AI can identify women with high risk of breast cancer in screening examinations

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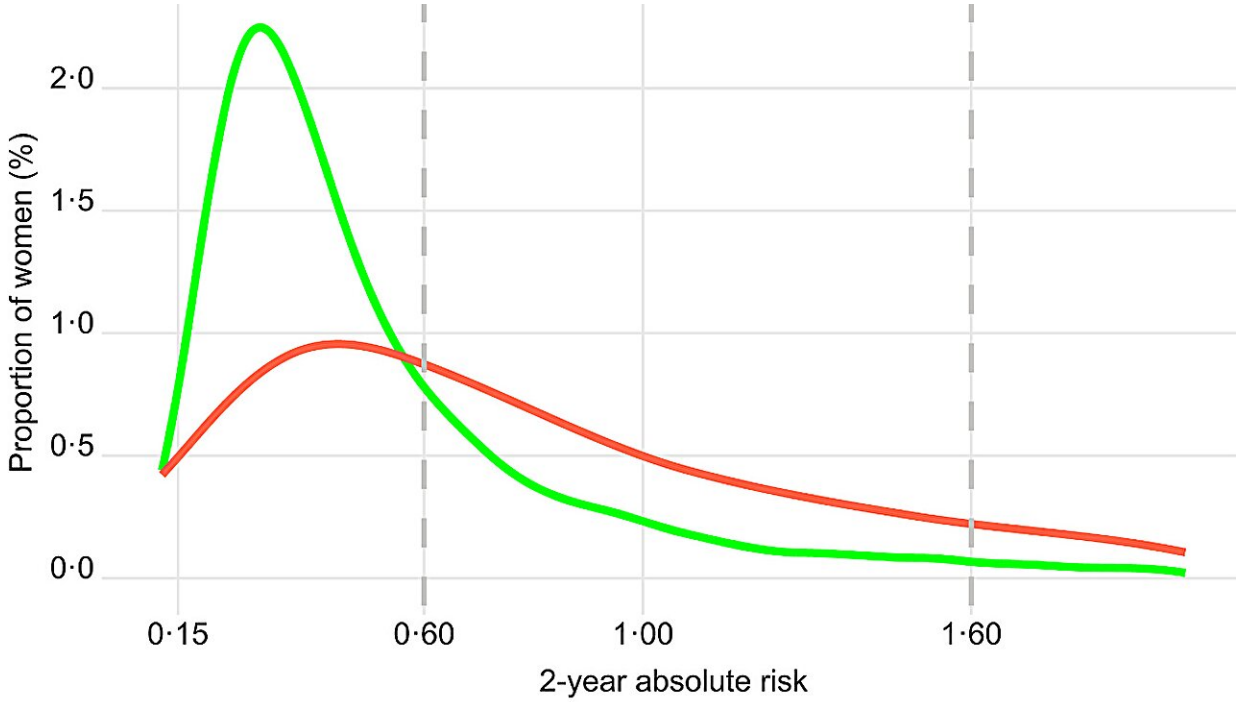

Frequency distribution of absolute 2-year risks at study-entry for developing breast cancer in cases (red) and controls (green) and, risk classification of women into high, moderate, and general risk using the NICE and USPSTF guidelines. Risk classification was additionally performed in women using USPSTF guidelines. Risk ratios were adjusted for study population, mammography vendor, year of mammogram, and age at study-entry. Credit: *The Lancet Regional Health - Europe* (2023). DOI: 10.1016/j.lanepe.2023.100798

The use of AI makes it possible for women with a high risk of breast cancer to be identified in mammography screening examinations so that the cancer can be caught earlier. An international research group led from Karolinska Institutet in Sweden has now shown that the method is effective in different European countries. The study is published in *The Lancet Regional Health—Europe*.

An AI-based risk model for evaluating mammographic images is able to identify women with a high risk of breast cancer who might need complementary examinations to improve the possibility of early detection. After testing the method on more than 8,500 women in Italy, Spain and Germany, the researchers can now show that the model works well in the different populations.

In current mammography programs, women are screened over a fixed age (40–74 years old in Sweden) and time interval, often every other year. However, research has shown that the risk of developing breast cancer varies, which means that women would benefit from individualized screening by obtaining a better idea of their personal risk. Risk models have existed for decades and are often based on a woman's family history of breast cancer and lifestyle factors.

AI detects tiny changes

By letting a trained AI examine screening images, researchers have developed an entirely new type of risk model based on tiny changes in the images that are far too small for the human eye to register.

"It's not as simple as traditional models that use a handful of factors such as genes, as there are thousands of factors in the image that are taken into account," explains study leader Mikael Eriksson, postdoc researcher at the Department of Medical Epidemiology and Biostatistics, Karolinska Institutet. "The AI is able to find different patterns in these

factors, each of which are weak but that the AI can combine. The AI can also give an overall assessment of what is likely to happen in the breast in the future."

At present, a large number of women are diagnosed at a late stage and can even develop breast cancer between screenings. The AI-based risk model can be used to determine which women need additional examination as a complement to their normal mammography, so that any tumors can be detected earlier. The current study confirms earlier reports in which the AI-based risk model was able to identify a group of women who had almost seven times the risk of developing breast cancer as the normal population.

Individualized screening

"Although about 6% of the women were high-risk, they are screened today in the same way as low-risk women," says Dr. Eriksson. "We think that a specially adapted screening could be more suitable for these women."

However, the purpose of this study was not to look at clinical use per se but to examine if the method, which had already been evaluated in Sweden and the U.S., also works in different mammography programs around Europe.

"First you develop the model and test it in a slightly more limited population, and then you go on to demonstrate generalizability in other populations, after which you reach a point where you believe that the model works," he continues.

The next phase of the research is to conduct a clinical study in Europe in which women are tested when screened and given different treatments depending on the risk value that the AI model gives them. This method

was clinically evaluated in the U.S. several years ago.

"We're now looking at the possibility of introducing the model in Europe," says Dr. Eriksson.

More information: Mikael Eriksson et al, European validation of an image-derived AI-based short-term risk model for individualized breast cancer screening—a nested case-control study, *The Lancet Regional Health—Europe* (2023). DOI: 10.1016/j.lanepe.2023.100798

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