

CALCULATING THE BENEFITS AND HARMS OF BREAST SCREENING FOR WOMEN ATTENDING SCREENING

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INTRODUCTION

The Marmot review provides much-needed insight into the estimated harms and benefits of the UK breast screening programmes.¹ The review found that these programmes extend lives, but at a cost. It estimated that while screening prevents about 1,300 breast cancer deaths per year, it can lead to about 4,000 women aged 50-70 in the UK being overdiagnosed each year – having a diagnosis and then maybe treatment for a condition that would never have caused them harm.

The review's results are based on an intention-to-treat analysis, and it therefore sets out its main findings in terms of women **invited** to screening. Such an analysis does not need to adjust for either non-compliance or loss to follow-up, and is useful for assessing the effect of the intervention on society, but it is not designed to portray the likely impact of screening on an individual.

In practice, women do not accrue benefits or harms of breast screening merely by receiving a screening invitation – these occur only during or after mammography itself. So, here we present an alternative set of statistics (derived from those within the Marmot review) estimating the risks and benefits to women of **attending** breast screening. It is clear in the Marmot review that the figures are subject to a large amount of uncertainty. This uncertainty also applies to the figures presented here.

METHODS

Mortality – The absolute reduction in the risk of dying from breast cancer for women aged 55 to 79 attending screening can be estimated by adjusting the absolute risk reduction in those invited to screening (0.43% as per the Marmot review) for the coverage of the breast screening programme (coverage rate: the proportion of women of the relevant age who have attended breast cancer screening in the last three years; 77% for England in 2010/11).² This assumes that the mortality from breast cancer is not related to socio-economic group: although it is known that more affluent groups have higher incidence rates of breast cancer, they also have higher survival rates and we assume that these differences balance, resulting in a similar mortality rate in more and less affluent groups.

Overdiagnosis – The same method used to adjust the mortality risk can be applied to adjust the overdiagnosis estimate. The estimated percentage of women with an overdiagnosis (1.29% as per the Marmot review) based on the intention-to-treat analysis is divided by the coverage rate (77%).

Incidence – This same method, however, cannot be repeated to estimate the number of breast cancers and ductal carcinomas in situ (DCIS) diagnosed in women attending breast screening, since socio-economic group is associated with both the risk of breast cancer and the likely attendance at screening (both are higher in more affluent populations).^{3,4} We have therefore assumed that the risk of breast cancer in women who attend breast screening is 10% higher than for the whole population of women invited for screening. This is reasonable, since a large range of estimates of the increased risk in attenders versus non-attenders has been reported; this figure is roughly in the middle of these estimates.^{5,6,7}

RESULTS

Mortality – The estimated breast cancer mortality risk reduction is 0.56% (0.43%/0.77), or 56 breast cancer deaths prevented per 10,000 women attending screening.

Overdiagnosis – The estimated overdiagnosis is 1.68% (1.29%/0.77), or 168 per 10,000 women attending screening.

Incidence – The estimated number of breast cancers diagnosed is 7.49%, or 749 per 10,000 women attending screening (681 breast cancers per 10,000 women in those invited for screening from the Marmot review + 10%).

To illustrate these harms and benefits we have compared what would happen to 10,000 women attending screening in the UK after 20 years with what would happen had they not been able to attend, for example, if there were no screening programme available to them. Not all numbers sum exactly due to rounding.

• 749 women will be diagnosed with breast cancer, and receive treatment.

Of these 749 women:

• 157 will die from breast cancer, 56 fewer than in the group not attending screening.

Of the 592 who survive:

• 56 will have their life extended by screening.
• 168 will be diagnosed and treated for a cancer that wouldn't have caused problems in their lifetime ('overdiagnosed').
• 369, the remainder, will be diagnosed with and treated for a cancer that would have been picked up later without screening.

If the same 10,000 women were not able to attend screening, then after 20 years:

- 582 will be diagnosed with breast cancer, and receive treatment, i.e. the 749 minus the number of overdiagnosed cases.
- 168 women will have a breast cancer they never know about and that will not cause any harm during their lifetime.

Of the 582 women diagnosed:

- 213 women will die from breast cancer, 56 more than in the group attending screening.
- 369, the remainder, will be treated for cancer and survive.

These figures are illustrated below. **Figure 1** shows the results of an intention to treat analysis as published in the Marmot review. **Figure 2** provides the same information with the figures adjusted to take account of the non-attendance following an invitation.

CONCLUSION

These figures give further insight into the benefits and harms of breast screening, but from the individual point of view. We hope they will inform the millions of women invited for screening in the UK each year, and those around the world, and help them to make their decision about whether or not to go for screening.

Figure 1. Women invited to breast cancer screening as published in the Marmot review
Looking at 10,000 women **invited to screening**, over 20 years:

