Cancer mortality predictions for 2019 in Latin America

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Novelty and Impact: Cancer mortality rates in major Latin American (LA) countries are predicted to decline until 2019. In Cuba, lung cancer rate remains extremely high in both sexes and in women exceeded the breast cancer one. In considered countries, breast cancer predicted rates in young

women were unfavourable. Estimated avoided cancer deaths in 1991-2019 are over 480,000 in the selected LA countries, but no decline was observed in Brazil and Cuba.

Abstract

We estimated mortality figures for 2019 in seven Latin American countries, with focus on breast cancer.

We retrieved cancer death certification and population data from the WHO and PAHO databases. We obtained mortality statistics for Argentina, Brazil, Chile, Colombia, Cuba, Mexico and Venezuela for 1970-2015. We predicted current death numbers and age-standardized (world population) mortality rates using joinpoint regression models.

Total cancer mortality is predicted to decline in all countries and both sexes, except Argentinean women. Cuba had the highest all cancer rates for 2019, 136.9/100,000 men and 90.4 women, while Mexico showed the lowest ones, 63.8/100,000 men and 61.9 women. Stomach cancer showed favourable trends over the whole period, while colorectal cancer only recently. Lung cancer rates declined in men, while in women they decreased slightly over most recent years, only. In Cuban women, lung cancer rates overtook breast cancer ones. Breast cancer showed overall favourable trends, but rates are rising in young women. Prostate and uterine cancer had favourable trends. Pancreas, ovary, bladder and leukaemias showed slightly decreasing trends. Between 1990 and 2019, mortality from all neoplasms is predicted to fall by about 18% in Argentina, 26% in Chile, 14% in Colombia, 17% in Mexico and 13% in Venezuela, corresponding to almost 0.5 million avoided cancer deaths. No decline was observed in Brazil and Cuba.

Of concern, the high lung cancer rates in Cuba, the possible increases in breast cancer in young women, and the lack of overall declines in Brazil, Cuba and Venezuelan men.

Introduction

Over the last decades, Latin American (LA) countries experienced a substantial decrease in infectious and cardiovascular diseases, and an increase in population life expectancy [1-3]. Trends in cancer mortality were less favourable [4]. Mortality from all cancers started to decline since around 1990 in men and since earlier in women, with some exceptions (i.e. Brazil, Cuba and Venezuelan men) [4, 5]. Despite lower overall cancer mortality rates compared to other areas of the world [6, 7], colorectal and pancreatic cancer in both sexes, and lung and breast cancer in women showed unfavourable trends [1, 4, 5]. In addition, (cervix) uterus cancer mortality was exceedingly high in LA. There were also major differences across countries, i.e. colorectal and breast were comparatively high in Argentina, but relatively low in Mexico. Stomach cancer in both sexes tended also to be higher than in North America or Europe [4].

We updated our previous work [4] on cancer mortality figures from several cancer sites and all cancers combined in seven major LA countries using recent available good-quality data, and predicted the number of deaths and rates for 2019, the current year. We also considered long term trends since 1970, and estimates of cancer deaths avoided over the last few decades. Since several reports [8, 9] identified breast cancer as the leading cause of cancer mortality among LA women, we focused on mortality from this cancer.

Materials and Methods

We obtained official deaths certification data from the World Health Organization (WHO) database for all cancers combined and for 10 major cancer types, i.e. stomach, colorectum, pancreas, lung, breast, uterus (cervix and corpus), ovary, prostate, bladder, and leukaemias. We retrieved data for the period between 1970 and 2015 for LA countries with over 10 million inhabitants – large populations should protect from random variation in the analyses- and over 85% deaths certification coverage [10, 11]. This selection included Argentina, Brazil, Chile, Colombia, Cuba, Mexico and Venezuela (2013 last available year), thus covering the majority of LA population. During the selected calendar period, three different Revisions of the International Classification of Diseases (ICD) were used (ICD 8 through 10) [12-14]. Since differences in classifications between Revisions were

minor, we recoded cancer deaths according to ICD 10 [14]. In addition, the selected cancer sites are generally easy to diagnose and hence certify. Thus, changes in the Revisions of the ICD did not introduce any appreciable modification in trends. We extracted resident population estimates, based on official censuses, from the Pan American Health Organization (PAHO) database [15].

We computed age-specific mortality rates for each 5-year age group (from 0-4 to 80+ years), sex, calendar year and quinquennium. We standardized mortality rates by age using the world standard population for all ages and, for breast cancer, we calculated rates also for the 20-49, 50-69 and 70-79 age groups.

To predict mortality figures for 2019, we fit a Poisson joinpoint regression model [16] to the number of deaths (log scale) in each 5-year age group. This model identified significant changes in trends testing from 0 to 5 joinpoints (up to six trend segments), using a Monte Carlo Permutation method. To estimate age-specific numbers of deaths for 2019 and the corresponding 95% prediction intervals (PIs), we fit a linear regression model, with calendar year as independent variable, to the mortality data for each age group over the most recent trend segment identified by the joinpoint model. Using the matrices of predicted age-specific deaths counts and of predicted populations from the PAHO database, we computed predicted age-specific and age-standardized deaths rates and their 95% PIs. We estimated numbers of avoided total cancer deaths over the years 1991-2019 by comparing observed and expected deaths on the basis of the 1990 age-specific rates, since the highest rates in most countries considered occurred around that year. We also estimated number of avoided total cancer deaths since the 2000.

Data availability

The data that support the findings of this study are openly available in World Health Organization database at http://www.who.int/healthinfo/statistics/mortality_rawdata/en/index.html, reference number [10].

Results

Total cancer mortality in men is predicted to decrease in all countries; declines in rates between 2015 and 2019 ranged between around -2% (Colombia and Cuba) and -9.3% (Venezuela) (**Table 1a**).

Among men, Cuba showed the highest rates, with values of 139.9/100,000 in 2015 and 136.9 in 2019 (**Figure 1**). The lowest male rates were in Mexico, 69.5/100,000 in 2015 and 63.8 in 2019. In women, total cancer mortality is predicted to decrease, but less markedly than in men. Falls in female rates since 2015 ranged between -1.8% (Colombia) and -5.5% (Mexico), while Argentinean women showed stable rates (**Table 1b**). Cuba showed the highest observed and predicted rates (95.4/100,000 women in 2015 and 92.9 in 2019), while Mexico had the lowest ones (65.5/100,000 in 2015 and 61.9 in 2019) (**Figure 1**). Details on the joinpoint analyses for each 5-year age group and cancer site, used for identify the last segments of the trends to then compute the predictions, are given in the supplementary Tables S1 and S2, available at *Annals of Oncology* online.

In contrast, numbers of deaths for all cancers combined are predicted to increase in 2019, in all countries and both sexes (**Table 1a** and **Table 1b**): the largest increase is around +15% in Colombia for men and in Venezuela for women.

Over the last decade, men from Brazil, Cuba and Venezuela showed favourable cancer mortality trends, while for the other countries the declines started earlier, between 1990 and 2000. Argentina showed decreases over the whole period (**Figure 2**). Except Brazil and Cuba, rates in women declined almost over the whole period. For both sexes, in 2019 disparities in rates across countries are predicted to be less marked compared to the early 1970s, with, however, substantial variability remaining.

