A Scoping Review of Economic Evaluation of Breast Cancer Screening in China

Jingjing Jiang [1], Shan Jiang [2*], Antonio Ahumada Canale [3], Zhuo Chen [4,5], Lei Si [6], Yawen Jiang [7], Li Yang [8], Yuanyuan Gu [3]*

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INTRO

The cost-effectiveness of conventional population-based breast cancer screening strategies (e.g., mammography) has been found controversial, while evidence shows that genetic testing for early detection of pathogenic variants is cost-effective.

METHODS

By systematically reviewing the economic evaluations of breast cancer screening in China, we aimed to confirm that the conventional strategies were economically unattractive, but the precision medicine technologies improved the cost-effectiveness. We searched PubMed, MEDLINE, and EMBASE to identify the economic evaluations that examined breast cancer screening and testing in China, supplemented by hand-searching the reference lists of the included studies. We finally included five studies that satisfied the reporting quality recommended by CHEERS.

RESULTS

Four articles examined mammography while the rest investigated multi-gene testing. The existing breast cancer screening programs were found cost-effective among urban Chinese women, but one study concluded that they might cause harm to women in rural areas. Multigene testing was found significantly cost-effective and has a promising population impact among all breast cancer women in China. Contextual factors, such as data absence, urban-rural disparity, willingness-to-pay threshold, and model design, imposed barriers to cost-effectiveness analysis.

DISCUSSION

Future research should focus on the cost-effectiveness of screening and identifying breast cancer through precision medicine technologies, including genetic testing, genome sequencing, cascade testing, and the return of secondary findings. These precision medicine technologies may significantly improve the cost-effectiveness of breast cancer screening.

Key Points

Precision medicine technologies improved the **cost-effectiveness** of breast cancer screening strategies.

Future research may focus on screening strategies through precision medicine technologies, including **genetic testing, genome sequencing, cascade testing, and the return of secondary genomic findings.**

CONTACT INFORMATION

Jingjing Jiang - jingjing.jiang@ndph.ox.ac.uk; Shan Jiang - mingshan1018@gmail.com;
Li Yang - lyang@bjmu.edu.cn

Affiliations

1. Health Economics Research Centre, Nuffield Department of Population Health, University of Oxford, Oxford, UK; 2. School of Population and Public Health, The University of British Columbia, Vancouver, British Columbia, Canada; 3. Macquarie University Centre for the Health Economy, Macquarie Business School & Australian Institute of Health Innovation, Macquarie University, Sydney, New South Wales, Australia; 4. Department of Health Policy and Management, College of Public Health, University of Georgia, Athens, Georgia, USA; 5. School of Economics, Faculty of Humanities and Social Sciences, University of Nottingham Ningbo China, Ningbo, Zhejiang, China; 6. The George Institute for Global Health, UNSW Sydney, New South Wales, Australia; 7. School of Public Health (Shenzhen), Sun Yat-Sen University, Shenzhen, Guangdong, China; 8.School of Public Health, Peking University, Beijing, China

* Equal contribution

Study (Year)	Study Aim	Population	Strategies	Study Design	Model Structure	Perspective and Time Horizon	Discount Rate	Outcome Measure
Sun et al. (2018)	To model the cost–effectiveness of a risk-based breast cancer screening programme in urban China, launched in 2012	Urban Chinese women aged 40–69 years with a risk of developing breast cancer	1) Annual ultrasound screening for high-risk women aged 40-44 years, with further mammography screening for women with suspected results; Annual ultrasound and mammography screening for high-risk women aged 45-69 years 2) No screening for women with low risk	CUA	Natural history Markov model	Societal perspective; Life-time	3% for both cost and outcome	Cost per QALY gained
Sun et al. (2019)	To compare for the first time the cost-effectiveness of breast cancer screening using clinical breast examination coupled with ultrasound as a primary screening test compared to no screening in rural China	Rural Chinese women aged 35–64 years from rural area in 31 provinces with no history of breast cancer in China	1) Clinical breast examination coupled with ultrasound, followed by undergoing mammography or clinical judgement if required every 3 years 2) No screening	CUA	Natural history Markov model	Societal perspective; Life-time	3% for both cost and outcome	Cost per QALY gained
Sun et al. (2022)	To estimate cost effectiveness and population impact of multigene testing for all Chinese breast cancer patients.	Breast cancer patients in China	1) BRCA1/BRCA2/PALB2 testing for all BC patients 2) BRCA1/BRCA2-testing for BC patients fulfilling family history/ clinical criteria 3) No genetic testing.	CUA	Patient level microsimulation model	Societal and payer perspectives; Life-time	3% for both cost and outcome	Cost per QALY gained; Cost per life year gained
Wang et al. (2021)	To assess the cost effectiveness of implementing a biennial mammography screening programme for Chinese women.	Urban Chinese women aged 45-70 years	1) Mammography screening every two years 2) No screening 3) Alternative Scenarios including varying the screening interval (2 or 3 years), screening start age (from age of 40, 45 or 50 years) and stop age (65 or 70 years).	CEA	The Simulation Model on radiation Risk and breast cancer Screening (SiMRiSc) model	Societal perspective; Life-time	5% for both cost and outcome	Average cost-effectiveness ratio (ACER); Cost per life year gained
Yang et al. (2018)	To predict the feasibility of a community-based breast cancer screening strategy in China	Women aged 35–69 years in China	1) Annual community- based breast cancer screening (first tested by clinical breast examination, then advised to undergo breast ultrasonography or/and mammography) 2) Biennial community- based breast cancer screening 3) Triennial community- based breast cancer screening 4) No screening	CUA	State-transition Markov model	Societal perspective; 50 years	3% for both cost and outcome	Cost per QALY gained

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