

BMJ Open Where do delays occur? A systematic review of the barriers to early breast cancer diagnosis across South Africa's health system

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ABSTRACT

Objectives Breast cancer is the most common cancer among South African women, yet the country has the lowest 5-year survival rate among the BRICS nations (Brazil, Russia, India, China, South Africa), at just 40%. Earlier diagnosis contributes to survival rates exceeding 90% in many high-income countries. We synthesised the evidence to identify barriers to early breast cancer diagnosis in South Africa and inform policy interventions.

Design A systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines.

Data sources OVID MEDLINE, Global Health, Health Management Information Consortium, Scopus and Web of Science were searched for studies published between 1 January 2015 and 31 March 2025.

Eligibility criteria We included English-language, peer-reviewed studies investigating patient-level, provider-level and/or health system-level barriers to early breast cancer diagnosis among adult women in South Africa. Barriers were classified using the WHO 2017 *Guide to Cancer Early Diagnosis* framework: (1) awareness and access to care; (2) clinical evaluation, diagnosis and staging and (3) access to treatment.

Data extraction and synthesis Two reviewers independently screened studies, extracted data and assessed risk of bias. Findings were synthesised narratively using the WHO framework.

Results 22 studies (n=8518 participants; 5048 women with breast cancer) were included. Step 1 barriers included limited breast cancer knowledge and poor healthcare access, particularly among rural and less educated women. Step 2 barriers included multiple prediagnosis visits and inadequate diagnostic capacity, with delays of 28 days to over 12 months. Step 3 barriers included limited surgical and oncology services, requiring many rural patients to travel for treatment. One-stop clinics were associated with shorter diagnostic intervals.

Conclusions Barriers to early diagnosis occur across the breast cancer pathway in South Africa. Community awareness, culturally grounded education, streamlined referral pathways and equitable investment in diagnostic and oncology services may significantly improve timely diagnosis and breast cancer outcomes.

PROSPERO registration number CRD420261297178.

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ This review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines and synthesised evidence using the WHO *Guide to Cancer Early Diagnosis* framework.
- ⇒ Independent study screening, data extraction and quality assessment by two reviewers reduced the risk of selection and extraction bias.
- ⇒ Most included studies were observational or cross-sectional, making the findings susceptible to recall bias and inaccuracies in routinely collected medical records.
- ⇒ Restricting inclusion to English-language, peer-reviewed studies published between 2015 and 2025 may have excluded relevant locally derived evidence.
- ⇒ Heterogeneity in study designs, outcome measures and definitions of diagnostic delay precluded meta-analysis and necessitated narrative synthesis.

INTRODUCTION

Breast cancer is the most common cancer among women in South Africa, with an annual incidence rate of 37 per 100 000.¹ In 2017, the Department of Health, responding to a 42% increase in breast cancer-related mortality over the preceding decade,¹ declared breast cancer control and prevention a national priority.² However, the country continues to suffer from poor outcomes and has the lowest 5-year survival rate among the BRICS economies (Brazil, Russia, India, China, South Africa), at just 40%.³ In contrast, rates in high-income countries (HICs) often exceed 90%⁴ with significantly lower disability and mortality burden.⁵ This difference is largely attributed to the fact that women in HICs are more likely to be diagnosed at an earlier stage of breast cancer, which increases the possibility of cure.⁶

The disparity between HICs and low- and middle-income countries (LMICs) led to

the formation of the WHO Global Breast Cancer Initiative (GBCI) in 2021.⁴ The GBCI's goal is to increase rates of early diagnosis and treatment of breast cancer in LMICs, with a target of less than 2 months from patient presentation to a pathological diagnosis.⁷ These recommendations drew on findings from the African Breast Cancer—Disparities in Outcomes study, a large prospective cohort study launched in 2016 across five countries in sub-Saharan Africa (SSA).⁷ It concluded that survival would improve most if a greater proportion of women were diagnosed at an earlier stage of disease.⁸

The causes of later diagnosis of breast cancer in SSA are complex and multifactorial.⁹ One review reported low levels of knowledge among the public regarding risk factors and symptoms of breast cancer.¹⁰ Agodirin *et al*¹¹ found that, across Africa, women who regularly performed breast self-examination (BSE) were more likely to seek help for new symptoms and be diagnosed at an earlier stage of disease. Meanwhile, Gbenonsi *et al*¹² highlighted the need for countries to implement standardised clinical competencies for their healthcare workers, including knowledge of how to perform clinical breast examination (CBE).

Both BSE and CBE have been recommended as alternatives to mammography screening in SSA, primarily due to the financial and logistical challenges of establishing national mammography-based screening programmes in lower-resource settings.^{13 14} However, a separate review exploring the use of CBE as a screening tool in SSA found that a variety of personnel perform the examinations, including trained lay persons, community health workers (CHWs) and healthcare professionals.¹⁴ While differences between countries are expected, such heterogeneity precludes further comparative analysis to determine the effectiveness of these interventions, limiting the value of these studies for individual countries trying to establish their own breast cancer screening guidelines.

