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Prospective of Medical Cost for Breast Cancer for Sex and Age Group in Range 2012-2050: Case of Mexico

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Abstract: ***Medical costs are calculated for breast cancer for all age groups of Mexican people and sex into range of 2012-2050. Probabilities of entrance or disease detection, permanence or in treatment and departure or death are calculated for each age group and sex. The maximum probabilities for each case are 0.0070% (45-49), 0.01347% (30-34) and 0.0043% (85+), for male. Analogously, for female are 0.94575% (45-49), 0.83105% (40-44) and 0.1313% (85+), respectively. The in treatment medical costs are not similarly between men and women. The maximum number of people in treatment is in (30-34) for male and (35-44) for female. The number of patients varies between 5 and 85+ years of age.***

Keywords: medical costs, prospective, aging, health, breast cancer

1. Introduction

Mexican food is varied but rich in carbohydrates and fats, the use of deodorants and dyes and exposure to spores and toxic materials are some causes of breast cancer (BC) in a country where protection rules do not apply to consciousness. This work shows the economic impact over a horizon of 2012-2050 of BC in terms of percentages of gross domestic product (GDP), for the three scenarios: base, optimal and worse. The base scenario is calculated by adjusting a model AR(2)MA(2)[2] with weighting, the other two are given by experts and both depend on the effect of energy and labor reforms.

The available information is from public institutions: Ministry of Health (Secretaría de Salud, SS[3], [8], [9],[11]), National Population Council (Consejo Nacional de Población, CONAPO[12]), Mexican Institute of Social Security (Instituto Mexicano del Seguro Social, IMSS[4], [6], [7]), National Institute of Statistics and Geography (Instituto Nacional de Estadística y Geografía, INEGI[10]) and private: Mexican Association of Insurance Institutions (Asociación Mexicana de Instituciones de Seguros, AMIS) and hospitals.

Population projections by CONAPO whose methodology appears on the official website[12] and decadal cohort of number of patients and unit costs for some diseases IMSS beneficiaries were used[6], [7]. IMSS information is not showed by age group neither sex (patients in treatment). New cases information appears since 1980 up to 1990 by big age group and sex and 1991-2011 by age group. Deceased people by BC is presented by age and sex.

The cost of this disease is high for its treatment and its duration. As insured persons by IMSS represent 40% of the population, IMSS data are taken as sampling. The Mexican health system (SS) covers the following institutions: IMSS, Institute for Social Security and Services for State Workers (Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado, ISSSTE), Popular Insurance (Seguro Popular, SP-IMSS), Oil Company (Petróleos Mexicanos, PEMEX), Ministry of Defense (Secretaría de la Defensa Nacional, SEDENA), Ministry of Navy (Secretaría de Marina, SEMAR), private institutions and other public institutions, so the numbers of deaths and new cases are representative of the population.

2. Methodology

The proposed model is stochastic[2] with entrance, in treatment and death probabilities by BC, population, number of patients and unitary cost at time t by age group and sex (stock).

The probabilities are calculated for each year, t, as

$$\Pr(\text{death; age; sex; } t) = \frac{\#\,\text{death by the disease (age; sex; t)}}{\#\,\text{death by the disease (age; sex; t)}} \tag{1}$$

$$\Pr(\text{new cases; age; sex; } t) = \frac{\#\,\text{new cases or}\ \#\text{detected disease (age; sex; t)}}{\#\,\text{death by the disease (age; sex; t)}} \tag{2}$$

$$\Pr(+1\text{; age; sex; } t) = \frac{\#\,\text{death by the disease(age; sex; t)}\ \#\,\text{permanence or}\ \#\text{people who have survived the disease one more year(age; sex; t)}}{\#\,\text{death by the disease(age; sex; t)}} \tag{3}$$

The model diagram is showed in Figure 1. Several considerations must be taken by each patient’s condition.

Deaths. It works with the records of the SS with respect to age, sex and cause key, excluding unspecified. It has the historical 1990 to 2011. Curve fitting are applied to these data by ordinary least-squares (OLS) after the transformation of equation (4). In most cases it is the exponential. The growth rates are denoted as λ´s. Prospective is constructed following behavior given these rates, for 2012-2050 taken as input data 2011.

The correlation coefficient of curve fitting are showed in Table 1.

$$death_t = b e^{\lambda t} \Rightarrow \quad (4)$$
$$Ln(death_t) = Ln(death_0\, e^{\lambda t}) = Ln(death_0) + \lambda t$$

The equation (1) is calculated using both prospective, the population and the exponential behavior of deaths by BC. This latter based on the high correlation coefficients by age group and sex shown in Table 1.