In men, stomach cancer trends were decreasing over the whole period in all countries (**Figure 3**). Colorectal cancer showed rising rates since the 1990s, with favourable trends in most recent years and up to 2019. Lung cancer rate declined since the early 1970s in Argentina, and started to decline during the last decade in Cuba, where it remain the highest predicted rate in LA (31.4/100,000 men) (**Table 1a** and **Figure 3**). In the other countries, lung cancer trends have decreased since around the 1990s; Mexico reached the lowest rate in 2019 (5.6/100,000). Since around the early 2000s, prostate cancer have followed a mortality pattern substantially different from other cancers, with all countries experiencing relatively high rates and declines only during the last decade. In men, pancreatic and bladder cancer and leukaemias showed stable or slightly decreasing rates since the 2000s, reaching the lowest predicted rates (around or below 5/100,000 men).

In women, stomach cancer trends were favourable over the whole period, except in Cuba, which experienced stable rates since the 1990s (**Figure 3**). Colorectal cancer rates were only decreasing over the most recent years. Lung cancer rates in Argentinean women rose since the 1980s (+6% increase between 2015 and 2019) (**Table 1b** and **Figure 3**); in the other countries trends started to level off or slightly decrease only over most recent years (in Mexico rates started to fall earlier). Lung cancer rate in Cuba is still increasing, reaching the highest value in 2019, 17.7/100,000 women, and overtaking breast cancer rates since the 2000s. Despite favourable trends in most countries since the 1990s, breast cancer is predicted to remain the cancer with highest mortality. In all countries, uterine cancer had relatively high rates, which have been descending over the whole period. In women, cancers of pancreas, ovary, bladder, and leukaemias had constant or slightly decreasing trends in all countries.

Predicted mortality rates from breast cancer decreased between the period 2010-2014 and 2019, at all ages and at age 50-59, in all countries, with the exception of Cuba which did not show a change in rates (**Table 2**). Rates in young women (at age 20-49) are predicted to increase in all countries except in Argentina. Percent differences between 2010-2014 and 2019 ranged between +1.7% in Chile and +12.9% in Cuba.

Using age-specific rates in 1990 as reference, over the period between 1991 and 2019, a considerable number of cancer deaths were avoided in most of the major LA countries (light grey area, **Figure 4**), except for Brazil, Cuba and Venezuelan men. Over the 29-year period considered, in Argentina a total of 152,900 total cancer deaths were avoided (104,200 in men and 48,700 in women), in Chile 77,200 deaths (21,100 in men and 56,100 in women), in Colombia 73,900 deaths (26,200 in men and 47,700 in women), in Mexico 147,100 deaths (53,800 in men and 93,300 in women), and in Venezuelan women 31,900 deaths. We also considered cancer deaths avoided since 2000: 113, 600 deaths in Argentina (77,900 in men and 35,700 in women), 60,000 in Brazilian men, 60,900 in Chile (26,200 in men and 34,700 in women), 64,000 in Colombia (31,400 in men and 32,600 in women), 145,500 in Mexico (68,300 in men and 77,200 in women), and 10,100 deaths in Venezuelan women.

Discussion

As observed for several other areas of the world [6, 7, 17], mortality from all cancers combined has been decreasing over recent decades in selected LA countries and this trend is predicted to persist at least up to the current year. The only exception is for Argentina women, which showed a stable cancer mortality trend between 2015 and 2019. The leading cancer types in men were lung and prostate (in spite of favorable trends) and colorectum. For women, the highest mortality rates were for cancers of the breast, lung, uterus and colorectum. However, due to population ageing and its increase in size, the number of cancer deaths from all neoplasms combined continued to increase.

In the WHO database, valid mortality data are available only for a few of LA countries, covering, however, the majority of LA population. In our analysis we considered major LA countries with satisfactory death certification coverage. Some of the trends, however, may be influenced by changes in death certification validity over time.

Prediction of future trends is complex and the resulting estimates should always be taken with caution: recent and sudden fluctuations in slope are difficult to capture for any model. Moreover, predictions are less reliable for rarer cancers. However, the large populations under analysis are likely to ensure stable estimates. With reference to the projection method used, we are aware that a Poisson logarithmic model is more appropriate and has many properties that make it a preferable choice to model mortality data. However, the linear model was chosen to compute projections after testing a series of models and link functions on a large and heterogeneous cancer mortality training dataset, and the linear model was the most performant in terms of short term predictions. We applied the same methodology to EU countries and showed that error in our short term predictions was less than 5%[18].

Breast cancer

Despite predicted declines, breast cancer is estimated to remain the major cause of cancer death in women, both in terms of number of deaths (predicted deaths in 2019 represent 15% of all cancer deaths) and age-standardized rates, in all countries, except Cuba. Indeed, in Cuba lung cancer is the leading cause of cancer mortality in women with rates that are among the highest in the world [7].

However, breast cancer rates were lower in the countries included in the analysis compared to other areas of the world (predicted age-standardized rates were 13.4/100,000 in 2019 in the EU [6], and around 12 in 2020 in North America [19]). This likely reflects favourable reproductive patterns (i.e. higher parity in the past), and possibly different genetic background in some LA populations, besides advancements in the management of the disease [19, 20]. The higher rates observed in Argentina over the whole period and up to recent years may be due to the wave of European immigrants in that country in the past [21] and to an age-structure similar to that of high-income countries, with an advanced epidemiological transition [22]. Nonetheless, breast cancer trends in Argentina started to decline earlier compared to other LA countries.

Breast cancer survival remains about 20% lower in LA than in the USA and Western European countries [23], health care resources are limited in most countries, and treatment costs are proportionally higher for middle income countries [9]. Limited access to screening and early diagnosis may cause delays in breast cancer detection, affecting clinical outcomes [24]. In LA, breast cancer at diagnosis tended to be higher stage, with other unfavourable prognostic indicators [8].

Compared to high income regions, LA women are also diagnosed at a younger age [8, 9]. The rising predicted trends in the 20-49 age group is possibly due to changes in menstrual and reproductive behaviour over the last few decades: early menarche, late full term pregnancy, nulliparity, and absence of breastfeeding are well recognized risk factors for breast cancer [8]. Moreover, lifestyle habits, such as diet and overweight, and environmental factors have possibly caused the unfavourable trends in young women [8].

Oral contraceptive and hormone replacement therapy may also play a role; however, specific risk factors for breast cancer trends in LA remain largely unclarified [9]. Improvements in primary prevention and higher access to screening and up to date treatments are needed to control this neoplasm in LA.

Lung and other tobacco-related cancers

Compared to the EU and North America [6, 7], lung cancer mortality rates in LA are noticeably lower in both sexes. Tobacco use is the key risk factor for lung cancer and the less frequent cigarette use

and lower number of cigarettes per day among smokers in this geographical area, explains the lower mortality from this malignancy [25, 26]. Cuba is a major exception, since historically it experienced a high prevalence of smoking [27]. Cuban women, in particular, have one of the highest lung cancer rate worldwide. Lung cancer rates in women are predicted to decline; a similar pattern applies to men, among whom, however, rates started to decline earlier and more extensively than in women, reflecting differences in smoking patterns across generations between the two sexes.
Despite low rates, particularly in Mexico [28], lung cancer remains a leading cause of mortality in the region. Inadequacy of anti-tobacco programs was reported in LA [25]. There are also differences in accessing diagnosis, therapy and surgery across countries [25, 29].

