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The Economic Evaluation Report of the Nationwide Breast Cancer Early Detection and Treatment Initiative in Egypt

Prepared for
The Ministry of Health and Population (MOHP)

١٠٠ مليون صحة

مبادرة رئيس الجمهورية لدعم صحة المرأة المصرية

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PREFACE

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ABSTRACT

Background and Objectives:

In Egypt, breast cancer (BC) is the most common malignancy among women (32.4%) and second most common in both genders (16.4%), imposing high clinical, psychological and economical burden on the Egyptian society. In 2019, a presidential initiative for the universal screening, early detection and treatment of Breast cancer started in Egypt. The main objective of this study was to measure the long-term health and economical benefits of running this initiative in Egypt.

Methodology:

Excel sheet-based Markov model was built to analyse the cost effectiveness and benefit of the universal screening and treatment campaign scenario versus no campaign scenario. The model accounted for the costs of Campaign in addition to the BC cases management costs, Life years and QALYs gained and loss in productivity due to premature death across both scenarios. The model time horizon is life-long, considering the mean age at diagnosis and the life-expectancy in Egypt. A discount rate equals to 3.5% was applied to both costs and outcomes.

Results:

23,803,726 women were screened from July 2019 till March 2022, out of which 8,467 (0.04%) were diagnosed with breast cancer at different stages. The campaign resulted in direct costs savings of EGP 905 Millions, due to the down-staging caused by the campaign and lower acquisition price of BC treatments. 27,432 years were saved and 14,100 incremental QALYs were gained in "screening" scenario vs. "no screening" scenario among the cohort with confirmed cancer diagnosis. The Campaign averted productivity loss equivalent to 269 million EGP.

Conclusion:

The results indicate significant clinical and economic benefits of the presidential initiative of the early detection of breast cancer, better health outcomes in terms life-years gained and QALYs, as well as savings in treatment costs. Campaign is considered a dominant option, with a significant positive return on investment.



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1. Introduction

INTRODUCTION

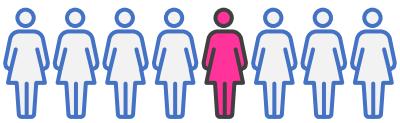
Breast Cancer (BC) is the world's most prevalent cancer type with an estimated 2.3 million new cases in 2020, surpassing Lung Cancer. [1]

BC imposes huge burden on societies with more lost disability-adjusted life years (DALYs) by women to breast cancer globally than any other type of cancer. [1]



Over **7.8 million**
women worldwide suffer from Breast cancer (36.3%) [1]

Over **2.3 million**
new cases are diagnosed each year [1]



1 in 8 women
will be diagnosed with Breast Cancer in their lifetime [1]



Every 20 seconds
a woman is diagnosed with Breast cancer [1]

BC is the leading cause of death among women and the fifth leading cause of cancer mortality worldwide, with 685,000 deaths annually. [1]



Every 5 mins
More than 6 women die of BC worldwide [1]

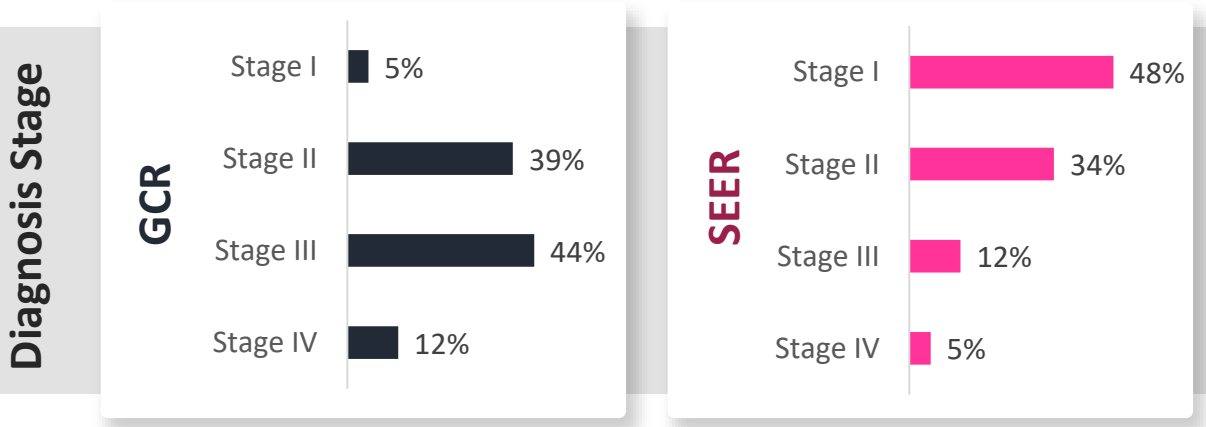


In Egypt, breast cancer is the most common malignancy in women, accounting to almost **33% of cancers** within this population and more than **22,000 new cases** diagnosed each year. [2]

Breast Cancer Burden and mortality rates in Egypt is higher than developed countries. BC mortality rates in Egypt is estimated at around 11% and a mortality to incidence ratio 0.41 which is higher than global rates. [2]

