Cancer mortality predictions for 2017 in Latin America

G. Carioli[1], C. La Vecchia[1], P. Bertuccio[1], T. Rodriguez[2], F. Levi[3], P. Boffetta[4], E. Negri[5], M. Malvezzi[1]

[1] Department of Clinical Sciences and Community Health, Universitá degli Studi di Milano, Milan, Italy.

[2] Navarra Health Service, Pamplona, Navarra, Spain.

[3] Institute of Social and Preventive Medicine (IUMSP), Lausanne University Hospital, Lausanne, Switzerland.

[4] Tisch Cancer Institute, Icahn School of Medicine at Mount Sinai, NY, USA

[5] Department of Biomedical and Clinical Sciences, Universitá degli Studi di Milano, Milan, Italy.

*__Correspondence to__: Prof. C. La Vecchia M. D., Department of Clinical Sciences and Community Health, Universitá degli Studi di Milano, Via Augusto Vanzetti 5, 20122 Milan, Italy. Tel: +39 02-503 20 863; Fax: +39 02 503 20 866; E-mail: carlo.lavecchia@unimi.it

Short title: Cancer mortality in Latin America.

Key message

Cancer mortality rates in major Latin American countries are relatively low, except in Cuba. Still, they are predicted to decline moderately until 2017. Stomach and cervix rates remain high, though declining in all countries except cervix in Cuba. Estimated avoided cancer deaths in 1990-2017 are over 420,000 in 5 of the countries, but not in Brazil and Cuba, despite high rates in the latter.

Abstract

Background: From most recent available data, we predicted cancer mortality statistics in selected Latin American countries for the year 2017, with focus on lung cancer.

Materials and Methods: We obtained death certification data from the World Health Organization and population data from the Pan American Health Organization database for all neoplasms and selected cancer sites. We derived figures for Argentina, Brazil, Chile, Colombia, Cuba, Mexico and Venezuela. Using a logarithmic Poisson count data joinpoint model, we estimated number of deaths and age-standardized (world population) mortality rates in 2017.

Results: Total cancer mortality rates are predicted to decline in all countries. The highest mortality rates for 2017 are in Cuba, i.e. 132.3/100,000 men, and 93.3/100,000 women. Mexico had the lowest predicted rates, 64.7/100,000 men and 60.6/100,000 women. In contrast, the total number of cancer deaths is expected to rise due to population ageing and growth. Men showed declines in lung cancer trends in all countries and age groups considered, while only Mexican and Venezuelan women had downward trends. Stomach and (cervix) uteri rates are predicted to continue their declines, though mortality from these neoplasms remains comparatively high. Colorectal, breast and prostate cancer rates were predicted to decline moderately, as well as leukaemia. There was no clear pattern for pancreatic cancer. Between 1990 and 2017 about 420,000 cancer deaths were avoided in 5 of the 7 countries, but no progress was observed in Brazil and Cuba.

Conclusion: Cancer mortality rates for 2017 in the seven selected Latin American countries are predicted to decline, though there was appreciable variability across countries. Mortality from major cancers – including lung and prostate – and all cancers remains comparatively high in Cuba, indicating the need for improved prevention and management.

Keywords: cancer, Latin America, mortality, projections, lung cancer, tobacco.

Introduction

National cancer mortality data have been available for a few Latin American countries since the 1970's. These showed relatively low rates for common cancers, including lung, colorectum and breast, in most countries, and relatively high rates, but with downward trends, for stomach and (cervix) uterus [1, 2].

Since death certification figures are available with a few years lag, predictions of cancer mortality for the current year have been published over several years for the USA [3] and the European Union (EU) [4], and have proven reasonably valid [3, 5]. Thus, despite some inherent uncertainty in any prediction, these are useful for public health planning, and for understanding patterns and trends in cancer rates and hence their major risk factors.

We therefore predicted the number of deaths and mortality rates for all cancers and selected major cancer sites for 2017 in seven Latin America countries providing death certification data of acceptable validity to the World Health Organization (WHO) database.

Materials and Methods

We retrieved official death certification data from the WHO database (WHOSIS) [6] for cancer of the stomach, colorectum, pancreas, lung, breast, uterus (cervix and corpus), prostate, leukaemia and total neoplasms (malignant and benign). We obtained data for the 7 Latin American countries with over 85% death certification coverage (over 90% for all countries except Brazil) and over 10 million inhabitants (Argentina, Brazil, Chile, Colombia, Cuba, Mexico, and Venezuela) [7], for the 1980-2014 calendar period (for Venezuela and Colombia up to 2013). We obtained resident population estimates, based on official censuses, from the Pan American Health Organization (PAHO) database [8].

Using certified deaths and resident population, we calculated age-specific death rates for each 5-year age group (from 0-4 to 80+ years), sex and calendar year. We computed age-standardized rates per 100,000 person-years at all ages, using the direct method on the world standard population.

To identify the most recent trend segment, we fit a logarithmic Poisson count data joinpoint regression model to the number of certified deaths in each 5-year age group [9] allowing for up to five joinpoints. We

then applied a linear regression to each age group's mortality data over the most recent trend segment identified by the joinpoint model to compute the predicted age-specific certified numbers of deaths and the corresponding 95% prediction intervals (PIs). We calculated the 95% PIs using a standard error accounting for the variability of the new observation [5, 10]. Predicted age-standardized death rates with their corresponding 95% PIs were estimated using the predicted age-specific death counts and the predicted population data from the PAHO database.

Numbers of avoided cancer deaths over the 1990-2017 period were estimated by comparing observed deaths and expected ones on the basis of 1990 age-specific rates.

