The Norwegian Breast Cancer Screening Program

(NBCSP)

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Head of NBCSP
The Cancer Registry of Norway
Institute of Population-Based Cancer Research, Oslo, Norway
> The Cancer Registry of Norway and some statistics

> Organization and logistics of the NBCSP

> Results of Early Outcome and Selected Process Indicators
The Cancer Registry of Norway

> Established in 1951

> Nationwide, population based

> Mandatory by law to report all new cancer cases, without consent

> Primary goal is the establishment and dissemination of new knowledge which contributes to the reduction of cancer.

> 225 000 notifications related to cancer illness every year. Of these, almost 25 000 are newly diagnosed

> Screening programs:
  Breast
  Cervix
The most frequent incident cancers 2003-2007

**FEMALES all ages (59 258 cases)**

- Breast: 23%
- Colon: 10%
- Lung, trachea: 8%
- Corpus uteri: 5%
- Skin, non-melanoma: 5%
- Melanoma of the skin: 5%
- Central nervous system: 5%
- Rectum, rectosigmoid, anus: 5%
- Ovary: 4%
- Non-Hodgkin lymphoma: 3%
- Remaining sites: 26%
Incidence of invasive breast cancer in Norway
(all ages, not age adjusted)
Incidence of breast cancer – 5 year age groups 1990-94 and 2006

Rate per 100,000 kvm/år

Aldersgrupper (år)
Rio de Janeiro 16042009

Cancer in Norway, 2006
Incidence of breast cancer in Norway

Rate per 100,000 women

- 20-39 y
- 40-44 y
- 45-49 y
- 50-54 y
- 55-59 y
- 60-64 y
- 65-69 y
- 70-74 y
- 75+ y
- All ages

Years:
- 1980
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
- 1993
- 1994
- 1995
- 1996
- 1997
- 1998
- 1999
- 2000
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
Relative survival from breast cancer diagnosed 1990-94, all ages
Mortality from breast cancer 1953-2003

Age adjusted rates
The Norwegian Breast Cancer Screening Program (NBCSP)
NBCSP

> Start: 1995 in 4 pilot counties (40% of the target population)
> Expansion: 1998
> Nationwide: 2004
> Owned by the Health Authorities
> Managed by the Ministry of Health and Care Services
> Administered by the Cancer Registry of Norway
> Co-operation between:
  > The Cancer Registry of Norway (administration)
  > The Norwegian Institute of Public Health
  > The Norwegian Radiation Protection Authority
  > The Health Trusts/counties
> National Advisory group: quality assurance
  > Different professions
  > Quality assurance manual
www.kreftregisteret.no
NBCSP

Population registry: 11-digit number
Target population: 50-69 year, 500 000 at the time being
Invitation: Personal letter,
Own risk: 25 Euro/ 40 US$
Screening procedures: 32 stationary and mobile units, 12/hour
Work up: at 17 centralized breast units (breast centers)

Two-years screening interval, two views
Double independent reading

Coding and reports: All units report all activity to the Mammography database at the Cancer Registry
Quality assurance: Quality assurance manual
The Norwegian Radiation Protection Authority

Rio de Janeiro 16042009
NBCSP
breast centers
NBCSP - Organization

- Breast unit
  - 2 view mammogram
  - Recall
  - Multidisciplinary team
    - Weekly meetings

- Mammography unit (Stationary/Bus)
- Reading: 2 radiologist
- Radiologist
- Surgeon
- Pathologist
- Nurse
- Radiographer
- Medizinisch-technischer assistent
IT-system: Flow chart

Cancer Registry of Norway
- Invitation
- Coding/registration
- Quality assurance
- Statistics
- Evaluation
- Research

Breast Clinics
- Double reading (radiologists)
- Appointments
- Statistics

Institute of Public Health
- Volume printing (letters)

IT-system: Flow chart
- Time tables
- Screening information, epidemiological information, pathology reports
- Information from double reading
- Changes in personal records

Screening unit
- Interview registration

Women
- Invitation letter
- Screened negative answer

Appointments
- Call up for screening positive women
- Change of appointment

Data for invitations and screened negative results
NBCSP - Invitation

ordinary

reservation

attendance
non-attendance

reminder
The aim is to reduce breast cancer mortality by 30% among the invited women.
Intermediate indicators are developed to measure effect of performance on service screening programs:

- Attendance rate
- Recall rate
- Detection rate
- Stage and morphological characteristics
- Interval cancer
## Attendance