The higher mortality rates are primarily due to the late detection of BC:

- A study in 2015 by the Egyptian MOH showed that only **2 %** of the surveyed Egyptian women had some form of clinical screening and **6%** performed breast self-examination. [3]
- Stage at diagnosis of breast cancer in Egypt were compared from the Gharbiah Cancer Registry (GCR) with the U.S. Surveillance, Epidemiology, and End Results (SEER). **GCR cases were diagnosed at more advanced stages**. [4]



INTRODUCTION

Early diagnosis (in symptomatic populations) and screening (in asymptomatic populations) are the two main components of cancer early-detection programs, as defined by the WHO, to reduce the incidence of advanced cancer and mortality.[5]

Egypt vision 2030 affirms the universal right to high quality healthcare, and the Sustainable Development Strategy (SDS) framed its dimensions that aims at ensuring all Egyptians enjoy a healthy, safe, and secure life through an integrated, accessible, high quality, and universal healthcare system capable of improving health conditions through early intervention, and preventive coverage.[6]

Health strategies were set to achieve this through different tactics on top of them "Enhancing preventive and public health programs". Between 2014 and 2020, Egypt adopted a set of policies and launched number of health programmes & initiatives aimed at achieving the strategic objectives of the health sector, which are related to advancement of public health of Egyptians.

The presidential initiative "100 Million Health"; have contributed to achieving comprehensive healthcare for all citizens and guarantee providing a decent medical service to all Egyptians with international standards that keep pace with the development that Egypt is currently witnessing in all fields



Accordingly, A nationwide screening, early detection and treatment of Breast Cancer among Egyptian women started in July 2019, costs and outcomes are reported and analysed in this report for the period from July 2019 to March 2022.



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2. BC Early Detection Campaign

BC INITIATIVE

I. Initiative Objectives:

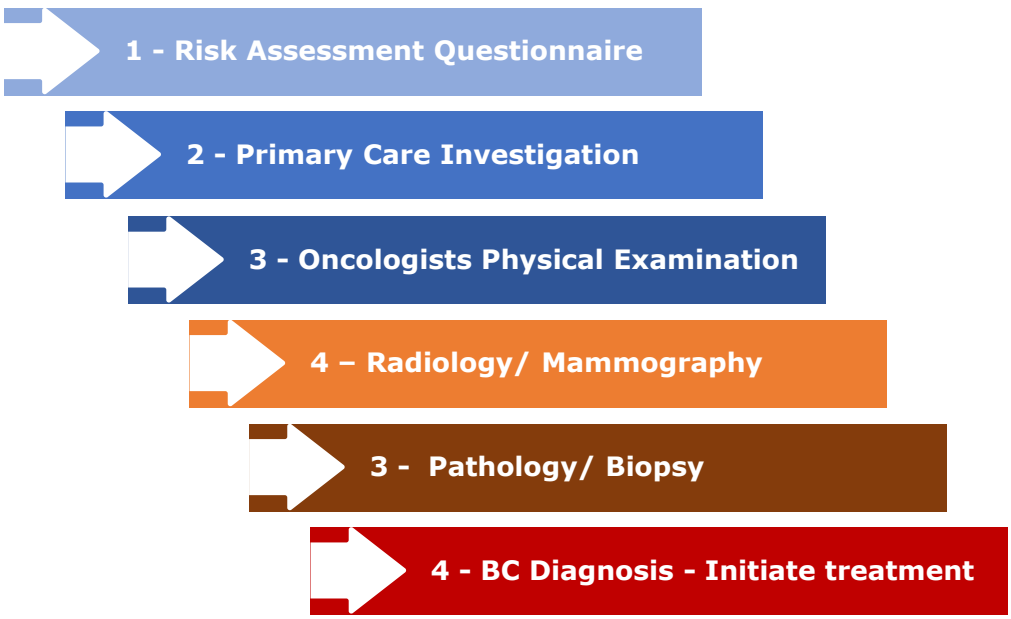
Promote breast cancer awareness and the importance of early diagnosis, screening and detection of breast cancer with fully reimbursed treatment with the latest evidence based treatment protocols.

II. Initiative Protocol:

The Initial screening protocol included risk assessment using pre-designed questionnaire. At risk patients are then referred to Primary care unit for further investigation.

Suspected patients are then referred to Oncologists for physical examination. Upon examination, patients might be referred to Mammography followed by biopsy for confirmation.

