Suicide mortality among adolescents and young adults aged 10–24 years in the Americas, 2000–2021: an analysis using the WHO Global Health Estimates

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Summary

Background Suicide remains the third leading cause of death among adolescents and young adults aged 10–24 years in the Americas. We aimed to evaluate patterns and trends in suicide mortality among adolescents and young adults across the Americas from 2000 to 2021.

Methods We used data from the WHO Global Health Estimates 2021 to estimate suicide mortality rates among individuals aged 10–24 years in 35 countries of the Americas, stratified by age, sex, and income. Temporal trends were assessed using average annual percentage change estimated through Joinpoint regression based on log-linear models of suicide mortality against calendar year.

Findings In 2021, suicide accounted for an estimated 18,157 deaths (95% uncertainty interval 16,103–20,475) among adolescents and young adults in the Americas; 75% occurred among males. Suicide mortality increased by 1.48% per year (1.08–1.89; $p < 0.0001$), rising from 5.70 deaths (5.13–6.26) per 100,000 population in 2000 to 7.84 (6.95–8.84) per 100,000 in 2021. Patterns were heterogeneous, with widening disparities by sex, age, and geography. Suicide mortality rates increased with age and were nearly threefold higher among males than females, although temporal increases were higher among females. North America had the highest rates, fastest growth, and largest sex disparities. Hanging, strangulation, or suffocation accounted for 58.4% of deaths, followed by firearms (24.4%) and poisoning by drugs (4.5%).

Interpretation Suicide mortality among adolescents and young adults in the Americas has increased over the past two decades, with marked demographic and geographic disparities. Steep increases among early adolescents (10–14 years) underscore the need for strengthened school-based prevention and early mental health interventions. Prioritizing countries with rates above the regional average and scaling up evidence-based means-restriction policies are essential components of comprehensive, youth-focused suicide prevention strategies in the Americas.

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Keywords: Suicide; Mortality; Adolescent and young adults; Region of the Americas

Introduction

Suicide is an urgent public health challenge affecting all regions and population irrespective of age or sex.[1,2] Preventing suicide is a global health priority recognized by the WHO General Programme of Work,[3,4] the WHO's Comprehensive Mental Health Action Plan,[5] and the UN Sustainable Development Goals.[6]

In the Region of the Americas, the age-standardized suicide rate among the whole population rose by 17.4% from 7.8 deaths per 100,000 population in 2000 to 9.2 deaths per 100,000 population in 2021.[7] The Americas has become the only WHO region where suicide rates are increasing in the past two decades.[1] Moreover, the Global Burden of Disease

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Research in context

Evidence before this study

We searched PubMed, MEDLINE, and Google Scholar for studies published between January 2000 and August 2025 using the terms ["suicide" OR "self-harm"] AND ["mortality" OR "disease burden"] AND ["Americas" OR "Region of the Americas" OR "North America" OR "Latin America and the Caribbean"] AND ["youth" OR "adolescent" OR "young adult" OR "children"]. Most studies retrieved examined suicide mortality at the global level, in specific subregions, or in individual countries. A few studies focused on adolescents and young adults in the Americas, and they were often limited in geographical and temporal scope. Available evidence indicates that several countries in the region have experienced rising suicide rates among adolescents and young adults, with consistently higher rates among males than females. However, a comprehensive regional assessment of suicide mortality trends in this age group, based on comparable data across countries, has been lacking.

Added value of this study

This study provides the most recent and comprehensive regional analysis of suicide mortality among adolescents and young adults (aged 10–24 years) in the Americas, using the WHO Global Health Estimates (GHE) 2021, which offer internally consistent and comparable cause-of-death annual estimates for 35 countries from 2000 to 2021. By analyzing patterns and temporal trends over two decades and stratifying by sex, geographic location, and income group, the study generates new insights into the magnitude, inequalities, and trajectories of suicide mortality among young people. This study also provides valuable information regarding the distribution of suicide deaths by suicide methods. This comprehensive region-wide perspective enables meaningful cross country comparisons and supports monitoring of progress towards regional and global suicide prevention targets.

Implications of all the available evidence

The increasing suicide mortality among adolescents and young adults in the Americas represents an urgent public health challenge. These findings call for the strengthening and better resourcing of suicide prevention programmes, integrated within national mental health and adolescent health strategies, and supported by coordinated multisectoral action. Addressing the rising burden of suicide in this age group requires improved access to quality school-based mental health programs, early identification and intervention on risk factors, and culturally appropriate community– and school–based interventions. Future research should explore contextual determinants and assess the effectiveness of national prevention strategies to guide evidence-based policies aimed at reducing suicide mortality and its broader societal impact.

Study (GBD) 2021 revealed that from 1990 to 2021, four subregions of the Americas (Central Latin America, Andean Latin America, Tropical Latin America, and high-income North America) have had the largest global increases in age-standardized suicide rates for both sexes combined.[8]

In the Americas, suicide among adolescents and young adults aged 10–24 years is a major public health concern, as it is the third leading cause of death after interpersonal violence and road injury.[9] A recent study using GBD 2021 data revealed that although global suicide in this age group declined by 1.6% between 1990 and 2021, regional disparities persist, with Central Latin America and Tropical Latin America showing significant increases, with an average annual percentage change (AAPC) of 1.7% and 1.5%, respectively.[10]

Adolescents and young adults represent a particularly vulnerable population. This life stage is marked by rapid psychological, emotional, and social development, highly influenced by environmental, contextual, social, and biological factors.[11] Suicide is a complex issue influenced by many factors, such as mental health conditions, substance use, experiences of trauma or violence, social and cultural pressures, poverty, and easy access to means of suicide.[12,13] Yet, with the right support and prevention efforts, most suicides can be prevented. According to recent studies, substantial proportions of suicide deaths are attributable to modifiable risk factors such as substance use, and mental health conditions that can be effectively treated.[14–17] Suicide prevention in this specific population requires an understanding of existing patterns and trends, and how such patterns vary across locations and demographics. Moreover, assessments of the burden of suicide are essential for monitoring and tracking the progress toward global targets, strategies, and commitments.[18,19]

Several studies have investigated deaths from suicide among specific populations, within countries, specific subregions and during defined periods[1,8,10,20–24] yet recent studies on the burden of suicide among adolescents and young adults in the Region of the Americas are limited.[25] In this context, this study aimed to analyze the levels, temporal trends, and disparities in suicide mortality among adolescents and young adults aged 10–24 years in the Americas from 2000 to 2021 by sex, age, and locations (subregions, income groups of countries, and countries), with the ultimate purpose of informing programmatic interventions and policy development on suicide prevention at regional, subregional, and national levels.

Methods

Overview

We analyzed adolescent and youth suicide mortality in the Region of the Americas using data from the 2021 WHO Global Health Estimates (GHE).[26,27] The GHE data sources and methods are extensively described elsewhere.[28–30] In brief, the GHE 2021 produces comparable measures of causes of death and disease burden globally, and across WHO regions and countries by age, sex, and year from 2000 to 2021. Estimates are based on data from national vital registration, WHO technical programs, United Nations partners and inter-agency groups, and the Global Burden of Diseases, Injuries, and Risk Factors Study. WHO uses the completeness of death registration, the quality of the cause of death information, and the timeliness and frequency of data provided to WHO to classify countries' death registration data quality (Appendix page 3). Based on data quality assessment, standard methods were applied to produce precise and internationally comparable estimates. This study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.[31]

Data sources

We extracted data from the 2021 GHE database (https://www.who.int/data/global-health-estimates), specifically annual estimates of deaths by sex, and age for 35 countries of the Americas from 2000 to 2021. We obtained annual population size by country, sex, age, and years from the World Population Prospects 2024 Revision[32] to estimate annual suicide rates per 100,000 population by age, sex, location (region, subregions, and countries) and year. Estimates for regional, subregional, and income groups of countries were computed by aggregating separately national estimates of deaths and populations, considering those countries in each geographic and income group. Because the WHO GHE do not provide suicide mortality estimates disaggregated by method, we obtained registered suicide deaths by methods, age, sex, country and year from the Pan American Health Organization (PAHO) Regional Mortality database.[33] This database comprises cause-of-death data from national civil registration and vital statistics reported by Member States to PAHO And serves as a primary input source for the GHE; however, the PAHO mortality data themselves are not subjected to the full GHE estimation and adjustment procedures.

