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The association between adolescent suicide rates and socioeconomic indicators in Brazil: a 10-year retrospective ecological study

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Objective: To examine suicide rates among adolescents from six large cities in Brazil and to analyze the relationship between adolescent suicide rates and socioeconomic indicators between 2006 and 2015.
Methods: Generalized estimating equation models were used to assess the impact of socioeconomic factors – including social inequality and unemployment rates – on adolescent suicide rates.
Results: The rate of adolescent suicide increased by 24% over the course of the study period. Social inequality (assessed using the Gini index), was positively associated with overall adolescent suicide rates (β = 10.68; 95%CI = 2.32-19.05; p $\leqslant$ 0.012). After disaggregating the findings by age (10-14 and 15-19 years), social inequality was associated with suicide rate only for adolescents aged 15-19 years (β = 9.63; 95%CI = 2.31-16.96; p $\leqslant$ 0.005). Disaggregating these findings by sex, the association with economic variables became significant only among females. Males had a higher overall suicide rate than females, and the highest rate was observed in male adolescents aged 15-19 years. Higher levels of unemployment were associated with higher suicide rates.
Conclusion: Our findings suggest that socioeconomic indicators, particularly unemployment and social inequality, are relevant social determinants of suicide in adolescence.

Keywords: Adolescent; suicide; socioeconomic factors; unemployment; inequality

Introduction

Suicide is a major global public health concern. It accounts for more than 800,000 deaths every year and is the second leading cause of death among people aged 15 to 29 years old.[1,2] A total of 78% of suicides occur in low and middle-income countries.[1] In Brazil, suicide also ranks among the leading causes of death in young people, ranking fourth for 15- to 29-year-olds.[3] Moreover, in Brazil there are striking gender differences in suicide rates. Suicide is the third leading cause of death among males (9.0 per 100,000 people each year) and the eighth leading cause among females (2.4 per 100,000 people each year).[3] Identifying suicide risk factors and sub-populations at increased risk of suicide is crucial for developing targeted, evidence-based preventive strategies.

Brazil is a country of continental dimensions and is highly heterogeneous in relation to population, distribution of economic activity, and access to mental health services. Since 1985, as a result of decades of social and economic developments, Brazil's epidemiological profile has been changing, contributing to a predominance of non-communicable diseases, especially in the most urbanized regions.[4-6] According to the most recent census, there are 15 cities in Brazil with a population of over one million inhabitants.[2,7] Although large cities can offer benefits in terms of social and economic development, individuals who live in large urban centers are also exposed to risks and hazards regarding physical and mental health problems.[8]

Brazil has experienced significant socioeconomic changes between 2003 and 2014,[9] including decreasing unemployment rates and income inequality, and an increase in the gross domestic product (GDP).[10,11] Although the country was not severely impacted by the 2008-2009 global economic crisis, the GDP declined by 3.7% in 2015

and the unemployment rate increased for the first time in over a decade, rising from 6.8 to 8.5%.[2,12]

Two South Korean studies, using social inequality indices, found a significant association between increased suicide rates in the general population and inequality (lower education levels,[13,14] rural residence, and residence in poorer areas). Furthermore, a time-series study in Japan found that income inequality was positively related to suicide rates in the general population.[13,15] Findings from a multilevel case control study in New York[13,16] also supported the association between adolescent and young adult suicide rates and socioeconomic inequality.

A recent study by Asevedo et al.[2] on suicide in Brazil between 2006 and 2015 showed a 9% increase in the age-adjusted suicide rate. To our knowledge, no study has examined the association between adolescent suicide rate and socioeconomic indicators in large urban centers in Brazil. We aimed to examine changes in suicide rates among adolescents from six large Brazilian cities between 2006 and 2015 and to examine the relationship between adolescent suicide rates and socioeconomic indicators such as GDP, social/income inequality, and unemployment rates. We hypothesized that, due to the recent economic recession, there would be an increase in adolescent suicide rates in the largest cities in Brazil between 2006 and 2015.

Methods

This study employed a retrospective ecological design. For inclusion, each city was required to have complete data on adolescent suicide rates, GDP, social inequality (as measured by the Gini index), and unemployment between January 2006 and December 2015.[2,17-19] Six cities met these criteria and were included in the analysis: Porto Alegre in the south, Recife and Salvador in the northeast, and Belo Horizonte, São Paulo, and Rio de Janeiro in the southeast.

