Mortality of Bolivian immigrants in São Paulo, Brazil: analysis of avoidable causes

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Abstract *The objective was to analyze the mortality of Bolivian immigrants compared to the Brazilian population, living in the city of São Paulo, with an emphasis on the analysis of avoidable deaths. Descriptive study of deaths in the city of São Paulo, between 2007 and 2018, registered in the Mortality Information System. Deaths of people aged 5 to 74 years were analyzed, according to "Brazilian List of Causes of Preventable Deaths", according to groups and sex; Pearson's chi-square test was used to compare nationalities. The temporal trend of avoidable deaths was evaluated by Prais-Winsten regression. There were 1.123 Bolivians deaths and 883.116 among Brazilians, with a predominance of male deaths and the Bolivians died on average 13.6 years younger. The proportion of deaths from preventable causes was similar between Bolivians (71.0%) and Brazilians (72.8%) and the trend did not show significant proportional annual variation for both nationalities. There is a higher frequency, among Bolivians, of external causes (27.6%) and of causes reducible by actions to health promotion, prevention, control, and care for infectious diseases (20.8%) than to Brazilians. Conclusion: Bolivians died younger and showed no reduction in the proportion of potentially avoidable causes, which may indicate unequal access to health services.*

Key words *Immigrants, Cause of death, Mortality premature*

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Introduction

The Lancet Commission on Migration and Health report[1] concluded that migration should be treated as a central feature of 21st century health and development. It also states that commitments to the health of migrating populations should be considered across all Sustainable Development Goals (SDGs).

The process of migration in search of better living conditions involves a series of events that can be traumatizing and place migrants at risk. The process involves uprooting, beginning with separation from family and traditional values, and being placed in new social and cultural situations where job and legal security may be minimal. Unemployment is one of the factors causing poor quality of life in migrant populations[2,3]. Factors such as lifestyle, social and community influences, living and working conditions, and general socioeconomic, cultural and environmental conditions are determinants that influence a person's health. These social determinants of health are also the main factors responsible for health inequalities and inequities within and between countries, also affecting immigrants[4].

Over the last three decades, Brazil has witnessed new trends in international migration, becoming a hosting country for immigrants from Korea, China, Bolivia, Paraguay, Chile, Peru and various African countries[5]. In 1980, the profile of immigrants shifted from European to predominantly Latin American nationalities, above all Bolivians, who initially migrated to areas close to the border and later to São Paulo[6].

According to the country's national immigrant register, Bolivians account for the largest share of immigrants in São Paulo (20.8%)[7]. The results of the 2010 census show that Bolivian immigrants living in São Paulo are predominantly young (20-34 years) and male and have a lower level of education that the overall population[8].

Mortality indicators indirectly show the health status of a community and may reflect the effects of health interventions and socioeconomic disparities. Many causes of death are preventable and the analysis of these causes can provide important inputs for the formulation of prevention and health promotion programs and measures to reduce inequalities in access to good quality health services[9,10].

A study undertaken in Belgium with immigrants aged 50 years and over showed that, depending on country of origin, age, sex, and socioeconomic status, immigrants have a higher risk of dying than nonmigrants[11]. On the other hand, a systematic literature review reported that international migrants in high-income countries had a mortality advantage compared with the general population and that this advantage persisted across the majority of the disease categories analyzed by the study[12].

To provide quality, accessible health care, it is necessary to undertake ongoing monitoring of patterns of mortality in different population groups. The comparison of mortality between immigrant and nonimmigrant populations can help understand possible differences and ultimately indicate the need for actions to reduce health inequalities[11]. Given the scarcity of studies on mortality among immigrants in Brazil[13], the aim of this study was to compare mortality among Bolivian immigrants and nonimmigrants in São Paulo, focusing on avoidable causes of death during the period 2007-2018.

Materials and methods

We undertook a population-based study of mortality among Bolivian immigrants living in São Paulo, a city with a population of 12,176,866 (2018) and Human Development Index of 0.805[14].

