Program against cancer in nicaragua

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Abstract

Worldwide, one in eight of deaths is due to cancer. Projections based on the GLOBOCAN 2012 evaluate divine a substantive increase new cancer cases per year by 2035 in developing countries if preventive measures are not widely applied. According to the World Health Organization (WHO), millions of lives could be saved each year if countries made use of existing knowledge and the best cost-effective methods to prevent and treat cancer. Therefore, the aim of this study is to estimate a provisional budget against cancer in low and middle incomes countries, according the GNI-PPP, the cancer incidence and the number of population.Economically country classification is determining with the Gross national income (GNI), per capita, Purchasing power parity (PPP), according the administrations of the International Monetary Fund (IMF), the World Bank (WB) and the Central Intelligence Agency (CIA). Cancer incidence data presented are based on the most recent data available at IARC. However, population compares estimates from the US

Bureau of the Census. The provisional allocate is establishing among the instruction developed by WHO for regional and national cancer manage programs according to national economic development. Provisional budget against cancer is estimated to **71,682.111** (thousands of U.S $) for a population of 6,025,951 persons in Nicaragua.

1. Introduction

Worldwide, one in eight of deaths is due to cancer. Cancer causes more deaths than AIDS, tuberculosis, and malaria combined [1]. When countries are assembled according to economic development, cancer is the leading cause of death in developed countries and the second leading cause of death in developing countries [2]. Rates of cancers common in Western countries will continue to rise in

Developing countries if preventive measures are not widely applied [3-5].Projections hinged on GLOBOCAN 2012, evaluate anticipation a substantive increase to 19.3 million new cancers casing per year by 2025, due to growth and ageing of the global population. Incidence has been increasing in most regions of the world, but there are huge inequalities between rich and poor countries. Further, half of all cancers (56.8%) &cancer deaths (64.9%) in 2012 occurred in less succeded regions of the worldwide, and these proportions will become high further by 2025 [6]. By 2030, the global burden is anticipated to grow to 21.4 million new cancer cases and 13.2 million cancer deaths [7]. Rates of cancers will continue to rise by 2035 with 23,980,858 new cancer cases [3-5].

In insertitn to the human toll of cancer, the economic cost of cancer is substantial [8-10]. Cancer has the most devastating economic impact of any cause of death in the world [10]. Data limitations do not allow rate the worldwide economic costs of cancer. However, sections of the total costs of cancer have been estimated to be as high as $895 billion (US) worldwide [9, 10]. It is estimated that more than half of all cancer cases and deaths worldwide are potentially preventable [3-5, 7].

In Nicaragua, the number of new cancer cases is estimated to 5,681 with 3,981 deaths in 2015. By 2025, incidence is expected to grow to 7,790 with 5,597 deaths. Rates of cancers will continue to rise to 10,724 new cancer cases by 2035 with 8,098 deaths if preventive measures are not widely applied [3-5]. As stated by the World Health Organization (WHO); Entitled: National Cancer Control Programs: Policies and Managerial Guidelines, millions of lives could be saved each year if countries made use of existing knowledge and the finest cost-effective methods to prevent and treat cancer [11].

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"An emergency need in cancer control today is to expand potent and affordable approaches to the advance detection, diagnosis, and therapy of breast cancer among women living in less developed countries," explains Dr Christopher Wild, Director of IARC. "It is analytic to bring morbidity and mortality in line with progress made in recent years in more developed parts of the world." [6].

With the data highlspoting a large variability of GNI/capita even within similar turnover levels in the various world regions, it is expected that additional investment in resources and costs may be more dependent on turnover level of the country than on the GNI group or the geographic region of the world [12]. Therefore, the aim of this study is to estimate a provisional budget against cancer in Nicaragua, according the GNI-PPP, the cancer incidence and the number of population.

2. Methods

2.1. Economically Country Classification

The economics states are established among the means of GNI-PPP according the administrations of the International Monetary Fund (IMF); the World Bank (WB) and the Central Intelligence Agency (CIA) [13-15]. The disagreement concerning the same country can be considerable between the data origin. These variations are explaining by:
- GNI-PPP is estimated
- Anterior prediction of an economic crisis changes GNI-PPP data
- The estimation of the population included in the local population
- The alternative elements for GNI-PPP evaluation have some subjective portion.

These data must be taken with precaution

Economically Country is divided according to the gross national income (GNI) per capita 2016, Atlas method and PPP [15].
- Estimated to be a low income ($1,005 or less)
- Estimated to be a lower middle income ($1,006 to $3,995)
- Estimated to bea upper middle income ($3,956 to $12,235)
- Estimated to be a high income ($12,236 or high).

2.2. Gross National Income (GNI), Per Capita, Purchasing Power Parity (PPP)

Gross national product is gross domestic product (GDP) and plus the net income (employee compensation and the investment income) from the abroad. GNI, per capita is a GNI divided by the mid-year population.

