

OBSERVATIONS

NOT SO STORIES

How a charity oversells mammography

In their occasional series highlighting the exaggerations, distortions, and selective reporting that make some news stories, advertising, and medical journal articles “not so,” **Lisa M Schwartz** and **Steven Woloshin** explain how a charity used misleading statistics to persuade women to undergo mammography

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Like US Independence Day, Thanksgiving, and Christmas, disease awareness has made it into the US calendar. In 2012 we have 175 officially designated “national health observances,” including rabies day, sleep awareness week, endometriosis awareness month, and many observances for heart disease and a variety of cancers.¹ None is more prominent than breast cancer awareness month, otherwise known as “October.” And no organisation has done more to promote this observance than Susan G Komen for the Cure, the world’s largest breast cancer charity and creator of the ubiquitous “pink ribbon,” which each year aims to “turn the country pink for national breast cancer awareness month.”^{2,3}

Komen’s portfolio of activities includes a variety of laudable efforts “to save lives, empower people, ensure quality care for all, and energize science to find the cures.”⁴ But the charity is best known for promoting mammography screening.

Unfortunately, there is a big mismatch between the strength of evidence in support of screening and the strength of Komen’s advocacy for it. A growing and increasingly accepted body of evidence shows that although screening may reduce a woman’s chance of dying from breast cancer by a small amount, it also causes major harms.^{5,6} In fact, the benefits and harms are so evenly balanced that the National Breast Cancer Coalition, a major US network of patient and professional organisations, “believes there is insufficient evidence to recommend for or against universal mammography in any age group of women.”⁷ Even the chief medical officer of the American Cancer Society, which has long promoted screening, calls for balanced information to ensure that women understand the benefits and harms of mammography.⁸ Recently in the United Kingdom an independent panel began reviewing the evidence for mammography to help the NHS decide whether the balance of benefits and harms justifies its national screening programme.⁹

In contrast, Komen’s public advertising campaign gives women no sense that screening is a close call. Instead it simply tells women to be screened, overstates the benefit of mammography, and ignores harms altogether. Consider the advertisement featured prominently in a national promotional blitz during the most recent breast cancer awareness month (figure).

Susan G Komen for the Cure’s mammography advertisement during breast cancer awareness month, 2011

The advertisement states that the key to surviving breast cancer is for women to get screened because “early detection saves lives. The 5-year survival rate for breast cancer when caught early is 98%. When it’s not? 23%.”

This benefit of mammography looks so big that it is hard to imagine why any woman would forgo screening. She'd have to be crazy.

But it's the advertisement that is crazy. Why? Because screening changes the point during the course of cancer when a diagnosis is made. Without mammography screening, a diagnosis is made when the tumour can be felt. With screening, diagnosis is made years earlier when tumours are too small to feel. Five year survival is all about what happens from the time of diagnosis: it is the proportion of women who are alive five years after diagnosis. Because screening finds cancers earlier, comparing survival between screened and unscreened women is hopelessly biased.

The time between when a cancer can be diagnosed by screening and when it can be felt is called the "lead time." Although a screening test must create lead time to have the possibility of working, lead time can bias survival statistics. Barnett Kramer, director of the National Cancer Institutes' Division of Cancer Prevention, explained lead time bias by using an analogy to *The Rocky and Bullwinkle Show*, an old television cartoon popular in the US in the 1960s. In a recurring segment, Snidely Whiplash, a spoof on villains of the silent movie era, ties Nell Fenwick to the railroad tracks to extort money from her family. She will die when the train arrives. Kramer says, "Lead time bias is like giving Nell binoculars. She will see the train—be 'diagnosed'—when it is much further away. She'll live longer from diagnosis, but the train still hits her at exactly the same moment."