Results

Table 1 (men) and 2 (women) include the number of predicted cancer deaths and rates for the year 2017 with the corresponding 95% PIs along with the 2012 observed data, and the percent difference between 2017 and 2012 for the 7 countries and the 9 cancer sites considered.

Figure 1 shows bar plots of age-standardized death rates per 100,000 population for all cancers in the countries considered, in men and women, in 2012 (dark grey), and the predicted rates for 2017 (light grey), with corresponding 95% PIs. Total cancer mortality is predicted to decline in all countries. In men the highest predicted rate is 132.3/100,000 for Cuba. Mexican men have the lowest predicted total cancer rate, 64.7/100,000, and the largest fall in rates. In women, Cuba has the highest predicted rate 93.3/100,000, compared to 96.3 in 2012; Mexico has the lowest one, 60.6/100,000, compared to 65.8 in 2012. The greatest falls are predicted for Chile and Colombia.

Despite favourable trends in rates, the number of deaths is predicted to increase in all countries and both sexes (Tables 1 and 2). The largest increase is in Colombian men.

Figure 2 shows trends in total cancer mortality rates, in men and women separately, from 1980-84 quinquennium to 2010-14, and predicted rates for 2017 with the corresponding PIs. In men trends started to decline between 1990 and 2000, except for Cuba and Brazil. Female trends generally declined over the whole period considered, except for Cuba and Brazil.

Figure 3 gives mortality trends for each cancer site and country. In men, lung cancer trends were moderately downwards in recent calendar periods for most countries. Mexico and Argentina showed strong downward trends since 1990. In contrast, lung cancer trends in women have been rising, except in Mexico, with however some levelling only in recent years. Stomach cancer mortality has long been downwards. Colorectal cancer has been rising in most countries, with a tendency to level off during the most recent period. Breast cancer mortality was relatively low in most countries (except Argentina) and tended to decline over recent years. In contrast, despite long term falls, cancer of the uterus rates remain high in all Latin America, particularly in Cuba and Venezuela, whose predicted rates remain around 10/100,000. Prostate cancer rates were particularly high in Cuba and Venezuela, but tended to moderately decline over the most recent years. While pancreatic cancer rates are inconsistent, leukaemia mortality shows some declines over recent years.

Table 3 presents all ages-standardized mortality rates for the age groups 25-44, 45-64, 65-74 and 75+ years for lung cancer in 2005-2009 and 2010-2014, the predicted rates for 2017 and the percent difference between 2012 and 2017. Men showed favourable patterns at all age groups and in all countries, generally larger in the young. With a few exceptions, rates were predicted to decline also in women, though generally not as much as for men.

Figure 4 shows the estimated number of avoided cancer deaths in men and women between 1990 and 2017, assuming constant age-specific rates in 1990 (light grey area). Over the 27-year period considered, a substantial amount of cancer deaths was avoided in Argentina (132,000 deaths, 88,000 in men and 44,000 in women), Chile (63,000 deaths, 16,000 in men and 47,000 in women), Colombia (83,000 deaths, 31,000 in men and 52,000 in women), Mexico (118,000 deaths, 39,000 in men and 79,000 in women) and Venezuela only for women (26,000 deaths). No appreciable reduction in cancer deaths was observed in Brazil, Cuba and Venezuelan men.

Discussion

Despite substantial variability across the seven Latin America countries considered (i.e., for all cancers in 2012 there was an about two fold difference between the lowest rate in Mexico and the highest one in Cuba for men, and an over 50% difference in women), rates for all cancers and for most major cancer sites are predicted to fall to 2017, confirming the global decrease in cancer mortality over recent decades [11]. However, as in most other areas of the world with the exception of the USA and a few western European countries [4, 12], the total number of cancer deaths is still rising, reflecting the lower rate of falls as compared to the USA [3] and the EU [4], as well the increasing size and ageing of the population.

Total cancer mortality rates in Argentina, Cuba and Chile were similar to those registered in Europe, North America and (for men) in Japan [11], but they were appreciably lower for both sexes in other Latin American countries considered. This essentially reflects the historical low lung cancer (and most likely other tobacco related cancers) rates in these countries, due to less frequent cigarette use [13-16]. However, in Cuba female lung cancer rates are higher than the EU ones, and not appreciably different from the North American ones [11], and rates are predicted to fall only modestly, contrary to the US ones [3].

Despite predicted continuous falls, stomach cancer rates remain high in Latin America (particularly so in Chile) [11]. This likely reflects the high prevalence of *Helicobacter Pylori* (HP) infection [17, 18] as well as the interaction between HP, unfavourable dietary habits and poor food preservation [19]. A meta-analysis of Latin American case control studies [20] confirmed the role of local dietary factors, i.e. meat, preserved meat, salt and chilli pepper on gastric cancer.

In most of Latin America, and particularly in Mexico, colorectal cancer rates are much lower than in other areas of the world [11], despite a high prevalence of overweight and obesity [21, 22]. This likely reflects favourable aspects of local diet and possibly physical activity [23].

Pancreatic cancer mortality has not been increasing in most Latin American countries. This is consistent with the favourable patterns and trends of other tobacco-related cancers, since tobacco is the strongest-recognised risk factor for this neoplasia, too [24]. Pancreatic cancer remains particularly difficult to diagnose, and hence a proportion of under-certification in some of the countries considered remains possible.

Breast cancer mortality has substantially declined in Europe and North America [3, 5] over the last few decades, following improvements in diagnosis and treatment. Most Latin American rates are comparably low, and show favourable predictions [25-27]. The low rates in Mexico are probably real, since breast cancer is easy to diagnose, and low breast cancer rates in these ethnic groups are registered in the USA as well [28-30].

