GINI coefficient and health inequalities in Portugal

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Abstract

Aim: Health inequalities still remain an on-going issue in research. Health inequalities are complex to measure even though a variety of indicators have been developed. This paper considers the GINI coefficient (income distribution) and life expectancy at birth in Portugal. The aim was to assess whether the GINI coefficient reflects health inequalities within a country.
Methods: Data was retrieved from the World Health Organization (WHO) Health for All Database (HFA-DB), the Organization for Economic Cooperation and Development (OECD) and Eurostat. The GINI coefficient and the life expectancy were visualized in figures and tables, which were also interpreted. Additionally, a brief narrative literature review was performed in order to gain in-depth knowledge about the indicators and health inequalities in Portugal.
Results: The GINI index for Portugal is higher than the European Union (EU) average and the WHO European Region. This indicates an unequal income distribution for Portugal. In turn, life expectancy in Portugal is slightly above the EU average since 2006 and tends to be increasing. The WHO European Region has significant lower numbers than Portugal and the EU. A literature review indicated health inequalities in Portugal within regions, which are measured by a variety of indicators. The statistics show different outcomes for the GINI coefficient (income distribution) and for the life expectancy. The GINI coefficient for Portugal (34.0) lies above the EU average (31.0) in 2015, indicating an unequal income distribution. However, Portugal performs above the EU average (80.6 years) in terms of life expectancy at birth, with 81.0 years.
Conclusion: The GINI coefficient can be strongly associated with income inequalities. The indicator is a good overview but needs additional (social) measurements to adequately predict health inequalities.

Keywords: GINI index, health inequalities, Portugal.

Introduction

Health inequalities remain one of the biggest public health issues across the globe, while only a few countries systematically monitor them (1). Health itself is a multidisciplinary concept, including a variety of socio-demographic, genetic and lifestyle-related aspects (2). That also refers to health inequalities, which is defined by the World Health Organization (WHO) as "differences in health status or in the distribution of health determinants between different population groups" (3). This health stratification is a result of significant discrepancies in income, education, access to health care and disadvantageous socio-demographic positions. Health inequalities can differ across the European Union (EU), within countries and even across genders (4). However, health inequalities are still complicated to measure across populations. Commonly, the health across a society is measured in general and subgroups or whole counties are compared with each other to measure stratifications. This can be done due to a number of indicators, which are for example listed in the 'Core Health Indicators in the WHO European Region 2017' report. Namely, the life expectancy rates, mortality rates, healthy life years, or the health expenditure are common indicators. An additional measurement is the GINI coefficient, which can measure the distribution of incomes within a population. A variety of paper holds the hypothesis that the GINI index is an outstanding, maybe even one of the best indicators to measure health inequalities (5).

It was developed by Corrado Gini and measures the distance between the Lorenz curve (true value of society) and perfect equality (6,7). A Gini coefficient of 0 represents an equal society with a perfectly shared income, where a GINI coefficient of 1 represents the opposite and therefore an unequal economy (8).

Context

A brief narrative literature review on health inequalities is done to adequately research if the GINI index is a good measurement for health inequalities. To gather an overview of general health inequalities in Portugal, the life expectancy at birth is measured and discussed in relation to health inequalities. Life expectancy at birth is a good indicator to measure health inequalities (9). Defined by WHO, life expectancy at birth "reflects the overall mortality level of a population. It summarizes the mortality pattern that prevails across all age groups in a given year – children and adolescents, adults and the elderly" (10). Subsequently, a intra-national comparison of the GINI index in Portugal is performed. Portugal faces remaining health inequalities but seems to lack national strategies to detect and reduce them (1).

The main aim of this article is to assess how well the GINI index is suited for measuring health inequalities. An additional goal is to discuss how it fits in line with the measurement of life expectancy at birth and with common literature.

Methods

This article includes an analysis of statistical data to compare the GINI coefficient and life expectancy in Portugal and therefore to best answer the research question. The narrative literature review was done to adequately study the data and discuss it in line with common findings in this field.

A narrative literature review is conducted on health inequalities, the GINI coefficient (income distribution) and the life expectancy at birth in Portugal. It was done by using the following keywords: *"Portugal, Health inequalities, life expectancy and GINI coefficient (income distribution)"*. Included were all articles indicating the keywords on PubMed and Google Scholar. Exclusion criteria were articles published in Portuguese and older than 15 years.

