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Assessment of the Iraqi Breast Cancer Early Detection and Downstaging Program: Mammography Cancer Detection Rate

Jamal Kareem Shakor[1*]

[1]*Department of Nursing, Darbandikhan Technical Institute, Sulaimani Polytechnic University, Sulaimani, Kurdistan Region, Iraq.*

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ABSTRACT

Background: In Iraq, early detection and downstaging of breast cancer programs were launched to control breast cancer (BC) in 2000. In the program model, mammography is conducted for normal and symptomatic women. This study aims to assess the program's model effectiveness in terms of mammography cancer detection rates and other screening determinates in the Iraqi Early Detection Program. **Method:** This is a retrospective study based on data from the Breast Disease Treatment Centre (BDTC) in Sulaimani, Iraq. From September 2016 to August 2021, 35,045 women visited the centre for BC screening and diagnosis of breast disorders. In BDTC, 16,186 mammograms and 1,289 biopsies were conducted, and 404 women were diagnosed with BC. This study measured the percentage of women who visited BDTC for screening, the women's ages at diagnosis, the cancer detection rate (BC per 1,000 women visiting), the mammography detection rate (BC per 1,000 mammograms) and the percentage of positive core biopsies. **Results:** The cancer detection rate (CDR) in 1,000 women was 11.53, the overall mammography detection rate was 24.96, and the highest rate was observed in 2018 (42.2). The overall percentage of positive core biopsies was 31.34%. The highest percentage biopsy rate was in 2017 (43.84%). From 2016 to 2021, the percentage of visits for screening increased gradually, rising from 9.5% to 28.6%. **Conclusion:** The early detection program in Iraq is considered effective in terms of high mammography cancer detection rates and the percentage of positive biopsies. Compared to the previous data, more women participated in the program for screening than for diagnosis.

Keywords: Breast Cancer, Early Detection, Mammography Detection Rate, Biopsy Rate, Iraq.

1. Introduction

Breast cancer (BC) is the most prevalent cancer among women worldwide and Iraqi women. In Iraq, BC has been diagnosed among younger women, presenting at an advanced stage with large tumour size. Clinical and histological differences of BC are related to the delay in diagnosis (only 10% of women were diagnosed with Stage I) and the early age at diagnosis among Iraqi women[1]. In developing countries, early detection programs, such as early diagnosis and screening, have not been widely introduced. However, due to the early detection program, the number of women in the early stages gradually increased. For instance, within two decades (1998–2011) in Malaysia, the diagnosis of Stage I BC has risen from 15.2% to 25.2%[2]. This rate is considered low compared to the most developed countries; over 50% of BC cases in developed countries are diagnosed at Stage I[3].

* Corresponding author
E-mail address: jamal.shakor@spu.edu.iq (Instructor).
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Breast self-examination, clinical breast examination, ultrasonography and mammography are the main tools of most screening programs[4,5]. In some countries, mammography screening has reduced 3 to 21 BC mortality in 10 years among 10,000 women[6-8]. Mammography is used for detecting BC in the clinical setting and for screening, and it has an acceptable sensitivity rate for detecting BC[9].

Most developed countries have launched organised screening programs over the long period of opportunistic screening programs[10]. Meanwhile, in developing countries such as Iraq, there is no distinct organised screening program; mammography has been used simultaneously in a model that includes the clinical settings, early diagnosis and opportunistic screening programs[11-12]. In those countries, each screening program has a particular model and detection rate. The CDR could vary in a particular screening model by considering the BC burden and epidemiological distribution of the population, and screening programs could also differ in reducing mortality rates.[6,8] In Iraq, the CDR has not been found in the model of the BC detection program.

Screening models can determine the screening target population, screening tools and methods used for women participating in the screening. The ages of the women and the family history of BC are the leading indicators for identifying the target population. For instance, in developed countries, almost all women over 50 years of age are targeted and recommended for organised mammography screening. Women are invited to participate in the organised mammography screening through telephone, messages and emails[13]. In Iraq, early detection and downstaging of BC programs were launched in 2000 to control BC[5]. According to the program model, normal women over 40 should participate in opportunistic mammography screening. Women with a history of BC or symptoms of BC are also recommended for earlier mammography screening. Early diagnosis programs that include diagnostic mammography for symptomatic women are a part of the Iraqi program model. Delays of symptomatic patients presenting symptoms for diagnostic mammography may also correlate with the advanced-stage diagnosis of BC[14]. This study aims to assess the Iraqi model of BC early detection and downstaging programs by measuring mammography detection rates and other screening determinants.