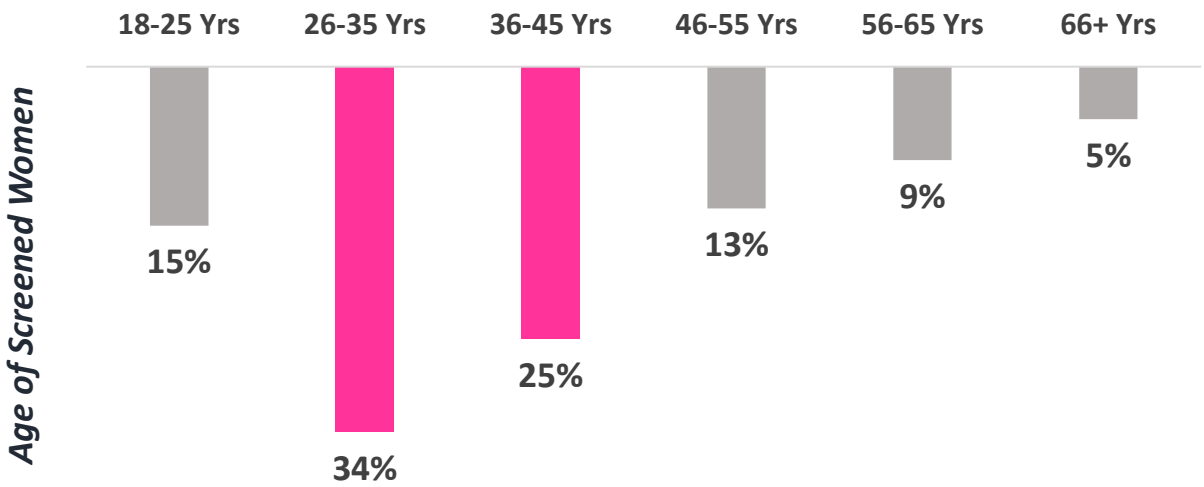
BC confirmed patients are then classified as per disease stage and are provided free follow up tests and free of charge medication based on latest protocols.



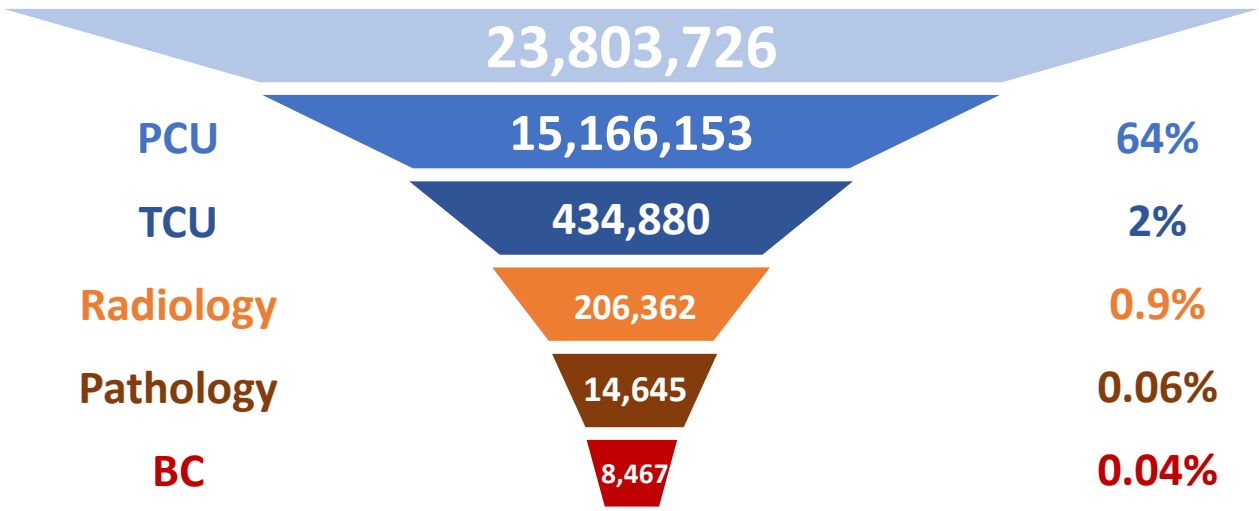
III. Initiative Outcomes:

Outcomes include data collected over **2.8 years** from the campaign launch in July 2019 till March 2022.

23,803,726 women were screened till March 2022. almost 60% of the screened women were between 26-45 years old.



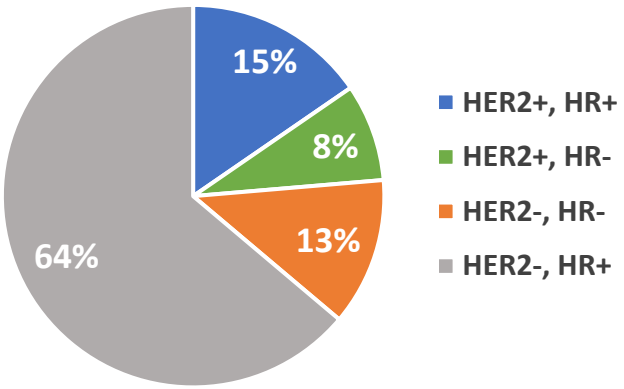
Out of the 23,803,726 women screened using risk assessment questionnaire, **8,467 cases were confirmed BC**. The complete journey of patients is illustrated as follows:



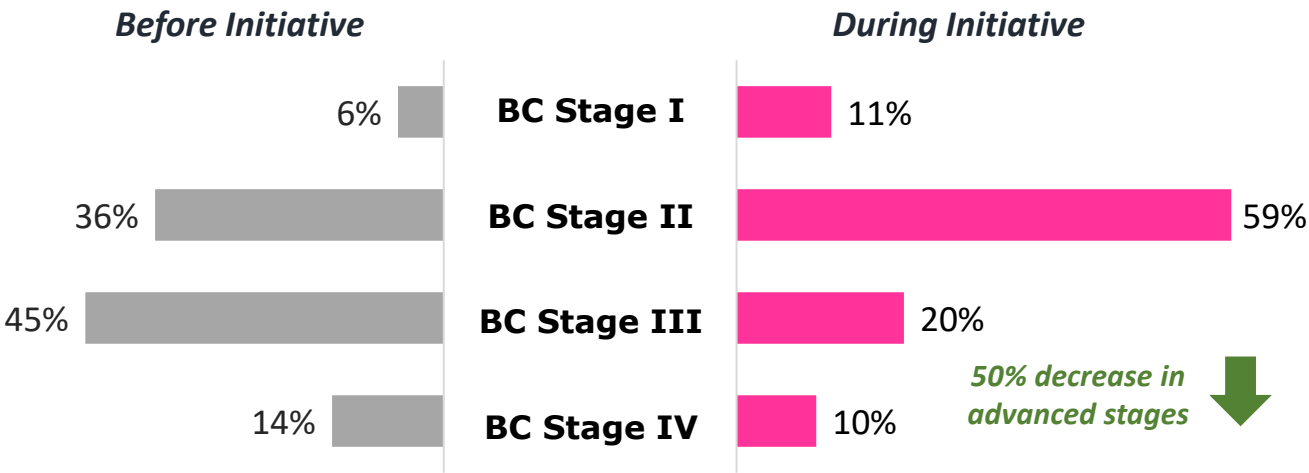
BC INITIATIVE

III. Initiative Outcomes - *Cont'd*:

Breast Cancer confirmed cases were classified based on their HER2 and hormonal status with **64%** showed HER2 negative expression and hormonal sensitivity



The campaign resulted in earlier detection rates of breast cancer compared to the before campaign rates.



Total campaign costs in terms of diagnosis and screening till march 2022 were **596 million EGP**.

- Screening & diagnosis cost / BC diagnosed patient is **70,377 EGP**
- Almost **75%** of screening costs were consumed in Primary care unit rewards

Newest treatments as per latest guidelines were secured and acquired at a discounted price compared to before campaign.

