Breast Cancer Screening Program in Morocco: Status of implementation, organization and performance

Partha Basu, Farida Selmouni, Latifa Belakhe, Catherine Sauvaget, Loubna Abousselham, Eric Lucas, Richard Muwonge, Rengaswamy Sankaranarayanan and Youssef Chami Khazraji

1Screening Group, International Agency for Research on Cancer, Lyon, France
2Department of Epidemiology and Disease Control, Ministry of Health, Rabat, Morocco
3Department of Population, Ministry of Health, Rabat, Morocco
4Research Triangle Institute, International-India, Commercial Tower, Pullman Hotel Aerocity, New Delhi, India
5Lalla Salma Foundation for Cancer Prevention and Treatment, Rabat, Morocco

Breast Cancer Screening Program was introduced and rolled out in Morocco in 2010. Women between 40 and 69 years are screened at the primary health centers (PHC) with clinical breast examination (CBE). A comprehensive evaluation of the program was conducted in 2016–2017 for quality assurance and mid-term course correction. The evaluation process involved: in-depth interviews of program managers; focus group discussions with service-providers of screening, diagnosis and treatment; supportive supervisory visits to randomly selected PHCs and diagnostic centers; desk review of the national guidelines and other published documents; and analysis of the performance data compiled by the program-in-charge. We found that the program has strong political support, a well-organized management structure and documented national policy and protocol. In absence of a mechanism to identify and invite the eligible women individually, the program is opportunistic in nature. Every PHC is provided with an annual target to be screened. A highly visible annual campaign to educate and motivate women has a major impact on participation. Record keeping and data collection are paper-based. In the years 2015 and 2016, 1.1 and 1.5 million women were screened, respectively. In the year 2015, 62.8% of the annual target population was covered, CBE positivity was 3.2%, a further assessment rate of screen-positive women was 34.1% and the breast cancer detection rate was 1.0/1000 women. Systematic paper-based data collection enabled the assessment of some of the process and outcome indicators. The screening coverage was moderate and the cancer detection rate was low.

Introduction

Breast cancer is leading cancer among females in Morocco, with an age-standardized incidence rate of 40.8 per 100,000 person-years and mortality rate of 18.0 per 100,000 person-years in the year 2012. The mean age at diagnosis of 49.5 years is approximately 10 years earlier than that reported in the Western world. The National Breast Cancer Screening Program was introduced and rolled out across all the 12 regions of Morocco in the year 2010, after the implementation and evaluation of a pilot project in Temara province. The major stakeholders in program implementation, in addition to the Ministry of Health (MoH) were the Lalla Salma Foundation for Cancer Prevention and Treatment (LSFCPT) and the United Nations Population Fund (UNFPA).

A core group of national and international experts supported by the MoH drafted the screening protocol in the year 2010. The target age for the biennial screening program was 45–69 years initially. The protocol was revised in 2016 to lower the age at screening initiation to 40 years. Trained nurses, midwives and general practitioners perform clinical breast examination (CBE) at the primary health centers (PHC) and refer the screen-positive women to the nearest Cancer Early Detection Center (CEDC) for further assessment. The CEDCs (total 27 across the country) are the diagnostic centers equipped with facilities for surgical consultation, digital mammography, breast ultrasound, core biopsy and fine needle aspiration cytology (FNAC).
What’s new?
The rising incidence of breast cancer is a tremendous public health challenge in the developing world. Clinical breast examination is a promising approach provided effective diagnosis, timely treatment, and adequate resources. Here, the authors conducted a comprehensive evaluation of the Breast Cancer Screening Program in Morocco, where systematic data collection is challenging in absence of a computerized information system. They found that the program has strong political support and a well-organized management structure. Systematic paper-based data collection showed a moderate screening coverage and low cancer detection rate. The experience will be useful for all developing countries implementing clinical breast examination.

A comprehensive evaluation of the screening program was conducted in 2017 by the International Agency for Research on Cancer (IARC) in collaboration with the MoH and LSFCPT. The evaluation process critically looked into the program policy, protocol and financing, community mobilization efforts, quality and performance of the screening and the diagnostic services, referral mechanisms, training of service providers and the current practices on program monitoring and coordination. The evaluation methodology, the key observations and the summary of the post-evaluation recommendations are described in this article.

