Cervical cancer burden in Latin America and the Caribbean: Where are we?

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List of abbreviations

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ASR: Age-standardised rate; CI5: Cancer Incidence in five continents; EAPC: Estimated average annual percentage change; HDI: Human Development Index; GICR: Global Initiative for Cancer Registry Development; HPV: Human papillomavirus; IARC: International Agency for Research on Cancer; ICD: International Classification of Disease; LAC: Latin America and the Caribbean; PAHO: Pan American Health Organization; PBCR: Population-based cancer registry; WHO: World Health Organization

Novelty and Impact

We described the cervical cancer incidence and mortality in Latin America and the Caribbean. In 2018, we estimated 56,000 and 28,000 new cervical cancer cases and deaths, respectively, with great variations between countries/territories. Despite a recent decrease in cervical cancer incidence and mortality rates, they are still high. Thus, achieving the elimination of cervical cancer in the Region still requires substantial effort, including the establishment of population-based cancer registries.

Abstract

In May 2018, the World Health Organization (WHO) called for the elimination of cervical cancer. To monitor this Initiative, we examined cervical cancer incidence and mortality in the Latin America and Caribbean (LAC) region using GLOBOCAN 2018, Cancer Incidence in Five Continents Series, and the World Health Organization Mortality Database. We estimated the number of cases and age-standardized rates (ASRs) for cervical cancer incidence and mortality for 2018. We also presented the ASRs for recorded cervical cancer incidence from the 2008-2012 period. We calculated annual rates and analysed trends in cervical cancer incidence and mortality for all ages combined and for the following age groups: 0-29; 30-49; 50-64; 65+. Finally, we calculated the estimated average annual percentage change in incidence and mortality rates for the past ten years. In 2018, an estimated 56,000 new cervical cancer cases and 28,000 cervical cancer deaths occurred among women in LAC, with great variations between sub-regions and countries/territories. Overall, trends in cervical cancer incidence and mortality have decreased over the past decade; however, the rates are still above the elimination threshold of 4 per 100,000 in most LAC countries/territories. Despite the encouraging trends observed, achieving the elimination of cervical cancer in the Region still requests substantial political commitment and economic effort. Population-based cancer registries are critical in monitoring the elimination Initiative.

Introduction

With more than 570,000 new diagnoses and 311,000 new deaths worldwide in 2018, cervical cancer ranks fourth in cancer incidence and mortality and remains one of the leading cancers among women worldwide[1]. Lower resourced countries bear the largest burden from this preventable disease, with over 80% of the global cervical cancer new cases and deaths in low-and-middle-income countries[2, 3]. Although marked declines have been observed in incidence rates worldwide, cervical cancer continues to disproportionally affect women in Latin America and the Caribbean (LAC), relative to most other regions. Recent reports ranked cervical cancer as the third most common cancer diagnosed in the LAC region[2], with considerable variations in incidence and mortality between countries; cervical remains the leading cause of cancer in women in 11 of the 32 countries/territories with estimated cancer data available [3-5].

In May 2018, the World Health Organization (WHO) called for a global scale-up of cervical cancer control that would lead to the eventual elimination of the disease[6]. Specifically, the WHO draft global strategy has established that "*cervical cancer should no longer be considered a public health problem when the age-adjusted incidence rate is less than 4 per 100,000 women·year*"[7]. The strategy aims that "*90% of girls fully vaccinated with the human papillomavirus vaccine by 15 years of age; 70% of women are screened with a high-precision test at 35 and 45 years of age; and 90% of women are identified with cervical disease receive treatment and care*"[7]. In September 2018, the Pan American Health Organization (PAHO) Directing Council endorsed a regional plan of action for cervical cancer prevention and control to reduce incidence and mortality rates by 30% by 2030[8].

Currently, 29 of 47 countries/territories in the LAC region have implemented human papillomavirus (HPV) vaccination programs in girls and almost all countries/territories have screening services in place, and while certain screening programs in the region reach a sizeable coverage[8], they are yet to reach the ambitious targets set by the elimination strategy[5, 9, 10]. In addition, although advances in treatment have been made in the LAC region, documented barriers to access treatment persist[11, 12].

Population-based cancer registries (PBCR) are critical in planning, monitoring and evaluating the success of the required national vaccine, screening and treatment actions towards the goal of cervical cancer elimination. Nevertheless, less than half of the countries in the LAC region have a high-quality PBCR, with less than 10% of the population covered by such registries in the region[13].

The present study examines the current cervical cancer burden in 32 countries/territories in the Latin America and Caribbean region, providing the most up-to-date data as a means to inform and monitor the Elimination Initiative in the Region.

Materials and methods

Data sources

Estimated incidence and mortality

Cervical cancer (International Classification of Disease 10th edition, ICD-10: C53) incidence and mortality estimates for the year 2018 were obtained for 32 countries/territories in LAC (see list in **Table 1**), by five-year age group (0-4, 5-9, …, 80–84, and 85 and over) from the GLOBOCAN database[14] compiled by the International Agency for Research on Cancer (IARC).

Detailed methodology used in GLOBOCAN 2018 have been previously published elsewhere[15]; the data are presented within the Global Cancer Observatory (http://gco.iarc.fr).

Observed incidence

Data on cervical cancer incidence by five-year age group and corresponding population were obtained from Cancer Incidence in Five Continents Volume XI[16], which includes high-quality global incidence data from national and sub-national PBCRs. We included data from 31 PBCRs in twelve countries/territories in LAC covering the 2008-2012 period (detailed in **Table 2**): Argentina (5 PBCRs), Brazil (6 PBCRs), Chile (4 PBCRs), Colombia (4 PBCRs), Costa Rica (national PBCR), Ecuador (5 PBCRs), France, Martinique (1 PBCR), French Guiana (1 PBCR), Jamaica (1 PBCR), Peru (1 PBCR), Puerto Rico (national PBCR), and Uruguay (national PBCR). For the assessment of time trends, annual incidence data and corresponding annual population data were extracted for PBCRs with incidence data for at least 15 consecutive years (i.e. Goiania, Brazil; Valdivia, Chile; Cali, Colombia; Costa Rica; Quito, Ecuador; Martinique, France) extracted from the CI5plus database[17].

