

## The burden of Noncommunicable Diseases in Portuguese Language Countries

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**Abstract** *The present study analyzed trends in premature mortality from Noncommunicable diseases (NCDs) between 1990 and 2019, the projections up to 2030, and the risk factors (RFs) attributable to these diseases in the Community of Portuguese Language Countries (CPLP). Estimates from the Global Burden of Disease (GBD) study and the analysis of the burden of premature mortality due to NCDs were used for nine CPLP countries, applying age-standardized rates, using RStudio. Portugal, Brazil, Equatorial Guinea, Angola, and Guinea Bissau showed declining premature mortality rates caused by NCDs, while East Timor, Cape Verde, São Tomé and Príncipe, and Mozambique showed an increase in rates. Projections indicate that none of the countries is expected to achieve the goals of reducing premature mortality due to NCDs by one third by 2030. The attributable burden of disease showed that the most important RFs in 2019 were: high systolic blood pressure (SBP), tobacco, dietary risks, high body mass index (BMI), and air pollution. It can therefore be concluded that there are profound differences in the burden of NCDs among the countries, with better results in Portugal and Brazil, and that no CPLP country is likely to reach the NCD reduction target by 2030.*

**Key words** *Noncommunicable diseases, Risk Factors, Global Burden of Disease, Community of Portuguese Language Countries, Sustainable Development Goals*

## Introduction

Noncommunicable diseases (NCDs) are one of the main global health problems, responsible for a large number of early deaths, disabilities, and a loss of quality of life<sup>1</sup>. NCDs also generate negative economic impacts on families, communities, and society<sup>2</sup>.

It is estimated that, annually, 41 million deaths around the world (71% of all deaths) are caused by NCDs, and of those deaths, 15 million are premature (30 to 69 years of age) and approximately 12 million occur in low- and middle-income countries<sup>3</sup>. The greatest probability of premature death occurs in African nations (22%), the Eastern Mediterranean (24%), and Southeast Asia (23%), followed by Europe (17%), the Western Pacific (16%), and the Americas (15%)<sup>4</sup>.

NCDs have a common set of determining socioeconomic factors and modifiable risk factors (RF) that result in the possibility of implementing a population intervention and public policy approach for prevention and control, together with measures aimed at social inclusion and the reduction of inequalities<sup>1,5</sup>.

To handle the problem, in 2011, the UN promoted a high-level meeting, examining the possibility of countries joining the discussions on the theme. This meeting resulted in the approval of the Global Plan for NCD by the World Health Organization (WHO)<sup>1</sup> in 2013, and in 2015, NCDs were included in the 2030 Agenda for Sustainable Development, which establishes the goal of reducing mortality due to NCDs by one third<sup>6</sup>.

However, the fiscal austerity measures and cuts in public spending on health implemented in several countries, especially due to the financial crisis in 2008 in Europe and Africa<sup>7</sup>, as well as in Brazil after 2015/2016<sup>8</sup>, indicate a decline in child health, mental health, and an increase in NCDs<sup>9</sup>, which may hinder the achievement of the Sustainable Development Goals (SDG) established in the 2030 Agenda.

Therefore, it is important to monitor the burden of NCDs and their risk factors, as well as to achieve the SDGs, especially within partner countries, seeking food collaboration and reciprocal participation. The Community of Portuguese Language Countries (CPLC) have more than 500 years of history and cultural and linguistic identity in common, which unite and join the peoples of Angola, Cabo Verde, Guinea-Bissau, Equatorial Guinea, Mozambique, and Sao Tome and Principe, in Africa; Brazil, from South America; Portugal, from Europe; and East Timor,

from Asia<sup>10</sup>. Its Strategic Plan of Health Cooperation (SPHC) identifies the fight against NCDs as a priority for the cooperation among the member states<sup>11</sup>.

There are still few studies regarding the performance of the CPLP in terms of the 2030 agenda; therefore, there is an important opportunity to make progress in such a diagnosis and contribute to the strengthening of partnerships, which can allow the group to monitor the progress in reaching the SDG. Authors, such as Milton Santos, defend the thesis according to which the process of globalization builds a “perverse world with a logic of profit, but which can be changed, by searching for a more humane world”<sup>12</sup>, rescuing the “experience of living together and in solidarity”. Boaventura Sousa Santos also defends cultures and frontier identities as doors across which migration flows<sup>13</sup>. Hence, the CPLP would have the possibility of operating as a community in constant dialogue, seeking the exchange of harmonious experiences<sup>14</sup>. Studies which cover different themes referring to the CPLP may support the cooperation between those countries.

This study, therefore, aims to analyze the tendencies for premature mortality due to NCDs between 1990 and 2019, the projections up to 2030, and the RF attributable to those diseases within the CPLP.

## Methodology

The present study used data and estimates from the Global Burden of Diseases (GBD) study developed by the Institute of Health Metrics and Evaluation (IHME)<sup>15</sup>. The GBD makes estimates for general mortality and for specific causes, disabilities and risk factors, along with specific estimates by age and sex, since 1990, for 204 countries around the world (including selected subnational units), 21 regions, and 7 subregions, which allows for the estimation of the burden of diseases in each country<sup>15</sup>.

Different data sources, in addition to published sources available in the countries, were used, totaling more than 300,000 available sources. However, the GBD applies methodologies for adjustment, standardization, and validation of the estimates. Mortality data is treated considering: 1) redistribution of garbage codes (GC) of causes which may be considered as basic causes or ill-defined causes of death; 2) correction for the deaths without notifications or underreporting<sup>16</sup>, besides the standardization of the rates, us-

ing standardized global population as estimated by the IHME<sup>17</sup>. Moreover, the data were adjusted by other national and international sources, allowing for the comparison between different populations over time<sup>17,18</sup>. Further details about the GBD are available in earlier publications<sup>18</sup>.