To see how much lead time can distort five year survival data, imagine a group of 100 women who received diagnoses of breast cancer because they felt a breast lump at age 67, all of whom die at age 70. Five year survival for this group is 0%. Now imagine the women were screened, given their diagnosis three years earlier, at age 64, but still die at age 70. Five year survival is now 100%, even though no one lived a second longer.¹⁰

Overdiagnosis also distorts five year survival. The idea here is that screening detects some cancers that would never have killed—or even caused symptoms during a person's lifetime. That is because some cancers detected by screening grow extremely slowly or not at all. Overdiagnosis distorts survival statistics because the numerator and denominator now include people who have a diagnosis of cancer but who, by definition, survive the cancer. Overdiagnosis inflates survival statistics even when screening fails to save lives. The more overdiagnosis that occurs, the greater the inflation.

If there were an Oscar for misleading statistics, using survival statistics to judge the benefit of screening would win a lifetime achievement award hands down. There is no way to disentangle lead time and overdiagnosis biases from screening survival data. That is why expert groups have long pointed out that, in the context of screening, these statistics are meaningless: there is no correlation between changes in survival and what really matters, changes in how many people die.¹¹

But that doesn't stop people from misinterpreting survival statistics. Disturbingly, these deceptively simple statistics trip up many doctors. In a recent survey we conducted with colleagues from the Max Planck Institute, most US primary care doctors mistakenly interpreted improved survival as evidence that screening saves lives.¹²

The only reliable way to know that a screening test works is the extent to which it reduces deaths in a randomised trial. The table

gives an idea of how much mammography works for women at different ages (though particular numbers can be questioned, the overall order of magnitude of the effect of screening is evident).¹³ These numbers surprise many people. That's because advertisements such as Komen's dramatically overstate the benefit of screening. Mammography certainly sounds better when stated in terms of improving five year survival—from 23% to 98%, a difference of 75 percentage points—rather than in terms of its actual benefit—a reduction in the chance that a woman in her 50s will die from breast cancer over the next 10 years from 0.53% to 0.46%, a difference of 0.07 percentage points.

The Komen advertisement is deceptive in another way: it ignores the harms of screening (summarised in the table¹⁴). Between 20% and 50% of women screened annually for a decade experience at least one false alarm requiring a biopsy. Most importantly, screening results in overdiagnosis. For every life saved by mammography, around two to 10 women are overdiagnosed. Women who are overdiagnosed cannot benefit from unnecessary chemotherapy, radiation, or surgery. All they do experience is harm.

Women need much more than marketing slogans about screening: they need—and deserve—the facts. The Komen advertisement campaign failed to provide the facts. Worse, it undermined decision making by misusing statistics to generate false hope about the benefit of mammography screening. That kind of behaviour is not very charitable.

Opinions expressed by the authors are their own and should not be interpreted as official positions of the US Department of Veterans Affairs.

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Table

Table 1 | What happens to women who are screened every year or two for 10 years?

Benefits and harms of screening	Age		
	40-49 years	50-59 years	60-69 years
Lower chance of dying from breast cancer			
% of women who die from breast cancer over 10 years (not screened versus screened)	0.35% v 0.30%	0.53% v 0.46%	0.83% v 0.56%
% of women avoiding breast cancer death because of screening	0.05%	0.07%	0.27%
Higher chance of experiencing false alarms and testing			
% of women experiencing false alarms who needed:			
Any follow-up testing (repeat mammography or biopsy) to rule out cancer	20% to 50%	20% to 50%	20% to 50%
A breast biopsy to rule out cancer	5% to 20%	5% to 20%	5% to 20%
Higher chance of being overdiagnosed with cancer			
% of women diagnosed with cancers that would never have caused symptoms or death yet were treated with surgery, chemotherapy, or radiation from which they cannot benefit	0.1% to 0.5%	0.1% to 0.7%	0.5% to 2.7%

All absolute risks of death from breast cancer with and without screening (and all absolute risk reductions) were calculated using the US Preventive Services Task Force's pooled relative risks and "number needed to invite to screening."¹³ The low and high ends of the ranges for false alarms reflect European and US experience.¹⁴
¹⁵ The ranges for overdiagnosis were derived by multiplying the absolute risk reduction by the ratios derived from two studies: two¹⁶ and 10⁵ women overdiagnosed for every one death from breast cancer avoided.