Regional dimensions of mortality and health status in Greece, 2000-2012

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Abstract

Based on a life table analysis, several mortality and health state characteristics of the peripheral populations of Greece were studied. The analysis revealed that despite the general improvement observed in their mortality and health status since the year 2000, still some significant differences exist among them. A further analysis of the results includes the ranking of the various regions and prefectures according to the total health state.

Key words: Greece, mortality, health status

JEL Code: I15, I18, J1

Introduction

In 1995 Jansen and Skiadas attempted to use published death and population statistics in order to evaluate the health status of a population with the appliance of the general theory of dynamic models. Based on the idea that despite the fact that the health state of an individual is unpredictable the mortality curve of human populations can be modeled and because of that the health state form derived from these data can be modeled too, in a series of subsequent papers the Health State Theory, as it was called, was further developed, refined and evaluated Skiadas and Skiadas, 2013a, 2013b; 2014) and the Health State Function of the population was introduced as:

$$H_x = \pm\left(-2xln\frac{d_{(x)}\sqrt{x^3}}{k}\right)^{\frac{1}{2}} \quad (1)$$

where k is a parameter given by $k=\max(d_{(x)}\sqrt{x^3})$ (2) and $d_{(x)}$ is the number of deaths per 100.000 of population provided by the classical Life Tables, or preferably they may correspond to the probability density function. According to the theory developed by Jansen and Skiadas [5], the Health State Function has an improvement

stage of human health during the first years after birth, followed by a decreasing one during middle and old age. Based on the Health State Theory (HST) many Demographic and Human Development Indicators have been proposed and calculated efficiently for numerous national populations based on data published by National Statistical Services or found in other databases (see Skiadas and Skiadas, 2013b). This is an attempt to apply the Health State Theory to the Regional Populations of Greece, after introducing it to some isolated populations of the country (see Zafeiris and Skiadas, 2014). Two main questions will be addressed in this paper. The first one deals with the national and regional characteristics of mortality and health in Greece. The second deals with the sensitivity of the Health State Theory in locating and evaluating differences among the populations. The analysis will take place as shown in Tables 1 and 2 in which the Regions of Greece (NUTS level 2) and the Department of Thessaloniki (NUTS level 3) are included coded according to the nomenclature of territorial units for statistics of Eurostat (15/9/1914)

As is well known Greece is a developed country and has been a member of the Euro zone since Jan 1st, 2001. It has a permanent population of 10.816.286 persons (2011 census; EL.STAT, 16/10/2014). According to the revised data of National Statistics Authority (EL.STAT, 2014a, pp.5-6), Greece, previously an economy with steady annual economic growth rates, exhibited a negative growth rate of -0,4% in 2008 and -4.4% in 2009 which progressively became maximum in 2011 (-8,9%). Later on, the recession rates declined to -3.3% in 2013. In March of 2010 (see BBC news, http://news.bbc.co.uk/2/hi/8546589.stm) a new package of major austerity measures were passed by parliament, which was followed by a series of new economic measures over the next couple of years, in actual fact a policy of internal devaluation. As a result of the economic crisis the Gross Domestic Product (GDP) declined from 20,800 euro in 2008 to 18,500 euro in 2011 (source: Eurostat, 15/10/2014). This economic crisis affected all the sectors of the Greek economy as well as the Greek society. It is indicative to say that unemployment rates from 9.6% in July 2009 increased to 27.8% in 2013 (EL.STAT, 2014b) and that 35.7% of the Greek population is at risk of poverty or social exclusion, in the second worst position after Bulgaria in the European Union. However, after social transfers the relevant

population declines to 23.1%; i.e. in the worst position of EU (EL.STAT, 2014c). At the same time material deprivation increased and it is characteristic of the living conditions in the country that 48.6% of the poor population of the country and 24.3% of non poor are unable to keep their home adequately warm (EL.STAT, 2014d).

Data and Methods

The data for the analysis comes from the National Statistical Authority of Greece and it is comprised of the death series per age, sex and NUTS 3 level and the relevant mean populations for each year from 2000 to 2012. It has to be noted that the available data from EL.STAT for the years 2001 until 2012 are in their new and revised form. On the contrary, data for the year 2000 has not been revised yet and because of that, for this year, all the results of the analysis are cited with this proviso and they will not be discussed in the text. For each of the NUTS2 regions and the Department of Thessaloniki (NUTS3) the number of deaths was smoothed as a three year moving average, except for the last year which in absence of data is the average number of deaths in the years 2011 and 2012. Then life tables were constructed with the aid of special software developed for the analysis. The death probabilities of the abridged life table produced for each year are based on the age specific mortality rates (deaths/mean population) according to the Chiang Method (Namboodiri, 1991; p. 85) and the relevant methodology for the columns of the abridged life table. Then by applying the equations (1) and (2) several indicators of the Health State Theory were computed. In this paper the Total Health State will be used, corresponding to the sum of H_x values of the relevant distribution before the zero point of the health status of the population and then to a comprehensive assessment of health levels.