Adolescents aged 10 to 19 years from each city were included in the analysis. The ages were stratified according to the World Health Organization's (WHO) chronological limits of adolescence[20]: 10 to 14 for young adolescents and 15 to 19 for older adolescents.

Adolescent suicide rates (the number of adolescent deaths caused by intentional self-harm each year per 100,000 adolescents in the population) for each city and for the entire country were extracted from the Brazilian Ministry of Health's IT Department (Departamento de Informática do Sistema Único de Saúde [DATASUS]).[2,21,22] Deaths were considered suicides when their causes were classified according to the following ICD-10 categories[23]: intentional self-harm (X60-X84), drug poisoning of undetermined intent (Y10-Y19), or sequelae of intentional self-harm (Y87.0). The latter two categories were included according to recommendations of the Brazilian Ministry of Health, in agreement with studies that found misclassified suicides in these groupings.[2,3] Data on suicide mortality in Brazil were derived from death certificate information compiled by the Brazilian Ministry of Health's Mortality Information System (Sistema de Informações sobre Mortalidade [SIM]).[24] The adolescent suicide rate was determined for each year by calculating the number of adolescent suicides per 100,000 adolescents.

The following socioeconomic indicators were used: GDP per capita, the unemployment rate, and social inequality (as measured by the Gini index). GDP is a measure of economic activity and serves as an indicator for tracking the economic health of a country. The GDP was converted to purchasing power parity (PPP) to provide comparability with international studies. The GDP of each city was adjusted for inflation and PPP to the fiscal year 2015.[25] Using online tools provided by the Banco Central do Brazil, inflation adjustments were made according to the Brazilian Consumer Price Index (Índice de Preços ao Consumidor [IPC-A]).[26] In 2015, the PPP conversion rate was 1.849 Brazilian reais per U.S. dollar.[25] The overall GDP per capita of the six cities was calculated by adding the nominal GDP of each city and dividing by the total population of the cities.

Unemployment data were obtained from the Brazilian Institute of Geography and Statistics (Instituto Brasileiro de Geografia e Estatística [IBGE]).[2,17-19,21] The overall unemployment rate was calculated by dividing the number of unemployed people by the total labor force (individuals aged 10 years and older). The labor force includes the economically active population, which is defined as people who supply labor for the production of goods and services during a specified period.[27]

The Gini index, which measures economic inequality, is calculated according to the distribution of income among people over 15 years of age.[12] The Gini coefficient ranges from 0 to 1, with 0 representing complete equality and 1 representing maximum inequality. According to the IBGE, the Gini coefficient is calculated as a ratio of the areas in the Lorenz curve.[19] In Brazil, the Gini index is calculated on national, regional, state, and, for the largest cities, metropolitan levels. In the present study, we used the "metropolitan region" data for each city from 2006 to 2015, except for 2010, when the IBGE provided no data in that category. As a substitute, we used the nearest available data for 2010, which was the state-level "urban zone" Gini index.[12]

Statistical analysis

For all analyses, the suicide rates were divided into two groups according to WHO definitions[20]: 10 to 14 years for younger adolescents, and 15 to 19 years for older adolescents.

We calculated the Spearman's rho correlation coefficient for the adolescent suicide rates, GDP per capita, unemployment rates and the Gini coefficient for each city and for all six cities together (online-only supplementary material, Table S1). The correlations were calculated for the first and last year of the study period. Due to the relationships between socioeconomic indicators, conclusions drawn from analyzing these variables separately are not reliable. For this reason, we performed multivariate analyses.

Generalized estimating equation models were used to assess the effect of the economic indicators on adolescent suicide rates. Seven separate models were

estimated for: 1) total suicide rate for 10- to 19-year-olds; 2) male suicide rate for 10- to 19-year-olds; 3) female suicide rate for 10- to 19-year-olds; 4) total suicide rate for 10- to 14-year olds; 5) total suicide rate for 15- to 19-year-olds; 6) male suicide rate for 15- to 19-year-olds; and 7) female suicide rate for 15- to 19-year-olds. Due to the rates of 0% among younger adolescents (10-14) during the study period, they were not divided by gender in this model. The large cities were used as the subject variable, while the year was used as the repeated-measure variable. The dependent variable was modeled with gamma distribution. The predictor variables were GDP per capita, unemployment rate, Gini coefficient, city, and year. Only the main effects were included in the model. The structure of the working correlation matrix was modeled as unstructured, exchangeable, and independent. The structure that provided the model with the lowest quasi-likelihood under independence model criterion (QIC) was selected. Independent structure provided the lowest QIC in all models, except for the suicide rate for 15- to 19-year-old females, in which an unstructured model provided the lowest QIC. All statistical analyses were performed using IBM SPSS version 22 for Windows.