Stomach cancer mortality is still high in LA, even though trends are declining in all countries. *Helicobacter pylori* (Hp) is the major risk factor for stomach cancer and prevalence of Hp is comparatively high in LA [30]. Diet rich in red meat, processed meat, salt and chili pepper, widespread in several countries considered, is associated to stomach cancer, too [31]. In addition, tobacco smoking increases the risk to develop this neoplasm [32]. Late stage at diagnosis and delay in treatments could also explain the high mortality rates [31].

Mortality rates for pancreatic cancer in LA were lower compared to those in Europe and North America, but higher compared to South-Central Asia and some African regions [33]. Incidence and mortality rates for this neoplasm increase with economic development and associated lifestyle risk factors (as smoking habits, obesity and diabetes) [33], and did not show favourable patterns and trends over the last few decades [34]. The etiology of pancreatic cancer is still largely unknown and caution in interpretation of our results is needed since diagnosis and death certification for pancreatic cancer are subject to misclassification [33, 35, 36].

The low bladder cancer rates in both sexes likely reflect the relatively low historical smoking patterns in LA; occupational exposures are also recognized as carcinogenic for this neoplasm and these two risk factors combined could partly explain the more than 2-fold (over 4-fold for Argentina and around 3-fold for Brazil) differences in rates between the two sexes [37]. High levels of arsenic,

particularly in the water, are also found to increase urinary tract cancers risk, especially in selected areas of Chile and Argentina [38].Differences in healthcare systems and changes in classification coding may also influence the observed differences in bladder rates across countries and complicate the interpretation of our results [37].

Other cancers sites

In most LA countries, colorectal cancer rates were lower than those in Europe and the USA [7, 39]. They remain among the highest worldwide in Argentina and the lowest in Mexico, widely reflecting substantial differences in meat intake and other aspects of diet in various LA countries. The high costs for diagnostic procedures and delays in treatment may explain the less favourable trends in LA as compared to North America and Europe [40], again calling for improvements for colorectal cancer management in LA.

WHO death certification data do not allow to distinguish between cervical and endometrial cancer, since a variable proportion of neoplasms is classified as uterus, unspecified. However, declining trends in all considered LA countries are observed for uterine cancer, which are likely driven by cervical cancer, because incidence rates of this cancer are very high in most LA populations [41]. Improved screening and diagnosis are the key determinants of the mortality patterns [42]; better hygiene conditions, education and socioeconomic status probably also play some roles. However, cervical cancer rates remain exceedingly high in most LA populations. This calls for urgent interventions in screening programs and HPV vaccine programs [43].

Ovarian cancer rates in LA were lower compared to other areas worldwide [44]. Indeed in this region obesity prevalence is high and parity low; these are well recognized risk factors for ovarian cancer [45]. The stable or slightly declining rates are probably partly or largely due to oral contraceptive use in subsequent generations [46].

Prostate cancer mortality rates in LA were higher compared to those of the EU and North America overall [6, 7] and are predicted to be among the highest worldwide. However, they showed favourable trends for most countries up to 2019, likely due to improvements in treatment [22, 47], and early

diagnosis [48]. As for other countries, progress on prostate cancer was however smaller than in high income areas of the world.

Decreasing trends in leukaemias are due to the spread of improved treatment [49, 50]. However, the progress has been later and smaller than in high-income areas of the world. Thus, access to effective treatment still needs to be further expanded in most LA.

In conclusion, our work has the inherent limitations and uncertainties of predictions modelling. However, short term predictions based on extrapolation of linear trends from age-specific joinpoint analysis proved to be satisfactorily valid, with errors around 1-2% for common cancers and below 5% for less common cancers [18].

Despite these limitations, our predictions indicate overall declining trends over the last decades in LA and lower total cancer mortality rates as compared to the EU and the USA. However, stomach cancer rates in both sexes remain high, particularly in Chile and Colombia; lung cancer in Cuban women and prostate cancer in Cuba and Venezuela are concerning. Further, the exceedingly high rates for (cervix) uterus cancer in all the countries considered, particularly so in Argentina, Cuba and Venezuela, require public health intervention.

The studied countries' more limited resources for primary and secondary prevention and cancer control management resulted in the smaller proportion of averted deaths since the peak rate in 1990, as compared to the EU [6] and the USA [17]. This calls for urgent improvements, particularly in Cuba and Venezuela, for whom there was no a considerable number of avoided cancer deaths over the three decades considered.

Future research requires additional improvement in deaths certifications across LA and better understanding of areas of intervention for cancer prevention, control and management, including adoption of newer innovative therapies.

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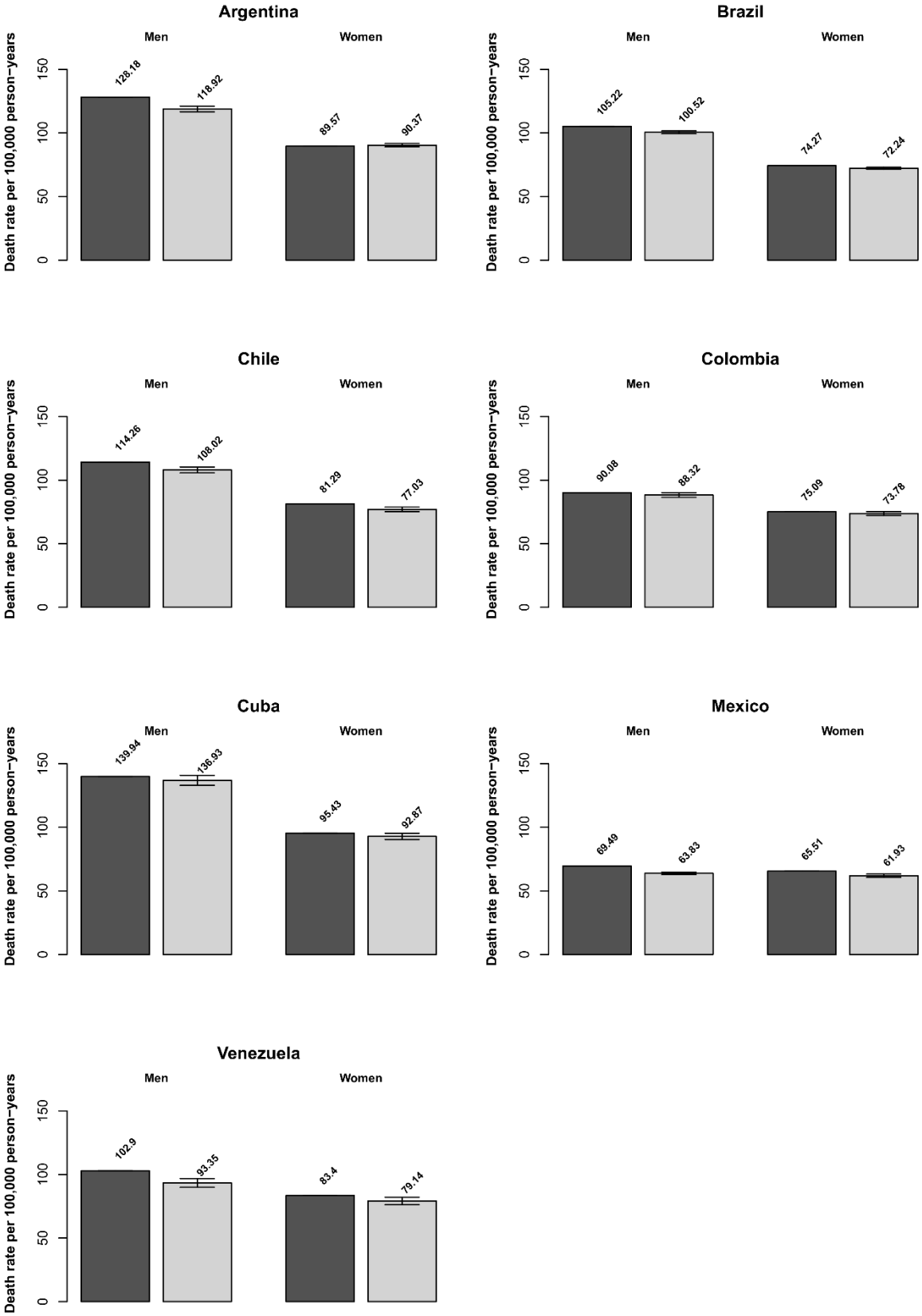
Figure legends