The current study analyzed the burden of premature deaths by NCDs for the 9 countries of the CPLP, using the definition adopted by the WHO<sup>1</sup> and by the 2030 Agenda<sup>6</sup>, which consider premature the deaths by NCDs occurring to people aged 30 to 69 years<sup>1,6</sup>. We calculated the absolute number and the standardized rates of death, of years of life lost due to premature death and disability (DALY), years of life lost (YLL) due to premature death, and years lived with disabilities (YLD). The metrics were calculated for the total number of NCDs and stratified by: cardiovascular diseases (CVD) (I00-I99), chronic respiratory diseases (J30-J98), diabetes mellitus (E10-E14), and neoplasms (C00-C97), in 1990 and 2019, and considering the population between 30 and 69 years of age. Furthermore, the percentage of change between 1990 and 2019 was also verified.

Considering SDG target 3.4, which established a reduction, up to 2030, of one third of all premature deaths by NCDs, and indicator 3.4.1: “mortality rates attributed to cardiovascular diseases (CVD), cancer, diabetes, and chronic respiratory diseases”, projections up to 2030 were calculated, using the linear progression model. To calculate the projections for 2030, the same behavior was considered for the mortality rates found in each country, from 2015 to 2019, based on the initial moment of the goals agreed upon by the United Nations in 2015<sup>6</sup>.

This study also estimated that the burden of NCDs attributable to the RF and to the changes that took place between 1990 and 2019 in its distribution. A ranking of the RF was created to represent the changes for each CPLP country.

To calculate the burden of NCDs attributable to the RF, the GBD uses a hierarchical list of RF, which is analyzed in four levels. Level 1 stratifies the RF in three groups: metabolic, behavioral, and environmental. Level 2 details the RF in level 1, including 20 RFs. Levels 3 and 4 progress into detailing, and in 2019, the GBD study analyzed 87 RFs<sup>15</sup>. The current study analyzed hierarchical levels 1 and 2 related to NCDs, as shown in Figure 3.

To calculate the value attributable to RF, the GBD follows the established framework for comparative risk assessment (CRA), which comprises 5 main steps: 1) Estimate the level of exposure by

means of the sources available in the countries by using a search and identification of data related to each risk factor; 2) Estimate the pairs of RFs and their outcomes; 3) Estimate the relative risks in terms of exposure; 4) Estimate the Theoretical Minimum Risk Exposure Level (TMREL), defined as the minimum level of exposure to each RF, in which the probability of occurrence of a given event is the least possible. The TMREL is used to calculate the population attributable factor (PAF) for different causes of death, diseases, or disabilities; 5) The calculation of the PAF, defined as the proportion of the number of cases that may be attributed to an independent exposure<sup>15</sup>.

The TMRELS of the RFs evaluated in this study are: 1) systolic blood pressure (SBP): 110 to 115 mm Hg; 2) fasting glycemia: 85 to 99 mg/dL; 3) LDL cholesterol: between 27 and 50 mg/dL; 4) body mass index (BMI): 20 to 25 kg/m<sup>2</sup> for adults; 5) kidney function: albumin-creatinine ratio at <30 mg/g or rate of glomerular filtration >60 mL/min by 173 m<sup>2</sup>; 6) environmental air pollution: 2.4 to 5.9 µg/m<sup>3</sup>; 7) smoking: no exposure, including passive smoking; 8) dietary risks, consumption of 1 to 5 g of salt and 20 to 400 g of fruits and vegetables daily, among others; 9) physical activity: 8000 METs per day; 10) alcohol consumption: no consumption; 11) ideal temperature: 25.6 °C; 12) drug use - no use; 13) safe sex - use of condoms; 14) occupational risks - no risk. Further information can be found in the GBD 2019 Risk Factors Collaborators<sup>15</sup>.

In the comparisons between countries, we considered rates standardized by age. The analysis was conducted using R software, (RStudio Team, 2019), and the images were produced using the ggplot package.

The data from the GBD study is public and is available at <http://ghdx.healthdata.org/>. The GBD Brazil project was approved by the Research Ethics Committee from the Universidade Federal de Minas Gerais (UFMG), logged under project number CAAE - 62803316.7.0000.5149.

## Results

Table 1 shows the number of deaths, mortality rates, and DALYs, as well as YLL, and YLD rates for all causes of death and those due to NCDs and the variation between 1990 and 2019. In Angola, the absolute number of deaths by all causes increased 94.6% and due to NCDs, increased 111.1%, meanwhile the rates of mortality by

**Table 1.** Number of deaths and age-standardized mortality, DALY, YLL, and YLD rates, in the population, aged 30 to 69 years, both sexes, in the Community of Portuguese Language Countries in 1990 and 2019.