2. Methodology

2.1 Study population and data collection

This is a retrospective study using a cross-sectional design. The study utilises data from the Breast Disease Treatment Centre (BDTC) in Sulaimani, Iraq. BDTC was launched in Sulaimani for screening and early diagnosis in 2007 based on the BC program's early Iraqi detection and downstaging. According to the program, all health facilities or the general population have sensitised women at risk for breast cancer to visit the BDTC. Until June 2021, there were 53,510 visits, and 35,045 women were screened or examined for early diagnosis of BC.

According to the detection program model in the BDTC, every eligible woman at risk for breast cancer who visited the centre for screening or early diagnosis was registered in an Excel sheet for a follow-up mammography or screening mammography. Data such as name, age, file code, mobile number and place of residence were recorded for each woman in the Excel sheet. Other information, such as the reason for the visit, the total number of mammograms, sonographies, total final needle aspiration (FNA) and core biopsies, was recorded each day in the BDTC. Every woman who visited the centre (DBTC) and was eligible for screening was included in this analysis. In total, 102 registered males and one cancerous male were excluded from this analysis.

2.2 Iraqi early detection model for Screening and early diagnosis

According to the model that has been performed in the BDTC, annual mammography screenings are being conducted for asymptomatic women ages 40 and above, women ages 35–40 with a family history of BC or nullipara and women with breast disorder, and they are also encouraged to have a follow-up mammography every six months. Normal and symptomatic women are assigned to a screening tool, such as clinical breast examination (CBE), sonography and mammography. Women whose symptoms are clinically confirmed and have abnormalities appearing in their sonography results undergo further tests by mammography, and the results are confirmed through a core biopsy and FNA. The confirmed cases are referred for surgery, oncology treatment and follow-up in the defined oncology hospital (Hiwa) in Sulaimani.

In this study, the effectiveness of the early detection program in Sulaimani/Iraq was assessed using different indicators, such as the frequency and percentage of women participating in screening, the percentage of women self-directed to participate in the screening, women's age at diagnosis and measuring the CDR (BC per 1,000 visiting women), mammography detection rate (BC per 1,000 mammographies) and percentage of positive core biopsies (BC per 100 biopsies).

2.3 Work of Iraqi early detection model for screening and early diagnosis during 2016–2021

Of 52,510 visits from September 2016 to August 2021, 35,045 were eligible for either the first screening round (13,789) or the second screening round and follow-up (21,256). In total, 16,186 mammograms, 10,988 ultrasounds, and 1,289 biopsies were conducted in the DBTC. The most mammograms were conducted in 2017 (3,806) and 2019 (4,377). Overall, 404 women were diagnosed with BC. (Table 1).

Table 1: Frequency of screening participants and BC detection rates from 2016 to 2021.

Parameters	Last 4 months 2016	2017	2018	2019	2020	first 6 months 2021	Total
Overall visits (n)	4,626	11,823	12,548	13,071	5,244	5,198	52,510
First visit (n)	2,648	6,789	7,490	7,816	2,857	1,428	29,028
Eligible women on the first visit	1,490	2,993	3,345	3,578	1,750	633	13,789
Follow-up visit (n)	1,978	4,986	5,058	5,255	2,387	1,592	21,256
Overall screened women in the first and follow-up visits	3,468	7,979	8,403	8,833	4,137	2,225	35,045
Cancer (n)	30	121	135	94	53	13	404
Detection rate: BC per 1,000 visits	8.65	15.16	16.07	10.64	12.8	5.84	11.53
U/S (n)	2,252	4,526	1,107	1,829	784	490	10,988
Mammography (n)	1,435	3,806	3,199	4,377	2,385	983	16,185
Mammography detection rate (BC per 1,000 mammograms)	20.90	31.79	42.20	21.48	22.22	13.24	24.96
Final needle aspiration (n)	9	62	66	71	36	10	254
Core biopsy (n)	123	215	297	235	120	45	1,035