We were unable to distinguish cervical from endometrial cancer from death certification data. The high rates in Latin America, however, are attributable to high cervical cancer [31] in this area. The predicted rates remain high on a global scale, despite substantial declines in all countries except Cuba. This underlines the persisting importance of prevention for this neoplasms [2, 32], through screening and – for younger generations - HPV vaccination.

For prostate cancer, the predicted rates are favourable, reflecting, as in other areas of the world with similar rates, improved management [33]. Likewise, the favourable predictions in leukaemia rates are attributable to improved treatment of the disease [5, 34-36].

Over the last three decades, there was no appreciable number of cancer deaths avoided in Brazil and Cuba - despite the high rates in Cuba – as well as in men from Venezuela. This points to the urgency of improving cancer prevention and management in these countries [37]. The total number of avoided deaths in the other four countries plus Venezuelan women was over 420,000. This may be an underestimate, assuming that cancer deaths certification accuracy has improved over the last three decades. In proportional terms, this was less than in the USA and in the EU, but is at least in part justified by the comparatively low rates of several cancers in Latin America.

Data available in the WHO database allowed analysis of trends and predictions for major cancers only in a proportion of Latin American countries, though these cover the majority of Latin American population. In some of the countries considered, validity of death certification may be subject to criticism, though we included only countries with acceptable indicators of death certification validity in the WHO database, and a selected number of major neoplasms relatively easy to diagnose and hence certify. In addition, this cannot explain the favourable predicted trends. It is moreover reassuring that the presented cancer rates

and patterns are consistent with those of selected groups of Hispanic whites in Florida, i.e. Mexican, Cuban, Central America, South America [30]. Another inherent limitation of predictions is their inability to model sudden changes or fluctuation in slope. These limitations notwithstanding, the general pattern emerging from the present work is of continuing, though modest, declines in cancer mortality in Latin America, with the exception of Cuba [30].

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Disclosure

The authors disclose no conflicts.

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Figure legends

Figure 1. Bar-plots of age-standardized (world population) death rates per 100,000 persons for the year 2012 (dark grey) and predicted rates for 2017 (light grey) with 95% prediction intervals (PIs) for total cancer in the 7 selected Latin American countries, men and women.

Figure 2. Age-standardized (world population) total cancer mortality rate trends in quinquennia from 1980 to 2014 and predicted rates for 2017 with 95% prediction intervals (PIs), for Argentina (squares), Brazil (circles), Chile (triangles), Colombia (crosses), Cuba (xs), Mexico (diamonds), and Venezuela (inverted triangles), in men and women.

Figure 3. Age-standardized (world population) cancer mortality rate trends in quinquennia from 1980 to 2014 and predicted rates for 2017 with 95% prediction intervals (PIs) for the 7 selected Latin American

countries. Men: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), prostate (inverted triangles) and leukaemias (ticked squares). Women: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), breast (xs), uterus (diamonds) and leukaemias (ticked squares).

Figure 4. Total avoided cancer deaths for 5 of the 7 Latin American countries considered, in both sexes between the top rate in 1990 and 2017 (light grey area); observed numbers of cancer deaths from 1990 to 2013/2014 and predicted cancer deaths from 2014/2015 to 2017 (black line); estimated numbers of total cancer deaths by applying 1990 age-specific peak mortality rate (dark grey). During the 27 years period a total of over 420,000 cancer deaths have been avoided in 5 of the 7 countries considered (174,000 in men and 248,000 in women). No reduction in cancer deaths was registered in Brazil, Cuba and Venezuelan men. In 2017 alone about 30,000 deaths are predicted to be avoided in men, but none in Cuba, and about 26,000 in women, but none in Brazil and Cuba. Abbreviation: ASR, age specific rate.

Table 1. Number of predicted deaths and mortality rates per 100,000 men for the year 2017 and comparison figures for the year 2012, from selected Latin America countries, with 95% prediction intervals.

	MEN	Observed number of deaths 2012	Predicted number of deaths 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	Observed ASR* 2012	Predicted ASR* 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference 2017 versus 2012
Argentina	STOMACH	1856	1830	1730	1935	7.47	6.78	6.41	7.16	-9.2
	COLORECTUM	3953	4330	4160	4495	15.38	15.51	14.91	16.11	0.9
	PANCREAS	1829	2000	1898	2098	7.41	7.29	6.93	7.66	-1.5
	LUNG	6422	6090	5862	6316	26.73	22.73	21.86	23.59	-15.0
	PROSTATE	3746	3590	3388	3790	12.99	11.32	10.73	11.92	-12.8
	LEUKEMIAS	899	980	907	1044	3.74	3.75	3.46	4.03	0.2
	ALL CANCERS	32349	33000	32439	33559	129.47	119.84	117.78	121.89	-7.4
Brazil	STOMACH	8716	9310	9099	9520	9.20	8.17	7.99	8.36	-11.2
	COLORECTUM	9048	10950	10686	11205	9.50	9.56	9.33	9.79	0.6
	PANCREAS	4017	4810	4649	4974	4.26	4.24	4.10	4.39	-0.5
	LUNG	14268	15970	15692	16248	15.29	14.11	13.85	14.36	-7.7
	PROSTATE	13353	14980	14608	15357	14.04	12.64	12.31	12.97	-10.0
	LEUKEMIAS	3397	3420	3255	3583	3.53	3.14	2.99	3.28	-11.1
	ALL CANCERS	102153	115300	114197	116400	107.52	101.04	100.06	102.01	-6.0
Chile	STOMACH	2181	2190	2076	2311	19.91	16.68	15.78	17.58	-16.2
	COLORECTUM	1101	1230	1162	1305	9.85	9.32	8.78	9.87	-5.3
	PANCREAS	526	640	593	694	4.85	4.99	4.58	5.39	2.9
	LUNG	1680	1840	1715	1969	15.86	14.67	13.68	15.66	-7.5
	PROSTATE	2045	2180	2071	2296	16.26	14.35	13.62	15.08	-11.8
	LEUKEMIAS	380	370	333	411	3.76	3.28	2.89	3.66	-12.9
	ALL CANCERS	13148	14680	14312	15046	118.45	111.21	108.53	113.89	-6.1
Colombia	STOMACH	2811	2990	2862	3115	13.57	11.75	11.25	12.26	-13.3
	COLORECTUM	1528	1500	1369	1624	7.36	5.91	5.42	6.41	-19.7
	PANCREAS	649	750	692	800	3.18	2.96	2.74	3.18	-6.9
	LUNG	2332	2560	2404	2718	11.50	10.25	9.63	10.88	-10.8
	PROSTATE	2499	2730	2600	2862	12.07	10.61	10.10	11.12	-12.1
	LEUKEMIAS	858	960	896	1026	3.92	3.92	3.66	4.18	-0.1
	ALL CANCERS	18352	20940	20365	21524	88.28	82.99	80.70	85.28	-6.0
Cuba	STOMACH	514	550	507	595	5.41	5.16	4.70	5.62	-4.6
	COLORECTUM	1105	1160	1089	1231	10.97	10.33	9.64	11.01	-5.8
	PANCREAS	449	450	406	500	4.82	4.31	3.82	4.79	-10.6
	LUNG	3287	3400	3225	3584	35.17	31.89	30.19	33.58	-9.3
	PROSTATE	2711	2840	2584	3100	23.38	21.16	19.60	22.73	-9.5
	LEUKEMIAS	315	320	283	350	4.02	3.52	2.94	4.10	-12.6
	ALL CANCERS	13453	14500	14007	15000	139.93	132.31	128.37	136.26	-5.4

