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Program against Cancer in Congo, Democratic Republic

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Abstract

Worldwide, one in eight deaths is due to cancer. Projections based on the GLOBOCAN 2012 estimates predict 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 budget is establishing among the guidelines developed by WHO for regional and national cancer control programs according to national economic development. Provisional budget against cancer is estimated to 86,980.024 (thousands of U.S $) for a population of 83,301,151 persons in Congo, Democratic Republic.

Keywords: cancer program; cancer control; prevention; early detection; institutional reinforcement; diagnosis; treatment; low and middle-income countries; congo, democratic republic

Introduction

Worldwide, one in eight deaths is due to cancer. Cancer causes more deaths than AIDS, tuberculosis, and malaria combined [1]. When countries are grouped 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 based on the GLOBOCAN 2012 estimates predict a substantive increase to 19.3 million new cancer cases 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. More than half of all cancers (56.8%) and cancer deaths (64.9%) in 2012 occurred in less developed regions of the world, and these proportions will increase further by 2025 [6]. By 2030, the global burden is expected 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 addition to the human toll of cancer, the financial 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 estimating the worldwide economic costs of cancer. However, portions 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 Congo, Democratic Republic, the number of new cancer cases is estimated to 40,496 with 33,405 deaths in 2015. By 2025, incidence is expected to grow to 54,513 with 45,053 deaths. Rates of cancers will continue to rise to 74,853 new cancer cases by 2035 with 62,063 deaths if preventive measures are not widely applied [3-5]. According to 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 best cost-effective methods to prevent and treat cancer [11].

"An urgent need in cancer control today is to develop effective and affordable approaches to the early detection, diagnosis, and treatment of breast cancer among women living in less developed countries," explains Dr Christopher Wild, Director of IARC. "It is critical to bring morbidity and mortality in line with progress made in recent years in more developed parts of the world." [6].

With the data highlighting a large variability of GNI/capita even within similar income levels in the various world regions, it is expected that additional investment in resources and costs may be more dependent on income 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 Congo, Democratic Republic,

according the GNI-PPP, the cancer incidence and the number of population.

Methods

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 difference concerning the same country can be considerable among the data origin. These variations are explaining by:

- GNI-PPP is estimated
- Anterior projection of an economic crisis changes GNI-PPP data
- The estimation of the population included in the local population
- The choice elements for GNI-PPP evaluation have some subjective part.

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 low income ($1,005 or less)
- Estimated to be lower middle income ($1,006 to $3,995)
- Estimated to be upper middle income ($3,956 to $12,235)
- Estimated to be high income ($12,236 or more).

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

Gross national product is gross domestic product (GDP) plus net income (employee compensation and investment income) from abroad. GNI, per capita is GNI divided by mid-year population.
PPP is purchasing power parity; an international dollar has the same purchasing power over 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. However, PPP is used to compare across national accounts, not for making international poverty comparisons [15].

Cancer Incidence

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

Population

Standard population (POPst) is determining to Senegal population (Western Africa) with 14, 668,522 persons. Congo, Democratic Republic population is estimated to 83, 301,151 persons. Population estimates for this country explicitly take into account the effects of excess mortality due to AIDS; this can result in lower life expectancy, higher infant mortality, higher death rates, lower population growth rates, and changes in the distribution of population by age and sex than would otherwise be expected. Population compares estimates from the US Bureau of the Census [16] based on statistics from population censuses, vital statistics registration systems, or sample surveys pertaining to the recent past and on assumptions about future trends:https://www.cia.gov/library/publications/the-world-factbook/geos/cg.html

Provisional Budget (thousands of U.S $)

The World Health Organization (WHO) emphasizes that, when developing national strategies for controlling cancer, countries should consider the following four broad approaches based on their economic development:

- The primary prevention
- The early detection and secondary prevention
- The diagnosis and treatment
- The palliative care.

The provisional budget is establishing among the guidelines developed by WHO for regional and national cancer control programs according to national economic development [11]. However, an International Atomic Energy Agency [17] report suggested that in developing countries at least 60% of cancer patients require radiation treatment.
Radiotherapy is one of the main components of modern cancer treatment and requires substantial capital investment, trained professionals in several disciplines, high precision equipment and a particular external and 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]. Cancer consumes about 5-10% of the global healthcare budget, of which radiotherapy only consumes about 5% [18, 19]; thus, more than 50% of cancer patients requiring radiotherapy in low and middle-income countries lack access to treatment. A benchmark of between 400 and 500 patients per treatment unit per year has been used to calculate machine throughput in several reports [17, 20-21]. The benchmark of 450 patients per machine, which corresponds to about 8 operating hours per day, seems adequate for High Incomes Countries. For scenarios where radiotherapy demand is not satisfied, a treatment day of 10 h optimizes the utilization of equipment and decreases the number of machines needed. But, the range of needs currently covered varies from 0% and 3-4% in Low Incomes Countries in Latin America and Africa up to 59-79% in Up-Middle Incomes Countries in Europe-Central and 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.