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3. Economic Evaluation

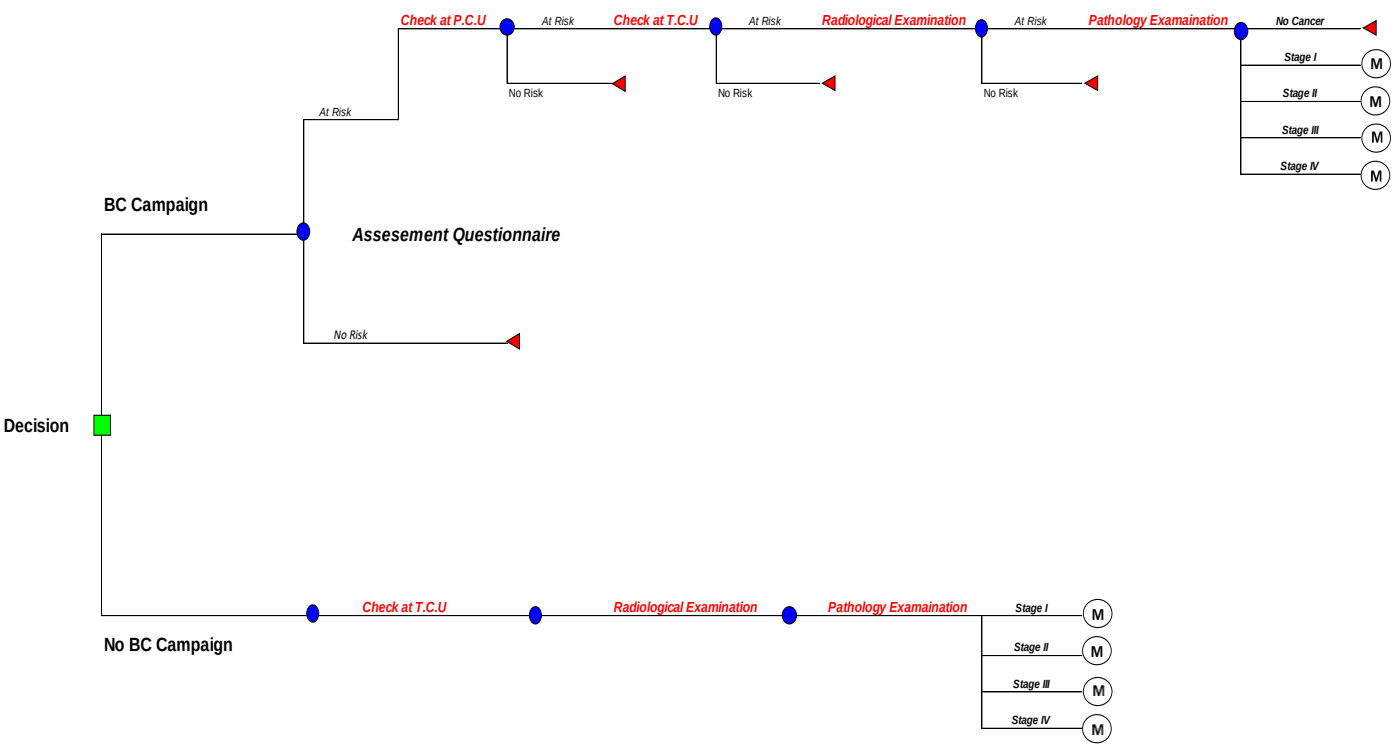


ECONOMIC EVALUATION

A Model assessing the cost effectiveness and benefit of the clinical and economical consequences of running the wide nation Breast Cancer screening and treatment campaign versus no Campaign

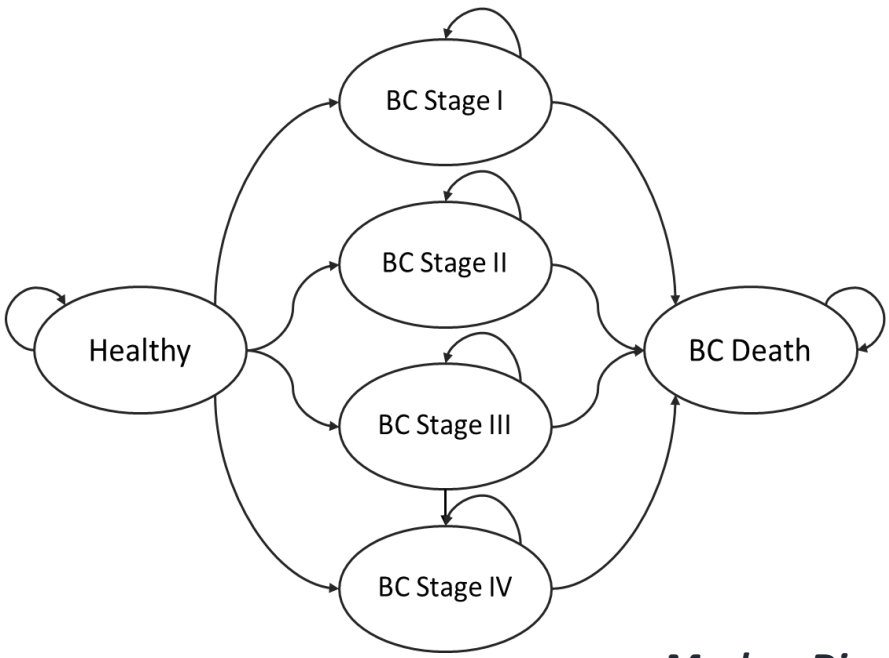
I. Study Methodology:

- The economic analysis used a decision tree approach to determine the cost-effectiveness and benefits of the campaign.
- The study compares 2 strategies scenarios "screening and treatment strategy" versus "no-screening strategy and treatment upon detection".



Decision Tree

- Markov model was built to follow up the BC confirmed cases, their prognosis and death through out their life-time.
- Patient diagnosed at a specific breast cancer stage will remain there till disease specific death except for stage III with 40% progressing to stage IV in first year



Markov Diagram

- Patients transitioning from one stage to another was calculated as follows:

	Stage I	Stage II	Stage III	Stage IV	BC Death
Stage I	0.996	0	0	0	0.004
Stage II	0	0.978	0	0	0.022
Stage III (1st Year)	0	0	0.536	0.400	0.064
Stage III (2nd Year+)	0	0	0.936	0.000	0.064
Stage IV	0	0	0	0.765	0.235
BC Death	0	0	0	0	1.000

ECONOMIC EVALUATION

- The study considers the main benefit of the early detection offered by the campaign is the early intervention and accordingly, lower treatment costs, lower mortality rates and accompanied loss of productivity.
- The study assumes that the detected BC patients during the campaign will be diagnosed later in life, but at later stages similar to the rates before campaign.
- Treatment options and outcomes were assumed to be the same across both Campaign and no Campaign scenarios. Treatment protocol cost is considered for all stages once and on annual basis for stage IV patients.
- Model is built on 28-years time horizon, with cohort starting age is 45 years old and is extended till life expectancy, considering a 3.5% discount rate as per EGY Guidelines.
- Quality adjusted life years (QALYs) were calculated based on the disutility associated to each BC stage obtained from literature.
- Life years gained were calculated based on the average life expectancy in Egypt and the survival rate for each BC stage.
- Productivity loss was estimated according to the minimum monthly wage in Egypt in 2021, until retirement age taking into consideration female unemployment rates in Egypt.