	MEN	Observed number of deaths 2012	Predicted number of deaths 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	Observed ASR* 2012	Predicted ASR* 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference 2017 versus 2012
Mexico	STOMACH	2910	2950	2836	3071	5.56	4.72	4.53	4.90	-15.1
	COLORECTUM	2741	2950	2789	3108	5.31	4.76	4.50	5.01	-10.4
	PANCREAS	1801	1880	1782	1976	3.58	3.07	2.90	3.24	-14.3
	LUNG	4067	3840	3666	4013	7.90	6.07	5.77	6.37	-23.2
	PROSTATE	5775	6400	6213	6588	10.35	9.41	9.14	9.68	-9.1
	LEUKEMIAS	2216	2300	2199	2401	3.83	3.56	3.41	3.72	-6.9
	ALL CANCERS	37946	41120	40511	41719	71.46	64.69	63.71	65.68	-9.5
Venezuela	STOMACH	1112	1230	1145	1314	9.20	8.41	7.83	9.00	-8.5
	COLORECTUM	827	940	883	1001	6.83	6.48	6.07	6.89	-5.2
	PANCREAS	451	440	399	478	3.78	3.02	2.74	3.29	-20.1
	LUNG	2038	2040	1919	2162	17.05	14.18	13.34	15.01	-16.8
	PROSTATE	2419	2690	2560	2823	20.70	18.80	17.89	19.70	-9.2
	LEUKEMIAS	495	510	465	550	3.67	3.34	3.06	3.61	-9.1
	ALL CANCERS	12781	13920	13393	14438	105.28	95.82	92.21	99.43	-9.0

*ASR, age-standardized mortality rates using the World Standard Population.

Table 2. Number of predicted deaths and mortality rates per 100,000 women for the year 2017 and comparison figures for the year 2012, from selected Latin America countries, with 95% prediction intervals.

	WOMEN	Observed number of deaths 2012	Predicted number of deaths 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	Observed ASR* 2012	Predicted ASR* 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference 2017 versus 2012
Argentina	STOMACH	1066	1040	962	1111	3.17	2.82	2.61	3.03	-10.9
	COLORECTUM	3419	3660	3526	3787	9.11	9.04	8.70	9.39	-0.7
	PANCREAS	2069	2220	2116	2326	5.67	5.50	5.21	5.78	-3.0
	LUNG	2735	3210	3072	3354	8.83	9.64	9.22	10.07	9.3
	BREAST	5491	5840	5586	6087	17.56	17.04	16.23	17.86	-2.9
	UTERUS (CERVIX AND CORPUS)	2583	2790	2667	2918	9.22	9.21	8.74	9.67	-0.2
	LEUKEMIAS	792	790	720	860	2.64	2.44	2.22	2.66	-7.7
	ALL CANCERS	29067	31560	30922	32205	88.73	88.88	87.15	90.62	0.2
Brazil	STOMACH	4990	5270	5093	5441	4.05	3.57	3.46	3.69	-11.7
	COLORECTUM	9717	11640	11320	11951	7.84	7.90	7.69	8.11	0.8
	PANCREAS	4206	4790	4634	4949	3.42	3.21	3.10	3.31	-6.2
	LUNG	9225	10450	9967	10935	7.80	7.43	7.10	7.76	-4.8
	BREAST	13590	15720	15426	16006	11.48	11.40	11.20	11.61	-0.7
	UTERUS (CERVIX AND CORPUS)	8683	9350	9086	9611	7.34	6.79	6.60	6.98	-7.4
	LEUKEMIAS	2954	3100	2985	3225	2.60	2.39	2.29	2.50	-8.1
	ALL CANCERS	89691	102410	101373	103439	74.74	71.96	71.21	72.71	-3.7
Chile	STOMACH	1173	1130	1044	1225	7.69	6.32	5.85	6.79	-17.9
	COLORECTUM	1199	1320	1234	1403	7.78	7.24	6.79	7.69	-7.0
	PANCREAS	610	730	652	799	4.06	4.11	3.63	4.60	1.4
	LUNG	1168	1090	996	1192	8.27	6.60	6.10	7.11	-20.2
	BREAST	1367	1390	1312	1471	10.16	9.13	8.64	9.61	-10.2
	UTERUS (CERVIX AND CORPUS)	849	860	790	920	6.47	5.56	5.08	6.03	-14.1
	LEUKEMIAS	315	330	298	368	2.65	2.42	2.10	2.73	-8.8
	ALL CANCERS	12284	13280	12988	13571	86.52	79.02	77.29	80.76	-8.7
Colombia	STOMACH	1839	1740	1618	1853	6.97	5.45	5.07	5.82	-21.9
	COLORECTUM	1610	1730	1609	1850	6.13	5.48	5.12	5.83	-10.6
	PANCREAS	779	920	868	965	3.04	2.93	2.77	3.09	-3.5
	LUNG	1725	1730	1621	1847	6.72	5.56	5.23	5.88	-17.4
	BREAST	2488	2630	2489	2773	9.69	8.71	8.25	9.18	-10.0
	UTERUS (CERVIX AND CORPUS)	1994	1930	1805	2054	7.82	6.36	5.95	6.77	-18.7
	LEUKEMIAS	808	810	745	871	3.23	2.91	2.68	3.15	-9.9
	ALL CANCERS	19184	20980	20558	21408	74.59	68.06	66.74	69.38	-8.7
Cuba	STOMACH	337	360	322	395	3.17	2.87	2.52	3.22	-9.6
	COLORECTUM	1376	1460	1409	1514	11.46	10.91	10.38	11.45	-4.7
	PANCREAS	382	470	424	508	3.50	3.76	3.39	4.12	7.3

