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Public Health in Portugal: Past and Future

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Preface

Sam Willner

We have the pleasure to welcome guest editor Professor Emeritus Jan Sundin from Linköping University to introduce this thematic issue of Hygiea Internationalis, focusing on the demographic development and public health policies in Portugal during the last century.

Introduction
Public Health in Portugal – Past and Future

Jan Sundin

Public health has converged in Western European countries during the last century as science, policy as well as demographic outcome. The road to this situation has, however, differed, for instance through a relatively early "modernization" towards a welfare state in the north compared with a later and less straightforward development in the south. Amongst the latter countries, Portugal's history during the 20th century has specific traits. It started with a monarchy, followed by a republic that evolved into a conservative dictatorship. Welfare was for long mostly handled by the *Misericórdias*, a non-state institution with deep historical roots, and religious foundations. Life expectancy quite low while fertility remained high. This situation changed rapidly after the democratic revolution in the 1970s. A new public health policy was formulated and implemented within a welfare state influenced by the British example. Simultaneously, both mortality and fertility dropped rapidly. Portuguese life expectancy approached the more favorable ones in Europe. Consequently, the population has been aging rapidly. International and domestic migration had for a long time been considerable with different shapes. In recent times it has mainly consisted of a population movement from the interior to the urban economically more expansive centers by the coast. Welfare and public health is therefore threatening to result in mismatches of the regional and local allocations of public resources, complicated by the economic crisis during the first decade of this century.

The present issue is a report from an ambitious project that analyses the demographic development and public health policies in Portugal from the onset of the 20th century until the year 2013. This history is followed by 20 year-projections of the county's demography from 2011 to 2031. The aim of this endeavor is to formulate realistic estimates of a continued ageing process and its impact on future regional and national expenditures for the support of a healthy population. Ageing and the development of new, costly medical treatments can for instance be expected to increase these expenses during the 20 years ahead. Introducing the potential effects of other structural factors, the project finds this challenge to be less massive than

expected. It is a common finding in today's Portugal and elsewhere that the individuals' educational levels are significantly, positively correlated with their health – from the lowest to the highest levels. The Portuguese projections suggest that the present trend towards an increase of the higher educational levels in the younger generations will continue. At the same time, as an undeniable event, the oldest generations with predominantly low educations will be replaced by younger peers with generally higher educations. This implies less need of health services among the elderly, at least partly counteracting the process of ageing.

After the reports of the main findings of the project *Pedro Guedes de Carvalho* gives a number of convincing arguments for the value of a multidisciplinary approach to issues concerning health and health policies.

Finally, *Pedro Pitta Barros* reports on studies of an expected but absent negative correlation between self-assessed health and tobacco consumption. Generally, it has been observed many a time that self-assessed health is a good indicator of a person's physically observable health. In the present study the said connection does not appear, whilst tobacco consumption is correlated with certain negative physical complaints that can be linked to the same factor. The author explains the contradiction as a psychological tendency of smokers to deny their health problems and over-estimate their subjective health.

The main objectives of this project has been to combine demographic and political data of past and present in order to be better prepared for the future. Present trends can of course not automatically be expected to continue. Results must therefore be handled with a considerable amount of caution by agents planning and investing in health services, which the authors are naturally aware of. Making cautious estimations based on the best available knowledge is, however, better than waiting and hoping for the best. The estimations may also be tested against the outcomes after some time, indicating whether the projections were trustworthy or not.

Demographic and Health Changes in Portugal (1900–2013)

Maria João Guardado Moreira and Filipa de Castro Henriques

Introduction

As in other parts of Europe, Portugal experienced great advances during the twentieth century. It started with more than 100 years of monarchy, then a Republic (1910), and a dictatorial regime that lasted more than forty years (until 1974). The dictatorship ended by a peaceful "Revolution of the Carnations"1, the most decisive event at the end of the century. Alongside these political events, other factors contributed to (re)configure Portuguese society, harmonizing its modernization process with that of other European countries. In fact, improvements in population's welfare sometimes took place unnoticed while occurring, only intelligible in the long term. It reflected the interdependence between demography, economy, wellbeing and public policy, in particular those implemented in healthcare areas.

At the beginning of the twenty first century, long and stable life cycle emerged, replacing the previous short and instable life cycle. This new life cycle is accompanied by a stagnation in natural growth, more recently in Portugal. Since 2009, a new trend in Portuguese demography break-out, it has been continuously negative. The continuous drop in fertility, the decrease of mortality levels, not only of infant mortality but also in older age groups, contributed to an ageing society.

Ageing has, in fact, become a dominant feature not only in Portugal but worldwide with consequences on support services for the elderly, adaptation of healthcare to new population groups and reformation of the public pension system.

Our aim with this paper is to give an overview of the Portuguese health and demographic change through the twentieth century up until today, with special focus on the 1970's until 2013, identifying the characteristics and specificities of the demographic and epidemiological transition model as well as the phases of the ageing process in Portugal in order to understand the different impacts on the health system. We base this article on own research; literature in different fields e.g. history,

1 "Revolução dos Cravos".

demography, health, policies, geography and data available on national and international sources.

This article begins with an introduction of Portugal in a European context, comparing the pre-war world with today, according to several indicators. Secondly, we focus on major demographic features, their chronological progress and relation with health and the epidemiological transition. This relation is discussed in more detail in the third part. Finally, we introduce the ageing process in Portugal and its milestones over time.

Introducing Portuguese Demographic Changes in a European Context

In Portugal, demographic change occurred not only slowly but also belatedly, when compared to Western European countries. While Eastern and Southern Europe struggled with an unequal development, Western Europe was leading in economic, social, health and wellbeing indicators.

In 1900, Western Europe registered a general mortality rate (GMT) of 17‰, Eastern Europe 27‰2 and Portugal3, as a southern country, 21‰. This intercontinental asymmetry still remains, though fainter, with GMT at 9‰ in Western, 14‰ in Eastern European and 10‰ in Portugal.

These achievements were even greater when taking into account infant mortality (IMR). In 1900, IMR was around 200‰ in most countries in Eastern and Southern Europe, but only 140‰ in Portugal, although it increased in the 1920's to 160‰, due to the Spanish flu epidemic. Northern countries, such as Sweden and Norway, already reported values below 100‰. Today, Europe is considered the safest place in the world for a new-born, with Sweden at 2.6‰ and Portugal at 3.4‰ (European average in 20124 at 3.8 ‰).

In the early twentieth century, life expectancy at birth (E0) was short. In Europe, in general, a man lived on average 47 years and a woman 50 years. By mid-century, this figure was 66 years for men and 72 years for women. In 2012, it had risen to 77 years for men and 83 years for women. But these figures cover different realities: in 1900, Norwegian women lived on average longest - 59 years; their Russian counterparts had the shortest life expectancy (38 years) and E0 for Portuguese women was also very short (40). In 2012, E0 for French, Swiss and Italian women was 84-86 years, but much lower in Eastern European countries with the lowest E0 in Moldova

2 J.-P. Bardet, J. Dupaquier, *Histoire des populations de l 'Europe-II La revolution demographique 1750–1914 (*Paris,1999), p.129

3 INE - *General Census of Portuguese Population* and *Demographic Statistics*, between 1900 and 2011.

4 *World Population Data Sheet 2013* (www.prb.org)

(75 years) and Russia (76 years). Nowadays, Portugal figures have moved towards the top, and women can expect to live almost 84 years.

During this period, fertility behaviour went through a gradual change. Policies that favoured the reduction of the number of children per woman, such as family planning, urban and industrial growth, emancipation, late marriages, and also because children are now seen as a cost rather than workforce. In 1900, Eastern Europe had more born children per thousand inhabitants and year (GFR), about 34, while the West had the lowest GFR (27‰)5. At this point, Portugal was close to the highest value (33‰). However, more than a century has passed and realities have changed. The number of born children is no longer sufficient to ensure the renewal of generations into equal sizes. Countries that had the strongest fertility indicators in the past are now struggling with extremely low GFR's. Portugal has one of the lowest GFR (8‰), while Northern countries, such as Sweden with 12‰, are now ranked at the top.

Low GFR and increased emigration reflects today's Portuguese reality. According to the latest data released by the National Institute of Statistics, the Portuguese population decreased by about 145,000 since 2010. This trend is the consequence of accumulated losses of natural growth since 2009, and strong net out-migration growth since 2011 as a result of both increased emigration reduced immigration.

Demographics Trends

At the beginning of the twentieth century Portugal was a monarchy, a kingdom with a vast colonial territory, where nothing seemed to disturb more than 750 years of political history. More than a century has passed since then and gradual changes has led to a democratic country with a smaller territory. But these are not the only important changes.

Comparing an average Portuguese from nowadays with an average Portuguese at the beginning of the twentieth century, in terms of economic, social, educational and demographic indicators tells us the following: In 1900 a Portuguese held a tenth of economic power when compared to today's reality. The population was mainly dedicated to the primary sector6 (64% of the workforce), due to a late and weak industrialization. Only 21% of the population were employed in services and 18% in the industry, as a contrast to today when the tertiary sector occupies 64%, agriculture 11% and industry the remaining 25% of the working population. In 1900, 75% of

5 J.-P. Bardet, J. Dupaquier, *Histoire des populations de l 'Europe-II La revolution demographique 1750-1914 (*Paris,1999), p.129

6 Álvaro Aguiar e Manuel M. F. Martins, "O Crescimento Industrial", in Pedro Lains, Álvaro Ferreira da Silva (org.) *História Económica de Portugal (1700–2000)*, Vol. III , ICS, (Lisboa, 2005) pp. 185–226.

the population was illiterate comparing to today's 5%7. Almost all marriages were Catholic, instead of the current 64% non-Catholic marriages; and if previously only 11% of births occurred outside marriage, today this figure can reach 47.6%. In the early twentieth century, Portugal had 5,446,7608 inhabitants. Today, it has almost doubled its population, with 10,562,178 residents. During these 100 years, many social and political changes occurred that resulted in today's reality, the most profound after the 1970's.

In 1970, 8,611,125 persons were registered in the Portuguese Census, 278,267, less than in the previous census. The difference was the result of a strong migratory wave that went mainly to the more industrialised parts of Europe. It is estimated that between the mid-1960s and mid-1970s about 1,200,000 Portuguese left the country9. This trend was reversed in the next decade due to the Revolution of April 1974, which opened the door to the decolonisation movement in the Portuguese territories in Africa. About 700,000 Portuguese returned from the former colonies plus the return of some migrants (Figure 4). As a result, the number of inhabitants increased by 2.6 percent in 1974 and 4.4 percent the following year10. The *impact of this return was felt, not only as a demographic change, mitigating the effects of the exodus of thousands of young people at working age in the previous decade, but also in economic and social terms. The effect was, however, not evenly felt throughout the territory. Urban areas and the coastline benefitted rather than the inlands.

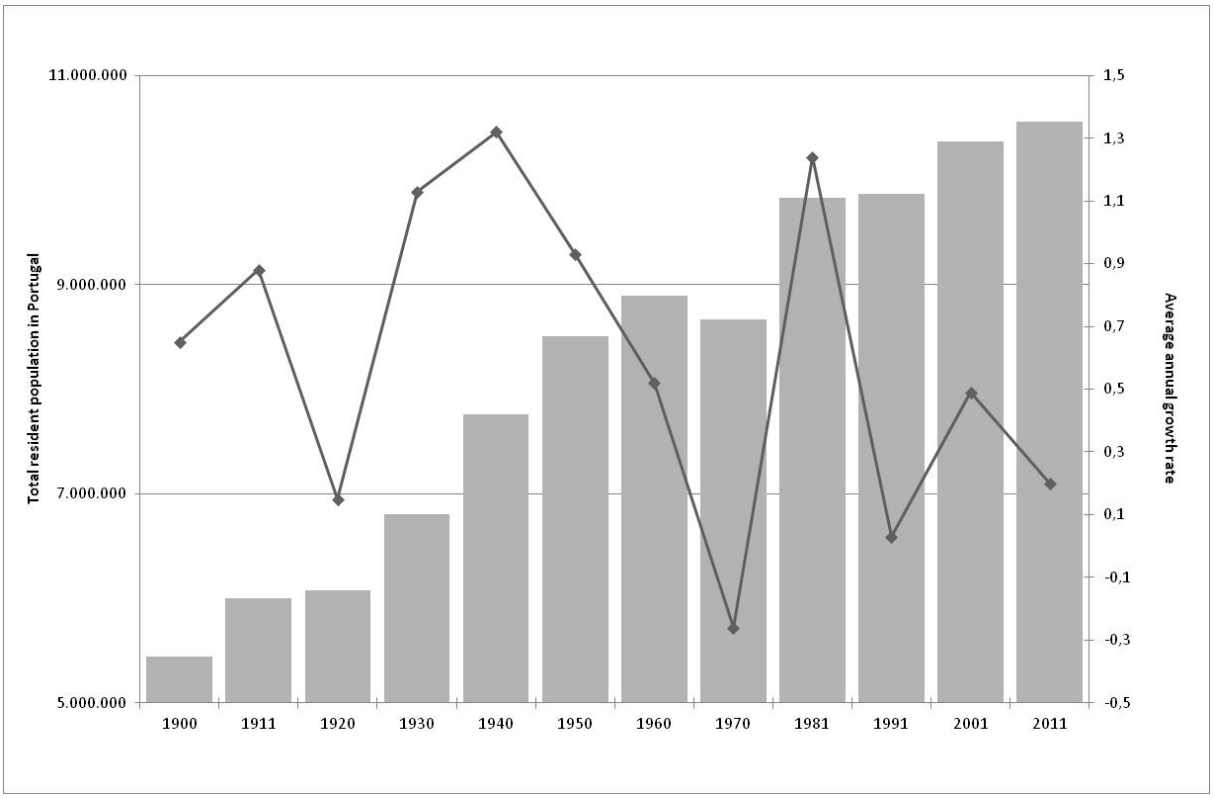
7 PORDATA, hwww.pordata.pt.

8 INE - *General Census of Portuguese Population*

9 M. I., Baganha, J. C. Marques, "População", in Nuno Valério, (org.). *Estatísticas Históricas Portuguesa*, II, INE (Lisboa, 2001) pp. 33-126; Maria João V. Rosa, P. Chitas, *Portugal: Os Números,* FFMS (Lisboa, 2010).

10 Filipa C. Henriques, Teresa Rodrigues, "O Século XX: a transição", in Rodrigues, Teresa, coord., *História da População Portuguesa,* (Lisboa, 2008) pp. 417–513.

Figure 1. Growth trend of the Portuguese population 1900-2011



Source: INE - General Census of Portuguese Population, between 1900 and 2011.

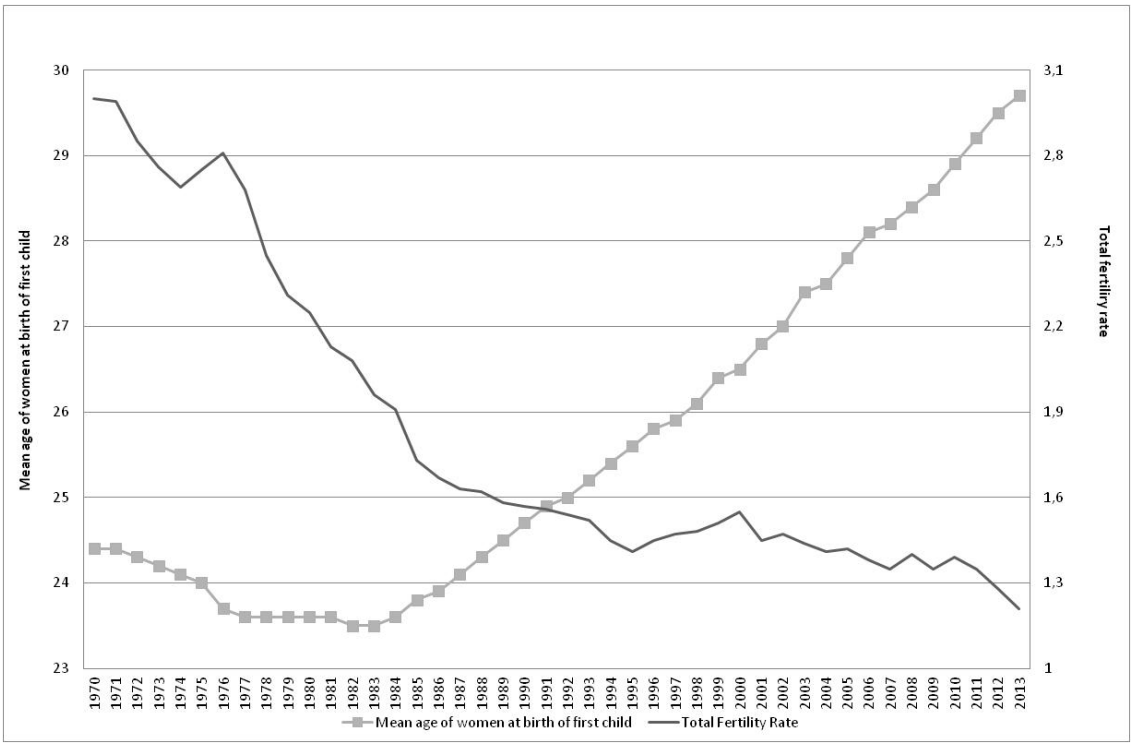
The following censuses registered a modest increase of the population (Figure 1). It was due to rapidly changing attitudes towards fertility and changing mortality patterns characteristic of other European countries. Indeed, the revolution of 1974 not only led to a change in political regime, and a greater openness towards economic development, foreign investment and influences from abroad. It also led to an improvement in the living conditions of the population, the development of a welfare state, the creation of the National Health Service and a system allowing for a gradual increase in the educational level of the Portuguese people. Simultaneously, the concentration of the population in urban areas and along the coastline contributed to a progressively evolving depopulation of the inland regions, especially the rural areas. In 2011, this means that: there has been a decrease in the number of municipalities in the inland. Only eleven of these, excluding the Algarve due to its tourism, have a positive trend in production and work opportunities. It can be compared with the coastline in general and the metropolitan areas of Lisbon and Oporto in particular, hosting around 43 per percent of the Portuguese population.

All these events are interrelated in complex ways and progressively influence individual behaviours, paving the way for new forms of parenthood and conjugal lifestyles. The increase in stepfamilies and single-parent families is a consequence of the increase in divorce, cohabitation without formal marriage, and the growth in the

number of births outside marriage. It also means a greater participation of women in the labour market and changes in the level and timing of fertility.

Such changes indicate a modernisation of the country that will translate into a reduction in fertility levels (Figure 2). In 1900, the total average number of children per women (TFR) was as high as 4.6, increasing even more in 1911 to 4.8. A substantial decline down to 3.7 took place between the 1930's and 1940's and in 1960 TFR was 3.2 children per woman, a figure that has hardly changed in 1970 (3.0). Since 1982 a stable reproduction rate of the population no longer exists, i.e. when TFR is 2.1, the figure necessary for a new generation of the same number of mothers. In 2013, this indicator has reached the lowest level ever, 1.2 children per woman, putting Portugal among the European countries with the lowest fertility rate and a secular downward trend of TFR. This evolution to a low fertility profile occurs, as mentioned, in the context of social changes associated with new family models. However, it also reflects a postponement of the mean age at which women give birth of their first child - in the 1960s 24- 25 years and in 2013 29.7 years of age (Figure 2). The impact of the changes observed in terms of the role and the intervention of women in society could also have been influenced by different reproductive behaviours, particularly when relating the time of motherhood with the mothers' levels of education. Women with higher levels of education tend to delay motherhood, which can be explained by the attendance of a longer school career.

Figure 2. Mean age of women at birth of first child and Total Fertility Rate (TFR) in Portugal 1970–2013



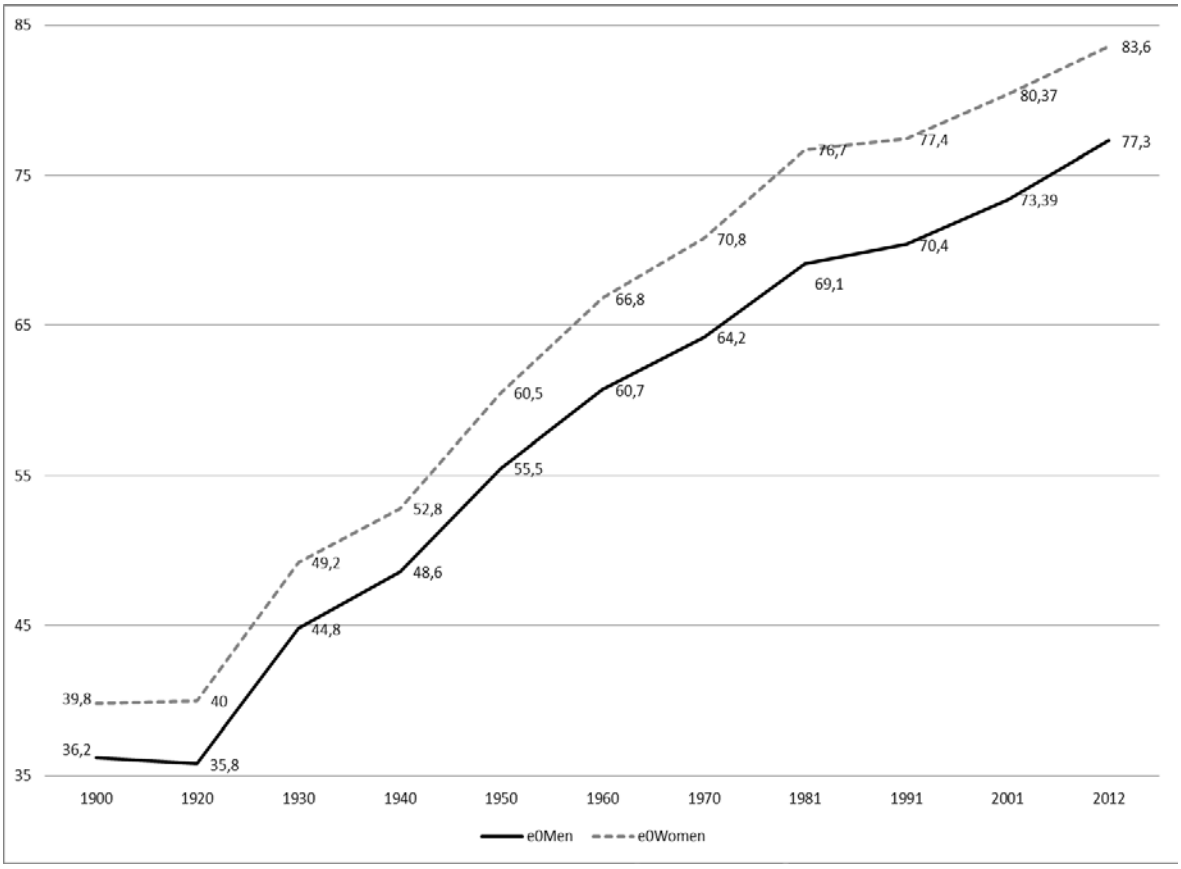
Source: PORDATA, 2014,

Arising from this trend of declining fertility levels, the number of live births has declined sharply. In 2013 there were 82,787 births, a figure very far from the 180,690 live births in 1970 (Figure 6). The consequence of this trend is the decrease in the number of children and youth, reflected in the progressive narrowing of the base of the age pyramid of the Portuguese population.

Alongside the reduction in fertility, a reduction in mortality rates also contributed to the ageing of the Portuguese population indicating substantial improvements in the quality of life and access of all social groups to the national health system. Throughout the twentieth century, the decline in mortality, which was reflected in the prolonged life expectancy, contributed to the enlargement of the top of the pyramid, causing the progressive increase of the population aged 65 and over. In 1900, life expectancy at birth was about 38 years (about 36.2 for men and 39.8 for 1900, life expectancy at birth was about 38 years (about 36.2 for men and 1900, life expectancy at birth was about 38 years (about 36.2 for men and 39.8 for women). These values even decreased after the Spanish Flu epidemic. In 1920, men were only expected to live about 35 years. Since 39.8 for women). These values even decreased after the Spanish Flu epidemic. In 1920, men were only expected to live about 35 years. Since then, life expectancy increased rapidly, reaching 67 years in 1970 (64.2 for men and 70.8 for women), while the same indicator for life expectancy at the age of 65 (E65) was 13.5 years, with an advantage for women (14.6 years against 12.2 years for men). About forty years later, in 2012, E0 reached the age of 80 for both genders, 77.3 for men and 83.6 for women11. E65 did also show significant gains for the elderly: over 5.5 years for both genders combined, a little less than 5 years for men and about 6 for women (17.1 and 20.4, respectively)12.

11 PORDATA, www.pordata.pt.
12 PORDATA, www.pordata.pt.

Figure 3. Life expectancy at birth for men and women in Portugal 1900-2012.



Source: INE - General Census of Portuguese Population, between 1900 and 2011.

Table 1. Annual growth average, total, natural and migratory rate in Portugal 1900-2011

Year	Total	Natural	Migratory
1900–1911	0,95%	1,37%	-0,42%
1911–1920	0,09%	0,70%	-0,62%
1920–1930	1,41%	1,42%	-0,01%
1930–1940	1,23%	1,15%	0,08%
1940–1950	0,97%	1,05%	-0,08%
1950–1960	0,47%	1,22%	-0,74%
1960–1970	-0,32%	1,15%	-1,47%
1970–1981	1,34%	0,87%	0,46%
1981–1991	0,03%	0,34%	-0,31%
1991–2001	0,48%	0,09%	0,39%
2001–2011	0,20%	0,02%	0,18%

Source: INE - *General Census of Portuguese Population* and *Demo graphic Statistics*, between 1900 and 2011.

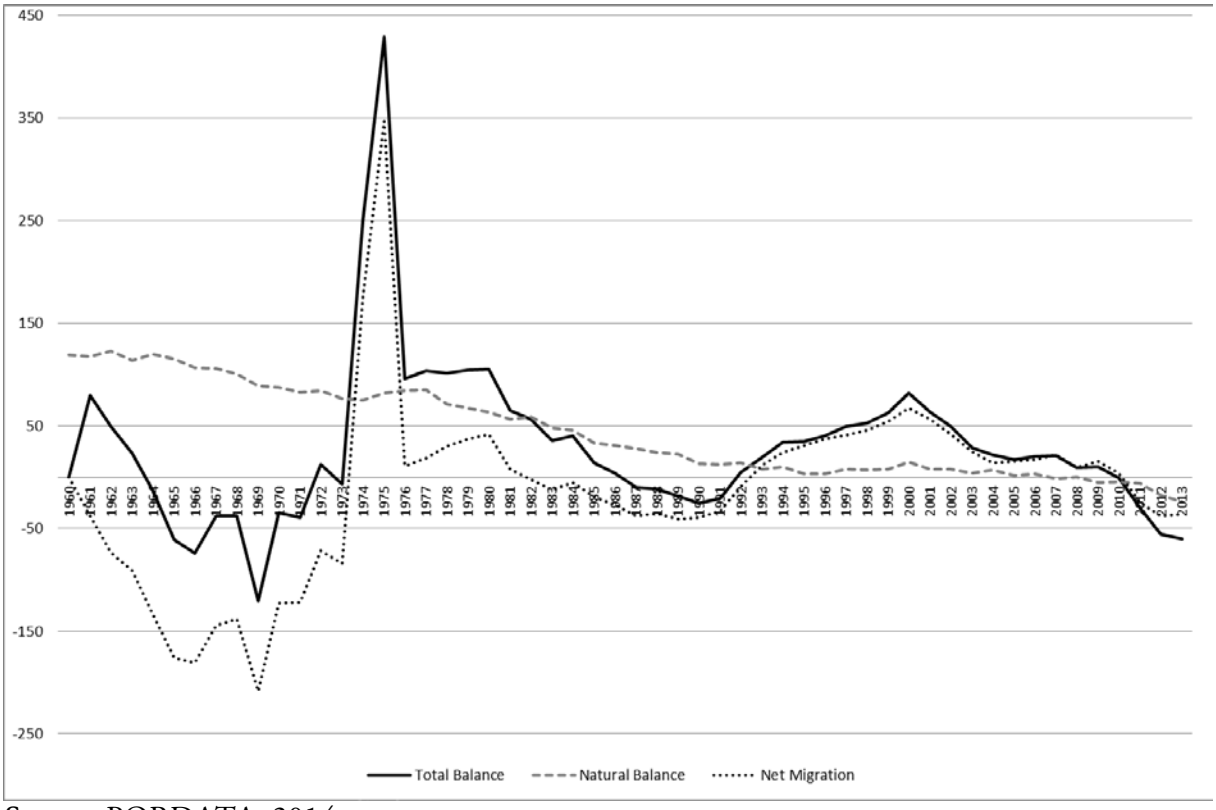
Behind this mortality decline (Figure 6) is the progress of medical science regarding diagnosis and treatment and improvements of socio-economic conditions, such as hygienic practices and the development of public health[13]. The changing pattern of mortality structure was in the recent past caused by a reduction during the first year of life, resulting in a concentration of deaths at older ages. Simultaneously, changes in the profile of causes of death occurred, such as a change from a dominance of infectious and parasitic diseases to chronic and degenerative diseases. These changing patterns of mortality, to which we should add the behaviour of fertility, characterise the demographic and epidemiological transition, to which we will return later.

Between 1970 and 2011, the dynamics of the Portuguese population reflects the trends of natural growth, but also the direction and intensity of migratory movements. Until the 1990s, population growth is mainly due to natural growth. However, from 1991 to 2001 migration becomes the primary determinant (Table 1 and Figure 4). The annual growth rates (total, natural and migratory) highlight the importance of migratory flows in that period. Indeed, emigration is a structural constant since the nineteenth century, although the intense emigration flows of the 1960s and 1970s had the greatest impact on the evolution of the population during the twentieth century.