Results

Life expectancy at birth (LEB; Figure 1) was almost linearly improved in the entire population of Greece: between 2001 and 2011 the gains were about two years of life. Afterwards LEB levels remained more or less stable in males, while in females the gains were rather insignificant, probably as a result of the economic crisis. Among the peripheral subpopulations of the country a more variable picture emerges related

mostly with the LEB levels and secondarily with the temporal trends of mortality after the beginning of the economic crisis in 2009.

In Northern Greece (EL1) the most differentiated Region of higher mortality is of Eastern Macedonia and Thrace (EL11), as one of the poorest areas of the country (GDP 2013: 13100 euro; source: Eurostat, 15/10/2014), followed by Central Macedonia (EL12) where mortality is rather lower than EL11 but still higher than the national population. Thessaloniki (EL112) gradually converges or overtakes slightly the national populations in longevity in the final years of the study. Even lower is the mortality in the population of Thessaly (EL14), and lower still is that observed in Western Macedonia (EL13). In both populations LEB improvements are halted between 2011 and 2012. The lowest mortality rates for females are observed in Thessaly for most of the time, followed by Western Macedonia.

Fig. 1: Life Expectancy at Birth (LEB, y axis) by year (x axis) and NUTS level.
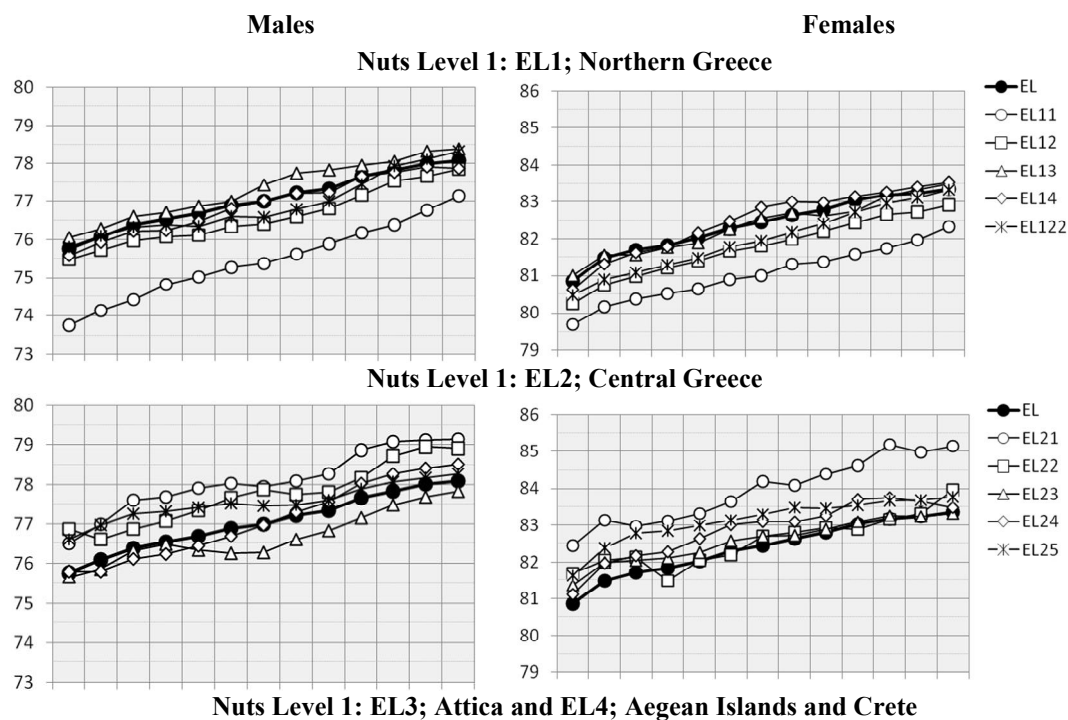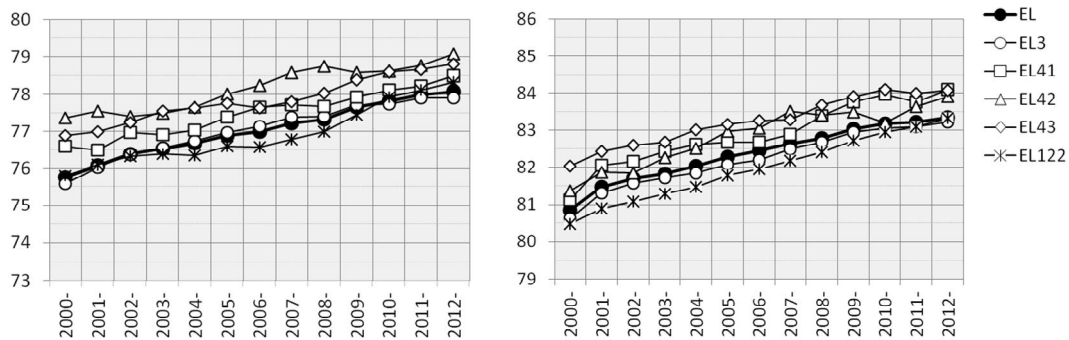