	WOMEN	Observed number of deaths 2012	Predicted number of deaths 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	Observed ASR* 2012	Predicted ASR* 2017	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference 2017 versus 2012
	LUNG	1831	2030	1929	2128	18.09	17.86	16.90	18.83	-1.3
	BREAST	1527	1550	1465	1636	14.86	13.71	12.94	14.48	-7.8
	UTERUS (CERVIX AND CORPUS)	1023	1170	1095	1244	10.75	10.83	9.97	11.69	0.8
	LEUKEMIAS	284	270	240	305	3.08	2.64	2.09	3.19	-14.2
	ALL CANCERS	9878	10810	10573	11054	96.32	93.25	90.72	95.78	-3.2
Mexico	STOMACH	2549	2700	2586	2813	4.21	3.72	3.55	3.89	-11.5
	COLORECTUM	2546	2780	2666	2890	4.23	3.87	3.71	4.03	-8.5
	PANCREAS	1959	2200	2111	2284	3.30	3.11	2.97	3.24	-5.9
	LUNG	2196	2400	2283	2525	3.67	3.33	3.16	3.51	-9.3
	BREAST	5525	5970	5793	6154	9.56	8.71	8.44	8.97	-9.0
	UTERUS (CERVIX AND CORPUS)	4559	4640	4460	4813	7.79	6.70	6.44	6.97	-14.0
	LEUKEMIAS	1874	1940	1853	2034	3.12	2.89	2.75	3.03	-7.3
	ALL CANCERS	38965	42590	42039	43138	65.84	60.59	59.76	61.41	-8.0
Venezuela	STOMACH	822	810	753	869	5.47	4.52	4.17	4.87	-17.3
	COLORECTUM	854	950	871	1031	5.82	5.38	4.92	5.84	-7.5
	PANCREAS	462	460	424	503	3.18	2.65	2.42	2.88	-16.8
	LUNG	1366	1410	1328	1492	9.60	8.08	7.59	8.58	-15.8
	BREAST	2067	2170	2037	2295	14.32	12.86	12.14	13.58	-10.2
	UTERUS (CERVIX AND CORPUS)	1853	1920	1830	2018	12.71	11.21	10.64	11.78	-11.8
	LEUKEMIAS	431	420	386	462	2.92	2.54	2.30	2.78	-13.1
	ALL CANCERS	12368	13710	13210	14206	84.74	80.08	77.33	82.83	-5.5

*ASR, age-standardized mortality rates using the World Standard Population.

Table 3. Age-standardized lung cancer mortality rates for all ages, 25-44, 45-64, 65-74, 75+ years age groups in different selected Latin America countries, in men and women.