Overall biopsy	132	277	363	306	156	55	1,289
% of BC per biopsy	22.73	43.68	37.19	30.72	33.97	23.64	31.34

3. Results and discussion

This study assesses the model used in the early detection program in Sulaimani, Iraq. This study uses data from the BDTC from September 2016 to August 2021, which included 35,045 visits (the number of first visits was 13,789, and the number of subsequent visits was 21,256). In this model, mammography screening has been utilised for normal women ages 40 and above, women with a family history of BC or nullipara and symptomatic women after clinical breast examinations[12]. This study found that despite the low percentage of women who visited a centre for screening purposes, the rate has increased gradually from (9.5%) to (28.6%) during 2016–2021 (Table 2). This figure is quite in contrast with the Canadian screening model, where during 2007–2012, only 7.35% of mammograms were conducted for diagnosis rather than screenin [15]. In contrast to Iraq, women in developed countries such as Canada have mostly visited health facilities for routine screening before presenting with any breast disorder.

Table 2: Reasons for visiting a screening centre, from September 2016 to August 2021.

Years	Family history	For Early Diagnosis				For Screening	Total
		Pain	Feeling lamp	Discharge	Other		
Last 4 months 2016	260	1,786 (61.2)	573 (19.6)	97 (3.3)	186 (6.5)	278 (9.5)	2,920
2017	1,128	4,470 (60.9)	1,465 (19.9)	254 (3.5)	316 (4.3)	84 4 (11.5)	7,349
2018	692	5,155 (61.3)	1,458 (17.3)	293(3.5)	446 (5.3)	1,057 (12.6)	8,409
2019	992	4,944 (57.6)	1,601 (18.6)	327 (3.8)	486 (5.7)	1231 (14.3)	8,589
2020	332	1,752 (48.5)	624 (17.2)	126 (3.5)	182 (5.0)	929 (25.7)	3,613
first 6 months 2021	216	824 (46.1)	310 (17.6)	42 (3.4)	99 (5.5)	511 (28.6)	1,786

In a current study, the CDR per 1,000 screened women was 11.53, with the highest rates in 2018 (16.07) and 2017 (15.16) (Table 1). CDR in this study was increased compared with the previous rate in the same setting from 2007–2016, which was 8.2 per 1,000 screened women[12]. The overall mammography detection rate was 24.96 per 1,000 mammograms, and the rate was high in 2018 (42.2) and 2017 (31.79) (Table 1). The high CDR in this model mainly correlates with the high number of symptomatic participants instead of screened participants. Less than one-quarter of mammograms were performed for the screening. In this model, among 35,045 screenings, 21,256 screenings were done as a follow-up. The high number of women who presented with symptoms may be related to a high recall rate and the frequency of mammograms being performed for suspected cases before organised mammography in the second-round screening, given that high recall rates are significantly associated with high CDR[16].

The high use of ultrasonography may also affect the high mammography detection rate because ultrasound was performed for nearly two-thirds of screened mammograms in this model. However, a study shows no significant difference in CDR in the use of ultrasound[4]. In contrast, another study found that symptomatic women presented with a lump will require an ultrasound, and using ultrasound with diagnostic mammography increased the CDR[17]. In this study, almost 18% of women were presented with a lump (Table 2). They have also been recommended for follow-ups every six months for clinical breast examination with or without an ultrasound examination. The high utilisation of mammography may be related to younger participants, dense breasts and family history of BC[4]. In another screening model in the US, due to dense breasts, ultrasonography has been used for nearly half of the mammography-screened women[18].

Another reason for the high CDR in this model may be related to digital breast tomosynthesis;[9,19] in the BDTC, both digital mammography and digital breast tomosynthesis were used for screening, but the frequency of using each tool was not available. A study has shown that digital breast tomosynthesis has increased mammography CDR from 2.5 to 3.5 and biopsy rates from 31.2% to 40%[20]. In this model, 1,289 biopsies were performed overall, which was quite low compared to the number of mammograms (16,185).

The percentage of positive biopsies was 31.34%, but the percentage was higher in 2017 (43.84%) and 2018 (37.19%). This rate has been considered high compared to digital mammography biopsies in the US (24% of biopsies were malignant) and ultrasound-guided core biopsies in Korea (23.85)[21,22]. Using ultrasound accompanied by mammography may have affected the positive results of the biopsies in the current study. Using ultrasound with mammography decreased the false positive biopsy rate and increased the positive protective value of biopsies recommended[4].