Definitions and primary outcomes

For our analysis, the underlying cause of death was suicide, defined according to the International Classification of Diseases 10th (ICD-10) by the codes: X60-X83, which is a cause category included in the GHE cause list.[28] To examine means of suicide, the following cause categories and ICD-10 codes were used: poisoning by drug and medications (X60-X64), poisoning by pesticides (X68), self-harm by hanging, strangulation and suffocation (X70), self-harm by firearms (X72–74), self-harm by jumping/lying before moving object (X80–X81), and a remainder group called Other specified and unspecified means, which includes self-poisoning by and exposure to alcohol, organic solvents and halogenated hydrocarbons and their vapors, unspecified chemicals and noxious substances, self-harm by drowning and submersion, self-harm by explosive material, smoke, fire and flames, steam, hot vapors and hot objects, sharp and blunt object, crashing a motor vehicle, and other specified and none specified means (X65–X67, X69, X71, X75–X79, X82, X83–X84). We focused on individuals aged 10–14, 15–19, 20–24 years, and the overall age group of 10–24 years. We reported the absolute number and the age-specific mortality rates per 100,000 population and their corresponding 95% uncertainty intervals (95% UI). The 95% UI was calculated by performing 1000 random samplings of the data and model parameters and selecting the 2.5th and 97.5th percentiles of the resulting distribution of estimates as the lower and upper bounds of the interval. This computation was conducted in Python 3.14 using NumPy, Pandas and SciPy libraries. We also computed and reported the proportion of suicide deaths among adolescents and young adults (10–24 years) by means of suicide in percentage using the total number of suicide deaths among individuals aged 10–24 years. Because the most recent year of available vital registration data varied by country, the distribution by method reflects the latest reported year for each country and may not correspond to 2021 in all settings.

Geographic area and locations

The study focuses on the Region of the Americas, comprising 35 countries, five subregions, including Andean Area: Bolivia (Plurinational State of), Colombia, Ecuador, Peru, and Venezuela (Bolivarian Republic of); Central America, Mexico, and Latin Caribbean: Costa Rica, Cuba, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Mexico, Nicaragua, and Panama; Non-Latin Caribbean: Antigua and Barbuda, Bahamas, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Suriname, and Trinidad and Tobago; North America: Canada and the United States of America; and Southern Cone: Argentina, Brazil, Chile, Paraguay, and Uruguay. Countries were also grouped according to the World Bank country classification of economies[34] as high-income, upper-middle income, and lower-middle income. No country in the region is in the low-income category. The classification of economies is in List 2 (Appendix, p 4).

Analysis

We applied exploratory data analyses to describe the magnitude and distribution of suicide mortality.

Temporal trends were assessed using the average annual percentage change (AAPC), estimated through Joinpoint regression using the Joinpoint Trends Analysis software.[35] For each analysis, we fitted a log-linear regression model with suicide mortality rate as the response variable and calendar year as the independent variable. We configured the model to detect a maximum of four joinpoints and assuming constant variance in the suicide mortality rate time series. We tested the constant-variance assumption by computing the first difference of rates over the year of each age, sex, and location time series, which suggested constant variance (homoscedasticity) in rates over time. We also assessed the autocorrelation of each cohort times series by computing the autocorrelation function at lags from 1 to 10 years (half of the total number of years), and examining the resulting correlogram, which informed no autocorrelation. Finally, we selected the Weighted Bayesian Information Criterion (WBIC) for final model selection, as it is the most flexible in adapting to different situations, and it performs better when working with large datasets and data cohorts with a variety of characteristics.[36] Joinpoint analyses were conducted separately for each age, sex and location and AAPC estimates with the 95% UI and corresponding p-value were reported for the period 2000–2021. Resulting AAPC uncertainty reflects differences in population size, mortality counts, and data quality across countries. The AAPC is considered significant when it is different from "zero" at an alpha equal to 0.05. A stable trend is considered when AAPC is not statistically significant (p-value $\geq$ 0.05), an increasing trend when AAPC is positive and significant (p-value < 0.05), and a decreasing trend when the AAPC is negative and significant (p-value < 0.05). The study period includes the COVID-19 pandemic (2020–2021); however, no specific modelling was undertaken to isolate its effects.

Ethical considerations

This study used publicly available data from the WHO GHE 2021 database, which estimates were approved by the World Health Organization, United Nations interagency groups, and WHO Member States. No personal identifying information was used in the analysis.

Role of the funding source

This study received no specific funding. The funders had no role in the study design, data collection, data analysis, interpretation of the findings, or writing of the final report.

Results

Regional levels and trends of suicide mortality

In the Americas in 2021, suicide among adolescents and young adults aged 10–24 years accounted for an estimated 18,157 deaths (95% uncertainty interval [UI]: 16,103–20,475), of which 13,607 deaths (12,130.50–15,268.11) (75% of suicides) were among males and 4612 deaths (4032–5272) in females (Supplementary Table S1; Appendix page 31). These numbers represented 9.7% of 187,600 total deaths (9.9% of 137,700 total deaths in males and 9.2% of 50,100 total deaths in females) in that age group, ranking suicide as the third leading cause of death, following interpersonal violence and road injuries (Fig. 1). Across subregions and countries, suicide was the leading cause in North America, the third leading cause of death in other subregions and ranked among the ten leading causes of death in most countries. Notably, suicide was the leading cause of death in Guyana, Suriname, and Uruguay; the second in six countries (Argentina, Canada, Chile, Ecuador, Paraguay, and United States of America); and the third in seven others (Costa Rica, Colombia, Cuba, El Salvador, Mexico, Nicaragua, and the Bolivarian Republic of Venezuela). The top ten leading causes of death by age are in Supplementary Fig. S1 (Appendix p 28).

Between 2000 and 2021, suicide mortality among people aged 10–24 years in the Americas increased notably (Table 1, Fig. 2). Suicide mortality rates in both sexes combined increased annually by 1.48% (1.08 to 1.89; p < 0.0001), from 5.68 deaths (5.13–7.84) per 100,000 population in 2000 to 7.84 deaths (6.95–8.84) per 100,000 population in 2021. For males, suicide mortality rose by 1.41% per year (0.96 to 1.86; p < 0.0001) from 8.57 deaths (7.86–9.33) in 2000 to 11.51 deaths (10.26–12.91) per 100,000 population in 2021. Among females, suicide mortality increased by 1.79% (1.36 to 2.22; p < 0.0001) per year, from 2.73 deaths (2.34–3.13) in 2000 to 4.07 deaths (3.56–4.65) per 100,000 population in 2021. Regional suicide mortality in 2021 was almost three times higher in males than in females, but the increasing rate of change in females was higher than in males.