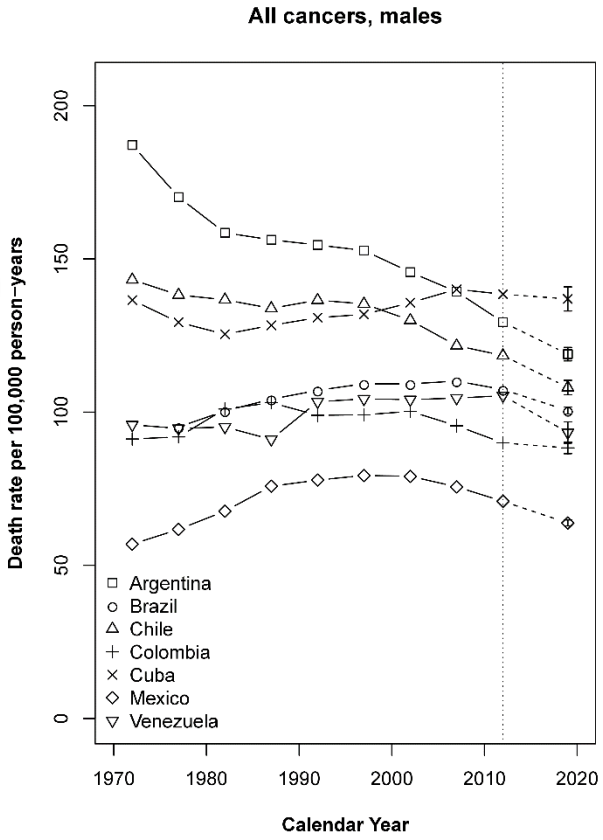
Figure 1. Bar-plots of age-standardized (world population) death rates per 100,000 persons for the year 2015 (dark grey) and predicted rates for 2019 (light grey), with 95% prediction intervals (PIs) for total cancers in the seven selected Latin American countries, men and women.

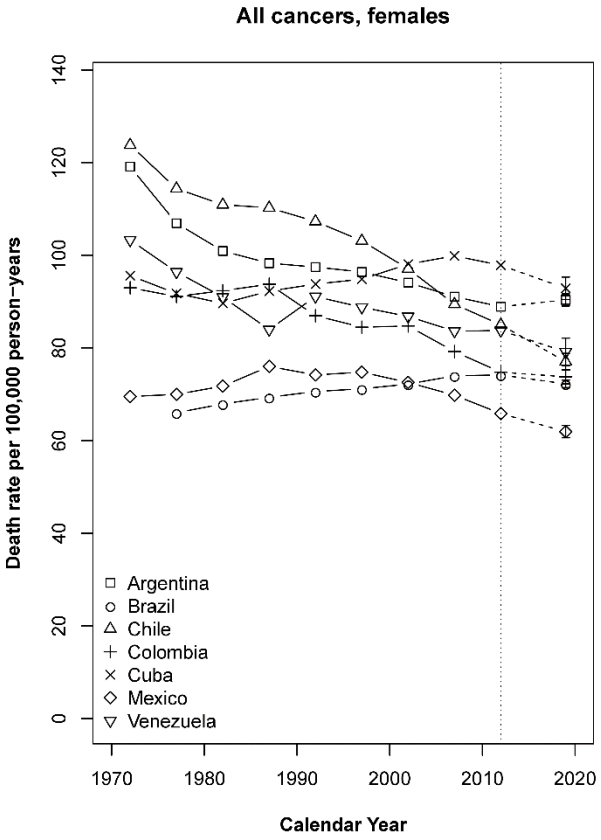
Figure 2. Age-standardized (world population) mortality rates from total cancers in quinquennia from 1970 to 2014 and predicted rates for 2019, with 95% prediction intervals (PIs), for Argentina (squares), Brazil (circles), Chile (triangles), Colombia (crosses), Cuba (xs), Mexico (diamonds), and Venezuela (inverted triangles), in men and women.

