

Breast Cancer Overdiagnosis

What is overdiagnosis?

Overdiagnosis is the diagnosis of disease that will never cause symptoms or death during a patient's lifetime. In breast cancer, that means a patient is diagnosed with cancer or pre-invasive cells that, if left untreated, would never metastasise (spread beyond the breast) and therefore would never kill the patient.

There are many different types of breast cancer with different biological behaviour. Some are very fast-growing, others are very slow-growing. This biological behaviour can be difficult to predict. Some breast cancers may not spread and kill a patient, whilst others will.

Overdiagnosis is *not* an error in diagnosis. For example, an incorrect assessment by a pathologist, or a false-positive, when a cyst is diagnosed as a tumour, is not overdiagnosis.

How does overdiagnosis happen?

Overdiagnosis occurs in screening programmes, when women with no symptoms of breast cancer undergo mammograms for screening purposes. The increased rate of overdiagnosis around the world over the past 30 years is due in part to the expansion of screening programmes.

It is not possible for doctors to determine prior to treatment whether or not an early cancer will eventually cause death, so some level of overdiagnosis is inevitable.

Why is overdiagnosis a problem?

Patients may undergo unnecessary treatments, including surgery, chemotherapy and/or radiation therapy for cancers that would never have caused them harm. These treatments can be invasive and painful, have major side-effects, and can require considerable rehabilitation and recovery time. They cause significant disruption to the lives of patients and their families. Cancer treatments are expensive; our public health system rightly tries to minimise wastage of its limited funds.

How common is overdiagnosis?

The most recent analysis suggests 11% of all breast cancers might be overdiagnosed – however the exact percentage is unknown. Various analyses by epidemiologists (scientists who study health and disease at a population level) have estimated between 1% and 50%, with many estimates around the 10-20% level. Some recent studies are discussed below.

A UK study examined the benefit of screening in terms of reduced breast cancer mortality, and the harm in terms of overdiagnosis. This meta-analysis concluded that overdiagnosis is 11% when expressed as a proportion of cancers diagnosed in the invited group in the long term, and 19% when expressed as a proportion of the cancers diagnosed during the active screening period. For every 10,000 UK women aged 50 years invited to screening for the next 20 years, 43 deaths from breast cancer would be prevented and 129 cases of breast cancer would be overdiagnosed; that is one breast cancer death prevented for about every three overdiagnosed cases identified and treated. Just over 1% of the women aged 50-52 years invited to begin screening every year would have an overdiagnosed cancer in the next 20 years.¹

A recent USA study examined breast cancer incidence trends over thirty years to determine whether screening mammography leads to earlier detection of disease that otherwise would have progressed to late-stage cancer. The study compared the increase in detection of early-stage breast cancers with the concomitant decrease in detection of late-stage cancers, and concluded that up to 31% of all breast cancer diagnoses in 2008 were overdiagnoses.²

The first comprehensive review of European breast screening programs, conducted by the European

¹ **The benefits and harms of breast cancer screening: an independent review** - *The Lancet*, Volume 380, Issue 9855, Pages 1778 - 1786, 17 November 2012

² **Effect of Three Decades of Screening Mammography on Breast-Cancer Incidence** - Archie Bleyer, M.D., and H. Gilbert Welch, M.D., M.P.H.; *New England Journal of Medicine*; 367:1998-2005, November 2012

Screening Network Working Group and the European Network for Indicators on Cancer (EUNICE), analysed data from about 12 million women collected from 26 screening programs in 18 countries from 2001 to 2007. The combined estimate of over-diagnosis for screened women, from European studies correctly adjusted for lead time and underlying trend, was 6.5%.³

Dr Otis Brawley, chief medical officer of the American Cancer Society, has stated that most epidemiologists believe overdiagnosis represents less than 10% of all breast cancers diagnosed.⁴

Does overdiagnosis mean mammogram-based breast screening programmes are ineffective?

Overdiagnosis is the result of the variable biological behaviour of breast cancer. Many scientific studies have shown that mammograms reduce breast cancer mortality (i.e., they save lives). The authors of the European screening review estimated that for every 1000 women who undergo screening every two years from age 50 to 68 or 69, seven to nine lives would be saved and four women would be overdiagnosed. Lives saved by screening outweighed overdiagnosed cases by a factor of 2 to 1. Pooled estimates of breast cancer mortality reduction among women invited to screening were 25% in incidence-based mortality studies and 31% in case-control studies (38% and 48% among women actually screened).

Authors of the *New England Journal of Medicine* study concluded that the 28% decrease in mortality over 30 years is due to a combination of the effects of screening mammography and better treatment. Modelling exercises by the Cancer Intervention and Surveillance Modeling Network suggested screening mammography might be responsible for as little as 28% or as much as 65% of the reduction in mortality (the remainder being due to better treatment). The study's authors believe mammography's contribution is at the lower end.

In New Zealand, where screening and treatment regimens differ from other countries, the best available data is supplied by the Auckland Breast Cancer Register, funded by the NZBCF. Data from 2000-2008

³ **Summary of the evidence of breast cancer service screening outcomes in Europe and first estimate of the benefit and harm balance sheet** - Eugenio Paci et al; *Journal of Medical Screening Sept 2012 vol. 19 no. suppl 1 5-13*

⁴ **'Overdiagnosis' of breast cancer may be higher than thought** - CNN online: <http://edition.cnn.com/2012/04/02/health/brawley-overdiagnosis-breast-cancer>

shows that women whose cancer is detected by screening mammogram have a 95% chance of surviving to five years, compared to 73% for women who find a lump.

The alternative to treating all cancers identified through screening is to adopt a wait-and-see approach, then treat only those cancers that show signs of progression. However, many clinicians are reluctant to do this in breast cancer cases.

Recent qualitative research in Australia shows that patients educated about the risks of overdiagnosis still choose to have screening mammograms. The highest estimate of overdiagnosis rates (50%) made some women perceive a need for more careful personal decision-making about screening. The lower and medium estimates (1–10% and 30% overdiagnosis) had limited impact on attitudes and intentions, with many women remaining committed to screening.

Some women said it was important to consider overdiagnosis and make informed choices about whether to have screening, but others wanted to be encouraged to be screened.⁵

Conclusion

While research consistently shows that mammograms save lives, and the benefits outweigh the risk of overdiagnosis, overdiagnosis is a genuine concern in any breast screening programme. For many women, overdiagnosis is an unfamiliar term, one that has not previously been a factor in their decision to undergo screening. It's important for women to be aware of the latest research on this issue.

Early detection of breast cancer has other significant benefits, in addition to lives saved. When breast cancer is diagnosed early, treatment is likely to be less invasive and painful, to allow a shorter recovery, afford less disruption to families, and have a lower financial impact on patients and the health system.

The New Zealand Breast Cancer Foundation recommends mammogram screening from age 40, but acknowledges that mammography is imperfect. The Foundation therefore encourages all women to make their own decision based on a consideration of the facts. The NZBCF reminds women who detect a lump or other change in their breasts at any age to get it checked by their doctor.

⁵ **Women's views on overdiagnosis in breast cancer screening: a qualitative study** - Jolyn Hersch et al. *British Medical Journal* 2013;346:f158; 23 January 2013