II. Study Inputs:

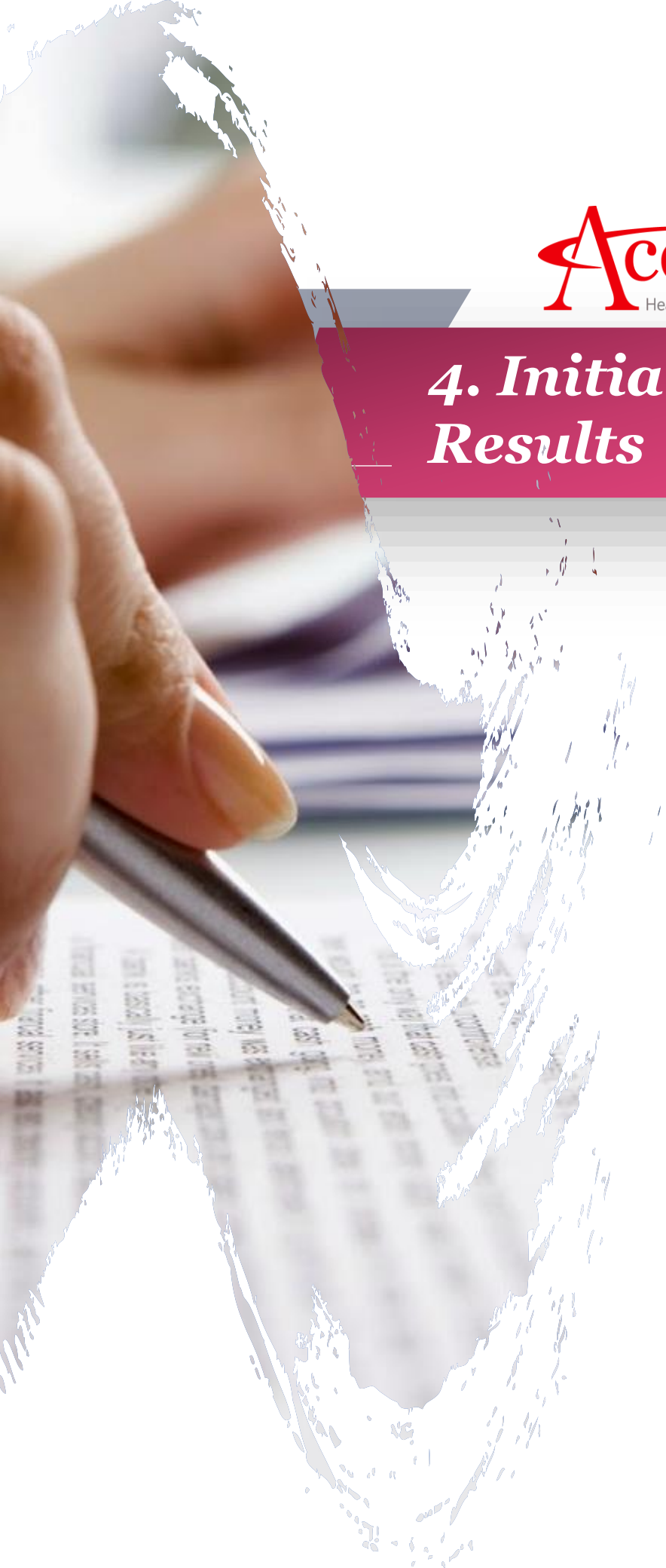
Variables	Input
Annual Mortality Rates	
Stage I	**0.004235731**
Stage II	**0.021723543**
Stage III	**0.063589016**
Sage IV	**0.235002073**
Utilities	
Stage I	**0.68**
Stage II	**0.61**
Stage III	**0.56**
Sage IV	**0.42**
Unemployment Rate across females	**15%**
Average Annual Wage (EGP)	**24,000**
Discounting Rate	**3.5%**
BC Stage I (Before Initiative)	**6%**
BC Stage II (Before Initiative)	**36%**
BC Stage III (Before Initiative)	**45%**
BC Stage IV (Before Initiative)	**14%**
BC Stage I (During Initiative)	**11%**
BC Stage II (During Initiative)	**59%**
BC Stage III (During Initiative)	**20%**
BC Stage IV (During Initiative)	**10%**

ECONOMIC EVALUATION

II. Study Inputs:

Screening Cost variables	Input in EGP
Total PCU Rewards	440,684,250
Total TCU Rewards	35,617,850
Total Radiology Costs	101,143,210
Total Pathology Costs	18,435,090

Protocols Costs Variables	Input in EGP
During Initiative	
Stage I (One time cost)	93,506
Stage II (One time cost)	135,739
Stage III (One time cost)	156,251
Sage IV (Annual Cost)	161,095
Before Initiative	
Stage I (One time cost)	95,526
Stage II (One time cost)	140,890
Stage III (One time cost)	236,601
Sage IV (Annual Cost)	200,429