Regionally, the overall suicide mortality among people aged 10–24 years rose with age across five-year age groups (10–14, 15–19, and 20–24) in 2021, and their temporal trends substantially increased from 2000 to 2021 (Fig. 2, and Supplementary Tables S1–S5 in Appendix pages 8–23). The highest suicide mortality rate was observed among individuals aged 20–24 years (12.78 deaths [11.48–14.23] per 100,000 population), which trend also increased (AAPC: 1.22% (0.84 to 1.60; p < 0.0001) (Supplementary Table S5 in Appendix page 23). However, the age group 10–14 years had the largest increasing trend (AAPC: 2.75% [2.04 to 3.46; p < 0.0001]), despite having the lowest suicide mortality (Supplementary Table S3 in Appendix page 13).

Suicide mortality by subregion and income group

In 2021, overall suicide rates among adolescent and young adults varied two-fold across subregions, from 5.88 deaths (4.36–7.74) per 100,000 population in the

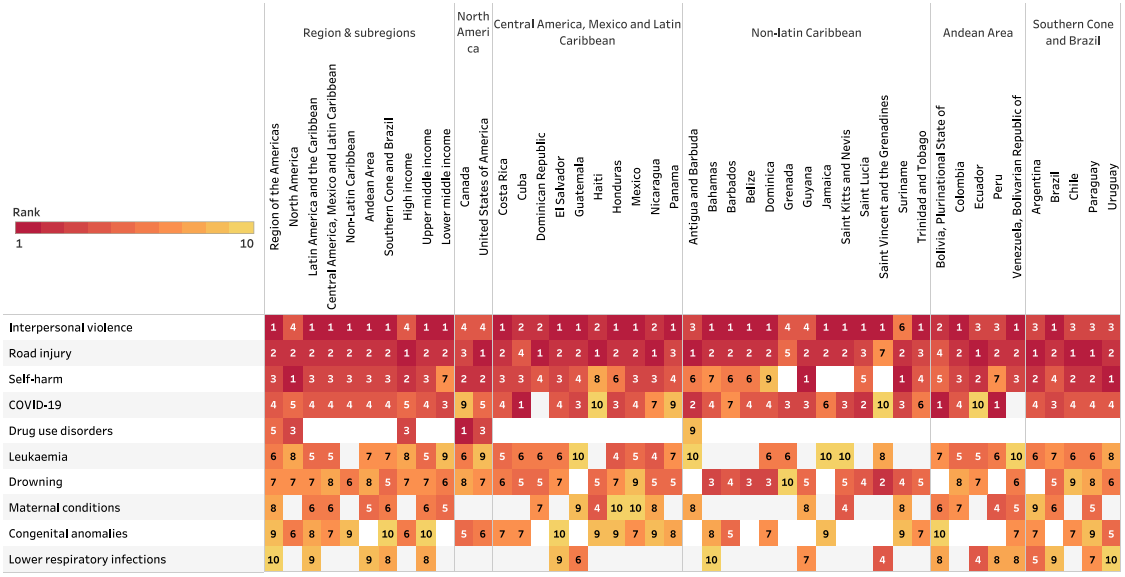

Fig. 1: Ten leading causes of death among individuals aged 10–24 years across locations (region, subregions, and countries) of the Americas in 2021. Causes of death are sorted in descending order based on the regional ranking. The number in each cell indicates the ranking of a specific cause in a location. The ranking is also color-coded using a sequential color schema from dark red for the first position to yellow for the tenth position. An empty or blank cell indicates that the specific cause is not ranked among the ten leading causes of death.

Andean Area to 11.51 deaths (10.89–12.14) per 100,000 population in North America (Table 1, Fig. 2). The largest increase in suicide rates over time (2000–2021) was also observed in North America (AAPC: 2.06% [1.66 to 2.47; $p < 0.0001$]). Brazil and the Southern Cone subregion, with a suicide mortality rate of 6.13 deaths ([5.48–6.85]) per 100,000 population, had upward trends (AAPC: 1.6% [1.25 to 1.94; $p < 0.0001$]) in the same period. Three subregions (Andean Area; Central America, Mexico, and Latin Caribbean; and Non-Latin Caribbean) experienced relative plateaus in suicide rates. Suicide rates among males across all subregions significantly increased over time (AAPC $\geq$ 0.48%), while for females, only the Andean Area, which had the lowest suicide rate (2.8 deaths [2.1–3.66] per 100,000 population) in 2021, showed a significant decline (AAPC: –2.16% [–3.97 to –0.31; $p = 0.022$]).

From 2000 to 2021, suicide mortality rates across subregions and age groups for males were consistently higher than those for females, except among adolescents aged 10–14 years in the Non-Latin Caribbean between 2005 and 2015 (Fig. 2). Notably, sex differences among adolescents aged 10–14 years in all subregions, except North America, are narrow compared to any other age group. In every age group, North America had both the highest level of suicide and the steepest increase during the period reviewed, as well as the largest differences between males and females.

Suicide mortality rates also varied by country income classification. High-income countries had the highest suicide rates in 2021 (11.15 deaths [10.49–11.83] per 100,000 population) and the steepest rise (AAPC: 1.83% [1.41 to 2.26; $p < 0.0001$]) from 2000 to 2021 (Table 1). Conversely, lower-middle-income countries experienced the lowest suicide rate (3.05 deaths (1.61–4.97) per 100,000 population), and the largest relative decline (AAPC: –3.1% [–5.25 to –0.9]; $p = 0.006$) over the study period, although substantial heterogeneity was observed across countries.

Suicide mortality across countries

Suicide mortality varied substantially across countries (Fig. 3). In 2021, suicide rates among individuals aged 10–24 years ranged from 21.8 deaths per 100,000 population (95% UI 15.7–29.7) in Guyana to 0.7 per 100,000 (95% UI 0.5–1.0) in Jamaica. The AAPC in suicide mortality between 2000 and 2021 ranged from a –5.96% decline in Bolivia to a +3.83% increase in Paraguay.

A general pattern emerged wherein countries with higher suicide rates in 2021 also have shown increasing mortality trends (AAPC > 0) over the period reviewed. Guyana was the only country with a suicide rate above the regional average (21.8 deaths per 100,000 population vs 7.8 deaths per 100,000 population) yet showed a declining trend (AAPC < 0).

Seven countries had suicide rates above the regional level and increasing trends, but only Paraguay, the United States, and Uruguay exhibited statistically significant increases. Six additional