Methods
A program evaluation team was constituted with representatives from the MoH, IARC and LSFCPT. The evaluation process involved (i) in-depth interviews of the program managers and the representatives from the major stakeholders, (ii) focus group discussions with the service-providers involved in screening, diagnosis and treatment, (iii) supportive supervisory visits to randomly selected PHCs and the CEDCs and (iv) desk review of the national guidelines, other published technical documents and the annual performance data compiled by the MoH.

In-depth interviews of two key MoH officials, two regional and two provincial program focal points, and one representative each from the LSFCPT and the UNFPA were conducted by three members of the evaluation team to collect information on the program policy, coordination and management, financing, existing quality assurance process, the challenges and barriers in implementation. The officials were interviewed after obtaining their verbal consent and a set of open-ended questions was used as the interview guide.

In addition, four focus group discussions (FGDs) were conducted with the different categories of service-providers (nurses, midwives, general practitioners, surgeons, radiologists and pathologists) involved in the program. A total of 32 participants for the FGDs were selected in consultation with the national focal point of the program to ensure the representativeness from the different regions. A set of open-ended questions was used to guide the discussions. The objectives of the FGDs were to get information on the screening and the diagnostic processes, mechanisms of referral and tracking of the screen-positive women, record keeping, training needs and the challenges encountered by the service providers.

Eight regions implementing the program for more than 1 year were included in the supportive supervision. A single province from each region was randomly selected from the complete list of provinces using the random sample selection command in Stata statistical software (Stataversion 13.1, StatCorp LLC, College Station, TX). In each selected province, one urban and one rural screening centers were selected randomly using the same method. The evaluation team visited a total of 14 screening centers (PHCs) in eight provinces. The selected province in the Casablanca-Settat region did not have any rural PHC and the selected province in the Drâa Tafilalet region did not have any urban PHC running the program for more than 1 year. The process of client counseling and registration, the CBE procedure, the referral practices and the systems of record keeping and report generation were observed at each PHC using a facility supervision checklist. The number of women screened and the number referred with positive CBE results during 2016 were abstracted from the registers maintained at the PHCs. The supervisory team visited the CEDCs in each randomly selected province, except Midelt and Al Haouz provinces where the CEDCs were not yet functional and the screen-positive women were being referred to the provincial hospital or to the CEDCs of the adjacent provinces. At each CEDC the supervisory team reviewed the process of client registration, further assessment protocol, availability of diagnostic services, number of procedures performed (mammography, ultrasound and core biopsies) and number of breast cancers detected during 2016, using a checklist.

The MoH shared with the team the aggregated performance data (number of women screened for the first time in the round, number positive on CBE, number of CBE positive women undergoing diagnostic procedures at the CEDCs and number of breast cancers detected) collected from all the screening centers and the CEDCs for the years 2015 and 2016. The Ministry has multiple “check” mechanisms to ensure the authenticity and validity of the data collected from the different health facilities. The report generated from each health facility is checked and certified by the facility in charge. The provincial focal point verifies the data by reviewing the registers maintained at each facility at
random. The supportive supervisory team cross-checked the periodic reports submitted by the screening and the diagnostic centers with the registers. The data were analyzed to estimate the screening coverage, CBE-positivity, proportion of CBE-positive women undergoing mammography and breast cancer detection rate. Rather than presenting the results of the in-depth interviews, the FGDs, supportive supervision and performance data analysis separately, we present, in this article, a summary of the comprehensive report generated from the different activities.

Results

A Core Technical Committee of the MoH is responsible for implementing and monitoring the nationally coordinated program. The program has an officially documented policy to provide breast cancer screening to all the eligible women and a dedicated budget initially planned over 10 years (2010–2019). The screening and the diagnostic tests are provided free of charge to the women participating in the program. Cancer treatment is not free of charge, though a large majority of the population is covered by mandatory health insurance plan or the special assistance schemes such as the Medical Assistance Regime for the economically disadvantaged.

Currently, there is no mechanism to identify and invite the eligible women individually. Hence the program is not population-based. The national program coordinator sets an annual target (number of women to be screened for breast cancer for the first time in the biennial round) for each province, based on which every provincial focal point allocates an annual target to every PHC within his/her jurisdiction. The target is usually set between 30% and 50% of the estimated number of age-eligible women residing in the PHC area. Lower targets are fixed for the PHCs initiating screening services recently or having fewer providers.

