**Title: The effect of homicides on life expectancy and Brazil (Aim: Health Affairs, AJPH,…)**

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**Abstract [Max 150 words]:**

**\maintext[~ 4500 words]**

**Introduction [450 words]**

Most Latin American countries have experienced substantial improvements in health since the second half of the 20th century [1]. More recently, major efforts towards universal health coverage have been implemented in most countries of the region [2]. Evidence suggest positive results in providing legal guarantees and increasing financial protection schemes related to health care for the population [2, 3]. Although most countries in the region still face major challenges in achieving universal health care, Brazil, Mexico and Colombia show the top levels of performance [3].

In Brazil, for example, universal health coverage was embedded as a mandate in 1988 [4]. As a result, there have been advances in primary care and a substantial decentralization process, social participation, and public awareness of a right to health care over the last two decades [5, 6]. Moreover, the implementation of the Family Health Program since 1994 has led to substantial benefits, such as a decrease in chronic disease hospitalizations and reductions in amenable mortality rates, including infant mortality and cardiovascular conditions [7-10]. This progress is also reflected in the continuous rise of national life expectancy over the last five decades for both females and males [11].

These improvements, however, are being jeopardized by a marked increase in homicide mortality in the new century in Latin America [12]. Violence and homicides have become a major public health concern in the region [13]. Mexico and Brazil, the two most populous countries of the region, account for most deaths caused by homicides among the young population [14], and Brazil had more than twice as high (23 per 100,000 population) the global injury rate (8.8 per 100,000) in 2000 [13].

Although important and informative, national figures mask large disparities at the subnational level, and between females and males. For instance, homicide rates are more than 10 times higher among males than females in countries with high levels of violence such as Brazil and Mexico [13, 15]. Even though homicides rates at the national level have not changed significantly in the last three decades in Brazil [12], at the state level major changes occurred between 2007 and 2011: some regions decreased homicides (e.g. Brasilia), while others (e.g. Bahia) suffered an increase of more than 40.0% [12]. Similarly, the largest reductions in amenable mortality in the period 2000-12 were achieved in regions with highest governance scores (11.0%), while those with lowest scores lagged with decreases of 4.3% [7]. Disparities are also shown in life expectancy levels, which ranged from 63.2 years in Alagoas, to 71.3 years in Santa Catarina in 2000 [16].

Here, we analyze the effect of amenable mortality and homicides on changes in life expectancy for each one of the 27 states in Brazil in the period 2000-15. Given the large decentralization process and the variation in homicides rates between states, we hypothesize large heterogeneity in changes in life expectancy between states and sexes. We expect, medically amenable causes to contribute to the rise in life expectancy, albeit with variation between states. In states with large increases in homicide mortality, we expect and offsetting effect of amenable causes and injuries. Since homicides occurred mainly among the male population, some states could have experienced reversals in male life expectancy. Understanding state-specific trajectories in an important step toward reducing disparities in life expectancy, and for public health planning to reduce the burden of violence in Brazil.

**Data & Methods [800 including limitations]**

[Bernardo: could you write a brief description of the data and their sources, and the adjustments made to get accurate estimates, ~200 words]

**Cause-of-death classification** The concept of *amenable/avoidable mortality* refers to those deaths that should not occur in presence of timely and high quality health care [17, 18]. This concept has successfully been used to link the progress of primary care expansion and reductions in amenable mortality in Brazil [7]. More recently the concept has also included causes amenable to public health interventions trough health behaviors, such as lung cancer, cirrhosis and homicides [19, 20].

We classified deaths with a classification previously used to capture the effect of homicides and progress in public health interventions [21]. Causes of death were grouped into eight categories (for details on codes from the International Classification of Diseases [ICD], see Appendix table 1 [22]) as follows: (1) amenable to medical service (includes those conditions that could be reduced by primary care, secondary intervention, and timely medical care), (2) homicides, (3) causes sensitive to public health policies and health behaviors (e.g. drunk driving, smoking), (4) diabetes, (5) ischemic heart diseases, (6) HIV/AIDS, (6) suicide and self-inflicted injuries.

The first two categories are linked to the major health care interventions that have been implemented in the last decades in Brazil such as the Family Health Program, and to the high prevalence of homicides, respectively. The third category includes deaths caused by lung cancer, cirrhosis, and accidents. We analyze diabetes, ischemic heart diseases (IHD), HIV/AIDS and suicide separately because these conditions are amenable to both health behaviors and medical attention. In addition, diabetes and IHD represent public health challenges in Brazil [10, 23] and the number of deaths caused by suicides places Brazil among the ten countries with highest number of suicides [24].

Our cause-of-death results refer to mortality below age 75. We do so in order to avoid miss-interpretations due to the high prevalence of comorbidities at older ages and because misclassification of causes of death is more frequent [25, 26]. In addition, the concept of avoidable/amenable mortality often truncates causes of death at age 75 [19], and most homicides occur below this age [14].

**Methods**

**Limitations**

[Julia: could you write a brief description of the methods, we will use the decomp:

Sánchez, Hiram, Samuel H. Preston, and Vladimir Canudas-Romo. "An integrated approach to cause-of-death analysis: cause-deleted life tables and decompositions of life expectancy." Demographic research 19 (2008): 1323.

I like better this one than Arriaga or Pollard because is based on continuous calculus and uses multiple decrement lifetables. It is just a brief description, you don’t have to write equations or large explanations.

Julia: could you also state the limitations and how we overcome/mitigate them, namely:

1. Inaccurate cause of death classification
2. The concept of amenable/avoidable mortality (you can see Nolte & McKee 2008 paper, or Beltrán-Sánchez 2011 chapter).
3. Missing homicides or individuals. Maybe you can find something similar to the document: “Mexico’s disappeared: the enduring cost of a crisis ignored” in the Igarape’s institute website
4. Other limitations that you can think of.

For some inspiration you can see

Canudas-Romo, Vladimir, Víctor Manuel García-Guerrero, and Carlos Javier Echarri-Cánovas. "The stagnation of the Mexican male life expectancy in the first decade of the 21st century: the impact of homicides and diabetes mellitus." J Epidemiol Community Health 69.1 (2015): 28-34.

Aburto, J. M., Beltrán-Sánchez, H., García-Guerrero, V. M., & Canudas-Romo, V. (2016). Homicides in Mexico reversed life expectancy gains for men and slowed them for women, 2000–10. Health Affairs, 35(1), 88-95.

These two sections should not take more than ~300 words]

**Results [750]**

**Discussion [1200]**

**Conclusion [200]**

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