Statistical data is taken from the WHO Regional Office for Europe "European health for all database" (HFA-DB), from the Organisation for Economic Co-operation and Development

(OECD), and from Eurostat. The HFA-DB latest general update was in July 2016, but some data is at a later point in time, such as the life expectancy at birth (11). Additional data for life expectancy is taken from the annual WHO report, namely the "Core Health Indicators in the WHO European Region 2017" which has a special focus on 2030 Sustainable Development Agenda (12). Some small data sets are also taken from the reports of 2016 and 2015 (13,14).

While comparing data, it is important to differentiate between the WHO European Region and the European Union (EU) countries. The WHO European Region is a regional office of the WHO, responsible for 53 countries, mainly located on the European continent (10). The European Union is a governmental union comprising 28 Member States (15). Both groups are included in the data collection. The EU is taken into the data collection since it is based on EU law that states that every citizen has an equal right to health. It is the EU's goal to reduce and prevent health inequalities. The European Region of the WHO is included in the research since it provides a moderate perspective on the data. The data from the OECD and Eurostat is taken from tables, provided at their web page (16).

Concept definition of the GINI coefficient

The GINI coefficient is measured in a number between 0 and 1 in the original calculation (17). However, common databases, such as the HFA, Eurostat and the OECD express their data with the GINI index. It is calculated with the GINI coefficient and expressed in percentage and therefore equal to the GINI coefficient multiplied by 100 (17). For Portugal, Eurostat measures the GINI index. The World Bank calculated other counties and estimates on average 7% higher values compared to Eurostat (11).

Definition of life expectancy

WHO Europe measures the life expectancy at birth by using Wiesler's method for the HFA-DB, which is used here (18). It is a reliable measurement to compare countries from the European region since almost all countries reported data to this indicator (19).

Results

Literature review

Inequalities occur within gender, social status, education status and income ranges, but also across counties (20). Health inequalities are mostly measured by the access to healthcare, unemployment rate, the socioeconomic status and health behaviours (1,21). A variety of articles, such as "Connecting the dots on health inequalities – a systematic review on the social determinants of health in Portugal" by Campos-Matos et. al., indicate the issue of health inequalities in Portugal (1). One study researched the self-rated inequalities in Portugal with similar findings of the occurrence of inequalities (20).

However, the majority of articles measured the health inequality based on economic measurements, such as the unemployment rate, income per household or the income distribution. The article "Income inequality and population health: A review and explanation of the evidence" by Wilkinson, R. G., & Pickett, K. E, researched 168 analyses and 155 papers and compared them. The hypothesis of higher income distribution and health inequalities was research. A large majority (70 %) were found to hold the given hypothesis and "suggest that health is less good in societies where income differences are bigger" (22). A cross-country comparison from Chauvel, L., & Leist, A. K in "Socioeconomic hierarchy and health gradient in Europe: the role of income inequality and of social origins", made in Europe indicated for example, that "income inequality was associated with worse average health" (4).

Of note, nearly no article focuses solely on the GINI coefficient (income distribution), but on additional (social) factors for measuring health inequalities (23). "The problems of related deprivation: Why some societies do better than

others" by Wilkinson, R. G., & Pickett, K. E. claims that all social discrepancies or problems occur based on income distributions, or could at least mainly be reduced within more equal societies (24).

The GINI coefficient

The GINI coefficient (income distribution) is shown in Figure 1. It indicates a negative course from 1995 to 2013. The number starts at a moderate value of

37, where they stayed relatively stable over 6 years. After 2000, they increased up to a point of 38.1 and decreased again to the lowest measured point of 33.54 in 2010. After 2013 they only adjusted in small changes. HFA-DB reports until 2013 but Eurostat published data until 2016 (seen in Table 1). The numbers were again relatively stable between 2013 and 2016, with a slightly decreasing trend in the end (33.9).