Location	Cause of death	Number of Deaths			Age-standardized deaths rate (per 100,000)			Age-standardized DALY rate (per 100,000)			Age-standardized YLL rate (per 100,000)			Age-standardized YLD rate (per 100,000)		
		1990	2019	% change	1990	2019	% change	1990	2019	% change	1990	2019	% change	1990	2019	% change
Angola	All causes	38,116	74,157	94.6	1,733.3	1,129.3	-34.8	75,301	54,908	-27.1	59,776	39,633	-33.7	15,526	15,274	-1.6
	NCD	12,664	26,722	111.0	625.5	453.8	-27.4	21,438	16,022	-25.3	19,767	14,221	-28.1	1,671	1,801	7.8
Brazil	All causes	370,896	567,054	52.9	839.2	542.9	-35.3	44,898	33,767	-24.8	29,135	18,724	-35.7	15,763	15,043	-4.6
	NCD	225,390	337,098	49.6	532.2	323.0	-39.3	18,711	11,846	-36.7	17,147	10,316	-39.8	1,564	1,529	-2.2
Cape Verde	All causes	557	1,256	125.4	655.8	628.6	-4.1	36,682	34,340	-6.4	23,420	20,898	-10.8	13,263	13,443	1.4
	NCD	293	713	143.4	342.9	368.9	7.6	12,667	13,199	4.2	11,248	11,459	1.9	1,419	1,740	22.6
Equatorial Guinea	All causes	1,998	3,420	71.2	1,977.9	1,139.7	-42.4	85,049	57,810	-32.0	68,210	42,030	-38.4	16,839	15,780	-6.3
	NCD	697	910	30.5	716.8	380.0	-47.0	24,356	13,627	-44.1	22,704	11,793	-48.1	1,652	1,833	11.0
Guinea-Bissau	All causes	3,982	6,012	51.0	1,924.2	1,474.2	-23.4	80,943	66,016	-18.4	66,177	51,471	-22.2	14,766	14,545	-1.5
	NCD	1,432	2,282	59.4	729.6	620.2	-15.0	24,993	21,650	-13.4	23,395	19,870	-15.1	1,598	1,780	11.4
Mozambique	All causes	44,578	108,097	142.5	1,420.7	1,723.0	21.3	64,778	80,091	23.6	48,825	63,687	30.4	15,953	16,405	2.8
	NCD	13,276	28,716	116.3	446.7	530.6	18.8	15,354	18,490	20.4	13,984	16,708	19.5	1,370	1,782	30.0
Portugal	All causes	30,559	22,296	-27.0	553.9	307.7	-44.4	33,557	24,753	-26.2	18,574	10,249	-44.8	14,983	14,504	-3.2
	NCD	21,705	16,086	-25.9	381.9	215.6	-43.5	13,939	8,752	-37.2	12,057	6,868	-43.0	1,881	1,884	0.1
Sao Tome and Principe	All causes	272	419	54.0	929.3	781.2	-15.9	44,801	38,916	-13.1	31,480	25,497	-19.0	13,320	13,420	0.7
	NCD	127	237	87.2	433.7	459.4	5.9	15,474	16,556	7.0	13,713	14,397	5.0	1,761	2,159	22.6
East Timor	All causes	1,686	2,953	75.1	988.0	762.7	-22.8	48,341	39,136	-19.0	34,026	25,017	-26.5	14,314	14,119	-1.4
	NCD	680	1,808	166.0	447.4	468.2	4.6	15,536	16,465	6.0	14,089	14,569	3.4	1,447	1,896	31.0

Source: Authors.

NCDs, DALY rates and YLL rates fell by 27.4%, 25.3%, and 28.1%, respectively; the YLD rate increased 7.8%. In Brazil, the deaths by NCDs in absolute numbers increased in 49.6%, reaching 337,098 deaths in 2019. However, the mortality rates standardized by NCDs indicate a decline (-39.3%) during the period. There was also a decline in the DALY (-36.7%), YLL (-39.8%), and YLD (-2.2%) rates. In Cape Verde, there was an increase in the absolute number of deaths by NCDs (143.4%), in mortality rates (7.6%), in DALY rates (4.2%), in YLL rates (1.9%), and in YLD rates (22.6%). Equatorial Guinea and Guinea-Bissau showed increases in the absolute number of deaths by NCDs (30.5 and 59.4%, respectively) and in the YLD rates (11.0 and 11.4%, respectively); however, the mortality rates (-47.0 and -15.0%, respectively, the DALY rates (-44.1 and -13.4%, respectively), and the YLL rates (-48.1 and -15.1%, respectively) showed a decline. Portugal presented a fall in the absolute number of deaths by NCDs (-25.9%), mortality rates (-43.5%), DALY rates (37.2%), and YLL rates (-43.0%); the YLD rate remained stable. In Mozambique, Sao Tome and Principe, and East Timor, an increase was observed in all of the analyzed metrics.

Table 2 shows the mortality rates standardized according to the four main NCDs for the CPLP for 1990 and 2019. In every country, there was a decline in the mortality rates by CVD and respiratory diseases, except for Sao Tome and Principe (5.5%), Mozambique (15.2%), and East

Timor (19.9%), which showed increases for CVD. For CVD, the most significant declines were observed in Portugal (-66.3%) and Equatorial Guinea (-60.2%). For diabetes and neoplasms, the standards varied according to country, with some showing an increase and others, a decrease. For diabetes mellitus, there was a greater decline in Portugal (-54.9%) and an increase in Cape Verde, Guinea-Bissau, Mozambique, and Sao Tome and Principe (158.4; 4.7; 31.4 and 24.1%, respectively). Mortality by neoplasms showed a greater decline in Portugal (-19.7%) and Brazil (-17.9%) and a greater increase in Cape Verde (37%) and Mozambique (30.3%) (Table 2, Figure 1).