We used microdata on deaths among the population living in São Paulo occurring between 01/01/2007 and 31/12/2018 taken from the national mortality information system, (SIM). The files were made available by the São Paulo City Council Department of Health (SMS/CEInfo/PRO-AIM).

Nationality was taken from the death certificate. The number of ignored cases was minimal, accounting for only two deaths in 2007[13].

The distribution of sex and age group was represented using a population pyramid of total deaths during the study period for each population, and the mean age at death was also calculated.

We analyzed the underlying cause of death based on the codes of the 10th Revision of the International Statistical Classification of Diseases and Related Health Problems (CID-10). Since deaths among Bolivian children under five were infrequent (35 deaths or 3.1% of the total), we opted to study causes of death among individuals aged 5-74 years grouped according to the List of Avoidable Causes of Deaths through Interventions under Brazil's Unified Health System[15]: 1) Causes of avoidable deaths and subgroups, 2)

Ill-defined causes of death, and 3) Other causes of death – not clearly avoidable. We calculated the proportions and respective 95% confidence intervals (CI) for groups and subgroups, sex, and nationality.

Descriptive statistics were used to analyze the data. Pearson's chi-squared test was used to test the null hypothesis (no relationship between population group and death due to preventable causes), adopting a 5% significance level. Two male deaths with inconsistent cause of death and six deaths with unknown data for sex variable were excluded.

The analysis of temporal trends in the proportion of preventable deaths in the period 2007-2018 among the population aged between 5 and 74 years was performed using Prais-Winsten regression. The data were processed using Microsoft Office Excel 2016 and R version 3.4.4. The software packages foreign, prais, readxl, stats and tidyverse were also used.

The study protocol was approved by the University of São Paulo's School of Public Health's (FSP/USP) research ethics committee (reference number 2.728.230/2018).

Results

There were 1,123 deaths among Bolivian immigrants and 883,116 among nonimmigrants during the period 2007-2018. Most of the deaths were among men (58.0% among Bolivian immigrants and 53.0% in nonimmigrants).

The distribution of deaths among nonimmigrants took the form of an inverted pyramid, with the number of deaths rising with increasing age, while deaths among Bolivian immigrants were concentrated in the 15-64 year age group (57.79%) (Graph 1). The difference in mean age at death between Bolivian immigrants (50.2 years) and nonimmigrants (63.8 years) was 13.6 years.

The analysis of the mortality curves using Prais-Winsten regression showed that neither population showed statistically significant proportional variability (Graph 2).

No differences were found in the proportion of overall deaths due to avoidable causes (p = 0.266) between Bolivian immigrants (71.0%, 95%CI [67.9;74.1]) and nonimmigrants (72.8%, 95%CI [72.7;72.9]) in both men (p = 0.210) and women (p = 0.811). However, differences were found when deaths due to specific causes were compared (Table 1).

The proportion of causes of deaths that could be avoided through adequate health promotion, prevention and control actions and non-communicable disease care was much lower among Bolivian immigrants than in nonimmigrants (45.9%, 95%CI [41.9; 49.9] versus 67.7%, 95%CI [67.5; 67.8]). For all other groups of avoidable causes of death, the proportion of deaths was higher among Bolivian immigrants (Table 1). With regard to specific causes within these groups, the proportion of deaths was higher among nonimmigrants for the causes in the ICD chapter Diseases of the Circulatory System. These differences were more pronounced for acute myocardial infarction and ischaemic heart disease (16.8% [95%CI: 16.6; 16.9] versus 11.4% [95%CI: 7.6; 15.1] and 6.7% [95%CI: 6.7; 6.8] versus 1.5% [95%CI: 0.0; 2.9] respectively (Table 2).