Figure 1. The GINI coefficient (income distribution) for Portugal, the European Region and EU *[Source: (11)]*
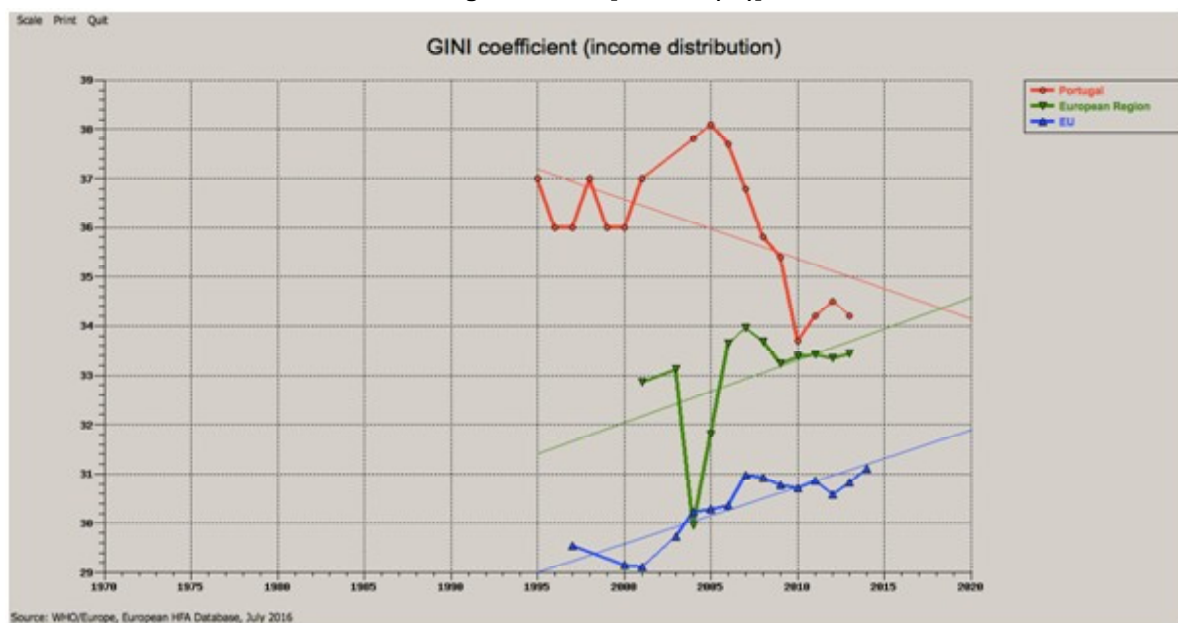
It is important to point out that a change in the figure might look huger than the actual numbers are. Moderate differences in the graph are only small changes in decimal numbers. Translating the numbers into words; the income distribution was

the most equal in the year 2010 (lowest measured number of Portugal). On contrary, the highest number was measured in 2005, which indicates an unequal income distribution.

Table 1. GINI coefficient, income distribution (scale from 0 to 100) for Portugal and the European Union. Data from 2008 to 2015 *[Source: (25)]*

| Years	2008	2009	2010	2011	2012	2013	2014	2015	2016
Portugal	35.8	35.4	33.7	34.2	34.5	34.5	34.5	34.0	33.9
European Union			30.5	30.8	30.5	30.5	30.9	31.0	

Compared to the European Union data, Portugal has the higher numbers and is therefore less equal than the average. The EU performs the best numbers with values between 29 and 31.1. In the WHO European Region the numbers were higher. Most numbers range between 33 and 34. Only the years of 2004 and 2005 have outstanding lower numbers (going down to 30.2).

Life expectancy

The life expectancy at birth in years for Portugal, the EU and the WHO European Region is presented in Figure 2 below. For Portugal, the rates significantly increased after 1973 and are equal to the EU standard since 2004. For the last 6 years they are above the EU standard. After 1980 the numbers were above the European Region's average of the WHO. Portugal's life expectancy significantly increased over the last 20 years (with nearly 10 years longer life expectancy at birth) and it is still rising. The WHO European Region performs worse in this comparison with only a moderate improvement over time.

