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LETTER TO THE EDITOR

A retrospective cohort study on breast cancer screening: Comparing false-positive and false-negative rates from two BCSC databases

Dear Editor,

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BCSC Databases;
Cancer screening;
Comparing false-positive and false-negative rates;
Retrospective cohort study

This paper presents a retrospective cohort study that examines breast cancer screening results from two Breast Cancer Surveillance Consortium (BCSC) databases [1]. Two databases, namely ''Screening Mammogram Classification 1994—2009'' [2] and ''Diagnostic Mammography Sensitivity, Specificity, & False Negative Rate 2007—2013'' [3], which cover the periods 1994—2009 (16 years) and 2007—2013 (7 years) respectively, were not selected by the author. The overlapping period from 2007—2009 does not influence the accuracy comparison when considering these two periods independently. However, it does affect accuracy if we were to exclude the 2007—2009 period from the first timeframe. Unfortunately, due to the databases not being publicly accessible, it is impossible to remove the 2007—2009 period from the first database. To our knowledge, there has not been any large-scale research conducted on the diagnostic accuracy of breast cancer screening, with regards to sensitivity and specificity, since 2013.

The study compares false-positive and false-negative rates, but finds no improvement over time. This lack of progress in breast cancer screening accuracy, despite significant advances in testing technology, may indicate a problem with the testing system or the professionals involved. The findings indicate that policymakers and administrators should take steps to enhance the effectiveness of the current system on breast cancer screening. The proposed study, which examines false-positive and false-negative rates, can provide valuable insights into the progress of other diseases and their improvement over time.

This paper presents a retrospective cohort study that compares false-positive and false-negative rates from two sets of data to assess the progress of system improvements over time. As an example, this study uses well-known breast cancer screening databases, as no previous research has compared these two databases. The proposed analysis is essential for enhancing screening procedures and monitoring the progress of other diseases on an annual basis. The new findings of this study reveal that no previous assessments have been conducted to evaluate the effectiveness of the current screening procedures. The Breast Cancer Surveillance Consortium (BCSC) [1] is a collaborative network of six active breast imaging registries and two historic registries focused on research to assess and improve the delivery and quality of breast cancer screening and related outcomes in the US.

To compare the improvement over time, confusion metrics are used with two sets. The accuracy can be calculated with accuracy = (TP+TN)/(TP+TN+FP+FN) where TP, TN, FP, and FN indicate true positive, true negative, false positive and false negative respectively. Sensitivity and specificity can be computed with Sensitivity = TP/(TP+FN) and Specificity = TN/(TN+FP) respectively.

From 1994—2009, 6,028,380 examinations were conducted according to the first result [2]. The result shows that true positive = 0.0042, true negative = 0.9019, false positive = 0.0930, and false negative = 0.0009. Sensitivity = TP/(TP+FN) = 0.8235 and Specificity = TN/(TN+FP) = 0.9065, and accuracy = (TP+TN)/(TP+TN+FP+FN) = 0.9061.

From 2007 to 2013, 401,548 examinations were conducted [3]. According to all diagnostic examinations, the result shows that Sensitivity = 0.8784, Specificity = 0.9047, true positive = 13,915/40,1548 = 0.03465, true negative = 348,963/40,1548 = 0.8690, and false negative = 1926/40,1548 = 0.004796. Therefore, false positive = 0.09155 and accuracy = 0.9037.

The median cost of breast cancer screening was $250 [4]. The cost of breast cancer screening from 1994 to 2009 was $1.507 billion for 16 years, while the cost from 2007 to2013 was only $0.1 billion for 7 years. This suggests that the cost of breast cancer screening has decreased over time. However, the specificity and accuracy of breast cancer screening has not improved. In fact, data shows that the specificity and accuracy of breast cancer screening from 1994 to 2009 were slightly worse than those from 2007 to 2013. This indicates that there has been no improvement in breast cancer screening despite advances in technology. Further research is necessary to determine why this is the case.

Whatever the reason, the lack of improvement in breast cancer screening is a serious problem. Breast cancer is the second leading cause of cancer death among women in the United States. Early detection and treatment are essential for improving survival rates, so it is important that we find ways to make breast cancer screening more accurate. The new findings indicate that policymakers and administrators

should take steps to enhance the effectiveness of the current system on breast cancer screening.

The Annotated Digital Mammograms and Associated Non-Image data (ADMANI) datasets were recently created, comprising 4,411,263 images from 629,863 patients [5]. A subset of these datasets will be made available for the Radiological Society of North America Breast Cancer Detection AI Challenge. In other words, with the availability of large datasets, it is now possible to examine the effectiveness of AI-assisted methods for breast cancer screening with mammograms from the perspectives of accuracy, sensitivity, and specificity.

In 2009, the U.S. Preventive Services Task Force (USPSTF) increased the age of routine mammograms from 40 to 50 [6]. The USPSTF issued a new draft recommendation in 2022, advising women to start screening at age 40 [6]. The task force acknowledged that women with dense breasts are at an increased risk of developing breast cancer. Additionally, they recognized that certain races or ethnic groups have a higher risk of early-onset breast cancer [6]. For example, black women under 50 have twice the mortality rate from breast cancer compared to white women under 50.

The change in the recommended age for breast cancer screening in 2009 may have contributed to a decline in the quality of breast cancer screening between the periods of 1994—2009 and 2007—2013.

Human and animal rights

The author declares that the work described has not involved experimentation on humans or animals.

Informed consent and patient details

The author declares that the work described does not involve patients or volunteers.

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Disclosure of interest

The author declares that he has no competing interest.

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