Behavior of deaths was analyzed. The female age groups 45+ showed an exceptional exponential behavior with correlation coefficients greater than 93%. In the case of male the data do not show trend.

New cases. From the database of the SS tables of major diseases are obtained by age group (<1, 1-4, 5-9, 10-14, 15-19, 20-24, 25-44, 45-49, 50-59, 60-65 & 65+). Information was obtained from 1990-2011 data which its trend behavior and basic statistics (mean and standard deviation) was analyzed. In case non-trend was chosen to simulate an exponential growth between the extreme values for the entire period. As a base scenario was chosen the trend values as first option and minimum among all the options as second choice.

The equation (2) is calculated using both prospective, the population and the exponential behavior of new cases by BC. For new cases exhibit this behavior with correlations of 96% for women and 33% for men in general. The probabilities of entrance, in treatment and death to BC are dynamics and they are different in each stage. Their dynamic changes are gotten by LSO. Table of these dynamic changes by age group are shown in the appendix.

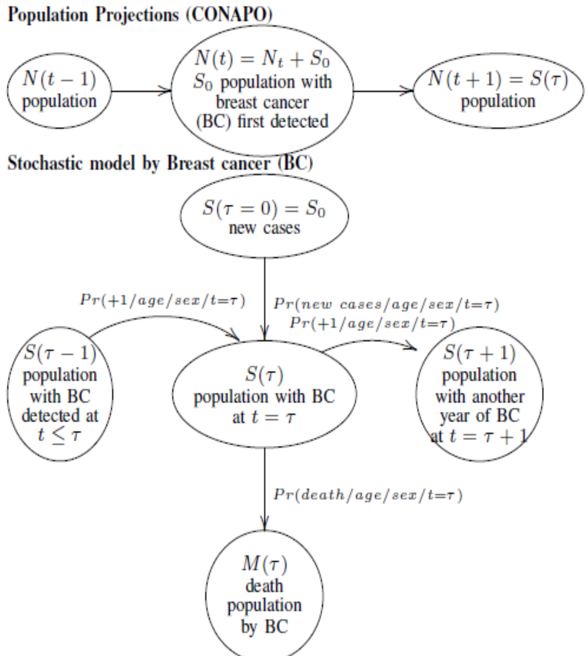
In treatment. IMSS data were used to rebuild the intermediate years. The method Runge-Kuta was applied to the exponential growth rates per period. Then data were redistributed according to death rates of SS for age groups. Subsequently normalized with respect to the prospective of the IMSS. The initial value is the amount of the average proportion of deaths[1] by age group by sex (2003-2011) multiplied by the number of patients treated according to IMSS prospective.

Data from 2011 patients in treatment are obtained by extrapolating the values of 2012 compared to exponential growth rates (2012-2020) of its prospective. The cases of initial values are the maximum, minimum and average in the period. After these are distributed by age and sex as mentioned in the previous paragraph.

The equation (3) is calculated using both prospective, the population and the exponential behavior of in treatment patients by BC. As the number of in treatment patients are IMSS data (sample), these were analyzed and calculated their behavior and prospective of both beneficiaries of the IMSS and beneficiaries who have survived the disease one more year. Latter, the probabilities by age group by sex by each year were gotten applying equation (3). After, these probabilities were input to make inference to population.

The AMIS published in 2011 the morbidity rate of BC for each 10,000. See Table 2.

Redistribution by age group (2012-2050) can be calculated using standard growth rates (about the death) following the general prospective IMSS or initial value using any of the three values obtained from the ratios of deaths by group age by sex by disease (1990-2012): average, maximum or minimum. And from the initial value to apply the before mentioned growth rates. The scenarios I, II and III use the average, maximum and minimal values as initial value (2011), respectively.



Pr(new cases/age/sex/t): Entrance probability for age for sex at time t
Pr(+1/age/sex/t): Suffering a year over the disease probability by age by sex at time t
Pr(death/age/sex/t): Death probability by BC by age by sex at time t

Figure 1: Schematic model. Started CONAPO population projections estimated population with BC, new cases and dying from this disease from 2012 to 2050.