Group	Suicide mortality rates per 100,000 population (95% UI)								
	Both sexes combined, 2021	Average annual percent change 2000–2021	p value	Males, 2021	Average annual percent change 2000–2021	p value	Females, 2021	Average annual percent change 2000–2021	p value
Region of the Americas	7.84 (6.95–8.84)	1.48 (1.08–1.89)	<0.0001	11.51 (10.26–12.91)	1.41 (0.96–1.86)	<0.0001	4.07 (3.56–4.65)	1.79 (1.36–2.22)	<0.0001
Subregion									
North America	11.51 (10.89–12.14)	2.06 (1.66–2.47)	<0.0001	17.68 (16.75–18.63)	1.61 (1.17–2.06)	<0.0001	5.1 (4.81–5.39)	4.18 (3.74–4.61)	<0.0001
Latin America and the Caribbean	6.14 (5.13–7.32)	0.77 (0.03–1.53)	0.043	8.61 (7.21–10.23)	0.74 (0.03–1.46)	0.040	3.6 (2.99–4.31)	0.93 (0.37–1.5)	0.0010
Central America, Mexico and Latin Caribbean	6.32 (5.25–7.52)	0.59 (−0.42 to 1.62)	0.25	8.66 (7.31–10.17)	0.48 (−0.64 to 1.61)	0.40	3.94 (3.16–4.83)	1.15 (0.71–1.58)	<0.0001
Non-Latin Caribbean	6.46 (4.58–8.78)	−0.02 (−1.13 to 1.1)	0.97	9.11 (6.45–12.4)	0.67 (0.13–1.22)	0.018	3.74 (2.64–5.07)	0.19 (−0.48 to 0.86)	0.57
Andean Area	5.88 (4.36–7.74)	−0.01 (−1.93 to 1.95)	0.99	8.85 (6.55–11.67)	1.31 (−0.19 to 2.82)	0.086	2.8 (2.1–3.66)	−2.16 (−3.97 to −0.31)	0.022
Southern Cone and Brazil	6.13 (5.48–6.85)	1.6 (1.25–1.94)	<0.0001	8.41 (7.53–9.39)	1.07 (0.32–1.81)	0.0050	3.76 (3.35–4.21)	2.34 (1.41–3.27)	<0.0001
Income group									
High income	11.15 (10.49–11.83)	1.83 (1.41–2.26)	<0.0001	17.09 (16.09–18.11)	1.47 (1.03–1.92)	<0.0001	4.99 (4.67–5.32)	3.78 (3.41–4.15)	<0.0001
Upper-middle income	6.09 (5.25–7.02)	1.38 (0.76–2)	<0.0001	8.39 (7.25–9.66)	0.96 (0.18–1.75)	0.016	3.72 (3.19–4.31)	1.32 (0.59–2.05)	<0.0001
Lower-middle income	3.05 (1.61–4.97)	−3.1 (−5.25 to −0.9)	0.0060	3.14 (1.82–4.94)	−2.84 (−6.87 to 1.36)	0.18	2.97 (1.41–5.01)	−4.02 (−4.81 to −3.21)	<0.0001
Countries									
Argentina	8.63 (7.45–9.88)	0.4 (−2.33 to 3.2)	0.78	12.1 (10.47–13.85)	−0.23 (−2.5 to 2.08)	0.84	4.97 (4.26–5.7)	1.42 (0.64–2.2)	0.0010
Antigua and Barbuda	2.85 (2.2–3.65)	–	–	5.63 (4.34–7.21)	–	–	0 (0–0)	–	–
Bahamas	1.91 (1.3–2.71)	−0.14 (−1.92 to 1.67)	0.88	3.3 (2.23–4.74)	0.1 (−1.63 to 1.85)	0.91	0.56 (0.4–0.72)	−1.34 (−5.24 to 2.72)	0.51
Belize	1.71 (1.34–2.17)	−4.7 (−7.55 to −1.77)	0.0020	3.25 (2.55–4.09)	−3.12 (−5.57 to −0.6)	0.016	0.14 (0.12–0.18)	−10.5 (−12.56 to −8.4)	<0.0001
Bolivia, Plurinational State of	1.9 (1.06–3.12)	−5.96 (−6.31 to −5.61)	<0.0001	1.77 (1–2.8)	−5.71 (−6.09 to −5.33)	<0.0001	2.04 (1.11–3.46)	−6.44 (−7.16 to −5.71)	<0.0001
Brazil	5.34 (4.96–5.78)	2.15 (1.22–3.08)	<0.0001	7.29 (6.75–7.9)	2.08 (1.51–2.65)	<0.0001	3.32 (3.1–3.58)	2.68 (1.82–3.55)	<0.0001
Barbados	1.65 (1.13–2.32)	−2.36 (−3.28 to −1.44)	<0.0001	2.08 (1.32–2.93)	−3.49 (−4.67 to −2.3)	<0.0001	1.25 (0.92–1.66)	2.55 (0.23–4.92)	0.031
Canada	6.16 (5.46–6.86)	−1.56 (−3.23 to 0.14)	0.072	8.47 (7.51–9.43)	−1.59 (−3.67 to 0.54)	0.14	3.73 (3.31–4.16)	1.75 (0.8–2.72)	0.0010
Chile	5.61 (4.86–6.41)	−1.11 (−2.51 to 0.31)	0.12	7.9 (6.85–9.01)	−1.85 (−3.19 to −0.5)	0.0080	3.24 (2.8–3.72)	−0.21 (−4.02 to 3.74)	0.91
Colombia	5.42 (4.33–6.65)	−1.28 (−1.98 to −0.58)	<0.0001	7.34 (5.81–9.08)	−0.67 (−2.47 to 1.17)	0.47	3.44 (2.8–4.15)	−1.37 (−2.7 to −0.02)	0.047
Costa Rica	6.22 (5.21–7.32)	0.31 (−1.11 to 1.75)	0.66	9.26 (7.77–10.89)	0.28 (−1.09 to 1.68)	0.67	3.04 (2.52–3.59)	0.47 (−2.16 to 3.18)	0.72
Cuba	3.44 (2.75–4.21)	−3.17 (−6.53 to 0.32)	0.075	5.21 (4.13–6.38)	−2.25 (−5.71 to 1.33)	0.26	1.57 (1.28–1.92)	−5.56 (−7.63 to −3.43)	<0.0001
Dominica	1.98 (1.25–3.15)	−0.46 (−1.23 to 0.32)	0.23	3.4 (1.92–5.17)	−0.46 (−1.26 to 0.35)	0.25	0.73 (0.29–1.31)	0.14 (−0.58 to 0.85)	0.70
Dominican Republic	2.41 (1.35–3.69)	−1 (−4.52 to 2.65)	0.59	3.69 (2–5.58)	−0.89 (−4.96 to 3.35)	0.68	1.08 (0.67–1.72)	−2.09 (−6.99 to 3.07)	0.42
Ecuador	9.17 (7.21–11.44)	1.74 (−0.04 to 3.54)	0.055	13.37 (10.45–16.75)	2.26 (1.2–3.34)	<0.0001	4.82 (3.85–5.94)	−0.14 (−2.08 to 1.83)	0.89
Grenada	0 (0–0)	–	–	0 (0–0)	–	–	0 (0–0)	–	–
Guatemala	5.82 (4.64–7.14)	−3.05 (−5.66 to −0.36)	0.027	7.17 (5.66–8.88)	−4.02 (−7.14 to −0.79)	0.015	4.43 (3.59–5.37)	−0.58 (−3.05 to 1.97)	0.65
Guyana	21.8 (15.7–29.67)	−0.89 (−2.59 to 0.84)	0.31	28.97 (20.71–39.63)	−0.64 (−2.54 to 1.31)	0.52	14.43 (10.53–19.39)	−0.54 (−1.64 to 0.56)	0.32
Honduras	1.97 (1.04–3.44)	−2.21 (−9.52 to 5.69)	0.57	2.95 (1.64–4.95)	−1.94 (−10.88 to 7.9)	0.69	0.94 (0.42–1.86)	−2.66 (−3.44 to −1.88)	<0.0001
Haiti	4.45 (1.96–7.57)	−1.48 (−2.06 to −0.9)	<0.0001	3.47 (1.8–5.77)	−0.88 (−1.43 to −0.33)	0.0020	5.45 (2.12–9.38)	−1.82 (−2.5 to −1.14)	<0.0001
Jamaica	0.7 (0.48–0.98)	3.47 (−1.15 to 8.31)	0.14	1.15 (0.79–1.62)	4.21 (−1.15 to 9.85)	0.12	0.23 (0.16–0.31)	1.55 (0.27–2.85)	<0.020
Saint Kitts and Nevis	0.95 (0.63–1.48)	−1.42 (−1.98 to −0.86)	<0.0001	1.53 (1.1–2.63)	−0.17 (−0.81 to 0.48)	0.60	0.41 (0.41–0.41)	−5.04 (−8.02 to −1.96)	0.0020
Saint Lucia	3.44 (2.62–4.49)	0.17 (−2.77 to 3.2)	0.91	6.12 (4.7–8.02)	0.59 (−2.75 to 4.04)	0.73	0.71 (0.46–0.87)	−2.85 (−6.86 to 1.33)	0.18
Mexico	7.73 (6.87–8.6)	2.88 (1.98–3.8)	<0.0001	10.98 (9.8–12.16)	2.57 (1.7–3.45)	<0.0001	4.44 (3.9–5)	3.75 (3.07–4.43)	<0.0001
Nicaragua	4.43 (2.94–6.2)	−3.22 (−3.87 to −2.57)	<0.0001	5.33 (3.6–7.32)	−2.38 (−3.07 to −1.68)	<0.0001	3.5 (2.27–5.06)	−4.49 (−5.46 to −3.5)	<0.0001
Panama	3.67 (2.81–4.67)	−3.73 (−5.4 to −2.04)	<0.0001	4.89 (3.69–6.26)	−3.98 (−5.85 to −2.08)	<0.0001	2.4 (1.89–3.02)	−3.88 (−7.41 to −0.21)	0.039
Peru	1.51 (0.88–2.33)	1.45 (−0.92 to 3.87)	0.22	1.63 (0.96–2.5)	2.41 (−0.34 to 5.23)	0.083	1.39 (0.81–2.16)	0.66 (−1.84 to 3.22)	0.60
Paraguay	8.93 (5.34–13.18)	3.83 (2.56–5.1)	<0.0001	9.46 (5.58–14.31)	5.6 (3.98–7.25)	<0.0001	8.38 (5.1–12)	1.51 (0.09–2.96)	0.038
El Salvador	6.11 (3.93–8.96)	−1.57 (−3.21 to 0.09)	0.062	7.73 (4.91–11.57)	−1.69 (−3.71 to 0.37)	0.10	4.38 (2.9–6.19)	−1.64 (−3.67 to 0.43)	0.12
Suriname	20.92 (14.28–28.71)	1.91 (−0.06 to 3.91)	0.057	29.86 (20.68–40.69)	2.25 (0.39–4.15)	0.017	11.87 (7.77–16.58)	0.48 (−1.21 to 2.19)	0.58