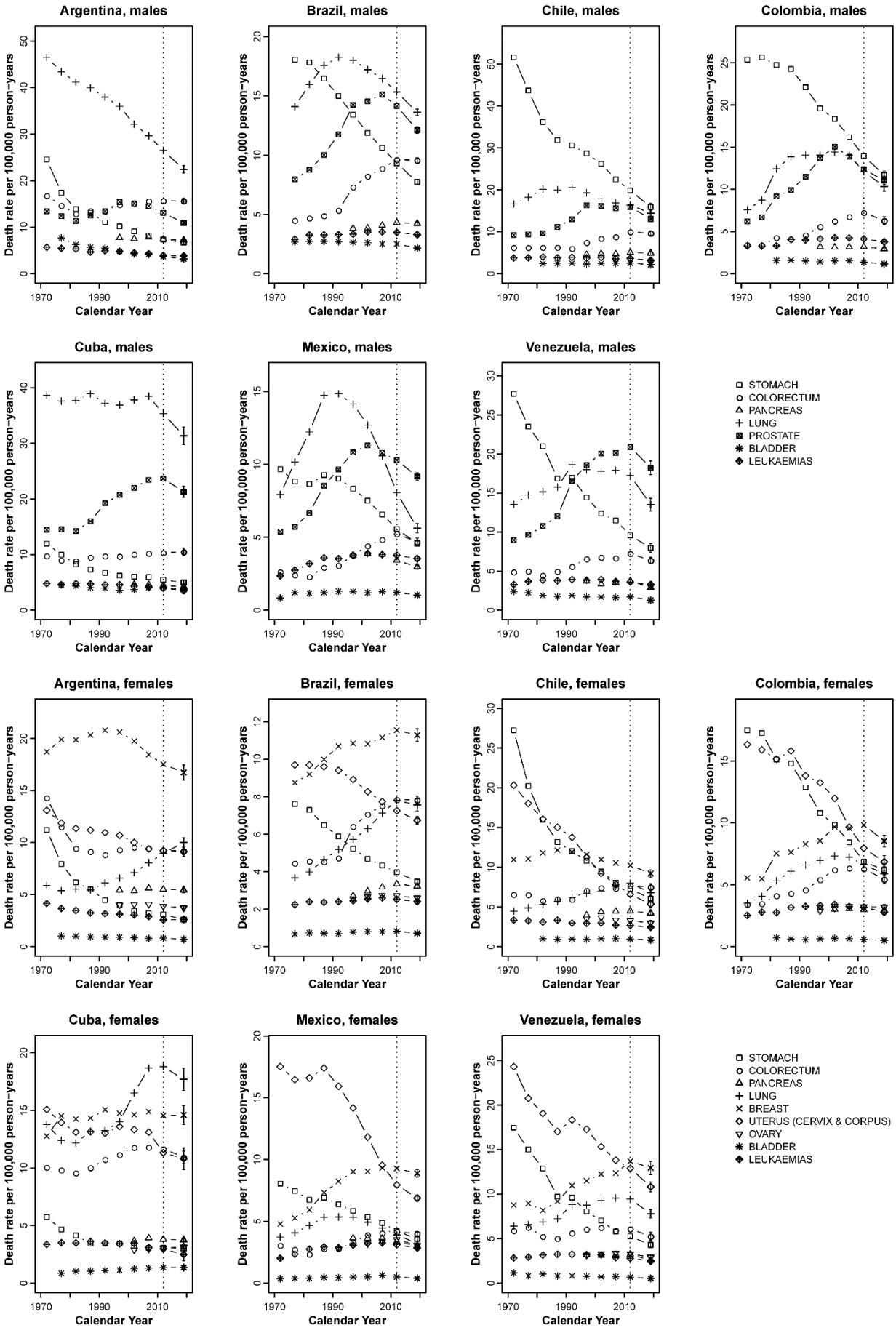
Figure 3. Age-standardized (world population) mortality rates from total cancers in quinquennia from 1970 to 2014 and predicted rates for 2019, with 95% prediction intervals (PIs) for the seven selected Latin American countries. Men: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), prostate (ticked squares), bladder (asterisks), and leukaemias (ticked diamonds). Women: stomach (squares), colorectum (circles), pancreas (triangles), lung (crosses), breast (xs), uterus (cervix and corpus) (diamonds), ovary (inverted triangles), bladder (asterisks), and leukaemias (ticked diamonds).

Figure 4. Total avoided cancer deaths for five of the seven Latin American countries considered, in both sexes between the top rate in 1990 and 2019 (light grey area); observed numbers of cancer deaths from 1990 to 2015 and predicted cancer deaths from 2016 to 2019 (black line); estimated numbers of total cancer deaths by applying 1990 age-specific peak mortality rates (dark grey line). During the 29-year period, a total of about 483 000 cancer deaths have been avoided in five of the seven countries considered (205 300 in men and 277 700 in women). No reduction in cancer deaths was registered in Brazil, Cuba and Venezuelan men. In 2019 alone, about 24 600 deaths are predicted to be avoided in men, but none in Brazil, Cuba, and Venezuela, and about 24 800 in women, but none in Brazil and Cuba.









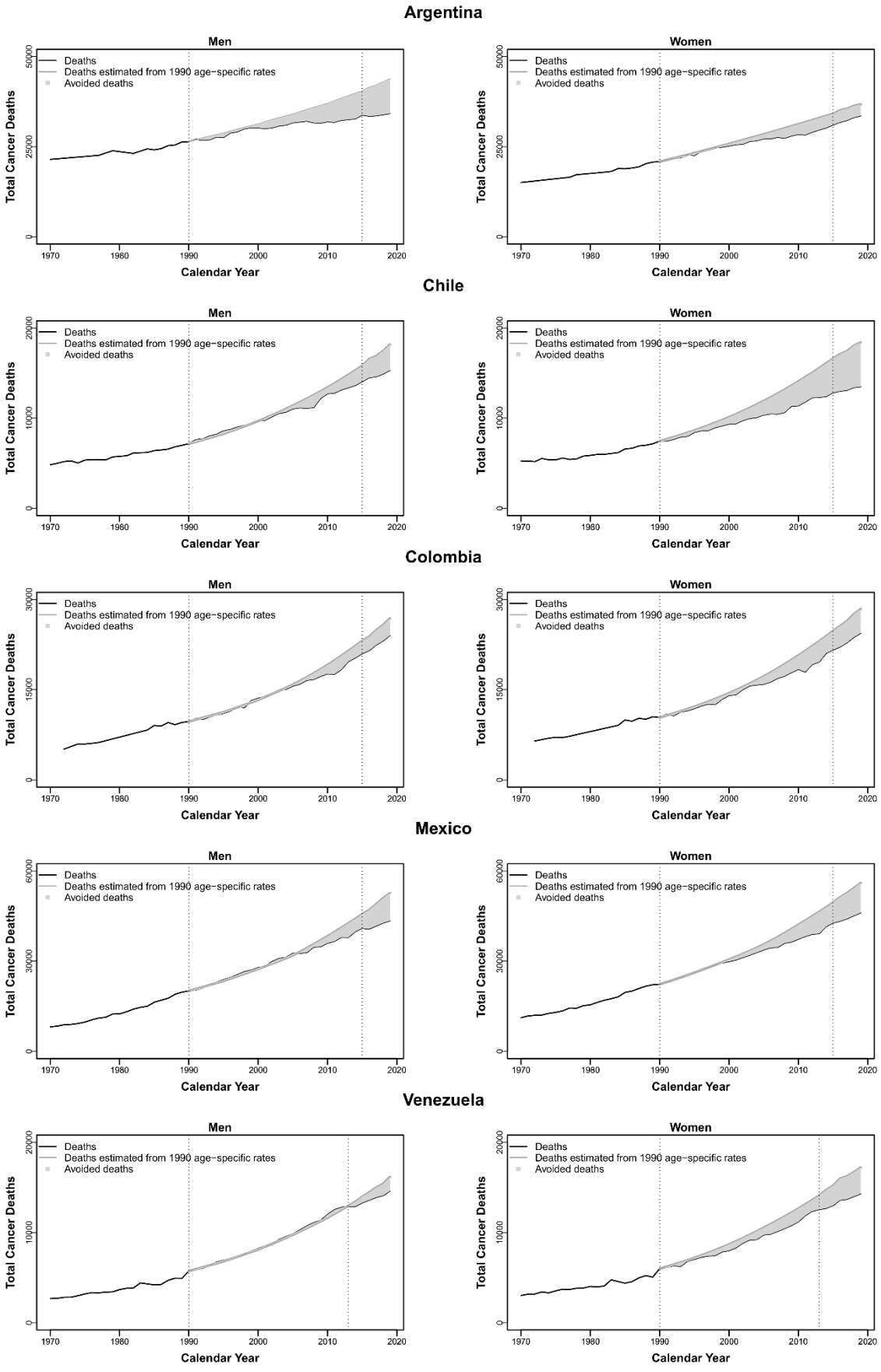


Table 1a. Number of predicted deaths and mortality rates per 100,000 men for the year 2019 and comparison figures for the year 2015 (2013 for Venezuela), from the seven selected Latin American countries, with 95% prediction intervals (PIs) and percent differences.