Currently, only four countries in SSA have national breast cancer screening programmes: Kenya, Mozambique, Rwanda and the Seychelles.¹⁵ The modality used is not standardised; however, BSE and CBE are more common than ultrasound and mammography.¹⁵ South African guidelines recommend screening for all women from 40 years of age, yet these have not been fully implemented.¹⁶ In contrast, all European countries offer some form of national breast cancer screening, with the majority using mammography as the gold standard.¹⁷ The mortality benefits gained from these programmes require high participation rates among the public,¹³ while in South Africa, mammography screening is confined to select groups of urban women with private or employer-funded medical insurance.¹⁸

The South African context presents unique health system challenges. The legacy of apartheid-era policies has created a dual health system with inequities in resource distribution, including workforce concentration in private urban facilities serving affluent minorities and weak primary care capacity in rural public settings.¹⁹ This

structural fragmentation means that cancer diagnosis and treatment differ for patients based on geography, insurance and socioeconomic status. Previous reviews examining cancer control in SSA have highlighted systemic barriers, including weak referral systems, limited diagnostic capacity and treatment access constraints,²⁰ but have not systematically examined how these manifest within South Africa's health system architecture. The WHO's International Agency for Research on Cancer has recommended that future research should evaluate the 'context-specific drivers of advanced stage at diagnosis... because the drivers vary between African settings'.⁷ This systematic review addresses this gap by synthesising the evidence regarding barriers to early diagnosis of breast cancer specifically within the South African context.

Understanding these barriers requires a broad health system perspective that examines how multiple components interact to facilitate or impede timely care. Unger-Saldana and Infante-Castañeda's model of total delay²¹ distinguishes between patient delay (symptom recognition to first consultation), provider delay (first consultation to diagnosis) and system delay (diagnosis to treatment initiation), emphasising that interventions must address all three domains. Similarly, the Pathways to Treatment framework²² identifies four key intervals, including appraisal (symptom recognition), help-seeking, diagnostic evaluation and treatment. These frameworks align with the WHO's three-pillar approach to early cancer diagnosis (figure 1), which emphasises that improving awareness without strengthening diagnostic and treatment capacity will fail to improve outcomes.²³ This review will use this framework to provide policymakers in South Africa with clear, context-specific policy recommendations to improve rates of early breast cancer diagnosis.

METHODS

The protocol for this review was preregistered with PROSPERO (CRD420261297178), and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist was followed (see online supplemental data).²⁴

Inclusion and exclusion criteria

The inclusion criteria were kept intentionally broad to capture a comprehensive picture of barriers to early diagnosis of breast cancer across South Africa's health system. Peer-reviewed journal articles published between 1 January 2015 and 31 March 2025 in English were searched. The population of interest was all adult women (over 18 years of age) living in South Africa, with or without a pathological diagnosis of breast cancer. Barriers to early diagnosis included patient, provider and/or health system factors across the three steps of the WHO's 2017 framework. For example, quantitative studies analysing health system delays, observational studies following patients through their diagnostic journey and qualitative studies exploring patient and/or provider opinions were

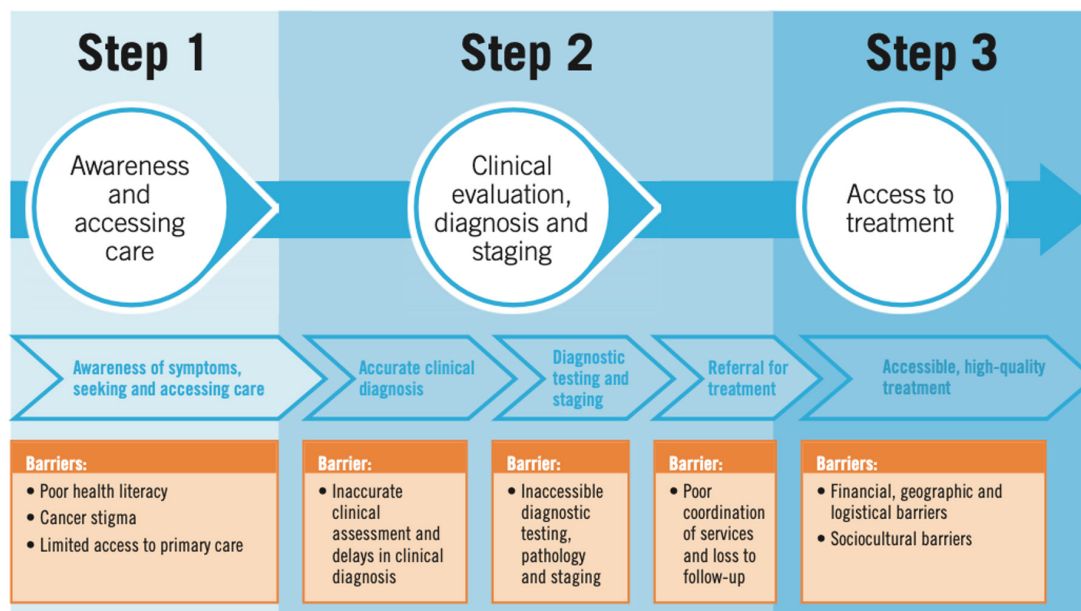


Figure 1 Barriers to early cancer diagnosis. Reproduced from: WHO. *Guide to Cancer Early Diagnosis*. 2017. Licence: CC BY-NC-SA 3.0 IGO.

all eligible. Previous literature reviews and meta-analyses were excluded.

Search strategy

A comprehensive search strategy was developed with the assistance of a librarian with a background in health policy from the London School of Economics and Political Science (see online supplemental data). On 12 March 2025, the following databases were searched using appropriate adaptations of search terms for each database: OVID MEDLINE, Global Health and Health Management Information Consortium, Scopus and Web of Science. De-duplication was performed using Rayyan software and EndNote V.21 according to validated protocols.²⁵

Titles and abstracts were screened against the inclusion and exclusion criteria by two independent reviewers using Rayyan software. Full texts were retrieved and screened independently by the same two reviewers. Conflicts were resolved by consulting a third reviewer to produce the final list of articles for analysis. Lastly, the reference lists of all included articles were searched for additional studies that met the inclusion criteria. Grey literature, including government documents and breast cancer guidelines,² were used to provide context but were not included in the database search.