Causes of deaths that could be avoided through intersectoral, health promotion and prevention actions and adequate external cause care (accidents and violence) accounted for 27.6% (95%CI: 24.0; 31.2) and 16.8% (95%CI: 16.7;16.9) of deaths among Bolivian immigrants and nonimmigrants, respectively. The frequency of these causes was higher among men. Within this group, transport accidents accounted for approximately one-quarter of deaths in both populations (Table 2).

Causes of deaths that could be avoided through health promotion actions and adequate infectious disease prevention, control and care represented 20.8% (95%CI: 17.6; 24.1) and 15.1% (95%CI: 15.0; 15.2) of deaths among Bolivian immigrants and nonimmigrants, respectively (Table 1), with deaths due to tuberculosis accounting for 25.8% (95%CI: 18.1; 33.5) and 5.4% (95%CI: 5.2; 5.6) of deaths in the two groups, respectively (Table 2).

Deaths that could be avoided through adequate prevention, control, and care of causes of maternal death were more frequent among Bolivian immigrants (3.7%, 95%CI [2.2; 5.7]) than in nonimmigrants (0.3%, 95%CI [0.3; 0.3]) (Table 1).

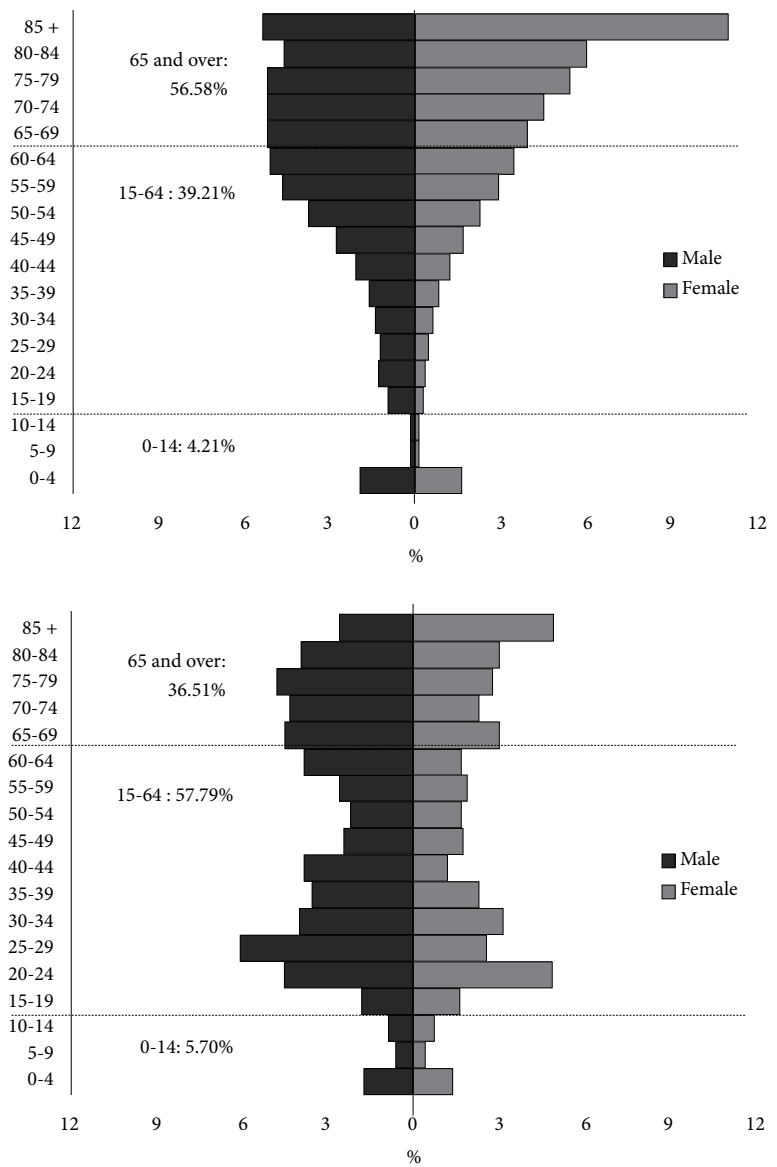
Ill-defined causes were also more frequent among Bolivian immigrants than in nonimmigrants in the overall population (2.6%, 95%CI [1.5; 3.7] versus 1.4%, 95%CI [1.4; 1.5]) and in men (3.7%, 95%CI [1.9; 5.2] versus 1.7%, 95%CI [1.7; 1.7]).