Recorded incidence by PBCR may differ from the corresponding country-specific GLOBOCAN 2018 estimates due to the differences in the methods used to calculate the rates, as well as, data availability and timeliness. Thus, a direct comparison between the two measures is not possible.

Observed mortality

Cancer mortality data by five-year age group for 32 LAC countries/territories were obtained from the WHO Mortality Database[18] that provides mortality data by age, sex and cause

of death as reported by WHO Member States (http://www.who.int/healthinfo/mortality_data/en/). Population data were obtained from the United Nations Population Prospect[19] by five-year age group for all 32 LAC countries/territories. We extracted all deaths coded as "malignant neoplasm of cervix uteri" (180 in ICD-9 and C53 in ICD-10), "malignant neoplasm of corpus uteri" (182 in ICD-9, and C54 in ICD-10), or "malignant neoplasm of uterus, part not specified" (179 in ICD-9 and C55 in ICD-10).

Reallocation of ill-defined deaths and uterine cancer, unspecified part

We reallocated uterus cancer deaths coded as 'uterus, part unspecified' to *cervix uteri* and *corpus uteri* independently by country, year and age group using an algorithm adapted from Diama Vale and colleagues[20], in four steps as described in **Supplementary Figure 1**:

1) We reallocated ill-defined causes of death proportionally between cancer-related deaths and other causes of deaths except for injury.
2) We redistributed these additional cancer-related deaths proportionally among cancer sites.
3) We proportionally reallocated deaths from *cervix uteri*, *corpus uteri* and "malignant neoplasm of uterus, part not specified" with unknown age into the known age groups.
4) We reallocated ill-defined uterine cancer deaths into cervical cancer deaths and uterine cancer deaths with varying methods depending on age at death.

As cancer of the *corpus uteri* is very rare among women below the age of 50, all ill-defined uterine cancer deaths in women aged less than 50 years were therefore assigned to cervical cancer deaths. For older women, we reallocated proportionally ill-defined uterine cancer deaths to cervical cancer deaths and uterine cancer deaths.

During the period when ICD-9 was utilized, all countries/territories (except for Chile in 1983, Cuba in 2000, Guatemala in 2000-2004, and Venezuela in 1980) did not report deaths coded as "malignant neoplasm of uterus, part not specified" (ICD-9: 179) and *corpus uteri* cancer deaths (ICD-9: 182) deaths separately; instead, these two categories were grouped under the category coded B122. To redistribute deaths coded B122 between *corpus uteri* and *cervix uteri* cancer deaths, we applied the percentage of cervical cancer deaths of the earliest year of ICD-10 use. For example, for Argentina and Brazil, we used the proportion of C53 for the year 1996 to redistribute cancer deaths for the years 1979-1995.

Trends

For incidence trends, we included data from PBCRs in Goiania (Brazil), Valdivia (Chile), Cali (Colombia), Costa Rica and Quito (Ecuador), Martinique (France) (six countries out of 32 LAC countries/territories). For mortality trends, we included Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Mexico, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, Trinidad and Tobago, Uruguay, and Venezuela (19 countries out of 32 countries/territories). We excluded countries with less than 50 annual deaths (Bahamas, Barbados, Belize, French Guyana, France, Guadeloupe and Martinique, Guyana, Haiti, Honduras, Saint Lucia, Suriname) and those with missing data for more than two consecutive years (Bolivia (available years: 2000-2003)), Jamaica (missing years: 1982, 1984, 1992-1999, 2007-2008, 2012-2015)).

Data analysis

The estimated number of cases and estimated age-standardized rates (ASRs) for cervical cancer incidence and mortality with 95% confidence interval were reported, using the World standard population[21] for each of the 32 LAC countries/territories included in GLOBOCAN 2018. Additionally, new observed cases were presented and the ASRs for observed cervical cancer incidence were calculated for the 31 PBCRs included in CI5 Volume XI.

We analyzed trends in cervical cancer incidence and mortality for all ages combined and for the following age groups: 0-29; 30-49; 50-64; 65+. Annual ASRs for incidence and mortality were calculated. For each country, to graphically summarize the trends, we fitted quasi-Poisson models with a cubic spline effect for year with three knots placed at quartiles of the variable year and an interaction term between age group and year to provide smoothed lines through the scatterplot of ASRs by year and age group. Rates are plotted on a semi-log scale. In addition, we calculated the estimated average annual percentage change (EAPC) in incidence and mortality rates, and its 95% confidence interval using adjusted quasi-Poisson regression models with a linear effect for year of incidence/death and an interaction term between year and age group to obtain EAPC for each age group. Quasi-Poisson models were privileged to account for over-dispersion.

Data availability

The data that support the findings of this study are openly available within the Global Cancer Observatory at http://gco.iarc.fr[14] for the 2018 GLOBOCAN estimates, the Cancer Incidence in Five Continents for the annual incidence data at http://ci5.iarc.fr/Default.aspx[22] and the WHO Mortality Database for the mortality data at

http://www.who.int/healthinfo/mortality_data/en/[18]. Datasets used for the analysis will be made available upon reasonable request.

Results

Cervical cancer burden in Latin America and the Caribbean in 2018

In 2018, an estimated 56,000 new cervical cancer cases and 28,000 cervical cancer deaths occurred among women in LAC, representing around 10% of the total global number of new cervical cancer cases (569,000) and 9% of the total global cervical cancer deaths (311,000). An estimated 39,600 new cervical cancer cases and 19,200 cervical cancer deaths in the region occurred in South America alone (**Table 1**). The age-standardised incidence and mortality rates in the LAC region were 14.6 and 7.1 per 100,000 respectively, with the disease ranking second in LAC after the African region (27.6 and 20.0, respectively) and slightly higher than the global rates (13.1 and 6.9, respectively) (**Supplementary Figure 2**). Incidence rates were lower in Central America (13.0 per 100,000) than in South America (15.2) and the Caribbean (15.5) while mortality rates were higher in the Caribbean (8.5) than in South America (7.1) and Central America (7.0) (**Table 1 – Figure 1**). At the country level, Martinique exhibited the lowest incidence and mortality rates in 2018 (7.6 and 1.9, respectively), while Bolivia had the highest estimated incidence rate (38.5) and Jamaica the highest mortality rate (20.1) (**Figure 1**).

