammography, etc. – has more impact on breast cancer mortality, one would expect a more distinct reduction of the mortality in Finland and in Sweden. In fact, with its opportunistic system, Austria is not performing worse. In all three age categories, the downward trend is more pronounced in Austria with an APC and ARC at least double as high as in Finland and Sweden (Figs 2–4, Table 1). Even though relative survival (%; 5 years after diagnosis for women diagnosed between 1990 and 1994 was significantly lower in Austria (75.4; 95% CI 72.8, 78.2) than in Finland (81.4; 95% CI 80.4, 82.4) and in Sweden (82.6; 95% CI 82.0, 83.3) (Sant et al., 2003), it significantly improved in patients diagnosed from 1993 to 1997 (84.8; 95% CI 82.7, 85.3) (Vultur et al., 2002). As differences in the quality of treatment between Austria and Finland and Sweden are unlikely, a plausible explanation would be that the performance of opportunistic screening in Austria is at least comparable to the controlled screening in Finland and Sweden but with a postponed impact on mortality. Furthermore, the usage of mammography screening by women in the target age group must be widespread in Austria, otherwise the observed impact on mortality cannot be explained. This means that mammography screening seems to be highly accepted and used regularly by Austrian women. This in turn could be explained by the fact that the service is consumer friendly, being available not only in dedicated centres but also in radiologists’ offices and thus providing women with easy access to the service.

Moreover, opportunistic screening in Austria seems to have less impact on incidence and thus produces less morbidity due to overdiagnosis. Less overdiagnosis also means less burden of the diagnosis of breast cancer on women and their relatives, and the preservation of resources.

We are aware that the information derived from the analysis of cancer registry data and of mortality data is limited because cases detected by screening cannot be separated from cases detected clinically. Nevertheless, incidence and mortality reflect well the impact of medical intervention as a whole.

Our results raise the question whether a country with an ‘established’ opportunistic breast cancer screening should switch to a controlled (centralized) breast cancer screening programme. From the point of epidemiology, a controlled screening programme is state-of-the-art because it allows evaluation of the screening effect when planned and implemented correctly. Referring to our analysis, it can be doubted that a change would improve the situation significantly in Austria. Moreover, implementing a controlled screening would mean that the programme would deal with a highly contaminated population because of previous opportunistic mammographies. Thus, for years it would produce data not allowing a precise measurement of the screening effect. Furthermore, changing a controlled programme would be costly because there will be a need to build up a centralized administrative organization. So, in times of tight resources, from our current point of view, money is better invested in the ‘field’, meaning improved information for women, enhancement of training and quality assurance of key professionals, and high standards of equipment.

References


European health for all database (HFADB) (2005). WHO Regional Office for Europe, Copenhagen, Denmark (http://www.euro.who.int/HFADB).


