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## Cancer in Central and South America: Introduction<sup>☆</sup>

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### ABSTRACT

Central and South American countries (including Cuba) are experiencing rapid socio-demographic and epidemiologic changes and the nature of health problems are undergoing transition from infectious to chronic diseases, including cancer. Countries are poorly prepared to respond effectively to the subsequent challenges posed by the new patterns of disease. Existing data delineating the number of cancer cases and the distribution of cancer types from each country in the region are sparse due to limitations on health information systems for recording incidence and mortality despite improvements made in recent years. There is an urgent need for reliable statistics on cancer to inform governmental entities responsible for cancer control in the region. We attempted to obtain the best available cancer data from each country located in the region to provide an overview of current geographic patterns of cancer incidence and mortality in the 21st century.

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### 1. Background

Non-communicable diseases (NCDs) – including cancer, cardiovascular diseases, stroke, and diabetes, among others – are the leading contributors to the global disease burden [1]. In low- and middle-income countries, NCDs now surpass infectious diseases as causes of death; this transition is multifactorial, a consequence of demographic changes (in aging and population growth), exposure to risk factors (i.e. smoking, harmful use of alcohol), and a substantial decline in infections as a cause of infant death [1,2]. As in many other parts of the world, countries in Central and South America (including Cuba) have been undergoing rapid urbanization which has been accompanied by an increased burden of NCDs [3]. The levels of urbanization in the region have increased from 65 to 74% in 1990 to 73 to 83% in 2014, comparable to the urbanization levels of North America and many European countries [3]. The economy in the Central and South American region has grown at a steady pace since the 1980s, as

represented by the overall increases in per-capita gross domestic product (GDP) and human development index (HDI), and by declines in income inequality (Gini coefficient) from nearly 60 in 1980 to the 40s in 2010 [4,5] (Tables 1 and 2). Countries are spending a larger percentage of their per-capita GDP on public health, although this percentage varies considerably across the region, with more affluent countries generally spending more than their poorer counterparts (ranging from 2.1 in Paraguay to 7.4 in Costa Rica and 9.7 in Cuba for the year 2010). In recent decades, infant mortality has declined remarkably and life expectancy has increased. For example, life expectancy in Honduras (a country of medium human development) increased by more than 13 years between 1980 and 2010 (59.4 versus 72.8 years), while infant mortality significantly decreased between 1990 and 2010 (58 deaths versus 24 deaths per 1000 live births in 2010) [4] (Table 1). Population estimates indicate striking increases in population size since the 1960s as well as changes in the distribution of age groups; the proportion of the population under 15 years declined while the proportion of the population aged over 65 years increased [6]. This may, in part, be a result of the investment of individual countries in universal health care and improvements in the public health services and implementation of health policies [7–14]. The Central and South American region (including Cuba) have simultaneously experienced a complex epidemiologic transition from mortality due to communicable, maternal, and perinatal diseases to mortality due to NCDs [1,2,15–17]. In 2008, mortality due to NCDs accounted for 50–87% of total deaths in the region, with cancer carrying 8–25%

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**Table 1**  
Selected economic and health indicators by country (from [4;5]).

	Year	Argentina	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica	Cuba	Ecuador	French Guyana [21]	Guatemala	Guyana	Honduras	Mexico
<b>Economic indicators</b>															
GDP per capita (2005 PPP \$) <sup>a</sup>	1980	10,075	3342	3779	7567	5654	5297	6378		5699		3873	2059	2820	10,238
	2005	10,833	6254	3772	8509	12,663	7305	9042		6510		4062	2536	3277	12,191
	2010	14,363	5980	4350	10,093	14,540	8479	10,453		7201		4297	3104	3519	12,441
Human development index (HDI) value <sup>b</sup>	1980	0.68	0.62	0.49	0.52	0.64	0.56	0.62	0.63	0.60		0.43	0.51	0.46	0.60
	2005	0.77	0.69	0.65	0.70	0.79	0.68	0.73	0.74	0.68	0.85	0.55	0.61	0.58	0.75
	2010	0.81	0.70	0.67	0.73	0.81	0.71	0.77	0.78	0.72		0.58	0.63	0.63	0.77
Income Gini coefficient <sup>c</sup>	1980														
	2005	49.3			57.4			47.6		54.1				59.7	
	2010	44.5						55.9		49.3					
Public expenditure Education (% of GDP) <sup>d</sup>	1980	2.6				4.4	1.7	7.3	8.4					3.0	
	2005				4.5	3.4	4.0		10.6				8.1		5.0
	2010						4.8		12.9				3.7		
Expenditure on health, public (% of GDP) <sup>d</sup>	2000	5.0	2.2		2.9	3.4	5.5	5.0	6.1	1.3		2.2	4.6	3.0	2.4
	2005	4.6	2.1		3.3	2.8	5.3	5.3	8.7	2.1		2.2	6.0	3.8	2.6
	2010	4.4	3.3		4.2	3.8	5.5	7.4	9.7	3.0		2.5	5.1	4.4	3.1
<b>Health indicators</b>															
Life expectancy at birth (years) <sup>e</sup>	1980	69.4	70.2		62.5	69.2	65.5	72.5	73.5	62.9		57.3	59.5	59.4	66.6
	2005	74.8	74.5		71.6	78.4	72.3	78.6	77.7	74.7		69.7	67.3	71.4	75.6
	2010	75.7	75.9		73.1	79.0	73.5	79.2	79.0	75.5	72/78 (m/f)	70.9	69.6	72.8	76.7
Health index <sup>f</sup>	1980	0.78	0.79		0.67	0.78	0.72	0.83	0.84	0.68		0.59	0.62	0.62	0.74
	2005	0.87	0.86		0.81	0.92	0.83	0.92	0.91	0.86		0.78	0.75	0.81	0.88
	2010	0.88	0.88		0.84	0.93	0.84	0.93	0.93	0.88		0.80	0.78	0.83	0.90
Under-five mortality (per 1000 live births) <sup>g,h</sup>	1990	27	44		59	19	37	17	13	52	18	78	66	58	49
	2010	14	17		19	9	19	10	6	20		32	30	24	17