PPP is a (purchasing power parity); an international dollar'shas the same purchasing power over the GNI as a U.S. dollar has in the United States. PPP exchange rates are used to account for the local prices of goods and services not traded internationally. Though, PPP is used to balance across national accounts, and not for making the international poverty comparisons [15].

2.3. Cancer Incidence

Incidence is the number of new cases that occurs during a given period of time in a specified population. It can be indicated as an absolute number of the cases per year, or as a rate of per 100,000 persons per year. The rate gives an approximation of the mode risk of developing a cancer. Cancer incidence data presented are based on the most recent data available at IARC. GLOBOCAN 2012, layout a global profile of the cancer that has been expanded using a number of methods that are dependent on the accessibility and the accuracy of the data. National sources, are used where probable, with local data and the statistical modeling used in their exclusion [3-5].

2.4. Population

The Standard population (POP$_{st}$) is the determining to the Senegal population (Western Africa) with 14,668,522 person's. The Nicaragua population is estimated to 6,025,951 person's. The Population compares the estimation from the US Bureau of Census [16] based on the statistics from the population censuses, and the vital statisticsis a registration systems, or asample surveys pertaining to recent past and on the assumptions about the future trends: https://www.cia.gov/library/publications/the-world-factbook/geos/nu.html

2.5. Provisional Budget (thousands of U.S $)

The World Health Organization (WHO) highlight that, when the developing national strategies for controlling the cancer, all countries should consider the following 4 broad approaches, based on their economic developments:
- The primary prevention
- The early detection and secondary prevention
- The diagnosis and treatment
- The palliative care.

The provisional budget is the beginning,among the guidelines of the developed by the WHO for the regional and the national cancer control programs is according to the national economic development [11].Since, an International Atomic Energy Agency [17] reports the suggested that in developing countries at least 60% of the cancer patients require the radiation therapy.

The Radiotherapy is the main components of amodern cancer treatment and it requires asubstantial capital investment, by some trained professionals in several disciplines, & a high precision equipment and particular external & internal organizational structure. In High Incomes Countries, the healthcare costs can be as much as 8.4% (UK in 2007) to 18% (USA in 2009) of a country's gross domestic product [18]. The Cancer absorbs nearly 5-10% of the global healthcare budget, in which radiotherapy only consumes about a 5% [18,19]; & more than 50% of cancer patients are requiring radiotherapy in a low and a middle-income countries lack, which access to treatment. A benchmark is of between a 400 to 500 patients per treatment, and unit per year has been used to calculate a machine throughput in a several reports [17, 20-21]. A benchmark of 450 patients per machine, which corresponds to abouta 8 operating hours per day, which seems adequate for a High Incomes Countries. For the scenarios, where radiotherapy inquire is not satisfied, to a treatment day of 10 hours to optimizes the utilization of the equipment and it decreases the number of machines needed. But, range of needs is currently covered varies from the 0% to 3-4% in a Low Incomes Countries in Latin America &Africa up to 59-

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79% in the Up-Middle Incomes Countries in Europe-Central & Asia [22].

However, in this study, in order to found the best cost-effective methods to prevent and treat cancer, the number of machines needs is establishing among 3 millions of peoples and not by the number of cancer cases, according to the weakness of the countries incomes.

2.6. Standard budget for 5 years (S$_0$)

The Standard budget for 5 years (S$_0$) is estimated for using a population of nearly 1,000,000 persons in Senegal (POP$_{st}$). Senegal has over 8361 new cancer cases, (CI$_{st}$) in 2015 [3-5] which a means GNI-PPP$_{st}$ of US\$ 2,551 referred to the year in 2016 (low middle income country), according to the administrations of the International Monetary Fund (IMF); the World Bank (WB) &the Central Intelligence Agency (CIA) [13-15]. Estimation budget is taken into an account of the weakness of the countries incomes.

2.7. Standardized rapport (R$_0$)

The Standardized rapport (R$_0$), is among the GNI-PPP, CI & the number of population, is calculated. The Standardization simplifies the comparisons of GNI-PPP and the cancer incidence rates among the populations.

$$R_0 = \frac{\text{GNI-PPP} \times \text{CI} / \text{POP}}{\text{GNI-PPP}_{st} \times \text{CI}_{st} / \text{POP}_{st}}$$

Note:
* For a Radiotherapy equipment, R$_0$ = GNI-PPP X POP / GNI-PPP$_{st}$ X 3 million people;
Senegal has been installed a two new radiotherapy machines in 2017. Radiotherapy equipment has been estimated to US\$ 2,500,000.
** For the prevention & screening infrastructure, R$_0$ = GNI-PPPX POP / GNI-PPP$_{st}$ X 3 million people.

