

Global burden of disease among teenagers in Uruguay and its comparison with Latin America and the Caribbean

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Abstract *Introduction.* Adolescence is considered a healthy stage of life and therefore little studied. This study described mortality over time in teenagers in Uruguay and analysed the burden of disease at this stage of life by the measure of Years of Life Lost by Premature Death in Uruguay and by comparison with rates in Latin America and the Caribbean by sex, cause and sub-region. *Methodology.* Secondary data sources used were the national registry of deaths in Uruguay, the first Global Burden of Disease study in Uruguay and the information on the data visualisation page of the Institute of Metrics and Health Evaluation. Data were extracted by the authors and displayed in tables and graphs. *Results.* Teenager mortality held roughly stable between 1997 and 2015. More years were lost to premature death among Uruguayan men, the main causes being traffic accidents, self-inflicted injuries and violence. The same behaviour occurs throughout the region. *Conclusions.* The social determinants of health connected with poverty and inequality play a role in the development of depression, risky and violent behaviour, which possibly explain the loss of years due to premature death in adolescence.

Key words Teenager, Burden of disease, Latin America

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Introduction

The World Health Organisation (WHO) defines adolescence as the stage of life between 10 and 19 years of age¹. There are currently 1,200 million teenagers in the world, representing 16% of the world population². That population peaked in 1980 and is currently declining in proportional terms, which is expected to continue until 2050, although the absolute number of teenagers can be expected to grow². Asia is the continent with most teenagers (more than half the world total)². The proportion of teenagers to total population varies around the world: around a quarter (23%) in Africa, 19% in Southern Asia and 18% in Latin America and the Caribbean².

Annual global teenager mortality is 1.2 million, of which most deaths are estimated to result from preventable causes^{3,4}. Worldwide, the five leading causes of death among teenagers in 2012 were traffic accidents, HIV-related diseases, self-inflicted injuries, respiratory infections and violence³.

In Uruguay there are 533,434 teenagers from 10 to 19 years old (projected population figures for 2013 – INE)⁵. Teenager mortality in 2015 was 40.5 per 100,000 and the main causes were traffic accidents, self-inflicted injuries and violence⁶. In Latin America, there are 111 million teenagers from 10 to 19 years of age^{7,8}.

Adolescence is considered a healthy stage, but is a period of major interest, because on it depend countries' development and future production and it is a time when behaviour develops that will influence the burden of disease among future adults⁹. It is estimated that 2/3 of premature deaths and 1/3 of the burden of disease among adults stem from behaviour that developed in adolescence¹⁰.

The burden of disease in different age groups can be measured using three types of indicators: Years of Life Lost due to Premature Death (YLLs), Years of Life Lost due to Disability (YLD) and Healthy Years of Life Lost (Disability-Adjusted Life Years, DALYs), the latter being the sum of the previous two. Calculation of YLLs takes mortality and standard life expectancy in order to identify how many years individuals in different age groups failed to live at the time of their death. It is an indicator widely used to compare the incidence of mortality in different populations and, on that basis, to compare their health conditions and levels of development.

This study described the behaviour of mortality over time in teenagers in Uruguay and examined the burden of disease at this stage of life

as a way of the measure of YLL in Uruguay and comparison with those of Latin America and the Caribbean, by sex, cause and sub-region.

Methods

The data used in this study were drawn from three sources: the Uruguay national deaths registry, the first Global Burden of Disease study in Uruguay¹¹ and the information offered by the data visualisation tool webpage from the Institute of health metric evaluation (*Instituto de Métricas y Evaluación en Salud*, IHME)¹².

The national deaths registry is fed with data from death certificates, which achieve 100% coverage in Uruguay. This study took data for the period from 1997 to 2015, which is available on line except for 2011¹³.

The Uruguayan Global Burden of Disease study, published in 2016, drew on national databases from 2010 to 2013. The methodology was as described by Murray & López in 1996¹⁴, with YLDs and DALYs calculated using DISMOD II software¹⁵. The parameters the program operates with include: incidence, prevalence, remission, case-fatality, duration, mortality and relative risk of mortality due to pathology. The software assures internal consistency among parameters and among age strata. To obtain the final indicators, we used tables designed for that purpose by the WHO¹⁶. The methodology can be found in the original study report¹⁷.