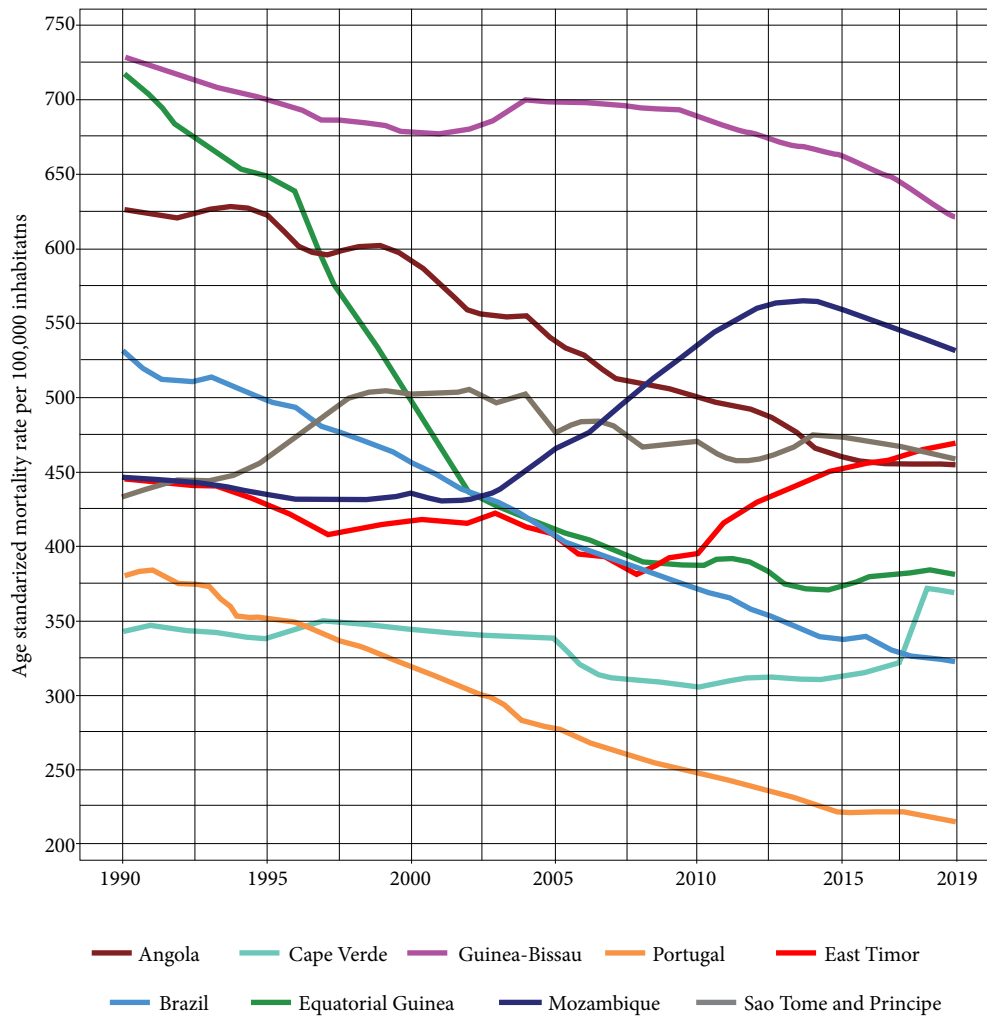
Figure 2 shows the temporal tendencies of premature mortality by NCDs (30 to 69 years of age) between 1990 and 2015 (solid red line), in each country, and the projections according to the SDGs proposed in UN 2030 Agenda, showing a one third reduction in mortality rates from 2015 onward (dotted green line). It also shows the linear projections based on what was observed between 2015 and 2019 in each country (dashed orange line). We can notice that none of the analyzed counties is likely to meet the reduction of one third in mortality due to NCDs as compared to 2015 levels. However, the worst performances are expected from Cape Verde, Sao Tome and Principe, and East Timor.

Figure 3 shows the rate of premature mortality by NCDs attributed to the risk factors in 1990 and 2019 for each CPLP country. In Angola, high SBP was the main RF in 1990 and 2019, with a reduc-

**Table 2.** Premature mortality rate due to age-standardized NCDs in the population aged 30 to 69 years for both sexes and according to the selected causes of death in the Community of Portuguese Language Countries in 1990 and 2019.

Location	Cardiovascular Diseases			Chronic Respiratory Diseases			Diabetes Mellitus			Neoplasms			NCD		
	1990	2019	% change	1990	2019	% change	1990	2019	% change	1990	2019	% change	1990	2019	% change
Angola	351.9	240.1	-31.8	69.7	33.3	-52.2	49.4	42.2	-14.7	154.5	138.3	-10.5	625.5	453.8	-27.4
Brazil	303.0	145.3	-52.0	35.4	20.9	-41.0	33.0	24.8	-24.8	160.8	132.0	-17.9	532.2	323.0	-39.3
Cape Verde	166.4	162.7	-2.2	47.2	17.6	-62.6	9.3	24.1	158.4	120.1	164.4	37.0	342.9	368.9	7.6
Equatorial Guinea	417.3	166.2	-60.2	84.0	25.5	-69.7	55.4	47.1	-15.1	160.1	141.3	-11.8	716.8	380.0	-47.0
Guinea-Bissau	395.0	340.9	-13.7	100.4	57.2	-43.0	51.9	54.3	4.7	182.3	167.7	-8.0	729.6	620.2	-15.0
Mozambique	265.4	305.8	15.2	34.7	33.4	-3.8	38.8	50.9	31.4	107.9	140.5	30.3	446.7	530.6	18.8
Portugal	169.8	57.2	-66.3	18.8	8.5	-54.9	14.9	6.7	-54.9	178.3	143.2	-19.7	381.9	215.6	-43.5
Sao Tome and Principe	210.3	221.8	5.5	83.2	67.2	-19.2	12.7	15.7	24.1	127.6	154.6	21.2	433.7	459.4	5.9
East Timor	228.	273.3	19.9	72.0	47.2	-34.5	26.2	25.5	-2.6	121.2	122.2	0.8	447.4	468.2	4.6

Source: Authors.