R$_0$= Standardized rapport among the GNI-PPP, CI & the number of population
GNI-PPP$_{st}$= The Standard Gross National Income Per capita Purchasing
GNI-PPP= Gross National Income Per capita Purchasing Power Parity of interest
CI$_{st}$= Standard Cancer Incidence in Senegal
CI= Cancer Incidence of interest
POP$_{st}$= Standard Population in Senegal
POP= Population of interest

3. Results

Country	GNI per capita Purchasing power parity (PPP)				Population	Cancer incidence (CI)
	Ref.	US\$	Year	Means of GNI-PPP		

Country		Ref.	US\$	Year	Means of GNI-PPP	(US\$)		
Nicaragua	IMF	5,213	2016		5,421	6,025,951	5,681
	WB	5,550	2016				
	CIA	5,500	**2016**				

IMF= International Monetary Fund; **WB**= World Bank; **CIA**= Central Intelligence Agency; **GNI**= Gross National Income; **PPP**= Purchasing Power Parity; **Ref.**= Reference.

Table 1: GNI-PPP, Cancer incidence (CI) & the number of Population

Cancer Control	Management	Stand. budget (S$_0$)	Stand. rapport (R$_0$)	Account per (R$_0$)	General POP. budget
Cancer primary prevention	Development of an information system	50	**3.51477**	175.738	1,058.991
	Against Tobacco	250	**3.51477**	878.692	5,294.957
	Against Infections	500	**3.51477**	1,758.738	10,589.914
	Against carcinogenic substances	125	**3.51477**	439.346	2,647.478
	Against environmental risks	125	**3.51477**	439.346	2,647.478
	Diet or nutrition promotion	250	**3.51477**	878.692	5,294.957
	Sport promotion	200	**3.51477**	702.954	4,235.965
	Cancer risk factors survey	50	**3.51477**	175.738	1,058.991
Cancer early detection and secondary prevention.	Breast cancer screening	150	**3.51477**	527.215	3,176.974
	Cervical cancer screening	125	**3.51477**	439.346	2,647.478
	Prostate cancer screening	50	**3.51477**	175.738	1,058.991
	Colorectal cancer screening	50	**3.51477**	175.738	1,058.991

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	Colorectal cancer screening	50	**3.51477**	175.738	1,058.991

	Others cancers screening	50	**3.51477**	175.738	1,058.991
Cancer institutional reinforcement	Rise of cancer professional	125	**3.51477**	439.346	2,647.478
	Development of cancer research	175	**3.51477**	615.084	3,706.469
	Development of cancer prevention courses	100	**3.51477**	351.477	2,117.982
Cancer diagnosis and treatment	Assistance for Palliative Care	150	**3.51477**	527.215	3,176.974
	Chemotherapy equipment	100	**3.51477**	351.477	2,117.982
	Surgical equipment	175	**3.51477**	615.084	3,706.469
	Radiotherapy equipment *	2,500	4.26848	10,671.2	10,671.2
	Prevention and screening infrastructure **	400	4.26848	1,707.392	1,707.392
Total		**5,700**			71,682.111

Based on: World Health Organization. The National Cancer Control Programmes: policies & a managerial guidelines. 2nd ed. Geneva, 2002.

S_0= Standard budget for 5 years for a population of 1,000,000 persons; R_0= Standardized rapport among the GNI-PPP, CI and the number of the population; *For a Radiotherapy equipment among only **GNI-PPP/GNI-PPP$_{st}$** for each 3 million people; ** Prevention &screening infrastructure among only**GNI-PPP/GNI-PPP$_{st}$**, for each 3 million people.

Table 2: Estimated Budget (thousands of U.S $).

4. Conclusion

The Cancer has the allmost devastating economic impact of any of a cause of death in the world. Incidence has been increasing in most regions of the world, but there are huge inequalities between rich and poor countries. Projections are based on the GLOBOCAN 2012, estimates to predict a substantive increase to a millions new cancer cases per year by 2030.

Rates of cancers will continue to rise by 2035 in Nicaragua, if preventive measures are not widely applied. An urgent need in the cancer control, today is to develop an effective and the affordable approaches. It is expected to that additional investment in a resources and the costs may be more dependent on an income level of the country than on GNI group or the geographic region of the world. However, ina order to find the best cost-effective methods and to prevent & to treat cancer, provisional budget against the cancer is estimated to **71,682.111** (thousands of U.S $) for the population of 6,025,951 peoplein Nicaragua, according the GNI-PPP, the cancer incidence and the number of population.

It is a very important thing for all organizations to be aware of complexity of the cancer control. A flexible approach is to be needed. This account must be added to the actual supply efforts of cancer prevention and treatment. However, effective measures to reduce cancer morbidity and mortality require the active participation of cancer survivors and their local communities; the mobilization and appropriate allocation of resources; the formulation of evidence-based policies and proven interventions; and the commitment of organizations and institutions in the nonprofit, for-profit, and governmental sectors. Ultimately, cancer control goes hand in hand with efforts to promote human and economic development and to improve standards of health, education, and medical care throughout the world.

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