Along with emigration, internal mobility in the 1960s and 1970s contributed to the geographic redistribution of the population caused by—greater or lesser attractiveness of regions. Hence, the largest population streams went to the urban, coastal areas, the centres of economic, political and administrative activities. Consequently, youth at working ages gradually left the interior rural areas. Thus, the evolution of the Portuguese population, both at a national and regional level, has been conditioned by the intensity and direction of migratory flows. Some areas were penalised twice as origins for both emigration to other counties and migration to urban, coastal areas.

13 Ana A. Fernandes, Maria João G Moreira, Teresa Rodrigues, "Transição demográfica e transição epidemiológica", *Forum Sociológico*, 11/12 (2) (2004), 75-104; Maria João G Moreira, Teresa Rodrigues, "Os modelos de mortalidade em Portugal", *Ler História*, 49 (2010), 145–169.

Figure 4. Natural balance and net migration between 1960 and 2011



Source: PORDATA, 2014.

Demographic and Epidemiologic Transition

The relationship between a population's mortality and ageing is an important part of the demographic transition. In Portugal this occurred later than in Northern and Central Europe[14].

Throughout the nineteenth and twentieth centuries, changes in fertility and mortality in Western Europe led to the formulation of demographic transition as a theoretical concept[15]. This theory sought to analyse the process of changes in the behaviour on the micro level. It refers to a historical process that led to the transition from an old demographic regime, in which high levels of fertility usually outweighed high mortality levels, to a new regime, in which mortality and fertility declined during economic, social and political transformations during the industrial revolution. In other words, this process allowed the transition from a short and unstable cycle of life, due to morbidity and mortality conditioned by structural

14 Filipa C. Henriques, Teresa Rodrigues, "O Século XX: a transição", in Rodrigues, Teresa, coord., *História da População Portuguesa,* (Lisboa, 2008) pp. 417–513; M. Leston Bandeira, *Demografia e Modernidade. Família e Transição Demográfica em Portugal* (Lisboa, 1996).

15 This theory was first developed in the 1930s by W. S. Thomson and Landry, and later, between the '40s and '50s by Notestein, K. Davis, Blacker, Coale and Hoover (J.M Nazareth, *Explosão Demográfica e Planeamento Familiar*, Presença (Lisboa, 1982)).

conditions of the surrounding environment (nutritional deficiencies, poor health, and sanitary shortages) to a long and stable life cycle. The latter is characterised by low overall levels of mortality, high life expectancy and less dependence on sanitation, factors that changed the traditional profile of causes of death and age-specific mortality[16].

Interest in the transition is often focused on the decline in fertility. We do, however, also need to understand the evolution of mortality levels and the factors behind their sustained decline, linked to theories developed in epidemiology, public health and social sciences. One pioneer in this field is Abdel R., Omran's theory on *epidemiological transition* in the late 1960s[17].

Figure 5. The Demographic Transition - Mortality and Birth rates in Portugal 1801–2011

Source: INE – *Demographic Statistics* between 1801 and 2011.

Portugal remained in the "Old Demographic Regime", characterized by high mortality and high birth rates, until the last years of the ninetieth century. Between 1900 and 1920, a delayed demographic transition took place in a politically and socially unstable country, with a slow, but persistent, decline in mortality with the exception of the Spanish Flu epidemic in 1918. This caused an increase in life

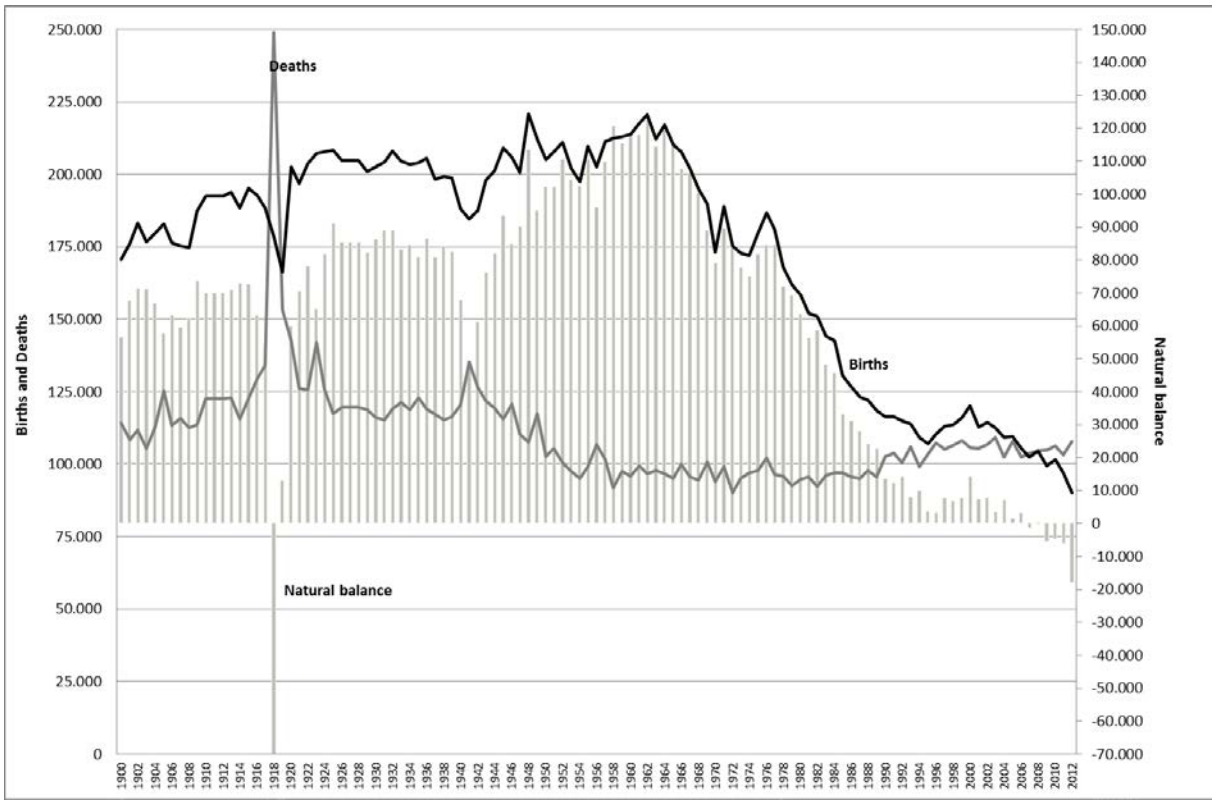
16 Maria João G Moreira, Teresa Rodrigues, "Os modelos de mortalidade em Portugal", *Ler História*, 49 (2010), 145–169.

17 A. R. Onram, "The Epidemiologic Transition: a theory of the epidemiology of population change", *The* Milbank Quarterly, 83: 4 (2005), 731–57.

expectancy (Figure 3), a decrease of the infant mortality rate (Figure 7) and the crude death rate (Figure 5). Simultaneously, the social-economic instability pressured the population to migrate and look for a better life outside Portugal. This trend intensified and remained until the 1970's. Portugal was a country of emigrants.

Despite this situation, the Portuguese population increased by 3,216,492 inhabitants between 1900 and 1970, due to natural growth. Fertility was high during the early twentieth century compared with European standards.

Figure 6. Births, deaths and natural balance of the population in Portugal .1900–2012



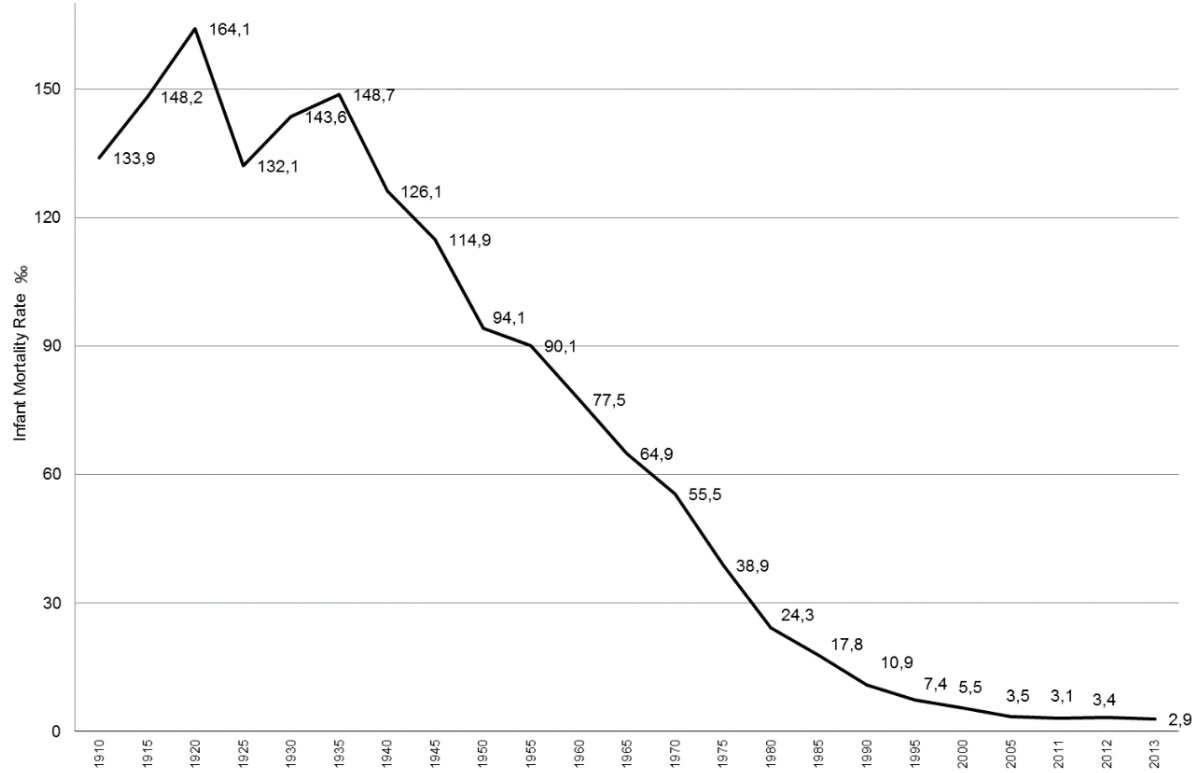
Source: INE – *Demographic Statistics* between 1900 and 2012.

However, after the 1930's a slow but consistent decline started, marking a new phase of the demographic transition, followed by the last phase in the 1980's when the number of births decreased quickly to a level below a positive reproduction rate.

For the first time since 1918, deaths exceeded births in 2007, since then a part of the Portuguese demographic scenario. The trends of mortality and life expectancy at birth refer, however, to the children's chances of survival, especially after the mid-twentieth century, thus highlighting the relationship between the decrease of infant mortality (Figure 7) and overall mortality. The decline of mortality during the first year of life has currently reached some of the lowest levels in the world (2.9 per thousand in 2013). It can be attributed to improvements in general health conditions, arising from the implementation of public health policies, as is the case of development in terms of maternal and child care and primary healthcare, widespread

family planning, and the implementation of the national plan for vaccination in 1965. But improvements in the economic and social conditions of the Portuguese population are also important factors[18].

Figure 7. Infant mortality rate (‰) in Portugal 1910–2013



Source: Filipa C. Henriques, Teresa Rodrigues, "O Século XX: a transição", in Rodrigues, Teresa, coord., *História da População Portuguesa,* (Lisboa, 2008) p. 426; INE - *General Census of Portuguese Population* 2011 and INE, *Demographic Statistics,* 2001–2013.

In the 1970s, the Portuguese population had an average life expectancy of 67 years, which placed Portugal in the third phase of Omran's transition model, i.e. at the age of degenerative and man-made diseases. According to Morais[19], it means "the loss of expression of infectious and parasitic diseases in the context of epidemiological transition, as well as respiratory infection, paralleled with worsening cardiovascular diseases".

18 Teresa R. Veiga, Maria João G Moreira, Ana A. Fernandes, "Social changes and better health conditions of the Portuguese population 1974–2000", *Hygiea Internationalis,* volume 4, Issue 4 (2004), 255–275

19 Graça Morais, *Causas de Morte no Século XX: A Transição da Mortalidade e Estruturas de Causa de Morte em Portugal Continental* (Lisboa, 2002), p. 258.

Table 2. Some causes of death in Portugal 1930-2012 (%)

Causes of death	1930	1940	1950	1960	1970	1980	1990	2000	2010	2012
Infectious and parasitic diseases	21.1	20.9	13.5	1.9	1.0	1.5	-	-	-	-
Tuberculosis	11.2	9.8	11.7	4.5	1.6	-	0.3	0.3	0.2	0.2
Disease caused by the human immunodeficiency virus (HIV)	-	-	-	-	-	-	0.1	0.9	0.6	0.5
Diseases of the circulatory system	8.5	11.7	14.2	14.8	17.0	42.8	44.2	38.7	31.8	30.4
Malignant Tumour	2.7	2.9	4.8	9.2	11.7	15.1	17.6	20.3	23.5	23.9
Diseases of the respiratory system	9.6	10.8	8.7	9.8	12.0	7.3	7.2	9.7	11.1	12.9
Diseases of the digestive system	2.1	3.5	3.8	10.1	7.5	4.9	4.5	3.9	4.4	4.2
Diseases of the genitourinary system	2.0	2.5	2.3	2.0	2.0	1.2	1.2	1.5	3.1	2.7
Symptoms, signs and abnormal clinical and laboratory findings, not elsewhere classified	16.8	16.4	17.0	15.6	15.3	13.6	11.8	12.4	9.5	9.5
Other causes resulting from diseases	22.9	18.2	20.4	27.6	26.5	6.2	6.6	7.8	11.6	12.1
External causes	3.0	3.3	3.6	4.4	5.5	7.4	6.5	4.5	4.3	3.7

Source: INE, *Annual Statistic*, 1940, 1940, 1950, 1979, 1980, 2011, 2012 (Author's calculations).

As seen in Table 2 deaths caused by infectious and parasitic diseases, usually related to poor social environment and hygiene, only started to decline after the 1950's, then presumably due to improvements in life conditions and the progress of specific therapies[20].

The revolution of 25th of April 1974 created favourable conditions for the implementation of a National Health Service, aimed to respond to the need for larger territorial coverage and a more equitable treatment, improving the access for all citizens.

Previously, the health system was very fragmented, integrating state hospitals, hospitals of *Misericórdias* (social organizations), other social medical services, municipal medical doctors, and local centres for support against maternal and child tuberculosis. Since the late nineteenth century, a special hygienist movement was created to combat tuberculosis by prophylaxis. The National League against TB was for example initiated in 1899 by the physician Miguel Bombarda and a National Tuberculosis Association was promoted by Queen D. Amélia.

20 Ana A. Fernandes, Maria João G Moreira, Teresa Rodrigues, "Transição demográfica e transição epidemiológica", *Forum Sociológico*, 11/12 (2) (2004), 75–104.

Table 3. Life expectancy in Portugal at age 65 by gender

Year	Life expectancy at age 65		
	M	F	Differences
1970	12,2	14,7	2,5
1981	14,4	18,0	3,6
1991	14,8	18,4	3,6
2001	15,6	19,0	3,5
2010	16,9	20,2	3,3
2011	16,9	20,3	3,4
2012	17,1	20,4	3,3

Source: Ana A. Fernandes, Maria João G Moreira, Teresa Rodrigues, "Transição demográfica e transição epidemiológica", *Forum Sociológico*, 11/12 (2) (2004), p. 92; PORDATA (www.pordata.pt)

During the first half of the twentieth century, the nosological framework of infectious and parasite diseases was linked to a social, hygienic and environmental contexts in the Portuguese society, revealing deficiencies in hygienic practices, preventive actions and the health system.

As previously mentioned, progressive decrease of external factors also lead to a change in the mortality profile, more visible after the 1950's. The decrease of these diseases must be related to the progress in therapy (vaccination, more widespread use of antibiotics, extending the screening), improvements of the Portuguese population's wellbeing, and to some reforms in the health system.

The impacts of the health system implemented after the mid 1970's are no doubt one of the causes of an increase in life expectancy at birth for both males and females in the 1970s and 1980s (Figure 3). Positive changes during this period in life expectancy at age 65 (Table 3), may also be related to greater efficiency in the provision of primary healthcare and a more effective and widespread network of hospitals[21].

Thus, if changes in the profile of mortality and morbidity contributed to a positive evolution of mortality rates, it is also necessary to take into account social and behavioural factors and "answers from society to health status"[22]. From this

21 Ana A. Fernandes, Maria João G Moreira, Teresa Rodrigues, "Transição demográfica e transição epidemiológica", *Forum Sociológico*, 11/12 (2) (2004), 75–104; Teresa R. Veiga, Maria João G Moreira, Ana A. Fernandes, "Social changes and better health conditions of the Portuguese population 1974–2000", *Hygiea Internationalis,* volume 4, Issue 4 (2004), 255–275.

22 In the original: "des réponses de la sociètè à cet état sanitaire" (F Meslé, J. Vallin, "La transition sanitaire: tendances et perspectives", in G. Caselli, J. Vallin e G. Wunsch. dirs., *Démographie: analyse et synthése – Les determinants de la mortalité,* Vol. III, (Paris, 2002), p. 440).

perspective, academics have since the 1980s developed the concept of health transition[23], as a compliment to the epidemiological transition theory, which they considered to be too reductive and only focusing on the determinants of health, whilst the state of health also depends on resources, values and behaviours. Moreover, it is necessary to account for a dynamic perspective, which acknowledges aspects of underlying changes in the health status of populations within a regional dynamic.

However, the concept of health transition does also have limitations, particularly with regard to the definition of health status. Infant mortality, life expectancy and the pattern of mortality by causes of death have traditionally been considered as indicators of health. However, changes in age structures in more developed countries (i.e. a higher proportion of adults and elderly due to the decline in infant mortality), and a new epidemiologic profile (prevalence of chronic and degenerative diseases), require a refocusing of research on mortality and morbidity among adults[24]. Therefore, the ageing of the population leads to a new set of questions, particularly because the outcomes in life expectancy are no longer the result of a recess in youth mortality but a delay in the mortality of the oldest.

Table 4. Healthy life expectancy in Portugal

Year	At Birth		At the age of 65	
	M	F	M	F
1995	59.6	63.1	8.3	9.9
2001	59.5	62.7	8.2	8.7
2005	58.6	57.1	6.5	5.2
2010	59.3	56.6	7.1	5.7
2011	60.7	58.6	7.8	6.3

Source: Eurostat.[25]

Although longevity may be considered an achievement, it is not synonymous with health. Living many years does not necessarily mean living them with a good quality of life. On the one hand, healthy survival and ageing has become a main goal for

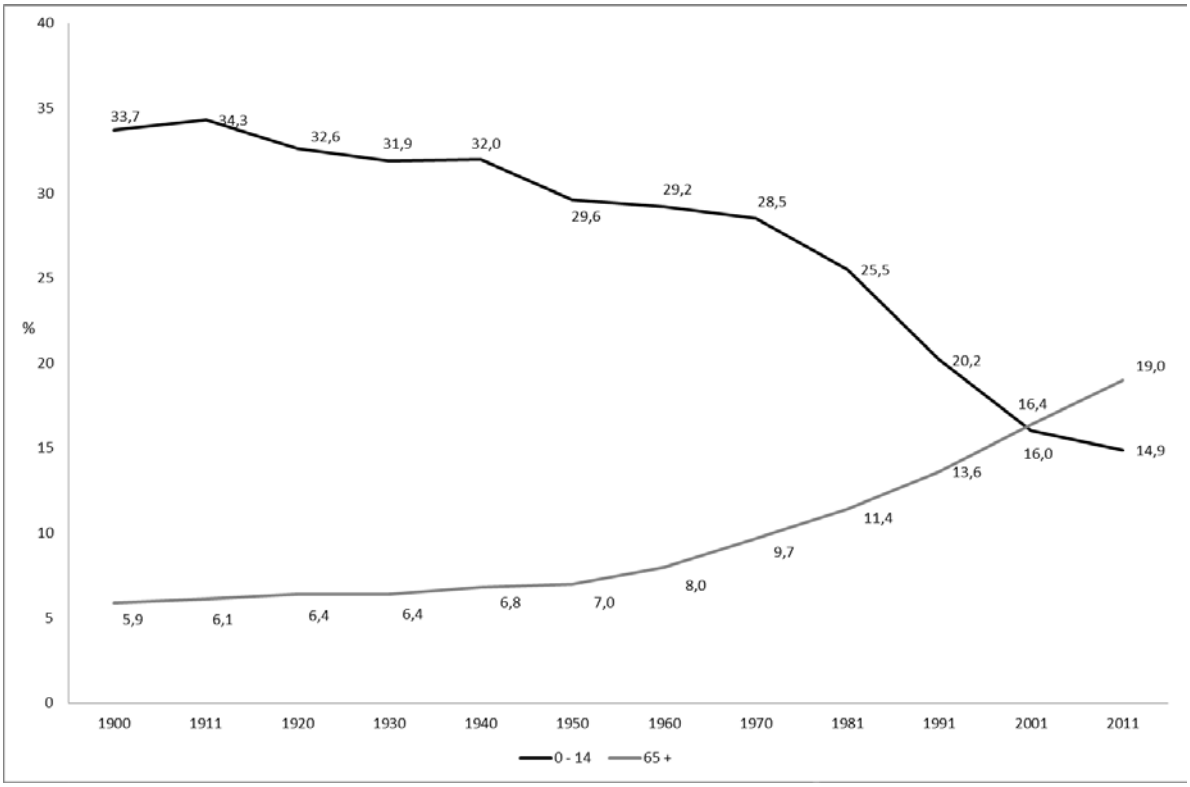
23 This concept was first developed in 1973 by Lerner. However, interest on this concept will only grow from the 1980s on, due to research at the Health Transition Centre, Canberra (Australia) driven by John Caldwell and Julio Frenk (E. R., Gonzalez, J. Bernabeu Mestre, F. G Benavides, "La transición sanitaria. Una revisión conceptual", Boletín de la Asociación de Demografía Histórica, XIV: 1 (1996), 117-144); F Meslé, J. Vallin, "La transition sanitaire: tendances et perspectives", in G. Caselli, J. Vallin e G. Wunsch. dirs., Démographie: analyse et synthése – Les determinants de la mortalité, Vol. III, (Paris, 2002), pp. 439–461).

24 E. R., Gonzalez, J. Bernabeu Mestre, F. G Benavides, "La transición sanitaria. Una revisión conceptual", *Boletín de la Asociación de Demografía Histórica,* XIV: 1 (1996), 117–144

25 The healthy life years are calculated based on mortality tables on the EU and on data collected in surveys about personal perceptions regarding disability.

populations[26], linked to the postponement of senescence and death[27]. On the other hand, it has also become important to know the vectors which determine health status (how the economic, social, cultural, biological, and environmental aspects are interrelated) in order to understand the different survival capacities of men and women. Indeed, the ageing of the population will require policies in the fields of health and social protection, responding to different levels of vulnerability[28]. Undeniably, the extension of life expectancy is accompanied by increased physical and/or mental dependence causing loss of mobility and autonomy, increasing and chronic illness, which increases the number of consumers of specific healthcare and affects requirements regarding the quality and complexity of care. Some health indicators have therefore been used, which can determine whether the prolonged life expectancy is accompanied or not by an increase of the time lived without disability. 'Life expectancy with health' does for instance measure the number of years a person of a certain age can expect to live without any moderate or severe health problem.

Figure 8. The proportion of young and elderly population in Portugal 1900–2011



Source: INE - General Census of Portuguese Population, between 1900 and 2011.

26 Ana A. Fernandes, "Determinantes da mortalidade da longevidade: Portugal numa perspectiva europeia (EU-15, 1991–2001)", *Análise Social*, XLII (183) (2007), 419–443.

27 J. W., Vaupel, "Biodemography of human aging" *Nature* 464(7288) (2010), 536–542.

28 Ana A. Fernandes, "Determinantes da mortalidade da longevidade: Portugal numa perspectiva europeia (EU-15, 1991–2001)", *Análise Social*, XLII (183) (2007), 419–443.

Actually, from 1995 to 2011, the average 'healthy life expectancy' without disabilities for Portuguese women at birth and at age 65 has diminished, despite the fact that they can expect to live longer (Figure 3 and Table 3)! In 2011 (Table 4), that number of 'healthy years of life' at birth, was 60.7 for men and 58.6 for women and at age 65 the same figures were 7.8 and 6.3. This suggests a greater need for healthcare, particularly for females.

The ageing process

The reduction in mortality and fertility during the demographic transition is accompanied by changes in the population's age structure. In the early twentieth century, Portugal was a young country (about 34 percent of the individuals were under the age of 15), but by the mid of the century this started to change. Thus, the proportion of the age groups at the top of the age pyramid increased gradually with a simultaneous reduction of the proportion of younger age groups (Figure 8) and an increase of the average age of the population. In 1970 the average age was 32.1 years, in 2011 it reached 41.8 years (40.3 for men and 43.3 for women). This process by which the Portuguese society went from young to aged, is one way to frame the outcome of the inter-relationship between trends in mortality and fertility.

Table 5. Deaths according to some causes of death by old age groups - % in Portugal

	1994			2001			2010		
	65-79	80 and +	Total	65-79	80 and +	Total	65-79	80 and +	Total
Infectious and parasitic diseases	0.8	0.4	1.5	1.2	0.6	2.0	2.3	1.9	2.5
Neoplasms	23.7	10.6	19.6	26.5	12.4	21.2	32.1	14.6	24.0
Endocrine, nutritional and metabolic diseases	4.7	3.0	3.5	5.4	3.9	4.2	6.3	5.6	5.3
Diseases of the circulatory system	45.0	54.5	42.9	38.2	49.0	38.6	28.6	39.6	31.8
Diseases of the respiratory system	7.2	8.9	7.1	8.0	11.1	8.5	9.0	14.7	11.1
Diseases of the digestive system	4.6	2.5	4.4	4.5	2.7	4.2	4.6	3.4	4.4
Symptoms, signs, abnormal clinical and laboratory findings, not elsewhere classified	7.7	15.7	11.5	8.5	13.8	11.3	7.3	9.9	9.5
External causes	3.0	1.6	5.7	2.9	1.7	4.9	3.4	2.1	4.3

Source: Eurostat (author's calculations).

The progressive and continuous decline in fertility is a key to the narrowing of the base of the population pyramid. The total fertility rate, i.e. the average number of

children per woman, is currently well below the level needed for a generational reproduction to the same size (see Figure 2). The analysis of the role of immigration as mitigating or reversing the ageing process indicates that this effect can only be a temporary conjuncture and, the ageing of the Portuguese population will continue, at least in the medium perspective [29].

The increased life expectancy of the Portuguese people during the twentieth century has no historical parallel: between 1900 and 2012 it meant an increase of 41 years for men and 44 years for women. In the first stage, this increase depended on the decline of infant mortality[30], rejuvenating the age structures. Later, declining levels of mortality for adults [31], reversed the process into an ageing population[32]. This meant a new pattern of causes of death, a result of the epidemiological transition.

Today, mortality is dominated by chronic and degenerative diseases, such as cardiovascular diseases or neoplasms that primarily affect the elderly population. Table 5 shows that these are the most common causes, both in the ages 65-79, and 80 years and older. Such a pattern has existed since the mid-1990s and throughout the first decade of the current century. However, diseases of the circulatory system have been decreasing since 1994, overtaken in 2010 by neoplasms in ages 65-79. According to Oliveira and Mendes[33], the decrease in mortality associated with diseases of the circulatory system has been the main factor behind the increase in life expectancy since the 1990s[34]. Diseases of the respiratory system have increased among 80 years and older, which may have contributed negatively to the prolongation of life expectancy[35].

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29 Maria João V Rosa, H Seabra, T. Santos, *Contributos dos "Imigrantes" na Demografia Portuguesa: O papel das populações de nacionalidade estrangeira*, (Lisboa, 2004); Maria João V. Rosa, P. Chitas, *Portugal: Os Números,* (Lisboa, 2010).

30 Isabel T. Oliveira, M. F., Mendes, "A diferença de esperança de vida entre homens e mulheres: Portugal de 1940 a 2007" *Análise Social*, XLV (194) (2010), 115–139.

31 Isabel T Oliveira, "Mortalidade: Compressão, Deslocamento e Causas de Morte (Portugal 1950-2005)", *Revista de Estudos Demográficos*, 48 (2010), 35–62.

32 "In short, up to the age of 80, improvements in life expectancy for both men and women are highly dependent on mortality of young people and particularly children up to their 1st birthday. From the '80s on,the evolution of life expectancy depends more significantly on the health of adults and the elderly and by the end of the period [2007] it mainly depends on the mortality of the elderly" (Isabel. T Oliveira, M. F., Mendes, "A diferença de esperança de vida entre homens e mulheres: Portugal de 1940 a 2007" *Análise Social*, XLV (194) (2010), 125).

33 Isabel T. Oliveira, M. F., Mendes, "A diferença de esperança de vida entre homens e mulheres: Portugal de 1940 a 2007" *Análise Social*, XLV (194) (2010), 115–139.

34 See also Felipe Ribeiro, M. F. Mendes, "O contributo das diferentes causas de morte para a diferença na esperança de vida entre Portugal e Espanha" Comunicação apresentada *X Congresso da ADEH, 18 A 21* de Junho de 2013, (Albacete, Espanha, 2013).

35 Isabel T. Oliveira, M. F., Mendes, "A diferença de esperança de vida entre homens e mulheres: Portugal de 1940 a 2007" *Análise Social*, XLV (194) (2010), 115–139.

Table 6. Proportion of people aged 80 and over in a. the age group of 65 + years and in b. the total population (%) in Portugal

Year	a. 65 +			b. Total population
	M/F	M	F	
1970	15.2	12.5	16.9	1.5
1981	14.9	11.7	17.1	1.7
1991	19.1	15.5	21.7	2.6
2001	20.9	17.5	23.3	3.4
2011	26.5	22.4	29.4	5.0

Source: INE - General Census of Portuguese Population, between 1970 and 2011.

Increased longevity also seems to be associated with increased gender inequalities in life expectancy[36]. Therefore, in Portugal, as in other countries, the female advantage has been increasing: in 1900 the female advantage was 3.6 years; in 1981, the largest difference ever was registered - 7.6 years' higher life expectancy for women. Since then this inequality has declined to 5.9 years in 2012.