Men		Observed number of deaths 2015	Predicted number of deaths 2019 (95% PI)	Observed ASR* 2015	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2015
Argentina	Stomach	1932	1890 (1789-1994)	7.43	6.74 (6.38-7.1)	-9.3
	Colorectum	4288	4540 (4373-4707)	16.02	15.65 (15.06-16.24)	-2.3
	Pancreas	1982	2060 (1956-2157)	7.58	7.22 (6.86-7.58)	-4.8
	Lung	6565	6280 (6056-6498)	25.62	22.44 (21.64-23.25)	-12.4
	Prostate	3803	3610 (3406-3812)	12.54	10.93 (10.35-11.51)	-12.8
	Bladder	1060	1000 (923-1081)	3.73	3.2 (2.93-3.47)	-14.2
	Leukaemias	1024	1020 (948-1086)	4.16	3.84 (3.56-4.12)	-7.7
	All cancers	33804	34180 (33536-34828)	128.18	118.92 (116.72-121.12)	-7.2
Brazil	Stomach	9131	9500 (9273-9724)	8.63	7.74 (7.56-7.92)	-10.3
	Colorectum	10526	11790 (11505-12084)	9.91	9.57 (9.35-9.8)	-3.4
	Pancreas	4653	5160 (4997-5329)	4.43	4.23 (4.09-4.37)	-4.5
	Lung	15511	16700 (16397-16999)	14.83	13.64 (13.38-13.89)	-8.1
	Prostate	14482	15690 (15349-16040)	13.45	12.13 (11.85-12.41)	-9.8
	Bladder	2662	2750 (2603-2894)	2.5	2.17 (2.06-2.28)	-13.2
	Leukaemias	3691	3780 (3595-3968)	3.54	3.3 (3.14-3.46)	-6.8
	All cancers	111300	123300 (121934-124664)	105.22	100.52 (99.4-101.64)	-4.5
Chile	Stomach	2247	2250 (2134-2370)	18.39	15.95 (15.1-16.8)	-13.3
	Colorectum	1319	1360 (1290-1439)	10.77	9.68 (9.14-10.21)	-10.1
	Pancreas	640	670 (620-727)	5.34	4.92 (4.52-5.31)	-8
	Lung	1845	1950 (1829-2065)	15.58	14.45 (13.61-15.29)	-7.2
	Prostate	2097	2160 (2057-2255)	15.02	13.08 (12.45-13.72)	-12.9
	Bladder	378	330 (290-365)	2.91	2.17 (1.93-2.42)	-25.3
	Leukaemias	372	380 (340-418)	3.39	3.16 (2.79-3.54)	-6.7
	All cancers	14051	15250 (14928-15579)	114.26	108.02 (105.69-110.36)	-5.5
Colombia	Stomach	3136	3210 (3088-3333)	13.42	11.72 (11.26-12.18)	-12.7
	Colorectum	1751	1730 (1596-1859)	7.49	6.29 (5.82-6.77)	-16
	Pancreas	772	800 (744-859)	3.34	2.93 (2.72-3.14)	-12.2
	Lung	2654	2830 (2682-2982)	11.6	10.34 (9.79-10.89)	-10.8
	Prostate	2888	3110 (2976-3252)	12.35	11.05 (10.57-11.54)	-10.5
	Bladder	315	320 (290-358)	1.36	1.17 (1.05-1.29)	-13.9
	Leukaemias	1020	970 (904-1036)	4.34	3.78 (3.53-4.04)	-12.8

Men		Observed number of deaths 2015	Predicted number of deaths 2019 (95% PI)	Observed ASR* 2015	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2015
	All cancers	20990	24090 (23589-24594)	90.08	88.32 (86.46-90.18)	-2
Cuba	Stomach	555	560 (519-609)	5.35	5.01 (4.56-5.46)	-6.3
	Colorectum	1188	1220 (1153-1297)	11.02	10.5 (9.83-11.17)	-4.7
	Pancreas	437	470 (417-514)	4.33	4.25 (3.75-4.74)	-1.9
	Lung	3539	3530 (3353-3697)	34.82	31.36 (29.8-32.93)	-9.9
	Prostate	2954	3060 (2909-3214)	23.16	21.3 (20.28-22.32)	-8
	Bladder	471	470 (411-530)	4.17	3.7 (3.16-4.25)	-11.2
	Leukaemias	341	320 (288-359)	4.05	3.55 (2.96-4.14)	-12.4
	All cancers	14580	15830 (15341-16326)	139.94	136.93 (133-140.87)	-2.1
Mexico	Stomach	3188	3090 (2973-3210)	5.49	4.58 (4.41-4.76)	-16.6
	Colorectum	3295	3120 (2949-3295)	5.68	4.68 (4.42-4.94)	-17.6
	Pancreas	1916	1950 (1852-2056)	3.41	2.97 (2.8-3.13)	-13
	Lung	4229	3840 (3649-4040)	7.32	5.63 (5.31-5.95)	-23.1
	Prostate	6307	6760 (6567-6944)	10.09	9.17 (8.92-9.42)	-9.1
	Bladder	708	720 (669-773)	1.18	1.03 (0.96-1.1)	-12.5
	Leukaemias	2329	2380 (2278-2480)	3.77	3.54 (3.39-3.69)	-6
	All cancers	40939	43440 (42796-44080)	69.49	63.83 (62.85-64.8)	-8.2
Venezuela (2013)	Stomach	1082	1250 (1168-1340)	8.6	7.98 (7.43-8.53)	-7.2
	Colorectum	913	990 (934-1056)	7.26	6.37 (5.98-6.77)	-12.2
	Pancreas	469	460 (415-495)	3.74	2.91 (2.65-3.17)	-22.2
	Lung	1999	2100 (1973-2223)	16.18	13.51 (12.72-14.31)	-16.5
	Prostate	2438	2840 (2697-2974)	20.16	18.23 (17.35-19.11)	-9.6
	Bladder	218	200 (173-225)	1.78	1.28 (1.1-1.45)	-28.3
	Leukaemias	485	520 (475-562)	3.52	3.27 (3-3.55)	-7
	All cancers	12921	14560 (14015-15108)	102.9	93.35 (89.87-96.83)	-9.3

*ASR, age-standardized mortality rates using the world standard population.

Table 1b. Number of predicted deaths and mortality rates per 100,000 women for the year 2019 and comparison figures for the year 2015 (2013 for Venezuela), from the seven selected Latin America countries, with 95% prediction intervals (PIs) and percent differences.