Table 1: Correlation coefficients for exponential behavior (Death)

age groups	male	female	age groups	male	female
0-4			45-49		0.95
5-9			50-54		0.93
10-14			55-59		0.96
15-19			60-64		0.97
20-24			65-69		0.99
25-29			70-74		0.99
30-34			75-79		0.94
35-39			80-84		0.95
40-44		0.74	85 +		0.97

Table 2: Morbidity rate of breast cancer for each 10,000 (2011)

MALE		(N10-N19)	FEMALE		(N10-N19)
age group	Distribution of insured	Malignant breast tumor	age group	Distribution of insured	Malignant breast tumor
0-20	29%	0	0-20	26%	1
21-35	30%	1	21-35	33%	20
36-50	29%	1	36-50	29%	261
51-65	10%	1	51-65	10%	1073
+ 65	2%	21	+ 65	1%	4089
TOTAL	100%	24	TOTAL	100%	5443
% casos/casos totales		0.01%	% casos/casos totales		1.35%

2.1 Gross Domestic Product scenarios: Basis, optimal and worse.

Base Scenario. Quarterly gross domestic product (GDP) data since 1996-I up to 2012-IV current prices are applied to AR(2)MA(2) model (Eq. (5)). Adjusted data are deflated to base year 2012.

$$GDP_t = 1.037568\, GDP_{t-2} + [AR(2) = 0.730942,\; MA(2) = -0.937709],\, 1996 \leq t \leq 2012 \quad (5)$$

From Table 3, AR process is stationary and ARMA model is invertible. The model presents positive serial correlation because of Durbin-Watson statistical is between 1 and 2. Covariance matrix values appear in Table 4.

Table 3: Statistical parameter of model AR(2)MA(2)

$R^2 = 98.99\%$	Inv. AR Root (0.85,-0.85) Inv. MA Root (0.97,-0.97)
$s_\epsilon = 3.66x10^8$	t-Student (433.15, 8.79, -23.86)
n = 64	D-W = 1.160196

Table 4: Covariance matrix of model AR(2)MA(2)

	GDP(-2)	AR(2)	MA(2)
GDP(-2)	5.74E-06	-7.41E-05	-2.26E-05
AR(2)	-7.41E-05	0.006918	-0.000999
MA(2)	-2.26E-05	-0.000999	0.001545

The increasing GDP was 2.5% (January 2013) fall dawn 1.7% (December 2013). Average rate in June 2014 was 3.1% (fall dawn up to 2.5%) and last semester is expected 1.7%. The government expects an increasing rates during 2015 between (2.5% - 3.5%). In 2016, rates could be of (3.0% - 3.1%) and in 2017-2050 of 3%. If energy and labor reforms are successful, the GDP growth rates could be of up to 7% from 2020. The GDP prospective is showed in the Figure 2.

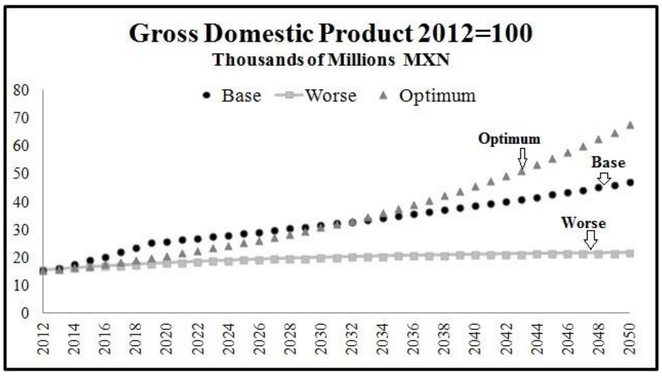


Figure 2: Curves fitted for each scenarios of gross domestic product are showed

Optimum scenario. Upper limits of the ranges of the above paragraph.

Worse scenario. Lower limits of the ranges of the above paragraph.

2.2 Probabilities of entrance, in treatment and death for breast cancer.

Dynamics probabilities prospective by patient condition by age group by sex by year are gotten from IMSS prospective for in treatment patients (Table 5) and applied to Runge-Kutta approximation to reconstruction year by year. Late, death data historic distribution by age groups and its prospective and applied to Table 6 data. Maximal rate for male is 0.00225% and 0.16746% for female at 2012. These rates are larger for women as men throughout the period. NOTE: In the IMSS prospective of in treatment patients, their rates are decreasing from 2031 to differences obtained from the analysis of historical data from 1990 to 2011.

Table 5: IMSS prospective for in treatment patients of Breast Cancer

Increasing rates of in treatment patients for range[9], [10]:	
λ_1 2012-2020	1.9%
λ_2 2021-2030	0.2%
λ_3 2031-2040	−0.5%
λ_4 2041-2050	−0.5%
λ 2012-2050	0.2%

In the cases of death and new cases condition, dynamics probabilities prospective are fitted by LSO. SS data are age groups.

3. Results

From Figures 3 and 4, comparing two arbitrary years, 2019 and 2040, BC medical costs are higher for women than men about 0.03239% and 0.025529% of GDP, respectively, for base scenario. To worse scenario the differences are

0.040975% and 0.021481% for each reference year. To optimum scenario are 0.04628% and 0.04671%. All in absolute terms.