The proportion of avoidable causes was higher among men than in women in both groups (72.1% versus 69.4% in Bolivian immigrants and 74.6% versus 69.9% in nonimmigrants); however,

this difference was statistically significant only in nonimmigrants ($p < 0.001$).

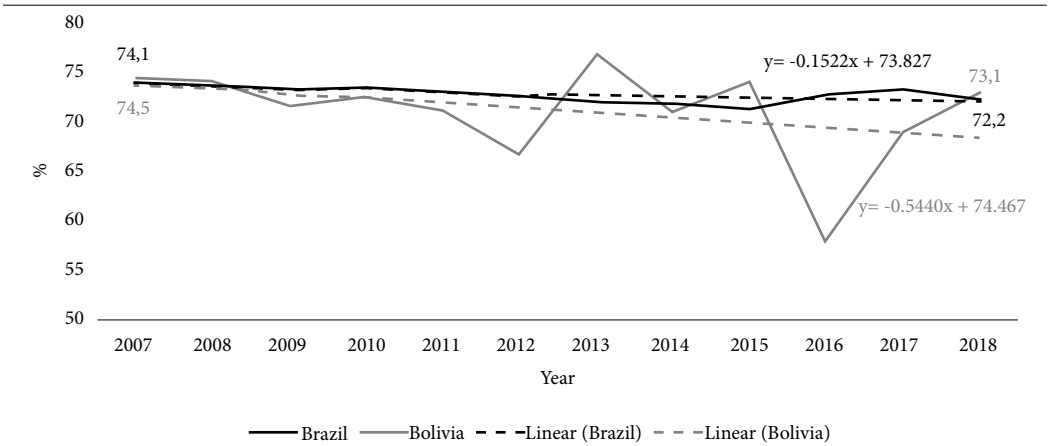
Discussion

Deaths among Bolivian immigrants were concentrated in the economically active population, while in nonimmigrants the population aged 65 and over accounted for the largest share of deaths. The proportion of deaths from avoidable causes remained relatively stable during the study period among both Bolivian immigrants and nonimmigrants. Overall, there was no significant difference in the proportion of avoidable deaths between Bolivian immigrants and nonimmigrants; however, there were differences in proportions of deaths due to specific causes within the different groups of avoidable causes of death and between sexes.



Graph 1. Population pyramids of deaths among Bolivian immigrants and nonimmigrants, São Paulo, 2007-2018.

Source: Authors.



Graph 2. Trends in proportion of deaths due to avoidable causes in people aged 5-74 years by nationality, São Paulo, 2007-2018.

Source: Authors.

Our findings show a -13.6 year difference in mean age at death between Bolivian immigrants and nonimmigrants. This difference partially reflects the profile of Bolivian immigrants, who are predominantly young people of working age[8,16]. A study in Canada also showed that age at death was lower in immigrants, although the difference was smaller (six years)[17].

Avoidable causes of deaths may be defined as causes that can be wholly or partly prevented by effective health care services that are accessible at a particular place and time, and must be updated in light of advancing knowledge and technologies[9]. In contrast to the present study, an investigation comparing deaths among the population aged 5-69 years in Brazil[10] and the Southeast between 2000-2013 using the Brazilian list of causes of avoidable deaths reported a fall in the proportion of deaths from avoidable causes over the study period. This may indicate that the living conditions and health status of the population in São Paulo may be less conducive to a reduction in avoidable mortality during the study period.