Every year, a nationwide breast cancer awareness campaign is conducted in the month of October through posters, billboards, mass media (print media, radio and television spots, sponsored events etc.) and social media. The civil society organizations are also involved in such a campaign and they organize road shows, group meetings and other educational activities during this period. The campaign has a huge impact on the participation in the screening program. It was observed that 51.6–87.4% of the total women screened in the year 2016 at the different PHCs were registered during the post-campaign months (November and December; Figure 1).

Women in the target age attending the PHCs for medical consultations, either for themselves or their relatives and friends, are invited by the PHC staff to undergo screening. The number of women screened at the PHCs visited during the supportive supervision ranged between 332 and 2108 in the year 2016. The PHCs do not have computerized information system. The records of the women undergoing CBE are maintained in a paper-based screening register designed and supplied by the program. If breast checkup is performed on a woman who is either beyond the eligible age or already has been screened in the round, her records are not entered in the screening register. The registers were observed to be up to date, complete and well maintained in the majority of the

![](image_url)

Figure 1. Proportion of women screened for breast cancer by month in 2016 at the PHCs included in the supervisory visits (a significant increase was observed during November and December—the campaign months) Source: Ref. 6
centers visited. In absence of a computerized information management system, the tracking of the screen-positive women was entirely manual and inefficient.

The program has a written protocol for data collection and program monitoring. Each PHC submits a monthly performance report to the provincial focal point, which includes the number of women screened and the contact details of the screen-positive women. The provincial focal points are responsible for cross-checking the list of the screen-positive women received from the PHCs with the list of the screen-positive women undergoing further assessments at the CEDCs and at the provincial hospitals. The provincial focal points submit the performance reports from the PHCs and CEDCs to the regional focal points. The aggregated data from the regions are submitted to the program officer-in-charge at the MoH.

The number of women screened for breast cancer nationwide in the years 2015 and 2016 were 1.1 and 1.6 million, respectively. The follow-up information from the provinces for the year 2016 was incomplete during the program evaluation in 2017. Since the data for the year 2015 were reasonably complete, we present the screening performance for that year in details. The screening performance data for 2015 were available from all the regions except the Oued Ed-Dahab-Lagouira region having a small eligible population (N = 11,000).

The annual targets fixed for the year 2015 in the different regions ranged between 25% and 60%; 11 regions (out of total 15) could achieve at least 75% of the target (Table 1). Overall 31.4% of the total eligible population (equivalent to 62.8% of the annual population eligible for the biennial screening) was screened nationwide in 2015.

The overall CBE positivity was 3.2% and ranged from 1.3% to 6.0% across the regions (Table 2). At the CEDC a trained gynecologist re-examined every CBE-positive woman and advised diagnostic mammography only if any abnormality was suspected on repeat examination. Breast ultrasound is often used as an adjunct to mammography as the facility is available in all the CEDCs. The radiologist may specifically request the ultrasound report if the interpretation of mammography is difficult due to the high density of the breast tissue (Figure 2). Approximately one-third (34.7%) of the total CBE-positive women underwent mammography at the CEDCs, though the rate varied between 10.5% and 64.9% across the regions (Table 2). The reasons for the rest of the women not undergoing mammography could be nonreferral by the gynecologists after a repeat physical examination or noncompliance of the CBE-positive women to further investigations through the program. The current system of data collection did not allow us to estimate the noncompliance rate separately. Core biopsies were performed on 14.4% of women.

Table 1. Breast Cancer Screening in Morocco: Screening coverage by total eligible population and by annual target population in different regions in 2015