*Recorded cervical cancer incidence***Table 2** presents the recorded cervical cancer incidence in selected PBCRs for the period 2008-2012. The lowest incidence rate was observed in Poços de Caldas, Brazil (6.8 per 100,000) and the highest in Chaco, Argentina (26.5). Incidence rates

varied greatly between populations within the same country. For example, the ASR ranged from 8.9 in Tierra del Fuego to 26.5 in Chaco in Argentina or from 6.8 in Poços de Caldas to 15.6 in Florianopolis in Brazil.

Trends in cervical cancer incidence in selected LAC populations

Figure 2 shows the trends in cervical cancer incidence rates, and **Table 3** presents the EAPC for all ages combined and by age group for six PBCRs in LAC. For all ages combined, incidence rates are rather stable in Quito, Ecuador (+0.4% yearly on average over the ten past years) and in Costa Rica (-0.7%), while incidence rates are decreasing in Cali, Colombia (-4%), Valdivia, Chile (-6%) and Goiania, Brazil (-4%) and appear to decrease in Martinique (-3%) over the same period. Overall, incidence rates are increasing as age increases irrespective of period of diagnosis (**Figure 2**). Over the most recent decade, incidence rates have significantly increased for the 0-29 year age group in Costa Rica (+11% yearly on average) and, despite the negative lower bound of the confidence interval, the same tendency is observed for Valdivia, Chile (+16% - **Table 3**). Among women aged 50 and older, incidence rates are, in general, decreasing, since the mid-1990s in most countries/territories, with the EAPC ranging from -4% in Ecuador and Costa Rica to -15% in Martinique in women aged 50-64 years and from -2% in Martinique to -10% in Brazil in women aged over 65 (**Table 3**). Ecuador, Quito is an exception with a tendency of increasing rates in women aged 65 years or older (**Table 3**).

Trends in cervical cancer deaths in selected LAC countries/territories

Figure 3 illustrates the trends in cervical cancer mortality rates and **Table 3** presents the EAPC for all ages combined and by age group in the 19 countries/territories where mortality

data were available. Over the past ten years, mortality rates for all ages combined have slightly increased in Puerto Rico (+2%), decreased in Chile (-2%), Colombia (-2%), Ecuador (-3%), Cuba (-1%), El Salvador (-4%), Mexico (-2%), and Paraguay (-2%) and stayed stable in the remaining countries. Mortality rates among the 0-29 year age group tended to decrease for all countries/territories, except for Brazil, where the mortality rates have significantly increased (+4%). The majority of countries/territories exhibited decreasing mortality rates at ages 30 years and older.

Discussion

This study provides the most up-to-date picture of the cervical cancer burden in LAC, in LAC, and illustrates the continuation of decreasing trends in cervical cancer, as has been shown in previous analyses[23]. Overall, cervical cancer remains a major health problem in the region. The encouraging decrease in incidence and mortality rates over the last decade observed among women aged over 30, is tempered by the observation that, in absolute terms, the rates were 10 above the elimination threshold of 4 per 100,000 in most LAC countries/territories. This study also illustrates the scarcity of high-quality reported incidence data in the region with only 31 PBCRs from 12 of 32 countries providing 2008-2012 incidence rates. This clearly highlights the need for the development of new PBCRs in most countries and the improvement of data quality in many existing registries.

The LAC region comprises a diverse set of countries/territories, which challenges the implementation of health policies that may serve to increase disparities if systems are not uniformly in place to support such actions. Variations in the incidence and mortality rates

between countries/territories in the LAC region appear to be correlated with their national human development index, as well as the robustness of the health system to implement comprehensive cervical cancer programs. For instance, the highest estimated cervical cancer incidence rates were estimated in Bolivia and Jamaica, both of which have a low Human Development Index (HDI). Furthermore, intra-country variations in cervical cancer incidence are also observed in most countries/territories; in Argentina, the highest rates were observed in El Chaco, which is one of the provinces in Argentina with a lower HDI[24]. Thus the marked differences in economic development and inequalities in access to screening may also potentially contribute to the disparities in cervical cancer incidence rates[25, 26].

Despite the high incidence rates in many countries/territories, we found a declining incidence of cervical cancer in selected PBCRs, particularly in Brazil, Chile, and Colombia. The decrease in incidence over time has been previously reported in the Region [27]. This decrease may be attributed to multiple factors, including declines in fertility rates, lower parity, and improvements in socioeconomic and education levels[3, 27, 28], as well as having well-structured screening and treatment programs with relatively higher screening coverage. While some LAC countries/territories have implemented cervical cancer screening programs in the past decade, the impact of screening may be limited to those populations due to suboptimal coverage and follow-up, unequal access to health care, and low adherence to the screening process[29].

Congruent with the decline in incidence and with previous reports, we also observed a consistent decline in cervical cancer mortality rates for the majority of the LAC countries/territories over time, while rates remained stable in a few countries, including Argentina and Brazil[30-33]. This decrease in mortality rates is likely attributable to the better

education of women who seek screening and advances in treatment[34]. Contrary to previous studies[35], we observed an increase in cervical cancer mortality rates in Puerto Rico over the past decade, mainly driven by increasing mortality among the 30-49 year age group. Although the reason for the rise is unclear, it could be linked to diagnosis at a more advanced-stage disease in this age group that has been associated with a lower prognosis[36]. Economic and societal development factors related to improved cancer prognosis may have also contributed to the decline in cervical cancer mortality in some LAC countries/territories, however, the specific determinants need further investigation.

Despite persistent declines in incidence and mortality, rates remain highest in women over the age of 65 in all LAC countries/territories. Several factors may contribute to the high incidence of cervical cancer among older women. While women over the age of 65 are no longer targeted by cervical cancer screening[5], they may also be more likely to have comorbidities that would increase their likelihood of contact with the healthcare system, although some studies have reported that a higher level of comorbidity decreased the likelihood of screening participation[37]. Furthermore, cervical cancer management among older women may be complicated by anatomical changes of the cervix, a higher level of comorbidities, and lower performance status, leading to sub-optimal treatment compared to younger women[38]. Furthermore, older women who develop cervical cancer are also more likely to be diagnosed with advanced-stage disease, contributing to higher mortality rates in this age group[39]. With the expected population growth among older women in the LAC region over the next decades[40], there is an overwhelming need for cervical cancer control programs and policies tailored to older women in LAC countries/territories.