Women		Observed number of deaths 2015	Predicted number of deaths 2019 (95% PI)	Observed ASR* 2015	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2015
Argentina	Stomach	1066	1010 (931-1079)	2.91	2.59 (2.39-2.79)	-10.9
	Colorectum	3703	3820 (3687-3951)	9.57	9.19 (8.84-9.53)	-4
	Pancreas	2244	2270 (2166-2381)	5.78	5.45 (5.16-5.73)	-5.8
	Lung	3123	3460 (3306-3614)	9.44	10.01 (9.57-10.46)	6.1
	Breast	5917	5970 (5725-6220)	17.65	16.74 (16.01-17.46)	-5.2
	Uterus (cervix and corpus)	2705	2840 (2712-2964)	9.27	9.12 (8.67-9.57)	-1.6
	Ovary	1164	1260 (1179-1342)	3.75	3.73 (3.47-3.99)	-0.6
	Bladder	325	280 (242-317)	0.78	0.7 (0.6-0.8)	-10.3
	Leukaemias	843	870 (786-948)	2.65	2.61 (2.36-2.86)	-1.5
	All cancers	31032	33470 (32956-33992)	89.57	90.37 (89.05-91.69)	0.9
Brazil	Stomach	5132	5470 (5293-5655)	3.73	3.47 (3.36-3.59)	-6.8
	Colorectum	10924	12420 (12097-12734)	7.91	7.83 (7.63-8.04)	-1
	Pancreas	4808	5200 (5035-5371)	3.46	3.23 (3.13-3.33)	-6.7
	Lung	10978	11400 (10879-11929)	8.31	7.57 (7.24-7.89)	-9
	Breast	15403	16570 (16116-17026)	11.8	11.29 (10.95-11.63)	-4.3
	Uterus (cervix and corpus)	9330	9810 (9529-10094)	7.2	6.75 (6.54-6.95)	-6.3
	Ovary	3574	3790 (3666-3919)	2.77	2.6 (2.52-2.69)	-6
	Bladder	1240	1210 (1117-1302)	0.85	0.71 (0.66-0.76)	-16.1
	Leukaemias	3147	3310 (3175-3436)	2.54	2.41 (2.3-2.52)	-5.1
	All cancers	98733	109860 (108752-110966)	74.27	72.24 (71.45-73.04)	-2.7
Chile	Stomach	1123	1150 (1062-1239)	6.64	6.01 (5.57-6.45)	-9.5
	Colorectum	1379	1510 (1439-1589)	7.88	7.5 (7.09-7.91)	-4.8
	Pancreas	709	790 (732-840)	4.28	4.2 (3.91-4.49)	-1.9
	Lung	1262	1190 (1090-1293)	7.9	6.79 (6.31-7.26)	-14.1
	Breast	1511	1510 (1438-1584)	10.28	9.2 (8.75-9.66)	-10.5
	Uterus (cervix and corpus)	959	870 (803-935)	6.8	5.35 (4.88-5.82)	-21.3
	Ovary	446	460 (418-508)	3.14	2.99 (2.67-3.31)	-4.9
	Bladder	156	180 (156-202)	0.85	0.84 (0.71-0.96)	-1.5
	Leukaemias	379	360 (327-399)	2.8	2.45 (2.13-2.76)	-12.6
	All cancers	12823	13810 (13502-14124)	81.29	77.03 (75.23-78.82)	-5.2
Colombia	Stomach	1975	2140 (2049-2223)	6.69	6.2 (5.93-6.46)	-7.4

Women		Observed number of deaths 2015	Predicted number of deaths 2019 (95% PI)	Observed ASR* 2015	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2015
	Colorectum	1952	1850 (1717-1981)	6.67	5.44 (5.08-5.79)	-18.5
	Pancreas	953	1000 (941-1055)	3.27	2.93 (2.76-3.1)	-10.4
	Lung	1981	1990 (1893-2095)	6.88	5.88 (5.6-6.17)	-14.5
	Breast	2865	2730 (2574-2883)	10.1	8.53 (8.07-8.99)	-15.5
	Uterus (cervix and corpus)	2195	2240 (2086-2396)	7.71	6.85 (6.33-7.36)	-11.2
	Ovary	968	1030 (965-1086)	3.44	3.2 (3.01-3.4)	-6.8
	Bladder	161	180 (161-208)	0.52	0.51 (0.44-0.58)	-2.1
	Leukaemias	841	810 (748-878)	3.13	2.79 (2.56-3.01)	-11
	All cancers	21606	24490 (23994-24989)	75.09	73.78 (72.24-75.31)	-1.8
Cuba	Stomach	346	380 (339-414)	3.01	3.01 (2.66-3.36)	0.1
	Colorectum	1504	1540 (1478-1593)	11.8	10.93 (10.41-11.46)	-7.3
	Pancreas	424	480 (433-523)	3.75	3.75 (3.37-4.12)	-0.1
	Lung	1984	2110 (2003-2211)	18.29	17.7 (16.73-18.66)	-3.2
	Breast	1557	1700 (1607-1787)	14.27	14.59 (13.78-15.4)	2.3
	Uterus (cervix and corpus)	1119	1210 (1128-1285)	10.94	10.8 (9.86-11.74)	-1.3
	Ovary	316	340 (293-377)	3.13	3.13 (2.68-3.57)	-0.1
	Bladder	188	200 (173-218)	1.51	1.35 (1.18-1.53)	-10.4
	Leukaemias	230	260 (227-292)	2.49	2.48 (1.94-3.02)	-0.2
	All cancers	10434	11180 (10940-11419)	95.43	92.87 (90.46-95.28)	-2.7
Mexico	Stomach	2749	2770 (2652-2878)	4.12	3.57 (3.42-3.72)	-13.4
	Colorectum	3021	3080 (2953-3209)	4.56	4 (3.83-4.17)	-12.3
	Pancreas	2197	2280 (2192-2376)	3.36	3 (2.87-3.13)	-10.8
	Lung	2539	2480 (2359-2604)	3.84	3.21 (3.05-3.37)	-16.5
	Breast	6168	6510 (6293-6720)	9.69	8.89 (8.59-9.18)	-8.3
	Uterus (cervix and corpus)	4914	5060 (4875-5235)	7.62	6.88 (6.63-7.13)	-9.7
	Ovary	2343	2220 (2089-2355)	3.75	3.06 (2.86-3.26)	-18.4
	Bladder	318	320 (256-381)	0.45	0.39 (0.33-0.46)	-13
	Leukaemias	1951	1990 (1903-2081)	3.06	2.85 (2.71-2.98)	-7
	All cancers	42726	46190 (45313-47062)	65.51	61.93 (60.6-63.26)	-5.5
Venezuela (2013)	Stomach	709	830 (769-888)	4.58	4.3 (3.97-4.63)	-6.2
	Colorectum	979	1000 (913-1084)	6.43	5.26 (4.8-5.73)	-18.2
	Pancreas	486	480 (442-521)	3.24	2.55 (2.34-2.76)	-21.3
	Lung	1414	1470 (1386-1556)	9.6	7.79 (7.31-8.26)	-18.9
	Breast	2062	2310 (2169-2451)	13.81	12.92 (12.18-13.67)	-6.4
	Uterus (cervix and corpus)	1882	1970 (1871-2065)	12.51	10.82 (10.26-11.37)	-13.5