| Region                        | Total No. of eligible women (age 45–69 years) | Annual target for breast cancer screening (age 45–69 years) | Annual target as % of total eligible | No. of women screened (age 45–69 years) | % of annual target population screened | % of total eligible population screened |
|-------------------------------|-----------------------------------------------|-------------------------------------------------|------------------------------------|-------------------------------------|--------------------------------------|----------------------------------------|
| Tangier-Tétouan                | 329,864                                       | 98,958                                          | 30.0%                              | 107,849                             | 109.0%                               | 32.7%                                   |
| Oriental                      | 229,513                                       | 70,313                                          | 30.6%                              | 59,409                              | 84.5%                                | 25.9%                                   |
| Fès-Bouleman                   | 200,298                                       | 100,150                                         | 50.0%                              | 91,011                              | 90.9%                                | 45.4%                                   |
| Meknès-Tafilalet               | 245,049                                       | 91,860                                          | 37.5%                              | 61,629                              | 67.1%                                | 25.1%                                   |
| Rabat-Salé-Zemmour-Zaer        | 311,090                                       | 111,044                                         | 35.7%                              | 75,733                              | 68.2%                                | 24.3%                                   |
| Oued Ed-Dahab-Lagouira¹         | 11,283                                        | –                                               | –                                  | –                                   | –                                    | –                                       |
| Grand Casablanca               | 451,350                                       | 186,326                                         | 41.3%                              | 163,461                             | 87.7%                                | 36.2%                                   |
| Marrakech-Tensift-El Haouz     | 348,880                                       | 139,552                                         | 40.0%                              | 134,315                             | 96.2%                                | 38.5%                                   |
| Lālīyoun-Boujdir-Sakia El Hamra| 15,444                                        | 9453                                            | 61.2%                              | 8431                                | 89.2%                                | 54.6%                                   |
| Guelmim-Es Semara              | 42,305                                        | 12,802                                          | 30.3%                              | 15,391                              | 120.2%                               | 36.4%                                   |
| Souss-Massa-Drāa               | 371,121                                       | 111,337                                         | 30.0%                              | 119,172                             | 107.0%                               | 32.1%                                   |
| Gharb-Chrarda-Bēni Hissen      | 190,880                                       | 82,802                                          | 43.4%                              | 48,169                              | 58.2%                                | 25.2%                                   |
| Chaouia-Guardigha              | 185,165                                       | 47,627                                          | 25.7%                              | 35,741                              | 75.0%                                | 19.3%                                   |
| Doukkala-Abda                  | 214,571                                       | 86,787                                          | 40.4%                              | 71,422                              | 82.3%                                | 33.3%                                   |
| Taddal-Azilal                  | 156,236                                       | 52,533                                          | 33.6%                              | 70,080                              | 133.4%                               | 44.9%                                   |
| Taza-Al Hoceima-Taounate        | 179,923                                       | 60,377                                          | 33.6%                              | 31,725                              | 52.5%                                | 17.6%                                   |
| Total national                 | 3,482,972                                     | 1,261,921                                       | 36.2%                              | 1,093,538                           | 86.6%                                | 31.4%                                   |

¹Data were not delivered to the Ministry of Health.
²The population relative to the year 2015 was estimated on the basis of the preliminary results of the last general census of the Population and the Habitat carried out in 2014.
³Decided by program focal point.

In the year 2015, there were total 16 regions in the country, which was subsequently reduced to 12 through administrative reorganization.

Source: Ref. 6; Population source: MoH.
undergoing mammography (range 0.9–37.4%). Total 1048 breast cancers were detected among the CBE-positive women attending the CEDCs for the diagnostic tests. The breast cancer detection rate in the screening program was 1.0 per 1000 women screened in the year 2015. The detection rates varied between 0.2/1000 and 2.3/1000 across the different regions (Table 2). The positive predictive value (PPV) of the clinician’s referral to mammography was 8.7% (1048/12075) to detect breast cancers.

According to the latest report available with the Ministry, total 1.6 million women (age between 40 and 60 years) were screened in the year 2016, achieving a population coverage of 32.8%; 84,671 (5.2%) were CBE-positive and a total of 1238 breast cancers were detected among them. The PPV of diagnostic mammography to detect breast cancers at the threshold of BI-RAD 4 was 71.3% (254/356).

The training of the service providers [general practitioners (GPs), nurses and midwives] on CBE is conducted over 4 days at the regional headquarters. However, the practical training is not very structured and no certificate is issued to the participants after the training completion. At the FGDs, the service providers expressed the need for periodic refresher training. Some of the nurses and midwives were observed during the supervisory visits to be performing CBE without any formal training through the program. They were trained by the GPs working at the PHCs.