Data extraction and quality appraisal

Relevant data from all included studies were extracted independently by two reviewers using a customised table in Microsoft Word. This included the demographics of study participants, study setting (primary/secondary/tertiary care; rural vs urban), the methodology used, key findings (categorised using the WHO framework) and implications for future policy and research. If data were unavailable for a given category, this was marked as 'not reported'. The quality of the studies, including data

collection methods and risk of bias, was assessed using the Critical Appraisal Skills Programme 2024 validated checklists, which provide a structured and widely accepted approach for appraising observational and qualitative study designs (see online supplemental data).²⁶

Synthesis of findings

A narrative synthesis was performed using the WHO 2017 framework. This facilitated the comparison of studies focusing on similar steps of the framework to create a comprehensive picture of the barriers to early diagnosis of breast cancer throughout the patient journey. Policy and research implications were derived from the studies to inform a set of key recommendations for future interventions and to highlight areas for future research.

Patient and public involvement

There was no involvement of patients or the public in this research study.

RESULTS

Search results

A total of 662 articles were identified from the online database search. After de-duplication, 374 individual articles were screened, of which 27 were eligible for full-text screening. In total, 22 articles met the inclusion criteria for the final analysis (figure 2).

Study characteristics

A summary of the included studies' characteristics is shown in table 1. All studies and their key findings are presented in online supplemental table 1. In total, 8518 participants were included: 5048 breast cancer patients; 3470 women without breast cancer; 46 healthcare professionals and 9 health facility

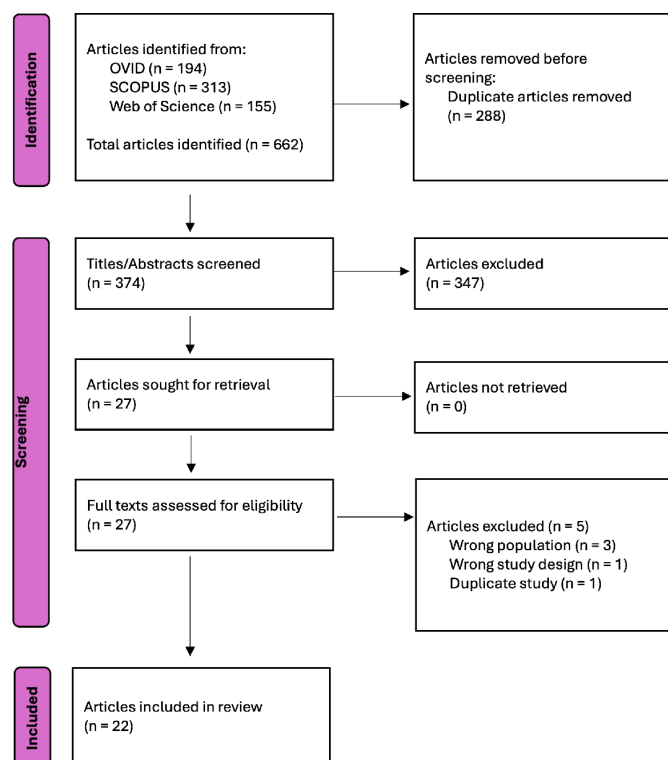


Figure 2 Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram.

managers. Sample size ranged from 10 in one qualitative study²⁷ to 3497 in a national cross-sectional study.²⁸ The age range was 22–100 years. Most studies were cross-sectional (n=15), in which patients were given questionnaires and/or their medical records were accessed at a single point in time. The remaining seven were qualitative studies that used semistructured interviews and focus group discussions to gain a more nuanced understanding of the barriers to early breast cancer diagnosis as perceived by the participants. Most studies (n=19) included subjects from urban settings, with less than half (n=10) exploring barriers among rural populations. As shown in figure 3, most studies were performed in the populous cities of the Gauteng (n=11) and Western Cape (n=6) provinces. KwaZulu-Natal was the most common province for the inclusion of rural communities (n=6). With regard to the steps of the WHO framework, the majority of studies (n=21) explored breast cancer awareness and barriers to accessing care (step 1), just over half (n=11) explored delays in clinical evaluation, diagnosis and staging (step 2) and a minority of studies (n=4) explored barriers to access to treatment (step 3).

Barriers to early diagnosis

Table 2 summarises the most common barriers to early diagnosis of breast cancer identified using the corresponding steps in the 2017 WHO framework.

Table 1 Summary of study characteristics

Study methodology	Number of articles (n=22)
Cross-sectional/observational	15
Patient questionnaires and medical records	6
Patient questionnaires only	8
Medical records only (retrospective)	1
Qualitative	7
Interviews only	5
Focus groups and interviews	2
Year of publication	
2015–2019	11
2020–2024	11
Steps of the WHO framework explored	
Step 1: awareness and access to care	21
Step 2: clinical evaluation, diagnosis and staging	11
Step 3: access to treatment	4
Rural/urban	
Urban	19
Rural	10
Setting (province)	
Gauteng	11
Western Cape	6
KwaZulu-Natal	6
Eastern Cape	4
Limpopo	3
Free State	2
North West	1
Mpumalanga	1
Northern Cape	1

Barriers in step 1 of the WHO framework: awareness and access to care

Health literacy, beliefs and attitudes

The time delay between symptom recognition and first presentation ranged from 23 days²⁹ to more than 3 months.^{28 30} The most commonly cited barrier in this step of the framework was a lack of breast cancer knowledge, including its causes, risk factors, signs and symptoms. This applied to women in both urban and rural settings but was more pronounced among rural populations²⁸ and women with lower levels of education.^{31–33} Botha *et al*³⁰ found that a lack of symptom recognition contributed to an average delay of 3 months before patients presented to a medical facility. Rayne *et al*³⁴ reported a median of 2 months, citing a lack of home internet access that correlated with delays in acknowledging symptoms. Regarding the use of BSE as a screening tool, Moodley *et al*²⁹ found that 55% of