		Men						Women					
		ASR* 2005-2009	ASR* 2010-2014	Predicted ASR 2017*	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference (2017/2010-14)	ASR* 2005-2009	ASR* 2010-2014	Predicted ASR 2017*	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference (2017/2010-14)
Argentina	All ages	29.66	26.48	22.73	21.86	23.59	-14.2	8.06	8.96	9.64	9.22	10.07	7.60
	Truncated 25-44 years	2.60	2.01	1.06	0.56	1.56	-47.2	1.42	1.18	1.14	0.76	1.51	-3.80
	Truncated 45-64 years	68.89	57.71	47.64	44.81	50.47	-17.4	21.37	23.18	24.20	22.83	25.57	4.40
	Truncated 65-74 years	209.31	195.48	170.73	159.49	181.97	-12.7	45.74	56.12	67.55	61.56	73.55	20.40
	Truncated 75+ years	266.65	256.40	240.79	223.28	258.30	-6.1	65.01	69.89	67.17	61.31	73.02	-3.90
Brazil	All ages	16.47	15.33	14.11	13.85	14.36	-8.0	7.13	7.80	7.43	7.10	7.76	-4.70
	Truncated 25-44 years	1.34	1.13	0.93	0.79	1.06	-18.0	1.20	1.11	1.04	0.90	1.17	-6.50
	Truncated 45-64 years	30.80	27.76	25.74	24.98	26.49	-7.3	15.79	17.27	18.43	17.46	19.40	6.70
	Truncated 65-74 years	120.76	112.71	101.26	97.62	104.89	-10.2	45.77	51.22	43.14	38.57	47.72	-15.80
	Truncated 75+ years	209.11	203.58	193.19	187.93	198.46	-5.1	74.94	81.39	73.60	66.20	81.00	-9.60
Chile	All ages	16.89	16.36	14.67	13.68	15.66	-10.3	7.60	7.98	6.60	6.10	7.11	-17.30
	Truncated 25-44 years	1.08	0.93	0.88	0.46	1.30	-5.4	0.65	0.75	0.81	0.49	1.13	8.20
	Truncated 45-64 years	30.47	27.42	25.55	22.87	28.24	-6.8	14.56	15.00	12.67	11.15	14.19	-15.50
	Truncated 65-74 years	132.08	134.65	124.13	110.46	137.80	-7.8	56.01	58.71	48.21	41.89	54.52	-17.90
	Truncated 75+ years	207.15	207.03	167.78	143.51	192.06	-19.0	91.73	98.98	77.96	65.15	90.76	-21.20
Colombia	All ages	14.02	12.14	10.25	9.63	10.88	-15.5	7.22	6.62	5.56	5.23	5.88	-16.10
	Truncated 25-44 years	1.18	0.88	0.73	0.45	1.01	-16.9	0.87	0.76	0.79	0.56	1.02	3.90
	Truncated 45-64 years	20.92	17.58	14.94	13.76	16.11	-15.0	11.18	10.38	9.10	8.42	9.79	-12.30
	Truncated 65-74 years	107.80	93.32	75.61	68.32	82.89	-19.0	56.75	47.91	37.65	34.72	40.59	-21.40

		Men						Women					
		ASR* 2005-2009	ASR* 2010-2014	Predicted ASR 2017*	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference (2017/2010-14)	ASR* 2005-2009	ASR* 2010-2014	Predicted ASR 2017*	Lower prediction limit (95%)	Upper prediction limit (95%)	% difference (2017/2010-14)
	Truncated 75+ years	212.44	192.65	171.68	149.54	193.82	-10.9	97.83	100.80	86.30	74.08	98.53	-14.4
Cuba	All ages	38.47	35.35	31.89	30.19	33.58	-9.8	18.67	18.79	17.86	16.90	18.83	-4.9
	Truncated 25-44 years	2.53	1.96	0.96	0.00	2.07	-50.8	2.15	1.76	1.76	0.77	2.75	0.0
	Truncated 45-64 years	81.84	70.34	60.31	54.55	66.07	-14.3	47.12	43.34	37.55	33.76	41.34	-13.4
	Truncated 65-74 years	256.19	265.60	257.18	235.77	278.60	-3.2	113.07	131.97	138.70	128.03	149.38	5.1
	Truncated 75+ years	468.92	406.71	365.49	332.44	398.53	-10.1	172.73	173.16	165.79	153.14	178.43	-4.3
Mexico	All ages	10.59	8.07	6.07	5.77	6.37	-24.8	4.46	3.90	3.33	3.16	3.51	-14.5
	Truncated 25-44 years	1.02	0.85	0.74	0.56	0.92	-13.0	0.72	0.68	0.63	0.51	0.75	-7.2
	Truncated 45-64 years	16.05	12.07	9.19	8.33	10.04	-23.9	8.23	7.17	5.81	5.20	6.42	-19.0
	Truncated 65-74 years	83.98	60.86	41.04	36.71	45.38	-32.6	32.06	27.09	22.85	20.96	24.75	-15.6
	Truncated 75+ years	151.36	123.70	102.15	96.12	108.19	-17.4	53.88	49.23	45.19	41.20	49.18	-8.2
Venezuela	All ages	17.93	17.23	14.18	13.34	15.01	-17.7	9.54	9.43	8.08	7.59	8.58	-14.3
	Truncated 25-44 years	2.04	1.60	1.26	0.84	1.69	-21.1	1.56	1.22	0.90	0.39	1.42	-25.8
	Truncated 45-64 years	38.12	36.94	28.86	26.04	31.68	-21.9	21.29	21.59	18.14	16.38	19.90	-16.0
	Truncated 65-74 years	116.66	110.81	98.03	89.31	106.76	-11.5	59.56	58.30	49.67	44.00	55.33	-14.8
	Truncated 75+ years	211.60	209.29	170.43	147.77	193.09	-18.6	103.11	102.58	94.16	85.17	103.16	-8.2