### Discussion

The increasing incidence of breast cancer in the low- and middle-income countries (LMICs) has been ascribed to the increasing life expectancy, adoption of western lifestyles, changing reproductive practices and improved diagnostic facilities. The relatively younger age at diagnosis (23% of the newly diagnosed breast cancers are in women below 50 years of age against 10% in high-income countries), higher prevalence of triple-negative disease, late-stage at detection due to poor access to care make breast cancer a formidable public health challenge in the developing world requiring urgent attention. Many experts share the view that CBE does have a role in breast cancer screening in the low-income countries.

### Table 2. Breast cancer screening in Morocco: information on the further assessment of the CBE positive women in different regions in 2015

| Region                          | No. of women screened (age 45–69 years) | No. (%) of women positive on CBE | No. (%) of CBE positive women undergoing mammograms | No. (%) of CBE positive women undergoing FNAC/core biopsies | No. of breast cancers detected<sup>3</sup> | Breast cancer detection rates (/1000) |
|--------------------------------|-----------------------------------------|---------------------------------|-----------------------------------------------------|--------------------------------------------------------|------------------------------------------|--------------------------------------|
| Tangier-Tétouan                 | 107,849                                 | 6443 (6.0)                      | 1692 (26.3)                                         | 152 (2.3)                                              | 193                                      | 1.8                                  |
| Oriental                       | 59,409                                  | 2500 (4.2)                      | 813 (32.5)                                          | 53 (2.1)                                               | 26                                       | 0.4                                  |
| Fès-Bouleman                    | 91,011                                  | 4281 (4.7)                      | 1228 (28.7)                                         | 105 (2.4)                                              | 50                                       | 0.5                                  |
| Meknès-Taflalet                 | 61,629                                  | 1791 (2.9)                      | 680 (38.0)                                          | 191 (10.7)                                             | 87                                       | 1.4                                  |
| Rabat-Salé-Zemmour-Zaer         | 75,733                                  | 4228 (5.6)                      | 1961 (46.4)                                         | 562 (13.3)                                             | 175                                      | 2.3                                  |
| Oued Ed-Dahab-Lagouira<sup>1</sup> | –                                      | –                               | –                                                   | –                                                      | –                                        | –                                    |
| Grand Casablanca                | 163,461                                 | 2160 (1.3)                      | 1402 (64.9)                                         | 258 (11.9)                                             | 214                                      | 1.3                                  |
| Marrakech-Tensift-El Haouz      | 134,315                                 | 3540 (2.6)                      | 1115 (31.5)                                         | 118 (3.3)                                              | 93                                       | 0.7                                  |
| Laâyoune-Boujdour-Sakia El Hamra | 8431                                   | 202 (2.4)                       | –                                                   | –                                                      | –                                        | –                                    |
| Guelmim-Es Semara               | 15,391                                  | 654 (4.2)                       | 173 (26.4)                                          | 7 (1.1)                                                | 3                                        | 0.2                                  |
| Souss-Massa-Drâa                | 119,172                                 | 2525 (2.1)                      | 753 (29.8)                                          | 73 (2.9)                                               | 69                                       | 0.6                                  |
| Gharb-Chrarda-Béni Hssen        | 48,169                                  | 2155 (4.5)                      | 494 (22.9)                                          | 122 (5.7)                                              | 88                                       | 1.8                                  |
| Chaouia-Ouardigha               | 35,741                                  | 1342 (3.7)                      | 775 (57.7)                                          | 7 (0.5)                                                | 6                                        | 0.2                                  |
| Doukkala-Abda                   | 71,422                                  | 2687 (3.8)                      | 286 (10.6)                                          | 37 (1.4)                                               | 21                                       | 0.3                                  |
| Tadla-Azilal                    | 70,080                                  | 1398 (2.0)                      | 612 (43.8)                                          | 21 (1.5)                                               | 18                                       | 0.3                                  |
| Taza-Al Hoceima-Taounate         | 31,725                                  | 866 (2.7)                       | 91 (10.5)                                           | 34 (3.9)                                               | 5                                        | 0.2                                  |
| Total national                  | 1,093,538                               | 34,828 (3.2)                    | 12,075 (34.7)                                       | 1740 (5.0)                                             | 1048                                     | 1.0                                  |

<sup>1</sup>Data were not delivered to the Ministry of Health.
<sup>2</sup>Mammogram is not available in this region, positive CBE was referred to the nearest region.
<sup>3</sup>All breast cancer detected included those whose FNAC/core biopsies were done in the private sector.