The gender gap in survival (Table 3) has contributed to a 'feminisation' of ageing, most visible in the population aged 80 years and over (Table 6). In this age group, women have been in majority since 1970. The preponderance of the female population becomes more evident as the population ages. In 2011 the male/female ratio for the total population was 91.5 % but only 72.1 % above 65 years, and no more than number 54.9 % for ages 80 years and above.

The increase in life expectancy has also increases the *number* of very elderly people. In 2011, 532,219 individuals were 80 years old or more, representing 5 percent of the total population. This group was the fastest growing, over 300 percent larger than in 1970.

Besides the decline of *natural* growth, migration has also had an important role in triggering the process of ageing in Portugal. As mentioned earlier, migratory movements are a structural constant in the Portuguese population dynamics and, evidently, the European emigration waves of the mid-twentieth century triggered the ageing process, especially on a regional level. We have seen that the internal mobility and the mobility to Europe that characterised the '1960s and '1970s had a very significant impact on the redistribution of the population and largely explain the regional asymmetries. In the second half of the twentieth century the coastline began to grow, partly at the expense of the inland. Since the typical migrant is usually young, mobility causes a rejuvenation in the areas of destination and ageing in the regions of out-migration.

36 Isabel T. Oliveira, M. F., Mendes, "A diferença de esperança de vida entre homens e mulheres: Portugal de 1940 a 2007" *Análise Social*, XLV (194) (2010), 115–139.

Thus, the combination of internal and external migration with fertility and mortality at different levels and speeds of decline, explain the regional dynamics of ageing. Rates of population change in the age groups 0-14 years and 65 years and over between censuses from 1960 to 2011, provides a chronological image this dynamic[37].

First of all the proportion of young people declines across Portugal with some exceptions in municipalities around the metropolitan areas of Lisbon and Oporto and in Algarve in the south. Instead, there is the continuous increase in the share of the elderly population, albeit less intense between 2001 and 2011 than in previous periods.

Cartograms[38] representing the rates of change of young people (Figure 9) shows that in 60 years the difference between the coast and the inland starts to emerge, though not continuously. The effects of internal and external population mobility is also seen in the forms of emigration and internal migration from the interior towards urban centres, mostly by the coast.

The positive changes that took place in the next decade was caused by regional net migration, although it should be borne in mind that the 1970s was a time of unusually intensive political and social change. In the following years, regional asymmetries became accentuated, reinforced by lower fertility levels, even in northern regions where they were higher.

Widespread and intense increase in the percentage of the population above 65 years of age can also be observed between 1970 and 1981 (Figure10).

Beside the already mentioned migratory flows, the progressive increase in the probability of survival along with a decline in fertility levels must be remembered, with effects extended to the following years. Indeed, the widespread use of contraception, resulting from the favourable political-social conditions offered by the Revolution of April 1974, led to a progressive standardisation of behaviours, converging regional differences, with consequences on the fertility decline.

37 This methodology was used in Rodrigues, Teresa, Alves, H., Fernandes, O. "Tipologias Regionais do Envelhecimento da População Portuguesa (1900- 2005). O envelhecimento na base", comunicação apresentada na sessão "Vejez y envejecimiento en la Península Ibérica desde una perspectiva comparada (siglos XVIII-XX)", no *IX Congresso da ADEH,* 16, 17, 18 e 19 de Junho (São Miguel, Açores, 2010); Moreira, Maria João G., Alves, H., Fernandes, O. 2010. Tipologias Regionais do Envelhecimento da População Portuguesa (1900-2005). O envelhecimento no topo", comunicação apresentada na sessão "Vejez y envejecimiento en la Península Ibérica desde una perspectiva comparada (siglos XVIII-XX)", no *IX Congresso da ADEH,* 16, 17, 18 e 19 de Junho de 2010 (São Miguel, Açores, 2010).

38 The authors are grateful to Eng. Natália Roque, from SIG and CAD Laboratories, from the School of Agriculture of the Polytechnic Institute of Castelo Branco, for the preparation of the maps.

Figure 9. Rate of change in the age group 0-14 years (%), in Portugal 1960–2011

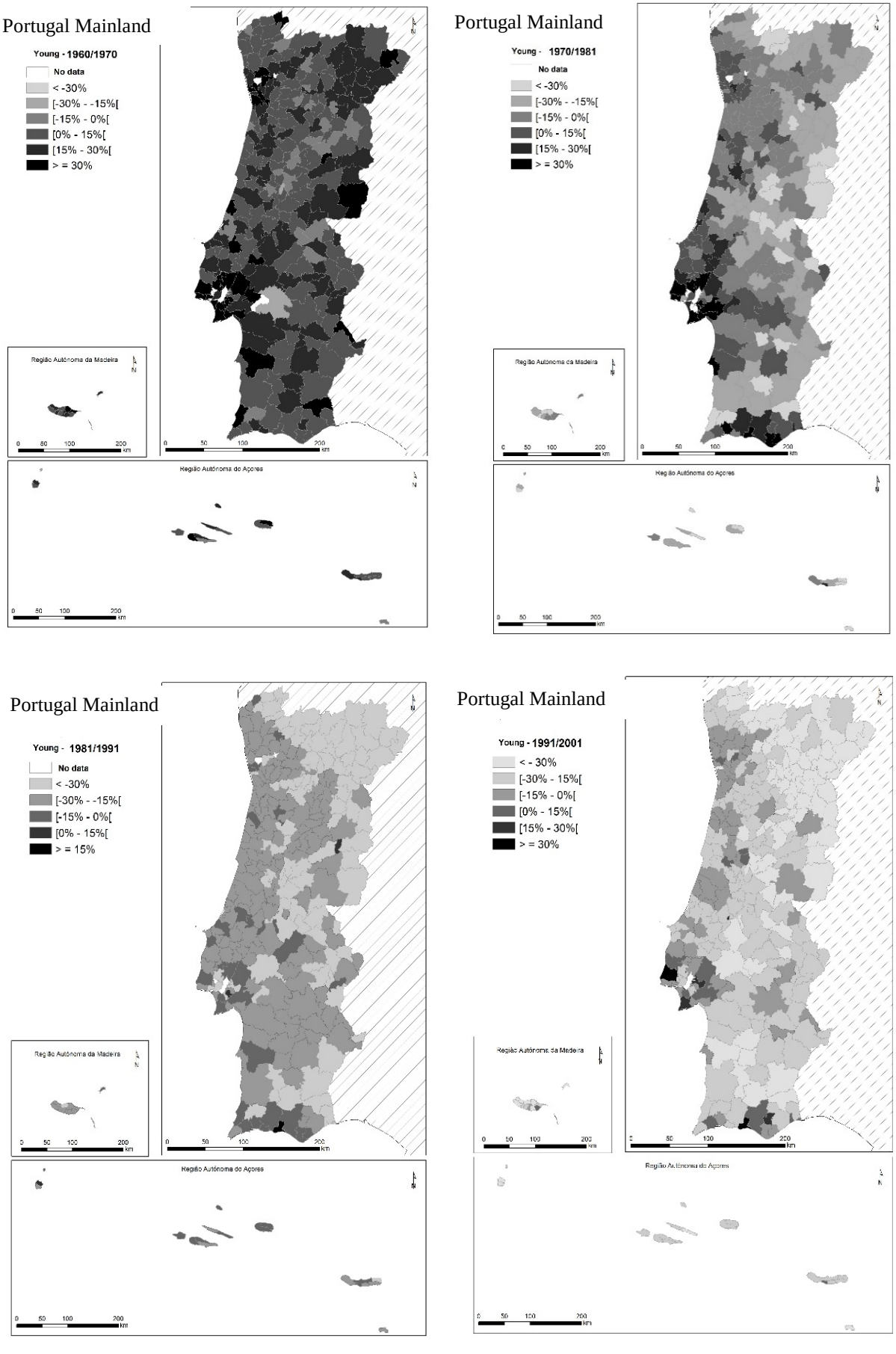
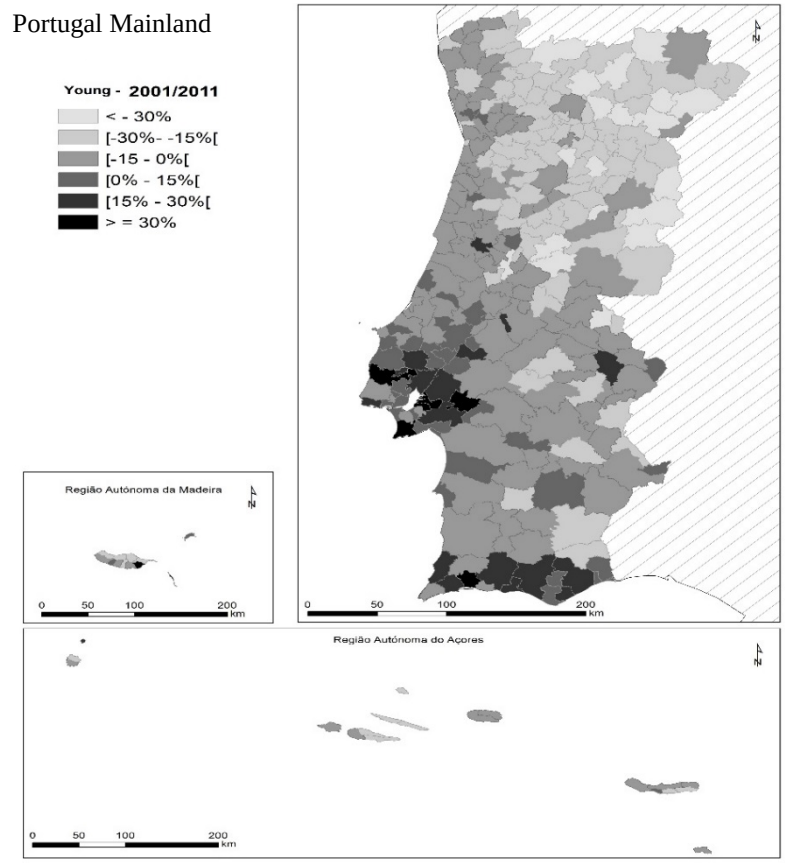


Figure 9. Continued



Source: INE - General Census of Portuguese Population, between 1970 and 2011.

In the 1990s, the ageing process extended regionally, influencing the top or the base of the age pyramid. However, in the last two decades, the municipalities that aged early had smaller variations than those that aged later, particularly visible for rural counties in the interior.

The relationship between youth and the elderly has been changing, as seen in the ageing ratio[39]. In 1970, only four municipalities had a ratio higher than 100, with the number of elderly exceeding that of the young. The situation reversed in 2011 when only 45 municipalities of the existing 308 reported an ageing ratio of less than 100, i.e. only about 14.6 percent of municipalities still maintain relatively young age structures. The values of this indicator (Figure 11), is strongly contrasting between the highest scores (597.8) and the lowest scores (64.4).

39 The ratio of the number of elderly persons of an age when they are generally economically inactive (aged 65 and over) to the number of young persons (from 0 to 14) (INE).

Figure 10. Rate of change in the age group 65 and over (%) in Portugal 1960–2011

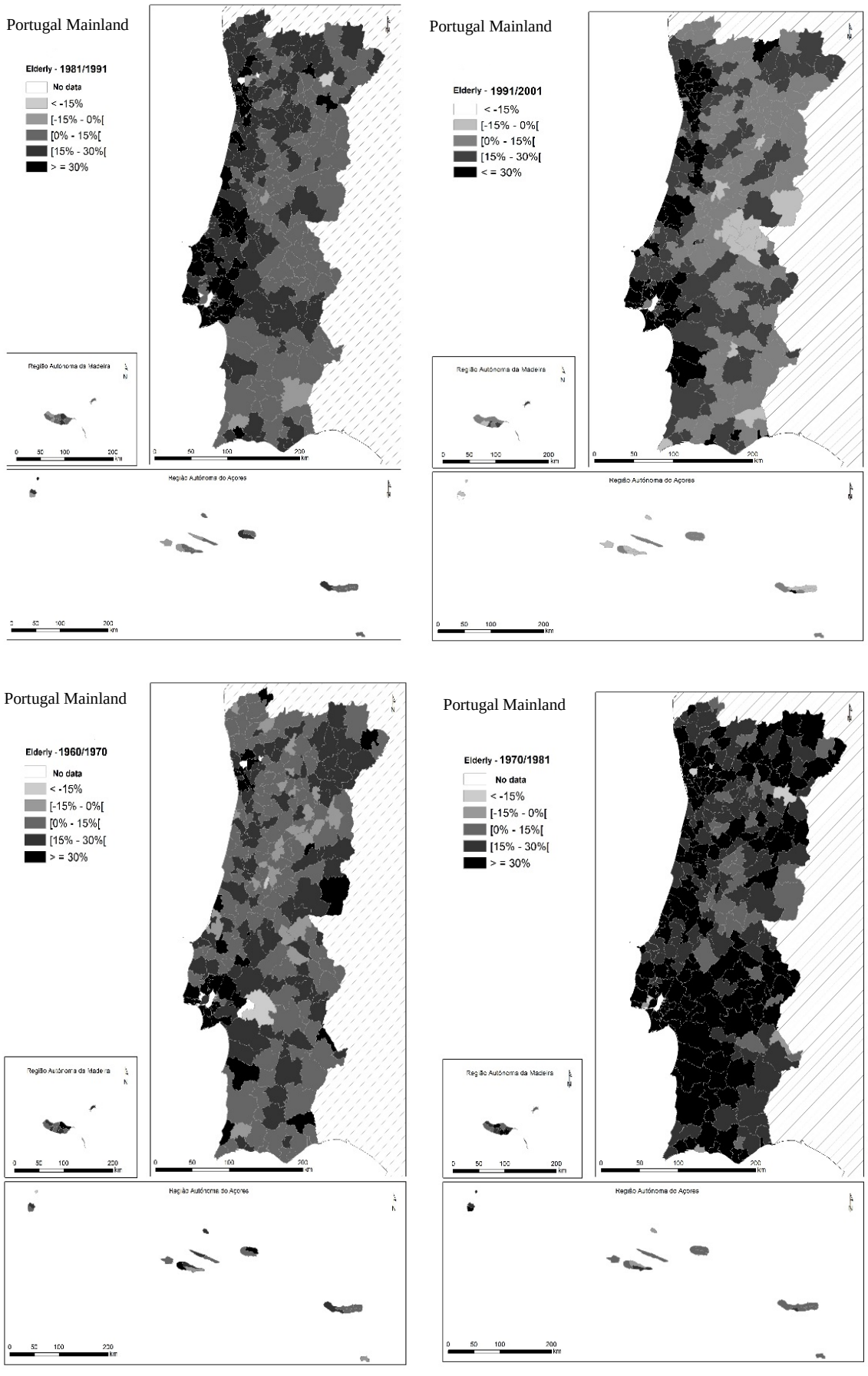
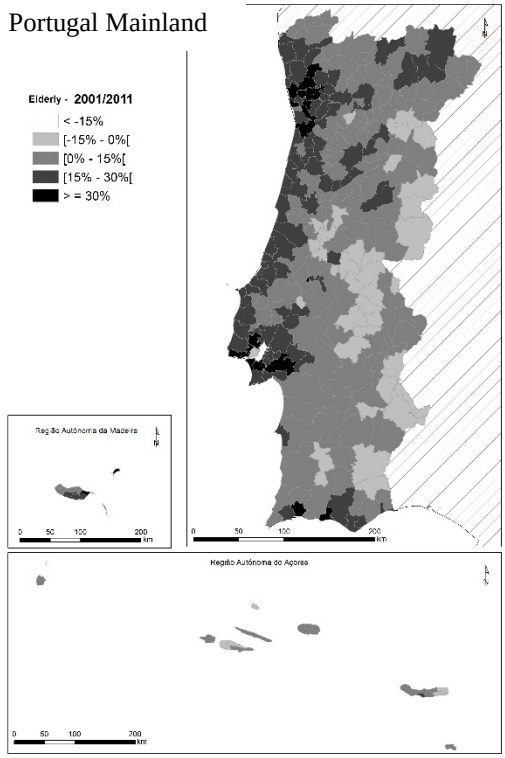


Figure 10, continued



Source: INE - General Census of Portuguese Population, between 1970 and 2011.

As mentioned, the Portuguese development has favoured the coastline, resulting in a progressive loss of demographic and economic vitality of the inland regions, reflecting the geographical distribution of ageing. Previous studies[40] show that the inland regions, especially the most aged counties, ,had an overall low index of demographic, economic and social[41] wellbeing. It confirms that different levels of regional development, distribution of wealth and equipment, and levels of wellbeing cause disadvantage and vulnerability for elderly[42].

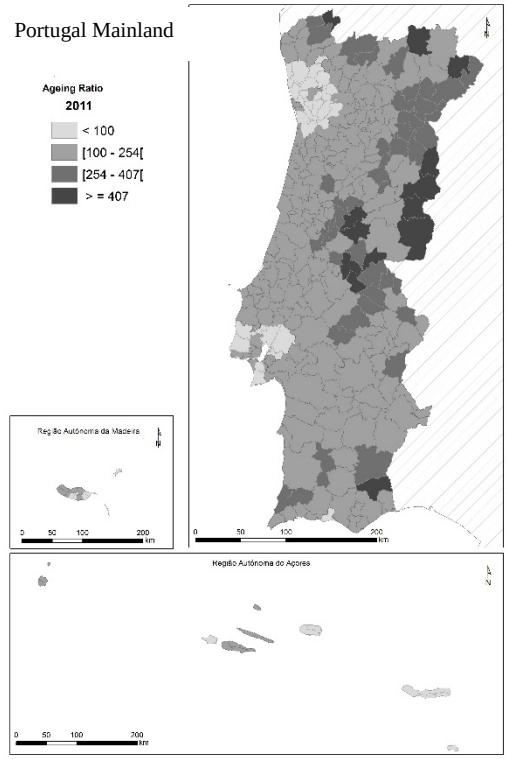
40 Teresa Rodrigues, Maria João G Moreira, "Realidades Demográficas", in Teresa Rodrigues, João T. Lopes, Luís Baptista, Maria João G, Moreira, coord., *Regionalidade Demográfica e Diversidade Social*, (Porto, 2009), pp. 77–110; Maria João G Moreira, "Environmental Changes and Social Vulnerability in an Ageing Society: Portugal in the Transition from the 20th to the 21st Centuries", *Hyginea Internationalis,* Volume 9, Issue 1(2010) 397–409.

41 With the goal of understanding if Portugal is or is not more homogeneous regarding the quality of life and social well-being, we built a statistical indicator to summarise and allow a stratification of what was referred to as "global rate of demographic, economic and social well-being", applicable to all districts of mainland Portugal between 1993 and 2004 (Pereira, L.N., Chorão, L.R. "Avaliação da qualidade de vida e bem-estar", in Teresa Rodrigues, João T. Lopes, Luís Baptista, Maria João G, Moreira, coord., *Regionalidade Demográfica e Diversidade Social.*, (Porto, 2009), pp. 129–151).

42 Maria João G Moreira, "Environmental Changes and Social Vulnerability in an Ageing Society: Portugal in the Transition from the 20th to the 21st Centuries", *Hygiea Internationalis,* Volume 9, Issue 1(2010) 397–409.

Figure 11. Ageing ratio in Portugal, 2011 (%)

Source: INE - General Census of Portuguese Population, 2011.



Consequently, and regardless of the intensity, in 2011 Portugal's ageing is consolidated, both at the national level and at the local county level. Some counties, around Lisbon and Oporto, in the islands and the Algarve (Albufeira) do, however, still maintain structures where the proportions of youths are higher than that of the elderly (Figure 11). The more aged counties are located in the interior, with some cases where the population aged 65 and over reaches 40 per cent of the total population.

Health facilities and medical personnel are mostly located in the coastal, urban areas, which is a quantitative and qualitative disadvantage for elderly in rural areas.[43] Therefore, this resource is not distributed according to in geo-demographic terms and the health/family/patient professional ratio. In addition, above 65 years, there is a growth of diseases related to human ageing (almost entirely chronic diseases, of prolonged evolution), increasing the number of consumers of health services.

43 Paula Santana, "Poverty, social exclusion and Health", *Social Science and Medicine*, 55, (2002), 132–145; Paula Santana, "Ageing in Portugal: regional inequities in health and health care", *Social Science and Medicine*, 50, (2000) 1025–1036; Paula Santana, *Geografias da Saúde e do Desenvolvimento. Evolução e Tendências em Portugal* (Coimbra, 2005).

Final Remarks

In 1979, a pioneer study on the aging of Portuguese society by J.M. Nazareth[44] stated that, although Portugal was a young country in the European context, it was already possible to see contrasts between young municipalities and other municipalities that already had aged structures.

Today, Portugal is not only one of the most aged countries in Europe, and regional asymmetries are less visible. In fact, between 1970 and 2013, the physiognomy of the Portuguese population has changed, it has grown old, as a result of improved living conditions. The ongoing ageing appears to be one of the biggest challenges of the Portuguese society, with consequences at the economic and social level. Those are not necessarily negative, but require planning and a paradigm shift in society[45], in a demographic context of negative natural and migratory balances and a declining population trend.

It will be necessary to develop policies that are adopted to real specificities of the Portuguese population structure, to different regional characteristics and to the epidemiological profile. The legislative implementation must be effective, based on transparency and well defined and realised responsibilities of institutions and professionals. If these changes are accomplished, they will contribute, in a positive way, to financial, economic and demographic sustainability of the society in general and of health system in particular, giving all Portuguese excellent standards of health and quality of life.

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44 J.M. Nazareth, *O envelhecimento da população portuguesa* (Lisboa, 1979).

45 J.M. Nazareth, *Crescer e envelhecer. Constrangimentos e oportunidades do envelhecimento demográfico,* (Lisboa, 2009); Maria João V, Rosa, *O Envelhecimento da Sociedade Portuguesa* (Lisboa, 2012).

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State and Health (1900–2013): Political Stability and Resources

Carla Leão and Teresa Rodrigues

Introduction

Throughout the twentieth century, Portugal has undergone major social, political, cultural and economic changes. The same happened in healthcare provision issues, even if the most relevant changes in the way Portuguese governments perceived the need and urgency of a real and effective health policy happened in the mid 1970's. Swiftly Portugal progressed from a narrow understanding of healthcare provision still linked to charitable assistance, to an inclusive approach, based on prevention and on the implementation of other needs, such as the provision of continued care.

In the first decades of the last century, the appearance of Ministries of Health throughout Europe was a sign of a full awareness assigned by the central governments to population's collective health. But in Portugal public health policies do not surpass 60 to 80 years of concerted decision-making, and it is inappropriate to speak of a national health policy before the second half of the century[1].

In this article we will analyse official legislation to describe the pathway of policymaking in the period 1900-2013, concerning the emergence of the Portuguese Welfare State. In methodological terms, we adopted a descriptive and chronological approach, based on the available national studies on the topic, which allow us to identify different health reforms, and each of their main constraints. Our aim is to answer the following questions: Which was the route of health policy in Portugal, and which was the role performed by the State, as the main actor in this field? How did policy options on public health look like in Portugal, and how might they have influenced morbidity and mortality levels?

The text is divided in two parts. The first systematises the main stages of the Portuguese health policies in the twentieth century, highlighting the relationship between political stability, resources and the State's intervention, strongly related to the emergence of the Welfare State. The second part summarises the milestones of

1 António Correia Campos and Jorge Simões, *O percurso da saúde: Portugal na Europa* (Coimbra, 2011), p. 65.

health policy decisions and describes each of them. It starts in 1910, with the establishment of the republic, goes through the military dictatorship and the *Estado Novo*[2], giving a more extensive presentation of changes after the democratic regime and the origins of the Welfare State, embodied in the creation of the National Health Service. It finishes in 2013, emphasising the process of epidemiological transition, the decline of infant mortality rate and the growth of average life expectancy levels. The article ends with major remarks, and the answer to the initial questions.

Part I. Actors and Temporalities

During the last century, Portugal registered considerable changes in the way collective healthcare and protection in illness were perceived. The legislation between 1910 and 2013 faced several constraints both related to the importance the State gave health and to different political, economic and social contexts of the Purtuguese history.

As in most European countries, the provision of healthcare and support to the poor had its genesis in religious and corporate initiatives. Only progressively did administrative and governmental authorities regard these issues as worthy of a legislative framework and permanent intervention. Until the 18th century, the Portuguese *Misericórdias*[3] were the most relevant institutions with regard to collective health, particularly that of the most economically vulnerable. The prominent role of the latter was a consequence of their closeness to the general population and their allocation throughout the country. These two characteristics made them the visible face of the population's support in situations of illness.

National indicators on health, illness and mortality remained stable for centuries, with parasitic and infectious diseases as the major cause of death, high infant mortality rates and low life expectancy, illustrating both the lack of medical knowledge and the slight importance given to health and assistance by the political power. Only in 1901 did a relevant Reform take place, aiming to reorganise public health and regulate public charity. It became the basis of Portuguese public health, inspired by the English model, at that time recognised as the world's most efficient model for hygiene and medical organisation[4]. But until the mid-twentieth century,

2 "New State" in Portuguese. It corresponds to the political dictatorship that ruled the country between 1932 and 1974.

3 Institutions of public utility with religious background, created in the late 15th century in major urban centres and later also in smaller towns and in the Portuguese African colonies. Their human profile and efficiency assured them a high prestige and a major role as providers of care assistance and solidarity. They are still active in Portugal.

4 Jorge Simões, *Retrato Político da Saúde. Dependência do Percurso e Inovação em Saúde* (Coimbra, 2009), p.26; Ministério da Saúde, *História do Serviço Nacional de Saúde*, Portal da Saúde. Retrieved from: http://www.min-saude.pt/portal/conteudos/a%2Bsaude%2Bem%2B

the measures adopted in the sphere of healthcare kept an *ad hoc* character and were mostly concerned with responses to specific episodes. Decision making on matters of health and disease were mostly materialised in situations of national emergency, such as epidemic outbreaks or other humanitarian catastrophes[5].

In Portugal, the decision-making in healthcare policies was influenced by the way the promotion of health services was seen and performed. Although other actors were involved, such as religious and private charity institutions, the central government maintained the key role, decisively influencing both the articulation of providers, the breadth, and the service's quality. All the legislation sanctioned throughout the last hundred years reflects its influence and main options.

So, when we analyse the evolution of health policies in Portugal for the twentieth century, we must consider the State as the key player, although its role diverges according to the peculiarities and resources in the historical periods identified in **Table 1. It** depended on three exogenous conditions:

1. the level of political stability;
2. the existence of public financial resources;
3. the intensity of central governmental intervention.

By political stability we mean the existence of the necessary conditions of governance for the design and implementation of health public policies. The existence of public financial resources refers to the State's financial capacity to promote public policies as a priority. The intensity of central governmental intervention concerns its role in health policy design, either when it takes the lead or when it allocates the responsibilities to the private sector. Indeed, if political stability and the existence of financial resources are important conditions in the definition of a health policy, the role that the State assumes towards health defines the healthcare model.

portugal/servico%2Bnacional%2Bde%2Bsaude/historia%2Bdo%2Bsns/historiadosns.htm [Accessed on 23 July 2014].

5 Teresa Rodrigues, "As estruturas populacionais", in José Mattoso, ed., *História de Portugal* (Lisboa, 1993), p. 127.

Table 1. Health Policy in Portugal. Attempted periodization (1910–2013)

Year	Political stability	Public financial resources	Substantial intervention of State in health policies
1910-1926	NO	NO	YES
1926-1933	NO	NO	NO
1933-1971	YES	YES	NO
1971-1995	YES	YES	YES
1995-2005	YES	NO	NO
2005-2011	YES	NO	NO
2011-2013	YES	NO	NO

Source: Author's elaboration.

Part II. Health as a Major Priority

In political terms, the first chronological phase corresponds to the historical period called the First Republic (1910-1926), a period of real concern with health issues. Protecting the population's health was taken as a positive symbol by the regime, which tried to create new health institutions with effective intervention. However that permanent aspiration was impossible to achieve, due to political instability, and the scarcity of public funds essential to meet several of the republican promises.

The Constitution of 1911 enshrines the right to public assistance, but not to public health. As in previous times, collective health continued to be understood as the provision of basic medical and healthcare services to the economically disadvantaged groups. In fact, the conceptual distinction concerning health and assistance is assumed by the politically responsible, which made a clear distinction between the right of all the Portuguese population to public health and healthcare, and the assumption of "a duty to aid and care" for the poorest.

At the beginning of the 20th century, the expectations on health sector reform were high. While in opposition, the reformist rhetoric of the Republican Party and the hygienist movement demanded that the new political regime would develop and implement a coherent and effective health policy. In its political program, the government promised all a fraternal society and a healthy lifestyle. So, as one of its main objectives it chose to implement a reform proposed in 1901 by Ricardo Jorge, which represented a significant progress in health care organisation, inspired by the English model[6]. But the assistance proposed in the Constitution was limited,

6 This one was implemented by the Liberal government (1906-1914), and is considered to represent the beginning of the Welfare State. Jorge Fernandes Alves, "Saúde e Fraternidade – A saúde na I República", in Maria Rita Lino Garnel, ed., *Corpo: Estado, medicina e sociedade no tempo*

confined to the standardization and control of medical care and the progressive implementation of primary healthcare. A compulsory social insurance for sickness, disability, and survival allowance[7] was adopted in May 1919. It reflected a change in the public health model, a wish to expand the population's access to health services and to strengthen the State's role[8].

The reformist impetus of the First Republic was hampered by the unfavourable economic and financial conjuncture. Nevertheless, some additional positive reforms took place in terms of medical training and public health, such as mandatory vaccination, improved water supply, sanitation, housing conditions and food quality control. By the mid 20's Portugal was a liberal Welfare State, with a "modest social security based on the control of financial and human resources"[9], in a changing relationship between State and citizens. Despite those improvements, no substantial decline of morbidity and mortality took place. The leading causes of death were still infectious and parasitic diseases, infant mortality was persistently high and life expectancy continued to be low[10].