If the initial value of patients in 2011 is the historical minimum, the differences in medical costs versus maximum are 0.000209% (2019) and 0.000108% (2040) for male. For female, the costs differences are 0.005892% and 0.003078%, respectively. All in absolute terms.

For historical minimum initial value versus average initial value, the differences in medical costs for male are 0.000088% (2019) and 0.000046% (2040) and for female are 0.003174% and 0.003078%, respectively. All in absolute terms.

From figure 5, 6 and 7, the medical costs represent 14.71% (2019) and 18.87% (2040) for 50 and more years old male respect all disease population. For female, the costs are 14.39% and 19.29%, respectively.

The maximum number of people in treatment is (30-34) years old for male and, (35-44) years old for female.

Table 6: Probabilities by patient condition by sex by year (2012-2050)

Proba-bilities	enter (all age groups)		in treatment (all age groups)		death (all age groups)		death (50 +)	
YEAR	male	female	male	female	male	female	male	female
2010	0.000%	0.015%	0.001%	0.215%	0.000%	0.010%	0.000%	0.042%
2011	0.001%	0.016%	0.001%	0.201%	0.000%	0.010%	0.000%	0.042%
2012	0.001%	0.017%	0.002%	0.236%	0.000%	0.010%	0.000%	0.042%
2013	0.001%	0.019%	0.002%	0.238%	0.000%	0.010%	0.000%	0.043%
2014	0.001%	0.020%	0.002%	0.240%	0.000%	0.011%	0.000%	0.043%
2015	0.001%	0.022%	0.002%	0.241%	0.000%	0.011%	0.000%	0.044%
2016	0.001%	0.024%	0.002%	0.243%	0.000%	0.011%	0.000%	0.045%
2017	0.001%	0.026%	0.002%	0.244%	0.000%	0.012%	0.000%	0.045%
2018	0.001%	0.028%	0.002%	0.245%	0.000%	0.012%	0.000%	0.046%
2019	0.001%	0.030%	0.002%	0.246%	0.000%	0.013%	0.000%	0.047%
2020	0.001%	0.033%	0.002%	0.247%	0.000%	0.013%	0.000%	0.047%
2021	0.001%	0.035%	0.002%	0.244%	0.000%	0.014%	0.000%	0.048%
2022	0.001%	0.038%	0.002%	0.240%	0.000%	0.014%	0.000%	0.049%
2023	0.001%	0.041%	0.002%	0.237%	0.000%	0.014%	0.000%	0.049%
2024	0.001%	0.045%	0.001%	0.233%	0.000%	0.015%	0.000%	0.050%
2025	0.001%	0.048%	0.001%	0.230%	0.000%	0.015%	0.000%	0.051%
2026	0.001%	0.053%	0.001%	0.226%	0.000%	0.016%	0.000%	0.052%
2027	0.001%	0.057%	0.001%	0.223%	0.000%	0.016%	0.000%	0.052%
2028	0.001%	0.062%	0.001%	0.219%	0.000%	0.017%	0.000%	0.053%
2029	0.001%	0.067%	0.001%	0.216%	0.000%	0.018%	0.000%	0.054%
2030	0.001%	0.072%	0.001%	0.212%	0.000%	0.018%	0.000%	0.055%
2031	0.001%	0.078%	0.001%	0.207%	0.000%	0.019%	0.000%	0.056%
2032	0.001%	0.085%	0.001%	0.202%	0.000%	0.019%	0.000%	0.056%
2033	0.001%	0.092%	0.001%	0.198%	0.000%	0.020%	0.000%	0.057%
2034	0.002%	0.099%	0.001%	0.193%	0.000%	0.021%	0.000%	0.058%
2035	0.002%	0.107%	0.001%	0.188%	0.000%	0.021%	0.000%	0.059%
2036	0.002%	0.116%	0.001%	0.184%	0.000%	0.022%	0.000%	0.060%
2037	0.002%	0.126%	0.001%	0.179%	0.000%	0.023%	0.000%	0.061%
2038	0.002%	0.136%	0.001%	0.175%	0.000%	0.024%	0.000%	0.062%
2039	0.002%	0.147%	0.001%	0.170%	0.000%	0.024%	0.000%	0.063%
2040	0.002%	0.160%	0.001%	0.166%	0.000%	0.025%	0.000%	0.064%
2041	0.002%	0.173%	0.001%	0.162%	0.000%	0.026%	0.000%	0.064%
2042	0.002%	0.187%	0.001%	0.158%	0.000%	0.027%	0.000%	0.065%
2043	0.002%	0.202%	0.001%	0.154%	0.000%	0.028%	0.000%	0.066%
2044	0.002%	0.219%	0.001%	0.150%	0.000%	0.029%	0.000%	0.067%
2045	0.002%	0.237%	0.001%	0.146%	0.000%	0.030%	0.000%	0.068%
2046	0.003%	0.257%	0.001%	0.142%	0.000%	0.031%	0.000%	0.069%
2047	0.003%	0.278%	0.001%	0.139%	0.000%	0.032%	0.000%	0.070%
2048	0.003%	0.301%	0.001%	0.135%	0.000%	0.033%	0.000%	0.071%
2049	0.003%	0.326%	0.001%	0.132%	0.000%	0.034%	0.000%	0.072%
2050	0.003%	0.353%	0.001%	0.129%	0.000%	0.035%	0.000%	0.074%