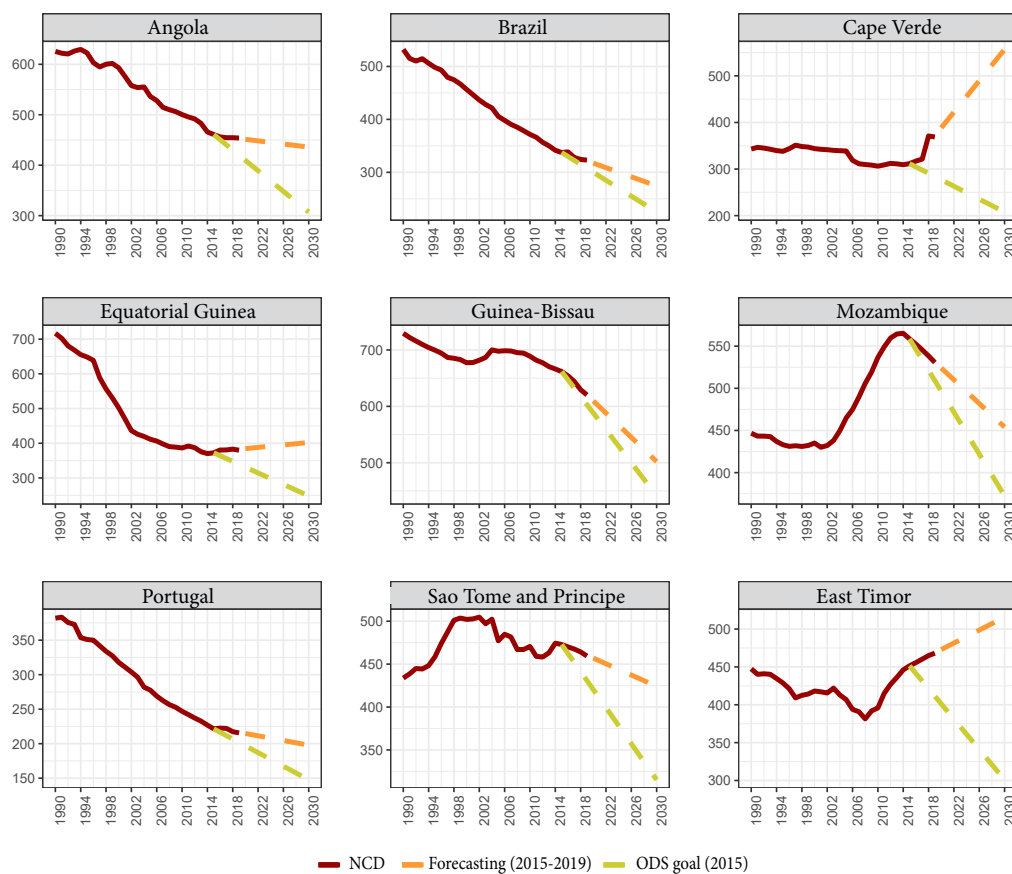
**Figure 1.** Trend of premature mortality rates due to NCD from 1990-2019 in the Community of Portuguese Language Countries.

Source: Authors.

tion in the period, and it was responsible for 162.4 deaths/100,000 inhabitants due to CVD in 2019.

In Brazil, the main RF that contributed to mortality rates in 1990 were smoking (204.3/100,000 inhabitants), high SBP (180.0/100,000 inhabitants), dietary risks (138.4/100,000 inhabitants), and high BMI (108.9/100,000 inhabitants). In 2019, the mortality rates attributed to the RFs showed a decrease, and the high SBP moved to first place, contributing to 86.2 deaths/100,000 inhabitants by CVD, followed by smoking (81.8 deaths/100,000 inhabitants) and BMI (79.8 deaths/100,000 inhabitants).

In Cape Verde, in 1990, high SBP was the main RF and corresponded to 108.8 deaths/100,000 inhabitants by CVD. The second and third causes were air pollution (57.8 deaths/100,000 inhabitants by CVD and 15.5 deaths/100,000 inhabitants by respiratory diseases) and dietary risks (63.4 deaths/100,000 inhabitants by CVD and 7.9 deaths/100,000 inhabitants by neoplasms). In 2019, the mortality rates due to RFs increased, high SBP continued to be ranked first and high BMI, second. High SBP contributed to 114.0 deaths/100,000 inhabitants due to CVD. High BMI was responsible for 58.0, 15.3, and 12.6



**Figure 2.** Projections of premature mortality rates due to NCD from 1990-2019 in the Community of Portuguese Language Countries.

Legend: Trend (full red line) and age-standardized projections by NCD based on 2015 to 2019 (orange dotted line) and 2030 SDG target (green dotted line). NCD = cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases.

Source: Authors.

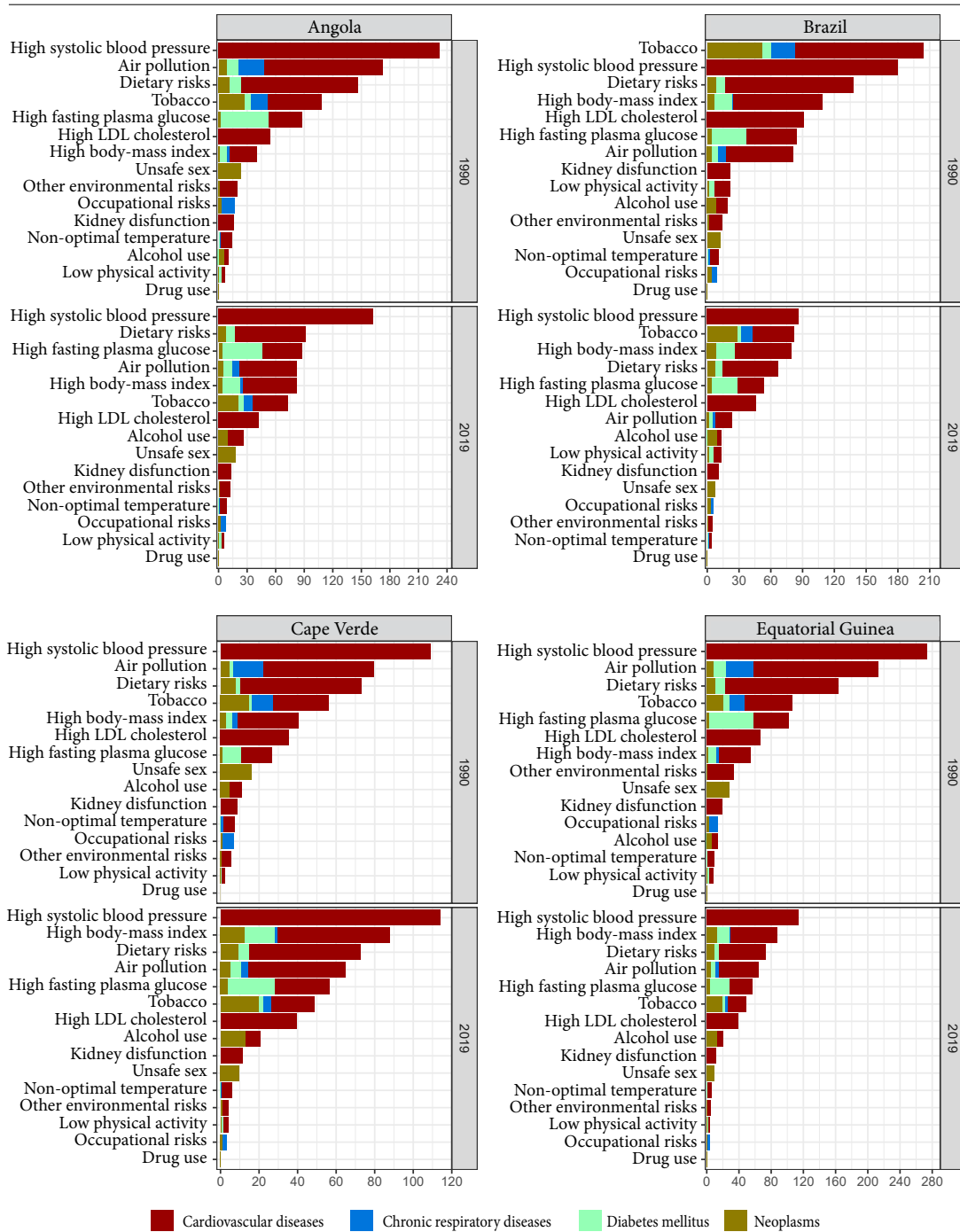
deaths/100,000 inhabitants due to CVD, diabetes, and neoplasms, respectively.