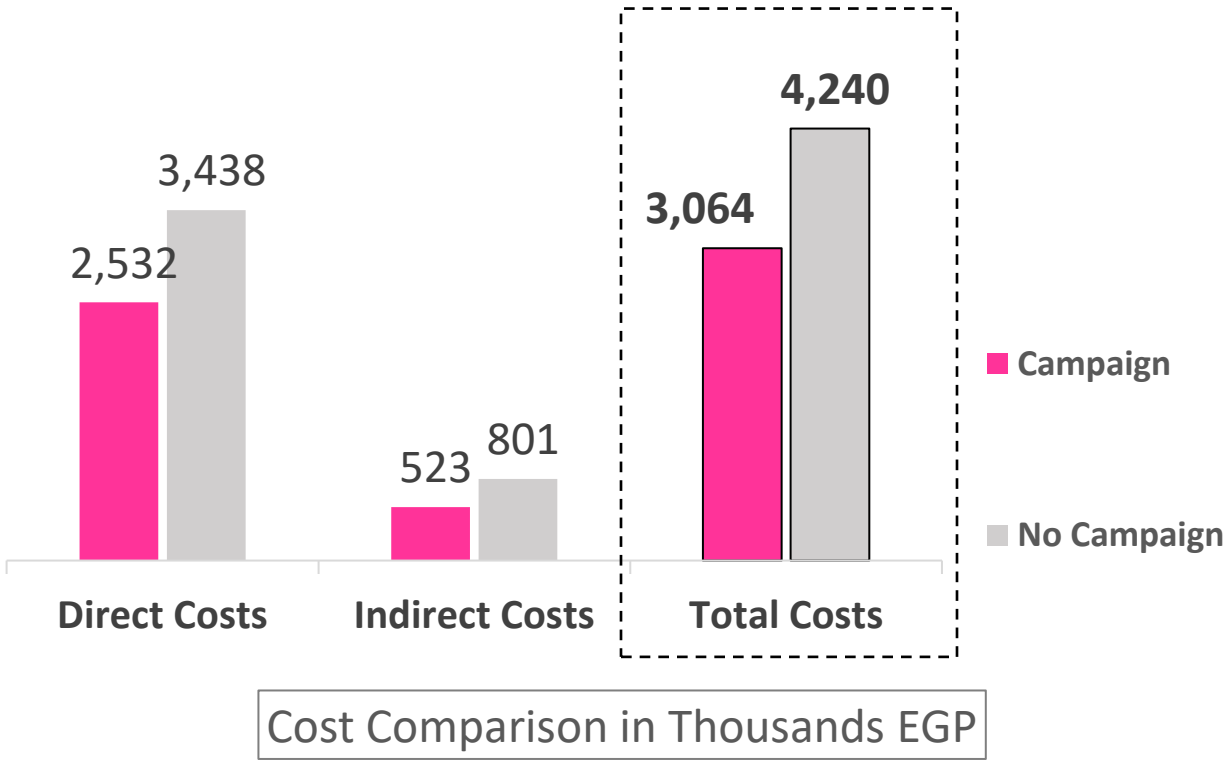
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4. Initiative Results

INITIATIVE RESULTS

The study measured the difference in the life-time costs and outcomes of both scenarios:

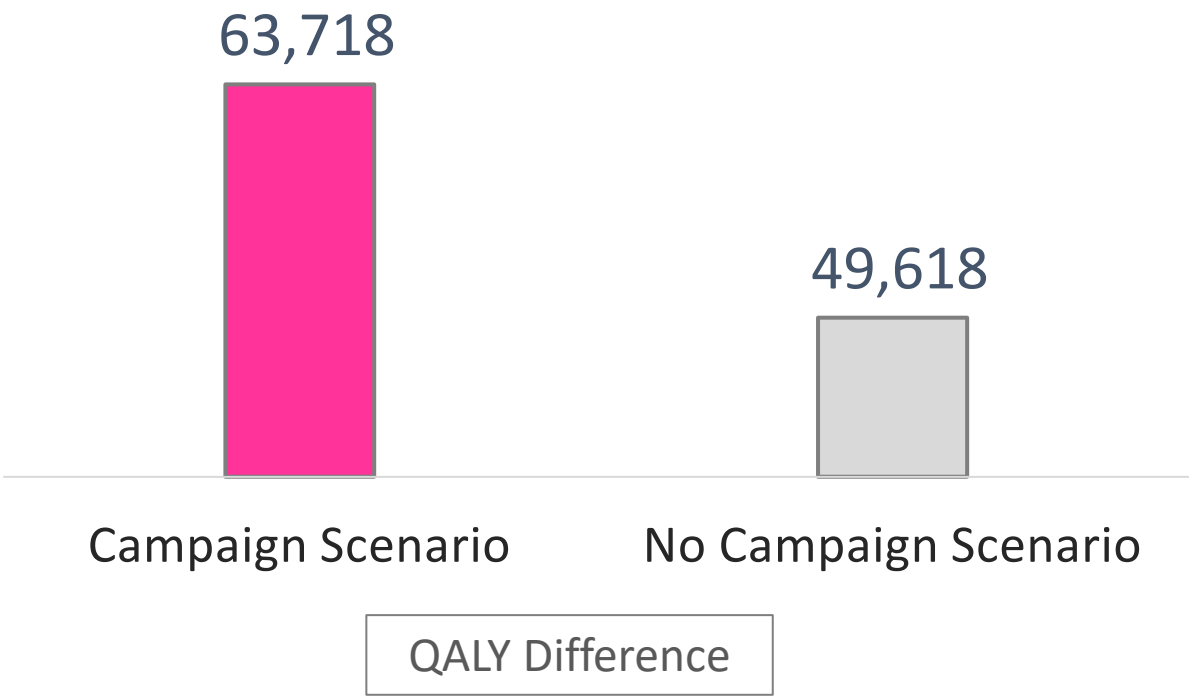
- Direct Costs in terms of Screening and Diagnosis Costs
- Direct Costs of Treatment Protocols and Monitoring