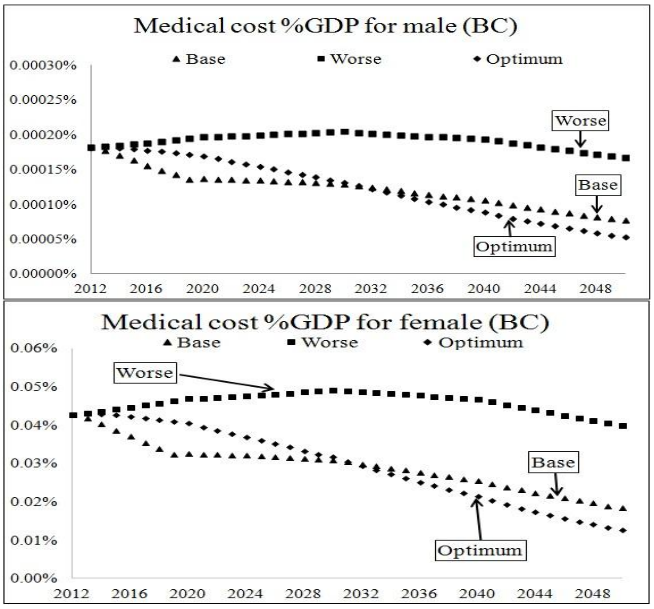


Figure 3: Medical cost as a percentage of GDP for male and female since 2012 up to 2050 for three scenarios: base, optimum and worse.

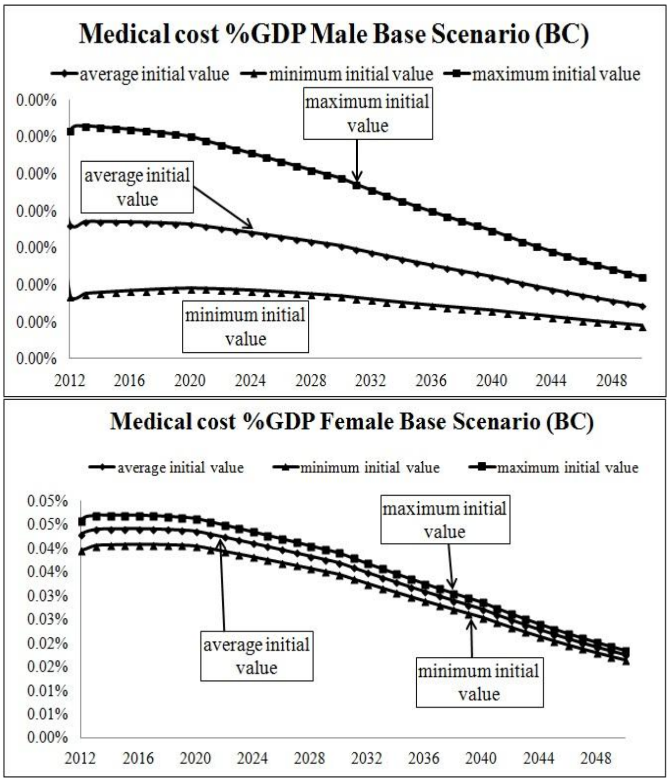


Figure 4: Medical cost as a percentage of GDP for male and female for base scenario.