In Central Greece (EL2), males of Western Greece (EL23) show many similarities with the population of Central Macedonia after 2004 and they can be classified with the Regions of higher mortality. The other populations are of lower mortality than the national population. Among them, Epirus (EL21), exhibited the lowest mortality of all the other areas of the country for several years between 2000 and 2012 (mainly alternating in the best position with the South Aegean Islands; EL42), and the Ionian Islands. LEB improvements were halted in these populations in 2011 and 2012, probably as a result of the economic crisis. Of the other populations, Peloponnesians (EL25) - originally of lower mortality - gradually converged with the national population. Males of Sterea Hellas (EL24) gradually diminished the small differences they had with the national population and over passed him in 2008. The longest-living women in Greece are found in Epirus (EL21) and also in Crete (EL43) and Peloponnese (EL25). Women of Sterea Hellas (EL24) were also of lower mortality than the entire population of the country. The remaining women of Central Greece, i.e. those of Ionian Islands (EL22) and Western Greece (EL23) for the majority of the years studied showed many similarities with the national population. Finally, of all the female populations of Central Greece only the females of Peloponnese (EL25) and Epirus (EL21) had some gains in LEB between 2011 and 2012.
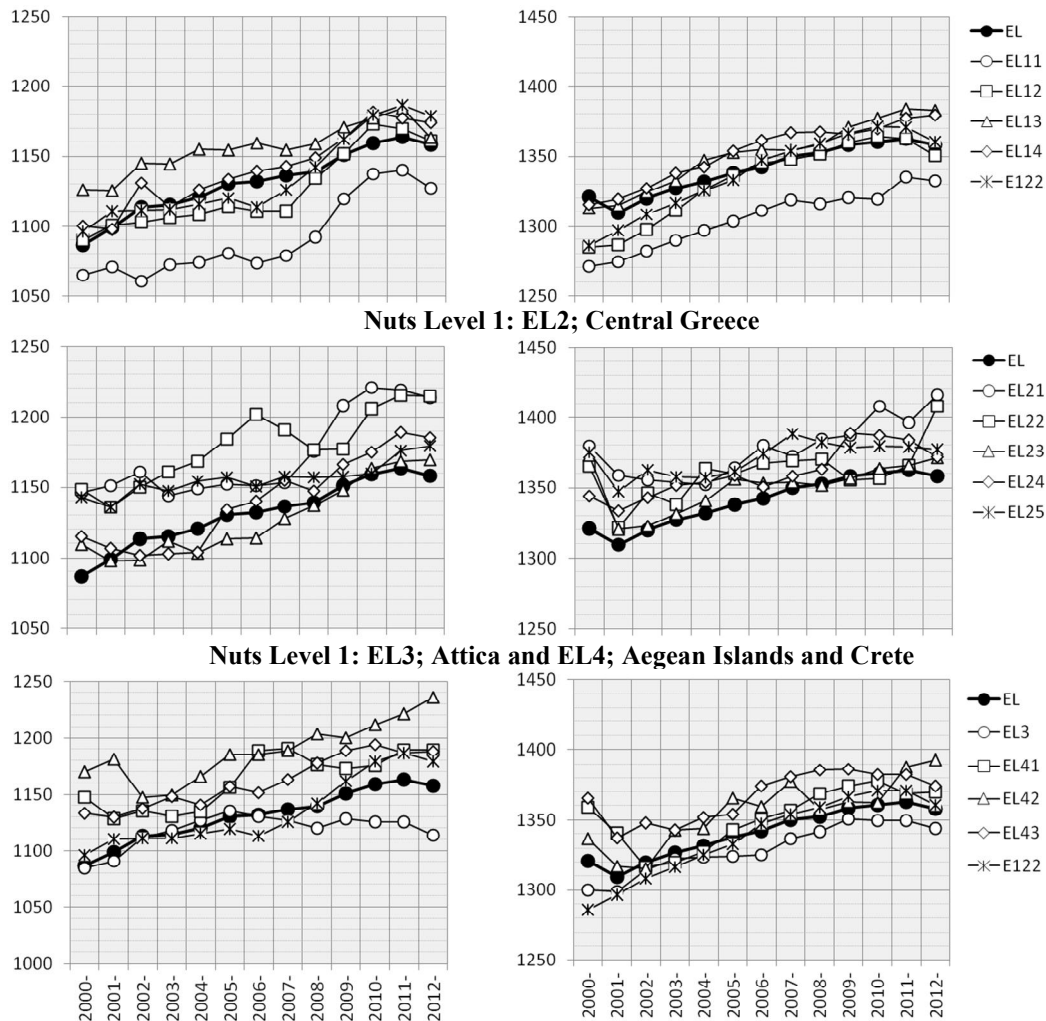
Fig. 2: Total Health State (THS, y axis) by year (x axis) and NUTS level.