Choosing Health or Security

The period 1926-1933 demarcates the military dictatorship, a complex period of financial problems and political instability. The design and implementation of a coherent and sustainable health policy was no longer possible, due to disputes within the regime and to its transience. The few available budgetary resources were used to maintain social order. Ensuring healthcare was one of the least priorities of the military government[11].

A few months after the military rebellion of 28 May 1926 and the rise of a military dictatorship, the prognosis for public health and collective hygienic conditions was pessimistic. The country faced a "considerable delay, detrimental to the life and

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da I República (Lisboa, 2010); Jorge Simões, *Retrato Político da Saúde. Dependência do Percurso e Inovação em Saúde* (Coimbra, 2009), p.26.

7 Teresa Rodrigues and Carla Leão, "Health in Portugal: actors and temporalities", in Teresa Ferreira Rodrigues and Maria do Rosário Oliveira Martins, eds., *Portugal 2031. Ageing and Health Policies, from demographic changes to political options* (Lisboa, 2014, forthcoming).

8 Maria Rita Lino Garnel, "Médicos e saúde pública no Parlamento republicano", in Pedro Tavares Almeida and Fernando Catroga, eds., *Res Publica: cidadania e representação política em Portugal* (Lisboa, 2010).

9 Miriam Halpern Pereira, "As origens do Estado Providência em Portugal: as novas fronteiras entre público e privado", *Ler História*, 37 (1999), p. 61.

10 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

11 Fernando Rosas, *O Estado Novo* (Lisboa, 1994).

health of citizens, vexing to the national pride"[12]. This *a posteriori* quotation was a political statement, meant to partially demonize the previous regime, but never the less true.

In this context, some positive arrangements were still made, such as the reorganization of public health services to render local medical authorities a greater autonomy. The central government created the Municipal Boards of Hygiene, designated Sub-inspectors of Health, and local sanitary brigades with the mission of addressing possible disease outbreaks. However, although it was intended to improve the health care system - bringing it to the proximity of populations - this reform did not have the desired effect, since the priorities of the new regime soon focused on the control of public finances[13].

Some demographic indicators improved, but the main causes of death, infant mortality rate and life expectancy remained the same[14].

Health and Assistance. The Poor and the Wealthy

A new stage began with the dictatorial regime known as *Estado Novo*. For a long period (1933-1971), political stability was ensured. In those decades the central government's inclination to intervene in economic and social affairs was also applicable on healthcare.

With Salazar government[15], the political and doctrinal conditions in favour of stability were united in order to improve healthcare services. *Estado Novo* was the golden age of private and religious assistance and healthcare institutions[16], as it was particularly hostile to the First Republic's health policy, considered to be too centralized. Salazar's position was very clear: *Misericórdias* regained their leading responsibility for charitable welfare on the basis of ethical criteria.

For the next few decades, a corporative model of society dominated, approved in 1933, based on a bottom-up system of representation of professional interests controlled by the State, i.e. a corporative vision of health[17]. The model presumed solidarity within each corporation, the upgrading of private public charitable

12 Decree 12477 of 12 October 1926

13 Ibid.

14 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

15 António de Oliveira Salazar served as Prime Minister of Portugal from 1932 to 1968. He founded and led the Estado Novo (*New State*).

16 Rui Manuel Pinto Costa, *O poder médico no Estado Novo (1945–1974)* (Porto, 2009), p.77; António Correia Campos, *Saúde: o custo de um valor sem preço* (Lisboa, 1983), p.26.

17 Philippe C. Schmitter, *Portugal: do Autoritarismo à Democracia* (Lisboa, 1999).

initiatives under State control, regulation, and partial support[18]. The 1933 Constitution (art.40 and 41) proclaimed the right and obligation of the State to preserve morality, sanitation, nutrition and public hygiene, and to promote and encourage charity, cooperation and mutual aid. It did not include any direct reference to public health, but advocated the need for charitable assistance, which should remain essentially in the hands of private suppliers. Charity prevailed as a traditional form of aid for poor citizens, and the State had only a supplementary intervention and the duty to supervise such institutions.

A Concordat between the Portuguese government and the Catholic Church in 1940 gave to the clerical institution a relevant role in internal affairs and reveals the deliberate choice to incorporate religious institutions in public healthcare, in opposition to the values assumed by the First Republic. In 1944, the basis for the legal organisation of social security was established. The 1998 Act of 15 May confirmed the supplementary nature of the State's action in healthcare provision, and underlined the central role of the *Misericórdias*. The Portuguese central government was just an intermediator, refusing a direct responsibility in healthcare, the peak of the highly ideological, charitable-corporatist model[19].

Meanwhile, the Welfare State continued its progress in European democracies. In this international context, profiting from an internal period of relative political freedom, due to the elections of 1945, a new reform on national healthcare took place. The Sanitary Reform of Trigo Negreiros[20] recognized the weaknesses of individual and corporative health, and advocated an extension of the government's obligations towards its citizens. It distinguished between three levels of intervention: preventive assistance, palliative and curative assistance and constructive assistance. It also deployed State agencies to regulate and supervise sanitary practice, health services and institutions (hospitals, sanatoriums, services related to child and maternal health), and regulated the organisation of particular care institutions. The new hospitals, built by State initiatives were given to the *Misericórdias*.

The creation of a Federation of Social Security Funds (*Caixas de Previdência*), allowed the gradual extension of socio-medical services to all citizens, by several independent subsystems of health according to professional activities. But this system continued to exclude a large percentage of the Portuguese population. Still, no universal and comprehensive health service existed, and social inequalities increased, due to each subsystem's lack of efficiency[21].

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18 Rui Manuel Pinto Costa, *O poder médico no Estado Novo (1945–1974)* (Porto, 2009), p.76.

19 António Correia Campos, *Saúde: o custo de um valor sem preço* (Lisboa, 1983), p.25.

20 Law Decree 35108 of 7 November 1945.

21 Rui Manuel Pinto Costa, *O poder médico no Estado Novo (1945-1974)* (Porto, 2009), p.89; Arnaldo Sampaio, *Evolução da política de saúde em Portugal depois da Guerra de 1939–K45 e suas consequências.* Arquivos do Instituto Nacional de Saúde (Lisboa, 1981), p.27.

Yet, those measures had a positive effect on health indicators, changing the order of the main causes of death from infectious and parasitic to diseases of the circulatory system[22]. Between 1930 and 1950 the infant mortality rate declined from 143.6 to 98.0‰, and the average life expectancy at birth increased from 45 to 55 years[23].

In 1958, Salazar condescended with public opinion and created the Ministry of Health. It induced a re-evaluation of the health sector, representing a slight change in the design and practice of assistance and health in Portugal[24], however, with no significant practical consequences.

The 1960s represented a period of economic growth based on the industrialisation and controlled economic liberalisation allowed by the European Free Trade Association (EFTA). In 1961, the colonial war started and social tensions rose, partially as a result of a more wide-spread knowledge about living conditions in other European countries, due to their more elaborated social security systems[25]. Still, the creation and development of health subsystems remained as the regime's official policy, and in 1963 the Social Assistance for Civil State Functionaries (ADSE) was founded.

The State kept the basic principles of its health and assistance policy practically unchanged, but other improvements were outlined. One of the most important acts was a Law on Health Policy and Assistance (1963), which reorganized the Health Base Law of 1944, essentially by removing the charitable character of assistance, and starting a process of centralised health services. However, the supplementary character of the State persisted, as well as its support to private initiative. Thus, barriers to the development of a consistent health policy continued to exist. The health coverage of the country's population progressed slowly, combining actions of private institutions and the State, although the latter was expanding its participation to other sectors, such as local primary health care institutions for maternal and child care.

The Health Ministry gained financial autonomy in the middle of the 1960s, a new awareness on the importance of collective health and the desire to ensure extended intervention by the State. This change was due to the arrival of an elite of technocrats with international experience in public administration[26]. The Portuguese reality was changing, and seizing the new window of opportunity was realised by the rise to

22 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

23 Teresa Ferreira Rodrigues; Maria João Guardado Moreira, "Modelos de Mortalidade em Portugal", *Ler História*, 49. (2005)

24 Carlos Farinha dos Santos, "Assistência social" pp. 13–74 in Fernando Rosas and José Maria Brandão Brito, eds., *Dicionário da História do Estado Novo* (Lisboa, 1996).

25 Rui Manuel Pinto Costa, *O poder médico no Estado Novo (1945–1974)* (Porto, 2009), p.97.

26 ´ António Reis, *Portugal Contemporâneo* (Lisboa, 1996).

power of Marcello Caetano[27]. In 1969, Miller Guerra[28], a former Health Ministry and a political opponent of the regime, argued for the urgent creation and enhancement of the health professional's careers, the establishment of sub-regional hospitals and health centres[29], the unification of medical health and social action, and the growth of qualified medical and other technical staff. He also underlined the benefits of a ministry that would join healthcare and assistance, and improve the coordination of national healthcare policy, spread between various ministries. These claims would be considered and partially solved with the Reform of Gonçalves Ferreira (1971), and later with the creation of the National Health Service in 1979[30].

Accompanied by the global advances of medical research, these reforms produced positive changes of the Portuguese population's health. Infectious and parasitic diseases were the sixth cause of death in 1970 (3% of all deaths), while circulatory diseases accounted for 39%. The epidemiological transition was on its march[31]. Between 1950 and 1970, the Portuguese infant mortality rate dropped from 98 to 51.3‰ and average life expectancy at birth increased from 55 to 65 years[32].

Health and Democracy. The Welfare State

In the final years of the Estado Novo, the Reform of 1971 (by Gonçalves Ferreira, State Secretary of Health and Assistance, and the establishment of democracy, the central government kept its dominant role in the definition and implementation of health policy, by developing a network of primary and hospital care, which from 1979 embodies the National Health Service (SNS).

Those were years of stability and ideological and operative continuity regarding public health services, which encompass primary health care services and hospitals closer to the population to which all citizens have access, regardless of their economic

27 Marcello José das Neves Alves Caetano was the last prime minister of the *Estado Novo* regime, from 1968 until his overthrow in the Carnation Revolution of 1974. He contributed to less rigid policies in social and health terms.

28 Chairman of Order of Physicians since 1968.

29 Public health services that provide primary health care and are located near the population.

30 Miller Guerra, "Saúde, educação e ciência. Três notas programáticas", *Brotéria*, 89: 12 (1969).

31 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

32 Teresa Ferreira Rodrigues; Maria João Guardado Moreira, "Modelos de Mortalidade em Portugal", *Ler História*, 49 (2005).

capacity, employment status or health subsystem. It provided the structural conditions for the emergence and consolidation of the Welfare State[33].

At the beginning of the 1970s, the outcome was just slightly positive. One of the remaining major problems was the still modest role of the State, and the fact that private health institutions were much more abundant than State-owned ones. Another problem was related to the various health subsystems, and the inefficient management of the existing resources, which maintained social inequalities[34].

The reform of 1971 was adapted in a context of partial political freedom, and of social claims (such as those of Miller Guerra)[35]. It aimed at the assurance of scientific and technical improvement, effective planning, unification and multidisciplinary in the design and implementation of health policy. It was also meant to guarantee centralized access to health to all Portuguese citizens, innovative in its intentions of coverage and provision[36]. The reform was a turning point, as it attributed to the State the responsibility of coordinating a health policy centralised in its principles, but decentralised in the provision of services, in order to reach the whole population with similar quality and accessibility. The government invested in prevention and proximity, creating the first generation of health centres and Health Posts in small villages. The reform was extremely advanced for its time, in a national, political context, and because it anticipated the creation of a National Healthcare Service, implementing the guidelines of the 1978 International Conference in Alma-Ata. But as expected, it did not definitively disrupt the role of private units providing health services, in particular the coordination between health centres and public and private services dispersed across the country.

The role of the State in the provision of healthcare services increased until 1973, as a result of the international conjuncture that emphasized the government's responsibility to ensure access to primary care to all its citizens. Internally, the government was pressured by public complaints about Portugal's high mortality and morbidity levels. In 1973, the Ministry of Health and Assistance was split, and health

33 António Barreto, "Portugal na periferia do centro: mudança social, 1960 a 1995", *Análise Social*, 30: 134 (1995); Ana Guillén, Santiago Álvarez and Pedro Adão e Silva "Redesigning the Spanish and Portuguese Welfare States: The Impact of Accession into the European Union", S*outh European Society and Politics*, 8 (2003), pp.57–89; José António Pereirinha and Francisco Nunes, "Política social em Portugal e a Europa, 20 anos depois", in António Romão, ed., *A Economia portuguesa - 20 anos após a adesão* (Coimbra, 2006).

34 Arnaldo Sampaio, "Discurso proferido pelo Dr. Arnaldo Sampaio no acto de posse como Director-geral de Saúde", *O Médico*, 54: 1098 (1972), p.518.

35 Law Decree 413/71 of 27 September.

36 Pedro Morais Barbosa, *Política Nacional de Saúde*. Arquivos do Instituto Nacional de Saúde (Lisboa, 1972), p.79; Arnaldo Sampaio, *Evolução da política de saúde em Portugal depois da Guerra de 1939-45 e suas consequências.* Arquivos do Instituto Nacional de Saúde (Lisboa, 1981), p.27.

became once again an autonomous ministry. Nevertheless, the political opposition disallowed the full realisation of the 1971 Reform objectives[37].

The Revolution of 25th April 1974 provided a break with the past, also in healthcare issues, by implementing a democratic regime, and abolishing the political impediments which previously barred the extension of universal healthcare. The Programme of the First Provisional Government declares the purpose to create a national health system and gathered both health and social security in the Ministry of Social Affairs. This decision, only apparently contradictory, wanted to assure the effective integration of medical and social services under the same guidance. Simultaneously, a decentralisation on Health provision was tried, in order to offer health care to populations in the smallest villages. The foundation of district administrations and periphery medical service, symbolizes a break with the previous political ideology. In November 1974, the integration of hospitals managed by *Misericórdias* into public administration was realised[38].

The democratic Portuguese Constitution of 1976[39] declares (art.64) that health is a universal right carried out by a national universal, comprehensive, and free system. The State should ensure universal access to healthcare, medical and hospital coverage throughout the national territory. Health became a constitutional obligation for the political system. But it did also occupy a prominent place in politics, the fundamental basis of the Portuguese democracy, embraced by several parties and socio-political trends. Indeed, political democratisation become inseparable from social democratisation[40].

Hence, Portugal recovered the needed political stability to build a real national health system[41]. The Order of 29 July 1978[42], recognized as Arnaut Order (Minister for Social Affairs), anticipates a National Health Service (*SNS*) that guarantees access to medical and social services to all citizens regardless of their ability to pay. In 1979, the SNS was established[43], implementing a Welfare State in Portugal inspired by the Beveridge model.

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37 Arnaldo Sampaio, *Evolução da política de saúde em Portugal depois da Guerra de 1939–45 e suas consequências.* Arquivos do Instituto Nacional de Saúde (Lisboa, 1981), p.34.

38 Decree-Law 488/75 of 4 September and Decree-Law 618/75 of 11 November

39 Assembleia da Republica, *Constituição de 1976*. Retrieved from: http://www.parlamento.pt/Parlamento/Documents/CRP1976.pdf [Accessed on 4 November 2013].

40 Ana Guillén, Santiago Álvarez and Pedro Adão e Silva "Redesigning the Spanish and Portuguese Welfare States: The Impact of Accession into the European Union", *South European Society and Politics*, 8 (2003), pp.57-89.

41 Carlos Farinha dos Santos, "Assistência social" pp.13-74 in Fernando Rosas and José Maria Brandão Brito, eds., *Dicionário da História do Estado Novo* (Lisboa, 1996).

42 António Arnaut, *Serviço Nacional de Saúde (SNS). 30 Anos de Resistência* (Coimbra, 2009).

43 Law 56/79 of 15 September

Different models could have been adopted to frame the Portuguese National Health Service, but the prevalent political option was to ensure a universal and free SNS, under central governance. The increase of services covering the entire population had a major, positive impact on health indicators in the post-25 April[44], although it was a slow process and not always linear, implying a strong public investment in terms of human resources, infrastructures and services. Between 1971 and 1995 infectious and parasitic diseases came to represent only 1.5% of total deaths[45], infant mortality rate fell from 50 to around 24‰, and average life expectancy at birth reached more than 70 years[46].

Although priority given to health and the development of the SNS differed throughout the 1980s, including some years of public disinvestment between 1980 and 1983[47], measures were taken to deepen the universality of healthcare provided by the State. They focused on autonomy, improvements of the training of health professionals, and decentralisation of services.

In 1983, the Ministry of Health was reopened and the sector got a strengthened structure, particularly for prevention and the regulation of medication. The first aspect is due to the fact that "our country [was] in an advanced stage of transition characterised by the dominance of infectious diseases to the prevalence of the so-called diseases of civilisation", to which primary care should respond accordingly[48]. The second aspect was meant to control both the quality and the prices of the prescript medicines.

Following Portugal's entrance in the European Economic Community (EEC), national economic and financial conditions improved in the mid-1980s. Meanwhile, an international vision of the need for an extended involvement of the private sector

44 The SNS includes integrated healthcare: promotion, surveillance, prevention, diagnosis, treatment, medical and social rehabilitation. It offers primary health care services (community Health Centres), differentiated care (general hospitals, specialty hospitals and other specialized institutions). Possess administrative and financial autonomy had decentralized structure and organization with central, regional and local authorities. António Correia Campos, *Saúde: o custo de um valor sem preç*o (Lisboa, 1983), p.26; Jorge Simões, *Retrato Político da Saúde. Dependência do Percurso e Inovação em Saúde* (Coimbra, 2009*);* Paula Santana, "Os ganhos em Saúde e no acesso aos serviços de Saúde: avaliação das últimas três décadas" pp.57-69 in Jorge Simões, ed., *Trinta anos do Serviço Nacional de Saúde. Um percurso comentado* (Coimbra, 2010).

45 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

46 Teresa Ferreira Rodrigues; Maria João Guardado Moreira, "Modelos de Mortalidade em Portugal", *Ler História*, 49. (2005)

47 Jorge Simões and Óscar Domingos Lourenço, "As políticas públicas de Saúde nos últimos 25 anos*",* in *Livro de Homenagem a Augusto Mantas* (APES, 2006), p.78.

48 Preamble of the Law Decree 74-C/84 of 2 March.

in the provision of health care also reached Portugal in the mid-1980s, calling for a larger individual responsibility in the financing and transformation of the SNS[49].

In the following years several measures were approved to ensure the financial sustainability of the system, such as the introduction of user fees, and other reforms, which aimed to change hospital management to a private business model, in order to reduce public expenditure. The amount of transfers of activities from the public to the private sector was significant. Within OECD, Portugal was spent above average on medication. Nor did an efficient system exist to control the amount and necessity of referral by doctors in primary health care to specialists in the private sector for complementary diagnosis and therapy. Trying to avoid abuses, rational rules on SNS charges were established in 1986[50].

A constitutional revision of 1989 changed the national legal framework, assuming that healthcare should be only "tendentiously free", although safeguarding each citizen economic condition. The *1990 Health Bases*[51] allowed and even encouraged the participation of private entities in the promotion and protection of public health, providing the State with regulatory functions (guidance, planning, evaluation and inspection). Following these amendments, the SNS regulation changed in order to: ensure the regionalisation of management services; promote the development of the private health sector; ensure business management of public health units; and encourage citizens to opt for private health insurances[52]. The new legislative framework intended to promote the integration of primary and hospital care through health facilities, invoking the principle of indivisibility.

In 1993, the Ministry of Health was reorganised, in order to regionalise health policy decisions, allocating powers and reinforcing assignments to five designated regional health authorities. These would ensure the link between local health centres and central hospitals, through integrated healthcare units. Improvements of the implementation of the SNS explain major changes of the leading causes of death[53], and a continuous decline in mortality and infant mortality rates (the last one from 50 to 6.9‰). The average life expectancy of the Portuguese population also continued to rise[54].

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49 Jorge Simões, *Retrato Político da Saúde. Dependência do Percurso e Inovação em Saúde* (Coimbra, 2009), p.98.

50 Decree 57/86 of 20 March

51 Law 48/90 of 24 August

52 Decree 57/86 of 20 March

53 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

54 Teresa Ferreira Rodrigues; Maria João Guardado Moreira, "Modelos de Mortalidade em Portugal", *Ler História*, 49. (2005)

A Time of Difficult Options

A new phase in health policy began in 1995, characterized by a gradual disengagement of the State, illustrated by the change of management model in public hospitals[55]. As in other European countries, it was a time of containment, adjustment to economic crises and financially restrained social systems resulting from demographic ageing. It focused on three main topics: re-commercialization, cost reduction and re-calibration[56]. Portugal was no exception, and in the second half of the 1990s, the process of adjustment began[57], worsened by the lack of a welfare system that had been allowed the time to mature. Gradually, adjustment to new realities became inevitable[58].

Multiple structures were created and new rules were tested. Based on the political and social consensus on urgent needs to strengthen the SNS and to rationalise its management, the measures adopted aimed to achieve such rationalisation without destroying the existing system[59]. Thus, measures were adopted to create a contractual model between payers and providers, to adapt health professional salaries according to their performance, and to modernise public health administration. In 1999 the SNS was restructured, to include regional and local levels of territorial activity. At the regional level, functions of planning, coordination and definition of strategies for technical assistance were assigned to health centres. At the local level, and endowed with a flexible organisation, the population could count on the public health units of local health systems and operative units of public health at the health centres.

At the beginning of the 21st century, new legislative acts were recommended, among others, permanent and exclusive contracts for physicians, the enlargement of the number of professionals, the regulation of pharmacy and prescriptions, the establishment of public-public partnerships (based on public sector partners), of

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55 In 1995 a first experience of private management within a public hospital, through the conclusion of a management agreement with private entities took place concerning the Hospital *Fernando da Fonseca* in Lisbon surroundings (Amadora-Sintra). Four years later, in 1999, another system at experimental level was adopted close to Oporto (*Hospital of São Sebastião*, in Santa Maria da Feira). In it the management of human resources and acquisitions of goods and services takes place in accordance with private sector practices.

56 Paul Pierson, "Coping with permanent austerity", in Paul Pierson, ed., *The new politics of the Welfare* (OUP, 2006), p.25.

57 António Barreto, "Mudança social em Portugal, 1960-2000" pp.46–78 in António Costa Pinto, ed., *Portugal contemporâneo* (Lisboa, 2005).

58 Paul Pierson, "Coping with permanent austerity", in Paul Pierson, ed., *The new politics of the Welfare* (OUP, 2006); Fernanda Rodrigues, "Assistência social: uma política reticente em tempo de globalização", in Pedro Hespanha and Graça Carapinheiro, eds., *Risco social e incerteza: pode o Estado recuar mais?* (Porto, 2002); Pedro Adão e Silva, "O Modelo de Welfare da Europa do Sul – Reflexões sobre a utilidade do conceito", *Sociologia, Problemas e Práticas*, 38 (2002), 76–96.

59 Pedro Pita Barros, *As políticas de Saúde em Portugal nos últimos 25 anos: evolução da prestação na década 1987–1996* (Lisboa, 1999).

public-private partnerships (combining public financing with private capital), and of partnerships within the social sector[60]. With the new political social democratic regime the spirit of the national health system changed. Portugal moved from a model primarily funded through SNS to one where both public and private initiatives coexist.

This change in the design of the national health system caused several discontinuities[61], such as the public-private partnerships regulated in 2002[62], with the hospital enterprise management models implementation (EPE)[63] sensitive to expenditure and committed to reward merit. Equally, the decision to establish the National Network of Continuing Care[64], comprising public, private and social entities, thus fulfilling the growing need of reassuring healthcare and maintaining the quality of life of citizens in a context of demographic ageing, changes of the family structure and other social transitions. The network was rebuilt in 2006 under the name of National Network of Integrated Continued Care (RNCCI)[65], taking advantage of EU funds to finance its execution, and to include palliative care. During a growing diversification of social and private operators participating in the SNS, the Portuguese Health Regulation Authority (ERS) was created [66]

The need to adapt health services to a rapidly changing demographic structure had already influenced the design of various health policy plans in this period, as the 2004-2010 National Health Plan, the National Programme for the Health of Elderly People, or the National Palliative Care Programme[67]. The obligation to find a solution for the long surgery waiting lists, also led to the creation of an Integrated Surgery for Subscribers Management System (SIGIC). Its purpose was to ensure that surgical treatment occurs within a minimum set time, and reduce the number of patients waiting for surgery at SNS establishments[68].

In 2005 the epidemiological, sanitary and demographic transition was concluded when infectious and parasitic diseases disappeared among the leading causes of

60 Resolution of the Council of Ministers 162/2001, of 16 November

61 Pedro Pita Barros, *Análises da saúde* (Lisboa, 2007), p.115.

62 With the first proposals thrown in 2003 and some completed in 2014, only hospitals (Loures, Braga, Cascais and Vila Franca de Xira). Decree-Law 185/2002 of 20 August.

63 Law 27/2002 of 8 November

64 Decree-Law 281/2003 of 8 November

65 Decree-Law 101/2006 of 6 June

66 Decree-Law 309/2003 of 10 December

67 Suzete Gonçalves, "Cuidados Continuados Integrados" pp.23–47 in Jorge Simões, ed., *Trinta anos do Serviço Nacional De Saúde. Um Percurso Comentado* (Coimbra, 2011).

68 Council of Ministers Resolution 79/2004 of 3 June

death[69], infant mortality rate was low (3.5‰) and average life expectancy at birth had increased up to 78 years[70].

Reorganization and Sustainability

The deterioration of Portugal's economic and financial crisis led to the Restructuring Programme for Central Administration (PRACE)[71] implemented in 2005. It aimed to reduce costs and enable economies of scale, without compromising specialisation, quality, and executive autonomy of hospitals and local Health Centres[72]. The Decree-Law 200/2006 of 25 October established the procedures for the extinction, fusion, and restructuring of services and reduction of human resources.

PRACE tried to rationalize the SNS through a multitude of adjustments, such as the closure of health services in smaller places, the fusion of hospitals and health centres, and the rearrangement of health units with management functions. User's fees were revised and increased after 2007, to guarantee SNS sustainability. Health administrators were required by the government to produce plans to reduce costs[73], and health investment was interrupted with two exceptions: the National Network of Integrated Continued Care and primary care programs. In fact, the Lisbon Treaty (2007)[74], and the International Health Regulations (2005)[75] made national decision makers adapt a new definition of the emergency network and hospital emergencies, the definition and improvement of surveillance, alert and response mechanisms, and the intensification in primary care.

In 2009, another restructuring of health services took place, in order to provide better operational services, a technical and flexible organisational model, and to ensure a swift and effective protection of the collective health[76]. This procedure included two levels of activity: *regional* and *local* surveillance and health monitoring based on a comprehensive epidemiologic perspective, health planning and strategies.

Portuguese health professionals had excellent competencies, and high qualitative standards in the provision of health care were guaranteed. However, a shortage of human resources, particularly doctors was eminent, explaining the increase of

69 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

70 Teresa Ferreira Rodrigues; Maria João Guardado Moreira, "Modelos de Mortalidade em Portugal", *Ler História*, 49. (2005)

71 Council of Ministers Resolution 124/2005 of 4 August

72 António Correia Campos, *Reformas da saúde: o fio condutor* (Coimbra, 2008), p.42.

73 Order 10760/2010 of 29 de June.

74 Title XIV Art.168 (Assunção Esteves; Noémia Pizarro, *O Tratado de Lisboa* (Chamusca 2008).

75 Notice 12/2008 of 23 January.

76 Decree-Law 81/2009 of 2 April.

numerus clausus in medicine and nursery graduations and legislation that allowed retired doctors to continue to practise (2010).

The shortage of human resources caused extensive waiting times for consultations and treatments. The problem had already been perceived in 2004 by the Integrated Surgery for Subscribers Management System (SIGIC) as a response. It was improved four years later, by extension to private entities contracted with the *SNS*. Two other measures (Law 41/2007 of 24 August, and Ministerial Ordinance 615/2008 of 11 July) improved and regulated the maximum guaranteed response times to all kinds of health care benefits (e.g. Health Centres care, home care, hospital care, diagnostic and therapeutic care and programmed surgeries), and regulated the integrated system of transfer and management access to the first hospital specialty consultation on *SNS* institutions, known as Consultation on Time, in order to ensure maximum terms of response, according to clinical priorities.

The evaluation made by the World Health Organisation on the implementation of the *2004-2010 National Health Plan* was largely positive, but underlined the need to achieve the goals set out in the *2011-2016 National Health Plan* in what concerns equity in access and quality of health services[77]. Although the purchase of goods, services and other activities involving public expenditure were reduced to their lower levels, those years stood as a period of positive demographic trends .In 2010, infant mortality rate had been reduced to a minimum level of 2.5‰, average life expectancy at birth had increased to 80 years. The epidemiological transition was definitely over[78].

Crisis, Sustainability, Reforms and Reductions

The last phase until the present date can be defined by words like "crisis", "restructuring", "sustainability of the SNS" and "reductions". It has also been a period of the State's disinvestment in health and of the civil society's dissatisfaction.

The autonomy of the Portuguese government was restricted after the signature of the Memorandum of Understanding, in July 2011, and the approval of PREMAC (Reduction and Improvement Program of State's Central Administration), with the aim of restructuring and reducing expenses, closures, fusion and restructuration of organizations and services and rationalization of human resources. The Decree-Law 124/2011 of 29 December presents the Health Program.

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77 Ministério da Saúde, *História do Serviço Nacional de Saúde*, Portal da Saúde. Retrieved from: http://www.min-saude.pt/portal/conteudos/a%2Bsaude%2Bem%2Bportugal/servico%2Bnacional%2Bde%2Bsaude/historia%2Bdo%2Bsns/historiadosns.htm [Accessed in 23 July 2014].