Results

Data on adolescent suicide rates, GDP, unemployment rates and the Gini index of each city, of all six cities together, and nationwide are presented in Table 1. There was a 13% increase in the nationwide adolescent suicide rate from 2006 (2.34 per 100,000 population) to 2015 (2.64 per 100,000 population). The overall rate for the six cities included in this study increased by 24%. More specifically, in 2006, the overall rate for these cities was 1.60, varying from 0.44 in Salvador to 2.81 in Porto Alegre. In 2015, the overall rate had risen to 1.99, ranging from 0.23 in Salvador to 3.13 in Belo Horizonte.

The annual progression of the combined adolescent suicide rates in the six cities according to gender and age group is presented in Figures 1A and 1B. Among 10- to 14-year-olds over the 10-year study period, the rates were higher for males in 5 of the years and were equal in

one other year. Nevertheless, the highest of any recorded rate was for females in 2009. Similarly, among 15- to 19-year-olds, the rates were also higher for males than
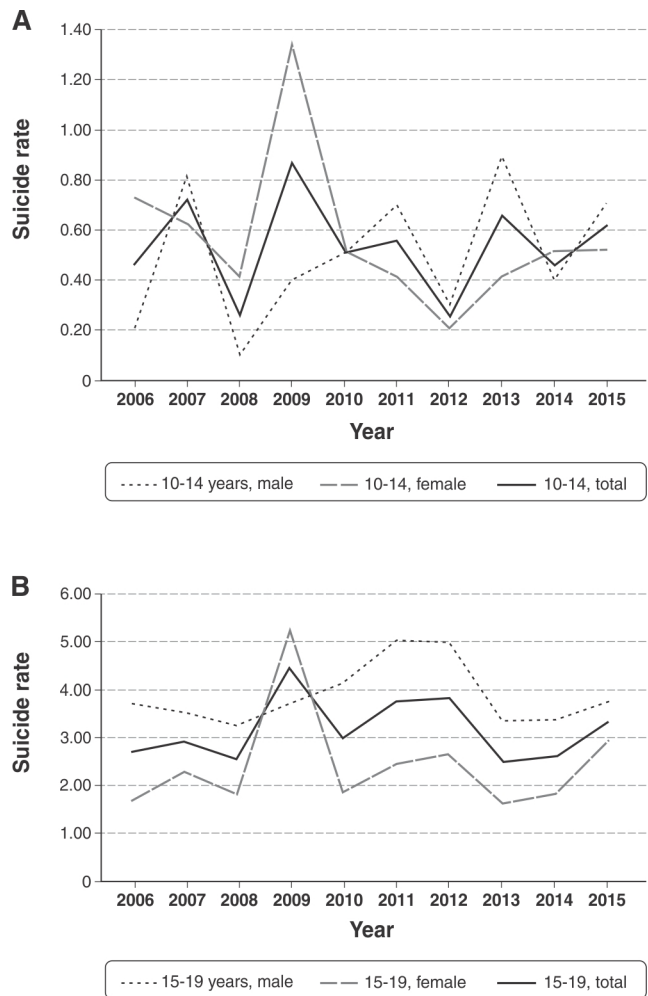

Figure 1 Suicide rate of adolescents aged A) 10-14 years and B) 15-19 years in six Brazilian cities.

Table 1 Adolescent suicide rates, GDP, Gini coefficient, and unemployment rates nationwide and for six large Brazilian cities between 2006 and 2015

Cities	Adolescent population* (% variation)		Adolescent suicide rate (% variation)		GDP per capita[†] (% variation)		Unemployment rate[‡] (% variation)		Gini index (% variation)	
	2006	2015	2006	2015	2006	2015	2006	2015	2006	2015
Porto Alegre	214	205 (-4)	2.81	2.93 (4)	19,524.61	24,944.72 (28)	8.02	5.63 (-30)	0.524	0.478 (-9)
Recife	258	243 (-6)	2.71	1.23 (-55)	11,288.5	16,063.45 (42)	14.57	8.91 (-39)	0.575	0.503 (-13)
Belo Horizonte	374	351 (-6)	1.07	3.13 (193)	12,634.1	18,880.55 (49)	8.53	5.64 (-34)	0.547	0.504 (-8)
Salvador	451	443 (-2)	0.44	0.23 (-48)	8,304.85	10,715.02 (29)	13.68	11.76 (-14)	0.553	0.503 (-9)
Rio de Janeiro	927	921 (-1)	1.19	1.52 (28)	19,479.8	26,786.36 (38)	7.88	5.18 (-34)	0.537	0.515 (-4)
São Paulo	1,771	1,806 (2)	1.92	2.44 (27)	23,976.58	29,398.49 (23)	10.52	7.00 (-33)	0.518	0.489 (-6)
All six cities[§]	3,994	3,969 (-1)	1.60	1.99 (24)	18,868.48	24,726.75 (31)	9.98	6.83 (-32)	-	-
Brazil	18,734	20,445 (9)	2.34	2.64 (13)	12,009.25	15,747.69 (31)	9.98	6.83 (-32)	0.544	0.491 (-10)