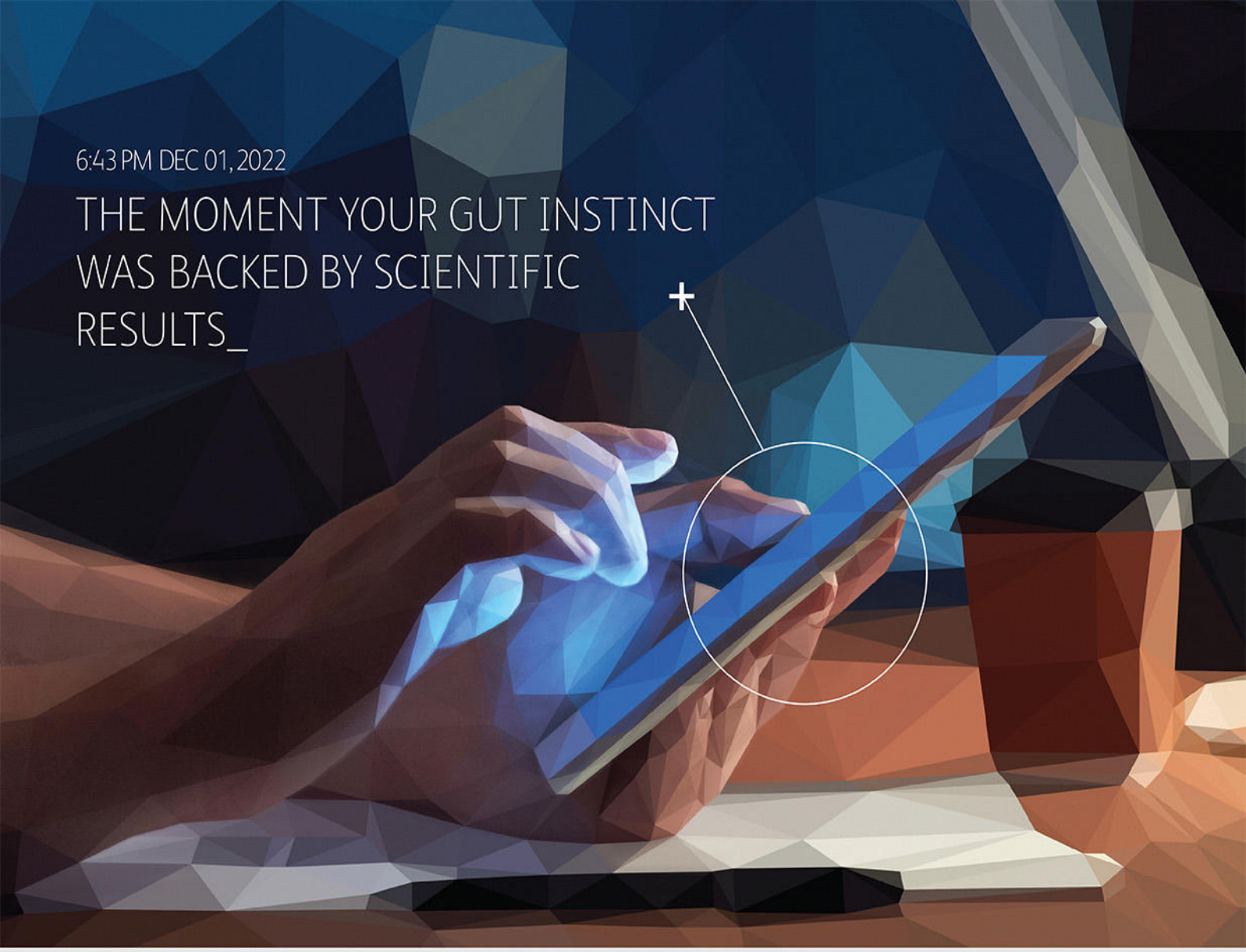
Women	Observed number of deaths 2015	Predicted number of deaths 2019 (95% PI)	Observed ASR* 2015	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2015
Ovary	498	530 (491-566)	3.38	2.93 (2.71-3.14)	-13.4
Bladder	105	110 (91-124)	0.66	0.53 (0.44-0.62)	-19.6
Leukaemias	396	430 (394-471)	2.59	2.48 (2.25-2.71)	-4.2
All cancers	12567	14460 (13902-15010)	83.4	79.14 (76.19-82.1)	-5.1

*ASR, age-standardized mortality rates using the world standard population.

Table 2. Age-standardized breast cancer mortality rates for all ages, 20–49, 50–69, 70–79 years age groups in the seven selected Latin America countries

		Observed ASR* 2005–2009	Observed ASR* 2010-2014	Predicted ASR* 2019 (95% PI)	% difference 2019 versus 2010-2014
Argentina	All ages	18.45	17.53	16.74 (16.01-17.46)	-4.5
	Truncated 20-49 years	8.81	8.3	7.84 (7.1-8.58)	-5.5
	Truncated 50-69 years	61.15	58.51	57.47 (53.81-61.12)	-1.8
	Truncated 70-79 years	107.41	101.06	86.4 (76.73-96.07)	-14.5
Brazil	All ages	11.17	11.56	11.29 (10.95-11.63)	-2.3
	Truncated 20-49 years	6.62	7.07	7.22 (6.57-7.88)	2.2
	Truncated 50-69 years	35.67	36.91	35.68 (34.51-36.85)	-3.3
	Truncated 70-79 years	57.51	57.46	56.03 (53.37-58.69)	-2.5
Chile	All ages	10.54	10.25	9.2 (8.75-9.66)	-10.2
	Truncated 20-49 years	5.49	5.53	5.62 (4.97-6.27)	1.7
	Truncated 50-69 years	33.4	32.02	27.53 (25.55-29.51)	-14
	Truncated 70-79 years	61.53	58.39	49.73 (43.92-55.54)	-14.8
Colombia	All ages	9.55	9.83	8.53 (8.07-8.99)	-13.2
	Truncated 20-49 years	5.38	5.54	5.65 (5.13-6.16)	1.9
	Truncated 50-69 years	31.28	31.46	26.5 (24.44-28.55)	-15.8
	Truncated 70-79 years	52.87	54.86	43.22 (37.54-48.89)	-21.2
Cuba	All ages	14.88	14.56	14.59 (13.78-15.4)	0.2
	Truncated 20-49 years	7.16	6.49	7.33 (6.14-8.52)	12.9
	Truncated 50-69 years	49.1	47.83	47.98 (44.54-51.43)	0.3
	Truncated 70-79 years	86.92	87.28	81.87 (71.96-91.77)	-6.2
Mexico	All ages	9.33	9.28	8.89 (8.59-9.18)	-4.2
	Truncated 20-49 years	6.3	5.86	6.11 (5.71-6.51)	4.3
	Truncated 50-69 years	31.64	31.72	29.31 (27.88-30.73)	-7.6
	Truncated 70-79 years	38.95	42.79	40.61 (37.73-43.5)	-5.1
Venezuela (2013)	All ages	12.36	13.69	12.92 (12.18-13.67)	-5.6
	Truncated 20-49 years	7.1	7.8	8.09 (7.5-8.69)	3.8
	Truncated 50-69 years	42.1	46.57	46.3 (42.21-50.39)	-0.6
	Truncated 70-79 years	60.2	65.48	49.47 (43.04-55.9)	-24.5

*ASR, age-standardized mortality rates using the world standard population.



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