The source of the secondary data used to evaluate the burden of disease measured through YLLs was obtained from IHME publications of data by regions¹².

YLLs were obtained from the IHME website, by sub-region of Latin America and the Caribbean, sex and causes.

Based on the available information, only teenagers from 15 to 19 age group were selected, because this subgroup contributes more YLLs among the 10 to 19 age group (median 63% of YLLs contributed by this group, with an inter-quartile range of 60%-70%).

The sub-regions considered, as shown in Table 1, were developed by the IHME itself.

Date extracted by the authors are displayed in tables and graphs. The mortality rate among teenagers in Uruguay, globally and by sex, was expressed per 100,000 per year. Total YLLs were extracted for Uruguay and the sub-regions and their distribution by sex. Causes of YLL were given as proportions of total YLLs.

Results

From 1997 to 2015 (discounting 2011) 4,643 teenagers died in Uruguay, constituting mean of 257 deaths per year (Table 2), representing 0.72% of total deaths. In these deaths, the man/woman ratio is 2.3 (median) with a range of 1.8-3.1. Change over time displays stable behavior, with decline in the final 2 years, which could not be interpreted as a trend at the time of the study.

Total YLLs for 2010 in the population from 10 to 19 years old were 12,763, with a man/woman ratio similar to that of mortality (2.2).

Table 3 shows distribution by causes. Of overall YLLs, 80% correspond to traffic accidents, self-inflicted injuries, violence and unintentional injuries. Violence was more frequent among males than among females.

Total YLLs for Latin America and the Caribbean for 2013 were 5,397,823. Distribution by sub-region and by age subgroup are shown in Table 4. The 10 to 14 year age group makes a relatively smaller contribution to total YLLs in

Table 2. Teenager mortality, by five-year period (N and rates per 100,000).

Year	Deaths from age 10 to 19 years	Rate per 100.000
1997	282	52,9
1998	310	58,1
1999	279	52,3
2000	230	43,1
2001	264	49,5
2002	249	46,7
2003	230	43,1
2004	231	43,3
2005	235	44,1
2006	234	43,9
2007	264	49,5
2008	264	49,5
2009	252	47,2
2010	276	51,7
2012	285	53,4
2013	304	57
2014	238	44,6
2015	216	40,5

Table 1. Countries that form part of the subregions of Latin America, as defined by the IHME.

South	
Chile	Uruguay
Argentina	
Andean	
Peru	Ecuador
Bolivia	
Central	
Colombia	Mexico
Costa Rica	Nicaragua
El Salvador	Panama
Guatemala	Venezuela
Honduras	
Tropical	
Brazil	Paraguay
Caribbean	
Antigua	Guyana
Bahamas	Haiti
Barbados	Jamaica
Belize	Puerto Rico
Bermuda	St. Lucia
Cuba	St. Vincent and the Grenadines
Dominica	Surinam
Dominican Rep.	Trinidad and Tobago
Granada	Virgin Islands

Table 3. LLYs in teenagers in Uruguay, by sex and cause.

Cause of Death	Men	%	Women	%	Total	%
Traffic accidents	2660	30,3	1232	31	3892	30,5
Self-inflicted injuries/violence	3140	35,7	871	22	4011	31,4
Unintentional injuries	1600	18,2	673	17	2273	17,8
Leukemia	389	4,4	200	5	589	4,6
Pneumonias and diarrhoea	125	1,4	195	4,9	320	2,5
Cardiac diseases	319	3,6	207	5,2	526	4,1
Stroke	0	0	130	3,3	130	1
Asthma	0	0	130	3,3	130	1
Spina bifida	125	1,4	0	0	125	1
Stomach cancer	0	0	70	1,8	70	0,6
Schizophrenia	0	0	65	1,6	65	0,5

adolescence, about 24% and 42%, by sub-region. The man/woman ratios continue skewed towards men, although less markedly so in the Andean and Caribbean regions.