GDP = gross domestic product; PPP = purchasing power parity
* Population aged between 10-19 years ($\times$ 100,000).
[†] GDP, inflation and PPP adjusted to 2015 values (USD).
[‡] Unemployment rate: number of unemployed people/labor force aged 10 and older.
[§] Overall suicide rate: total suicides per 100,000 population in the six cities. Overall GDP per capita: total nominal GDP in the six cities inflated to 2015 values/total population of the six cities. Expressed as PPP.

Table 2 The relationship between adolescent suicide rates and socioeconomic indicators

	β	Wald 95%CI	Wald $\chi^2_{(df)}$	p-value
Total suicide rate, age 10-19				
GDP	1.90	-5.97 to 9.76	$0.22_{(1)}$	0.637
Unemployment	-0.03	-0.19 to 0.14	$0.12_{(1)}$	0.733
Gini	10.69	2.32 to 19.05	$6.27_{(1)}$	0.012*
Male suicide rate, age 10-19				
GDP	4.04	-5.84 to 0.00	$0.64_{(1)}$	0.423
Unemployment	-0.03	-0.21 to 0.16	$0.07_{(1)}$	0.788
Gini	7.30	-2.31 to 16.90	$2.22_{(1)}$	0.136
Female suicide rate, age 10-19				
GDP	-5.82	-8.41 to -3.23	$19.37_{(1)}$	< 0.001[†]
Unemployment	0.06	0.02 to 0.10	$7.10_{(1)}$	0.008*
Gini	9.99	8.23 to 11.75	$122.69_{(1)}$	< 0.001[†]
Total suicide rate, age 10-14				
GDP	0.00	0.00 to 3.47	$3.66_{(1)}$	0.056
Unemployment	0.12	-0.02 to 0.26	$2.96_{(1)}$	0.085
Gini	-0.62	-12.40 to 11.16	$0.01_{(1)}$	0.918
Total suicide rate, age 15-19				
GDP	-3.34	0.00 to 5.34	$0.57_{(1)}$	0.122
Unemployment	-0.02	-0.17 to 0.13	$0.07_{(1)}$	0.796
Gini	9.63	2.31 to 16.96	$6.64_{(1)}$	0.010*
Male suicide rate, age 15-19				
GDP	5.19	-5.29 to 0.00	$0.94_{(1)}$	0.332
Unemployment	0.01	-0.13 to 0.15	$0.03_{(1)}$	0.854
Gini	4.93	-1.60 to 11.45	$2.19_{(1)}$	0.139
Female suicide rate, age 15-19				
GDP	3.38	-9.21 to 0.00	$0.57_{(1)}$	0.122
Unemployment	0.02	-0.09 to 0.12	$0.07_{(1)}$	0.796
Gini	13.20	9.23 to 17.14	$6.64_{(1)}$	0.010*

95%CI = 95% confidence interval; df = degrees of freedom; GDP = gross domestic product; QIC = quasi-likelihood under independence model criterion.
Generalized estimating equation model results. Seven separate models were tested. The six large cities were used as the subject variable and the year was used as the repeated measure variable. The dependent variable was modeled with gamma distribution. The structure that provided the model with the lowest QIC was selected, and this was independent structure in all models, except the suicide rate among 15- to 19-year-old females, for which the unstructured model provided the lowest QIC.
*p < 0.05; [†]p < 0.01.

females every year except 2009, when the female rate was also the highest recorded during the study period.