78 Teresa Rodrigues (Coord.), *A População Portuguesa. Das longas permanências à conquista da modernidade* (Porto, 2008).

Restrictive decisions predominate, although less pronounced in primary and in palliative care. A thorough restructuring of departments and organizations took place within the SNS and the Ministry of Health. The amount of health services and human resources was reduced and mega-health-units were created by merging/grouping Health Centres and hospitals. There was also an increase in healthcare costs for users, at a time when individual earnings were decreasing[79]. The recruitment of health professionals diminished, the number of working hours increased[80] with no increase in salary, and the prescription of Complementary Diagnostic Exams and Therapies became more difficult[81]. In primary care (health centres), the design of local health support changed[82], reducing the number of Groups of Health Centres (ACES) and abolishing the rule that previously limited the number of users to a maximum of 200,000. For inhabitants in smaller places in the interior, rural areas, distances to health services increased.

State budgets for 2012 and 2013 show widespread contention concerning the size of human resources, remuneration, and career progression. In May 2013, the final version of the new 2012-2016 National Health Plan[83], was published. It meant to be the "foundation for the health system of the 21st Century", intending to solve system problems, particularly those identified by WHO when evaluating the previous plan.

In October 2013, the articulation procedures between the institutions and services of the SNS and private institutions of social solidarity were defined. However, in a context of economic constraint, fusion and concentration of health services, this legislative document may produce some uncertainties, whilst at the same time representing a return to the trend initiated with democracy.

From 2010 until 2013 curious patterns emerged in Portugal, such as the increase of mortality caused by malignant tumors and of respiratory system diseases[84]. Since prevention and proximity to health services are very important in curbing the effects of these pathologies, might we interpret those negative trends as a consequence of the worsening of healthcare conditions, and the disinvestment in health? Simultaneously, the Portuguese life expectancy at birth stagnated at about 80 years and infant mortality increased to 2.9‰[85].

79 Council of Ministers Resolution 22/2012 of 9 March

80 Law 68/2013 of 29 August

81 Order 10430/2011 of 18 August

82 Ministerial Ordinance 394-A/2012 of 29 November

83 Direção-Geral de Saúde, *Plano Nacional de Saúde 2012-2016*. Retrieved from: http://pns.dgs.pt/pns-versao-completa [Accessed on 23 July 2014].

84 PORDATA. Available in: http://www.pordata.pt/

85 Idem.

Conclusions

In the previous pages we have described the most important political measures with regard to public health and assistance in Portugal, from the beginning of the twentieth century until the present day (2013). For each different phase, we made a final observation, about the contemporary epidemiological pattern, the infant mortality rate and the average life expectancy, indicating the potential influence of political decision making on health and the demographic pattern.

Portugal's journey went from healthcare provision linked to charitable assistance and mainly provided by private institutions, to a universal approach, with the main role played by public health services. On the way, a Welfare State and SNS developed, ending in a model where private and social institutions, such as the *Misericordia*, again have achieved an increasingly important role.

The strong links between political stability, resources and the Welfare State have been demonstrated. From 1900 to 2013, health policies were only indirectly affected by the sequence of political regimes and ideologies in power. In the long time perspective, there has been a growing interest and importance given by the central powers to healthcare and public health policies, with only two exceptions: in the Estado Novo 1926-1970 and during the economic crisis 2007-2013.

Over the years, the topic of health gained importance, and during all those years the State kept its key role in all health related issues and decisions, hence being the responsible for the final contributions to the Portuguese demographic and sanitarian conditions.

We have showed that the major turning point happened during the implementation of the SNS in the 1970's when central government adopted healthcare as a priority and a duty towards its voters. Thus, the Portuguese epidemiological transition became possible, with the drastic decline of infant mortality and the increase in average life expectancy during a record time of 31 years, putting Portugal in a privileged position within the European Union and the World. Despite of these improvements, Portugal is today a country with great constraints in the healthcare sector, parallel to a successive growth of a dominating private and social sector.

But what lessons can be drawn from these policy decisions for the future of Portuguese public health? The future remains *incognita* ...

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Regional Trends in Ageing and Health for Portugal, 2011–2031

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Introduction

Educational attainment is an attribute that leads to a great distinction between the members of a population, including when considering their health and well-being, an important aspect within an aging society. In Portugal there are significantly regional differences in educational, demographic and health indicators. It is crucial to analyse, not only at the national level but also at the regional level, how these set of variables will affect the demographic structure and the population's health, particularly when we expect an ageing process with pronounced regional differences.

The aim of this work was to produce regional demographic projections for the Portuguese population by sex, age group and level of educational attainment, for the period 2011–2031. Considering fertility, mortality and migration differentials by level of education, the population was projected by NUTS II region using the multistate cohort-component method with a block Leslie matrix. Two scenarios were considered, one where educational attainment prior to 2011 remains constant and another in which educational attainment will follow the trend observed over the last decade, being the trend in the state proportion model using continuation ratio models.

The results show an increase in the proportion of individuals who complete higher educational levels in almost all age groups of both sexes. However, significant differences existed across regions. We can expect the proportion of people with higher educational levels to continue to rise, as the education of younger cohorts seems to evolve positively. Trends in health outcomes also differ between the northern and southern regions. These results will be particularly useful for planning and monitoring public health policies at the regional level in Portugal.

Methods

The study had three main objectives (1) demographic projections for the Portuguese population for the period 2011–2031 by region, gender, age group and educational level, (2) a study of the impact of age and education on the indicators of health status and health services utilization, at the regional level and (3) the subsequent projection of these outcomes for the same period, for the seven main regions in Portugal: North, Center, Lisbon, Alentejo, Algarve, RAM (Madeira) and RAA (Azores).

Demographic projections by region, gender, age group and educational level

The methodology used is similar to the one proposed for the national projections; the multistate demographic model[1] as the major instrument for demographic projections by gender, age group and educational attainment, at the region level[2]. Details on the methodology are described elsewhere[3].

Impact of age and education on health status and health services utilization at regional level

The study of current differences in health status and health services utilization by age and educational level was based on the data from the fourth edition of the National Health Survey (4th NHS), a representative survey of the Portuguese population at the regional level, conducted by Statistics Portugal and the National Institute of Health (Dr. Ricardo Jorge INSA), in collaboration with the Directorate-General of Health. The 4th NHS collected information on health status, health determinants, use of health services and socio demographic characteristics of individuals, being the first edition to cover the entire national territory, including the Autonomous Regions of Azores and Madeira. As a whole, seven NUTS II Regions are covered by this survey. The questionnaire was administered by direct interviews of a representative probability sample of the Portuguese population, between February 2005 and February 2006. The study population included individuals living in family housing

1 Frans Willekens, *Description of the multistate projection model (Multistate model for biographic analysis and projection)*. Deliverable D1 in Work Package 1. Bridging the micro-macro gap in population forecasting - MicMac Project. Netherlands Interdisciplinary Demographic Institute. (The Hague, Netherlands, 2006).

2 Robert Schoen, "Population Models With Constant Rates" pp. 1-26 in *Dynamic Population Models*. The Springer Series on Demographic Methods and Population Analysis (Springer Netherlands, 2006).

3 Martins, M.R.O., Rodrigues, I.C., Rodrigues, T. Multistate projections by level of education for Portugal, 2011–2013, *Journal of Population Research*, 31; 317–343(2014).

units (therefore excluding people living in collective accommodations). In total, 41,193 individuals living in 15,239 family housing units were interviewed, and the interview completion rate was 76% nationwide.

As outcomes of health status, we chose: *self-reported health status*, dichotomized as "very good" or "good" and "fair", "bad" or "very bad"; *chronic diseases*, determined by the presence of at least one of 19 presented chronic diseases; *long term disability*, if any difficulty or complete inability in performing at least one of a set of tasks of daily living was reported. Regarding the indicators of health services utilization, the following were considered: the existence of *at least one medical consultation in the last three months* and the *use of prescribed medicines* in the two weeks preceding the survey.

Differences in health status and health services utilization by age and educational level were analyzed by logistic regression model[4], separately estimated for each gender and region. Dummy variables referring to five-year age groups and levels of education were used as explanatory variables. Only individuals aged over 15 years were considered, since only those cases in which the answers were provided by the respondent should be included and the education level should not have a great impact on the health status and the use of health services in children. The same four categories were considered for educational attainment: *No education/Primary*; *Lower Secondary*; *Upper Secondary* and *Higher Education*. A deviation coding scheme or the variables corresponding to age and educational level were used to estimate the effect of each class, compared to the average effect of all groups[5].

Projection of indicators of health status and health services utilization

In order to analyze the influence of education on the health status and the use of health services in the population at the regional level, we compared the results from the projections under the constant and the trend scenarios, for the seven regions.

We also considered two projection scenarios for the differences in health status and utilization of health services by level of education: a *stable scenario*, where it was assumed that the estimated differences based on the fourth edition of the NHS will remain constant throughout the period projection, and a *variable scenario*, in which these differences follow the changes observed between different editions of the NHS. To study the evolution of the differences over time, tests for structural change of the

4 David W. Hosmer and Stanley Lemeshow, *Applied Logistic Regression* (New Jersey, John Wiley & Sons, 2004); Inez M.A. Joung , Anton E. Kunst, Evert van Imhoff and Johan P. Mackenbach, "Education, aging, and health: to what extent can the rise in educational level relieve the future health care burden associated with population aging in the Netherlands?" *Journal of Clinical Epidemiology*, 53 (2000), 955–963.

5 Joseph F. Hair, Rolph E. Anderson, Ronald L. Tatham and William C. Black. *Multivariate Data Analysis* (Upper Saddle River, New Jersey, Prentice Hall, 1998).

regression models were made related to the second and fourth editions of the NHS (conducted in 1995/1996 and 2005/2006, respectively). In cases where the variation in the impact of education was statistically significant, the corresponding coefficient at the start of the projection period (estimated using the most recent NHS) was multiplied by the same factor, to obtain the magnitude of differences observed 10 years later. Given that the sample from the 1995/1996 edition of the NHS is only representative of the population from Mainland Portugal, only these five regions were considered in such calculations. Furthermore, due to the absence of data concerning the consumption of prescribed medicines in the two weeks preceding the survey on the 1995/1996 edition, we decided to use the multiplication factors estimated for the existence of at least one medical consultation in the last three months.

The expected proportions of individuals in each category of the dependent variables, for each gender, age group and educational level, were applied to the estimated number of individuals in each of the strata defined by gender, age group and educational level, obtained from the demographic projections previously described.

Software

The methodology was executed with *Microsoft Office Excel 2010* for the demographic projections. The R software (version 2.13.1) was used to construct the necessary life tables, through the *Life Tables* library, and to model the trend for the schooling levels of the Portuguese population (VGAM library).

In the last two tasks, logistic regression models were fitted using *IBM SPSS Statistics 19* software and *Microsoft Office Excel 2010* was used to compute the estimates for proportions of ill-health and use of health services.

Results

Demographic projections by region, gender, age group and educational level

Table 1. Population structure by gender, age group and educational level, 2011 and 2031 (Trend Scenario) by NUT II

	NUT II	North		Centre		Lisbon		Alentejo	
	Year	2011	2031	2011	2031	2011	2031	2011	2031
	Total (No.)	3,741,092	3,582,068	2,375,902	2,299,854	2,839,908	2,940,893	749,055	668,539
Gender	M	48.3%	48.4%	48.3%	48.5%	48.0%	48.5%	49.1%	48.9%
	F	51.7%	51.6%	51.7%	51.5%	52.0%	51.5%	50.9%	51.1%
Age Group (years)	0-14	15.1%	12.9%	13.7%	13.1%	16.2%	15.6%	13.3%	13.1%
	15-64	68.8%	64.8%	65,5%	65.2%	65.7%	64.3%	63.6%	64.7%
	65+	16.1%	22.3%	20.9%	21.7%	18.0%	20.1%	23.1%	22.1%
Level of Education	NS/2nd Cycle BE	60.5%	44.1%	58.6%	40.5%	49.5%	35.9%	60.5%	41.5%
	Basic Ed.	16.0%	17.7%	16.4%	18.2%	17.1%	16.9%	16.4%	19.1%
	Secondary Ed.	13.2%	20.3%	14.2%	22.5%	17.4%	23.7%	14.2%	23.3%
	Higher Ed.	10.3%	18.0%	10.7%	18.9%	16.0%	23.5%	8.9%	16.1%
Population 65 and over									
Level of Education	Total (No.)	602,798	797,961	496,103	499,808	511,896	590,479	173,145	148,031
	NS/2nd Cycle BE	89.5%	67.9%	91.2%	63.0%	75.7%	43.4%	92.7%	60.3%
	Basic Ed.	4.0%	12.5%	3.7%	14.9%	9.5%	19.0%	3.3%	16.0%
	Secondary Ed.	2.6%	9.5%	2.1%	11.0%	6.7%	17.5%	1.8%	12.2%
	Higher Ed.	3.8%	10.1%	3.0%	11.1%	8.1%	20.1%	2.3%	11.4%

	NUT II	Algarve		R.A.A.		R.A.M.[6]	
	Year	2011	2031	2011	2031	2011	2031
	Total (No.)	437,643	528,960	245,811	251,247	247,568	246,554
Gender	M	50.1%	49.5%	49.6%	49.2%	47.3%	47.6%
	F	49.9%	50.5%	50.4%	50.8%	52.7%	52.4%
Age Group (years)	0-14	15.8%	15.9%	18.3%	15.6%	17.2%	15.2%
	15-64	64.9%	65.2%	69.2%	68.4%	69.8%	69.5%
	65+	19.3%	18.9%	12.6%	16.0%	13.0%	15.3%
Level of Education	NS/2nd Cycle BE	55.5%	41.8%	64.6%	51.6%	61.0%	46.8%
	Basic Ed.	17.9%	19.9%	16.0%	18.8%	15.3%	16.3%
	Secondary Ed.	16.8%	22.9%	11.2%	16.4%	13.7%	21.8%
	Higher Ed.	9.8%	15.4%	8.1%	13.2%	10.0%	15.2%
Population 65 and over							
Level of Education	Total (No.)	84,463	99,941	30,864	40,158	32,188	37,824
	NS/2nd Cycle BE	84.9%	56.2%	88.8%	67.6%	90.0%	66.6%
	Basic Ed.	5.9%	16.7%	4.5%	12.6%	4.0%	10.9%
	Secondary Ed.	5.2%	15.3%	2.8%	9.0%	2.7%	10.9%
	Higher Ed.	4.1%	11.8%	3.8%	10.8%	3.3%	11.7%

Source: Author's calculations.

6 RAM is the Portuguese acronym for "Região Autónoma da Madeira".

Results for the Demographic Projections, by Portuguese NUTs II Regions, are shown in Table 1. The expected demographic pattern will generally be similar to the one obtained for the whole country. According to the trend scenario, the total number of residents is expected to decline in most regions, with the exception of Lisbon, the Algarve and the Azores (RAA)[7]. The proportion of young people will decline in almost all regions, with only a slight increase in the Algarve and a sharp decrease in the Autonomous Regions and the North, whilst the percentage of elderly is expected to rise in all regions, remaining at levels close to those achieved in 2011 only in Alentejo and Algarve.

Table 2. Demographic Indicators, 2011 and 2031 (Trend Scenario), by NUT II

	North		Centre		Lisbon		Alentejo		Algarve		R.A.A.		R.A.M.	
	2011	2031	2011	2031	2011	2031	2011	2031	2011	2031	2011	2031	2011	2031
Youth Ratio	93.8	58.1	65.4	60.2	90.1	77.6	57.7	59.3	81.7	83.9	145.4	97.6	132.6	99.1
Ageing Ratio	106.6	172.1	152.9	166.2	111.0	128.8	173.4	168.7	122.5	119.2	68.8	102.4	75.4	100.9
Longevity Ratio	46.6	41.1	50.1	43.0	44.2	44.2	52.2	42.7	48.8	43.8	45.6	34.7	45.9	32.7
Renewal of Working Age Population Ratio	111.9	66.5	103.4	68.9	87.6	79.5	96.6	70.6	97.4	86.7	164.7	88.2	153.7	79.8
Youth Dependency Ratio	22.0	20.0	20.9	20.1	24.7	24.2	21.0	20.3	24.3	24.3	26.4	22.8	24.7	21.9
Elderly Dependency Ratio	23.4	34.4	31.9	33.3	27.4	31.2	36.4	34.2	29.7	29.0	18.1	23.4	18.6	22.1
Total Dependency Ratio	45.4	54.4	52.8	53.4	52.1	55.4	57.4	54.5	54.0	53.3	44.5	46.2	43.4	44.0

Source: Author's calculations

Increased levels of schooling, for the general population and in particular for the elderly, is a generalized phenomenon and Lisbon will remain as the region with comparatively high levels of education. Projections obtained for crucial demographic indicators, by regions, are shown in Table 2.

Adjusted for other factors, logistic regression models based on data from the 4th INS (Table 3), suggest that there is an effect of education on health status self - perception, both among men and women, and in all NUT II regions. In general, individuals who have completed higher education tend to rate their health status more positively, and those who have not completed basic education tend to give more negative ratings.

7 RAA is the Portuguese acronym for "Região Autónoma dos Açores".

Table 3. Differences in self-rated health status as 'fair', 'poor' or 'very poor', between levels of education, by gender and NUTS II, adjusted for age (odds ratio).

Gender	Educational level	NUT II													
		North		Centre		Lisbon		Alentejo		Algarve		R.A.A.		R.A.M.	
		OR	p	OR	P	OR	p	OR	p	OR	p	OR	p	OR	p
Male	NS/2nd Cycle BE	2.27**	0.00	2.45**	0.00	2.51**	0.00	1.73**	0.00	2.18**	0.00	1.90**	0.00	2.58**	0.00
	Basic Ed.	0.91	0.54	1.21	0.20	1.06	0.67	1.14	0.42	1.08	0.56	1.35**	0.04	0.87	0.55
	Secondary Ed.	0.92	0.62	0.78	0.14	0.72**	0.02	0.81	0.25	0.75**	0.05	0.74*	0.08	0.88	0.63
	Higher Ed.	0.53**	0.00	0.43**	0.00	0.53**	0.00	0.63**	0.03	0.56**	0.00	0.53**	0.00	0.50**	0.02
Female	NS/2nd Cycle BE	2.28**	0.00	2.21**	0.00	2.20**	0.00	2.12**	0.00	2.29**	0.00	1.95**	0.00	2.32**	0.00
	Basic Ed.	1.21	0.16	1.29**	0.05	1.07	0.56	1.14	0.33	1.10	0.40	1.36**	0.02	1.14	0.42
	Secondary Ed.	1.35**	0.04	0.78*	0.07	0.87	0.23	0.72**	0.03	0.84	0.15	0.87	0.32	0.74*	0.07
	Higher Ed.	0.27**	0.00	0.45**	0.00	0.49**	0.00	0.57**	0.00	0.47**	0.00	0.43**	0.00	0.51**	0.00

** $p \leq 0.05$, * $p \leq 0.10$, n = 23839

Moreover, as suggested in Table 4, in general and when adjusting for age, chronic diseases do not seem to be strongly associated with the individuals' level of education. The only statistically significant differences for the prevalence of at least one chronic disease among individuals with different levels of education are found for Lisbon and Alentejo, among women in the Algarve and men in the North region. In these cases, the odds ratios indicate an increasing risk of the presence of chronic diseases among individuals with lower educational levels and a decreasing risk for those that have reached higher levels of education.

Table 4. Differences in the presence of at least one chronic disease among levels of education, by gender and NUTS II, adjusted for age (odds ratio)

Gender	Educational level	NUT II													
		North		Centre		Lisbon		Alentejo		Algarve		R.A.A.		R.A.M.	
		OR	p	OR	P	OR	p	OR	p	OR	p	OR	p	OR	p
Male	NS/2nd Cycle BE	1.45**	0.01	1.19	0.39	1.22*	0.06	1.32*	0.09	1.13	0.25	1.12	0.35	1.45	0.13
	Basic Ed.	0.85	0.26	0.88	0.41	0.95	0.67	0.88	0.41	0.92	0.52	1.10	0.44	1.03	0.90
	Secondary Ed.	0.95	0.70	1.04	0.82	0.75**	0.03	0.84	0.31	0.83	0.16	0.82	0.15	0.78	0.31
	Higher Ed.	0.86	0.37	0.91	0.57	1.15	0.28	1.03	0.89	1.14	0.40	0.99	0.93	0.86	0.57
Female	NS/2nd Cycle BE	1.24	0.11	1.28	0.13	1.15	0.12	1.41**	0.01	1.35**	0.00	1.21	0.17	1.09	0.58
	Basic Ed.	1.04	0.76	0.90	0.42	0.96	0.69	1.08	0.58	0.88	0.26	1.01	0.91	1.00	0.99
	Secondary Ed.	0.94	0.64	0.91	0.47	1.16	0.20	0.89	0.44	0.72**	0.00	0.89	0.32	0.81	0.21
	Higher Ed.	0.83	0.16	0.96	0.76	0.79**	0.04	0.74**	0.04	1.17	0.24	0.92	0.51	1.13	0.49

** $p \leq 0.05$
* $p \leq 0.10$
n = 23840

The association between schooling and the number of medical consultations is less evident. It is more evident in the Lisbon region, among men in the North and Centre and, once more, among women in the Alentejo and Azores (Table 5). In most cases, schooling is positively associated with the use of health services. Usually, individuals who have not completed basic education are less likely to have made at least one medical visit in the past three months.

Table 5. Differences in the existence of at least one medical visit in the past three months, between educational level, by gender and NUTS II, adjusted for age (odds ratio).

Gender	Educational level	NUT II													
		North		Centre		Lisbon		Alentejo		Algarve		R.A.A.		R.A.M.	
		OR	p	OR	p	OR	p	OR	p	OR	p	OR	p	OR	p
Male	NS/2nd Cycle BE	0.99	0.12	0.90	0.20	0.76**	0.03	0.97	0.13	0.95	0.15	0.67	0.42	0.90	0.88
	Basic Ed.	0.77**	0.05	0.81	0.13	1.32**	0.02	0.92	0.56	0.90	0.35	1.22	0.10	0.81	0.31
	Secondary Ed.	1.01	0.92	0.93	0.64	0.86	0.20	1.18	0.31	0.95	0.70	1.08	0.54	1.23	0.37
	Higher Ed.	1.29*	0.10	1.49**	0.01	1.16	0.21	0.96	0.80	1.23	0.17	1.13	0.44	1.12	0.65
Female	NS/2nd Cycle BE	0.89*	0.08	1.04	0.11	0.98**	0.00	1.08*	0.10	1.05	0.14	0.91	0.06	0.87	0.43
	Basic Ed.	1.04	0.74	1.06	0.66	0.84*	0.10	0.79**	0.05	0.98	0.87	0.85	0.14	0.78	0.12
	Secondary Ed.	1.01	0.94	0.84	0.18	1.05	0.64	0.97	0.84	1.02	0.87	0.91	0.36	1.19	0.26
	Higher Ed.	1.07	0.62	1.08	0.51	1.15	0.19	1.21	0.17	0.95	0.66	1.43**	0.00	1.23	0.20

** $p \leq 0.05$
* $p \leq 0.10$
n = 23831

Table 6. Differences in the use of prescription medicines in the past two weeks, between levels of education, by gender and NUTS II, adjusted for age (odds ratio).

Gender	Educational level	NUT II													
		North		Centre		Lisbon		Alentejo		Algarve		R.A.A.		R.A.M.	
		OR	p	OR	p	OR	p	OR	p	OR	p	OR	p	OR	p
Male	NS/2nd Cycle BE	1.27	0.12	0.95	0.20	0.96**	0.03	1.04	0.13	0.83	0.15	0.92	0.42	1.26	0.88
	Basic Ed.	0.86	0.34	1.07	0.67	1.00	1.00	1.01	0.94	0.83	0.13	1.16	0.27	0.89	0.61
	Secondary Ed.	0.86	0.35	0.97	0.87	0.88	0.34	0.92	0.65	1.02	0.89	0.93	0.64	1.14	0.61
	Higher Ed.	1.07	0.71	1.01	0.96	1.18	0.20	1.03	0.88	1.42**	0.03	1.00	0.99	0.79	0.40
Female	NS/2nd Cycle BE	1.31*	0.08	1.00	0.11	1.09**	0.00	1.52*	0.10	1.16	0.14	0.96*	0.06	0.85	0.43
	Basic Ed.	0.76**	0.03	0.96	0.79	1.06	0.61	1.01	0.91	0.79**	0.02	0.85	0.17	1.08	0.63
	Secondary Ed.	1.60**	0.00	0.98	0.90	0.89	0.29	0.73**	0.02	1.03	0.76	1.04	0.75	1.19	0.28
	Higher Ed.	0.63**	0.00	1.06	0.68	0.97	0.81	0.89	0.41	1.06	0.65	1.17	0.22	0.91	0.56

** $p \leq 0.05$
* $p \leq 0.10$
n = 23837

Table 7. Prevalence projected for self-rating of health status as 'fair', 'poor' or 'very poor', 2011, 2021 and 2031, by gender and NUTS II, Constant Scenario and Trend Scenario (%).

NUT II	Year	Gender	Constant Scenario	Trend Scenario
North	2011	M	44.3%	44.3%
		F	58.8%	58.8%
	2021	M	44.6%	44.4%
		F	58.8%	58.4%
	2031	M	45.6%	45.1%
		F	59.4%	58.3%
Centre	2011	M	53.1%	53.1%
		F	63.3%	63.3%
	2021	M	51.2%	50.9%
		F	61.5%	61.2%
	2031	M	51.2%	50.3%
		F	61.2%	60.4%
Lisbon	2011	M	41.9%	41.9%
		F	55.4%	55.4%
	2021	M	40.4%	40.2%
		F	54.6%	54.3%
	2031	M	39,8%	39.1%
		F	53,9%	53.2%
Alentejo	2011	M	44.2%	44.2%
		F	60.3%	60.3%
	2021	M	42.3%	42.2%
		F	57.8%	57.7%
	2031	M	42.3%	41.9%
		F	57.1%	56.6%
Algarve	2011	M	40.8%	40.8%
		F	52.8%	52.8%
	2021	M	38.8%	38.7%
		F	50.5%	50.3%
	2031	M	37.8%	37.5%
		F	49.4%	48.8%
R.A.A.	2011	M	35.5%	35.5%
		F	48.8%	48.8%
	2021	M	36.3%	36.2%
		F	49.5%	49.3%
	2031	M	38.2%	38.0%
		F	51.5%	51.1%
R.A.M.	2011	M	42.6%	42.6%
		F	55.9%	55.9%
	2021	M	41.1%	40.9%
		F	54.8%	54.7%
	2031	M	41.3%	40.7%
		F	54.9%	54.6%

Source: Author's calculations.

There is a positive association between educational level and prescribed medicines for women in the North region. As can be seen in Table 6, those who have not completed basic education and those who have attained secondary education have a higher rate of consumption of medicines. However, the relationship between schooling and use of medicines is not obvious or similar in different regions. Thus, among women in Lisbon and Alentejo, education seems to be negatively associated with the prescription of medicines, but the opposite occurs among men in Lisbon, Algarve and the Azores.

Projections for Indicators of Health Status and Use of Health Services, 2011–2031, by NUT II

Self-Perception of Health Status

Table 7 shows the projected proportions of individuals who evaluate their health status as 'fair', 'poor' or 'very poor' for each region and gender in the years 2011, 2012 and 2031, comparing the constant scenario with the trend scenario. Differences between the estimated proportions according to the two scenarios depend on the level of education, previously analysed as the odds ratio of logistic regression models.

Individuals with a higher education tend to rank their health status more positively (for the same age) compared with less educated persons. The same table also reveals that in all regions the proportions of women with a negative self-reported health status outweigh the proportions recorded for the opposite gender. The Centre region is projected to have a less favourable health status, in contrast to the Azores, where these proportions reach lower values.

Chronic Diseases

Table 8 compares the prevalence of at least one chronic disease with the two scenarios. As can be seen, the most favourable results correspond to the variable scenario. Moreover, although the differences between the constant scenario and the trend scenario are small, they become more evident when we assume that the differences between the levels of education are accentuated (variable scenario). The projected prevalence is higher in the North region in contrast to the Autonomous Region of Madeira with minimum values. Women always have higher prevalence than men, regardless of the region and the scenario considered.

Table 8. Prevalence projected for the presence of at least one chronic disease, 2011, 2021 and 2031, by gender and NUTS II, Constant Scenario and Trend Scenario (%).

			Stable Scenario		Variable Scenario	
NUT II	**Year**	**Gender**	**Constant Scenario**	**Trend Scenario**	**Constant Scenario**	**Trend Scenario**
North	2011	M	60.1%	60.1%	60.1%	60.1%
		F	73.2%	73.2%	73.2%	73.2%
	2021	M	61,7%	61.6%	40.7%	40.5%
		F	75.1%	75.0%	75.1%	75.0%
	2031	M	63.9%	63.6%	59.7%	61.0%
		F	77.0%	76.8%	76.4%	74.7%
Centre	2011	M	62.8%	62.8%	62.8%	62.8%
		F	72.8%	72.8%	72.8%	72.8%
	2021	M	63.0%	62.9%	46.2%	46.0%
		F	73.2%	73.1%	73.1%	73.0%
	2031	M	64.5%	64.4%	59.8%	61.3%
		F	74.3%	74.1%	72.6%	72.2%
Lisbon	2011	M	63.2%	63.2%	63.2%	63.2%
		F	73.4%	73.4%	73.4%	73.4%
	2021	M	64.5%	64.4%	60.5%	60.7%
		F	74.2%	74.1%	74.3%	74.2%
	2031	M	65.0%	64.6%	52.3%	52.3%
		F	74.5%	74.2%	74.1%	73.2%
Alentejo	2011	M	57.8%	57.8%	57.8%	57.8%
		F	69.7%	69.7%	69.7%	69.7%
	2021	M	57.4%	57.3%	42.6%	42.5%
		F	69.2%	69.0%	69.1%	69.0%
	2031	M	58.1%	57.9%	53.4%	56.1%
		F	69.6%	69.3%	67.9%	68.3%
Algarve	2011	M	53.0%	53.0%	53.0%	53.0%
		F	67.2%	67.2%	67.2%	67.2%
	2021	M	52.8%	52.7%	45.8%	45.8%
		F	67.0%	67.0%	66.3%	66.3%
	2031	M	52.9%	52.8%	50.8%	52.6%
		F	67.0%	67.1%	60.9%	62.7%
R.A.A.	2011	M	50.1%	50.1%	50.1%	50.1%
		F	64.6%	64.6%	64.6%	64.6%
	2021	M	51.8%	51.7%	62.6%	62.5%
		F	66.6%	66.5%	67.1%	67.0%
	2031	M	54.4%	54.3%	36.1%	31.7%
		F	69.4%	69.3%	69.9%	67.9%
R.A.M.	2011	M	45.2%	45.2%	45.2%	45.2%
		F	57.9%	57.9%	57.9%	57.9%
	2021	M	45.9%	45.7%	45.5%	45.7%
		F	59.7%	59.6%	60.6%	60.4%
	2031	M	47.7%	47.5%	33.8%	30.4%
		F	62.3%	62.1%	62.1%	61.4%

Source: Author's calculations.