This study has reported increased incidence rates among the youngest age group (0-29 years) in some certain cancer registries in the LAC region, although incidence and mortality estimates in this group should be interpreted with caution due to the relatively small number of cases and deaths. Our findings emphasize the importance and the need to continue efforts in improving HPV vaccination coverage in these countries/territories, while also improving the effectiveness of screening and treatment programs. A recent modeling study, including Bolivia, El Salvador, Haiti, Honduras, and Nicaragua, showed that cervical cancer elimination in all of the 5 LAC countries could be reached by 2120, provided that the HPV vaccination coverage is 90% and there is at least one screening at 35 years[41]. However, only 80% of LAC countries would reach the elimination threshold with HPV vaccination alone. Furthermore, achieving the 90–70–90 WHO targets on cervical cancer would reduce cervical cancer mortality by more than 95% by 2120[42]. As of October 2019, four-fifths, or 26 of the 32, mainly middle-income countries/territories under study in the region had introduced HPV vaccination programs, the exceptions being El Salvador, Nicaragua, Venezuela, Haiti and Cuba[43]. Notably, a higher average vaccine coverage level among girls aged 10-14 years has been observed in Latin America compared to Northern America and some regions of Europe[10].

It can be anticipated that there will be further decreases in cervical cancer incidence in the future. It will take decades before the impact of HPV vaccination will be observable at the population level. Therefore, screening pre-cancerous cervical lesions remains essential in lowering cervical cancer incidence. These programs should be reinforced and implemented in all LAC countries/territories.

Our study has limitations. The accuracy of GLOBOCAN 2018 estimates is dependent on the availability and of the quality of national or sub-national incidence and mortality data, thus these estimates should be interpreted with some caution. In countries where national mortality data are available, but national or subnational cancer registries are not (e.g. Venezuela, Nicaragua), the national incidence estimates relied on national mortality estimates and modelling of the mortality to incidence ratio from neighboring countries[15].

Although good vital systems are available in many LAC countries/territories, there is room for improvement in the vital registration of cervical cancer deaths, as indicated by the large disparities in the percentage of ill-defined uterine cancer deaths (ICD10: C55 - **Supplementary Table 1**). In the absence of validated methods to reallocate ill-defined uterine cancer deaths into cervical cancer deaths, we apply a reallocation process adapted from Bhadra and colleagues and Loos and colleagues [20, 44]. However, when applying the same rule for reallocation in all countries/territories we assume that mortality data in all these countries have the same quality but that could be wrong.

Reliable cancer incidence data are critical for cancer surveillance and in monitoring progress towards the elimination of cervical cancer in the Region[45]. However, the paucity of high quality (and longstanding) available incidence data precludes monitoring trends in cervical cancer incidence in many LAC countries/territories. Having PBCRs in the region alone is not sufficient. There is a need to improve the data quality of existing PBCRs in many countries, as well as providing support and resources into the development of cancer registries in countries without existing PBCRs. IARC has been coordinating the Global Initiative for Cancer Registry Development (GICR), a multi-partner initiative that aims to improve the inequity in data

availability and quality [https://gicr.iarc.fr/]. However, such an initiative can only be successful if countries/territories recognize that importance of having sustainable PBCRs with high-quality and reliable data to monitor cancer burden, as well as, to plan and evaluate cancer control activities. The PAHO Plan of Action on Cervical Cancer Prevention and Control has set a target of 19 countries to have PBCRs in place by 2030 and the Cervical Cancer Elimination Strategy sets a good opportunity to advance cancer registration as a means to monitor successes in moving towards this target.

Conclusion

In this study, we aim to provide a comprehensive description of the cervical cancer burden in Latin America and the Caribbean region as a means to inform the Cervical Cancer Elimination Initiative. While the decrease in incidence and mortality suggests improvements in screening and treatment, further investigation is needed to understand the underlying reasons for these declines. The incidence and mortality rates remain high in the region and highlight the need for increased efforts, political commitment and adequate funding to improve the effectiveness of existing cervical cancer programs on the road to the elimination of cervical cancer. These efforts necessarily includes the establishment and sustainable development of PBCRs in the LAC region as a comprehensive surveillance tool for cancer control.

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Conflict of interest

The authors declare that they have no conflicts of interest.

TABLES

Table 1. Estimated cervical cancer incidence and mortality, numbers and rates (ASR per 100,000 women·year) in Latin America and the Caribbean, by country, 2018

Table 2. Recorded cervical cancer incidence cases and rates (ASR, per 100,000 women·year) in selected Latin American and the Caribbean registries, ca. 2008-2012

Table 3. Estimated annual percent change (EAPC, %) and 95% confidence interval (CI) for cervical cancer incidence and mortality rates in selected Latin America and the Caribbean cancer registries and countries

FIGURES

Figure 1. Distribution of age-standardized incidence rates per 100,000 women·year by country and sub-region comparatively to the elimination threshold defined by WHO, 2018

Figure 2. Trends in cervical cancer incidence rates (ASR, per 100,000 women·year, log scale) in six selected cancer registries of Latin America and The Caribbean, all ages combined and by age groups, ca.1980-2012

Figure 3. Trends in cervical cancer mortality rates (ASR, per 100,000 women·year, log scale) in 19 Latin America and the Caribbean countries/territories, all ages combined and by age groups, ca.1979-2015

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Table 1. Estimated cervical cancer incidence and mortality, numbers and rates (ASR per 100,000 women·year) in Latin America and the Caribbean, by country, 2018