Table 4 shows the CDR per mammography in selected countries' different screening models and early detection programs. Current results show that the CDR per mammography in the most developed countries is nearly 4.5 to 5.9/1,000 mammograms, and women over 45 or 50 were recommended to have an organised mammogram. The CDR in developing countries such as Thailand and Iraq were 10.3 and 24.96/1,000 mammograms, respectively. The screening model is opportunistic mammography screening for women over 30 in Thailand, and Iraq has a specific early detection model for women in any age group.

The current study shows that in 2016 and 2017, most women visited a screening centre through referrals (20.6% and 18.9%, respectively (Table 3). Women unaware of the screening program mostly use the effective referral process[23]. From another perspective, a high referral rate indicates a low awareness among women about the screening program. Referral rates in this study were quite high compared to developed countries, such as the Netherlands, from 1998 to 2008, where the referral rate was only 1.25%[24]. In addition, the low percentage of women participating for screening purposes rather than diagnosis indicate that women are less aware of screening methods; however, the rate has increased compared with the previous study in the same setting[12]. The low rate of utilising mammograms for screening was being considered among those countries that recently launched a screening program. For instance, in Estonia, only 16% of BC women used mammography for screening; others have used mammograms for diagnosis[11].

Table 3: Per cent methods of visiting and mean age at diagnosis with breast cancer and screened women.

Years	Referring N (%)	Direct visiting N (%)	Mean of Age at visiting time N (%)	Mean of age at diagnosis	Total
Last 4 months 2016	559 (20.6)	2,154 (79.4)	48.19	48.5	2,713
2017	1,145 (18.9)	4,913 (81.1)	48.38	48.03	6,058
2018	798 (10.7)	6,610 (89.2)	47.93	49.69	7,408
2019	998 (12.7)	6,858 (87.3)	52.68	50.79	7,856
2020	354 (12.8)	2,396 (87.2)	48.51	51.01	2,750
first 6 months 2021	172 (12.2)	1,234 (87.8)	48.05	54.23	1,406
Total	4,026 (14.3)	24,165 (85.7)	48.9567	49.58	28,191

Table 4: Mammography detection rate in different screening models.

Countries	Early detection program model	Mammography detection rate
Netherlands (1998–2008)[24].	Women ages 50–75, biennial screening mammography	5.1 /1000 Mam* 20%–30% of BC was interval cancers
Spain (1995– 2012)[3]	Women ages 50–69, invited by personal letter to participate in biennial screening mammography	3.5–4.9 per 1000 Mam* Interval cancer: 0.1–0.21
Canada (2007–2012)[15]	Women ages 50–69, organised mammography screening, biennially screening mammography	5.1, 5.1 and 5.9 BC per 1,000 Mam of SFM, CR and DR, respectively.
Italy (2011–2012) [27]	Women ages 45–74, biennially screening mammography	screen-film: 5.9/1,000, DM: 5.2/1,000
Czech Republic (2002–2008)[10]	Women ages 45–69, organised mammography screening, biannually mammography screening	4.5/1,000 screening women in ages 45–69 5/1,000 screened women in ages 50–69 Recall rate: 2.7% and 2.5% Use both screen-film and DM
Thailand (2001–2010)[28]	Opportunistic mammography screening, women ages 30–80, average time between mammography (1.8 years)	10.3 per 1,000 persons Overall interval cancer was 0.91 per 1,000 women
Current study	Annual mammography screenings for normal women ages ≥40, women ages 35–40 with a family history of BC or nullipara and symptomatic women are contributed to early diagnosis and follow-up	24.96/1,000 mam Both mammography and digital breast tomosynthesis

DM: Digital Mammography; Mam: Mammography; CR: computed radiography; DR: digital direct radiography