The findings show a high percentage of deaths from avoidable causes among Bolivian immigrants. Although the legislation in Brazil ensures access to health services for immigrants, a number of barriers to access remains[16,19]. Bolivian immigrants have specific characteristics, including language barriers and high level of mobility[16]. In addition, illegal entry into the country and lack of documentation can also hamper access to primary health care[19].

In both population groups deaths that could be avoided through adequate health promotion, prevention and control actions and non-communicable disease care accounted for the largest share of avoidable deaths; however, the proportion was lower in Bolivian immigrants, which may be explained by the younger demographic profile of the two populations[8,16]. Non-communicable diseases are one of the biggest public health problems because they result in a large number of premature deaths, loss of quality of life, and severe limitations in activities of daily living[10].

According to Yazaky et al.[8], São Paulo has a large concentration of working-age Bolivian men. Bolivian immigrants come to Brazil primarily in search of better employment, with over 70% of the population employed in low-paid jobs in the clothing industry with poor working terms and conditions. With regard to causes of deaths that could be avoided through health promotion actions and adequate infectious disease prevention, the proportion of deaths due to tuberculosis was higher among Bolivian immigrants. This concurs with the findings of a study by Martinez et al.[20], which reported an increase in the number of cases of tuberculosis among Bolivian immigrants in São Paulo between 1998 and 2008, and other studies showing that the prevalence of the disease is higher in this population[21-22]. Other studies have shown that Bolivian immigrants living in São Paulo experience poor living and working conditions and often live and work in the same space[16,23-25]. A similar situation was observed with

Table 1. Distribution of deaths among Bolivian immigrants and nonimmigrants aged 5-74 years by group of avoidable causes. São Paulo. 2007-2018.

Groups	Immigrants		Nonimmigrants*		p-value
	Nº	Prop. (%) 95%CI	Nº	Prop. (%) 95%CI	
1.0 - Avoidable causes 5-74 years	595	71.0[67.9;74.1]	377.391	72.8[72.7;72.9]	0.266
1.1 - Causes that could be avoided through immunoprevention actions	12	2.0[0.9;3.2]	519	0.1[0.1;0.2]	<0.001
1.2 - Causes that could be avoided through health promotion actions and adequate infectious disease prevention. control and care	124	20.8[17.6;24.1]	56.871	15.1[15.0;15.2]	<0.001
1.3 - Causes that could be avoided through adequate health promotion. prevention and control actions and non-communicable disease care	273	45.9[41.9;49.9]	255.443	67.7[67.5;67.8]	<0.001
1.4 - Causes that could be avoided through adequate prevention, control, and care of causes of maternal death	22	3.7[2.2;5.2]	1.189	0.3[0.0;0.3]	<0.001
1.5 - Causes that could be avoided through intersectoral, health promotion and prevention actions and adequate external cause care (accidents and violence)	164	27.6[24.0;31.2]	63.369	16.8[16.7;16.9]	<0.001
2.0 - Ill-defined causes of death	22	2.6[1.5;3.7]	7.369	1.4[1.4;1.5]	0.005
3.0 - Unavoidable causes of death	221	26.4[23.4;29.4]	133.809	25.8[25.7;25.9]	0.737
Total	838	100.00	518.569	100.00	
Men					
1.0 - Avoidable causes 5-74 years	364	72.1[68.2;76.0]	235.878	74.6[74.5;74.8]	0.210
1.1 - Causes that could be avoided through immunoprevention actions	6	1.6[0.3;3.0]	356	0.2[0.1;0.2]	<0.001
1.2 - Causes that could be avoided through health promotion actions and adequate infectious disease prevention, control and care	69	19.0[14.9;23.0]	35.249	14.9[14.8;15.1]	0.038
1.3 - Causes that could be avoided through adequate health promotion, prevention and control actions and non-communicable disease	163	44.8[39.7;49.9]	147.245	62.4[62.2;62.6]	<0.001
1.5 - Causes that could be avoided through intersectoral, health promotion and prevention actions and adequate external cause care (accidents and violence)	126	34.6[29.7;39.5]	53.028	22.5[22.3;22.6]	<0.001
2.0 - Ill-defined causes of death	18	3.7[1.9;5.2]	5.370	1.7[1.7;1.7]	0.002
3.0 - Unavoidable causes of death	123	24.4[20.6;28.1]	74.907	23.7[23.5;23.8]	0.766
Total	505	100.00	316.155	100.00	
Women					
1.0 - Avoidable causes 5-74 years	231	69.4[64.4;74.3]	141.506	69.9[69.7;70.1]	0.811
1.1 - Causes that could be avoided through immunoprevention actions	6	2.6[0.5;4.7]	163	0.1[0.1;0.1]	<0.001
1.2 - Causes that could be avoided through health promotion actions and adequate infectious disease prevention, control and care	55	23.8[18.3;29.3]	21.621	15.3[15.1;15.5]	<0.001
1.3 - Causes that could be avoided through adequate health promotion, prevention and control actions and non-communicable disease	110	47.6[41.2;54.1]	108.195	76.5[76.2;76.7]	<0.001
1.4 - Causes that could be avoided through adequate prevention, control, and care of causes of maternal death	22	9.5[5.7;13.3]	1.187	0.8[0.8;0.9]	<0.001
	38	16.4[11.7;21.2]	10.340	7.3[7.2;7.4]	<0.001
2.0 - Ill-defined causes of death	4	1.2[0.0;2.4]	1.999	1.0[0.9;1.0]	0.907
3.0 - Unavoidable causes of death	98	29.4[24.5;34.3]	58.901	29.1[28.9;29.3]	0.952
Total	333	100.00	202.406	100.00	