Table 9. Prevalence projected for the presence of at least one long-term disability, in 2011, 2021 and 2031, by gender and NUTS II, Constant Scenario and Trend Scenario (%).

			Stable Scenario		Variable Scenario	
NUT II	**Year**	**Gender**	**Constant Scenario**	**Trend Scenario**	**Constant Scenario**	**Trend Scenario**
North	2011	M	6.0%	6.0%	6.0%	6.0%
		F	8.1%	8.1%	8.1%	8.1%
	2021	M	6.1%	6.1%	6.1%	6.1%
		F	8.1%	8.1%	7.8%	7.8%
	2031	M	6.3%	6.2%	6.3%	6.1%
		F	8.2%	8.2%	7.8%	7.7%
Centre	2011	M	6.1%	6.1%	6.1%	6.1%
		F	7.1%	7.1%	7.1%	7.1%
	2021	M	5.6%	5.6%	5.6%	5.6%
		F	6.6%	6.6%	7.8%	7.8%
	2031	M	5.5%	5.4%	5.5%	5.6%
		F	6.3%	6.3%	7.7%	8.6%
Lisbon	2011	M	5.4%	5.4%	5.4%	5.4%
		F	7.7%	7.7%	7.7%	7.7%
	2021	M	5.1%	5.1%	5.1%	5.1%
		F	7.3%	7.2%	6.3%	6.3%
	2031	M	5.1%	5.1%	5.1%	5.1%
		F	6.7%	6.7%	6.0%	5.9%
Alentejo	2011	M	6.0%	6.0%	6.0%	6.0%
		F	9.2%	9.2%	9.2%	9.2%
	2021	M	5.0%	5.0%	5.0%	5.0%
		F	8.4%	8.4%	5.6%	5.5%
	2031	M	4.4%	4.4%	4.4%	5.0%
		F	8.0%	7.9%	5.4%	4.7%
Algarve	2011	M	5.4%	5.4%	5.4%	5.4%
		F	7.3%	7.3%	7.3%	7.3%
	2021	M	4.9%	4.9%	4.9%	4.9%
		F	6.8%	6.8%	6.8%	6.8%
	2031	M	4.8%	4.7%	4.8%	4.9%
		F	6.4%	6.4%	6.5%	6.9%
R.A.A.	2011	M	3.8%	3.8%	3.8%	3.8%
		F	6.9%	6.9%	6.9%	6.9%
	2021	M	3.9%	3.9%	3.9%	3.9%
		F	7.1%	7.1%	5.6%	5.6%
	2031	M	4.3%	4.3%	4.3%	3.9%
		F	7.6%	7.5%	5.9%	5.1%
R.A.M.	2011	M	3.0%	3.0%	3.0%	3.0%
		F	5.2%	5.2%	5.2%	5.2%
	2021	M	2.6%	2.6%	2.6%	2.6%
		F	5.0%	5.0%	4.5%	4.5%
	2031	M	2.4%	2.4%	2.4%	2.6%
		F	5.1%	5.1%	4.5%	4.3%

Source: Author's calculations.

Table 10. Prevalence projected for the existence of at least one medical appointment in the last three months 2011, 2021 and 2031, by gender and NUTS II, Constant Scenario and Trend Scenario (%).

			Stable Scenario		Variable Scenario	
NUT II	**Year**	**Gender**	**Constant Scenario**	**Trend Scenario**	**Constant Scenario**	**Trend Scenario**
North	2011	M	51.9%	51.9%	51.9%	51.9%
		F	64.4%	64.4%	64.4%	64.4%
	2021	M	52.9%	53.0%	50.5%	50.6%
		F	65.9%	66.0%	66.8%	66.7%
	2031	M	54.2%	54.4%	53.6%	52.3%
		F	67.6%	67.7%	66.8%	64.8%
Centre	2011	M	52.6%	52.6%	52.6%	52.6%
		F	64.7%	64.7%	64.7%	64.7%
	2021	M	52.7%	52.8%	51.3%	51.4%
		F	64.5%	64.6%	65.4%	65.4%
	2031	M	54.2%	54.4%	54.0%	52.4%
		F	65.1%	65.2%	64.4%	63.2%
Lisbon	2011	M	56.8%	56.8%	56.8%	56.8%
		F	66.0%	66.0%	66.0%	66.0%
	2021	M	57.7%	57.7%	58.4%	58.4%
		F	66.6%	66.6%	66.7%	66.5%
	2031	M	57.9%	57.9%	58.1%	58.0%
		F	67.2%	67.3%	67.0%	65.7%
Alentejo	2011	M	47.2%	47.2%	47.2%	47.2%
		F	59.4%	59.4%	59.4%	59.4%
	2021	M	47.4%	47.4%	46.7%	46.7%
		F	59.4%	59.4%	62.2%	61.9%
	2031	M	48.1%	48.2%	48.0%	47.2%
		F	59.8%	59.9%	57.2%	55.1%
Algarve	2011	M	44.3%	44.3%	44.3%	44.3%
		F	58.3%	58.3%	58.3%	58.3%
	2021	M	44.5%	44.6%	43.9%	43.9%
		F	58.2%	58.1%	57.5%	57.5%
	2031	M	44.8%	44.9%	44.7%	44.4%
		F	58.3%	58.3%	58.7%	58.8%
R.A.A.	2011	M	38.9%	38.9%	38.9%	38.9%
		F	52.7%	52.7%	52.7%	52.7%
	2021	M	40.7%	40.8%	42.9%	43.0%
		F	53.8%	53.9%	60.5%	60.1%
	2031	M	43.3%	43.4%	43.8%	41.4%
		F	55.4%	55.6%	47.0%	43.9%
R.A.M.	2011	M	40.4%	40.4%	40.4%	40.4%
		F	49.6%	49.6%	49.6%	49.6%
	2021	M	41.1%	41.2%	39.2%	39.3%
		F	51.1%	51.1%	54.7%	54.7%
	2031	M	42.6%	42.8%	42.0%	40.6%
		F	53.2%	53.3%	50.4%	46.7%

Source: Author's calculations

Long-term disability

The projected prevalence for long-term disability (Table 9) tends to decrease in the various scenarios and for the different regions. The exception is in the Azores and in the North region as well as for women in the Centre. In 2031, and according to regional diversity, the North is expected to be the region with higher proportions of individuals with long-term disability in both genders. This happens even though the values in this region were lower than those of the Alentejo region in 2011, particularly among women. The Autonomous Region of Madeira will continue to report the lowest prevalence of disability.

Medical visits

The expected proportions of individuals who will attend a medical appointment (Table 10) the results for 2031 are relatively similar to those of 2011 in most regions. In 2031, the lowest percentage of use of this service is expected in the variable scenario, where an increasing level of education is assumed with the exception of Lisbon and Algarve. Once again, the lower prevalence rates are those projected by the trend scenario and Lisbon reports the highest levels. On the contrary, the lowest values are found in the Autonomous Regions. In all areas of Portugal, women have higher values for this indicator.

Conclusions

The estimation results of the logistic regression based on data from the 4th INS suggest that there is an association between education (adjusted for age) and self-perception of health status for both genders and in all regions. In general, individuals with higher education also tend to have a higher perceived health status. Those who have not completed a basic education are more likely to report more negative ratings. For the remaining indicators, the association with educational levels does not seem to be so clear. In regions where these effects are statistically significant, individuals without basic education are more likely to have at least one chronic disease or a long-term disability. However, this risk is reduced among ageing persons with higher education, particularly among women in all regions. In general, the associations between health indicators and educational levels seem to be more visible and significant among women.

For each of the five indicators used, self-perception of health status showed the most obvious improvements. A substantial increase will be expected in the proportion

of residents who rate their health as 'good' or 'very good' in all scenarios and both genders.

For this indicator, the increased levels of education (trend scenario) seem to have a great impact compared with the constant scenario. The same is true for the use of prescription medicines among men and for medical visits by women. This impact is always expected to be positive, since the trend scenario results suggest a lower prevalence of individuals who rate their health status negatively, with fewer medical appointments and less use of prescription medicines.

Projections on the health status of the population is a complex and challenging task, given the difficulties to estimate changes in morbidity and health[8]. The projections have followed an approach of 'what if', based on the definition of different scenarios for the projections of educational levels and the differences between educational levels versus health status and the use of health services. Thus, the uncertainty associated with the results is evident. Nevertheless, in our opinion such projections will be valuable for planning and policy decision-making.

We can thus assume that if increased longevity is accompanied by an increase in the number of years lived in good health, the ageing of the Portuguese population may not necessarily translate itself into an increase in health expenditures. A better health status will contribute to a lower use of health services and can consequently can lead to reduced costs[9].

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8 European Commission, *The 2012 Ageing Report: Economic and budgetary projections for the 27 EU Member States (2010–2060).* European Economy, 2/2012 (Brussels, 2012).

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Impact of the Demographic and Educational Structure on Health Outcomes: A Prospective Analysis for the Portuguese Population

Maria Rosário Oliveira Martins, Inês Rodrigues and Teresa Rodrigues

Introduction

The analysis of the recent demographic development of the Portuguese population reveals a marked change in its age structure, with a distinct aging process, resulting both from decreased levels of fertility and a progressive decrease in mortality levels, in both genders and in all age groups. Additionally, the contribution of migration to population growth and reproduction has substantially decreased, being now insufficient to ensure population growth and to counteract the aging, process. As a consequence, natural increase diminishes (Statistics Portugal, Demographic Indicators) and the population is increasingly aging. Between 1992 and 2011, the number of people aged 65 years and more increased by approximately 42%, accounting for 19.1% of the total population at the end of the period. It is clearly above the EU-27 average (17.5%) and only exceeded by Germany (20.6%), Italy (20.3%) and Greece (19.3%)[1]. At the same time, the proportion of individuals who complete all higher levels of education rise in both genders and in all age-groups[2].

Demographic ageing is a-major challenge for political decision makers, due to its inevitable impact on social support, health care and the labor market. The population's ageing changes its pattern of health status.

1 Eurostat, 2013.

2 OECD, Education at a Glance: OECD Indicators 2012 (2012). Country Note Portugal.

In fact, among different structural, behavioural and psychosocial factors, age is associated with health status. Orfila, Ferrer, Lamarca and Alonso (2000)[3] suggest that, in addition to an augmented death probability, increased age is also linked to a decline of self-reported health status. However, the same study also shows that the association between age and declining health status loses its significance when comorbidities are considered, suggesting that this decline is not due to chronological age in itself.

Education is a frequently studied socio-structural determinant of health[4], together with gender, income, occupation or marital status[5]. Accounting for the combined influence of gender, age and education on the population's health, the prospective study is an important contribution for informed health policies and health promotion. If, ageing individuals report a worsening health status but improved levels of education lead to better health status[6], the effects of these two processes on the population's health might, to a greater or lesser extent, counterbalance each other.

The objective of this work was to produce projections for a set of indicators on health status and the Portuguese population's use of health services for the period

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3 Francesc Orfila, Montserrat Ferrer, Rosa Lamarca and Jordi Alonso, "Evolution of self-rated health status in the elderly: Cross-sectional vs. longitudinal estimates", Journal *of Clinical Epidemiology,* 53(2000), 563-570.

4 Adriënne E. J. M. Cavelaars, Anton E. Kunst, José J. M. Geurts, Roberta Crialesi, Liv Grötvedt, Uwe Helmert, Eero Lahelma, Olle Lundberg, Jil Matheson, Andreas Mielck, Andreé Mizrahi, Arié Mizrahi, Niels Kr Rasmussen, Enrique Regidor, Thomas Spuhler, Johan P. Mackenbach, "Differences in self-reported morbidity by educational level: a comparison of 11 Western European countries*", Journal of Epidemiology & Community Health*, 52 (1998), 219-227; David M. Cutler and Adriana Lleras-Muney, "Education and Health: Evaluating Theories and Evidence", National Bureau of Economic Research Working Paper No. 12352 (Cambridge, MA, USA, 2006); Filipa Castro Henriques, Teresa Ferreira Rodrigues and Maria Fraga O. Martins, "Ageing, Education and Health in Portugal: Prospective from the 19th to the 21st Century", *Hygiea Internationalis,* 8: 1 (2009), 81–96; Giorgio Brunello, Margherita Fort, Nicole Schneeweis and Rudolf Winter-Ebmer, "The Causal Effect of Education on Health: What is the Role of Health Behaviors*",* IZA Discussion Paper No. 5944 (Bonn, Germany, 2011).

5 Margaret Denton, Steven Prus and Vivienne Walters, "Gender differences in health: a Canadian study of the psychosocial, structural and behavioural determinants of health", *Social Science & Medicine*, 58 (2004), 2585–2600.

6 Inez M.A. Joung , Anton E. Kunst, Evert van Imhoff and Johan P. Mackenbach, "Education, aging, and health: to what extent can the rise in educational level relieve the future health care burden associated with population aging in the Netherlands?" *Journal of Clinical Epidemiology*, 53(2000), 955-963; Martijn Huisman, Anton E. Kunst and Johan P. Mackenbach, "Socioeconomic inequalities in morbidity among the elderly; a European overview", *Social Science & Medicine*, 57 (2003), 861–873; Filipa Castro Henriques and Teresa Ferreira Rodrigues, "Essay on Ageing and Health projections in Portugal". *Item 3 – Challenges and use of population projections* (2010). Joint Eurostat/UNECE Work Session on Demographic Projections (28-30 April 2010, Lisbon, Portugal). Statistical Office of the European Union (EUROSTAT).

2011-2031, considering the expected changes in population structure by gender, age group and educational attainment.

Methods

This study consists of three main parts: (1) demographic projections by gender, age group and educational level, for the Portuguese population, for the period 2011-2031, (2) a study of the impact of age and education on the indicators of health status and health services utilization, and (3) the subsequent projection of these outcomes for the same period.

Demographic projections by gender, age group and educational level

A multistate demographic model [7] was used to produce demographic projections by gender, age group and educational attainment, at the national level, using discrete matrix equations[8]. Each group of the population (by gender and age group) was divided into four categories according to the highest level of education completed:

1. *No education/Primary Education*: includes those who have not completed any formal education and those who have only completed the first cycle of basic education (first four year of schooling) or the second cycle (six years) of primary education;
2. *Lower Secondary Education*: includes those who completed all nine years of the lower secondary education;
3. *Upper Secondary Education*: includes those who completed the 12th year of education;
4. *Higher Education*: comprises those who completed some academic courses, achieving, at least, a degree of *Bacharel* (Bachelor) or *Licenciado (*Graduated).

The model is based on the cohort component methodology adapted to a multidimensional population, assuming that the passage across levels of education can be described by a Markov process with finite state space and that the rates that

7 Frans Willekens, *Description of the multistate projection model (Multistate model for biographic analysis and projection)*. Deliverable D1 in Work Package 1. Bridging the micro-macro gap in population forecasting – MicMac Project. Netherlands Interdisciplinary Demographic Institute. (The Hague,The Netherlands, 2006).

8 Robert Schoen, "Population Models With Constant Rates" pp. 1–26 in *Dynamic Population Models*. The Springer Series on Demographic Methods and Population Analysis (Springer Netherlands, 2006).

drive the population dynamics remain constant across each five-year projection period. Besides the estimation of transition probabilities between levels of education, by gender and age group, it was also needed to consider the existence of differentials regarding fertility, mortality and migration, by level of education. For this purpose, data from the 2001 and 2011 censuses, national projections produced by Statistics Portugal (Instituto Nacional de Estatística (INE), I.P.), the Labour Force Survey (INE, I.P.) and the 2010 Revision of the World Population Prospects (United Nations) were all used in order to estimate the necessary parameters.

The age- and education-specific survival ratios, fertility rates and transition probabilities estimates were disposed into a block Leslie matrix. This matrix was, together with a vector for net migration, used to estimate the number of individuals from each gender, age group and education level, by the end of each five-year projection period.

Two scenarios were considered, one where educational attainment prior to 2011 remains constant and another in which educational attainment will follow the trend observed over the last decade, being the trend in the state proportion modeled using continuation ratio models.

Impact of age and education on health status and health services utilization

The study of current differences in health status and health services utilization by age and educational level was based on the data from the fourth edition of the National Health Survey (4th NHS), a representative survey of the Portuguese population, planned and conducted by the Statistics Portugal and the National Institute of Health Dr. Ricardo Jorge (INSA), in collaboration with the Directorate-General of Health. The 4th NHS collected information on health status, health determinants, use of health services and sociodemographic characteristics of individuals, being the first edition to cover the entire national territory, including the Autonomous Regions of Azores and Madeira. The questionnaire was administered by direct interviews of a representative probability sample of the Portuguese population, between February 2005 and February 2006. The study population included individuals living in family housing units (therefore excluding people living in collective accommodations). A total of 41,193 individuals living in 15,239 family housing units were interviewed with a nationwide completion rate of 76%.

Health status outcomes were: *self-reported health status*, classified as "very good", "good", "fair", "bad" or "very bad"; *chronic diseases*, determined by the presence of at least one of 19 presented chronic diseases; *long term disability*, if any difficulty or complete inability to perform at least one of a set of tasks of daily living was reported. Indicators of health services utilization were: *at least one medical consultation in the*

last three months and the *use of prescribed medicines* in the two weeks preceding the survey.

To study the differences in health status and health services utilization by age and educational level, logistic regression models [9] were separately estimated for each gender. Dummy variables referring to five-year age groups and levels of education were used as explanatory variables. Only individuals aged over 15 years were considered, since only cases when the answers were given by the respondent himself, and since the educational level cannot have a great impact on the health status and the use of health services among children. The same four categories were considered for educational attainment: *No education/Primary*; *Lower Secondary*; *Upper Secondary* and *Higher Education*. Both for the variables corresponding to age and to educational level, we used a deviation coding scheme, in which the effect of each class is compared with the average of all groups[10].

Projection of indicators of health status and health services utilization

In order to analyze the influence of education on the health status and the use of health services in the Portuguese population, results from the projections under the constant versus trend scenarios were compared.

We also considered two projection scenarios on the differences in health status and utilization of health services by level of education: a *stable scenario*, where it is assumed that the estimated differences based on the fourth edition of the NHS will remain constant throughout the period projection, and a *variable scenario*, in which these differences follow the changes observed between different editions of the NHS. To study the evolution of the differences over time, tests for structural change of the regression models were performed, considering the second and fourth editions of the NHS (conducted in 1995/1996 and 2005/2006, respectively). In cases where the variation in the impact of education was statistically significant, the corresponding coefficient at the start of the projection period (estimated using the most recent NHS) was multiplied by the same factor, to obtain the magnitude of differences observed 10 years later. Since the sample from the 1995/1996 edition of the NHS is only representative of the population from mainland Portugal, only these regions were considered in such calculations. Furthermore, due to the absence of data

9 David W. Hosmer and Stanley Lemeshow, *Applied Logistic Regression* (New Jersey, John Wiley & Sons, 2004); Inez M.A. Joung , Anton E. Kunst, Evert van Imhoff and Johan P. Mackenbach, "Education, aging, and health: to what extent can the rise in educational level relieve the future health care burden associated with population aging in the Netherlands?" *Journal of Clinical Epidemiology*, 53 (2000), 955-963.

10 Joseph F. Hair, Ralph E. Anderson, Ronald L. Tatham and William C. Black. *Multivariate Data Analysis* (Upper Saddle River, New Jersey, Prentice Hall, 1998).

concerning the consumption of prescribed medicines in the two weeks preceding the survey on the 1995/1996 edition, the multiplication factors estimated for the existence of at least one medical consultation in the last three months were used.

The expected proportions of individuals in each category of the dependent variables, for each gender, age group and educational level, were applied to the estimated number of individuals in each of the strata defined by gender, age group and educational level, obtained from the demographic projections previously described.

Software

The methodology for producing the demographic projections was executed with *Microsoft Office Excel 2010*. The R software (version 2.13.1) was used to construct the necessary life tables, through the *Life Tables* library, and to model the trend for the schooling levels of the Portuguese population (VGAM library).

In the last two tasks, logistic regression models were fitted using *IBM SPSS Statistics 19* software and *Microsoft Office Excel 2010* was used to compute the estimates for proportions of ill-health and use of health services.

Results

The Portuguese population by gender, age and educational attainment

Concerning the results of demographic projections by educational attainment between the years 2011 and 2031, we can in both scenarios expect a decrease in the total number of residents in Portugal, from 10,636,979 to 10,284,134 inhabitants in the constant scenario or to 10,265,109 in the trend scenario. The age structure of the population is expected to change significantly, in relation to the baseline year: the proportion of individuals above 65 years is expected to increase to approximately 22%, while the proportion of children and young people under 15 years is projected to be slightly above 14%, by 2031.

The proportion of residents who complete at least lower secondary education will continue to rise, expecting over half of the population to finish this level of education by 2031 (table 1). Even with fixed transition proportions (constant scenario), the levels of education of the whole population will tend to increase over time, as younger and more educated cohorts replace older cohorts. The trend scenario leads to an acceleration of that trend, since it is based on transition proportions that follow the trend of the last decade and, as such, increase during the projection period.

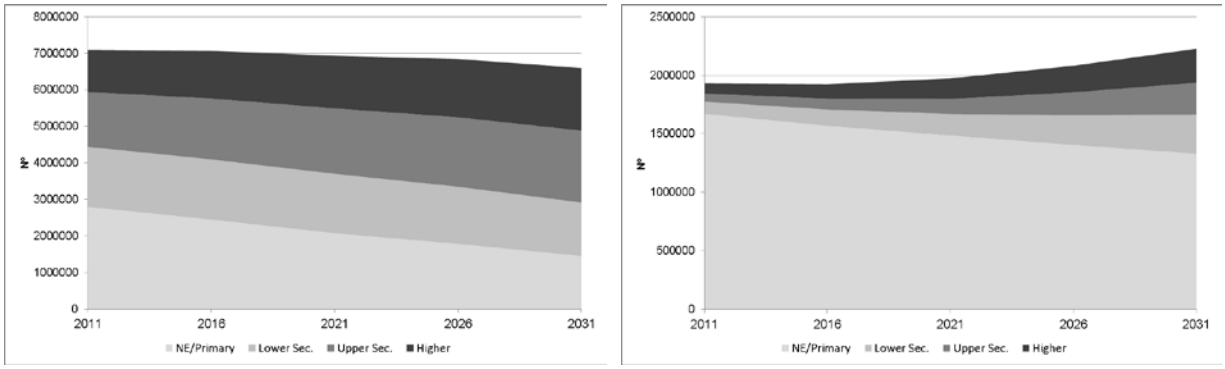
Health improvements should be evident in the age group 15 to 64 years (figure 1), caused by the reduced proportion of those who did not complete the lower secondary level - from 39.4% in 2011 to approximately 25% by 2031 (26.65% under the constant scenario and 22.03% in the trend scenario).The percentage of individuals who have a 'higher education course' in the same group is also expected to rise from 16.4%. In the same figure, we see an increase in the total number of people aged 65 or over, together with a clear change in its educational structure: by 2031, 40.3% of individuals in this group should have completed at least lower secondary education, i.e. a rise of 26.8 percentage points compared to since 2011, whilst the percentage of people with higher education in 2011, is expected to increase from 4.6% to 13.04% by 2031 in both scenarios.

Table 1. Population structure by gender, age group and level of education, 2011 and 2031, by scenario

		Portugal		
	Year	**2011**	**2031 Constant**	**2031 Trend**
	Total (Nº)	10.636.979	10.284.134	10.265.109
Gender	**M**	48.4%	48.5%	48.5%
	F	51.6%	51.5%	51.5%
Age group (years)	**0-14**	15.1%	14.2%	14.0%
	15-64	66.7%	64.1%	64.3%
	65+	18.2%	21.6%	21.7%
Level of education	**N.E./Primary**	57.1%	44.2%	41.1%
	Lower Sec.	16.4%	17.4%	17.6%
	Upper Sec.	14.7%	19.7%	21.8%
	Higher	11.7%	18.7%	19.5%
Population aged 65+				
Level of education	**Total (Nº)**	1.931.457	2.226.497	2.226.497
	N.E./Primary	86.5%	59.7%	59.7%
	Lower Sec.	5.4%	15.1%	15.1%
	Upper Sec.	3.6%	12.2%	12.2%
	Higher	4.6%	13.0%	13.0%

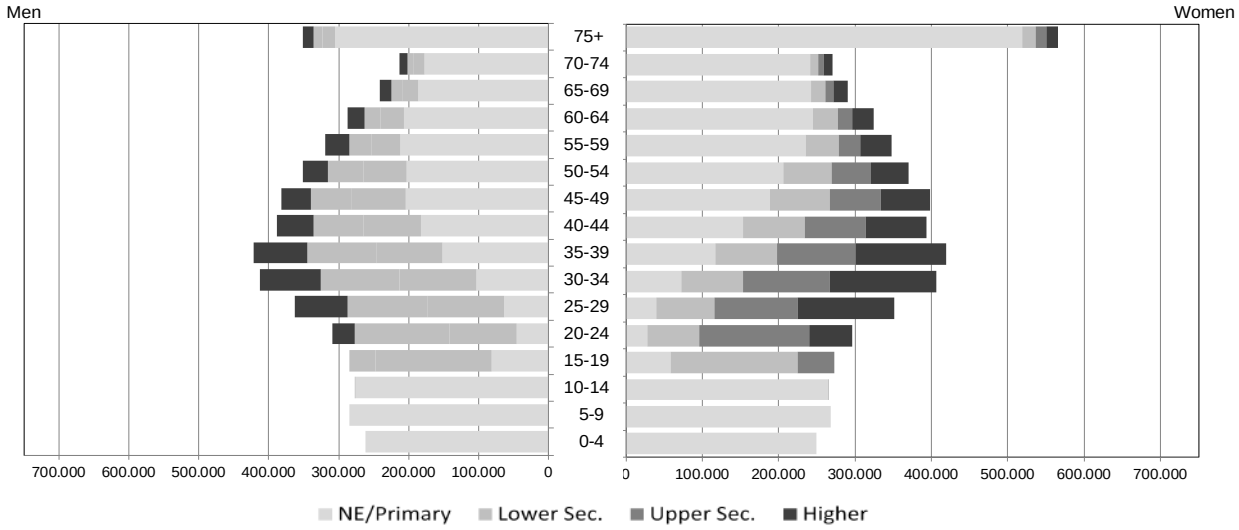
Source: Authors' calculations.

Figure 1. Number of people aged 15-64 (left) and 65+ (right), by level of education, 2011-2031, Trend scenario



Source: Authors' calculations.

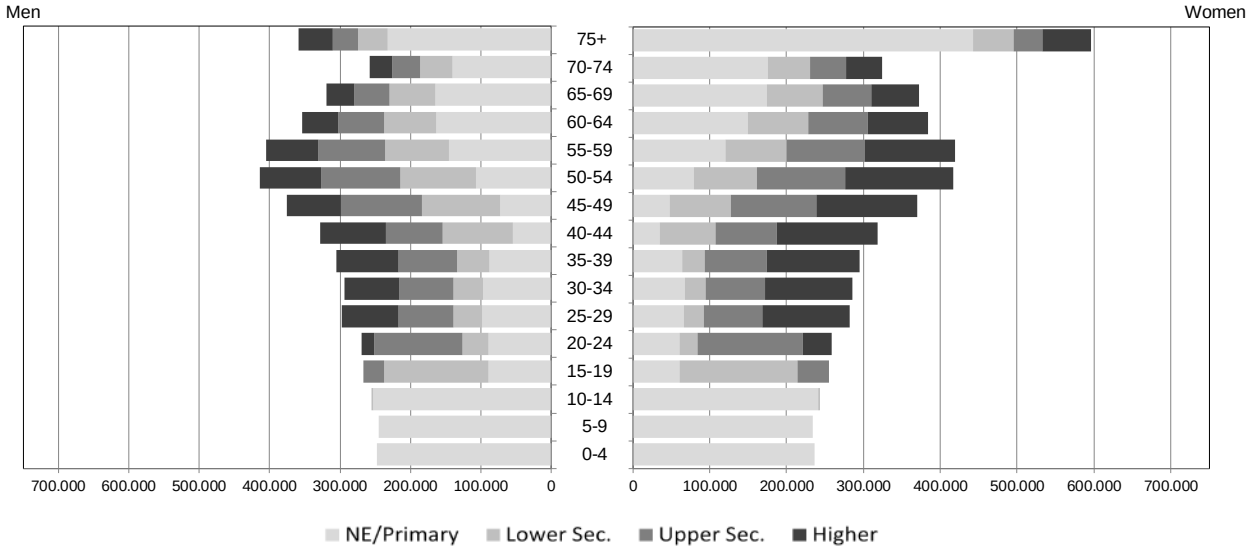
Figure 2. Portuguese population by gender, age group, and level of education, January 1st, 2011



Source: Statistics Portugal, annual Estimates of the Resident Population and authors' calculations.