In Equatorial Guinea, in 1990, high SBP, the main RF, was responsible for 273.6 deaths by CVD, while air pollution contributed to 155.1 deaths by CVD and 33.8 by respiratory diseases/100,000 inhabitants. In 2019, there was an important reduction in deaths due to RFs; high SBP continued to be ranked first, and was responsible for nearly 117.3 deaths due to CVDs, while BMI ranked second (66.8 by CVD and 32.0 by diabetes mellitus).

In Guinea-Bissau, high SBP, air pollution, and dietary risks were, in this order, the three main

RFs attributed to premature deaths by NCDs in 1990 and 2019. The mortality rates attributed to CVD and high SBP were 235.4/100,000 inhabitants and 224.1/100,000 inhabitants in 1990 and 2019, respectively. Air pollution was responsible for 129.7 deaths by 100,000 inhabitants due to CVD and 19.5 by respiratory diseases in 2019.

In Mozambique, high SBP, air pollution and dietary risks were also the three main RF attributed to premature mortality by NCD in 1990 and 2019, and an increase can be observed in mortality rates due to the risk factors in 2019. High SBP was responsible for 187.2 deaths/100,000 inhabitants in 1990 and rose to 222.2 deaths/100,000 in-



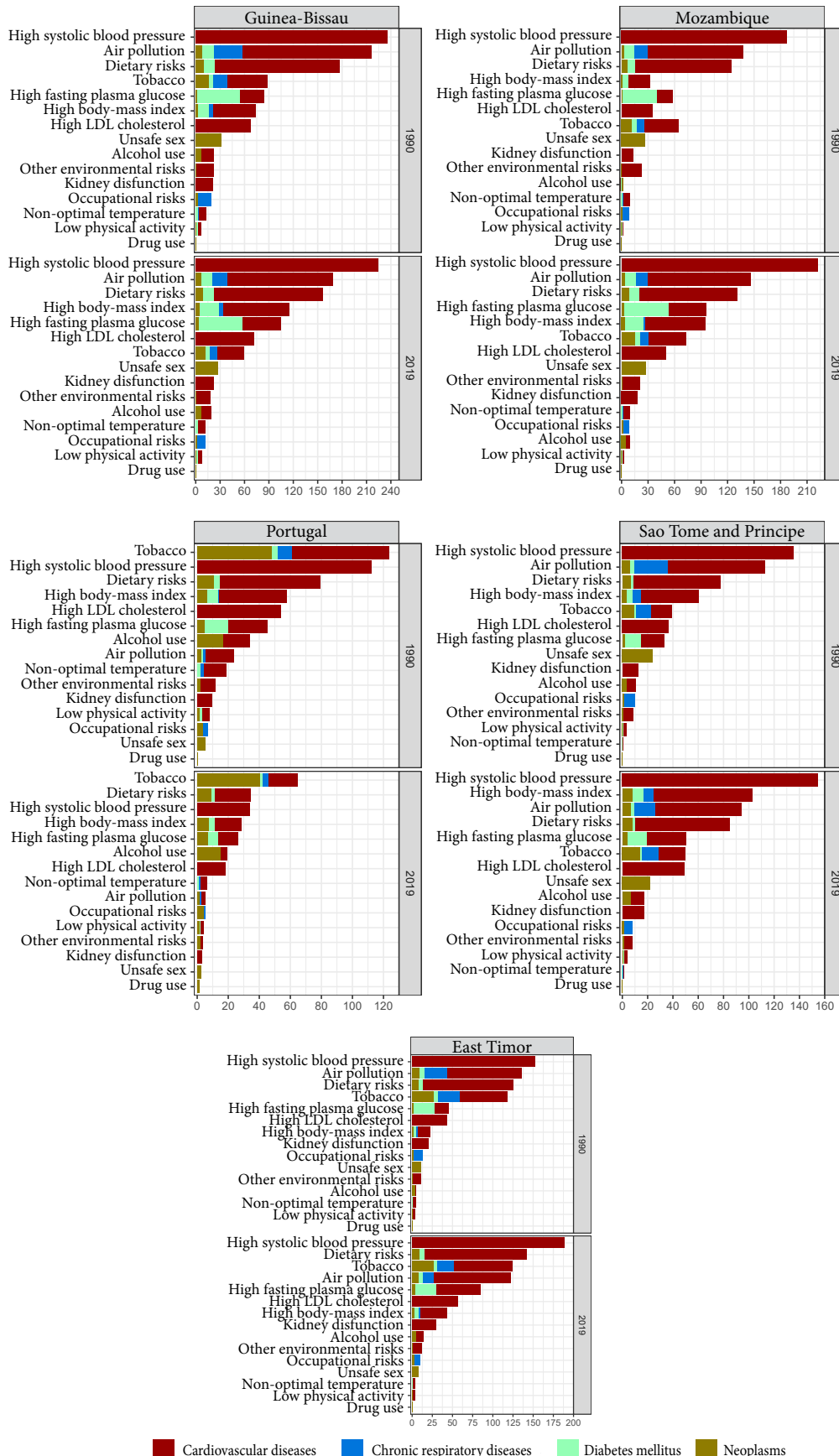
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**Figure 3.** Premature mortality rate due to NCD attributable to metabolic nutritional, environmental, and behavioral RFs, in 1990 and 2019, in the Community of Portuguese Language Countries.