* *Includes six deaths with unknown data for sex.

Source: Authors.

Table 2. Distribution of deaths among Bolivian immigrants and nonimmigrants aged 5-74 years by main causes within the groups of avoidable causes, São Paulo, 2007-2018.

Groups	Immigrants		Nonimmigrants*		p - value
	Nº	Prop. (%) 95%CI	Nº	Prop. (%) 95%CI	
1.2 - Causes that could be avoided through health promotion actions and adequate infectious disease prevention, control and care	124	100.00	56.871	100.00	-
Tuberculosis	32	25.8[18.1;33.5]	3.081	5.4[5.2;5.6]	<0.001
Pneumonia	31	25.0[17.4;32.6]	23.503	41.3[40.9;41.7]	<0.001
Others	61	49.2[40.4;58.0]	30.287	53.3[52.8;53.7]	0.415
1.3 - Causes that could be avoided through adequate health promotion, prevention and control actions and non-communicable disease	273	100.00	255.443	100.00	-
Acute myocardial infarction	31	11.4[7.6;15.1]	42.819	16.8[16.6;16.9]	0.021
Ischaemic heart disease	4	1.5[0.02;2.9]	17.235	6.7[6.7;6.8]	<0.001
Others	238	87.2[83.2;91.1]	195.389	76.5[76.3;76.7]	<0.001
1.5 - Causes that could be avoided through intersectoral, health promotion and prevention actions and adequate external cause care (accidents and violence)	164	100.00	63.369	100.00	-
Transport accidents	43	26.2[19.5;33.0]	15.918	25.1[24.8;25.5]	0.815
Events of undetermined intent	15	9.1[4.7;13.6]	6.834	10.8[10.5;11.0]	0.583
Suicide	15	9.1[4.7;13.6]	6.140	9.7[9.5;9.9]	0.918
Falls	12	7.3[3.3;11.3]	6.667	10.5[14.9;15.5]	0.227
Homicide	7	4.3[1.2;7.4]	1.879	3.0[2.8;3.1]	0.452
Others	72	43.9[36.3;51.5]	25.931	40.9[40.5;41.3]	0.486

Source: Authors.