	Incidence			Mortality		
Population	**Cases**	**Uncertainty interval**	**ASR (W)***	**Deaths**	**Uncertainty interval**	**ASR (W)***
Latin America and the Caribbean	56,187	[52,987-59,581]	14.6	28,318	26,658-30,081]	7.1
Central America	12,406	[11,891-12,944]	13	6,619	[6,380-6,867]	7
Belize	46	[27-79]	28	25	[17-40]	16.2
Costa Rica	351	[263-468]	11.2	192	[152-242]	5.6
El Salvador	724	[604-868]	18.5	386	[329-454]	9.4
Guatemala	1,503	[1,300-1,737]	21.1	793	[700-898]	11.7
Honduras	804	[666-970]	19.6	480	[418-551]	12.5
Mexico	7,869	[7,469-8,290]	11	4,121	[3,945-4,305]	5.8
Nicaragua	677	[533-859]	21.2	409	[335-500]	13.3
Panama	432	[334-559]	18.4	213	[171-265]	8.8
South America	39,581	[36,852-42,512]	15.2	19,235	18,662-19,825]	7.1
Argentina	4,484	[4,068-4,943]	16.7	2,231	[2,053-2,425]	7.7
Bolivia, Plurinational State of	1,949	[1,732-2,193]	38.5	1,022	[913-1,144]	19
Brazil	16,298	[15,319-17,340]	12.2	8,079	[7,817-8,350]	5.8
Chile	1,549	[1,301-1,845]	12.2	725	[636-826]	5
Colombia	3,853	[3,421-4,340]	12.7	1,775	[1,615-1,951]	5.7
Ecuador	1,612	[1,462-1,778]	17.8	838	[746-941]	9
French Guyana	29	[16-52]	20.8	5	[2-12]	3.7
Guyana	124	[99-156]	32.7	64	[48-86]	17.3
Paraguay	1,033	[842-1,267]	31.5	519	[435-619]	16
Peru	4,103	[3,776-4,459]	23.2	1,836	[1,681-2,006]	10.2
Suriname	85	[57-126]	26.8	47	[33-67]	14.3
Uruguay	288	[231-359]	12.4	168	[130-217]	6
Venezuela, Bolivarian Republic of	4,174	[3,838-4,539]	23.7	1,926	[1,794-2,067]	10.9
The Caribbean	4,200	[3,695-4,775]	15.5	2,464	[2,182-2,782]	8.5
Bahamas	29	[16-51]	10.9	23	[14-38]	7.9
Barbados	38	[22-65]	15.5	27	[17-43]	9.4
Cuba	1,231	[1,065-1,423]	14.6	597	[529-674]	6
Dominican Republic	981	[807-1,193]	17.1	571	[483-675]	9.9
France, Guadeloupe	39	[26-58]	9.3	19	[11-33]	3.3
France, Martinique	32	[22-48]	7.6	14	[8-25]	1.9
Haiti	835	[265-2,634]	17.1	563	[185-1,711]	12.5
Jamaica	486	[324-729]	28.4	361	[256-509]	20.1
Puerto Rico	262	[229-300]	10.2	114	[88-148]	3.5
Saint Lucia	15	[7-31]	13	12	[6-23]	10
Trinidad and Tobago	140	[86-229]	15.2	97	[64-146]	9.4

*Age-standardized rates per 100,000

Source: GLOBOCAN 2018

Table 2. Recorded cervical cancer incidence cases and rates (ASR, per 100,000 women·year) in selected Latin American and the Caribbean registries, ca. 2008-2012

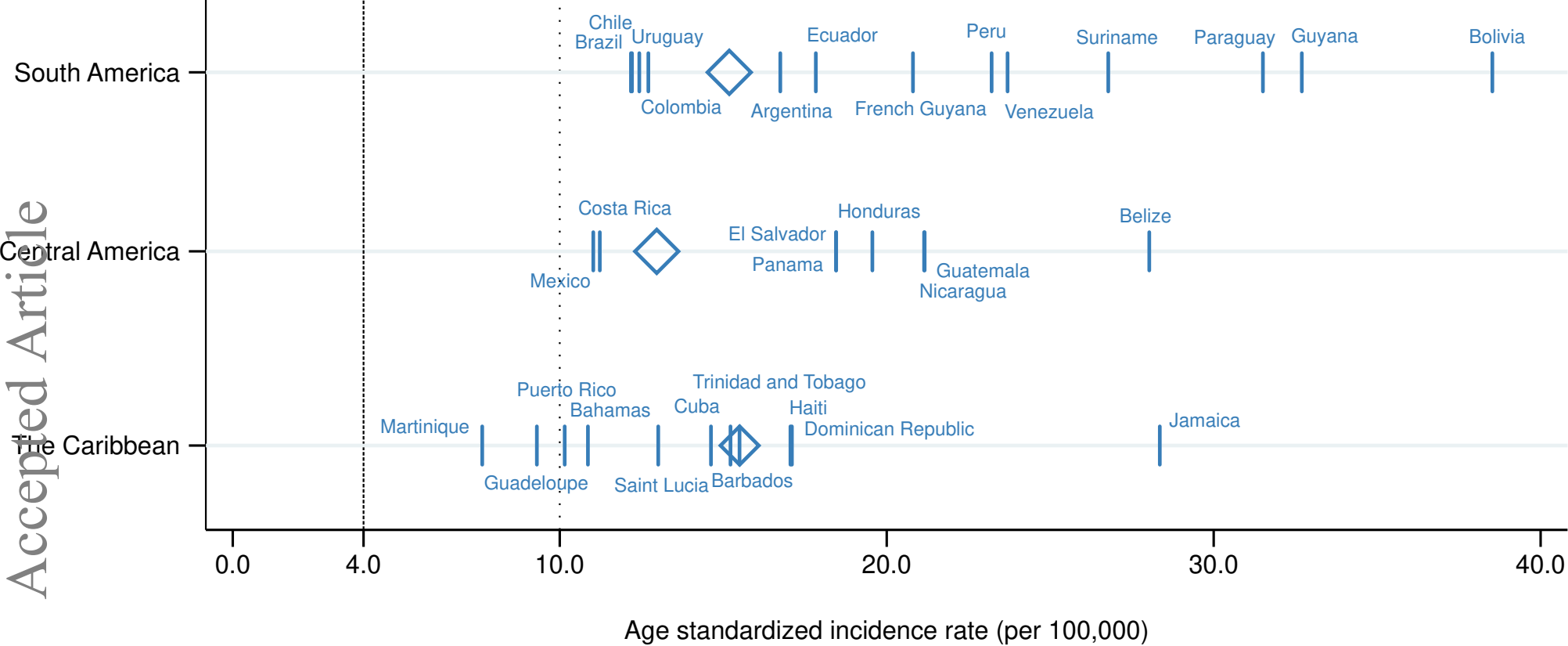
Region/Country/Registry		Incidence			
		Period	Cases	Population	ASR (W)*
Central America					
Costa Rica		2008-2011	1,284	2,234,847	13.2
South America					
Argentina†		-	2,128	2,741,414	15
	Argentina, Chaco	2008-2012	684	536,278	26.5
	Argentina, Córdoba	2008-2012	430	713,427	10.6
	Argentina, Entre Rios Province	2008-2011	357	540,963	15.1
	Argentina, Mendoza	2008-2012	630	886,320	13
	Argentina, Tierra del Fuego	2008-2012	27	64,426	8.9
Brazil†		-	1,444	2,280,906	12.4
	Brazil, Aracaju	2008-2012	210	301,692	13.1
	Brazil, Curitiba	2008-2011	490	939,546	10.7
	Brazil, Florianopolis	2008-2010	123	212,088	15.6
	Brazil, Goiânia	2008-2012	555	681,738	14.5
	Brazil, Jau	2008-2012	40	67,832	9
	Brazil, Pocos de Caldas	2008-2011	26	78,010	6.8
Chile†		-	725	1,170,607	13.8
	Chile, Bío Bío Province	2008-2012	173	192,466	14.6
	Chile, Concepcion	2008-2010	281	517,176	14.4
	Chile, Region of Antofagasta	2008-2010	121	270,863	13.2
	Chile, Valdivia	2008-2012	150	190,102	12.9
Colombia†		-	1,887	2,148,204	15.2
	Colombia, Bucaramanga	2008-2012	417	559,487	13
	Colombia, Cali	2008-2012	1,037	1,171,181	15.4
	Colombia, Manizales	2008-2012	222	203,681	17.5
	Colombia, Pasto	2008-2012	211	213,855	18
Ecuador†		-	2,679	15,305,292	18.2
	Ecuador, Cuenca	2008-2012	190	266,088	14.1
	Ecuador, Guayaquil	2008-2012	1,169	1,208,654	20.2
	Ecuador, Loja	2008-2010	76	105,583	24.5
	Ecuador, Manabi	2008-2012	499	686,192	16.1
	Ecuador, Quito	2008-2012	745	836,775	17.6
French Guiana		2008-2012	104	115,982	20.7
Peru		-	-	-	-
	Lima	2010-2012	3,161	4,768,406	21.1
Uruguay		2008-2012	1,603	1,754,981	14.6
The Caribbean					
France		-	-	-	-
	Martinique	2008-2012	129	211,844	7.1
Jamaica		-	-	-	-
	Kingston and St Andrew	2008-2011	233	342,509	15.6
Puerto Rico		2008-2012	1,203	1,981,028	9.3