Males   **Females**
Nuts Level 1: EL1; Northern Greece

568

Nuts Level 1: EL2; Central Greece

Nuts Level 1: EL3; Attica and EL4; Aegean Islands and Crete

The improvements in LEB were also halted in the females of Attica (EL3) between 2011 and 2012, because of the economic crisis. As part of the largest population of Greece (total permanent population 2011: 3.828.434), the temporal trends of females' LEB in Attica largely follow those of the national ones and the observed differences are rather insignificant. Longevity in the Attican females seems to be slightly higher in comparison to those of the Department of Thessaloniki, the second most populous area of Greece (Total permanent population 2011: 1.110.551). The rest of the female Greek populations had lower mortality levels. Among them, the women of Crete (EL43) - where no significant improvements of LEB were observed after 2009 – had the lowest mortality in the EL4 area (Aegean Sea Islands and Crete), followed alternatively by the women of the Aegean Islands (EL41 and EL42). The male population of Attica follows the same trends as the female one compared with

the relevant national population, but in the EL4 area the situation is rather different in males than in females. There, the most diverse population with the lowest mortality is of the South Aegean Islands (EL42), followed in most of the years studied by the Cretans (EL43) and the people of the North Aegean Islands (EL41).

The temporal trends of Total Health State Levels (THS; Figure 2), produce a clearer picture, as, in comparison with LEB, they seem to be more detailed and sensitive in presenting the differences existing among the populations. In the total population of the country (EL; national population from now on), three years after the economic crisis of 2009, the health levels of the male and female populations decreased) slightly; in other words the effects of the economic crisis are evident.

In Northern Greece (EL1), Eastern Macedonia and Thrace (EL11) was also burdened by the economic crisis. It is worthy to note that despite the observed improvements of the THS levels up to a time point in both sexes, this Region had the worst health in the country and only its male population overpasses Attica after 2010 attaining the penultimate position of the regions with the worst health. In Central Macedonia (EL12) the observed differences found in the LEB compared with the national population are accompanied by more clear differences in the THS levels for the first years of the study. Afterwards, the health of the male population improved until 2010, when it was negatively affected by the economic crisis. Temporal trends of females' health status are equivalent to the national population after 2004, despite the differences found in LEB among them, while in 2010 THS levels started to decrease. The population of Western Macedonia (EL13) is always of better health than the national one. In males a significant decrease of THS levels is observed in 2012. In females a gradual improvement of health progressively places them in the 3rd or 4th place of the populations of better health in Greece. More moderate effects of the economic crisis are found in the males of Thessaly (EL14) than those of Western Macedonia, but there the decrease of THS started a year earlier, in 2011. After some fluctuations in the first years the male population of EL14 maintains and even increases the positive difference it had with the national population until 2010, but health there was for most of the time worse than Western Macedonia (EL13). This is

also the case for females, who unlike males exhibit a constant increase in their health status.