(Table 1 continues on next page)

countries had rates below the regional average yet rising trends, with significant increases observed in Mexico and Brazil. Eighteen countries fell within the most favorable quadrant, characterized by both low mortality rates and decreasing trends. Among these, Belize, Bolivia, Canada, Guatemala, and Nicaragua showed the steepest and statistically significant declines (AAPC < −3%; p < 0.0001). Sex-specific patterns are presented in Supplementary Fig. S2 (Appendix, p 29).

Distribution of means of suicide

In the Region of the Americas, suicide by hanging, strangulation, or suffocation accounted for 9486 suicide deaths among adolescents and young adults, representing 58.4% of all suicide deaths in this age group (Fig. 4). This pattern was consistent across most countries; 23 out of 30 countries with available data reported this method in more than 60% of suicides. The second most common means at the regional level was self-harm by firearm (3969 suicides, 24.4%), followed by other specified and unspecified means (952 suicides, 5.9%), poisoning by drugs, medications and biological substances (734 suicides, 4.5%), jumping or lying before moving objects (691 suicides, 4.3%), and poisoning by pesticides (406 suicides, 2.5%). Marked heterogeneity across countries was evident, with countries exhibiting high proportion of suicides by pesticides (e.g. Guyana [34 suicides, 64.2%], Suriname [12 suicides, 57.1%], El Salvador [16 suicides, 35.6%], Nicaragua [40 suicides, 28.4%], and Guatemala [55 suicides, 23.9%]), whereas the United States (3460 suicides, 54.0%), Puerto Rico (3 suicides, 16.7%), Uruguay (16 suicides, 14.0%), and Canada (49 suicides, 11.8%) showed higher proportions of suicides by firearms.

Discussion

This study revealed that suicide mortality among adolescents and young adults aged 10–24 years in the Americas has risen steadily during the last two decades, increasing from 5.68 to 7.84 deaths per 100,000 population between 2000 and 2021, representing over 18,000 suicides annually, equivalent to nearly one in ten deaths. Suicide remains the third leading cause of death among young people in the region, with three times as many males affected compared to females, although the relative rate of increase was higher among females. Particularly concerning are the sharp increases observed among the youngest age group (10–14 years) in countries and subregions with historically high levels, especially North America. These findings underscore that suicide in adolescents and young people is a major and escalating public health challenge in the Americas, with widening disparities by sex, age, and geography.

Group	Suicide mortality rates per 100,000 population (95% UI)								
	Both sexes combined, 2021	Average annual percent change 2000–2021	p value	Males, 2021	Average annual percent change 2000–2021	p value	Females, 2021	Average annual percent change 2000–2021	p value
(Continued from previous page)									
Trinidad and Tobago	6.46 (4.68–8.59)	−2.3 (−5.03 to 0.52)	0.11	9.2 (6.63–12.26)	−1.71 (−4.34 to 0.99)	0.21	3.61 (2.65–4.77)	−3.09 (−4.85 to −1.31)	0.0010
Uruguay	16.09 (13.94–18.44)	3.69 (1.86–5.56)	<0.0001	25.92 (22.47–29.74)	4.19 (3.13–5.25)	<0.0001	5.85 (5.06–6.68)	2.64 (0.53–4.79)	0.016
United States of America	12.04 (11.43–12.66)	2.27 (1.81–2.73)	0.000	18.6 (17.67–19.55)	1.82 (1.32–2.31)	<0.0001	5.24 (4.96–5.52)	4.54 (4.08–5)	<0.0001
Saint Vincent and the Grenadines	0 (0–0)	–	–	0 (0–0)	–	–	0 (0–0)	–	–
Venezuela, Bolivarian Republic of	11.32 (8.07–15.42)	2.23 (−0.15 to 4.66)	0.066	19.68 (13.98–26.86)	2.6 (0.05–5.23)	0.046	2.39 (1.75–3.18)	−0.32 (−1.73 to 1.11)	0.66

Table 1: **Suicide mortality rates among adolescents and young adults aged 10–24 years in 2000 and 2021 and the average annual percent change in both sexes from 2000 to 2021 at the regional, subregional, and national levels of the Americas.**