In this study, the mean age at diagnosis was 49.58 years, and this mean gradually increased from 48.5 in 2016 to 54.24 in 2021 (Table 3). This study's mean age at diagnosis was similar to other studies in Iraq and 12 years earlier than in the UK.[1,12] BC diagnosis at younger ages in Iraq and other developing countries is the leading cause of women presenting with symptoms when they visit a screening centre. In the current study, the mean age for visiting the centre was almost the same as at diagnosis (48 years). In contrast, according to the screening model, women aged more than 40s and symptomatic women of any age were recommended to visit the centre for mammography screening. Similarly, in the Czech Republic, of BC screenings from 2002 to 2008, more than half the visiting women had a higher median age (56 years)[10]. Women diagnosed with BC at an early age have led to the necessity of early diagnosis and downstaging of BC in developing countries, including Iraq. Even in the US, among 145 women under 40 with cancer, only 9.1% were diagnosed through routine screening; the rest were diagnosed through symptoms[25].

Clinical downstaging of BC in developing countries such as Brazil and Iraq was considered more effective in saving women's lives than mammographic screenings alone[26]. The clinical downstaging of BC with its model in Iraq could be regarded as effective in terms of a high CDR and percentage of positive

biopsies. This model could be recommended for other developing countries where women are diagnosed with BC at an early age.

This study has many limitations in assessing the early detection program in Iraq. The study could not learn the proportion of women diagnosed at each BC stage and the extent of delays of women presenting symptoms in clinics or screening centres. The CDR could not be distinguished between screening women, women at risk for breast cancer and symptomatic women. In addition, the CDR could not be determined in each screening round, and the screening interval could not be measured.

Conclusions

This study shows that the Iraqi model for early diagnosis and downstaging BC has been substantially effective in BC management regarding CDR, mammography detection rates, increased participation rates for screening purposes and positive biopsy rates. Women's awareness or self-referral was lower than in the developed world but gradually increased. A younger age at diagnosis may lead to more women presenting with breast disorders in early detection programs.

Conflict of interests

I declare that there is no competing interest, financial and any other interest.

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Author contribution

The author developed the research design, analysed the data and drafted the manuscript report.