Analysis of distribution by cause, age and sub-region (Table 5) reveals an occurrence pattern similar to Uruguay's, with more than 50% of YLL causes centring on 4 basic causes: traffic accidents, violence, self-inflicted injuries and unintentional injuries. In all cases, these causes are more common among the men, especially in the central and tropical zone, where violence and self-inflicted injuries correspond to 44.8% and 51% of YLLs among men. Note that among the women, overall, pregnancy-related causes were not among the most frequent causes of YLLs, except for in the Caribbean and tropical zones, where they represent 6.8% of YLL in women. Also HIV and tuberculosis do not figure among the causes that most contribute to YLLs, except in the Caribbean zone, where they account for 13% of the total (11.5% in males and 18.2% in females).

Discussion

Over an 18-year period, mortality in teenagers in Uruguay showed no major variations and is consistently greater in males.

In both Uruguay and all Latin America and Caribbean countries, in more than 50% of cases, YLLs are caused by accidents and violent, voluntary or involuntary external injuries. While these causes rank first in both sexes, levels are lower in women, among whom other frequent causes of death are heart disease, neoplasms and certain infectious diseases (respiratory and gastrointestinal infections).

These patterns of disease highlight the epidemiological transition ongoing in the region, the consequence of which is the increase in non-communicable diseases and external causes, as responsible for premature mortality. During

Table 5 – YLLs per 100.000 in teenagers (15 to 19 years old), by cause, sex and sub-region of Latin America and the Caribbean (2013).

Cause of death	Southern Cone (w/o Uruguay)			Central Zone			Andean Zone			Caribbean			Tropical Zone		
	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total	Men	Women	Total
	Traffic accidents	23,5	18,6	21,3	19,3	11,5	17,7	22,3	11,5	18,1	19,5	12,2	16,7	21,3	19,4
Violence and self-inflicted injuries	35	23	31,5	44,8	24,4	39,6	21,5	17,7	20	23,6	12	19,5	51,3	22	45,5
Unintentional injuries	14	7,8	12,8	11,2	6,3	10	16,1	8,5	13,2	15,2	5,8	11,6	9	5,3	8,2
Neoplasms	9,1	14,8	9,9	6,6	11,9	7,9	9,6	11,1	10,2	6,2	7,8	6,8	4,3	10,9	5,6
Diabetes/Blood/Urogenital	1,9	4,4	2,5	3	7,9	4,2	2,6	8,4	3,7	3,5	8,4		1,5	5,5	2,2
Cardiovascular	4,7	6,7	5,3	3,5	10	4,1	8	10,1	8,8	5,2	9,1	6,7	3,4	7,1	4,1
Diarrhoea, Infectious diseases and others	3,6	5,2	4	2,9	8,2	3,4	6,8	8,2	7,4	2,5	5,5	5,1	2,5	5,9	3,2
Other non-communicable	1,8	3,6	2,3	1,5	3,3	2	1,4	2,1	1,6	2	2,8	2,3	0,8	2,8	1,2
Pathologies connected with pregnancy					6,6			9			6,8				

Table 4. Total YLLs, by subregion and man/woman (M/W) ratio for 2013.

	South*	Central	Andean	Caribbean	Tropical
10 to 14	83241	686690	180657	177924	476702
15 to 19	231107	1563030	250022	240655	1507795
Total (1019)	314348	2249720	430679	418579	1984497
10 to 14 year group contribution to total YLLs (%)	26,5	30,5	41,9	42,5	24
M/W ratio 2.1 2.4 1.5 1.4 3.2	2,1	2,4	1,5	1,4	3,2

* w/o Uruguay

adolescence, patterns of mortality begin to differentiate by sex and, as seen above, environmental and behavioural factors begin to play a key role¹⁸.

The communities these young people live in exert an important influence in the development of violent behaviour. Accordingly, rates of criminality in these countries can be seen to correlate positively with the increase in violent deaths among teenagers. In this connection, Latin America and Africa have been considered the regions of the world with the highest rates of violent crime¹⁹.