* Age-standardized rates per 100,000; (W) World standard population

† Combined ASRs from sub-national PBCRs

Table 3. Estimated annual percent change (EAPC, %) and 95% confidence interval (CI) for cervical cancer incidence and mortality rates in selected Latin America and the Caribbean cancer registries and countries

Country/Registry	Period	All ages combined	0-29 y	30-49 y	50-64 y	65+ y
Incidence						
Brazil, Goiania	2003-2012	-4.2 (-7.0, -1.3)	-6.6 (-14.3, 1.9)	-2.1 (-5.7, 1.6)	-10.4 (-14.3, -6.3)	-10.0 (-14.3, -5.4)
Chile, Valdivia	2003-2012	-5.6 (-10.8, -0.1)	15.9 (-2.9, 38.4)	-6.9 (-12.8, -0.6)	-8.9 (-17.4, 0.4)	-9.1 (-17.4, 0.1)
Colombia, Cali	2003-2012	-4.2 (-5.3, -3.0)	0.4 (-5.4, 6.5)	-4.8 (-6.6, -2.9)	-4.6 (-6.8, -2.4)	-8.9 (-11.2, -6.5)
Costa Rica	2003-2012	-0.7 (-3.6, 2.3)	10.8 (3.2, 19.1)	-1.5 (-4.3, 1.5)	-4.3 (-8.3, -0.1)	-6.6 (-11.2, -1.7)
Ecuador, Quito	2003-2012	0.4 (-2.7, 3.6)	-0.1 (-11, 12.2)	-1.3 (-5.1, 2.6)	-3.9 (-8.2, 0.6)	3.4 (-1.3, 8.3)
France, Martinique	2003-2012	-3.4 (-6.9, 0.3)	0.5 (-24.4, 33.7)	-1.3 (-8.5, 6.6)	-15.3 (-23.6, -6.2)	-2 (-8.3, 4.8)
Mortality						
Central America						
Costa Rica	2005-2014	1.4 (-0.8, 3.6)	-2.3 (-15.1, 12.3)	1.5 (-2.1, 5.2)	-2.4 (-6.7, 2.2)	-1.1 (-3.9, 1.7)
El Salvador	2005-2014	-3.6 (-5.1, -1.9)	-16.5 (-26.5, -5.2)	-6.1 (-8.3, -3.8)	-3.8 (-6.4, -1.0)	-5.1 (-6.7, -3.4)
Guatemala	2006-2015	-0.2 (-1.8, 1.4)	-9.4 (-16.3, -2)	-2.5 (-4.6, -0.4)	-0.7 (-3.1, 1.7)	-0.8 (-2.5, 0.8)
Mexico	2006-2015	-2.1 (-2.7, -1.5)	1.2 (-2.4, 4.9)	-2.5 (-3.4, -1.7)	-4.5 (-5.4, -3.5)	-4.0 (-4.6, -3.3)
Nicaragua	2006-2015	0.4 (-1.2, 2.1)	-6.8 (-16.9, 4.6)	0.0 (-2.6 ,2.7)	-4.3 (-7.2, -1.2)	-0.9 (-3.3, 1.4)
Panama	2006-2015	1.3 (-1.1, 3.8)	-10.1 (-20.8, 2.0)	2.1 (-1.4, 5.7)	0.3 (-4.0, 4.9)	-1.4 (-4.2, 1.4)
South America						
Argentina	2006-2015	-0.1 (-0.7, 0.5)	1.8 (-1.9, 5.7)	0.7 (-0.4, 1.8)	-2.2 (-3.4, -0.9)	-1.1 (-2.0, -0.2)
Brazil	2006-2015	0.3 (0.0, 0.5)	4.0 (2.4, 5.6)	-0.1 (-0.6, 0.3)	-2.4 (-2.9, -1.9)	-2.8 (-3.2, -2.5)
Chile	2006-2015	-1.8 (-2.9, -0.7)	3.5 (-4.4, 12.1)	-1.9 (-3.8, 0.1)	-4.2 (-6.2, -2.1)	-3.8 (-5.0, -2.6)
Colombia	2006-2015	-1.7 (-2.5, -0.8)	-1.1 (-4.8, 2.8)	-3.1 (-4.1, -2.1)	-4.3 (-5.4, -3.1)	-4.1 (-4.9, -3.4)
Ecuador	2006-2015	-2.7 (-3.4, -1.9)	-12.7 (-20.1, -4.5)	-3.0 (-4.9 ,-1.1)	-5.4 (-7.4, -3.4)	-4.0 (-5.2, -2.8)
Paraguay	2005-2014	-2.3 (-3.6, -0.9)	-5.8 (-13.3, 2.3)	-0.7 (-3.0, 1.7)	-5.3 (-8,.0 -2.6)	-4.9 (-6.8, -3.0)
Peru	2006-2015	-1.4 (-3.0, 0.2)	-5.0 (-12.3, 3.0)	-3.5 (-5.3, -1.8)	-2.9 (-4.8, -1.0)	-2.6 (-3.9, -1.2)
Uruguay	2006-2015	-1.4 (-3.3, 0.5)	-6.0 (-21.8, 13.1)	-1.5 (-4.9, 2.1)	-2.7 (-6.6, 1.3)	-1.7 (-4.2, 0.8)
Venezuela	2004-2013	-0.5 (-1.2, 0.1)	-0.3 (-3.3, 2.8)	-0.8 (-1.6, 0.1)	-3.2 (-4.3, -2.2)	-2.8 (-3.7, -2.0)
The Caribbean						
Cuba	2006-2015	-1.2 (-2.0, -0.3)	-0.2 (-8.1, 8.4)	-4.0 (-5.6, -2.4)	-4.0 (-5.8, -2.2)	-0.8 (-2.0, 0.5)
Dominican Republic	2004-2013	-0.1 (-1.8, 1.5)	-5.8 (-14.7, 4.1)	0.1 (-2.9, 3.2)	-3.5 (-7.0, 0.1)	-1.5 (-3.6, 0.6)
Puerto Rico	2006-2015	2.4 (0.6, 4.4)	-9.5 (-22.4, 5.6)	3.3 (-1.6, 8.4)	2.0 (-3.8, 8.2)	0.6 (-2.7, 4.0)
Trinidad and Tobago	2002-2011	-0.2 (-3.3, 3.0)	-7.8 (-24.2, 12.0)	-0.1 (-4.9, 5.0)	4.4 (-1.0, 10.2)	-5.0 (-8.0, -1.9)