habitants in 2019. Air pollution contributed with 108.5 deaths/100,000 inhabitants due to CVD, 2.8 deaths/100,000 inhabitants by neoplasms, and 15.4 deaths by respiratory diseases in 1990;

in 2019, the mortality rate was 117.0/100,000 inhabitants due to CVD, 3.8/100,000 inhabitants for neoplasms, and 13.1/100,000 inhabitants for respiratory diseases in 2019.





**Figure 3.** Premature mortality rate due to NCD attributable to metabolic nutritional, environmental, and behavioral RFs, in 1990 and 2019, in the Community of Portuguese Language Countries.

Source: Authors.

In Portugal, smoking, high SBP and high BMI were the main RFs in both 1990 and in 2019. An important reduction in mortality rates due to RFs was also observed in 2019. For example, the mortality rates by neoplasms attributed to smoking was 48.1/100,000 inhabitants and 40.4/100,000 inhabitants in 1990 and 2019, respectively.

In Sao Tome and Principe, high SBP was the main RF observed in the two evaluated periods, with 135.4 and 154.7 deaths/100,000 inhabitants in 1990 and 2019, respectively. Air pollution, the second RF in 1990 and third in 2019 totalled 68.9/100,000 inhabitants due to CVD and 15.9/100,000 inhabitants due to respiratory diseases in 2019.

In East Timor, an increase was found in the number of deaths due to RFs between 1990 and 2019. The high SBP was the main RF for both years and accounted for 152.3 deaths/100,000 inhabitants due to CVD in 1990, and 188.9 deaths/100,000 inhabitants due to CVD in 2019. Dietary risks contributed with 112.2 deaths/100,000 inhabitants due to CVD, 7.5 deaths/100,000 inhabitants by neoplasms in 1990, and 127.4 deaths/100,000 inhabitants due to CVD and 8.9 deaths/100,000 inhabitants due to neoplasms in 2019.

## Discussion

The present study shows that there are profound differences in the NCD burden in the countries and great disparities among them. Some countries show declining mortality rates, such as Brazil and Portugal, which present better performances, followed by such countries as Equatorial Guinea, Angola, and Guinea-Bissau, with high rates, but showing decline. The more concerning scenarios are in countries like East Timor, Cape Verde, Sao Tome and Principe, and Mozambique, in which the mortality rates due to NCDs have shown an increase. The tendency analysis indicates that none of the nine Portuguese speaking countries is likely to meet the goals of a one-third reduction in premature mortality due to NCD by 2030. The burden of diseases attributable to RFs also shows differences between the countries. Cape Verde, Mozambique, Sao Tome and Principe, and East Timor have witnessed increases in the burden of disease due to RFs. In the remaining countries, the risks attributed to deaths by NCDs have been declining. The most important RFs in 2019 were high SBP, ranked first in the majority of the countries; smoking, dietary risks;

high BMI; and air pollution (Mozambique and Guinea-Bissau, ranked second).

The inequalities in the NCD burden among the countries from the CPLP observed in the present study were also noticed in previous publications<sup>19</sup>. The African continent shows enormous challenges, caused by their internal structure, huge inequalities, a lack of health service structure, among others<sup>6,20</sup>. The 2030 Agenda highlights the principle of shared responsibility, and the challenges in moving forward and not leaving anyone behind<sup>6</sup>. However, the present study indicates that the perspectives are challenging, and without support from more developed countries and from the WHO, it is unlikely that there will be progress resulting in changes in the indicators<sup>6,20</sup>. Therefore, the SDGs may be able to influence national agendas to support the priorities of the global commitments established to achieve the SDG goals in terms of NCDs<sup>6</sup>.

Despite the differences in the processes of sociohistorical and cultural development, the CPLP countries maintain the Portuguese language as a key link, together with the constitution of a lusophone community interested in developing connections, fraternity, and international cooperation in different areas, such as health, education, and economy. Bringing this network together in the sense of amplifying dialogue and articulation for collaborative actions to fight the challenges that prevent the achievement of the 2030 Agenda may be a strategic political action towards improvement. The most adequate instrument for that is the PECS. Hence, the results of this study should be incorporated into the implementation of the strategic priorities concerning NCDs.