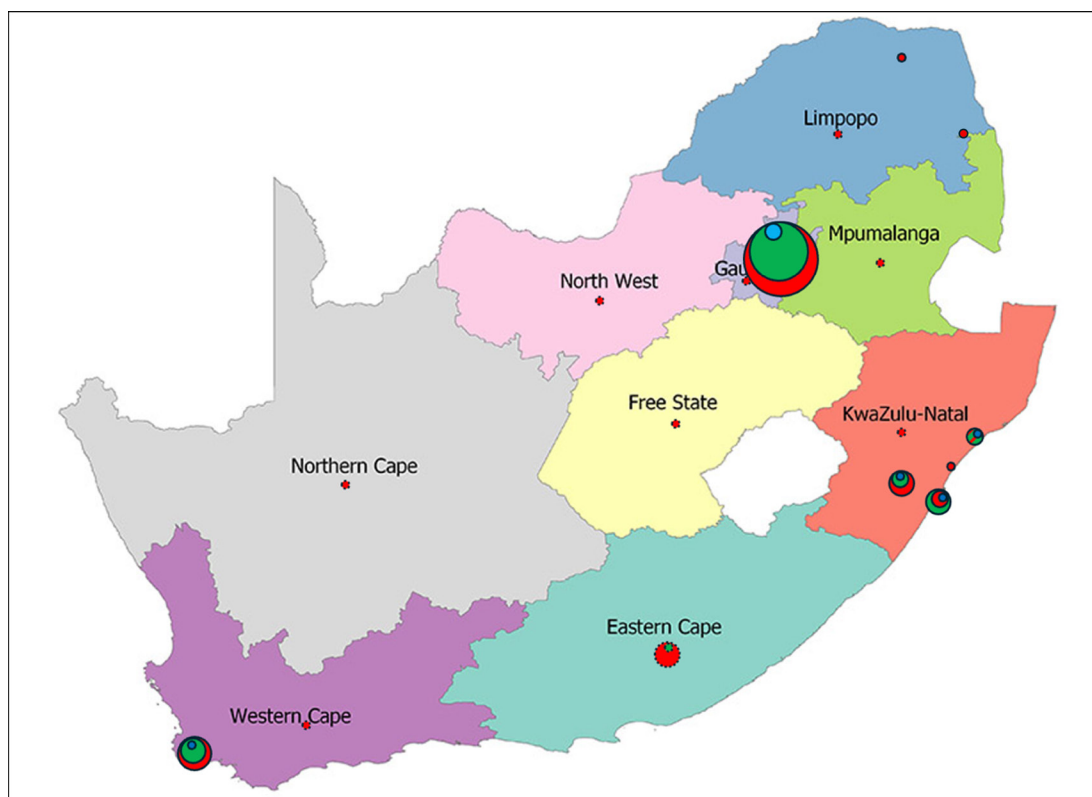


Figure 3 Study locations and the step(s) in the WHO framework they explored. Awareness and access to care (red); clinical evaluation, diagnosis and staging (green); and access to treatment (blue). Circle sizes are proportional to the number of studies exploring that step in the framework (a striped colour pattern indicates equal numbers). Dashed circle lines indicate that the exact study location within the province is not clear.

participants from a tertiary hospital in Cape Town regularly performed BSE, whereas studies by Ramathuba *et al*³³ and Sarmah *et al*³⁵ from rural settings reported very little knowledge of BSE due to a lack of screening campaigns in these communities.

Low breast cancer awareness was often compounded by fear of diagnosis and treatment,^{31 36} including the belief that breast cancer is a fatal disease.³⁷ Malope *et al*³⁸ found that this belief was fuelled by stigma surrounding breast cancer within their urban community in Soweto. Consultation with traditional healers was common among study participants in both urban and rural settings,^{31 35 39} and one study found that patients who used traditional remedies often delayed seeking care and subsequently presented with late-stage disease.³⁷ Furthermore, discrepancies between women's anticipated behaviour and their health-seeking actions were observed. The studies by Moodley *et al*⁴⁰ and Harries *et al*²⁷ were performed at similar time points and across the same sites in the Western and Eastern Cape provinces. While the former study found that the majority (89%) of asymptomatic women anticipated seeking care for breast changes within 1 week of symptoms arising, the latter study interviewed symptomatic women and found that many of them had delayed seeking care in the first instance to monitor symptom progression.

Socioeconomic barriers

Financial barriers were common and led to difficulties accessing care. These included taking time off work³⁰ and prohibitive transportation costs.³⁴ The study by Rayne *et al*³⁴ showed that a lower level of formal education significantly exacerbated the fear of missing work ($p=0.008$), while Harries *et al*²⁷ reported greater financial constraints among rural women. In the urban setting, Lince-Deroche *et al*⁴¹ calculated the average cost for seeking breast cancer screening at US\$13.8, a small proportion of the participants' average monthly household income of US\$488. Nonetheless, screening uptake via all modalities (BSE/CBE/mammography) was low. Peresu *et al*³⁹ found that BSE and CBE were more common among women in formal employment and Phaswana-Mafuya and Peltzer⁴² showed that women were more likely to have undergone mammography screening if they had a higher level of formal education and/or private insurance.