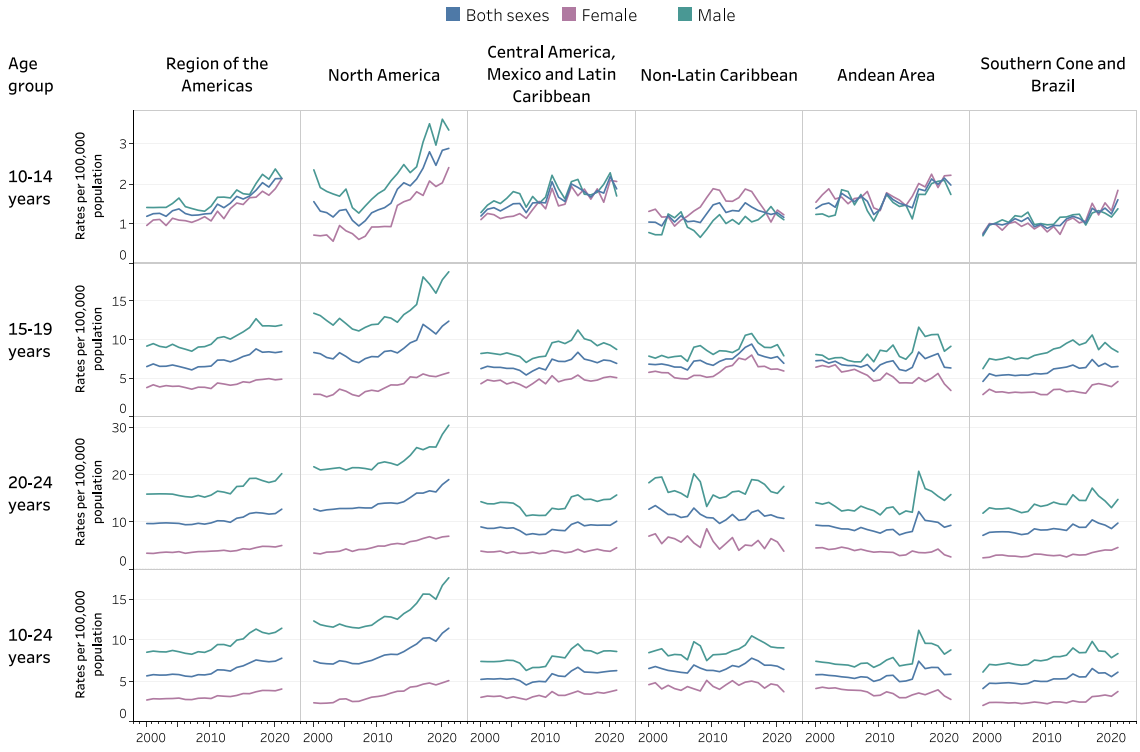

Fig. 2: Suicide mortality rates per 100,000 population among people aged 10–24 years by sex across age groups and the regional and subregional levels, 2000–2021.

Globally, suicide mortality among adolescents and young adults has declined in the past three decades, with heterogeneous patterns across regions.[1,8,10,23] Our results suggest that the Americas are diverging from the global favorable trends, particularly in North America and some Southern Cone countries such as Brazil, Paraguay, and Uruguay, where suicide levels are among the highest worldwide and continue to rise. The steepest relative increases in girls and in the youngest adolescents mirror emerging reports from other regions, raising concern that the social, digital, and environmental determinants of self-harm are evolving in ways that disproportionately affect these groups.[37–39]

Although national income classifications mask within-country socioeconomic inequalities and individual-level suicide risks, the downward trends observed in lower-middle- and upper-middle-income countries in the Americas (e.g. Bolivia, Belize, Cuba, Guatemala, Nicaragua and Panama) may partly reflect strengthened suicide-prevention efforts, including means restriction (notably firearms and pesticides),[40] expansion of primary and community-based mental health care,[41,42] and broader protective social policies,[43] which together may contribute to mitigating poverty-related mental health risks associated with suicide.

Our study found the predominance of hanging as suicide method across most countries, underscoring its widespread accessibility and lethality. Moreover, the high proportion of suicides by exposure to pesticides observed in some countries suggests contextual influences related to cultural norms, availability and access to lethal pesticides. These findings highlight that the development of effective means restrictions intervention research is largely needed due to the magnitude of the availability and easy access to means used for hanging in most countries. Certainly, the observed cross-national variation highlights the importance of tailored prevention approaches—particularly those addressing access to firearms and toxic substances.

The high annual percentage change (2.75%) in the 10–14 age group demands a focused analysis. Several converging factors may explain this pattern. Research indicates that mental health conditions, particularly depression and anxiety, are manifesting at earlier ages than in previous decades.[44] According to a comprehensive meta-analysis by Kessler and colleagues, approximately half of all lifetime mental disorders have their first onset by age 14,[45] establishing a critical developmental window for early intervention. Solmi et al.'s systematic review of 192 studies encompassing over 700,000 individuals found that 34.6% of mental

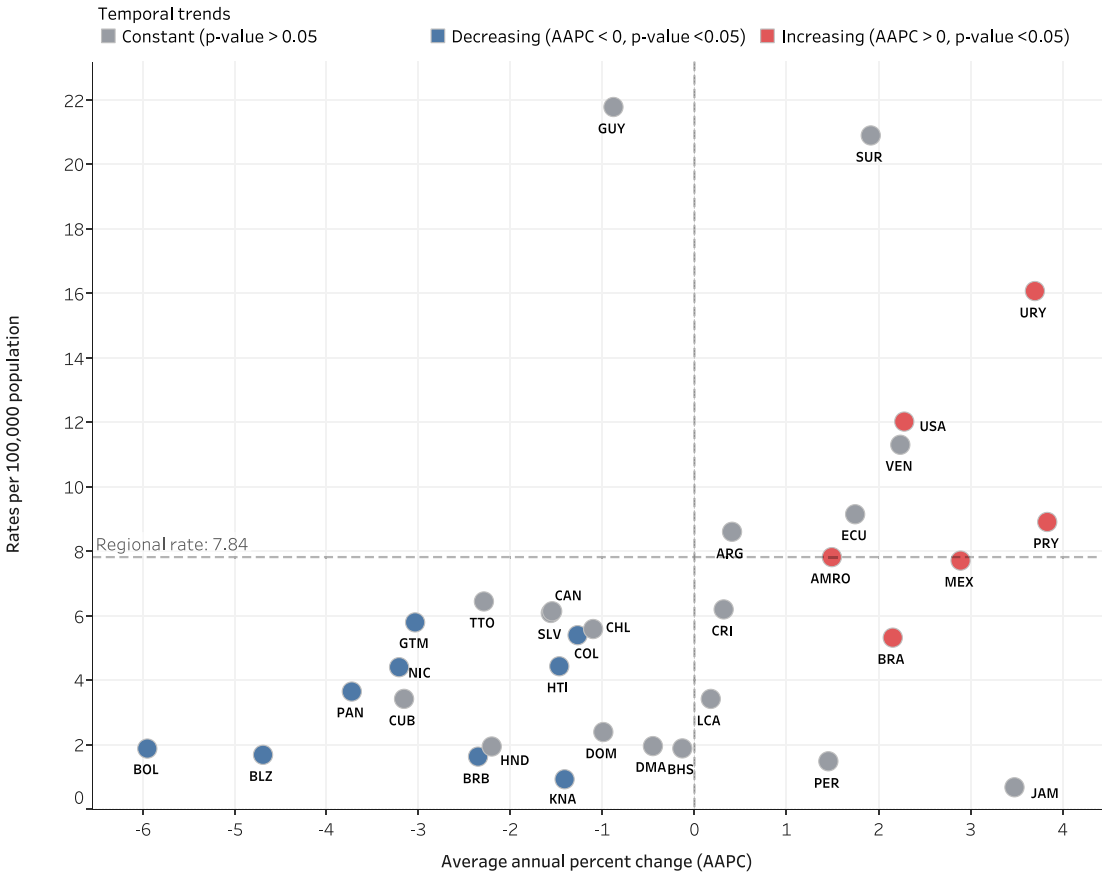

Fig. 3: Suicide mortality rates per 100,000 population among people aged 10–24 years in 2021, and average annual percent change (AAPC) from 2000 to 2021 in countries of the Americas. The Y-axis represents the level of suicide mortality rates in 2021, and the X-axis represents the trend in suicide mortality quantified as the average annual percentage change (AAPC). Each circle symbol represents a country, which is identified by the ISO 3266 code of three alphabetical letters. The horizontal line represents the regional suicide rate, and the vertical line represents AAPC = 0. Countries are color-coded by the significance of the AAPC estimates, where red indicates significant increasing trends (AAPC > 0 and p-value < 0.05), blue indicates significant decreasing trends (AAPC < 0 and p-value < 0.05), and gray means constant trends or no significant change (p-value > 0.05).