Bolivian immigrants living in the Buenos Aires metropolitan area[26] and other studies have shown poor living and working conditions can lead to a higher frequency of respiratory diseases[27].

Various studies[26,28] show that women have better health status than men. Our findings show that the proportion of deaths from avoidable causes was higher among men in both nationalities. Similar findings were reported by a study in São Paulo[28] that investigated avoidable deaths due to cancer, hypertension, and external causes, which showed that men were more affected by external causes than women.

External causes disproportionately affect men[29,30]. This is confirmed by the high proportion of these deaths in this group among both nonimmigrants and immigrants in the present study, with the latter showing a higher percentage than the former. These findings are corroborated by a report on immigrant health produced by the São Paulo City Council Department of Health showing that Bolivian immigrants registered the highest proportion of deaths due to external causes[31]. This situation is explained partly by the demographic profile of this population, which is predominantly young and male[8]. In this regard, a systematic literature review of studies from 92 countries found that mortality rates due to external causes were higher among migrants than in the general population[12]. This may be due to several interrelated factors, such as socioeconomic status, cultural adaptation, prejudice[2,24]. In addition, young men are more likely to be exposed to occupational risk, drink, and engage in aggressive behavior and dangerous driving[18].

The proportion of deaths due to that could be avoided through adequate prevention, control, and care of causes of maternal death was also higher among Bolivian immigrants. A study undertaken in Spain showed excess risk of maternal death among immigrant women and that women from South America had the highest adjusted risk of maternal death[32]. Various factors may explain these disparities, including preexisting conditions and other risk factors such as differences in access and adherence to antenatal care. Differences in access to health services have also been reported, with a study by Ferreira et al.[33] showing that, despite the provision of free health care by Brazil's public health system, Bolivian immigrants go to less antenatal care appointments and begin care later than Brazilian mothers[33].

São Paulo has excellent information coverage and high-quality death certification. An important factor influencing the quality of death certification in São Paulo is the Mortality Information Enhancement Program (PRO-AIM), which seeks to provide timely and quality data and decentralize information[34-35]. As a result, we identified a low proportion of ill-defined causes among both study populations in comparison to the average rate for the overall population in Brazil in 2010 (7%)[36].

There is no consensus about the "healthy migrant effect", which suggests that migrants often have a better health status than the population of the host country. Although some studies have shown the presence of this effect[12], others, including the present study, suggest that it is not observed in some regions[37-39]. The lack of research in this area means it is not possible to determine whether migration improves or worsens health by altering a range of individual and population health risk factors[1]. The health risks faced by migrants are determined by their pre-migration health status and are part of a complex combination of biological and socioeconomic factors that accumulate throughout the lifecycle[1]. Further research on this topic is warranted in São Paulo, a region with a high level of inter-regional population mobility, which has regained importance recently due to the rise in international migration[8].

One of the limitations of this study is that data on how long the immigrants have resided in the country and the region and different immigrant subgroups (vulnerable groups such as refugees for example) was not available. Second, we did not use mortality rates, which provide a better measure of risk of death, due to the lack of a denominator for Bolivian immigrants. It is important to consider that the list of avoidable causes may vary according to advances in knowledge and the use of new technologies and should therefore be constantly updated.

In conclusion, Bolivian immigrants died younger than nonimmigrants and the profile of causes of death in this group is different to that of the general population, there was no reduction in the proportion of potentially preventable causes, showing greater difference for the group of infectious causes and accidents and violence. Differences in avoidable mortality are an indicator of disparities in access to and the utilization of health services and living conditions. A better understanding of the mortality profile of this population can provide important inputs to inform the formulation of disease prevention and health promotion programs and policies and help avoided premature deaths in this group.

Collaborations

RC Silveira and ZP Silva: planning and design of the study. RC Silveira, ZP Silva and GP Alencar: data analysis and interpretation. RC Silveira, ZP Silva and GP Alencar: elaboration and revision of the manuscript.

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