Health system barriers

A number of studies ($n=7$) reported women being deterred by unpleasant experiences at health facilities. This included rude clinic staff and language barriers at a community centre in Johannesburg³⁸ and long wait times at a tertiary clinic in Cape Town.⁴³ The latter study found that, while the majority of women attended public medical facilities for

Table 2 Barriers to early diagnosis of breast cancer identified using the WHO framework

Step 1: awareness and access to care	
Health literacy, beliefs and attitudes	Articles (n)
▶ Lack of breast cancer knowledge (eg, causes, signs and symptoms, knowing how to perform BSE)	15
▶ Fear of diagnosis and/or treatment (including stigma)	9
▶ Consulting a traditional healer first and/or belief that faith/religion can cure cancer	6
▶ Seeking help/screening only when symptoms persisted or persuaded by family member or friend	5
▶ Lack of a preventative healthcare culture in the community	4
Socioeconomic barriers	
▶ (Perceived) financial difficulties accessing care	11
▶ Lower level of education	7
▶ Living in a rural setting (including lack of internet access)	6
▶ Being unemployed	2
▶ Lack of private insurance (eg, for screening)	1
Health system barriers	
▶ Unpleasant experiences/long waiting times at public facilities	7
▶ Lack of local screening programmes or campaigns	2
▶ Long distance to the nearest primary care facility	2
▶ Lack of an open-access breast clinic	1
Step 2: clinical evaluation, diagnosis and staging	
▶ Multiple health visits prior to diagnosis	5
▶ Lack of routine CBE during clinic appointments	3
▶ Delays obtaining radiology scans	2
▶ Delays obtaining clinic appointments/test results (eg, lack of resources in clinic)	2
▶ Long distances/additional referrals to attend a diagnostic facility	2
▶ Difficulties navigating the referral system	2
▶ Lack of provider awareness of breast cancer management	2
▶ Delays to biopsy when referred from public versus private clinic	1
Step 3: access to treatment	
▶ Lack of surgical capacity	2
▶ Constrained chemotherapy and/or radiotherapy services	1
▶ Delays obtaining radiology scans	1

.BSE, breast self-examination; CBE, clinical breast examination.

financial reasons, private facilities were perceived to be of higher quality. Geographical variation in access to care was evident and revealed disparities between rural and urban populations. Mapanga *et al*²⁸ analysed data for 3497 breast cancer patients across five tertiary hospitals and found that only in Soweto was there an open-access breast clinic where no referral was required.²⁸ In contrast, rural hospitals had a higher proportion of patients (38% in Empangeni compared with 26% in Soweto) who delayed seeking care for more than 3 months after first noticing symptoms, despite offering weekly breast clinics. Sarmah *et al*³⁵ found that rural women were often deterred by the long distances to their nearest primary care facility, which may explain this delay.

Barriers in step 2 of the WHO framework: clinical evaluation, diagnosis and staging

The most common barrier in this category (n=5) was undergoing multiple health visits prior to obtaining a pathological diagnosis of breast cancer. Mapanga *et al*²⁸ showed that this disproportionately affected patients in rural communities, most of whom (64%) were referred to breast units indirectly via secondary hospitals as opposed to directly from primary care, which was the most common pathway in the urban setting. The Johannesburg clinics evaluated in the study performed diagnostic biopsies on site, whereas 90% of patients in rural Empangeni were sent to a district secondary hospital for biopsy, with 75% living more than 60km away from the diagnostic facility. Women diagnosed at the Empangeni site

had a corresponding fourfold increase in the prevalence of late-stage diagnosis compared with women diagnosed in Johannesburg. However, at a separate clinic in urban Johannesburg, Joffe *et al*³⁶ found that late-stage disease was also more common in patients who had multiple prediagnosis visits via secondary hospitals (OR 2.73 for patients who had three or more visits).

Botha *et al*³⁰ reported an average delay of 4 months between first health visit and diagnostic biopsy among breast cancer patients treated at a tertiary hospital in Johannesburg. The delay was far greater for patients being referred from the public sector (median 7 months' delay) compared with those referred from the private sector (median one and a half months' delay). In addition, only a minority (8/79) of patients received staging scans prior to their first oncology appointment, causing delays in starting treatment. Tshabalala *et al*⁴⁴ interviewed healthcare providers at eight primary care clinics in Johannesburg. They cited difficulties navigating the complex referral system, with delays in receiving test results causing patients to be lost to follow-up, and acknowledged that they lacked the requisite clinical skills (including knowledge of how to perform CBE) and awareness of breast cancer guidelines. The study by Malope *et al*³⁸ supported this finding, with women attending a primary care clinic in Johannesburg expressing concerns about the quality of care provided, including a lack of routine CBE during consultations.

Barriers in step 3 of the WHO framework: access to treatment

Few studies (n=4) evaluated barriers in this step of the pathway. In the country-wide study by Mapanga *et al*²⁸ the hospital in Pietermaritzburg (treating a mixture of urban and rural patients) shared surgical services with regional hospitals and had constrained chemotherapy services with waiting times often exceeding 60 days. Therefore, patients with locally advanced tumours often underwent more aggressive (and morbid) surgery upfront. Only the Johannesburg and Durban sites had adequate chemotherapy services, with waiting times less than 60 days. Therefore, these centres received referred patients from Soweto and Empangeni, respectively. Similarly, all patients diagnosed at the rural Empangeni site were sent to Durban for treatment because of limited resources.