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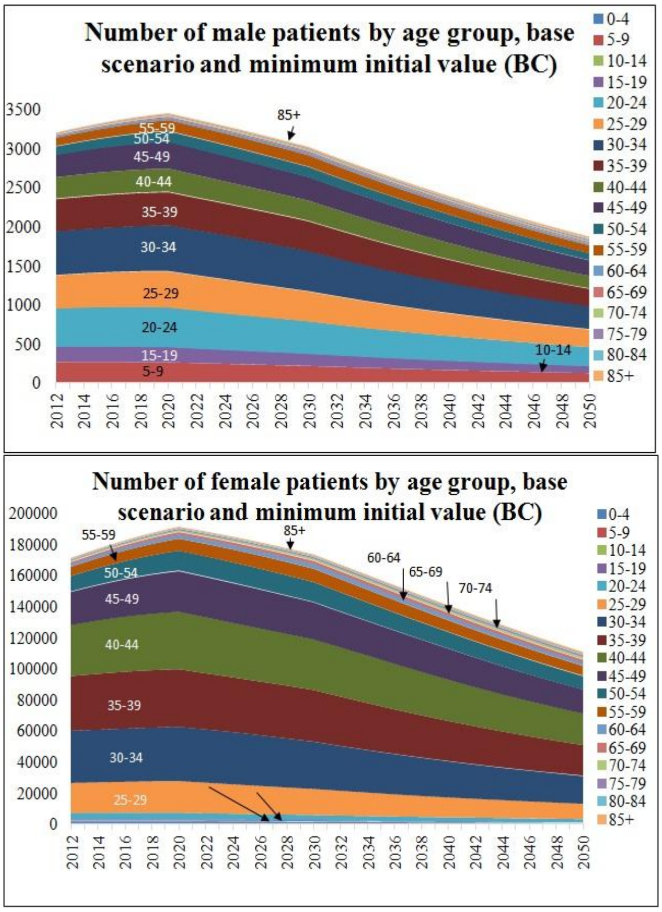

Figure 5: Comparative number of patients for male and female by age group for base scenario and minimum initial value.

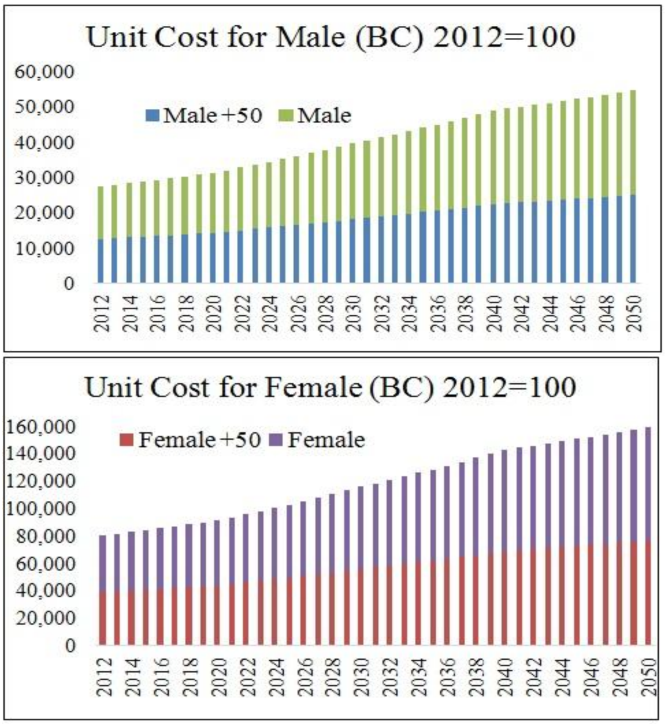

Figure 6: Comparative unit cost for male and female all age group vs. 50 and more years old.

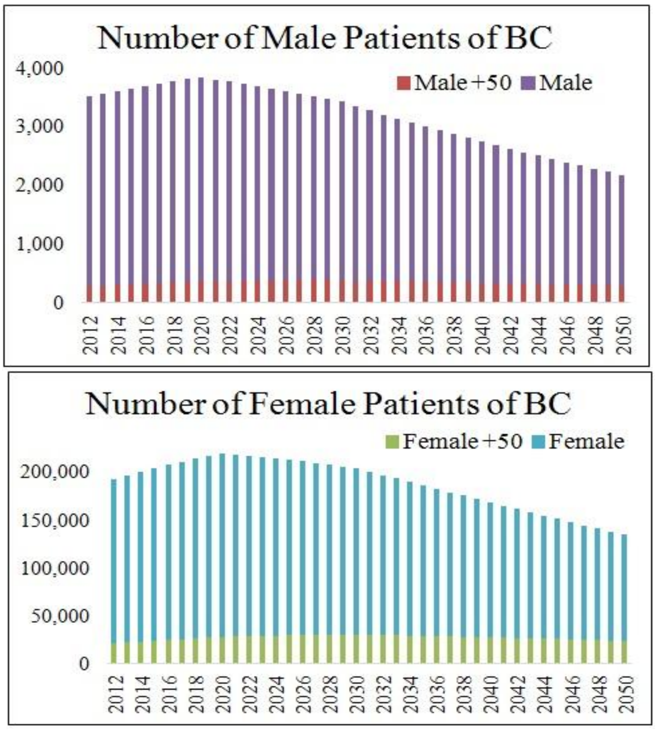

Figure 7: Comparative number of patients of BC for male and female all age group vs. 50 and more years old.