<sup>a</sup> GDP, gross domestic product (PPP, purchasing power parity).

<sup>b</sup> HDI, the average achievement in three basic dimensions of human development: a long and healthy life, knowledge, and a decent standard of living.

<sup>c</sup> Measure of the deviation of the distribution of income (or consumption) among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute inequality.

<sup>d</sup> Current and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and non-governmental organizations), and social (or compulsory) health insurance funds, expressed as a percentage of GDP.

<sup>e</sup> Number of years a newborn infant could expect to live if prevailing patterns of age-specific mortality rates at the time of birth stay the same throughout the infant's life.

<sup>f</sup> Life expectancy at birth expressed as an index using a minimum value of 20 years and observed maximum value over 1980–2010.

<sup>g</sup> Probability of dying between birth and exactly 5 year of age, expressed per 1000 live births.

<sup>h</sup> Mortality data are of variable quality in this region [22].

of the total NCD burden [18]. The NCD burden brings a significant economic impact, particularly for lower-income countries with insufficient economic resources to respond to this emerging public health problem [13,14,19,20].

## 2. Estimating the burden of cancer in Central and South America

The GLOBOCAN project has estimated that approximately 14 million cancer cases and 8.2 million cancer deaths were estimated to have occurred worldwide in 2012 (excluding non-melanoma skin cancer), with one million cancer cases and more than half a million cancer deaths occurring in Central and South America [23]. GLOBOCAN further predicts that these latter figures will increase to 1.7 million new cancer cases and 1 million cancer deaths by 2030, due to the growth and aging of the population (and without taking changes in underlying risk into account); corresponding to an increase of around 75% [23]. In 2012, GLOBOCAN indicates that the most common cancer diagnoses and causes of cancer-related death in the Central and South American region were prostate, lung, colorectum, and stomach cancers for males and breast, cervix, colorectum and lung for females (Fig. 1). In South America, the incidence of prostate cancer was similar to the incidence in more developed regions of the world (60.1 versus 68.0 per 100,000, respectively). Infection-related cancers – such as cervix and stomach cancers – are higher in Central and South America as compared to more developed regions of the world. Although cancer incidence in Central and South America is, in general, lower than the cancer

incidence in more developed regions of the world, mortality is remarkably higher. This may be explained in part by more advanced stages at cancer diagnosis and by poorer access to cancer diagnostic, screening and treatment services [7].

Nevertheless, the cancer profile between countries for the 2012 estimates is markedly different, depending on the measure of disease frequency evaluated. In males, prostate cancer incidence was estimated to be highest in Cuba and lowest in Bolivia (84.2 versus 25.9 per 100,000, respectively). Lung cancer incidence rates were estimated as being highest in Brazil and Cuba (21.3 and 42.8), while mortality rates were highest in Argentina, Cuba, Paraguay, Uruguay and Venezuela (18.7–47.3). Countries with the lowest incidence rates of lung cancer also experienced the lowest mortality rates (i.e. Bolivia, Guatemala, Guyana and Honduras). Stomach cancer incidence and mortality were highest in Chile, Colombia, Costa Rica, Ecuador, El Salvador, and Guatemala and are lowest in French Guyana, Guyana, and Suriname. In females, breast cancer incidence and mortality rates were highest in Argentina and Uruguay and lowest in Bolivia. Brazil also had one of the highest estimated incidence rates of breast cancer, but mortality was lower (59.5 versus 14.3), whereas in Guyana estimated incidence was relatively low and mortality high (50.4 versus 20.1). Cervical cancer incidence and mortality rates were highest in Bolivia, Guyana, Nicaragua, Paraguay, and Suriname. French Guyana and Venezuela also had high incidence rates but lower mortality rates. These estimates reflect the ongoing transition from infection-related cancers (typical of countries of low human development) to those cancers usually observed in the most affluent countries. Regional

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