Botha *et al*³⁰ reported an average of 18 days from referral to starting treatment at an academic hospital in Johannesburg, with longer delays for patients waiting for additional imaging. Therefore, access to treatment contributed less towards the 12 month total delay between first symptom and treatment; a lack of breast cancer awareness and delays in accessing care were more important. Meanwhile in Cape Town, patients diagnosed at an open-access breast clinic started treatment after a median of 37 days from diagnosis.²⁹ Surgical capacity was constrained, with women waiting a median of 40 days to have their operation, compared with 14 days to start chemotherapy. Once more, treatment delays comprised a relatively small proportion (37/110 days) of the overall delay.

Quality assessment

Cross-sectional/observational studies

Overall, the quality of these studies was good (see online supplemental data). Two studies did not provide evidence of whether their questionnaire had been validated^{30 31} and one acknowledged that their questionnaire was heavily subjective.⁴²

Qualitative studies

Overall, the quality of these studies was very good (see online supplemental data). Three studies did not explicitly comment on whether they had explored or ruled out bias within the researcher-participant relationship,^{38 43 45} and two did not clearly state whether ethical issues had been accounted for.^{43 45}

DISCUSSION

This systematic review synthesises the barriers to early diagnosis of breast cancer in South Africa using the WHO's *Guide to Cancer Early Diagnosis* framework.²³ Across 22 studies, delays were identified at all steps of the patient pathway: (1) awareness and access to care; (2) clinical evaluation, diagnosis and staging and (3) access to treatment. These steps are interdependent, with improvements in one domain unlikely to achieve better outcomes without concurrent strengthening across the entire care continuum.

Most studies focused on evaluating barriers in step 1 (awareness and access to care). Longer delays were associated with lower levels of breast cancer knowledge, lower educational attainment^{34 36} and rural residence.^{31 40} These findings are consistent with broader evidence across SSA showing that religious beliefs and stigma can promote fear of a breast cancer diagnosis, including perceptions of deformity after mastectomy.⁴⁶ Educational intervention offers one solution.⁴⁷ Eskandari-Torbaghan *et al*⁴⁸ demonstrated a significant increase in patient awareness and risk perception scores after a three-session oral and written intervention in Iran, a middle-income country like South Africa. Local context is important, and it has been proposed that such educational campaigns should be delivered in close collaboration with traditional healers,⁹ whose role as a trusted source of information across both urban and rural parts of South Africa was evident in this review.

Recent evidence suggests that many women in South Africa have positive attitudes towards seeking care for breast changes, yet delayed presentation remains common.¹⁶ In our review, Moodley *et al*⁴⁰ found that women anticipated seeking care within 1 week of symptoms, yet such a short timeframe was not observed in any study. This discrepancy could be due to participants' social desirability bias when responding to surveys but could also represent a genuine disconnect between their anticipated and observed health-seeking behaviour. Raising awareness remains just one piece of the puzzle. Abdul Rehman *et al* evaluated barriers to breast cancer

care in Pakistan (an LMIC) and identified seven other themes that are closely interlinked and, therefore, cannot be addressed in isolation: accessibility, affordability, fear, hesitancy/embarrassment, cultural traditions, commitments and physician error.⁴⁹ Meanwhile, Hoveling *et al* conducted a review of breast cancer diagnostic delays across HICs and reported many similar barriers, including fear, low income, underinsurance and policy gaps.⁵⁰ These overlap significantly with the barriers identified in our review, implying that many of the root causes of delayed breast cancer diagnosis are universal. While local context matters, governments in both HICs and LMICs can learn from the successes and failures of one another's policies.⁵¹

Barriers in step 2 of the early diagnosis pathway included multiple prediagnosis visits, inefficient referral processes and limited diagnostic capacity, especially in the public sector.³⁰ South Africa's two-tier health system disproportionately benefits white middle-class urban residents, who make up the majority of the 16% of individuals with private insurance,¹ and in 2017, the government's national cancer plan recommended the implementation of public-private partnerships to 'increase capacity in the public sector'.⁵² Of note, the 28-day diagnostic interval reported by Moodley *et al*²⁹ occurred for patients in the public sector and was an outlier in this review. Despite 54% of patients attending more than four primary care visits before being referred to a specialist, they benefited from direct referral from primary care to an open-access one-stop breast clinic with imaging and diagnostic

capabilities on site. These clinics are the standard of care in England's National Health Service (NHS), which recommends a diagnostic interval of 28 days⁵³—half the 2-month target set by the GBCI (figure 4).⁴ The implication is that, with targeted investment, earlier diagnostic intervals can be achieved within South Africa's public health system.

Treatment delays contributed less to overall delays than earlier stages but remain important, particularly for patients travelling long distances or requiring referral between facilities. A recent review of barriers to radiotherapy access in SSA found large disparities across the region, with 25 countries collectively having fewer treatment centres than South Africa alone.²⁰ South Africa was comparatively well-resourced, yet significant barriers to equitable access remain. Only 20% of South Africa's clinical and radiation oncologists work within the public sector, which serves more than 80% of its population, and underserved regions like the Eastern Cape are disproportionately affected by a lack of treatment infrastructure.⁵⁴ In this review, two public hospitals in Johannesburg and Durban were able to cut waiting times for chemotherapy to within 60 days³²; however, this falls far short of the GBCI's target of 1 month.⁵⁵ Moodley *et al* reported the shortest treatment interval for chemotherapy of 14 days at a public hospital in Cape Town, but this increased to 40 days for patients undergoing upfront surgery²⁹ and would have been far longer if it were not for the non-governmental organisation (NGO) Project Flamingo, which helped provide extra theatre lists on weekends and public holidays.