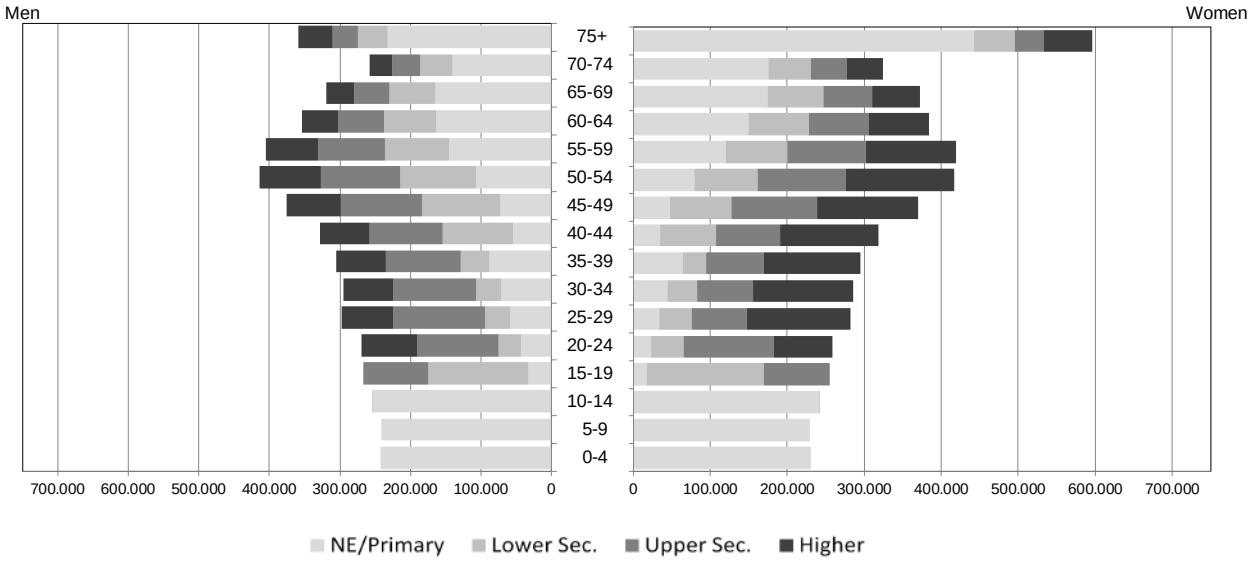
The distribution of residents by all three variables – gender, age group and educational level – can be analyzed through the construction of multistate population pyramids. The comparison between the observed population structure in 2011 and that estimated for 2031 (figures 2, 3 and 4) indicates that the proportion of individuals who complete higher levels of education should increase in all age groups of both sexes, according to any of the scenarios.

Figure 3. Portuguese population by gender, age group, and level of education, January 1st, 2031: Constant Scenario



Source: Authors' calculations.

Figure 4. Portuguese population by gender, age group, and level of education, January 1st, 2031: Trend Scenario



Source: Authors' calculations.

In all age groups, the percentage of men who never completed lower secondary education was slightly higher than for women (57.2% of men and 57% of women) in 2011, a situation that remains throughout the projection period, with 42.4% of men without completed lower secondary education, against 39.95% of women (trend scenario) by 2031. Among women, 13.6% had completed some level of higher education in 2011, a figure that is expected to approximately 23.4% by 2031, whereas among men this figure was only 9.7% in 2011 and should rise to 15.5% by 2031. Since the educational level of younger cohorts seems to continue to evolve positively,

the transition to a higher level of education in the population becomes irreversible, and the proportion of elderly people with higher levels of education will continue to increase.

Health status and health services utilization, 2011-2031

Table 2. Adjusted odds ratios from logistic regressions on health factors

Gender	Level of education	Health status ("fair", "bad" or "very bad")[a]		Chronic diseases (≥1)[b]		Long term disabilities (≥1)[c]		Medical consultations (≥1)[d]		Use of prescribed medicines[e]	
		OR	p	OR	p	OR	p	OR	p	OR	p
Male	NE/Primary	2,09**	0,00	1,19**	0,00	1,77**	0,00	0,82**	0,00	0,97	0,34
	Lower Sec.	1,09	0,11	0,92	0,13	1,07	0,66	0,96	0,43	0,97	0,59
	Upper Sec.	0,79**	0,00	0,86**	0,01	0,81	0,24	1,00	0,97	0,95	0,34
	Higher	0,55**	0,00	1,06	0,38	0,65**	0,03	1,26**	0,00	1,12*	0,07
Female	NE/Primary	2,16**	0,00	1,21**	0,00	1,63**	0,00	0,94**	0,00	1,10**	0,02
	Lower Sec.	1,16**	0,00	0,97	0,52	0,83	0,14	0,91**	0,03	0,91**	0,04
	Upper Sec.	0,86**	0,00	0,91**	0,05	1,06	0,67	1,00	0,96	1,03	0,55
	Higher	0,47**	0,00	0,93	0,17	0,70**	0,01	1,17**	0,00	0,97	0,55

[a] n = 23839; [b] n = 23840; [c] n = 23840; [d] n = 23831; [e] n = 23837

** $p \leq 0,05$; * $p \leq 0,10$

Source: Authors' calculations.

The results from the logistic regression models based on data from the 4th NHS (table 2) suggest that the effect of education (adjusted for age) is observed mainly on the self-perception of health status, among both men and women. Generally, individuals who have completed higher education tend to classify their health status more positively, in relation to the entire population, and those who did not complete lower secondary education tend report worse figures. For the remaining indicators, the effect of education doesn't seem to be so obvious.

Statistically significant differences indicate a higher risk for individuals without lower secondary education to have at least one chronic disease or long-term disability. The reduction of this risk among individuals with higher education occurs mainly with respect to long-term disabilities. Those who have secondary education have a statistically significant lower risk of suffering from chronic diseases. With respect to the use of health care, the effects of education appear to be more clearly manifested among women. On the other hand, higher education seems to be associated with an increased risk of having medical appointments in the last 3 months, whilst, the use

of prescribed medicines seems to be more associated with educational levels among women than among men.

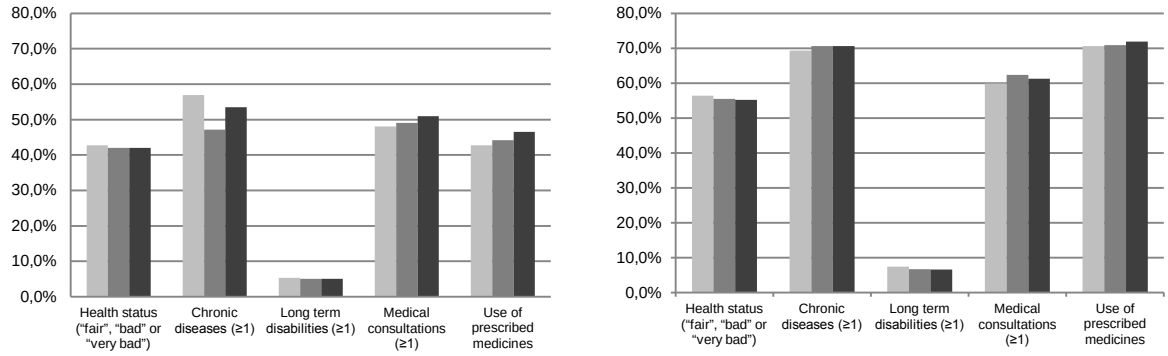
Table 3. Projected prevalence for each health indicator, by gender, 2011-2031, Portugal, Variable scenario

	Gender	Scenario	2011	2021	2031
Health status ("fair", "bad" or "very bad")	M	Constant	42.7%	40.9%	42.6%
		Trend		42.0%	42.0%
	F	Constant	56.4%	56.3%	55.8%
		Trend		55.5%	55.2%
Chronic diseases (≥1)	M	Constant	56.9%	46.8%	56.6%
		Trend		47.2%	53.5%
	F	Constant	69.3%	70.7%	71.3%
		Trend		70.6%	70.6%
Long term disabilities (≥1)	M	Constant	5.3%	5.1%	5.1%
		Trend		5.1%	5.1%
	F	Constant	7.5%	6.7%	6.7%
		Trend		6.7%	6.6%
Medical consultations (≥1)	M	Constant	48.1%	49.1%	50.8%
		Trend		49.1%	51.0%
	F	Constant	59.9%	62.6%	60.6%
		Trend		62.4%	61.3%
Use of prescribed medicines	M	Constant	42.7%	44.2%	46.6%
		Trend		44.2%	46.5%
	F	Constant	70.6%	70.9%	72.1%
		Trend		70.9%	71.9%

Source: Authors' calculations.

According to projected prevalence for each indicator, the variable scenario (table 3) suggests, on the one hand, an improvement in perceived health status and the prevalence of long-term disabilities, which might, on the other hand, be accompanied by an increased use of health services (medical consultations and use of prescribed medicines), both among men and women. For the end of the projection period, the trend scenario results in more positive outcomes in both genders and for all indicators of health status, particularly with respect to the presence of chronic diseases among men.

Figure 5. Projected prevalence for each health indicator, men (left) and women (right), 2011-2031, Portugal, Trend and Variable scenario



Source: Authors' calculations.

The major differences between the two scenarios are actually found for the presence of chronic diseases among both men and women. The proportion of individuals who classify their health status negatively, having some chronic disease or long-term disability, will continue to be considerably higher among women than among men. Gender differences are also reflected in the use of health services. Hence, the female dominance is particularly evident with regard to the use of prescribed medicines and the prevalence of chronic diseases. Figure 5 shows exactly these differences between men and women, considering the trend scenario for education.

Discussion

Demographic projections for the period 2011-2031 have been made for the Portuguese population by sex, age group and level of educational attainment. The multistate projection model was used in order to cover dynamics inherent to demographic behaviour. Besides the estimation of transition probabilities between levels of education, by gender and age group, it was also needed to consider the differentials regarding fertility, mortality and migration, by level of education. We established two scenarios, a constant and a trend scenario.

These demographic projections provided the basis for projecting the expected changes on the population health status and health care utilization. We found that the expected self-reported health status is the indicator that has the more obvious improvement, with an increase in the proportion of residents who rate their health as “fair”, “good" or “very good”, according to all scenarios and for both genders. This is also one of the indicators for which increasing levels of education (trend scenario) seem to have a greater impact, when compared to their maintenance (constant scenario). The same is true also, and even more obvious, to regarding the presence of

chronic diseases in both genders. We can consider this impact to be solidly positive, since the trend scenario results in lower prevalence of both individuals who classify their health status negatively as well as of those suffering from chronic diseases.

We may assume that, if increased longevity is accompanied by an increase in the number of years lived in good health, aging may not necessarily translate into the same growth of health expenditure. Improved health status will, in principle, be reflected in a lower use of health services and can consequently lead to lower health expenditure[11]. Our results also indicate a future improvement in health status (particularly in self-reported health status and in the prevalence of long-term disabilities) due to a rising level of education in future generations, however, for the same reason a more extensive use of health services (medical consultations and use of prescribed medicines). In fact, as discussed by Frie, Eikemo and von dem Knesebeck (2010)[12], there is a positive association between having more years of education and the frequency to consult a doctor. Therefore, we might question whether, in the coming decades, the increased use of health services can lead to better health status, and lead to lower expenditure with health services.

Projecting the health status of a population is a complex and challenging task, given the difficulties associated with the estimation of changes in morbidity and* the measurement of health[13]. The presented projections follow a "what if" approach, through the definition of different scenarios for the trends of educational levels and the differences between these levels in relation to health status and use of health services. Thus, the uncertainties are evident. Nevertheless, these projections are points of departure when estimating and getting prepared for the future impact of aging and education on the population's health status, influencing the main demand for health services. These scenarios will have an impact upon health organization and health expenditures, the two major considerations for political and administrative decision making in the field of public health.

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11 Bernd Rechel, Yvonne Doyle, Emily Grundy and Martin McKee, *How can health systems respond to population ageing?* (Copenhagen, World Health Organization, Regional Office for Europe, 2009); European Commission, *The 2012 Ageing Report: Economic and budgetary projections for the 27 EU Member States (2010–2060).* European Economy, 2/2012 (Brussels, 2012).

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Health Policies Require New Multidisciplinary Research

Pedro Guedes de Carvalho

Introduction

The world trends in human life activity highlight that health is beyond a doctor, a hospital or an illness problem. Feeling healthy really impacts productivity and is also very important to fully understand human wellbeing, physical and mental personality, and consequently policies. In health policy the "diagnosis" is not always suitable and this will sometimes open incentives for wrong policy responses.

According to Silva (2012),[1] we should consider three important features relating to health policies in Portugal: sustainability and financial efficiency; equity in access and results and system quality. Taken as a whole, all the three features are connected with "cost" management. In fact, since the 1970's in 20th Century Portugal, the National Health System was implemented as a democratic achievement guaranteeing free health access to every citizen, independent of race, socioeconomic or religious status. It was a democratic political decision after the revolutionary process within a context of economic expansion free of special financial constraints. Suddenly the health care system changed rapidly: higher salaries, a huge increase of new infrastructures and demand for health services and an exponential use of new and expensive technologies. If we link this to the new international and multinational sector of pharmacy and the changes in demographic trends, namely higher life expectancy rates and ageing society, we have the right environment where designing policies would include extremely delicate financial strategies.

Furthermore, new physical and nutritional habits were induced through new technology based industries after World War II. The last 70 years brought

1 Silva, M. V. (Maio de 2012). Políticas Públicas de Saúde: Tendências recentes. *Sociologia, Problemas e Práticas no.69*

important changes in ways of life, physical activity and its interaction with health services.

In rural societies, human activity was physically demanding. Long distance commuting between home and workplace consumed people's time and energy, leaving little room for attention to their health. Nowadays, work usually requires minimal levels of physical energy but good competence and psychological efforts that may lead to difficulties to concentrate and stress, which may in its turn lead to psycho-somatic dysfunctions. In addition, with lesser time for sport activities, workers do not exercise enough to restore their feelings of complete health – which is different to being ill. In sum, health is not simply the absence of illnesses in society; we are defining new meanings of 'health', 'wellbeing' and 'happiness', which requires a broad range of approaches and different instruments to lessen the costs of regular and traditional national health systems.

Today, in a large number of societies, information comes faster than our brains' capacity to digest it. Societies are facing ageing processes[2] and chronicle diseases (hypertension, diabetes, arthritis and posture) with obesity prevalence. The interaction between school and families has changed dramatically and while more children can access education, families have not adapted accordingly to support healthier daily habits. Young people live alone, isolated, when making their consumption choices, and over 64% of the Portuguese population do not engage in physical exercise. As a consequence, usually avoidable diseases will emerge, making a demand on the National Health System. Financially, when people live longer the demands increase on the National Pensions System. High tech innovations will diminish the need for workers with demands on the National Labour/Security System. Generally, public policies need to be innovative to meet this challenge.

Proposal

The aim of this article is to underline the need for researchers from different disciplines to work together. The main health issues for a country or a National Health System have been too much focused on illnesses instead of health, wellbeing and happiness, mono-disciplinary dealing with the costs of illness or producing statistics on hospital expenditures and medical prescriptions. However, Health policies are not just a matter for doctors, hospitals and pharmacies. They should also be designed to deal with a more human, holistic understanding when people who ask for help experiencing illness or pain and

2 David A, W. (2007). *Economics of Ageing Program.* NBER, Report 4.

complimentary approaches would be helpful. The theories, questions and methods of a number of disciplines are relevant for the studying and design of health systems. Too many health problems do not find efficient solutions when they are too much restricted to what hospitals and other health services can provide. We need a wider approach to find new, efficient financial solutions for sustainable solutions of the population's need for health.[3]

Examples of the multidisciplinary rationale

Economists use to look and believe in facts; facts are our basic data. Usually data is expressed through numbers. However, besides data we have to be open to other important issues such as the way data was collected and extracted, the reason why we use additional information to improve the quality of our analysis.

Let us take a simple example of what could happen to one Portuguese citizen that feels sick or experience a painful situation thinking he needs health care. This simple situation gives rise to a number of decisions by the health consumer, each one with slightly different impact on costs for the public health and care systems. If we decompose this possible process we will be able to define adequate strategies.

First of all the sociological viewpoint oblige us to consider the social status of that citizen and the system to which he is part of. Secondly, someone has to define the exact physical and psychological status, i.e. the visible and invisible pain and emotional status. In a way, to find out how severe the complaints are in order to filter them down and establish the adequate path for observations. Thirdly, the time of assistance comes, usually spent with a doctor. At this point the effective relationship between citizen and health system will start. The doctor is the only authority that can define what is going to happen afterwards – which is too much responsibility for emerging excessive or negligible costs to a single person. The system itself defends their staffs with regular protocols for each described illness or complaint, which looks understandable. Fourthly, we have the technological question. In order to be completely safe defence against hard legislation, doctors do prefer to prescribe additional examinations before they give the illness verdict (double competencies). In the past, very well prepared doctors had to define diseases with simple and more natural clinical instruments. Simple body touching, contextual information and storytelling would be enough to accurate diagnosis. Technological development has led to

3 WHO. (2003). *Making Choices in Health:WHO Guide to cost-effectiveness analysis.* T. Tan-Torres Edejer, R. Baltussen, T. Adam, R. Hutubessy, A. Acharya, D.B. Evans and C.J.L. Murray (eds). Geneve: WHO

rising costs and given birth to a rapidly growing market for technological and informatics firms, which produce new machinery offered to hospitals and promising to enhance the quality of diagnosis. And this becomes a cumulative process, when technology reduces doctors' own judgments, making them more dependent on laboratory instruments and permanent updating of skills. In the past we had more simple and costless diagnosis for most of the hospital entrances. Today we replaced it by a technological, costly system of diagnosis. Naturally, we do not defend conventional medical practices just because they are not compatible with new technologies, the latter are needed and represent indispensable scientific achievements. The remedy is to re-train health professionals in lean diagnosis methods and a deeper understanding of patients' emotions and needs.

Most decisions of these professionals also depend on the consumers' type of health care system, being either private or public, designed for the rich or for the poor. Access to health provision should be for everyone. If not well designed, these financing medical costs would be overpaid later. Consultations, examinations and other medical interventions could be paid differently, depending on the social and health needs of the consumers. This is why a new multidisciplinary approach should be applied to study and propose new health policies and measures.

Questions in the Agenda

A number of important questions can, in this context, be raised:

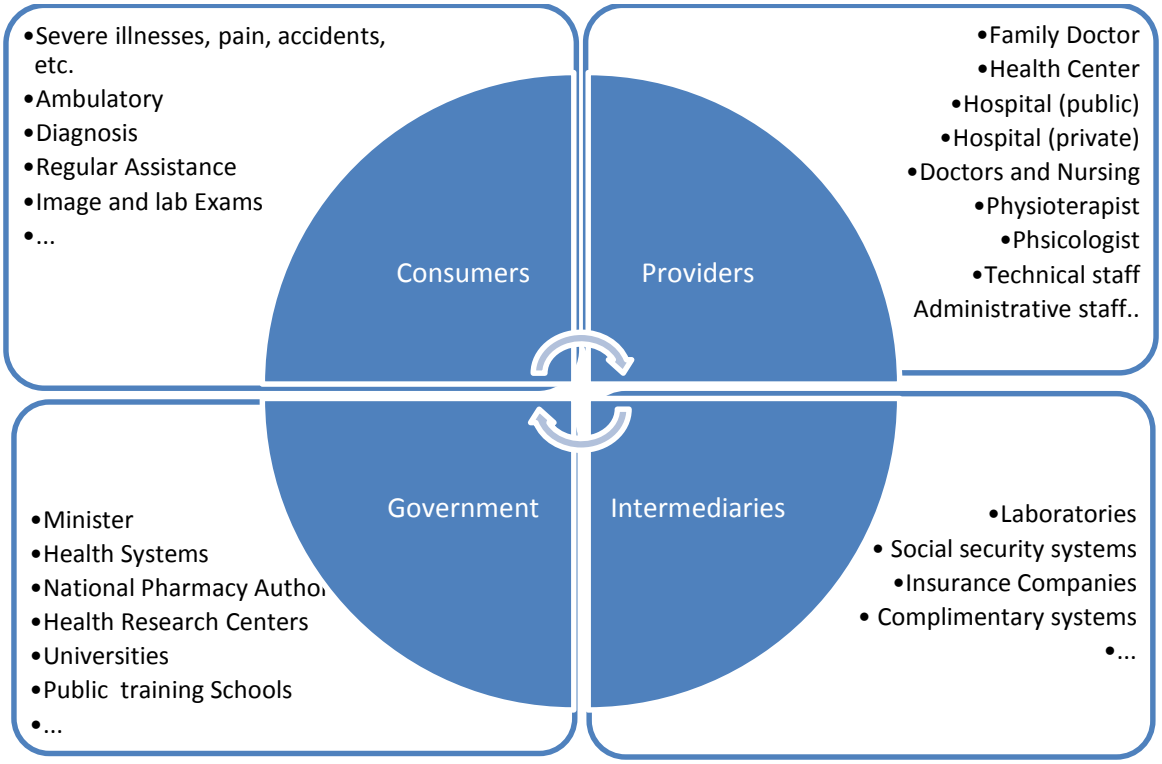
- How do social demographic changes transform economic markets?
- How do cultural and regional aspects do affect social behavior, and how should that have an influence upon decisions concerning the demand for health services?
- How can different types for the provision of health service alter future demand for the health service system?
- What do we know about the provision of new, alternative (or complimentary) health services?
- When might physical exercise be an effective prescription for better health?
- How do pharmaceutical and chemical laboratories operate in the economy?

- How does this multinational, industrial complex function and affect health professionals' decisions?
- Who should pay for the health care systems?

Many other markets – *e.g.* education and training, recreation and leisure, housing, transportation, food, pharmaceutics, etc. - must be developed and adapted to the process of demographic ageing. These transformations will also influence the whole macro economy, its GDP, productivity, per capita income, consumption patterns and socioeconomic growth.

New research projects should also attempt to integrate into their measurements of health these multiple domains, such as physical and psychological functioning, mental health, access, equity and the particular conditions that encompass overall health like wellbeing and happiness. The project producing the articles in this special issue have already taken a first step towards such an integrated effort. It has followed in two tracks: one is focused on aggregate measurements, another on condition-specific analysis.

Figure 1. Agents and health care actions



Source: Health policies require new multidisciplinary research: By Pedro Guedes de Carvalho.

Our hope is that the collaborative effort will be further enhanced by an outreach component, engaging academics, health care professionals, consumers of health care systems and government officials, by the establishment of practically useful

national health accounts. Otherwise, national health systems financing would be less sustainable.

Proposal

Since cost efficiency is a major issue when promoting the sustainability of health systems, every research field should be involved in the design of a new health policy. Every discipline should provide its specific approaches, opening a wide discussion in order to find network instruments able to impact cost structure.

A multidisciplinary approach fits the study of real, complex situations, indeed a characteristic of a task to make health provision sustainable, equally accessible and with good quality.

Figure 1 gives an image of the agents involved in the health system. These actors are not homogeneous, must sometimes be decomposed and studied apart, can represent different interests and decision-behaviour to be considered in policy making. A seemingly innocent, even positive situation or intervention in one of the fields might be hampered or completely void by conditions or events in one of the other fields.

For the sake of simplicity we do not consider the completely market oriented system, where each citizen consults a doctor in the private sector for the first visit and diagnosis, whilst the overall system shares the expenses according to each individual's own health care arrangement and socioeconomic condition.

Figure 1 is mostly applicable to national health conditions in Portugal. Other or new agencies can be included, as well as different conceptions, disciplines, issues or problematic topics. Here, we focus on people or activities that are supposed to carry the major part of the health costs.

In the figure, the four quadrants represent examples of types of agents and types of actions. These refer to a functioning market with consumers and providers of public services, i.e. the regular type of interventions either severe, accidental, regular or consequences of past interventions.

In order to further enhance research on the foundations for health policies, we must pay more attention to existing possibilities within the systems and actions of the consumer. Theoretically, the set of those opportunities are described within each quadrant. In practice, all of them can occur without special enforcements. As a consequence, several financial costs are differently associated with each decision.

We might raise the question of family doctors: Is it a question of equity of access or a financial? When does the system save more resources? If we go straight to the hospital, will they assist us? Are we doubling the expenses?

The second, lower, set of quadrants refer to the governance system and the intermediaries interconnecting perfectly. Usually, health policy is seen as the business of only one ministry, i.e. the minister is responsible for the whole health administration from infrastructure to staff labour conditions and system regulation. But social security systems are also highly connected and should be studied and approached together. If we want to pursue the equity in health accessibility, different solutions may be necessary for apparently the same problems, depending on demographic trends, regional situations, composition of the labour force or age-structure.

Between actions in the lower quadrants, a very important game takes place, involving private interests of provider firms and public interest of good quality service and cost-efficiency. This should be given much attention, since private agents do intervene in the provision of machinery, medical instruments, equipment, pharmaceutical products and services, established protocols and other items. How are, for instance, public competitions regulated? Or who decides if a new drug is better than one used up until today? Is there a policy of cheaper medicine for the poor (generics) than for the rich? Is actually health uncomplicated merchandise that should be traded and regulated exclusively by prices and the market? Is public intervention necessary to guarantee equal access for all? As we can see, several issues must be addressed before we settle for the most adequate health policies.

Another concern exposed by a multidisciplinary approach is that practically every implemented policy will influence the agents' behaviours. They will try to counteract and offset potentially negative effects, which – if wanted and needed - requires reinforcement procedures. In the ideal multidisciplinary setting, every question should be put to participants representing all disciplinary angles, gathering, integrating and synthesizing their feedback.

In Figure 1, all research approaches have to be tested on each of the segments, disclosing the interconnection between such fields as medicine, technology, economy, sociology, psychology, physiology, market, prices and costs, etc. As well as today's new trends of retirement, new labour market constraints, new and more genetically complex diagnosis for exquisite illnesses, and several other developments must be part of the contextual understanding.[4]

Conclusions

Most universal health policies are being centred on cost efficiency approaches, in addition to a more recent concern with equity and sustainability of the

4 David A 2007

systems. However, too few improvements are noticed and countries are simply cutting public spending without qualified information. It means high risks of under-performance.

The main reason for these conditions is that the governance is mostly focused on illnesses, pain, surgeries, medicine and chemical treatments. We argue for an approach with more focus on the human being, wellbeing and happiness. Sometimes people do not need to visit a hospital or a doctor's consultation but can be treated in a more efficient and cost-effective way. We presented a 'industrial diagram' interpreting health related actions, proposing an interdisciplinary approach, trying to find where the cost is and suggesting more socially efficient and qualified network solutions, where every disciplinary voice is listened to.

Pedro Guedes de Carvalho has a PhD in Economics and is the actual Dean of a Human and Social Sciences Faculty at University of Beira Interior - Portugal

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Tobacco and the Health of the Portuguese Elderly: Where to Look?

Pedro Pita Barros

Introduction

Ageing of the Portuguese population is one of the fastest in Europe (European Commission, 2012). The health of an aged population is a concern for policy makers, although estimates in general provide a less dramatic picture than what is usually thought. The health of the elderly and their needs of health care pose challenges to countries that go beyond the expenditure it generates. The Portuguese government, which runs the National Health Service, recognizes that organizational challenges lie ahead.[1]

These challenges and the associated health care expenditure are determined also by past life-style decisions of the population. Tobacco consumption is a decision often taken early in life and with life-long implications. Tobacco consumption is seen as a public health issue in many countries, leading to policies aimed at consumption cessation and preventing the start of regular smoking habits in the young generations. As tobacco consumption is associated with respiratory diseases and oncological problems, it is a potentially important determinant of the quality of life and use of health care resources in the elderly population.

Taking advantage of the SHARE database,[2] we assess the association between smoking habits and health status. The SHARE data include a physical measure of health, respiratory peak flow, as well as the more standard measures of medical-doctor-diagnosed respiratory problems and self-assessed health. While self-assessed health is widely used, we cannot rule out some bias (people feeling sicker will not smoke, irrespective of whether they are objectively healthier than others or not).

Our results show that tobacco consumption has an important negative impact on the health of the elderly, which is not captured by self-assessed health. From a policy perspective, this is an argument for the routine collection of physical measures of

1 See Barros et al (2011) for a description of the Portuguese health system. See the Portuguese National Health Plan 2012–2016, section 4.2, for a discussion of implications from ageing.

2 http://www.share-project.org.

health in order to have effective knowledge about the health of the population and for appropriate designs of interventions.

Tobacco consumption and health measures

We address the association between being (or having been) a regular smoker and the health status. Health status is measured in three different ways: existence of diagnosed respiratory diseases, self-assessed health and respiratory peak flow. This last measure is the maximum value of asking the interviewee to blow into a breath flow meter twice.

Naturally, other factors can, and do, account for differences in health status across the population. We account for variables usually associated with health status: education (measured by years of schooling), income level (measured by adjusted per capita household income), gender, body mass index, living alone, civil status (which may also proxy the presence of informal health care at the household level) and age.

Borges et al (2009) report estimates indicating a high burden of disease associated with smoking in the Portuguese population although no specific treatment of the elderly is done. The authors estimate that 11.7% of deaths in Portugal are related to smoking, with males taking a higher toll of burden of disease. These estimates are higher than previously reported ones, highlighting the importance of a better knowledge about the relationship between health and smoking habits in the elderly population. Smoking cessation in the Portuguese elderly population is addressed in Fradinho et al (2013). Based on a detailed analysis of the pathways among 28 patients in a single hospital, the authors conclude that smoking-cessation of elderly can be as successful as in younger ages. This suggests that quitting smoking is possible, with potential positive effects in health status. The empirical link of smoking cessation to health is tested later on.

Santos and Barros (2004) take an epidemiological view on smoking habits in the early 2000s in Portugal, showing that the elderly generations smoke less than younger groups. There is, however, no link of smoking habits to health problems addressed in their analysis.