Between 2006 and 2015, social inequality (Gini index) and unemployment levels decreased, while GDP per capita increased. The results of the generalized estimating equation models, which assessed the effects of economic indicators on adolescent suicide rates, are presented in Table 2. The Gini index was significantly associated with overall adolescent suicide rates, with greater inequality being associated with higher suicide rates (β = 10.68; 95% confidence interval [95%CI] = 2.32-19.05; p ⩽ 0.012). Among females aged 10-19 years, all three economic variables included in the model were significantly associated with suicide rate: a higher Gini coefficient was associated with higher suicide rates (β = 9.99; CI = 8.23-11.75; p ⩽ 0.001), higher GDP per capita was associated with lower suicide rates (β = -5.82; 95%CI = -8.41 to -3.23; p ⩽ 0.001), and higher unemployment rates were associated with higher suicide rates (β = 0.06; 95%CI = 0.02-0.10; p ⩽ 0.008).

We also estimated models that assessed suicide rates in the two age groups (10-14 years and 15-19 years)

separately and aggregated by gender. The only economic variable that was significantly associated with adolescent suicide rate was the Gini coefficient in the 15- to 19-year-old age group (β = 9.63; CI = 2.31-16.96; p ⩽ 0.005). Finally, we tested models with each age group divided by gender. Again, the only significant association was between the Gini Index and the suicide rate among 15- to 19-year-old females (β = 13.20; CI = 9.23-17.14; p ⩽ 0.005).

Discussion

We found that the adolescent suicide rate increased by 24% in six large Brazilian cities and increased by 13% overall in Brazil between 2006 and 2015. We also found an association between socioeconomic indicators, particularly inequality and unemployment, and suicide rates in adolescents. Higher levels of inequality and unemployment were associated with higher rates of suicide.

In the present study, the highest suicide rates among adolescents were found in males aged 15-19 years. Throughout the world, suicide is more frequent among

adolescent males than females,[13,28,29] and some studies have associated this difference with greater exposure to certain risk factors for males. These include impulsivity, aggressiveness with themselves and their relatives, using substances to deal with their problems,[13,28,29] and using more lethal methods when attempting suicide.[30,31]

As has been reported before, the suicide rate peaked in 2009.[32,33] Christante[34] suggested that this increase was exacerbated by the manner in which newspapers reported and published certain suicide cases on the front pages, with detailed descriptions of the method of death.[34] Later that year, the Brazilian Psychiatric Association published a manual for the media on how to report suicide deaths and promote suicide prevention in a more balanced way.[34,35]

We found a positive relationship between suicide rates among 15- to 19-year-old females with social inequality and unemployment, and a negative relationship with GDP. In the mid-twentieth century, it was predicted that suicidal behavior or destructive behavior would become more common as quality of life improved.[36] Machado et al., using regression models, showed that suicides in Brazil are affected by income inequality, specifically that each 10-point decrease in Gini index would result in a 5.5% reduction in the suicide rate. In the south and midwest regions – areas with the greatest decrease in Gini index – the rate of suicide also decreased.[10]

In 2015, suicide surpassed maternal mortality as the leading cause of death globally among girls aged 15-19 years.[37,38] In this study, we observed an increase in suicide rates among adolescent females in the past decade. In many cases, exaggerated forms of gender-based discrimination and exploitation, such as limitations on reproductive control, child marriage, exclusion from education, employment, unequal distribution of chores and caretaking responsibilities,[38] social cohesiveness, and matriarchal family structure, can all be viewed as potential risk factors for suicide.[39,40] Adolescent women who are exposed to contexts of greater social inequality, increased gender role differentiation, and unemployment are also more likely to be exposed to all forms of violence.[41-44]

No significant association was observed between economic indicators and suicide rates among adolescent males, suggesting that males and female suicide attempts may have different precipitating factors. For example, among adolescent males, better economic conditions could facilitate easier access to drugs and alcohol, which are both recognized as risk factors for suicide.[45] However, since this study was conducted with aggregated data, individual risk analysis could not be performed. Further studies are needed to better understand the risk factors for suicide among Brazilian adolescents who live in large cities.

The present study demonstrated a correlation between adolescent suicide rates and economic factors. Over the 10 years of the study period, despite improved GDP and reduced inequality, the adolescent suicide rate increased. Although this finding was surprising, previous studies have demonstrated that countries with a higher GDP tend to have higher rates of mental disorders such as depression, which is associated with subsequent suicide.[46,47]

This leads us to believe that the increase in suicide rates cannot be completely attributed to GDP, although it contributes to a number of conditions that could be risk factors for suicide: lower religiosity, changes in family structure, greater female empowerment and independence, higher divorce rates, youth rebellion against social inequality, greater Internet access, isolation, and behavioral influence from social media.[38,39,42,45,48]

To our knowledge, this is the first study on adolescent suicide rates and socioeconomic indicators in Brazil, and the long follow-up period was a notable strength. Our findings should also be considered in light of some potential limitations. The Brazilian Ministry of Health recommended including the ICD-10 categories intentional self-mutilation (X60-X84), drug poisoning of undetermined intent (Y10-Y19), and sequelae of intentional self-mutilation (Y87.0) among suicide deaths to reduce misclassifications.