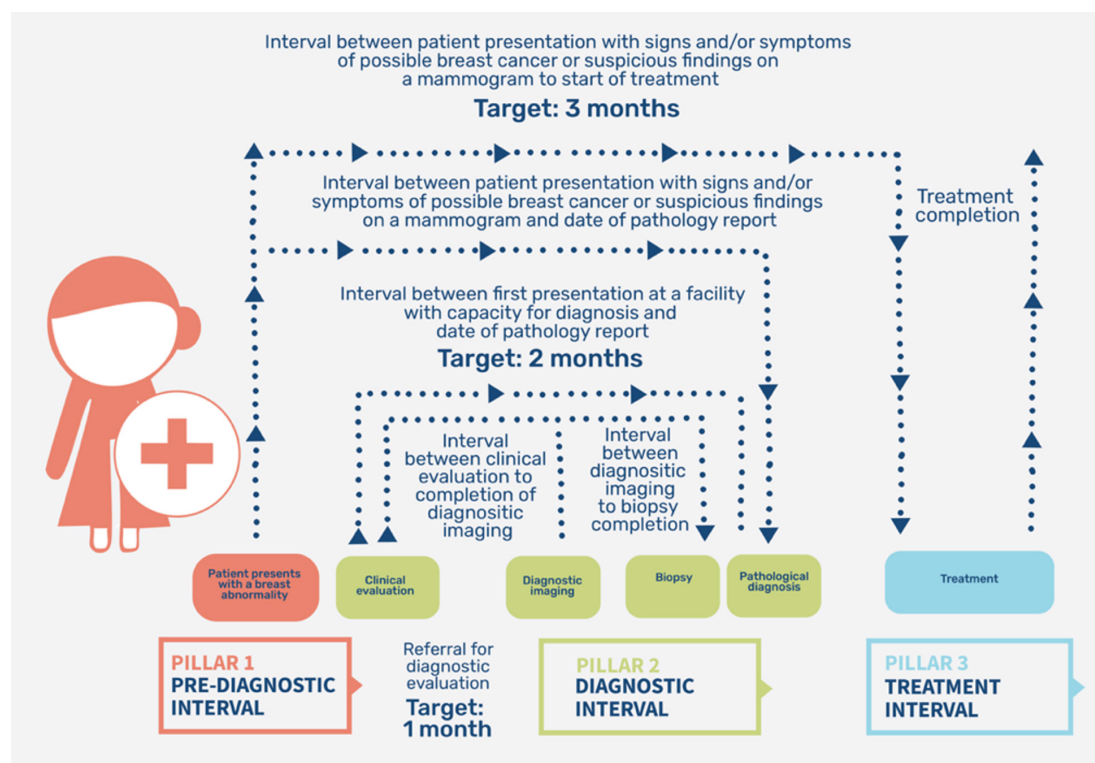


Figure 4 The Global Breast Cancer Initiative (GBCI) targets for intervals between patient presentation and starting breast cancer treatment. Reproduced from: the Global Breast Cancer Initiative: operational approach based on 3 pillars of action. World Health Organization online; 2021. Licence: CC BY-NC-SA 3.0 IGO.

Policy implications

As our understanding of breast cancer advances, its diagnosis and management are becoming increasingly complex and resource-intensive.⁵⁶ Many public sector hospitals in South Africa are shifting towards the recommended 'triple assessment' approach to diagnosis that combines clinical examination, imaging and diagnostic biopsy, while treatment is increasingly being dictated by multidisciplinary teams at specialist centres.⁴⁷ This mirrors the current standard of care in England's NHS. Despite England's well-established mammography-based screening programme, most breast cancers (as in South Africa) are diagnosed via the symptomatic pathway,⁵⁷ and there is significant variation in rates of early diagnosis across different regions and socioeconomic groups. A population-based mammography screening programme in South Africa is not feasible due to limited resources, but one study found that integrating CBE with artificial intelligence (AI)-based risk prediction tools (using demographic, clinical and lifestyle information) may help identify women most likely to benefit from further diagnostic evaluation.⁵⁸ Of note, the comparison between AI and CBE was not statistically significant, and larger multi-centre studies incorporating cost-effectiveness analyses are needed before implementation at scale.

Box 1 summarises the key recommendations from the studies in this review for South African policymakers. These recommendations target both demand-side (patient/community) and supply-side (health system) factors. Step 1 recommendations focus on community-based interventions that encourage multisectoral collaboration (including religious leaders and CHWs) to raise breast cancer awareness and support patients in navigating the health system. A multifaceted approach is required to address the social determinants of health (eg, level of education and financial constraints) because these have a large influence on care-seeking behaviour.⁴⁷ Step 2 recommendations centre around streamlining breast cancer diagnosis through direct referral pathways to specialist units and highlight the need to invest in digital technologies. Regular monitoring and audits, including high-quality breast cancer registries, are crucial to evaluate future performance.²³ Lastly, step 3 recommendations focus on the equitable distribution of breast cancer services across tertiary and provincial hospitals, in addition to funding training opportunities in oncology specialties and supporting partnerships with NGOs and the private sector to improve service delivery across South Africa.

Health system implications: the dual system challenge

The findings of this review must be interpreted within the context of South Africa's unequal dual health system, which has fundamentally shaped cancer diagnosis pathways. As highlighted, the large difference in diagnostic intervals between public and private sectors reveals that barriers to early diagnosis are not equally distributed but concentrated among those dependent on public care. This creates structural

Box 1 Policy recommendations for each step of the early diagnosis pathway

Step 1: awareness and accessing to care

- ⇒ Health education campaigns^{29 38}: use radio, television, churches and schools to disseminate culturally sensitive breast cancer information, including how to perform BSE.
- ⇒ Community engagement^{35 44}: involve traditional healers, CHWs and religious leaders to improve breast cancer awareness and build trust in the health system.
- ⇒ Financial and logistical support^{34 41}: provide transport vouchers for poorer/rural patients and include diagnostic costs in public health coverage; use CHWs to provide community-based navigation services.