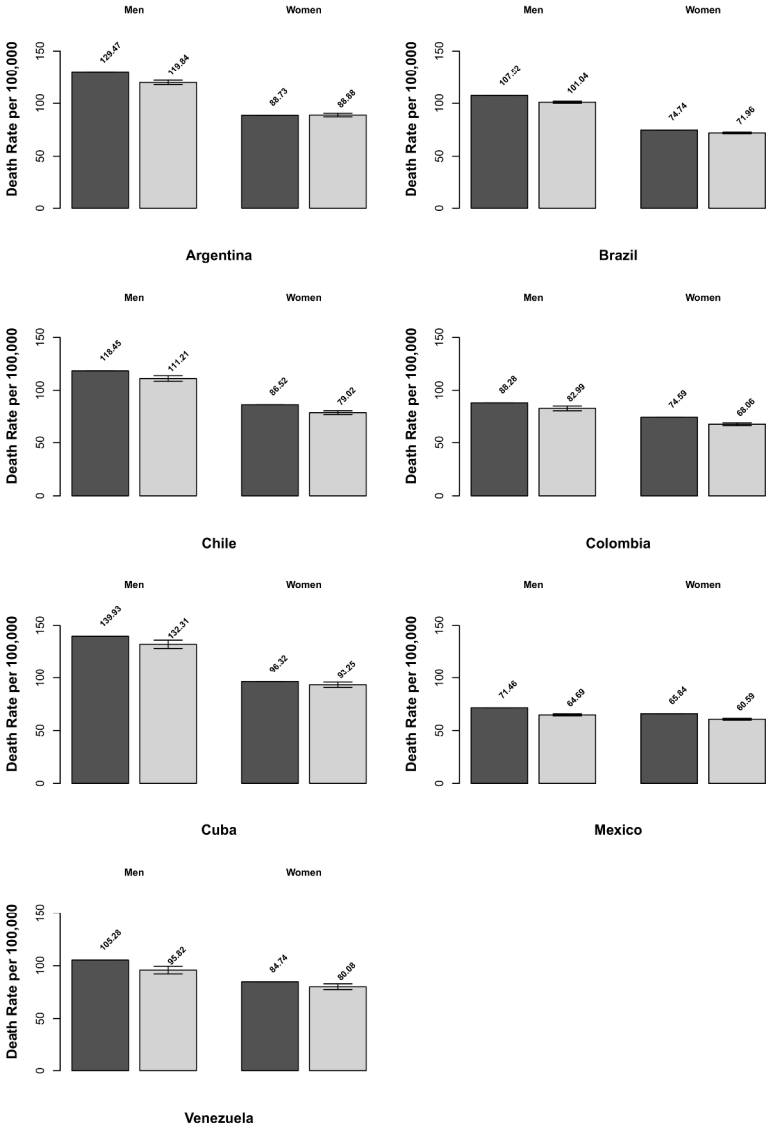

Figure 1. Bar-plots of age-standardized (world population) death rates per 100,000 persons for the year 2012 (dark grey) and predicted rates for 2017 (light grey) with 95% prediction intervals (PIs) for total cancer in the 7 selected Latin American countries, men and women.

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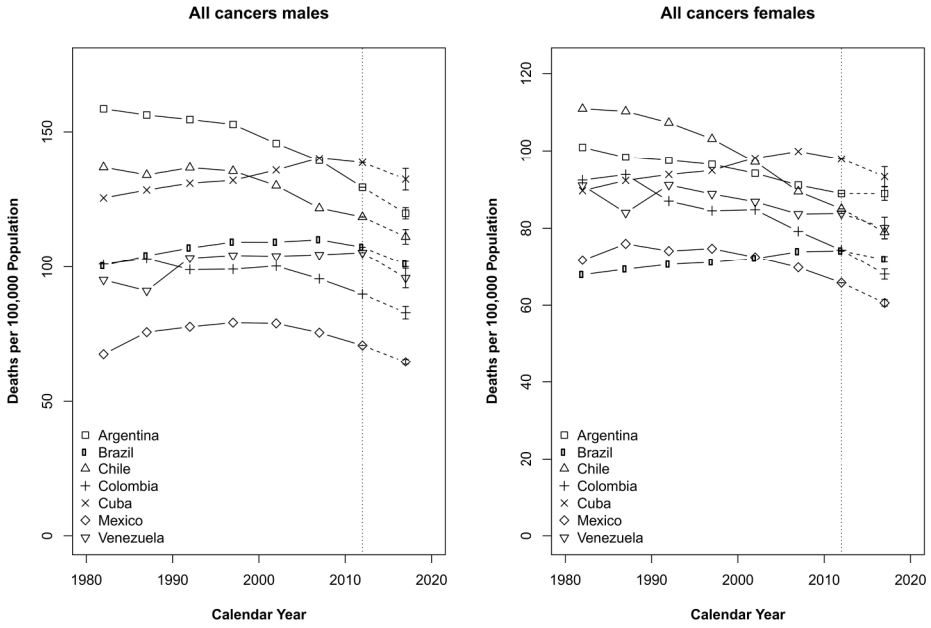

Figure 2. Age-standardized (world population) total cancer mortality rate trends in quinquennia from 1980 to 2014 and predicted rates for 2017 with 95% prediction intervals (PIs), for Argentina (squares), Brazil (circles), Chile (triangles), Colombia (crosses), Cuba (xs), Mexico (diamonds), and Venezuela (inverted triangles), in men and women.

209x148mm (300 x 300 DPI)

