Methods in
“Effect of Screening Mammography on Breast-Cancer Mortality in Norway”

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NORWEGIAN BREAST CANCER SCREENING PROGRAM

- Started in 1996
  - ~40% of the eligible Norwegian population was invited
- Gradual implementation from 1996 to 2005
- Multidisciplinary teams
- Since 2005 all women aged 50-69 years are invited every second year

AIM OF STUDY

Evaluate the effectiveness of the Norwegian Breast Cancer Screening Program

Challenge:

- Valid control group
- Risk factors
- Treatment
- Awareness
- Differences in incidence and mortality in the different counties
- Account for these changes
- Changes with time
Methods

- Individual data on all breast cancer patients from the Cancer Registry of Norway, Cause of Death Registry

- Data on person-years in all women from Statistics Norway

- 1986-2005
  - After 2005, all eligible women are invited
  - Difficult to establish valid control group

- 77% attendance in the screening program
Methods

- Used incidence-based mortality (refined mortality): Counting the deaths only for women diagnosed after invitation to the program
- Non-constant hazard of breast cancer mortality with follow-up time:
  - Need equal follow-up in the comparison groups
Implementation of the screening program establishing valid control groups


Incidence-based mortality
Mortality from breast cancer women aged 50-69 years in the four groups

- **Historical Nonscreening Groups**
  - Current: 25
  - Time effect: 18% Reduction

- **Historical Screening Groups**
  - Current: 20
  - Time effect: 10% Reduction

- **Current Nonscreening Groups**
  - Historical: 30
  - Time effect: 18% Reduction

- **Current Screening Groups**
  - Historical: 25
  - Time effect: Screening effect
Other age groups

• 20-49 years: Death from breast cancer reduced by 23 to 27%

• 70-84 years: Death from breast cancer reduced by 16 to 24%

• Can not be associated with screening

Possible outcomes, age 50 to 69 years

• Pre- (historical data) and post screening comparison not valid:
  – If we did not account for time changes: 28% reduction in mortality

• Equal follow-up time in the comparison:
  • If the current screening group was followed for 9 years and the historical screening group was followed for 3 years a 63% reduction in mortality would be found (MRR 0.47)
SUMMARY

• Four-group comparison eliminates biases
  — Changes over time (underlying risk, treatment, awareness)
  — Regional differences
  — Follow-up time

• Individual data for all cancer patients; county data for the rest (as “individual” as it gets)
  — Problem? I doubt it!

• Reduction in death from breast cancer from 1986 to 2005
  — Overall: 28%; Associated with screening: 10%

Benefit and Harm with Screening Mammography and Aspirin

10-year risk of death from breast cancer (bars above 0) and 10-year risk of diagnosis of breast cancer (bars below 0) with and without mammography screening/Aspirin use. Difference between the percentages represented by the bars shows the absolute benefit or (background data from literature).