Source: Ref. 6
According to WHO, CBE is a promising approach for low resource settings if effective diagnosis and timely treatment are available and adequate resources are available to sustain the program and maintain quality. CBE has several logistic advantages in the context of the LMICs (feasible, less resource-intensive, point-of-care in nature and low training needs) and its efficacy to achieve significant downstaging has been demonstrated in at least three randomized controlled trials. The cost-effectiveness of annual CBE screening in 40–60 years old women has also been demonstrated in simulation modeling studies in low resourced countries. Morocco, like some other limited resourced countries (Bangladesh, China, India, Ghana, Colombia etc.) with growing breast cancer burden, decided to implement CBE-based screening through routine health services, in view of the fact that mammography screening is too complex, resource-intensive and not feasible to implement and unaffordable.

The evaluation of the National Breast Cancer Screening Program in Morocco demonstrates the real-world perspective on CBE practice in the diverse healthcare settings. The evaluation process comprised of an analysis of aggregate data manually collected from all the screening and the diagnostic centers supplemented by supportive supervisory visits to at least a few representative health facilities. This approach is feasible in many developing countries that have introduced cancer screening programs but do not have a well-functioning health information system. The Moroccan experience also highlights that effective program leadership, a written standard operating procedure of data collection for program monitoring, appropriate coordination between different service delivery settings, meticulous maintenance of paper-based records and orientation of the service-providers to the importance of proper record-keeping can help collect performance data even in absence of a computerized information system from a mass-scale screening program in a developing country. However,
data collection solely is not enough to ensure improvement in the quality of the program. The performance of the program in terms of inputs and outcomes should be monitored and evaluated and specific actions need to be taken to fill in the gaps identified during the evaluation.

The screening program evaluation is based on a set of performance indicators along with their pre-defined standards. The national breast cancer screening guidelines of Morocco enlisted only two process indicators and their desirable standards—the screening coverage of the annualized target population (acceptable standard 60%) and the CBE positivity (acceptable standard 10–13%). The program achieved the acceptable annual screening coverage of 60%, both in 2015 and 2016. The average CBE positivity was 3.2% in the year 2015 and increased to 5.2% in 2016 essentially due to the lowering of the target age to 40 years. However, both the values were substantially lower than the acceptable standards (10–13%) mentioned in the protocol. An earlier evaluation of the Moroccan program (2012–2014) also reported a screen positivity of 3.3% (range 2.1–4.5%). The national standard was determined based on the CBE positivity of 9.3% observed in the pilot study conducted among 2350 women in Temara region. CBE being a subjective test, the positivity is often high when the newly trained providers initiate screening. This is most likely the explanation for the high CBE positivity observed in the pilot study. Taking cognizance of the consistent and robust data obtained from the program over several years, the national experts need to review the standards. CBE positivity should be regularly monitored across the PHCs and either too high or low values would necessitate retraining of the service providers.

The detection rate for breast cancer is an important outcome indicator that we could estimate for the Moroccan program. The detection rate depends on a number of factors, for example, disease prevalence, screening target age group and coverage, sensitivity of the screening tests, efficiency of the diagnostic workup, compliance of screen-positive individuals to further assessment, etc. A low detection rate should always alert the program managers to review the quality of screening and diagnostic tests and also the compliance of the screen-positive women to further evaluation. The detection rate of breast cancer (1.0/1000 women screened) in the screening program of Morocco was much lower than the detection rates reported from the mammography-based screening programs in Europe (5.9/1000 women screened) or CBE-based screening in USA (5.0/1000 women screened); a phenomenon that can partially be explained by the difference in the disease prevalence. The detection rate in Morocco was comparable to that reported in a large breast cancer screening study using annual CBE among 896,596 women between 40 and 69 years of age in Taiwan. The detection rate in the Taiwanese program was 1.0/1000 screened women, significantly lower than mammography screening of the same population (4.9/1000), thus highlighting the inherently lower sensitivity of CBE. It is possible that the opportunistic program is screening a proportionately higher number of younger women and the elderly women with much higher risk of breast cancer are being left out. The detection rate of breast cancer in Morocco could also be influenced by the noncompliance of the CBE-positive women to further assessment, which was not possible to measure. The access to the diagnostic procedures remains quite variable in the country, and particularly low in the geographically difficult areas. It is possible that some of the CBE positive women underwent diagnostic evaluations in the private sector and the program did not have access to the data. The low detection rate of breast cancer in the program is likely to reduce the cost-effectiveness of breast cancer screening significantly. It is important to perform a formal cost-effectiveness analysis of the program by carefully estimating the direct as well as the opportunity costs.