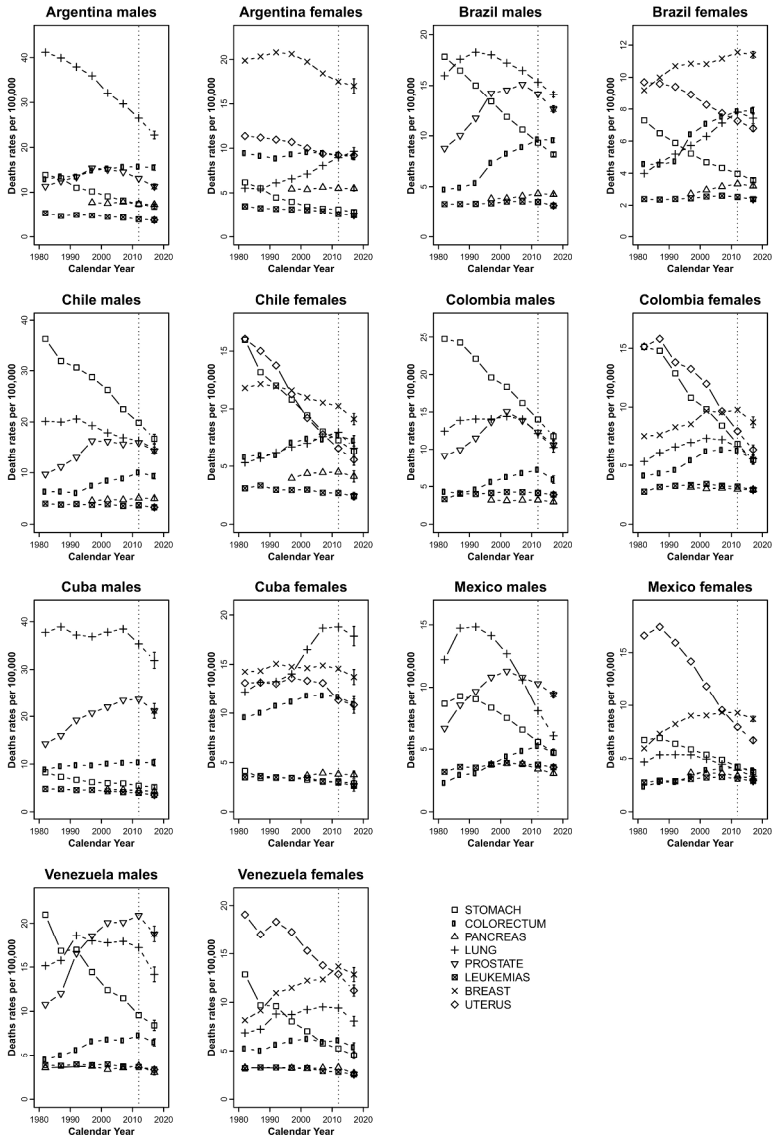

Figure 3. Age-standardized (world population) cancer mortality rate trends in quinquennia from 1980 to 2014 and predicted rates for 2017 with 95% prediction intervals (PIs) for the 7 selected Latin American countries. Men: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), prostate (inverted triangles) and leukaemias (ticked squares). Women: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), breast (xs), uterus (diamonds) and leukaemias (ticked squares).

296x419mm (300 x 300 DPI)

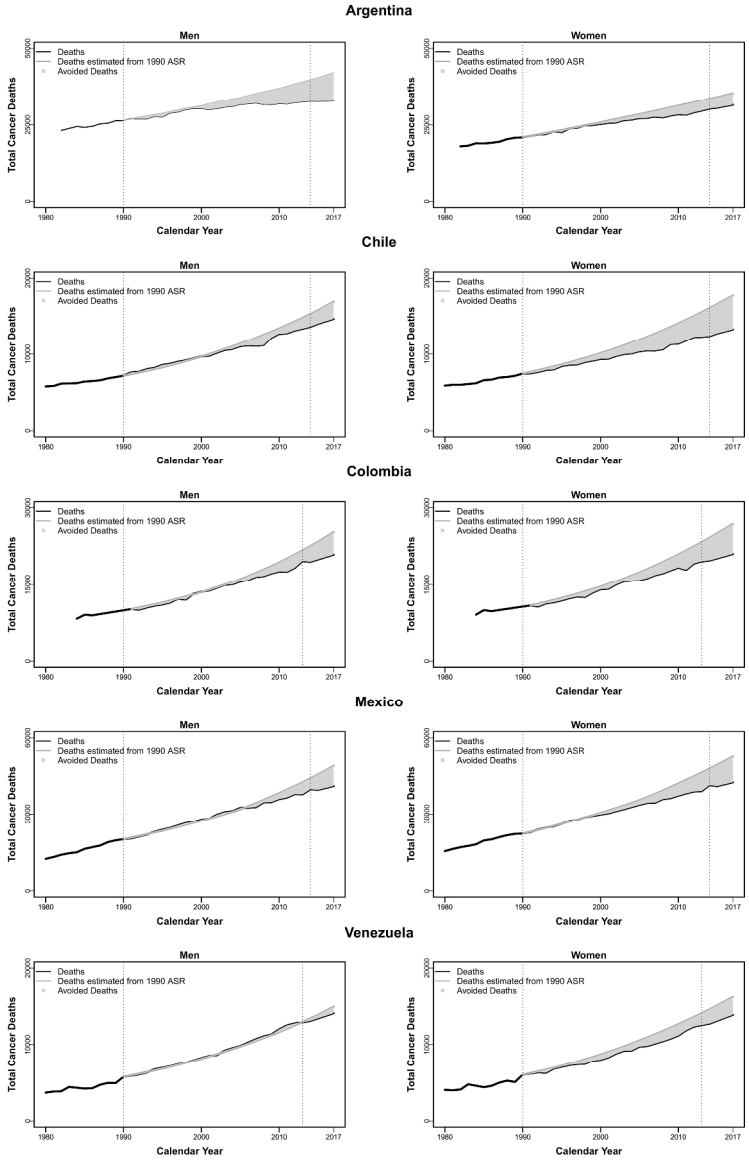

Figure 4. Total avoided cancer deaths for 5 of the 7 Latin American countries considered, in both sexes between the top rate in 1990 and 2017 (light grey area); observed numbers of cancer deaths from 1990 to 2013/2014 and predicted cancer deaths from 2014/2015 to 2017 (black line); estimated numbers of total cancer deaths by applying 1990 age-specific peak mortality rate (dark grey). During the 27 years period a total of over 420,000 cancer deaths have been avoided in 5 of the 7 countries considered (174,000 in men and 248,000 in women). No reduction in cancer deaths was registered in Brazil, Cuba and Venezuelan men. In 2017 alone about 30,000 deaths are predicted to be avoided in men, but none in Cuba, and about 26,000 in women, but none in Brazil and Cuba. Abbreviation: ASR, age specific rate.

296x419mm (300 x 300 DPI)