Figure 2. Life expectancy at birth (years) for Portugal, the European Region and the EU *[Source: (11)]*
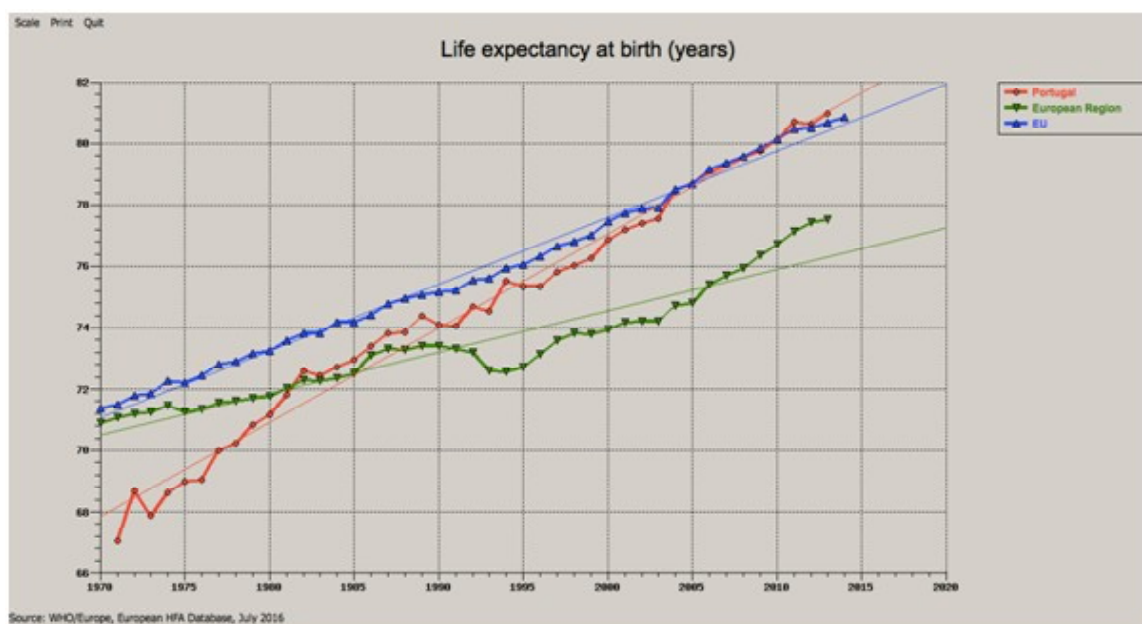
Data is available until 2013. For 2015, the numbers from Eurostat and from the WHO European Region were 84.1 years, which is relatively stable over the last 3 years (see Table 2 below).

Table 2. Life expectancy at birth (years) for Portugal and the European Union from 1980 to 2015. Data from 2014 and 2015 are estimated *[Source: (12,26)]*

Years	1980	1990	2000	2010	2013	2014	2015
Portugal	71.5	74.1	76.8	80.1	80.6*	81.3/*81.0	81.3/*81.0
European Union				79.9		80.9	80.6
WHO European Region					77.0*	77.5*	77.7*

*Rates differ between sources.

Discussion

Summary of evidence

As pointed out during the literature review, Portugal has measurable health inequalities across regions and across gender. An expected result of this study was therefore that Portugal performed worse than the European average in both indicators, which in fact is not the case.

However, the majority of articles claim that income distribution is strongly related to social factors, influencing health inequalities.

Looking at the measured GINI index (income distribution) it became clear that Portugal performed worst in the comparison and that the EU average performs with the best numbers. Portugal has higher numbers referring to an unequal distribution of income. The WHO European region performs moderately. However, the unusually numbers in 2004 and 2005 were significantly low and indicate an equal economy.

For the life expectancy at birth, Portugal performs with the highest numbers of 81 years. The EU has similar numbers, with half a year less on average. The WHO European Region has a significantly lower life expectancy at birth (77.5) years. It became clear that these indicators (both common measurement for health inequalities) differ from their results and conclusions.

The results of the statistical analysis go in line with the literature review. The GINI index should not be taken as the only measurement for health inequalities since the social aspects of them are multi-factorial and complex to measure (23).

In addition, the findings are contrary to the argumentation of Wilkinson, R. G., & Pickett, K. E, which claim that a majority of societies with a high-income distribution perform worse in health

comparisons (22). This article indicates a higher life expectancy of Portugal, compared to the EU average and simultaneously a higher GINI coefficient for Portugal.

Limitations

Several data resources, such as the WHO report or the HFA-BD are lacking data from some countries or only include data from 2013 or older dates. In addition, several data sources present different numbers and vary in the way the indicators were measured.

A further limitation was the language barrier, since some articles were only published in Portuguese or only published as an English abstract.

This article indicates a need for further research for health indicators to adequately calculate health inequalities and all related socio-economic factors. This requires additional effort for consistent and coherent data collection across the EU and the WHO European Region. Interpretations of data collections like this can be used for policy recommendations towards the reduction of health inequalities.

Conclusion

This article's aim was to identify if the GINI indicator is a good measurement for assessing health inequalities. The literature review and the researched statistic indicate a similar result: the GINI index is a measurement to assess social stratification and issues that strongly influence health. Nevertheless, no direct conclusion from the GINI coefficient (income distribution) can be drawn to health inequalities. Additional indicators have to be taken into consideration when making conclusions from the income distribution to health inequalities.

Conflicts of interest: None declared.

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