The data source

This study uses data from SHARE wave 4 release 1.1.1, as of March 28th 2013 (DOI: 10.6103/SHARE.w4.111). The SHARE data collection has been primarily funded by the European Commission through the 5th Framework Program (project QLK6-CT-2001-00360 in the thematic program Quality of Life), through the 6th Framework Program (projects SHARE-I3, RII-CT-2006–062193, COMPARE,

CIT5- CT-2005-028857, and SHARELIFE, CIT4-CT-2006-028812) and through the 7th Framework Program (SHARE-PREP, N° 211909, SHARE-LEAP, N° 227822 and SHARE M4, N° 261982). Additional funding from the U.S. National Institute on Aging (U01 AG09740-13S2, P01 AG005842, P01 AG08291, P30 AG12815, R21 AG025169, Y1-AG-4553-01, IAG BSR06-11 and OGHA 04-064) and the German Ministry of Education and Research as well as from various national sources. The methodological aspects on the SHARE survey are discussed in detail in Börsch-Supan, Brandt, Litwin and Weber (2013), Malter and Börsch-Supan (2013) and Borsch-Supan and Brandt (2013). A paper by Linardakis et al (2013), using SHARE data from earlier waves, which did not include Portugal, computed multiple behavioural risk factors. As expected, it showed that tobacco consumption is an important risk factor.

A first glance at the data

Our first explorative part is mainly descriptive, reporting the histogram of each proxy of health status versus the status of "never a regular smoker"/ "regular smoker or past regular smoker". We then make a detailed study of the multivariate relationships between tobacco consumption and health status of the 50 years or older in Portugal. A word of caution needs to be given: 'Non-smoker' in the SHARE survey means not having smoked regularly every day for a year. Occasional smokers are classified together with true non-smokers. This definition also means that smokers are a relatively small number of cases in the sample, and should be seen as "strong smokers".

Figures 1–3 do not reveal much difference between the two groups. If any, 'smokers' report better (!) health status. However, this neglects the role of other variables, like age, education, gender, etc. Analysing differences between the groups using t-tests for means, we find that smokers have a lower body mass index and are younger (with an average difference of – 5,6 years). On average, all other characteristics are not statistically significant across the two groups.[3]

Two issues related to the data deserve some further methodological discussion: The income variable is not asked directly in the SHARE survey. There are several questions related with the households' sources of income in the survey, and the values are obtained by bracketing of intervals. For non-responses, the SHARE team uses an imputation technique. There are several options to do imputation of missing values, and the SHARE data provide five alternatives. We use the first one (the results are not sensitive to whichever income proxy is used).

3 The results from the t-tests are available upon request from the author.

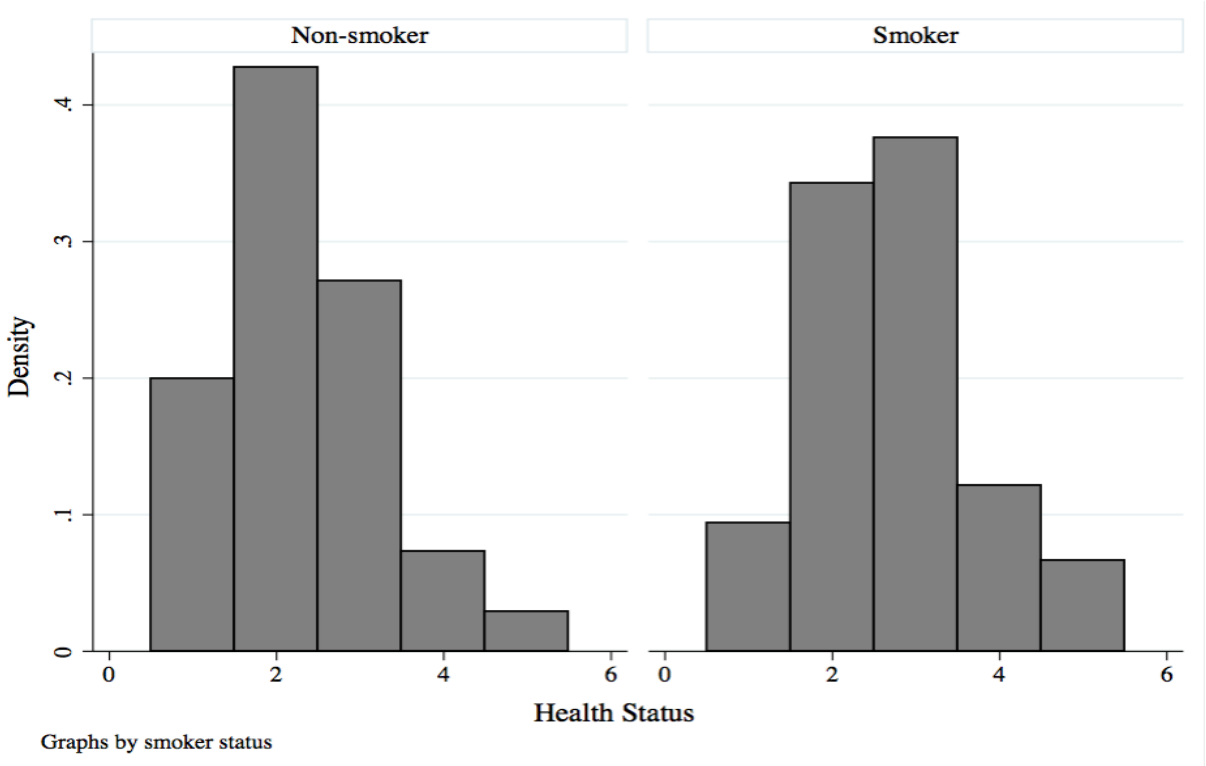
Table 1. Variables definition

Name	Description
Health	From 1 (bad health) to 5 (excellent health)
Peak Respiratory flow (puff)	Variable reporting the maximum value in the test, ranging from 30 (lower limit) to 890 (upper limit).
Diagnosed respiratory disease	Takes value 1 if a medical doctor diagnosed a respiratory disease, takes value 0 otherwise
Body mass index (bmi)	Computed as the weight (in kg) divided by the square of height (in meters)
Female	Dummy variable taking value 1 if female and value 0 if male
Age	Age in years
Income	Income, in euros, normalized for the size of the household with a power scale factor of 0.6
Household size	Number of individuals present in the household
Education	Completed schooling years
Smoker	Dummy variable taking value 1 if a smoker, zero in all remaining cases
Quit_smoker	Dummy variable taking value 1 if a previous smoker, zero in all the remaining cases
Years_smoker	Number of years of smoker, independently of current situation (uncompleted spell for current smokers).
Live_alone	Dummy variable taking value 1 if living alone, zero otherwise.
Married	Dummy variable taking value 1 if married, otherwise.

Source: Own construction, based on original data from SHARE wave 4, release 1.

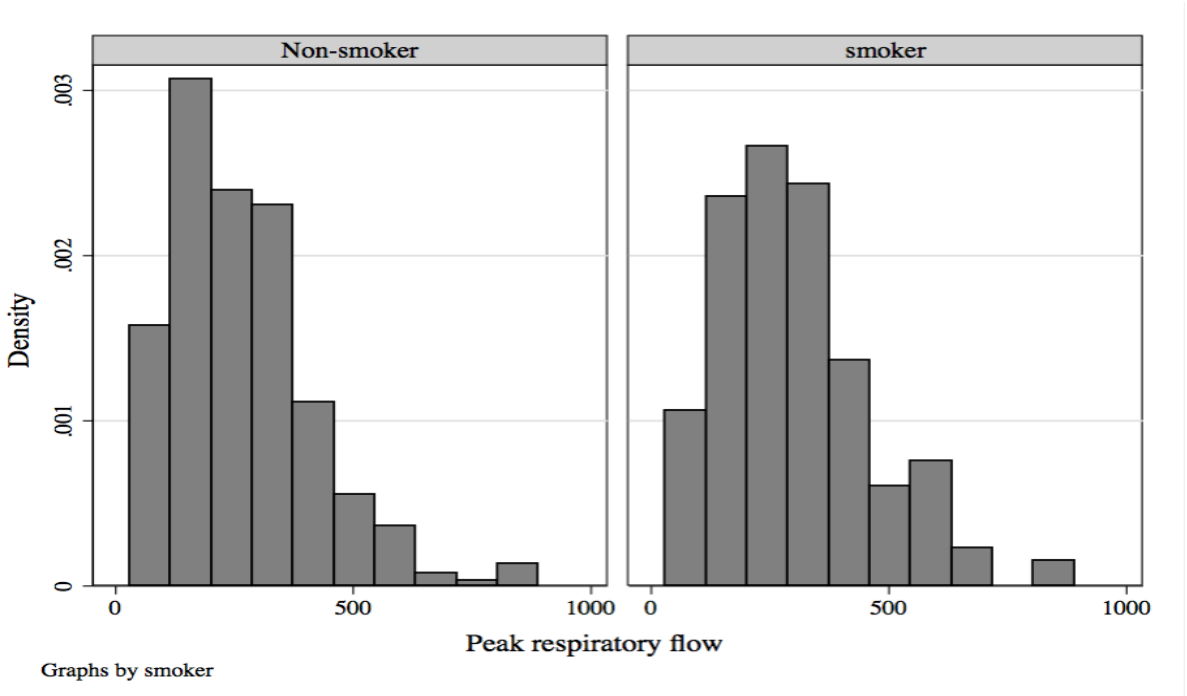
The second important aspect is whether or not applying weights to each observation. The SHARE data for Portugal included an oversampling in the capital of Lisbon, making the sample diverge from national representativeness. We report econometric results below for both weighted and non-weighted procedures. Table 1 presents the definition of the control variables.

Figure 1. Self-assessed health, by smoker status



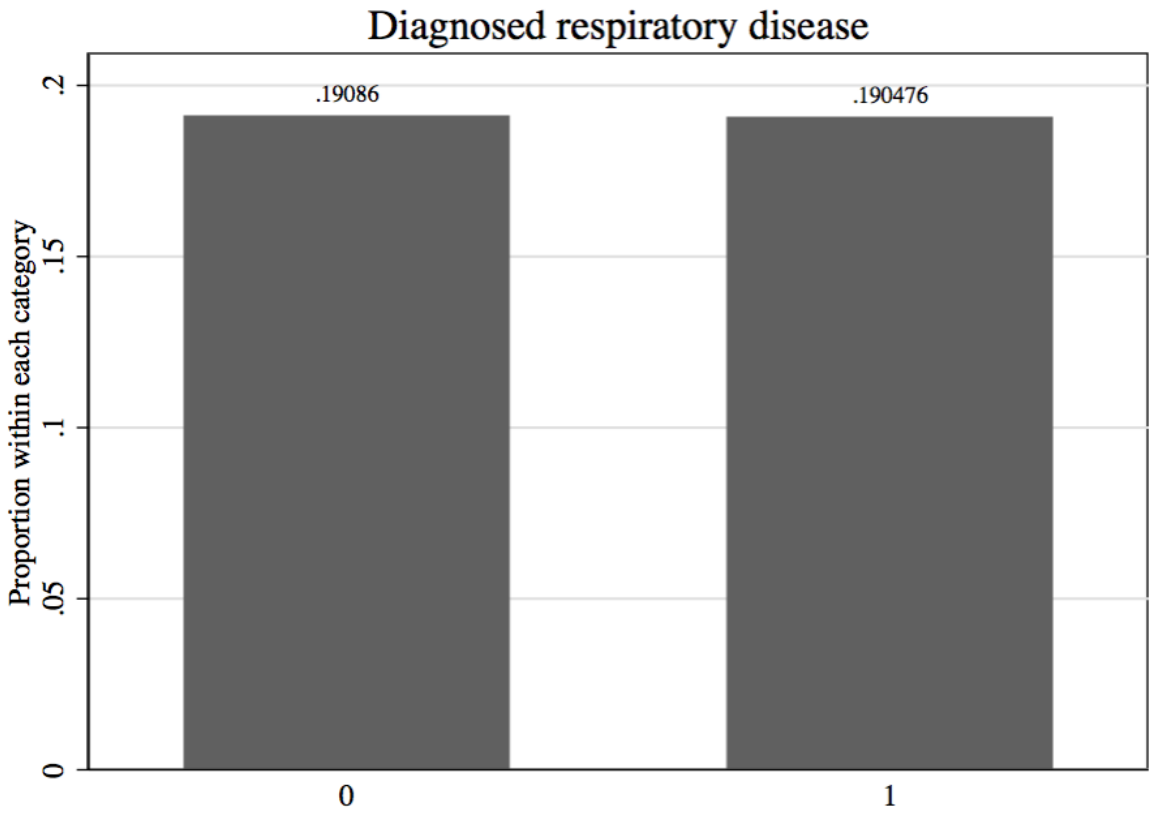
Source: own construction, original data from SHARE wave 4, release 1.

Figure 2. Peak respiratory flow, by smoker status



Source: own construction, original data from SHARE wave 4, release 1.

Figure 3. Diagnosed respiratory disease, by smoker status



Source: own construction, original data from SHARE wave 4, release 1.

Accounting for multiple simultaneous influences

The first variable of interest is self-reported health status, which has five ordinal values as possible answers. Dividing the sample according to "never a smoker" / "smoker or ex-smoker", we observe that the latter group has a better self-reported health on average. This may be due to a biased perception of health condition or being a spurious result caused by other relevant effects not accounted for in this crossing.

A more complete analysis is performed using an ordered probit model, which accounts for the ordinal nature of the variable.[4] Table 2 reports the main estimates.

The results are consistent across variants of the econometric specification. In particular, older ages are associated with lower self-assessed health status. Education, measured by completed schooling years, is positively associated with better health status. Both of these effects are consistent with previous international literature.

On the other hand, there is no association between income and self-assessed health. This is at odds with regular findings of a strong positive income gradient.

4 See Wooldridge (2001) for a description of the econometric procedure and underlying assumptions.

Still, differences among the Portuguese elderly are more pronounced with respect to education levels than to income levels. Living alone is a factor that contributes to a lower health perception. Taken together, these results are in line with previous literature on the health determinants in Portugal.[5]

Related to obesity, the body mass index variable has a consistent negative association with self-perceived health throughout. A possible non-linear (quadratic) relationship was tested but the results did not reject the hypothesis of a linear relationship.

Having found consistent results with previous works, we turn the attention to the results associated with smoking behaviour, captured by three different variables, as detailed above: being a current smoker, being a previous smoker and number of years as a smoker.

The results from the ordered probit model are clear. Ex-smokers do not self-report a different health status from non-smokers. Smokers do, on the other hand, report a positive direct effect. This suggests that smoking contributes to a better health status if an interpretation of direct causality is assumed, which contradicts many results in the literature. A possible justification for this result is a situation of reversed causality: people with the worst health status and aged above 50 years do not smoke regularly, precisely because of the perception of lower health status. Another, different source with the same perceived bias is that smokers report a better self-assessed health status as part of their internal justification to keep a habit that is often reported as health damaging.

We still have to account for an indirect effect of the years of smoking, which provides some additional information. The computation of the cumulative effect of years of smoking is statistically not different from zero. There is considerably heterogeneity across individuals, as shown in Figure 2.

Therefore, using self-assessed health as the relevant measure, does not help to identify a negative effect of smoking, although we cannot rule out a reverse causality effect associated with health perception and the decision to smoke in the Portuguese population.

5 See, among others, Barros (2009).

Table 2. Self-assessed health (ordered probit estimation)

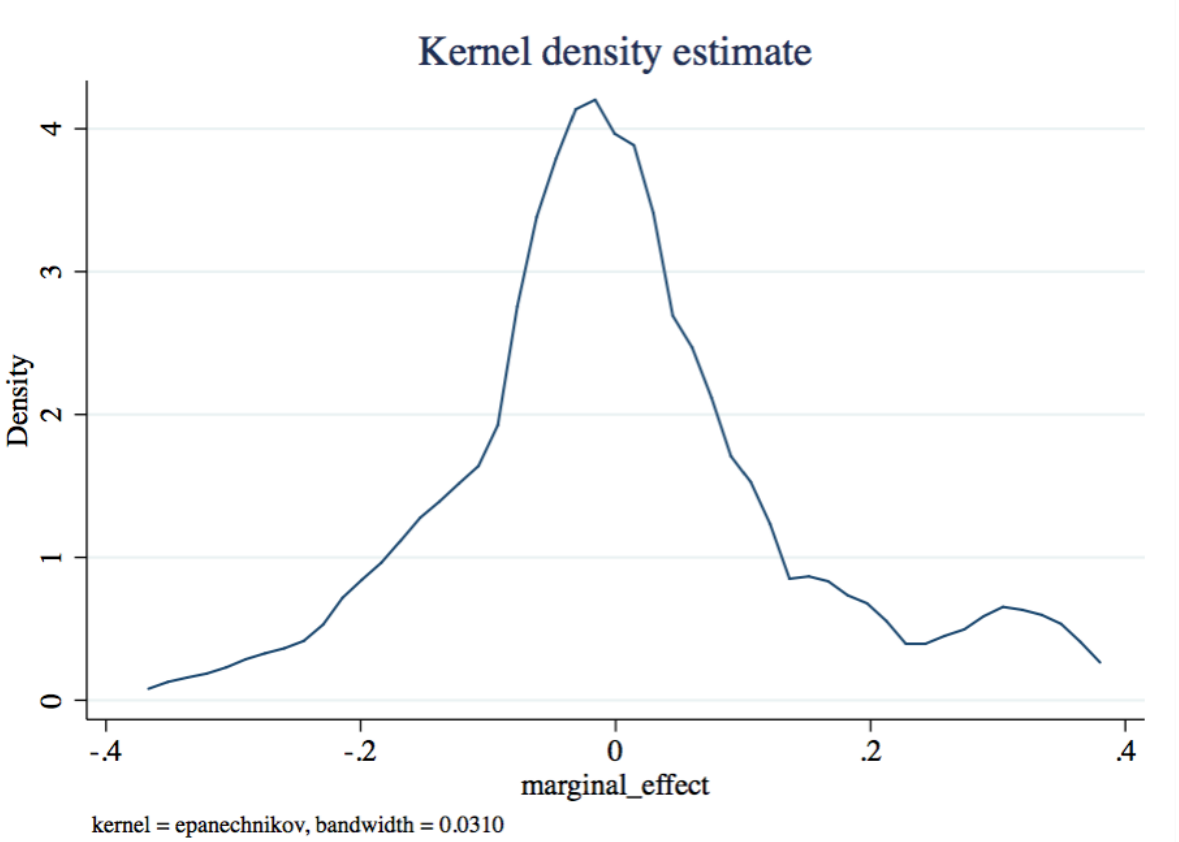
	Non-weighted estimates		Weighted estimates	
	(1)	(2)	(3)	(4)
body mass index	-0.039***	-0.039***	-0.049***	-0.051***
	(0.01)	(0.01)	(0.01)	(0.01)
Female	0.308***	0.304***	0.409**	0.365**
	(0.06)	(0.06)	(0.14)	(0.12)
Age	-0.028***	-0.028***	-0.019***	-0.019**
	(0.00)	(0.00)	(0.01)	(0.01)
income	-0.000		-0.000	
	(0.00)		(0.00)	
household size	-0.071**	-0.070**	-0.066	
	(0.03)	(0.02)	(0.06)	
education	0.071***	0.069***	0.076***	0.079***
	(0.01)	(0.01)	(0.02)	(0.02)
smoker	0.329*	0.349**	0.364	
	(0.14)	(0.11)	(0.35)	
quit_smoker	-0.015		-0.107	
	(0.08)		(0.15)	
years_smoker	-0.009**	-0.009***	-0.017**	-0.014***
	(0.00)	(0.00)	(0.01)	(0.00)
live_alone	0.029		-0.519*	-0.558*
	(0.13)		(0.25)	(0.22)
married	0.193*	0.176*	0.181	
	(0.09)	(0.07)	(0.16)	
cut1	-3.391***	-3.380***	-3.207***	-3.214***
	(0.35)	(0.34)	(0.64)	(0.66)
cut2	-2.076***	-2.066***	-1.981**	-2.000**
	(0.34)	(0.33)	(0.65)	(0.69)
cut3	-0.999**	-0.990**	-0.971	-0.998
	(0.34)	(0.33)	(0.65)	(0.69)
cut4	-0.324	-0.316	-0.211	-0.252
	(0.34)	(0.32)	(0.61)	(0.63)
Observations	1712	1712	1652	1658

* p<0.05, ** p<0.01, *** p<0.00. Standard errors within brackets.

Source: Own construction, original data from SHARE wave 4, release 1.

Notes: First and third columns of results contain full models, second and fourth restrict to statistically significant variables. cut1-cut4 denote the threshold points of the latent variable (Wooldridge, 2001).

Figure 4. Marginal effect of smoking years on latent variable for self-assessed health



Source: own construction, original data from SHARE wave 4, release 1.

The next step in the analysis is to look at a physical measure of the health status: the peak respiratory flow. Smoking over the years is likely to reduce breathing capabilities, and a lower peak respiratory flow would result.

The peak respiratory flow is collected in the SHARE interviews, and the way it is recorded truncates values lower than a minimum threshold and values above a maximum threshold. This procedure in data collection suggests that a Tobit model is applied, to explicitly account for the characteristics of data collection.[6] As explanatory factors, the same ones as for the ordered probit model are used (the definitions in Table 1 apply here).

6 The interested reader is again referred to Wooldridge (2001) for details of the econometric procedures.

Table 3. Peak respiratory flow (Tobit estimation)

	Non-weighted estimates		Weighted estimates	
	(1)	(2)	(3)	(4)
body mass index	0.571		0.597	
	(0.79)		(1.37)	
Female	107.308***	108.287***	110.299***	119.294***
	(8.06)	(7.86)	(12.16)	(12.54)
Age	-3.574***	-3.553***	-3.806***	-4.391***
	(0.42)	(0.38)	(0.88)	(0.82)
income	0.000		-0.000	
	(0.00)		(0.00)	
household size	-1.951		-6.028	
	(3.80)		(6.70)	
education	7.397***	7.444***	5.691***	
	(0.86)	(0.84)	(1.66)	
smoker	3.388		21.891	
	(19.72)		(41.30)	
quit_smoker	34.659**	33.697***	68.696***	58.110***
	(12.02)	(9.30)	(18.54)	(16.56)
years_smoker	-0.578	-0.540*	-1.620	-1.297*
	(0.43)	(0.26)	(0.86)	(0.55)
live_alone	5.624		-39.546	
	(15.85)		(26.35)	
married	7.825		5.830	
	(12.03)		(16.73)	
Constant	383.122***	400.875***	414.001***	472.830***
	(42.72)	(25.68)	(71.79)	(51.36)
Sigma	134.475***	134.561***	119.021***	121.881***
	(2.48)	(2.48)	(5.70)	(6.19)
Observations	1523	1523	1468	1468

* p<0.05, ** p<0.01, *** p<0.001. Standard errors within brackets.

Source: Own construction, original data from SHARE wave 4, release 1.

Notes: First and third columns of results contain full models, second and fourth restrict to statistically significant variables.

The qualitative results of the control variables are essentially the same as in Table 2, and are presented in Table 3. The same considerations as before apply here. More interesting is to see what happens to the effects of tobacco consumption. For the first variable of interest, "never a smoker" or "being a smoker", no distinction is visible. It should, however, be remembered that 'non-smokers' in this survey is a mix of people that never smoke and the ones classified as occasional smokers. This may blur the inferences from the coefficient of this variable being statistically not different from zero. In contrast to the above results, with self-assessed health as dependent variable,

the accumulation of smoking years has a clear negative effect on the peak respiratory flow. Smokers have lower peak respiratory flow and the more so the higher the number of years as a smoker. Quitting to smoke, however, has a positive effect on this health-status variable.

Table 4. Presence of diagnosed respiratory disease (probit estimation)

	Non-weighted estimates		**Weighted estimates**	
	(1)	**(2)**	**(3)**	**(4)**
body mass index	0.042***	0.041***	0.038*	0.037*
	(0.01)	(0.01)	(0.02)	(0.02)
female	-0.436***	-0.432***	-0.248	
	(0.09)	(0.09)	(0.22)	
age	0.023***	0.022***	0.026**	0.021*
	(0.00)	(0.00)	(0.01)	(0.01)
income	0.000		0.000	
	(0.00)		(0.00)	
household size	0.086*		0.131	
	(0.04)		(0.07)	
education	-0.036***	-0.036***	-0.052*	-0.060*
	(0.01)	(0.01)	(0.02)	(0.03)
smoker	-0.162		-0.220	
	(0.20)		(0.54)	
quit_smoker	-0.025		-0.294	
	(0.13)		(0.25)	
years_smoker	0.017***	0.015***	0.026**	0.018**
	(0.00)	(0.00)	(0.01)	(0.01)
live_alone	0.112		0.869**	0.620*
	(0.15)		(0.33)	(0.26)
married	-0.040		0.143	
	(0.11)		(0.24)	
Constant	-3.541***	-3.254***	-4.057***	-3.285***
	(0.44)	(0.37)	(0.85)	(0.76)
Observations	1716	1716	1656	1656

* p<0.05, ** p<0.01, *** p<0.001. Standard errors within brackets.

Source: Own construction, original data from SHARE wave 4, release 1.
Notes: First and third columns of results contain full models, second and fourth restrict to statistically significant variables.

A third proxy for health status, is the presence or not of a respiratory disease, diagnosed by a medical doctor. As the dependent variable in this case takes only

values 0 (not having a respiratory disease) and 1 (having a respiratory disease), a simple probit model is adequate.[7]

The estimates are reported in Table 4. Once again, the socio-economic characteristics effects are consistent with previous tables of results. Note that for previous dependent variables, higher value meant a better health status, while under this third proxy for health status a higher value – having a respiratory disease – means a lower health status. The signs of the coefficients will be reversed in comparison with the ones above.

Briefly, and focussing the attention on the smoking-habit-related variables, years of smoking are statistically significant determinants the presence of a respiratory disease. This holds true whether the individual is currently a smoker or an ex-smoker. The cumulative number of smoking years is the crucial point.

Final Remarks

There is a growing consensus that sustainability of modern health systems will, to a considerable extent, have to rely on healthier habits by the population. Ageing of the population is also posing new challenges to the organization of health systems. One of the more important habits is the decision to smoke – it has an impact on health according to the medical literature and it is a decision that can be changed. The elderly are often considered to belong to a vulnerable population and in increasing need of health care. While age is not reversible, the decision to smoke is a controllable risk factor.

Gaining knowledge about the effects on health of smoking habits in the older ages of the population is thus of great interest to public health. However, there is a need for caution in the way we measure these effects. Relying on the common self-assessed health information can be misleading, as the decision to smoke (or not quitting) is likely to be influenced by the perception people have about their own health and /or the perception of health itself may rationalize implicitly the decision to keep on smoking at advanced ages.

The use of two other proxies for the health status shows clearly the relevance of this consideration. The peak respiratory flow and the presence of a respiratory disease diagnosed by a medical doctor indicate a detrimental effect of tobacco consumption to the health of the population above 50 years old in Portugal. The number of years as a smoker does have a sizeable effect, part of it remaining even after the individual quits smoking.

Besides smoking, for this population above 50 years old, the standard effects of more advanced age (negative) and higher education level (positive) versus health

7 See Wooldridge (2001).

status were observed, whilst income had no discernible effect. Living alone has a negative association with health status, consistent with the view that it is a risk factor for the health of the elderly in Portugal.

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Appendix

The different dependent variables used have distinct missing values, which lead to slightly different samples in each estimation procedure. For completeness, we report below the descriptive statistics associated with each particular set of estimates.

Table A1. Dependent variable: self-assessed health status

Variable	Obs	Mean	Std. Dev.	Min	Max
health	1652	2.330508	.9762604	1	5
bmi	1652	27.15543	4.4641	15.20381	54.01026
female	1652	.4485472	.4974962	0	1
age	1652	65.25182	9.442268	51	95
income	1652	17392.67	24774.66	620.7382	210000
hhsize	1652	2.447337	1.091906	1	8
education	1652	6.12046	4.230419	0	24
smoker	1652	.1016949	.3023382	0	1
quit_smoker	1652	.2306295	.4213633	0	1
years_smoker	1652	8.383172	15.4071	0	73
live_alone	1652	.12046	.3255973	0	1
married	1652	.7953995	.4035315	0	1

Source: Own construction, original data from SHARE wave 4, release 1.

Table A2. Dependent variable: peak respiratory flow

Variable	Obs	Mean	Std. Dev.	Min	Max
puff	1468	271.5783	151.4236	30	890
bmi	1468	27.1869	4.410767	15.20381	54.01026
female	1468	.4543597	.4980823	0	1
age	1468	64.54973	8.960238	51	95
income	1468	17430.09	24815.87	620.7382	210000
hhsize	1468	2.446185	1.071013	1	8
education	1468	6.232289	4.269531	0	24
smoker	1468	.1042234	.3056543	0	1
quit_smoker	1468	.229564	.4206958	0	1
years_smoker	1468	8.331063	15.21075	0	70
live_alone	1468	.1158038	.3200986	0	1
married	1468	.8085831	.3935505	0	1

Source: Own construction, original data from SHARE wave 4, release 1.

Table A3. Dependent variable: presence of diagnosed respiratory disease

Variable	Obs	Mean	Std. Dev.	Min	Max
resp_disease	1656	.1908213	.3930672	0	1
bmi	1656	27.15126	4.462015	15.20381	54.01026
female	1656	.4486715	.4975086	0	1
age	1656	65.25423	9.436318	51	95
income	1656	17389.82	24752.04	620.7382	210000
hhsize	1656	2.44686	1.090836	1	8
education	1656	6.128019	4.233435	0	24
smoker	1656	.1014493	.3020139	0	1
quit_smoker	1656	.2300725	.4210061	0	1
years_smoker	1656	8.362923	15.39398	0	73
live_alone	1656	.1201691	.3252574	0	1
married	1656	.7958937	.4031688	0	1

Source: Own construction, original data from SHARE wave 4, release 1.