disorders had onset before age 14, with the peak age of onset at 14.5 years.[44]

Early adolescents face developmental challenges that may amplify vulnerability. This age group is navigating significant cognitive, emotional, and social transitions while lacking the fully developed coping mechanisms and executive function capacities that emerge later in adolescence. Contemporary environmental factors compound these vulnerabilities. Early adolescents have unprecedented exposure to digital environments and social media, often without the cognitive maturity and regulatory frameworks to navigate online risks such as cyberbullying, social comparison, and exposure to harmful content.[37–39] While research on social media's impact on youth mental health shows mixed findings and methodological limitations, there is emerging evidence of associations between intensive social media use and increased risk of depression, anxiety, and self-harm behaviors in some adolescent populations, though causal pathways remain incompletely understood.[46,47]

The accelerating trend in this age group also coincides with accumulating evidence that early adolescents may be gaining access to information about suicide methods through online sources, potentially increasing the lethality of self-harm behaviors. The confluence of earlier onset of psychopathology, developmental vulnerabilities, digital environment exposure, and potentially evolving means access creates a particularly high-risk profile for this age group. These findings underscore the urgent need for prevention strategies specifically tailored to early adolescence,

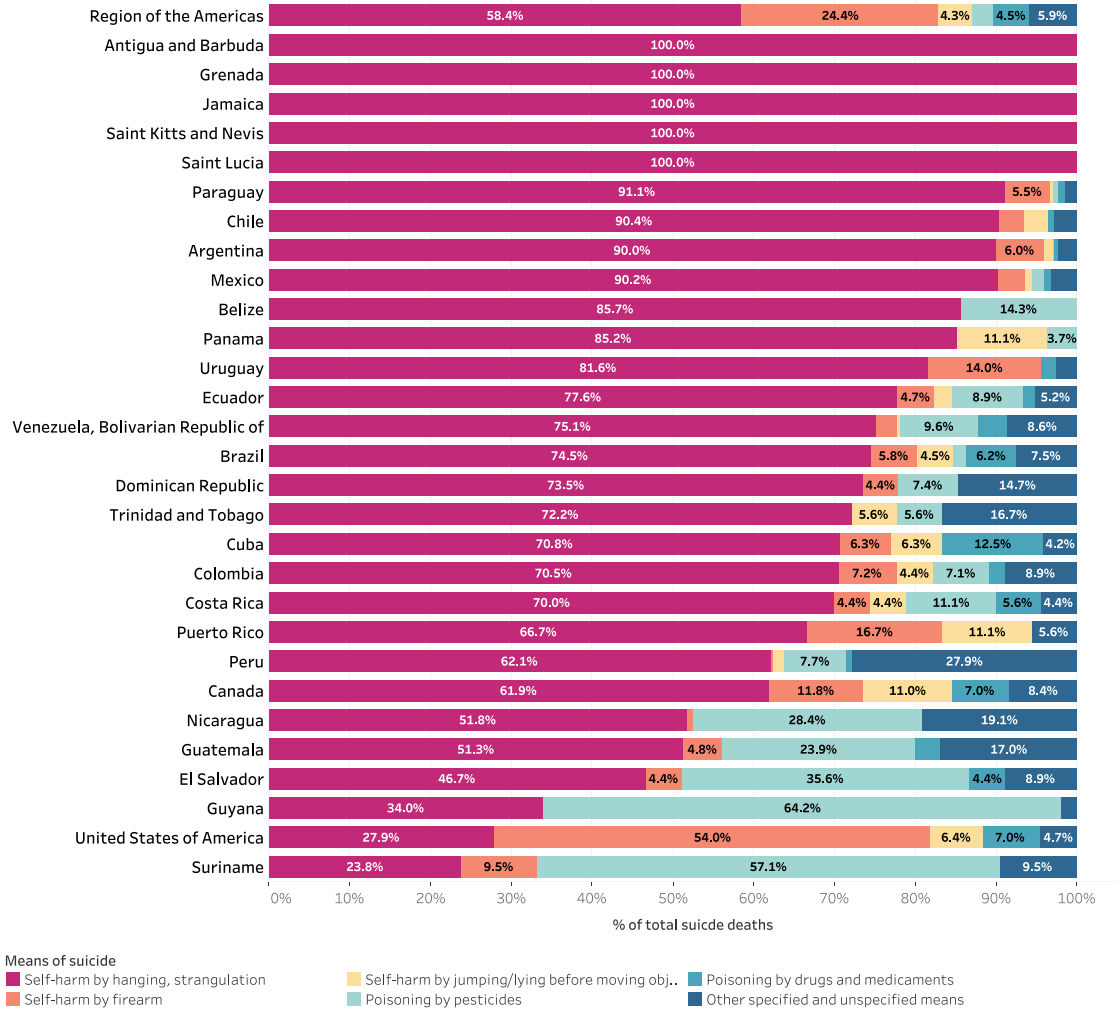

Fig. 4: Distribution of suicide deaths by method among adolescents and young adults aged 10–24 years in the Americas, based on registered deaths in the latest year available for each country. The distribution is presented as proportion of suicide by means of the total suicides, expressed in percentage, in the total population in each country and year of available data. Source: Regional Mortality database for the Region of the Americas.

including universal school-based mental health promotion, enhanced detection and early intervention systems in educational and primary care settings, and age-appropriate digital literacy and online safety education.

The "gender paradox" in suicidal behavior—wherein females exhibit higher rates of suicide attempts, but lower suicide mortality rates than males— has been consistently documented across settings and provides important context for interpreting sex differences in suicide mortality trends during adolescence. Our finding that female suicide mortality is increasing at a faster rate (1.79% per year) than male mortality (1.41% per year) is consistent with some recent reports,[48,49] though whether this represents a true narrowing of the gender paradox or reflects region-specific dynamics requires careful interpretation. Emerging evidence suggests that several adolescent-specific factors may contribute to evolving sex differences in suicide mortality, including the earlier onset of depression and anxiety in females during puberty,[50] potential changes in exposure to interpersonal and digital stressors, and possible shifts in patterns of access to lethal means.[51,52]

With respect to digital environments, the literature indicates heterogeneous and context-dependent associations between social media use, mental health, and suicidality. While some studies report links between intensive or harmful patterns of social media use, such

as exposure to cyberbullying, appearance-focused content, or sleep disruption, and increased risks of depression and anxiety, particularly among adolescent girls,[47,53,54] other studies highlight small effect sizes, bidirectional relationships, and the potential for protective or neutral effects depending on use patterns and individual vulnerability. These complexities underscore the need for cautious interpretation and for sex-responsive prevention approaches that address distinct risk profiles of adolescent males and females rather than attributing risk to any single exposure.

Multiple factors contribute to the pronounced geographical and sex differences in suicide mortality among adolescents and young adults in the Americas. A substantial body of evidence indicates that the availability and use of highly lethal means of suicide is a key explanatory factor, particularly in North America, where firearms account for a large share of suicide deaths and where the largest sex differentials in suicide mortality are observed.[51,52,55,56] Studies have consistently demonstrated that greater access to lethal means is associated with higher suicide mortality across populations, including adolescents and young adults, and that males are more likely to use methods with higher case fatality—such as firearms or hanging—whereas females more frequently engage in attempts involving less lethal means, such as poisoning or overdose.[39,51,56] In addition to method choice, sex differences in suicide risk are shaped by psychosocial and behavioral factors, including norms related to masculinity, lower help-seeking behaviors among males, and differential exposure to social and reproductive stressors, such as unplanned pregnancy and abortion, which disproportionately affect young females in some settings.[48,49,57] This differential use of means is central to understanding sex disparities in suicide mortality, as evidenced by the narrowing of the male-to-female ratio in settings where females have gained access to more lethal methods.