Step 2: clinical evaluation, diagnosis and staging

- ⇒ Community-based screening^{31 35}: use mobile units/clinics and train PCPs to perform opportunistic screening with CBE.
- ⇒ Open-access breast clinics²⁸: invest in one-stop (triple assessment) breast clinics in centres with diagnostic capabilities and streamline direct referrals to these clinics from primary care.
- ⇒ Electronic medical records^{44 63}: establish digital reporting of test results and electronic referral tracking systems, including in rural clinics, to avoid delays in diagnosis and facilitate regular audits.

Step 3: access to treatment

- ⇒ Specialist units and staff³⁰: increase the number of accredited breast units, especially in provincial hospitals, and fund fellowship programmes in oncology specialties.
- ⇒ Optimal treatment services^{30 32 63}: strengthen provincial units to provide neoadjuvant therapies for locally advanced/higher risk patients and fast-track those with early-stage disease for surgery.
- ⇒ Public—NGO partnerships²⁹: provide government support for NGOs (e.g., Project Flamingo) to expedite care, in alignment with national breast cancer goals.

inequities whereby the ability to pay determines time to diagnosis. The good performance of certain public facilities (eg, 28-day diagnostic interval in Cape Town) demonstrates that public sector excellence is achievable with adequate resources and streamlined processes. However, these remain isolated examples that reflect the fact that South Africa's low breast cancer survival rates are the product of health system design choices rather than just resource constraints.

The challenge is therefore not just to improve diagnostic and treatment capacity but a political-economic one⁵⁹ that aims to redistribute resources and infrastructure so that high-quality diagnostic pathways are accessible to all South Africans regardless of insurance status or geography. The National Health Insurance Act currently under negotiation represents an attempt to address this challenge, but implementation has faced substantial obstacles, including fiscal constraints and resistance from vested interests in the private sector.⁶⁰ National cancer control policies cannot succeed in isolation from these broader health system reforms.

Research implications

This review reveals several crucial evidence gaps requiring research attention. First, no studies employed rigorous economic evaluation to assess the cost-effectiveness of

specific interventions (eg, one-stop clinics, CHW-led awareness programmes and digital referral systems). Such analyses are essential for resource allocation decisions in fiscally constrained contexts.^{61 62} Research should compare the cost savings per additional early-stage breast cancer diagnosis achieved across different interventions. Second, implementation science research is needed to understand how successful interventions, such as the Cape Town one-stop clinic, can be adapted and scaled to different settings across South Africa. Third, equity-focused research should explicitly examine how interventions impact different population subgroups. Fourth, longitudinal studies tracking patients through the entire diagnostic and treatment pathway are needed to identify where delays accumulate and which bottlenecks are most amenable to intervention. The current evidence base relies on cross-sectional studies, limiting understanding of temporal dynamics and causal pathways. Finally, mixed-methods research can yield richer insights. As noted earlier, qualitative and quantitative studies from the same facility reported different diagnostic intervals, suggesting that different methodologies capture different aspects of the patient journey.

Limitations

This review has limitations that need to be considered when interpreting the results. First, most of the included studies used an observational or cross-sectional approach and therefore relied on patient recall via questionnaires and/or retrospective analysis of patient records. These are subject to recall bias and rely on the accuracy of the medical record, respectively. Most studies were, however, of good quality and used validated questionnaires. Second, articles were excluded if they were not published in peer-reviewed journals, were written in a language other than English or were published before 2015. This 10-year timeframe was chosen to capture studies that could be interpreted within the context of the recent movement towards prioritisation of early diagnosis in South Africa.² The exclusion of articles from non-English language journals may, however, have missed relevant studies from local research groups, for example, in rural communities. Lastly, the heterogeneity of the methodologies used in the quantitative studies meant that further meta-analysis could not be performed to synthesise these findings.

CONCLUSIONS

This systematic review has synthesised the latest evidence to identify barriers to early diagnosis of breast cancer in South Africa using the WHO's 2017 *Guide to Cancer Early Diagnosis* framework. Our findings demonstrate that delays occur across all stages of the patient journey, with compounding effects that extend from symptom recognition to treatment initiation and fall far short of international targets. The achievement of 28-day diagnostic intervals in certain public facilities shows that excellence is possible within resource constraints but requires integrated service delivery alongside streamlined referral pathways and adequate diagnostic capacity. Barriers in step 1 of the pathway include inadequate

breast cancer knowledge, cultural beliefs (eg, societal stigma) and socioeconomic inequalities. Barriers in step 2 include low levels of provider awareness, lack of routine CBE and limited specialist capacity, particularly outside urban centres. Barriers in step 3 include constrained surgical and oncology services, requiring many patients to travel long distances to urban centres.

Interventions to address these barriers include culturally grounded community-level education developed in partnership with trusted local leaders and financial assistance for poorer communities (step 1); investment in one-stop clinics, provider training and streamlined referral processes supported by robust digital infrastructure (step 2) and strengthening provincial oncology units while fostering sustainable public-NGO partnerships to further enhance capacity in the public sector (step 3). However, the evidence indicates that isolated interventions targeting single barriers will fail, and a coordinated multilevel approach is required. Critically, these recommendations must be implemented alongside broader health system reforms addressing the structural inequities of South Africa's dual health system. Only through such comprehensive approaches can South Africa reduce diagnostic delays, improve patient outcomes and advance towards achieving national and international targets for timely breast cancer care.

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