In addition, we analyzed only six of the 15 largest Brazilian cities, because only these could provide complete data. As such, we cannot claim that our findings are representative of the whole country, or even of all large Brazilian cities. Conversely, since adolescent suicide is a rare event, the suicide rates in smaller cities could vary greatly from one year to another.

The development of suicide prevention strategies is critical, given the enormous increase in suicidal thoughts and behaviors during adolescence.[45] Thus, suicide prevention is a major public health policy issue.[49] Globally, a number of programs have been developed to preempt common risk factors for suicidal behaviors and other mental health outcomes by teaching adaptive skills, such as problem solving and self-regulation, and enhancing social support.[45] Smartphone applications are another innovative prevention strategy, since they can allow adolescents access to personal assessment and help with depression and/or other psychiatric disorders.[50] Brief interventions during high-risk periods after discharge from emergency departments or acute care settings are another important step for preventing suicide.[45,51]

In conclusion, in this set of large Brazilian cities, there was an increase in adolescent suicide rates between 2006 and 2015, with social inequality having an overall effect. The highest adolescent suicide rates were found among 15- to 19-year-old males. The rates for females were related to lower economic indicators, such as high unemployment and inequality and low GDP. Studies focusing on individual risk factors for suicide, especially among older male adolescents, are needed to plan preventive strategies. Since this was an ecological study, caution should be used when applying findings from the aggregated data to an individual level. Since little data is available on confounding factors, the relationships between socioeconomic indicators and adolescent suicide rates cannot be inferred as causal.

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Disclosure

The authors report no conflicts of interest.

References

1 World Health Organization (WHO). Preventing suicide, a global imperative [Internet]. 2014 [cited 2018 Nov 1]. www.who.int/mental_health/suicide-prevention/world_report_2014/en/

2 Asevedo E, Ziebold C, Diniz E, Gadelha A, Mari J. Ten-year evolution of suicide rates and economic indicators in large Brazilian urban centers. Curr Opin Psychiatry. 2018;31:265-71.

3 Brasil, Ministério da Saúde, Secretaria de Vigilância em Saúde. Perfil epidemiológico das tentativas e óbitos por suicídio no Brasil e a rede de atenção à saúde [Internet]. 2017 [cited 2018 Nov 1]. http://portalarquivos2.saude.gov.br/images/pdf/2017/setembro/21/2017-025-Perfil-epidemiologico-das-tentativas-e-obitos-por-suicidio-no-Brasil-e-a-rede-de-atencao-a-saude.pdf

4 Ribeiro WS, Mari Jde J, Quintana MI, Dewey ME, Evans-Lacko S, Vilete LM, et al. The impact of epidemic violence on the prevalence of psychiatric disorders in Sao Paulo and Rio de Janeiro, Brazil. PloS One. 2013;8:e63545.

5 Borges GM. Health transition in Brazil: regional variations and divergence/convergence in mortality. Cad Saude Publica. 2017;33:e00080316.

6 Prata PR. A transição epidemiológica no Brasil. Cad Saude Publica. 1992;8:168-75.

7 Instituto Brasileiro de Geografia e Estatística (IBGE). Censo Demográfico 2010 [Internet]. [cited 2017 Dec]. ww2.ibge.gov.br/home/estatistica/populacao/censo2010/default.shtm

8 Ziebold Jorquera C, Jaen-Varas D, Mari JdJ. Homicide and suicide in megacities. In: Jorgensen PM, Okkels N, Kristiansen CB, editors. Mental health and illness in the city. Singapore: Springer Singapore; 2016. p.1-20.

9 The World Bank. The world bank in Brazil [Internet]. 2018 [cited 2018 Nov 1]. http://www.worldbank.org/en/country/brazil/overview

10 Machado DB, Rasella D, Dos Santos DN. Impact of income inequality and other social determinants on suicide rate in Brazil. PloS One. 2015;10:e0124934.