Morocco has made significant efforts to ensure access to breast cancer screening and diagnostic services to the population, even though there are major pitfalls in the program. The program is opportunistic in absence of a mechanism to individually identify the eligible women and invite them. It is well-established that an opportunistic screening program is not only inefficient but also promotes inequity by leaving the socially and economically disadvantaged women out of the program. The PHCs may be entrusted to invite the population from the list of beneficiaries maintained at the PHCs. In some countries, the community health workers have been successfully engaged to mobilize the individuals eligible for screening. The variability in the CBE positivity and the detection rates of breast cancer across the different regions in Morocco highlight the requirement of further training and retraining the providers. Some of the PHCs screen very few women per month and it is difficult to maintain the skills of the providers. A structured training plan should be introduced to ensure that there are adequately trained and certified providers and each provider attends one refresher-training course per year. The alteration in the target population to include the younger women may further reduce the PPV of the screening test and the detection rate of breast cancer, which effectually can reduce the efficiency of the program and increase the cost. The extension of the screening to the younger age should be reviewed by assessing the detection rates stratified by the age groups. The program needs to collect the age of the screen-detected cancers to perform such analysis.

The MoH has set up upgraded facilities for breast cancer management at the oncology centers at Rabat and Casablanca and has established tertiary care cancer centers in the majority of the regions. The program does not have any linkage with the oncology centers and as a result, it is not feasible to track the screen-detected women or to assess the impact of the program in achieving downstaging of breast cancer or improved survival. Setting up computerized information systems at the CEDCs (CEDCs have more resources and better internet access compared to PHCs) and linking them at least with the
major oncology centers and ensuring that the oncology centers share the breast cancer data with the program on regular basis can minimize these gaps.

The evaluation team suggested a set of recommendations to improve the quality of the program. These recommendations included ensuring adherence to the screening and further assessment protocols by all the service providers, strengthening the community mobilization activities around the year, introducing computerized database at the CEDCs, greater stress on the hands-on practical training and periodic re-orientation of the providers, more structured evaluation of the screening as well as the diagnostic activities on yearly basis etc. The team also recommended that the program should collect data from the major oncology centers and the population-based cancer registries to document the proportion of breast cancers being detected through the program and to document the stage shift achieved through screening. A prospective collaborative study has been initiated by IARC and LSFCPT to compare the stage distribution, quality of life and survival between the screen-detected and the non-screen-detected breast cancer patients at the major oncology centers in Morocco. Our study will provide valuable information on the benefit of the screening program. The MoH has already taken necessary steps to introduce the computerized database at the CEDCs and review the training plan, thus completing the dynamic process of program monitoring leading to quality improvement.

ACKNOWLEDGEMENTS

We gratefully acknowledge the support from the Ministry of Health, Government of Morocco and Lalla Salma Foundation for Cancer Prevention & Treatment, Morocco.

Author Contributions

PB contributed to the design and implementation of the study, analysis and interpretation of data and was involved in drafting the manuscript. FS contributed to the design and implementation of the study, interpretation of data and was involved in drafting and revising the manuscript. LB contributed to the conception and design of data and drafting the manuscript. CS contributed to the design and implementation of the study and was involved in designing and drafting the paper. LA contributed to the conception and design of data and drafting the manuscript. EL and RM contributed to the analysis and interpretation of data and was involved in revising the manuscript. RS contributed to the conception of data and was involved in revising the manuscript. YCK contributed to the design of data and was involved in drafting the manuscript. All authors reviewed and approved the final version to be published.