<table>
<thead>
<tr>
<th></th>
<th>Prevalent round</th>
<th>Subsequent round</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total attendance</strong></td>
<td>76,5 %</td>
<td>76,7 %</td>
<td>76,6 %</td>
</tr>
<tr>
<td>- Stationary units</td>
<td></td>
<td></td>
<td>75,8 %</td>
</tr>
<tr>
<td>- Mobile units</td>
<td></td>
<td></td>
<td>79,6 %</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Prevalent round</th>
<th>Subsequent round</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>City</strong>*</td>
<td>73,8 %</td>
<td>69,4 %</td>
<td>70,1 %</td>
</tr>
<tr>
<td><strong>Rural</strong>**</td>
<td>86,8 %</td>
<td>84,3 %</td>
<td>84,7 %</td>
</tr>
</tbody>
</table>

*The two counties with the most densely built-up areas (Oslo + Akershus)
** Two counties more sparsely populated (Hordaland + Rogaland)
### Recall and screen detection rates

<table>
<thead>
<tr>
<th></th>
<th>Prevalent screens N=488,696</th>
<th>European guidelines</th>
<th>Subsequent screens N=570,613</th>
<th>European guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recalls (n, %)</strong></td>
<td>22,275 / <strong>4.6</strong></td>
<td>&lt; 5.0</td>
<td>14,723 / <strong>2.6</strong></td>
<td>&lt; 3.0</td>
</tr>
<tr>
<td><strong>Screen cancers (n, %)</strong></td>
<td>3,168 / <strong>0.6</strong></td>
<td>2,810 / <strong>0.5</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Screen detection rate of invasive cancers / background incidence</strong></td>
<td>534 / 180</td>
<td>408 / 180</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>3.0</strong></td>
<td>&gt; 3.0</td>
<td><strong>2.3</strong></td>
<td>&gt; 1.5</td>
</tr>
</tbody>
</table>

Prognostic tumor characteristics in invasive screen detected breast cancer

<table>
<thead>
<tr>
<th></th>
<th>Prevalent screens (N=2,609)</th>
<th>European Guidelines</th>
<th>Subsequent screens (N=2,326)</th>
<th>European Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Tumor size</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (mm)</td>
<td>15.2</td>
<td></td>
<td>14.1</td>
<td></td>
</tr>
<tr>
<td>Median (mm)</td>
<td>13</td>
<td></td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>≤ 10mm (%)</td>
<td>34.3</td>
<td>≥ 25</td>
<td>30.7</td>
<td>≥ 30</td>
</tr>
<tr>
<td>&lt; 15mm (%)</td>
<td>53.9</td>
<td>&gt; 50</td>
<td>61.3</td>
<td>&gt; 50</td>
</tr>
<tr>
<td>&gt; 20mm (%)</td>
<td>18.4</td>
<td>&lt; 25</td>
<td>15.6</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>88</td>
<td></td>
<td>102</td>
<td></td>
</tr>
</tbody>
</table>

**Grade**

<table>
<thead>
<tr>
<th></th>
<th>Prevalent screens</th>
<th>European Guidelines</th>
<th>Subsequent screens</th>
<th>European Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 (%)</td>
<td>38.0</td>
<td></td>
<td>34.3</td>
<td></td>
</tr>
<tr>
<td>2 (%)</td>
<td>47.8</td>
<td></td>
<td>48.5</td>
<td></td>
</tr>
<tr>
<td>3 (%)</td>
<td>14.2</td>
<td></td>
<td>17.2</td>
<td></td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>139</td>
<td></td>
<td>110</td>
<td></td>
</tr>
</tbody>
</table>

**Axillary lymph node metastasis**

<table>
<thead>
<tr>
<th></th>
<th>Prevalent screens</th>
<th>European Guidelines</th>
<th>Subsequent screens</th>
<th>European Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>No metastases (%)</td>
<td>74.1</td>
<td>&gt; 70</td>
<td>75.2</td>
<td>&gt; 75</td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>131</td>
<td></td>
<td>199</td>
<td></td>
</tr>
</tbody>
</table>

**Hormone receptor status**

<table>
<thead>
<tr>
<th></th>
<th>Prevalent screens</th>
<th>European Guidelines</th>
<th>Subsequent screens</th>
<th>European Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estrogen positive (%)</td>
<td>88.8</td>
<td></td>
<td>86.3</td>
<td></td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>331</td>
<td></td>
<td>316</td>
<td></td>
</tr>
<tr>
<td>Progesterone positive (%)</td>
<td>69.5</td>
<td></td>
<td>65.5</td>
<td></td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>362</td>
<td></td>
<td>360</td>
<td></td>
</tr>
</tbody>
</table>
Incidence and tumor characteristics of breast cancer diagnosed before and after implementation of a population-based screening-program
Hofvind S, Sorum R, Thoresen S. Acta Oncol. 2007 Sep 12;:1-7