11 Menezes-Filho N, Scorzafave LG. Employment and inequality of outcomes in Brazil [Internet]. 2009 [cited 2018 Nov 1]. www.researchgate.net/publication/254000686_Employment_and_Inequality_of_Outcomes_in_Brazil

12 Instituto Brasileiro de Geografia e Estatística (IBGE). Pesquisa nacional por amostra de domicílios contínua [Internet]. [cited December 2017]. ww2.ibge.gov.br/home/estatistica/indicadores/trabalhoerendimento/pnad_continua_mensal/default.shtm

13 Cuadrado C, Zitko P, Covarrubias T, Hernandez D, Sade C, Klein C, et al. Association between adolescent suicide and sociodemographic factors in Chile: cross-sectional ecological study. Crisis. 2015;36:281-90.

14 Hong J, Knapp M, McGuire A. Income-related inequalities in the prevalence of depression and suicidal behaviour: a 10-year trend following economic crisis. World Psychiatry. 2011;10:40-4.

15 Inagaki K. Income inequality and the suicide rate in Japan: evidence from cointegration and LA-VAR. J Appl Econ. 2010;13:113-33.

16 Miller JR, Piper TM, Ahern J, Tracy M, Tardiff KJ, Vlahov D, et al. Income inequality and risk of suicide in New York City neighborhoods: a multilevel case-control study. Suicide Life Threat Behav. 2005;35:448-59.

17 Instituto Brasileiro de Geografia e Estatística (IBGE). Taxa de desocupação [Internet]. [cited 2017 Dec]. ww2.ibge.gov.br/home/estatistica/indicadores/trabalhoerendimento/pme_nova/defaulttab_hist.shtm

18 Instituto Brasileiro de Geografia e Estatística (IBGE). Produto Interno Bruto dos Municipios 2005-2009 [Internet]. [cited 2017 Dec]. ww2.ibge.gov.br/home/estatistica/economia/pibmunicipios/2005_2009/default.shtm

19 Instituto Brasileiro de Geografia e Estatística (IBGE). Produto Interno Bruto dos Municipios: tabelas. 2010-2015 [Internet]. [cited 2018 Nov 1]. www.ibge.gov.br/estatisticas-novoportal/economicas/contas-nacionais/9088-produto-interno-bruto-dos-municipios.html?edicao=18760&t=resultados

20 World Health Organization (WHO). Global Accelerated Action for the Health of Adolescents (AA-HA!): Guidance to Support Country Implementation [Internet]. 2017 [cited 2018 Nov 1]. apps.who.int/iris/bitstream/handle/10665/255415/9789241512343-eng.pdf;jsessionid=4D148D83D080241E2487A511796A480F?sequence=1

21 Tecnologia da Informação a Serviço do SUS (DATASUS), Informações de Saúde (TABNET). Estatísticas vitais [Internet]. [cited 2017 Dec]. www2.datasus.gov.br/DATASUS/index.php?area=0205

22 Tecnologia da Informação a Serviço do SUS (DATASUS). Estudo de estimativas populacionais por município, idade e sexo. 2000-2015 [Internet]. [cited 2018 Nov 1]. www.who.int/classifications/icd/en/bluebook.pdf

23 World Health Organization (WHO). The ICD-10 Classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines 1992 [Internet]. [cited 2018 Nov 1]. www.who.int/classifications/icd/en/bluebook.pdf

24 Botega NJ. Comportamento suicida: epidemiologia. Psicol USP. 2014;25:231-6.

25 OECD Data. Purchasing power parities (PPP) [Internet]. [cited 2018 Nov 1]. data.oecd.org/conversion/purchasing-power-parities-ppp.htm

26 Banco Central do Brasil, Calculadora do cidadão. Correção de valores [Internet]. [cited 2017 Dec] www3.bcb.gov.br/CALCIDADAO/publico/exibirFormCorrecaoValores.do?method=exibirFormCorrecaoValores&aba=1

27 Fountoulakis KN, Kawohl W, Theodorakis PN, Kerkhof AJ, Navickas A, Hoschl C, et al. Relationship of suicide rates to economic variables in Europe: 2000-2011. Br J Psychiatry. 2014;205:486-96.

28 Gould MS, Greenberg T, Velting DM, Shaffer D. Youth suicide risk and preventive interventions: a review of the past 10 years. J Am Acad Child Adolesc Psychiatry. 2003;42:386-405.