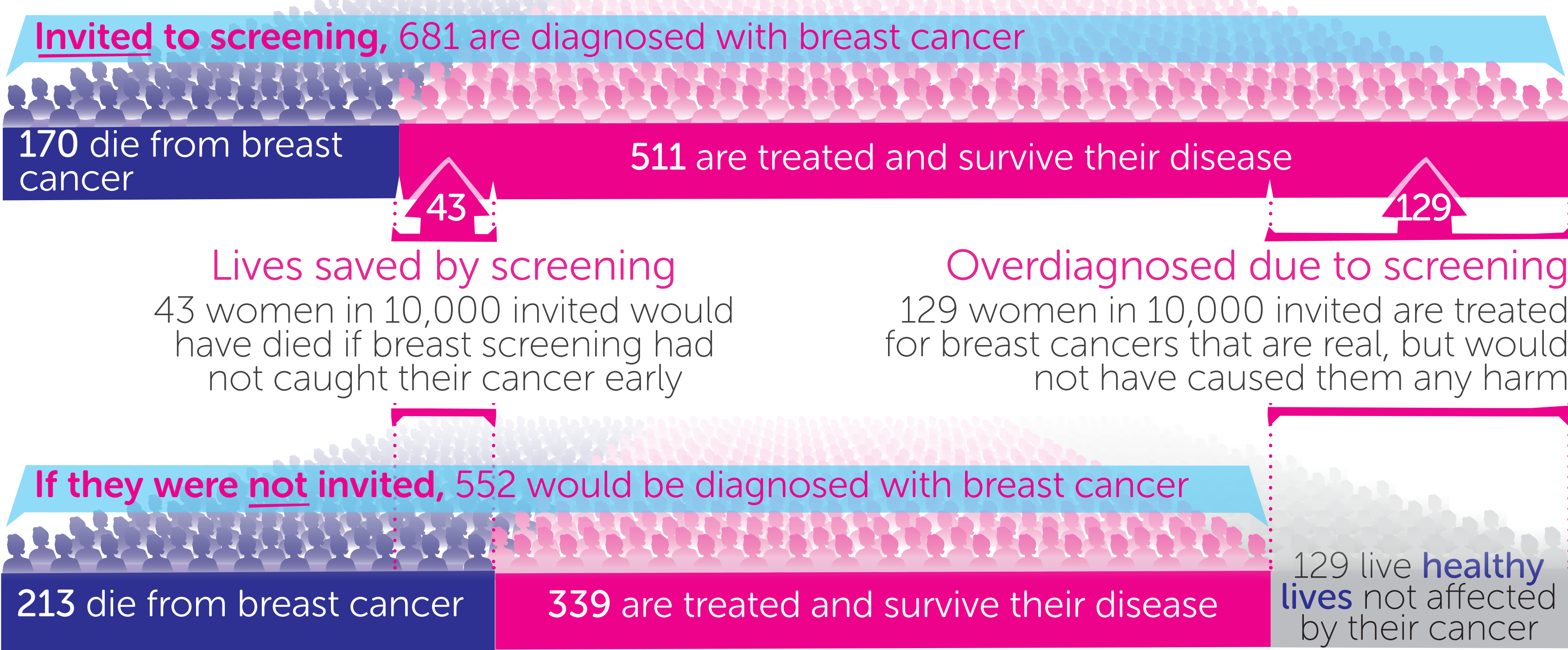
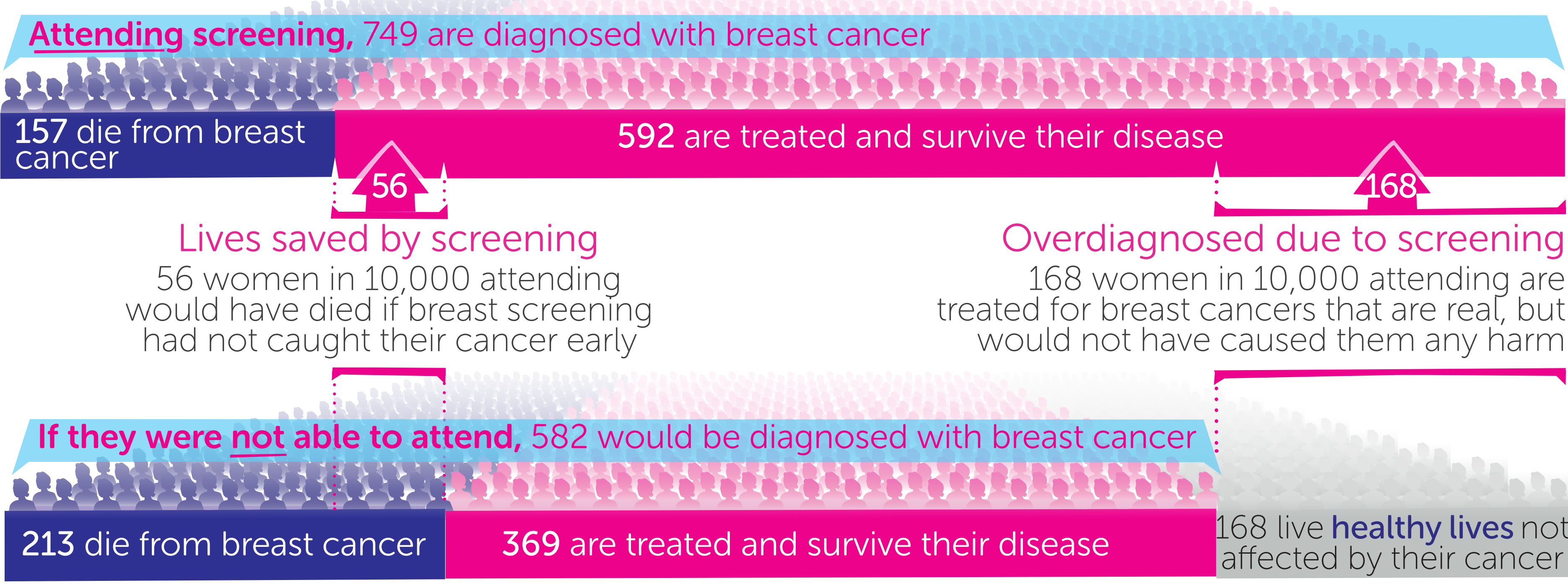


Figure 2. Women attending breast cancer screening
Looking at 10,000 women **attending screening** over 20 years:



Not all numbers sum exactly due to rounding.

REFERENCES

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