<table>
<thead>
<tr>
<th>Tumor size</th>
<th>Before screening</th>
<th>Invited</th>
<th>Not invited</th>
<th>Exposed</th>
<th>Not exposed</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 20mm</td>
<td>778 (55.7)</td>
<td>2,561 (74.3)$</td>
<td>268 (63.8)$</td>
<td>2,244 (76.8)$</td>
<td>585 (61.8)$</td>
</tr>
<tr>
<td>&gt; 20 ≤ 50mm</td>
<td>463 (33.2)</td>
<td>745 (21.6)$</td>
<td>122 (29.0)$</td>
<td>584 (20.0)$</td>
<td>283 (29.9)$</td>
</tr>
<tr>
<td>&gt; 50mm</td>
<td>53 (3.8)</td>
<td>56 (1.6)$</td>
<td>12 (2.9)</td>
<td>41 (1.4)$</td>
<td>27 (2.9)</td>
</tr>
<tr>
<td>Grown into chest-wall, cutis</td>
<td>102 (7.3)</td>
<td>85 (2.5)$</td>
<td>18 (4.3)$</td>
<td>51 (1.7)$</td>
<td>52 (5.5)</td>
</tr>
<tr>
<td>No information</td>
<td>1,138</td>
<td>610</td>
<td>165</td>
<td>471</td>
<td>304</td>
</tr>
</tbody>
</table>

Data from Akershus, Hordaland, Oslo and Rogaland.
Interval cancer detection rates
(Hofvind et al, Eur J Epi, 2007)

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<tr>
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<th>Prevalent screens (n=448,696)</th>
<th>Subsequent screens (n=570,613)</th>
</tr>
</thead>
<tbody>
<tr>
<td>DCIS</td>
<td>0.17</td>
<td>0.12</td>
</tr>
<tr>
<td>Invasive</td>
<td>1.65</td>
<td>1.69</td>
</tr>
<tr>
<td>DCIS + invasive</td>
<td>1.72</td>
<td>1.81</td>
</tr>
<tr>
<td>(per 1000 screens)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Histological prognostic factors in invasive screen detected and interval cancers diagnosed in the NBCSP 1996-2005

<table>
<thead>
<tr>
<th></th>
<th>Screen detected</th>
<th>Interval cancer</th>
<th>Chi-square</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=4,945</td>
<td>N=1,173</td>
<td></td>
</tr>
<tr>
<td>Tumor size</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean (mm)</td>
<td>14.7</td>
<td>21.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Median (mm)</td>
<td>13</td>
<td>18</td>
<td></td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>190</td>
<td>117</td>
<td></td>
</tr>
<tr>
<td>Grade</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>1 (%)</td>
<td>36.2</td>
<td>20.7</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>2 (%)</td>
<td>48.2</td>
<td>48.6</td>
<td></td>
</tr>
<tr>
<td>3 (%)</td>
<td>15.6</td>
<td>30.6</td>
<td></td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>249</td>
<td>63</td>
<td></td>
</tr>
<tr>
<td>Axillary lymph nodes</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Negative (%)</td>
<td>74.6</td>
<td>56.2</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>330</td>
<td>180</td>
<td></td>
</tr>
<tr>
<td>Hormonal status</td>
<td></td>
<td></td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Estrogen positive (%)</td>
<td>87.6</td>
<td>73.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>647</td>
<td>155</td>
<td></td>
</tr>
<tr>
<td>Progesterone positive (%)</td>
<td>60.6</td>
<td>53.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Unknown (n)</td>
<td>722</td>
<td>178</td>
<td></td>
</tr>
</tbody>
</table>
Interval cancer – When do they appear?

Hofvind et al, J Med Screen, 2006
Surgery treatment of breast cancer in the pre-screening and screening period

Breast conserving treatment
Ablatio
Other/missing information

Year of diagnosis
Proportion of cases treated (%)
Use of Sentinel Node Technique

(AHOR, 50-69 years old, 1993-2004)
Evaluation of the NBCSP

The Ministry of Health and Care Services has charged the Research Council of Norway with responsibility for conducting a research-based evaluation of the Norwegian Breast Cancer Screening Program.

The objective is to investigate whether the program has fulfilled its intentions and purpose, with special weight on mortality-reduction.
Encontro Internacional sobre
Rastreamento do Câncer de Mama
International Meeting on Breast Cancer Screening
16 e 17 de abril
Rio de Janeiro