Standard budget for 5 years (S0)

Standard budget for 5 years (S_0) is estimated using a population of 1,000,000 persons in Senegal (POPst). Senegal has 8361 new cancer cases (CI_{st}) in 2015 [3-5] with a means GNI-PPPst of US$ 2,551 referred to the year 2016 (low middle income country), according the administrations of the International Monetary Fund (IMF); the World Bank (WB) and the Central Intelligence Agency (CIA) [13-15]. Estimation budget is taken into account the weakness of the countries incomes.

Standardized rapport (R0)

Standardized rapport (R_0), among the GNI-PPP, CI and the number of the population, is calculated. Standardization simplifies comparisons of GNI-PPP and cancer incidence rates among populations.

$$R_0 = \frac{\text{GNI-PPP} \times \text{CI/POP}}{\text{GNI-PPPst} \times \text{CIst /POPst}}$$

Note:

* For Radiotherapy equipment, $R_0 =$ GNI-PPP X POP / GNI-PPPst X 3 million peoples;

Senegal has installed two new radiotherapy machines in 2017. Radiotherapy equipment is estimated to US$ 2,500,000.

** For Prevention and screening infrastructure, $R_0 =$ GNI-PPPX POP / GNI-PPPst X 3 million peoples.

R_0= Standardized rapport among the GNI-PPP, CI and the number of the population

GNI-PPP$_{st}$= Standard Gross National Income Per capita Purchasing Power Parity in Senegal

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

Results

Country	GNI per capita Purchasing power parity (PPP)				Population	Cancer incidence (CI)
	Ref.	US$	Year	Means of GNI-PPP (US$)		
Congo, Dem. Rep.	IMF	791	2016	794	83,301,151	40,496
	WB	790	2016			
	CIA	800	**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) and the number of the 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	**0.26546**	13.273	1,105.656
	Against Tobacco	250	**0.26546**	66.365	5,528.280
	Against Infections	500	**0.26546**	132.73	11,056.561
	Against carcinogenic substances	125	**0.26546**	33.182	2,764.140
	Against environmental risks	125	**0.26546**	33.182	2,764.140
	Diet or nutrition promotion	250	**0.26546**	66.365	5,528.280
	Sport promotion	200	**0.26546**	53.092	4,422.624
	Cancer risk factors survey	50	**0.26546**	13.273	1,105.656
Cancer early detection and secondary prevention.	Breast cancer screening	150	**0.26546**	39.819	3,316.968
	Cervical cancer screening	125	**0.26546**	33.182	2,764.140
	Prostate cancer screening	50	**0.26546**	13.273	1,105.656
	Colorectal cancer screening	50	**0.26546**	13.273	1,105.656
	Others cancers screening	50	**0.26546**	13.273	1,105.656
Cancer institutional reinforcement	Rise of cancer professional	125	**0.26546**	33.182	2,764.140
	Development of cancer research	175	**0.26546**	46.455	3,869.796
	Development of cancer prevention courses	100	**0.26546**	26.546	2,211.312
Cancer diagnosis and treatment	Assistance for Palliative Care	150	**0.26546**	39.819	3,316.968
	Chemotherapy equipment	100	**0.26546**	26.546	2,211.312
	Surgical equipment	175	**0.26546**	46.455	3,869.796
	Radiotherapy equipment *	2,500	8.64251	21,606.27	21,,606.27
	Prevention and screening infrastructure **	400	8.64251	3,457.004	3,457.004
Total		**5,700**			**86,980.024**

Based on: World Health Organization. The National Cancer Control Programmes: policies and 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; * Radiotherapy equipment among only **GNI-PPP /GNI-PPP$_{st}$** for each 3 million peoples; ** Prevention and screening infrastructure among only **GNI-PPP /GNI-PPP$_{st}$**, for each 3 million peoples.

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

Conclusion

Cancer has the most devastating economic impact of any 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 based on the GLOBOCAN 2012 estimates predict a substantive increase to millions new cancer cases per year by 2030.

Rates of cancers will continue to rise by 2035 in Congo, Democratic Republic, if preventive measures are not widely applied. An urgent need in cancer control today is to develop effective and affordable approaches. It is expected that additional investment in resources and costs may be more dependent on income level of the country than on the GNI group or the geographic region of the world. However, in order to found the best cost-effective methods to prevent and treat cancer, provisional budget against cancer is estimated to 86,980.024 (thousands of U.S $) for a population of 83,301,151 persons in Congo, Democratic Republic, according the GNI-PPP, the cancer incidence and the number of population.

It is very important for all organizations to be aware of the complexity of cancer control. A flexible approach is 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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