Of the male population of Central Greece (EL2), that of Epirus (EL21), because of the improvements observed there over time, attained one of the three best health levels of the country after 2008. The same is the case for the Ionian Islands (EL22) after 2002, even if large temporal fluctuations are found there probably due to the small population sizes. A small reduction in THS is observed in Epirus in 2012 because of the economic crisis. A similar situation with males is observed for the females of the two Regions. In Peloponnesus, males (EL25) were also of better health than the national population. Originally they exhibited many similarities with Epirus but after 2006 the improvements they had were more moderate. Peloponnesian females, in their turn, had a fairly steady increase in their health status in the period 2001-2007, when they were 1 of the 3 populations with the best health in Greece. After 2008 any health improvements were halted. A more variable but in general increasing course of THS in comparison to the national population was followed by the male and female population of Sterea Hellas (EL24). In males this trend was halted in 2012 while in females, who had the best health in Greece in 2009 and the second best in 2010, it was reversed in 2008. One of the populations with the worst health level in the country are the males of Western Greece (EL23). In 2002, 2004 and 2005 they had the second worst health just above Eastern Macedonia and Thrace and besides the improvements made over time they were always classified as a lower health population. After 2010 their health status remained fairly stable. Females, in their turn, experienced an increase in health status after 2001, even with minor fluctuations, and after 2006 they largely follow the temporal trends of the national population of the country.

In Attica (EL3), despite the fact that LEB levels practically coincide with those of the relevant national populations of the two sexes, the THS levels deviate a great deal over time. In males at first, health levels are close to the national ones until 2006. Afterwards THS deviates significantly and by time males attained the worst health status in the country. This deviation was at its greatest in 2012. The female population has deviated since 2000. At the same time the further burdening of the

population's health because of the economic crisis in the last years of the study is obvious, as it is for males. It seems then that along with the economic situation in Attica several other factors may have acted in shaping the health status of the population, such as the quality of life, atmospheric pollution, local unemployment rates, infrastructure issues and others. As a result of the combined action of these factors, women in Athens have steadily reached the level of the second worst health in the country after 2004. If the relevant female populations of Attica and Thessaloniki (EL112), where the second most populous city of the country (Thessaloniki) is located, are compared an interesting observation can be made. On the one hand LEB was always higher in Attica. On the other hand health status was originally lower in Thessaloniki and afterwards it increased -in 2006 becoming better than Attica. Obviously then, Total Health State (THS) is a more informative and sensitive measure than LEB in describing temporal changes and spatial differences among populations. In any case the worsening of health status of females due to the economic crisis is also evident in Thessaloniki, as it is in its male population, which has had better health than the population of Attica since 2008. Considering in total the picture of Attica and Thessaloniki it may be assumed that life in the big cities of Greece affects negatively the health of the population. Probably this is the reason why Thessaloniki (EL122) may entrain Central Macedonia (EL12) in low places in the THS ranking or the reason for the poor performance of Western Greece, where Patra, one of the biggest cities is located (Total permanent population 2011: 213.984).

Finally, males in the Northern Aegean Islands (EL41) exhibit many fluctuations in the THS levels, but their health is in general improving and remain constantly high. During the last two years of the study (2011-2012) the health status of the male population remains stable while of the female declines. In the Southern Aegean Island (EL42) the increase in the health status of males and females after 2002 is uninterrupted even if its course is quite variable. During this time period males, with one exception, take up the 1st or 2nd position of the populations with the best health in Greece. Among the populations with the best health in Greece are also the females of this Region after 2011. There is no evidence then to support that the economic crisis had any effects on the health of the Southern Aegean people. On the

contrary, Cretans (EL43), both males and females, seem to have been affected by the economic crisis in the last years of the study. Despite that, they are one of the populations with the better health status in the country, and in fact males had the 2nd best health in the country in 2008 and the 3rd in 2003 and 2009. Females had the 1st best health in 2008 and the 2nd in 2006 and 2007.

Results

The Life Expectancy at Birth and Total Health State analysis revealed significant improvements in the country and its regional populations up to a time point and a clear influence of the economic crisis and probably other factors. Significant spatial differences were found among the Regional populations of the country, which in our opinion mostly reflect peripheral inequalities and local particularities. Except Western Macedonia, the rest of Northern Greece, Attica and Western Greece tend to have lower LEB and worse health than the other areas of the country. The effects of the economic crisis vary among the areas studied. However, Attica seems to have been afflicted by in a greater degree than the other areas of the country. Finally Health State Analysis seems to be more sensitive in presenting the differences existed among populations than LEB.

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