4. Conclusions

The breast cancer is less expensive than degenerative chronic-diseases as diabetes mellitus[13], renal failure and hypertensive disease. After of 50 years old BC decreasing costs conceivably owing to the survive probability are less. BC appears at early age (0-4) for female and (5-9) for male. The BC is more expensive for female then male.

It is necessary to construct consistent data bases for new cases and in treatment condition patient for age by sex by year to better models.

5. Appendix

Table 7: Probabilities of enter or disease detection – Male

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%
5-9	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
10-14	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%
15-19	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%
20-24	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%
25-29	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%	0.002%	0.003%
30-34	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%	0.002%	0.003%
35-39	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%	0.002%	0.003%
40-44	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.002%	0.002%	0.003%
45-49	0.001%	0.001%	0.002%	0.002%	0.003%	0.003%	0.004%	0.005%	0.007%
50-54	0.001%	0.001%	0.001%	0.002%	0.002%	0.002%	0.003%	0.004%	0.005%
55-59	0.001%	0.001%	0.001%	0.002%	0.002%	0.002%	0.003%	0.004%	0.005%
60-64	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.005%	0.007%
65-69	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%
70-74	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%
75-79	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%
80-84	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%
85 +	0.002%	0.002%	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%

Table 8: Probabilities of enter or disease detection – Female

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.002%	0.002%	0.004%
5-9	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.002%
10-14	0.000%	0.000%	0.001%	0.001%	0.001%	0.002%	0.004%	0.006%	0.009%
15-19	0.001%	0.001%	0.002%	0.003%	0.004%	0.007%	0.011%	0.017%	0.027%
20-24	0.002%	0.003%	0.005%	0.007%	0.012%	0.018%	0.029%	0.045%	0.071%
25-29	0.015%	0.018%	0.028%	0.042%	0.065%	0.101%	0.159%	0.251%	0.394%
30-34	0.015%	0.018%	0.028%	0.042%	0.065%	0.101%	0.159%	0.251%	0.394%
35-39	0.015%	0.018%	0.028%	0.042%	0.065%	0.101%	0.159%	0.251%	0.394%
40-44	0.015%	0.018%	0.028%	0.042%	0.065%	0.101%	0.159%	0.251%	0.394%
45-49	0.046%	0.055%	0.076%	0.112%	0.171%	0.258%	0.387%	0.601%	0.946%
50-54	0.049%	0.058%	0.077%	0.106%	0.151%	0.225%	0.340%	0.511%	0.779%
55-59	0.049%	0.058%	0.077%	0.106%	0.151%	0.225%	0.340%	0.511%	0.779%
60-64	0.056%	0.064%	0.082%	0.108%	0.144%	0.200%	0.292%	0.441%	0.662%
65-69	0.042%	0.050%	0.065%	0.083%	0.108%	0.140%	0.185%	0.253%	0.356%
70-74	0.042%	0.050%	0.065%	0.083%	0.108%	0.140%	0.185%	0.253%	0.356%
75-79	0.042%	0.050%	0.065%	0.083%	0.108%	0.140%	0.185%	0.253%	0.356%
80-84	0.042%	0.050%	0.065%	0.083%	0.108%	0.140%	0.185%	0.253%	0.356%
85 +	0.042%	0.050%	0.065%	0.083%	0.108%	0.140%	0.185%	0.253%	0.356%

Table 9: Probabilities of stock or in treatment – Male

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
5-9	0.005%	0.005%	0.005%	0.004%	0.004%	0.004%	0.003%	0.003%	0.003%
10-14	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
15-19	0.004%	0.004%	0.004%	0.003%	0.003%	0.003%	0.002%	0.002%	0.002%
20-24	0.010%	0.010%	0.010%	0.009%	0.008%	0.007%	0.007%	0.006%	0.005%
25-29	0.009%	0.009%	0.010%	0.009%	0.008%	0.007%	0.007%	0.006%	0.005%
30-34	0.013%	0.013%	0.013%	0.012%	0.012%	0.010%	0.009%	0.008%	0.007%
35-39	0.010%	0.010%	0.010%	0.010%	0.009%	0.008%	0.007%	0.006%	0.006%
40-44	0.007%	0.007%	0.008%	0.007%	0.006%	0.006%	0.005%	0.005%	0.004%
45-49	0.009%	0.009%	0.009%	0.009%	0.008%	0.007%	0.006%	0.006%	0.005%
50-54	0.004%	0.004%	0.004%	0.004%	0.004%	0.003%	0.003%	0.003%	0.002%
55-59	0.005%	0.005%	0.005%	0.005%	0.004%	0.004%	0.004%	0.003%	0.003%
60-64	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
65-69	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
70-74	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
75-79	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
80-84	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
85 +	0.004%	0.004%	0.004%	0.004%	0.003%	0.003%	0.003%	0.002%	0.002%