The poverty and inequity in which many of the teenagers in this region live leads to marginalisation and violence, which has health implications, not only in the acquirement of risk conducts, but also in access to the health system²⁰. Teenagers usually do not have services to meet their specific needs. Interventions for children generally extend to the early stages of adolescence, but it is common for teenagers not to be contemplated by either paediatric or adult care, nor to have care services specific to their age. This is especially so in primary care, where it could be possible to develop prevention and promotion strategies focussed on their needs and delivered jointly with other community institutions.

In Uruguay a number of policies – both universal and those aimed at specific target populations – are being developed to prevent youth violence. The initiatives are heterogeneous in their programmes and institutional anchorage. As regards to violence in school, the approach has shifted from the use of sanctions to one based more on student's rights and responsibilities. Uruguayan society at large has engaged in a debate over the benefits of lowering the age of criminal responsibility for teenager offenders and those of a harsher punitive system on the assumption that such measures will influence the decision-making process of those who commit crimes (theory of rationality)²¹. This led in 2014 to a public consultation in the form of a plebiscite, which culminated in the rejection of the proposal. Current programmes are directed towards strengthening social integration, participation and coexistence among the various actors, although the weaknesses of the information systems and the characteristics of the studies on the subject hinder both the design of evidence-based policies and their subsequent evaluation²¹.

As a cause of YLLs, self-inflicted injuries correlate with suicides, which constitute the second or third most frequent cause of death in this age group²¹. This pathology is the “tip of the iceberg”

of teenager depression, the individual disease that generates most burden^{22,23}.

In Uruguay, this problem has been addressed through the National Suicide Prevention Plan, which has identified teenagers as a risk population and as such recommends the construction of specific-approach strategies²⁴. In 2017, the State Health Services Administration (*Administración de Servicios de Salud del Estado*) drafted a Protocol for the Prevention of Attempted Suicide in Teenagers, designed to contribute to preventing suicide and attempted suicide in teenager user the public health system²⁵. Despite advances in the process of implementing public suicide prevention policies, work should continue on implementing the protocol and universalising it to users of the private subsector.

A man/woman ratio greater than 2 in YLLs is not exclusive to our region, but can be seen in high-income areas (Europe, North America), where causes of death connected with pregnancy, childbirth and puerperium have been controlled, as have those connected with HIV and tuberculosis, which affect particularly women²².

Nonetheless, there are countries in the region with high YLLs from childbirth-related causes, calling for energetic sexual and reproductive health policies, including better access to education and contraceptive methods²². Also, mortality and YLLs connected with infection by HIV and tuberculosis are high in the Caribbean, which requires intensive prevention and treatment policies, including education and access to preventive strategies²⁶.

As examined here, it is the social determinants of health that define how many, which and from what causes teenagers die in the region. Viner et al.²⁷, using ecological analysis, ascertained that the strongest determinants of teenager health are inequity in income and access to education.

In this context, the greatest intervention for reducing teenager deaths in our region would be to generate the structural changes necessary to reduce poverty and increase young people's access to quality employment, education and the health system²⁸. In this respect, Uruguay has promoted work for young people by passing legislation (Law No. 19.133 of 20 September 2013), which stimulates the creation of job opportunities, labour practices in educational programmes and autonomous enterprises by young people, with remuneration in line with the provisions of current law, awards and conventions and with subsidies for employers in cases of first employment and protected employment.

One strategy pursued in the region has been to set up interdisciplinary programmes that offer individualised socio-educational projects for teenagers and young people who are outside the formal labour market: in Uruguay, there is the Networked Youth (*Jóvenes en Red*) programme for teenagers and young people who neither

study nor work²⁹. Lastly, by enabling young people to exercise their civil rights to the full by creating spaces that foster youth leadership in social, cultural and political matters, can contribute to their being heard when public policies are formulated to improve their conditions and quality of life.

Collaborations

A Aleman drafted the manuscript. A Aleman, V Colistro, M Colomar, F Cavalleri y M Alegretti performed the calculations and analyses for the study of global burden of disease in Uruguay, as well as the data mining in the IHME for Latin America and the Caribbean. M Buglioli made a critical reading of the results and assisted in interpretation and comparisons.

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