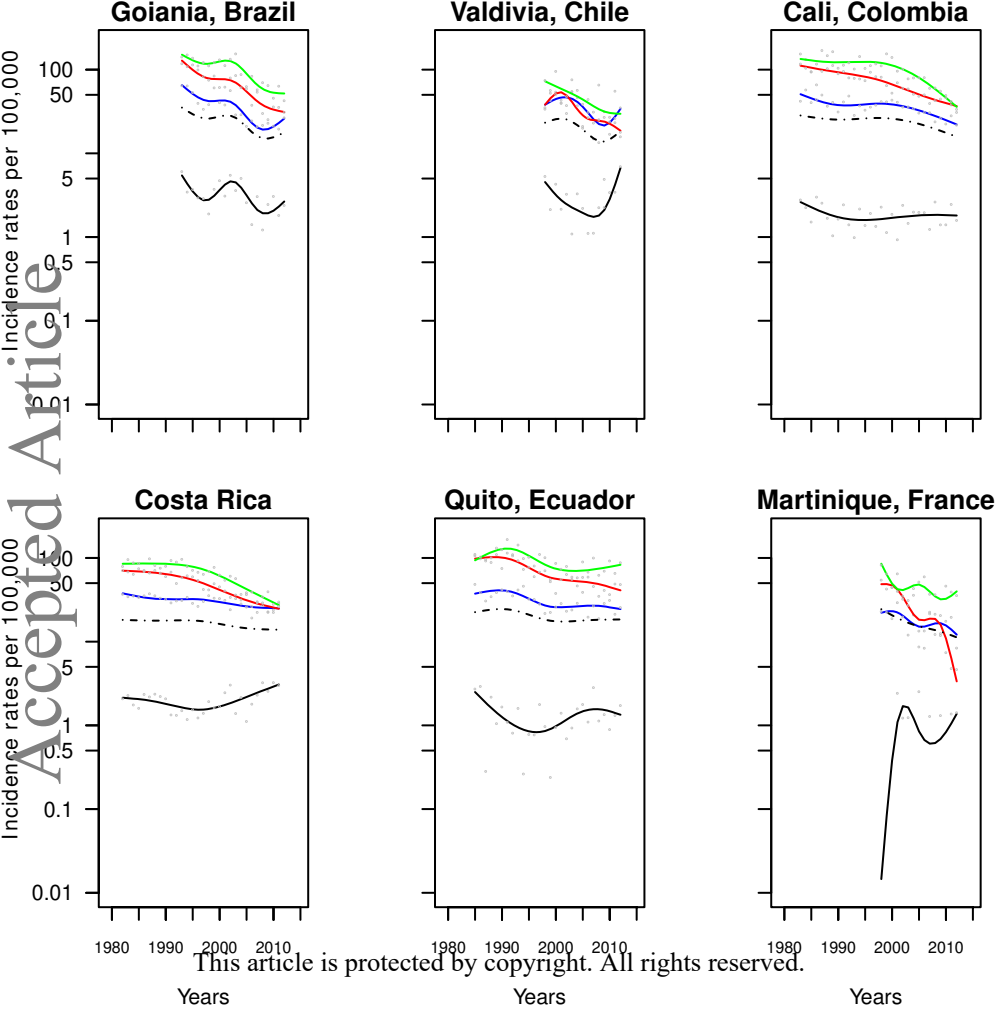


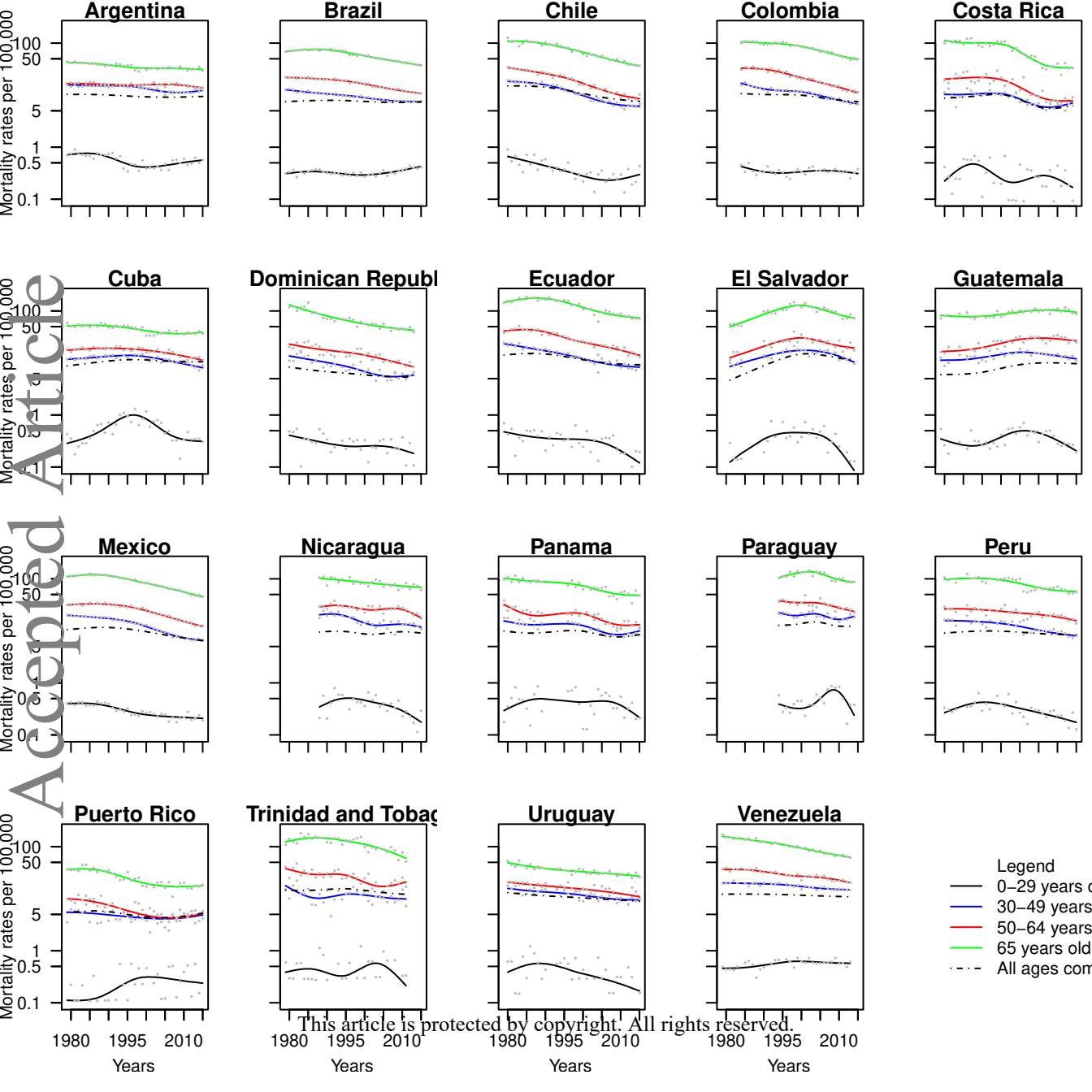
Intermediate Threshold

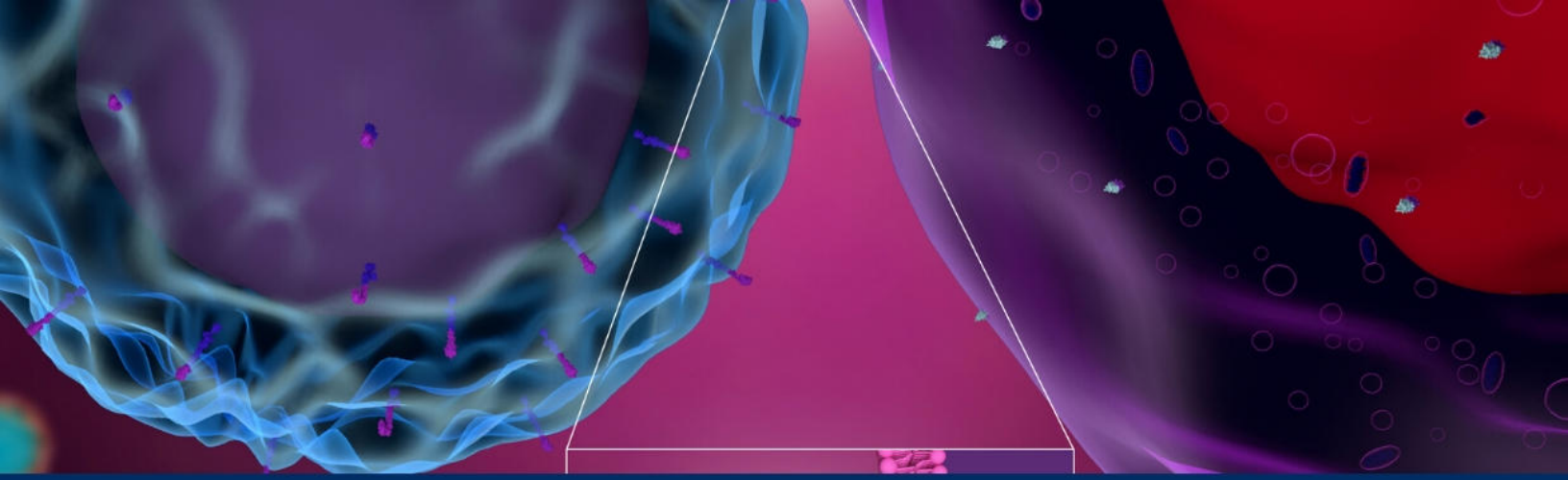
Elimination Threshold defined by WHO

Country incidence estimates

Sub-region incidence estimates







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