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References

1. Alwan NAS, Kerr D, Al-Okati D, Pezella F, Tawfeeq FN. Comparative study on the clinicopathological profiles of breast cancer among Iraqi and British patients. *Open Public Health Journal*. 2018;11:177–191.
2. Bhoo-Pathy N, Subramaniam S, Taib NA, Hartman M, Alias Z, Tan GH, et al. Spectrum of very early breast cancer in a setting without organised screening. *British Journal of Cancer*. 2014;110:2187–2194.
3. Sala M, Domingo L, Macià F, Comas M, Burón A, Castells X. Does digital mammography suppose an advance in early diagnosis? Trends in performance indicators 6 years after digitalization. *European Radiology*. 2015;25:850–859.
4. Lee JM, Arao RF, Sprague BL, Kerlikowske K, Lehman CD, Smith RA, et al. Performance of screening ultrasonography as an adjunct to screening mammography in women across the spectrum of breast cancer risk. *JAMA Internal Medicine*. 2019;179:658–667.
5. Mualla FHF. Promoting clinical breast examination as a screening tool for breast cancer in Iraq. *Iraqi National Journal of Nursing Specialties*. 2014;27(1).
6. Nattinger AB, Mitchell JL. Breast cancer screening and prevention. *Annals of Internal Medicine*. 2016;164,81–94.
7. Nelson HD, Fu R, Cantor A, Pappas M, Daeges M, Humphrey L. Effectiveness of breast cancer screening: Systematic review and meta-analysis to update the 2009 U.S. preventive services task force recommendations. *Annals of Internal Medicine*. 2016;164:244–255.
8. Myers ER, Moorman P, Gierisch JM, Havrilesky LJ, Grimm LJ, Ghate S, et al. Benefits and harms of breast cancer screening: A systematic review. *JAMA, the Journal of the American Medical Association*. 2015;314:1615–1634.
9. Phi XA, Tagliafico A, Houssami N, Greuter MJW, de Bock GH. Digital breast tomosynthesis for breast cancer screening and diagnosis in women with dense breasts: A systematic review and meta-analysis. *BMC Cancer*. 2018;18:1–9.
10. Majek O, Danes J, Skovajsova M, Bartonkova H, Buresova L, Klimes D, et al. Breast cancer screening in the Czech Republic: Time trends in performance indicators during the first seven years of the organised program. *BMC Public Health* 2011;11:288.
11. Innos K, Valvere V, Padrik P, Eelma E, Kütner R, Lehtsaar J, et al. Mammography use and mode of detection among breast cancer patients in Estonia. *Women and Health*. 2016;56:129–140.
12. Shakor J, Mohammed AK. Assessment of breast cancer early detection program in Iraq-Sulaimania: Measuring the cancer detection rate. *Indian Journal of Cancer*. 2018;55:84–87.
13. Puharić Z, Žulec M, Ceronja I, Parun AŠ. High participation rate in mammography screening: Experience from Croatia. *Central European Journal of Public Health*. 2017;25:303–306.
14. Unger-Saldaña K, Miranda A, Zarco-Espinosa G, Mainero-Ratchelous F, Bargallõ-Rocha E, Miguel Lázaro-Leõn J. Health system delay and its effect on clinical stage of breast cancer: Multicenter study. *Cancer*. 2015;121:2198–2206.
15. Théberge I, Vandal N, Langlois A, Pelletier É, Brisson J. Detection rate, recall rate, and positive predictive value of digital compared to screen-film mammography in the Quebec population-based breast cancer screening program. *Canadian Association of Radiologists Journal*. 2016;67:330–388.
16. Grabler P, Sighoko D, Wang L, Allgood K, Ansell D. Recall and cancer detection rates for screening mammography: Finding the sweet spot. *American Journal of Roentgenology*. 2017;208:208–213.
17. Jacobs L, Bevers TB, Helvie M, Lehman CD, Bonaccio E, Monsees B, et al. Breast cancer screening and diagnosis, version 3. *Journal of the National Comprehensive Cancer* Network. 2018;16:1362–1389.
18. Geisel J, Raghu M, Hooley R. The role of ultrasound in breast cancer screening: The case for and against ultrasound. *Seminars in Ultrasound, CT and MRI*. 2018;39:25–34.
19. Marinovich ML, Hunter KE, Macaskill P, Houssami N. Breast cancer screening using tomosynthesis or mammography: A meta-analysis of cancer detection and recall. *Journal of the National Cancer Institute*. 2018;110:942–949.
20. DiPrete O, Lourenco AP, Baird GL, Mainiero MB. Screening digital mammography recall rate: Does it change with digital breast tomosynthesis experience? *Radiology*. 2018;286:838–844.
21. Rochat CJ, Baird GL, Lourenco AP. Digital mammography stereotactic biopsy versus digital breast tomosynthesis–guided biopsy: Differences in biopsy targets, pathologic results, and discordance rates. *Radiology*. 2020;294:518–527.
22. Jung I, Han K, Kim MJ, Moon HJ, Yoon JH, Park VY, et al. Annual trends in ultrasonography-guided 14-gauge core needle biopsy for breast lesions. *Korean Journal of Radiology*. 2020;21:259–267.
23. Palmer RC, Samson R, Batra A, Triantis M, Mullan ID. Breast cancer screening practices of safety net clinics: Results of a needs assessment study. *BMC Women's* Health. 2011;11:2–7
24. Setz-Pels W, Duijm LEM, Groenewoud JH, Voogd AC, Jansen FH, Hooijen MJHH, et al. Detection of bilateral breast cancer at biennial screening mammography in the Netherlands: A population-based study. *Radiology*. 2011;260:357–363.

25. Hu X, Myers KS, Oluyemi ET, Philip M, Azizi A, Ambinder EB. Presentation and characteristics of breast cancer in young women under age 40. *Breast Cancer Research and Treatment*. 2021;186:209–217.

26. Yip CH. Downstaging is more important than screening for asymptomatic breast cancer. *Lancet Global Health*. 2019;7:e690–e691.

27. Campari C, Rossi PG, Mori CA, Ravaioli S, Nitrosi A, Vacondio R, et al. Impact of the introduction of digital mammography in an organized screening program on the recall and detection rate. *Journal of Digital Imaging*. 2016;29:235–242.

28. Sripaiboonkij N, Thinkamrop B, Promthet S, Kannawat C, Tangcharoensathien V, Ansusing T, et al. Breast cancer detection rate, incidence, prevalence and interval cancer-related mammography screening times among thai women. *Asian Pacific Journal of Cancer Prevention*. 2016;17:4139–41343.