Substance use is another well-documented risk factor for suicidal behavior in this age group, with strong bidirectional associations between adolescent substance use patterns and suicide risk.[58,59] The heterogeneity of suicidal behaviors demonstrates the need to recognize underlying factors to further coordinate responses at the local level.

The period 2020–2021 coincides with the COVID-19 pandemic and may have influenced suicide mortality patterns among adolescents and young adults. Evidence suggests heterogeneous effects across settings,[60–62] with some countries reporting stable or reduced rates early in the pandemic, followed by increases among younger populations in later periods. Proposed mechanisms include increased psychological distress, social isolation, disruption to education and support systems, and reduced access to mental health services, alongside possible short-term protective effects. Given these context-specific dynamics, the extent to which observed trends reflect pandemic-related effects versus pre-existing trajectories remains uncertain.

The marked and rising burden among adolescents and young adults calls for urgent investment in comprehensive, evidence-based suicide prevention strategies. The WHO LIVE LIFE implementation guide provides a framework for governments and communities to develop suicide prevention initiatives built on recommended interventions.[63] Key evidence-based approaches include strengthening early detection and treatment of mental health conditions, restricting access to common means of suicide, expanding community-based programs to build resilience, and raising awareness to reduce stigma and improve reporting of suicides.

For adolescent populations specifically, restriction to means of suicide remains a cornerstone intervention with the strongest evidence. Systematic reviews consistently demonstrate that reducing access to lethal means—including firearms, pesticides, and medications—is among the most effective suicide prevention strategies, with effect sizes that exceed most psychosocial interventions.[50,64] Implementation of means restriction policies in several countries has been followed by substantial reductions in method-specific and overall suicide rates, including among young people.[65] Although political and implementation challenges to means restriction persist in many settings—particularly regarding firearm regulation in North America and pesticide control in agricultural regions—the evidence consistently supports prioritizing these interventions.

School-based interventions are an important complementary strategy for suicide prevention, as most individuals aged 10–24 years are engaged in educational settings, which provide a platform for universal approaches that can reach young people who might not otherwise access mental health services.[66,67] Evidence shows such interventions are valuable when implemented as part of comprehensive, multi-component strategies. Effective school programs typically integrate multiple elements including mental health literacy curricula, gatekeeper training for teachers and school staff to identify at-risk students, peer support programs, and clear referral pathways to specialized care. The evidence is strongest for programs that combine universal prevention with targeted approaches for high-risk students, and that ensure adequate training and ongoing support for implementation.[66–68] Schools can serve as important settings for early identification, crisis response, and connection to mental health services, particularly when linked to robust community mental health systems.

Age-differentiated prevention strategies are essential given the distinct developmental needs and risk profiles across adolescence. For early adolescents (10–14 years),

priorities include universal school-based mental health promotion integrated with family-based interventions, given that this age group typically has closer family supervision. For mid-adolescents (15–19 years), peer-based support programs and digital safety education become increasingly important as peer relationships intensify and online engagement increases. For young adults (20–24 years), prevention efforts should extend to higher education settings and workplace environments where this age group typically spends substantial time.

Continuing surveillance and monitoring of suicide, improving data quality, and enhancing timeliness of mortality reporting are crucial for identifying susceptible populations and evaluating prevention efforts. Tailoring strategies to the needs of subgroups at heightened risk—including early adolescents, specific subregions with high and rising burdens, and populations with limited access to mental health care—will be essential to reverse current trajectories. Such targeted prevention strategies should be prioritized first in countries facing both high and increasing suicide burden, and secondly in those with increasing suicide mortality despite having levels below regional rates. At the same time, the declines observed in some lower-middle-income countries show that progress is achievable, offering valuable lessons for the region. Addressing youth suicide in the Americas is therefore critical not only for safeguarding the health and well-being of the next generation but also for advancing regional and global commitments to reduce premature mortality from non-communicable diseases and mental health conditions under the WHO's Comprehensive Mental Health Action Plan and the Sustainable Development Goal target 3.4.

Future research should prioritize intervention studies focused on means restriction, particularly addressing hanging, which remains the most common method of suicide among adolescents and young people in the Americas. There is also a critical need for large-scale evaluations of school- and college-based interventions that strengthen socio-emotional and life skills, including problem-solving, emotional regulation, and help-seeking behaviors, to reduce suicide risk at the population level. Evidence on the effectiveness, scalability, and sustainability of these interventions is essential to inform comprehensive youth suicide prevention strategies.

Limitations of the study

Our study has certain limitations that need to be acknowledged. Firstly, vital registration systems for some countries of the region have low data quality, so mortality estimates for those countries are heavily modeled, which may affect the accuracy of estimates. This is reflected in the level of the estimate uncertainty. Second, the latest iteration of the WHO GHE provides estimates from 2000 to 2021, which limits our ability to examine suicide patterns after 2021. The next iteration of the GHE is not expected in the coming months. Third, the inclusion of the COVID-19 period (2020–-2021) may have introduced short-term variability in suicide mortality that could not be disentangled from longer-term trends. Fourth, suicide is often underreported or miscoded due to stigma and social pressure, and although the WHO GHE has adjusted for data quality factors, estimates from countries with low data quality should be interpreted with caution. Fifth, we did not carry out analysis by ethnicity, race, or any other structural dimensions that are necessary to target high-risk population groups. Sixth, we used registered death data from the PAHO Regional Mortality Database to quantify suicide methods, which is a primary input source for the WHO GHE estimates; however, the PAHO data themselves are not subjected to the full GHE estimation and adjustment processes. Moreover, method-specific data reflect the latest available year by country and may not correspond exactly to year 2021.

Conclusion

Suicide mortality among adolescents and young adults in the Americas has increased over the past two decades, with particularly concerning trends among younger adolescents (10–14 years), who experienced the steepest rate of increase. Persistent and widening disparities by sex, age, and geography suggest that existing prevention efforts are insufficient and unevenly implemented across the region. Strengthened, coordinated, and sustained action involving governments, civil society, and international partners is needed to elevate suicide prevention as a public health priority. Without renewed commitment, suicide will remain a leading yet preventable cause of death among young people, with substantial implications for population health and development. Growing evidence indicates that means restriction is the most effective for adolescent suicide prevention, while school-based and other community strategies can provide important complementary benefits when integrated into comprehensive, developmentally appropriate, and context-specific approaches.

Contributors

ROS, AJMH, and RM conceived the idea of the study. NN reviewed the scientific literature and prepared a summary of evidence on the topic. RM prepared the datasets, conducted the data analyses, and prepared the results, tables, and figures. NN and RM drafted the manuscript with contributions from MI, ROS and AJMH. All authors contributed important intellectual content to the study and commented critically on the manuscript. All authors have full access to all the data in the study, accept accountability for the overall work, and the corresponding author has the final responsibility for submitting the manuscript for publication.

Data sharing statement

All GHE data used in this study are publicly available through the online ENLACE Results Tool (https://ais.paho.org/phip/viz/nmh_data_ghe_results_tool.asp) and the Burden of Suicide (https://www.paho.

org/en/enlace/burden-suicide). Data on means of suicide is available in the Means of suicide visualization (https://www.paho.org/en/enlace/means-suicide). All results generated by this study are included in this paper and the Appendix (Section 2: Supplemental Tables, page 9 and Section 3: Supplemental Figures pages 16).

Declaration of interests

We declare no competing interest.

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Appendix A. Supplementary data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.lana.2026.101497.

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