Table 10: Probabilities of stock or in treatment – Female

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.039%	0.039%	0.040%	0.037%	0.034%	0.030%	0.027%	0.024%	0.022%
5-9	0.004%	0.004%	0.005%	0.004%	0.004%	0.003%	0.003%	0.003%	0.002%
10-14	0.003%	0.003%	0.003%	0.003%	0.003%	0.003%	0.002%	0.002%	0.002%
15-19	0.018%	0.018%	0.018%	0.017%	0.015%	0.014%	0.012%	0.011%	0.010%
20-24	0.076%	0.076%	0.076%	0.071%	0.065%	0.058%	0.052%	0.047%	0.042%
25-29	0.391%	0.393%	0.396%	0.366%	0.339%	0.303%	0.270%	0.241%	0.215%
30-34	0.704%	0.707%	0.712%	0.659%	0.610%	0.545%	0.487%	0.434%	0.387%
35-39	0.794%	0.797%	0.803%	0.743%	0.688%	0.614%	0.548%	0.489%	0.436%
40-44	0.822%	0.825%	0.831%	0.769%	0.712%	0.636%	0.568%	0.506%	0.452%
45-49	0.624%	0.626%	0.631%	0.584%	0.540%	0.483%	0.431%	0.384%	0.343%
50-54	0.345%	0.347%	0.349%	0.323%	0.299%	0.267%	0.239%	0.213%	0.190%
55-59	0.257%	0.258%	0.259%	0.240%	0.222%	0.198%	0.177%	0.158%	0.141%
60-64	0.115%	0.116%	0.117%	0.108%	0.100%	0.089%	0.080%	0.071%	0.063%
65-69	0.087%	0.088%	0.088%	0.082%	0.076%	0.067%	0.060%	0.054%	0.048%
70-74	0.078%	0.079%	0.079%	0.073%	0.068%	0.061%	0.054%	0.048%	0.043%
75-79	0.085%	0.085%	0.086%	0.080%	0.074%	0.066%	0.059%	0.052%	0.047%
80-84	0.090%	0.090%	0.091%	0.084%	0.078%	0.069%	0.062%	0.055%	0.049%
85 +	0.120%	0.120%	0.121%	0.112%	0.104%	0.093%	0.083%	0.074%	0.066%

Table 11: Probabilities of death – Male

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
5-9	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
10-14	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
15-19	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
20-24	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
25-29	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
30-34	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
35-39	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
40-44	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
45-49	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
50-54	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
55-59	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
60-64	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
65-69	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%
70-74	0.000%	0.000%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
75-79	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
80-84	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.002%
85 +	0.002%	0.002%	0.003%	0.003%	0.003%	0.004%	0.004%	0.004%	0.004%

Table 12: Probabilities of death - Female

Age Group/ Year	2012	2015	2020	2025	2030	2035	2040	2045	2050
0-4	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
5-9	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
10-14	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%
15-19	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.003%	0.008%	0.020%
20-24	0.000%	0.000%	0.000%	0.000%	0.000%	0.000%	0.001%	0.001%	0.001%
25-29	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%	0.001%
30-34	0.003%	0.003%	0.003%	0.003%	0.003%	0.004%	0.004%	0.004%	0.005%
35-39	0.006%	0.006%	0.007%	0.007%	0.007%	0.008%	0.008%	0.009%	0.010%
40-44	0.010%	0.010%	0.011%	0.011%	0.012%	0.013%	0.014%	0.015%	0.017%
45-49	0.019%	0.019%	0.020%	0.022%	0.024%	0.027%	0.030%	0.035%	0.041%
50-54	0.025%	0.025%	0.027%	0.029%	0.033%	0.040%	0.047%	0.055%	0.067%
55-59	0.029%	0.030%	0.033%	0.035%	0.040%	0.047%	0.058%	0.071%	0.087%
60-64	0.036%	0.036%	0.038%	0.041%	0.044%	0.050%	0.059%	0.073%	0.089%
65-69	0.039%	0.040%	0.042%	0.044%	0.048%	0.053%	0.060%	0.072%	0.090%
70-74	0.038%	0.039%	0.040%	0.040%	0.040%	0.041%	0.043%	0.047%	0.054%
75-79	0.045%	0.047%	0.050%	0.053%	0.053%	0.054%	0.057%	0.060%	0.067%
80-84	0.057%	0.061%	0.069%	0.076%	0.081%	0.085%	0.089%	0.097%	0.106%
85 +	0.077%	0.079%	0.086%	0.095%	0.104%	0.113%	0.118%	0.124%	0.131%

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