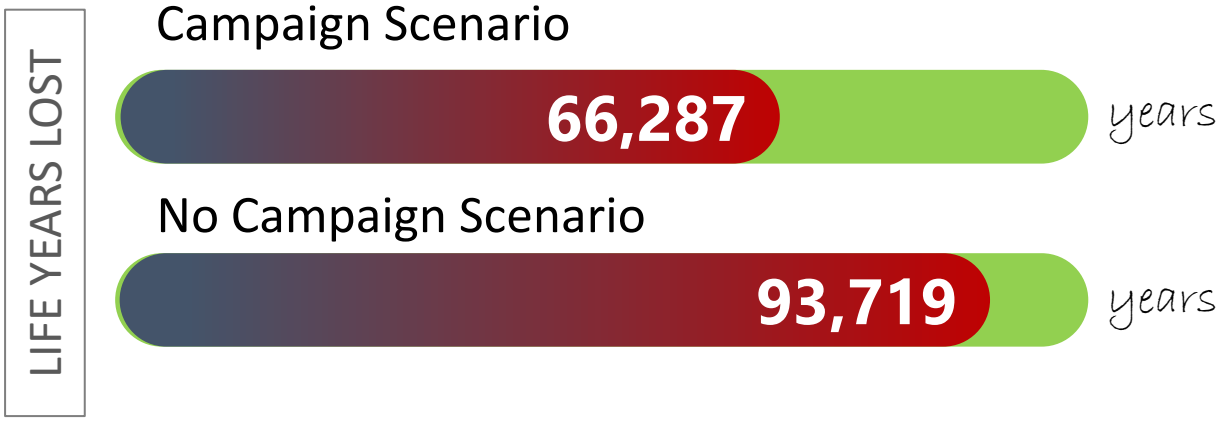


Scenario	Direct Costs (Diagnostics, Treatment & Monitoring)	Indirect Costs (Loss in Productivity)	Total Costs
Campaign Scenario	2,532,683,656.2	532,094,702.4	3,064,778,359
No Campaign Scenario	3,438,165,407.6	801,967,572.9	4,240,132,981
Difference	**(905,481,751)**	**(269,872,871)**	**(1,175,354,622)**

The study measured the difference in the life-time costs and outcomes of both scenarios:

- Life Years Saved
- Quality Adjusted Life Years (QALYs) Gained
- Loss in Productivity Averted





INITIATIVE RESULTS

The study yielded more clinical outcome in terms of 14,000 incremental more QALYs and 27,000 incremental more life years saved with less cost with difference of 1.2 billion EGP saved in favour of the campaign, thus the campaign arm is considered dominant over the no campaign arm.

Economic Benefits

1.2 Billions EGP

Savings

38% ROI



A return of 1.38 EGPs for every 1 EGP spent on the campaign

Clinical Benefits

+27K

Life years saved

+14K

QALYs gained

CONCLUSION

Breast cancer represents a major health hazard clinically, socially and economically, evaluating the initiative from health economics perspective and return on investment is an important step to ensure the right allocation of resources and validating the approach.

The initiative showed dominance in terms of cost effectiveness yielding more life years gained, more QALYs and in the same time cost savings. It's a dominant options versus not doing the campaign, and this is mainly due to the early detection in earlier stages and using efficient health technologies in treatment.

RECOMMENDATIONS

Breast cancer initiative is important to continue detecting women in early stages using the same methodology in screening and referral.

Women from the age of 18 to the age of 45 years old represents the highest segment and with less incidence of BC among study population, caution is to be taken in the continuation of the program to do targeted selection of that segment with high risk factors, and trying to increase the flow of women aged more than 45 to be enrolled in the initiative.

The program ROI will increase upon the continuation of the program and the study should track it again after 12 months to compare results.

ANNEX

1. **BC:** Breast cancer is a disease in which cells in the breast grow out of control. There are different kinds of breast cancer. The kind of breast cancer depends on which cells in the breast turn into cancer.
2. **QALY:** quality adjusted life year, a generic measure of disease burden, including both the quality and the quantity of life lived. 1 QALY is interpreted as 1 life year lived in perfect health state.
2. **Cost-Effectiveness Analysis**: a form of economic analysis that compares the relative costs and outcomes of different interventions.
3. **ICER**: incremental cost-effectiveness ratio, is a summary measure representing the economic value of an intervention, compared with a comparator. It is usually the main output or result of an economic evaluation, it's ICER is calculated by dividing the difference in total costs by the difference in outcomes.
4. **ROI**: Return on investment, is a mathematical formula to evaluate investments in a program or project and judge how well the investment has performed compared to others or compared to not doing the investment.

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