# We need to talk about breast cancer screening (part 1)

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*Editor note: This week Dr Caroline Shaw and Associate Professor Diana Sarfati consider the pros and cons of breast cancer screening, in light of the growing controversy (mostly in the northern hemisphere) about the possibility that the benefits of breast cancer screening are (much) less than previously thought due to over-detection and other issues. In today's Part 1 blog, Caroline and Diana outline the issues. In the Part 2 blog (appearing on Thursday), they aim for more specific recommendations.*

Population screening attracts controversy. For breast cancer screening there is an ongoing controversy being played out in the international literature related to the absolute fundamental rationale of screening; should we be screening for breast cancer at all? This is a big deal, given that most developed countries have invested hundreds of millions of dollars in the human and technical infrastructure for screening in the last few decades. BreastScreen Aoteroa, for example, costs over $50 million annually.The debate comes down to three issues. These are:

1. How much, if at all, does screening reduce breast cancer mortality?

2. Have the treatment advances in breast cancer in the last 3 decades meant that any advantage of screening (early detection) is now no longer relevant?

3. What is the amount of over-diagnosis (that is, the extra cancers detected by screening that would never have caused a problem in a woman's lifetime) caused by screening?

These issues are at the heart of the core ethical judgement that needs to be made about any screening programme – do the theoretical benefits of the proposed screening programme outweigh the definite harms that will be incurred? We talk through these issues in this Part 1 blog.

**How much does mammographic screening reduce breast cancer mortality?**

There have been more randomised controlled trials (RCTs) of breast cancer screening than for any other type of cancer screening. The first started in 1963 and the remainder mostly commenced in the 1970s and early 1980s. Some of these studies continue to report results, and information is also now available from the many population screening programmes internationally.

A number of high level organisations have recently carried out careful reviews involving meta analysis (combining) of information from the RCTs, including the Cochrane Collaboration (1), the US Preventive Services Task Force (2), the Canadian Task Force on Preventive Health Care (3) and the UK Independent Review (4). These organisations all concluded that there was evidence for breast cancer mortality reduction from mammographic screening, of between 15-32% (depending on age among the population invited). However there are long standing, legitimate concerns about the quality of many of the RCTs, specifically inadequate randomisation and bias in the ascertainment of outcome (cause of death). The reviews differ in their assessment of how important these shortcomings are. The Cochrane authors, who have published widely cautioning against breast cancer screening, show that if you look only at the three best quality trials (with the least likelihood of bias) then the reduction in mortality from breast cancer is not statistically significant after seven (RR 0.93 95%, CI 0.79-1.09) or 13 years follow up (RR 0.90 95%, CI 0.79-1.02). The Canadian review also noted that there was a serious risk of bias in the RCTs used to base their conclusions about screening, meaning the quality of evidence to support their recommendations was only moderate. The UK Panel however, while acknowledging the deficiencies in many of the trials, concluded that the biases were not sufficient (and all in the direction of favouring screening) to preclude using the information from the studies.


The benefits and harms of breast cancer screening: an independent review

Independent UK Panel on Breast Cancer Screening*

**Treatment advances vs. early detection**

Many of the randomised controlled trials of breast cancer screening were conducted in the 1970s and early 80s. Advances in treatment of breast cancer since then have been substantial, and consequently survival and mortality have improved considerably. For example, 5 year survival in NZ increased from ~75% to ~87% between 1991 and 2004 (5). There is an argument that, treatment was so crude (compared to now) in the 1970s/80s that detecting the breast cancer a bit earlier through screening was more important. The UK Independent Review noted that mortality from breast cancer had reduced over this time period, which was probably a result of improvements in treatment as well as screening, but they concluded these were independent of each other. Others argue that improvements in mortality due to causes other than screening mean that the absolute benefit of screening will have decreased in the population.

**Over diagnosis**

This is a complex concept. Essentially, experience in screening for many different cancers shows that screening results in the identification of cancers that would never cause a

problem in a person's lifetime. This is completely counter to how most people think about cancer, but this phenomenon is seen in all cancers (and many other medical conditions) we screen for. The problem is that when we identify a breast cancer through screening we can't always tell if it is a cancer that is going to cause a problem or not. So we have to treat them all; and cancer treatments can be mutilating, painful and involve long term side effects. For example radiotherapy to the breast results in an increase in subsequent deaths from heart disease and lung cancer (6). If a woman has been diagnosed with a breast cancer that would never have caused her any harm in her life, and about which she would never have been aware, then the treatment she has received is entirely unnecessary (and thus referred to as over-treatment). Thus, any potential benefits of screening have to be weighed up against the harms of unnecessary mastectomies, side effects from the surgery, chemotherapy and radiotherapy. Not to mention stress and anxiety.

Despite (or perhaps because of) the importance in knowing how much over-diagnosis occurs in breast cancer screening, this is a hugely controversial area. Estimates of over-diagnosis vary substantially depending on data and methods used to calculate it. For example the Independent Review in the UK calculated rates of over diagnosis between 10-20% from one RCT, using different methods. The UK review concluded that their best estimate was that 11% of women (aged 50-65) diagnosed with breast cancer would not have been diagnosed in the absence of screening. The Cochrane authors suggest over-diagnosis is somewhere between 30 and 50% (1, 7). Others suggest it is more likely to be between 1-10% (8). (NB: an 11% over-diagnosis rate in a screening programme translates to one life being saved for 3 cancers over diagnosed and over treated (9) [see Editor Footnote]). However even the most appropriate method for calculating over diagnosis remains highly contested.

**Summary – to this point**

The issues we have summarised are the core of what appears to be an almost unsolvable problem – at this point there is no obvious piece of evidence that will resolve these issues and as many of them rely on judgements of researchers there is unlikely to be universal agreement on any of these issues. In Part 2 of our blog we will explore some of the implications of these issues.

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*Editor Footnote*

*How does a 11% over-diagnosis rate in a screening programme translate to 'only' one life being saved for 3 cancers over diagnosed and over treated? Because of the high survival to start with. For example, if breast cancer relative survival is 85%, then 'only' 15% of diagnosed cases are going to die from their breast cancer. Assume screening reduces cancer mortality by 25%, then 15% becomes approximately 11% mortality (among those case who were initially diagnosed) – a 4% reduction in a women's absolute risk of death from her breast cancer. And 11% over-detection is (nearly) three times the absolute percentage reduction in mortality. (These calculations are basic, not allowing for competing mortality, time lags, etc – but illustrate the point.)*

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