29 Qin P, Agerbo E, Mortensen PB. Suicide risk in relation to socioeconomic, demographic, psychiatric, and familial factors: a national register-based study of all suicides in Denmark, 1981-1997. Am J Psychiatry. 2003;160:765-72.

30 Macente LB, Zandonade E. Estudo da série histórica de mortalidade por suicídio no Espírito Santo (de 1980 a 2006). J Bras Psiquiatr. 2011;60:151-7.

31 Machado DB, Santos DN dos. Suicide in Brazil, from 2000 to 2012. J Bras Psiquiatr. 2015;64:45-54.

32 Bando DH, Brunoni AR, Fernandes TG, Bensenor IM, Lotufo PA. Suicide rates and trends in Sao Paulo, Brazil, according to gender, age and demographic aspects: a joinpoint regression analysis. Rev Bras Psiquiatr. 2012;34:286-93.

33 Martins Junior DF, Felzemburgh RM, Dias AB, Caribe AC, Bezerra-Filho S, Miranda-Scippa A. Suicide attempts in Brazil, 1998-2014: an ecological study. BMC Public Health. 2016;16:990.

34 Christante L. Com saída [Internet]. Out 2010 [cited 2018 Nov 1]. www.unesp.br/aci/revista/ed13/com-saida

35 Associação Brasileira de Psiquiatria (ABP). Comportamento suicida: conhecer para prevenir [Internet]. 2009 [cited 2018 Nov 1]. http://www.proec.ufpr.br/download/extensao/2017/abr/suicidio/manual_cpto_suicida_conhecer_prevenir.pdf

36 Moniruzzaman S, Andersson R. Relationship between economic development and suicide mortality: a global cross-sectional analysis in an epidemiological transition perspective. Public Health. 2004;118:346-8.

37 Hawton K, Saunders KE, O'Connor RC. Self-harm and suicide in adolescents. Lancet. 2012;379:2373-82.

38 Petroni S, Patel V, Patton G. Why is suicide the leading killer of older adolescent girls? Lancet. 2015;386:2031-2.

39 Agerbo E, Nordentoft M, Mortensen PB. Familial, psychiatric, and socioeconomic risk factors for suicide in young people: nested case-control study. BMJ. 2002;325:74.

40 Beautrais AL. Risk factors for suicide and attempted suicide among young people. Aust N Z J Psychiatry. 2000;34:420-36.

41 Rodrigues NC, O'Dwyer G, Andrade MK, Flynn MB, Monteiro DL, Lino VT. The increase in domestic violence in Brazil from 2009-2014. Cien Saude Colet. 2017;22:2873-80.

42 Gallo EA, De Mola CL, Wehrmeister F, Gonçalves H, Kieling C, Murray J. Childhood maltreatment preceding depressive disorder at age 18 years: a prospective Brazilian birth cohort study. J Affect Disord. 2017;217:218-24.

43 Borowsky IW, Ireland M, Resnick MD. Adolescent suicide attempts: risks and protectors. Pediatrics. 2001;107:485-93.

44 Krug EG, Mercy JA, Dahlberg LL, Zwi AB. The world report on violence and health. Lancet. 2002;360:1083-8.

45 Cha CB, Franz PJ, M Guzman E, Glenn CR, Kleiman EM, Nock MK. Annual research review: suicide among youth – epidemiology, (potential) etiology, and treatment. J Child Psychol Psychiatry. 2018;59:460-82.

46 Harris EC, Barraclough B. Suicide as an outcome for mental disorders. A meta-analysis. Br J Psychiatry. 1997;170:205-28.

47 Hidaka BH. Depression as a disease of modernity: explanations for increasing prevalence. J Affect Disord. 2012;140: 205-14.

48 Miller AH, Raison CL. The role of inflammation in depression: from evolutionary imperative to modern treatment target. Nat Rev Immunol. 2016;16:22-34.

49 Fond G, Llorca PM, Boucekine M, Zendjidjian X, Brunel L, Lancon C, et al. Disparities in suicide mortality trends between United States of America and 25 European countries: retrospective analysis of WHO mortality database. Sci Rep. 2016;6:20256.

50 Lim GY, Tam WW, Lu Y, Ho CS, Zhang MW, Ho RC. Prevalence of depression in the community from 30 countries between 1994 and 2014. Sci Rep. 2018;8:2861.

51 Stanley B, Brown GK, Currier GW, Lyons C, Chesin M, Knox KL. Brief intervention and follow-up for suicidal patients with repeat emergency department visits enhances treatment engagement. Am J Public Health. 2015;105:1570-2.

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