References

1. Ferlay J, Soerjomataram I, Ervik M, et al. GLOBOCAN 2012 v1.0. Cancer Incidence and Mortality Worldwide: IARC CancerBase No. 11. Lyon, France: International Agency for Research on Cancer, 2013.
2. Bouchbika Z, Haddad H, Benchakroun N, et al. Cancer incidence in Morocco: a report from Casablanca registry 2005-2007. Pan Afr Med J 2013;16:31.
3. ElFakir S, Najdi A, Khazraji YC, et al. Breast cancer screening in Morocco: performance indicators during two years of an organized programme. Asian Pac J Cancer Prev. 2015;16(15):6285–8.
4. Selmouni F, Zidouh A, Belakhel L, et al. Tackling cancer burden in low-income and middle-income countries: Morocco as an exemplar. Lancet Oncol 2018;19(2):e93–101.
5. Association Lalla Salma de Lutte Contre le Cancer. Guide de détection précoce des cancers du sein et du col de l’utérus 1. Available from: http://www.contrelacancer.ma/site_media/uploaded_files/Guide_de_détection_precoce_des_cancers_du_sein_et_du_col_de_lut/Cancer du sein et du col de l’utr. 1.pdf. [date last accessed: 19 April 2017].
6. IARC. Programme de dépistage des cancers du sein et du col de l’utérus du Maroc: état de la mise en œuvre, organisation et résultats, Lyon: International Agency for Research on Cancer, 2018.
7. Bray F, Reu JS, Masuyer E, et al. Global estimates of cancer prevalence for 27 sites in the adult population in 2008. Int J Cancer 2013;132(5):1133–45.
8. Corbex M, Burton R, Sancho-Garnier H. Breast cancer early detection methods for low and middle income countries: a review of the evidence. Breast 2012;21(4):428–34.
9. Institute for Health Metrics and Evaluation. The challenge ahead: progress and setbacks in breast and cervical cancer. Seattle, WA: IHME, 2011.
10. Akinmenju TF. Socio-economic and health access determinants of breast and cervical cancer screening in low-income countries: analysis of the World Health Survey. PLoS One 2012;7(11):e48834.
11. Stark A, Kleer CG, Martin I, et al. African ancestry and higher prevalence of triple-negative breast cancer: findings from an international study. Cancer 2010;116(21):4926–32.
12. Harford JB. Breast-cancer earlier detection in low-income and middle-income countries: do what you can versus one size fits all. Lancet Oncol 2011;12(3):306–12.
13. Mitrtra I. Breast cancer screening in developing countries. Prev Med 2011;53(3):121–2.
14. Pan American Health Organization. Cancer in the Americas: Country profiles 2013, Washington, DC: PAHO, 2013.
15. World Health Organization. Cancer. Breast cancer. Available from: http://www.who.int/cancer/prevention/diagnosis-screening/breast-cancer/en/. [date last accessed 10 February 2018].
16. Mitrtra I, Mishra GA, Singh S, et al. A cluster randomized, controlled trial of breast and cervix cancer screening in Mumbai, India: methodology and interim results after three rounds of screening. Int J Cancer 2010;126(4):976–84.
17. Miller AB. Practical applications for clinical breast examination (CBE) and breast self-examination (BSE) in screening and early detection of breast cancer. Breast Care (Basel) 2008;3(1):17–20.
18. Sankaranarayanan R, Ramadas K, Thara S, et al. Clinical breast examination: preliminary results from a cluster randomized controlled trial in India. J Natl Cancer Inst 2011;103(19):1476–80.
19. Olkonkwo QI, Draisma G, der KA, et al. Breast cancer screening policies in developing countries: a cost-effectiveness analysis for India. J Natl Cancer Inst 2008;100(18):1290–300.
20. Charaka H, Khalis M, Eliás R, et al. Organization and evaluation of performance indicators of a breast cancer screening program in Melknes-Tafalalt region, Morocco. Asian Pac J Cancer Prev 2016;17(12):5153–7.
21. Baines CJ. Screening for breast cancer: how useful are clinical breast examinations? J Natl Cancer Inst 2009;102(12):958–964.
22. Ponti A, Anttila A, Ronco G, et al. Cancer Screening in the European Union. Report on the implementation of Council Recommendation on Cancer Screening. Brussels: European Commission, 2017.
23. Yen AM, Tsau HS, Fann JC, et al. Population-based breast cancer screening with risk-based and universal mammography screening compared with clinical breast examination: a propensity score analysis of 142980 Taiwanese women. JAMA Oncol 2016;2(7):915–21.
24. Khudaprema T, Sangrajrang S, Lalitwongsa S, et al. Organised colorectal cancer screening in Lampang Province, Thailand: preliminary results from a pilot implementation programme. BMJ Open 2014;4(1):e003671.