This study presents a common challenge for the CPLP, which are the indicators referring to NCDs and the RFs. These results are aligned with the findings of the STEPS inquiries conducted in Cape Verde<sup>21</sup>, Mozambique<sup>22</sup>, Sao Tome and Principe<sup>23</sup>, and East Timor<sup>24</sup>. The National Health Inquiry with Physical Exam 2013-2016 in Portugal also corroborates the findings of our study<sup>25</sup>. The objective of the GARD-CPLP (Global Alliance against Chronic Respiratory Diseases) was to contribute to a world in which every person is able to breathe freely<sup>26,27</sup>. Such progress requires cooperative prevention and intersectoral actions, prioritizing public policies and investments<sup>1</sup>. There is the need for articulated, cooperative work, since no country should be left behind up to 2030<sup>6</sup>.

A set of behavioral and metabolic RFs are the leading risks attributable to premature deaths caused by NCDs, such as smoking, dietary risks,

high SBP, and high BMI. In three of the countries, air pollution is also an issue. Evidence indicates that the control of RFs for NCDs is more effective when regulatory measures are implemented by the state and the environment is changed by regulating trade, availability, and the providing of services<sup>6,28</sup>. The best evidence would include taxing products that are harmful to people's health, labelling foods, regulating the commerce of alcohol and tobacco<sup>5,29</sup>, governmental measures establishing limits for the amount of salt used by food manufacturers, among other examples<sup>29</sup>. Therefore, it is urgent that measures of effective protection and public policies be taken by all countries.

It is important to highlight the important reduction in smoking as an RF for NCDs in most of the countries during the studied period. Countless regulatory measures have been adopted in the countries, including the prohibition of tobacco advertising, the ratification of the Convention-Picture on the use of Tobacco, decrees making environments smoking free, among other measures<sup>30</sup>. In Portugal, for instance, smoking continues to be the main RF, although it proved to be in decline during the period of our study.

High SBP was the first RF in most of the African countries and in East Timor, indicating the need to improve medical care and treatments, followed by primary health care, access to essential care, as well as progress in terms of prevention, reducing salt in foods, and creating regulatory measures, especially increasing taxes on ultra-processed foods<sup>1</sup>.

We should also highlight the importance of dietary risks and obesity, along with the need to make progress in such measures as the taxation of sugary drinks and ultra-processed foods, which are currently recommended by the WHO and that have already been adopted by some countries, such as Mexico, which reduced the consumption of fizzy drinks by 10%<sup>5,29</sup>. However, the fight against this problem demands political will in order to go against the interests of the food industry<sup>29</sup>.

Another RF that deserves attention is air pollution, which significantly affects health, causing a large number of premature deaths and hospitalizations. Some studies show associations between air pollution and CVD<sup>31</sup>, diabetes<sup>32</sup>, rheumatic diseases<sup>33</sup>, cognitive function<sup>34</sup>, neurodegenerative diseases<sup>35</sup>, and chronic respiratory diseases such as asthma<sup>3</sup>. Therefore, there is a

need to advance in intersectoral and structuring measures to control air pollution related to the development of public policies and the elaboration of norms regulating the issue and guiding interventions<sup>36</sup>.

This study has some limitations which should also be mentioned. Our data analysis used the age group of 30 and 69 years to estimate premature death, according to that established by the WHO and adopted for the 2030 Agenda<sup>1,6</sup>. However, it is important to remember that in some of the countries, such an age group could be different, due to the heterogeneity observed among the countries regarding low life expectation<sup>37</sup>, considering the significant inequalities in epidemiological transition experienced by each country. In terms of RFs, the GBD assumes that the relative risks are distributed evenly in all the countries for some age groups and genders, thus requiring more caution in interpreting the data. The most distal RFs, such as the social health determinants, were not evaluated by the GBD; it is well-known that these may have a prevalence in intermediate RFs, even before affecting the attributable mortality estimates. Although the GBD methodology does adjust the different definitions of RF for a standardized definition, the adjustments may be insufficient, causing bias. Finally, it is important to highlight the difficulty for the GBD to obtain local information and access data from every country. The 2015-2019 period was used as a hypothetical scenario for projections, assuming that the same conditions will remain for the mortality rates in the years to come, which may not correspond to reality.

The GBD offers a unique and opportune platform to monitor the NCD burden, with the SDG related to health and all the geographic and demographic dimensions, as well as the RFs attributed to diseases, thus contributing to comparisons among the countries. However, it is important to improve the collection and analysis of non-aggregated data, supporting health planning, guiding the definition of priority interventions, which may boost the progress of the SDGs<sup>38</sup>. The GBD calculates the indicators for each country, using data available for each location. However, when systems of information and local data are not available, subregional and regional data is adopted for local estimations. Therefore, improvements in the data collection systems of these countries will certainly contribute to improve the estimates.

## Conclusion

There are profound differences in the NCD burden in the member countries of the CPLP. Moreover, none of these countries is likely to reach the goal of reducing deaths by one third before 2030. Among the countries in the study, Portugal and Brazil present the best performances, whereas

Angola, Guinea-Bissau, Mozambique, and Equatorial Guinea present the worse numbers. In terms of RFs, high SBP was a problem in most of the CPLP countries in 2019. To make truly effective progress, it is urgent that partnerships and exchanges be established among the CPLP countries, especially with the support of the countries which, to date, have the best indicators.

## Collaborations

DC Malta: conception and design of the study, interpretation of results, writing of the article and approval of the version to be published. CS Gomes: interpretation of results, writing of the article and approval of the version to be published. GA Veloso: data analysis, interpretation of results, critical review and approval of the version to be published. JB Souza: interpretation of results, critical review and approval of the version to be published. PPV Oliveira: interpretation of results, critical review and approval of the version to be published. AVL Ferreira: critical review and approval of the version to be published. M Nagavi: critical review and approval of the version to be published. P Ferrinho: critical review and approval of the version to be published. PC Freitas: interpretation of results, critical review and approval of the version to be published. ALP Ribeiro: interpretation of results, critical review and approval of the version to be published.

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