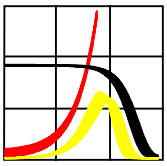

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Can Diet and Life Style Explain Regional Differences in Adult Mortality in the Balkans?

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1. Introduction

The health of any population is determined by a complex set of factors. While demographers often consider socio-economic determinants, such as income or urban-rural status, longer-standing cultural factors are often hard to assess. Nevertheless, there are parts of the world where issues such as diet and life-style, often linked both to geography and history are important considerations for a full understanding of a population's health. One such region is the Balkans in south-east Europe, the focus of this paper.

After this introduction, the paper begins (section 2) with a consideration of the historical background that has influenced the economic, social and cultural life of the Balkans. It then goes on to consider the availability and quality of the data for this study (section 3), before assessing the trends and levels of mortality in Balkan countries since World War II (section 4). Section 5 considers regional (sub-national) patterns of adult mortality, with special reference to Albania, Greece and the Former Yugoslavia. In section 6 we investigate the issue of regional (sub-national) patterns in cardiovascular disease, the leading cause of death in these countries, with particular reference to Albania, Bulgaria and the Former Yugoslavia. Section 7 considers if diet can provide a possible explanation of the observed regional mortality patterns. The paper ends (section 8) with our conclusions and our ideas for a future research agenda.

2. Historical Background

An awareness of the past is an essential component to any understanding of the present. This is true for all populations, but none more so than the Balkans. Most aspects of the history, geography and current pattern of ethnic and cultural diversity in the Balkans, though complex, are, fortunately, already very well documented (King 1973, Poulton 1991; Bookman 1994, Carter and Norris 1996). While a simple definition of what constitutes the Balkans remains elusive, and disagreement continues over just how best to categorise the various groups in question, there is no doubt that south-eastern Europe is one of the most culturally diverse regions on earth (Hall and Danta 1996). With about 20 identifiable ethnic groups, at least ten languages (many of which have marked regional dialects), three alphabets and three main religions, the Balkans constitutes a patchwork quilt of traditions and beliefs. This diversity is undoubtedly influenced by the geography and history of the region. The mountainous terrain of many areas has encouraged isolationism, while historical forces led to the arrival and dispersion of many population groups. For almost half a millennium the region was a zone of border conflict between the Ottoman and Hapsburg empires, both of whom sought to consolidate their control by deliberately encouraging settlement by groups they favoured and discouraging others.

In contrast with the distribution of different ethnic and cultural groups, which reflects the long and turbulent history of the region, the national borders of the Balkans mostly date only from the late-nineteenth and early-twentieth centuries. At that time a series of international conferences, overseen by the great powers of the day, partitioned the European territories of the collapsing Ottoman empire (Palmer 1993). The boundaries assigned at that time by the major powers owed more to *realpolitik* considerations of maintaining a balance between their various client states than creating logical units of cultural identification. In consequence, national frontiers bear only a partial relationship to ethnic and cultural patterns.

Thus, when it comes to cultural, ethnic and life style differences, it is difficult to find a region more diverse than the Balkans. Socio-economic differences are also very marked in the region. Moreover, such differences are found not just among the nation states, but also between the numerous regions of a particular country. Simply recalling that the former Yugoslavia was a state build on ten nationalities, one can get some insight into the diversity of the Balkans. While analysing the trends in former Yugoslavia, Kunitz argues that health transition and mortality trends in Yugoslavia can only be understood in the context firstly of moves toward national unification of Yugoslavia, and then of the subsequent demise of this aspiration (Kunitz, 1996, p. 270). Similarly Bookman (1994) has argued that economic stagnation or decline is an essential pre-requisite for traditional culturally-defined differences to emerge. In short, the complex web of cultural, social and economic variation can often be hard to disentangle.

In spite of its tremendous diversity, however, the geographical and political realities of the Balkans make it unquestionably a coherent unit of study. As Sjoberg and Wyzan (1991) put it, "Despite the great diversity of experiences, one should not lose sight of the fact that the Balkans are once again an integral unit whose component states have sufficient in common to make the concept meaningful."

It is these arguments that lead us in this paper to focus our analysis not just on the mortality differences between nation states, but also, wherever possible, among their composing sub-regions.

The mortality trends and patterns of different Balkan countries have been the focus of considerable research during the last decade. One reason for this was the rapid improvement of life expectancy in some of these countries after World War II. The second reason was the unexpected slow down in improvements in much of eastern Europe. The Balkan countries generally had rather relatively stable trends during the eighties and the beginning of the nineties. Albania and Yugoslavia did not experience the mortality increases among adults in this period seen in some other former communist countries. While Bulgaria and Romania had a less substantial worsening compared with former communist countries further north and east. Different scholars have considered this phenomena. Thus, Mesle (1991, 1996) points out that countries such as Albania and Yugoslavia, which had the worst life expectancy at birth in 1950 were among the leading East European countries in 1990. The second important point considered by Mesle is that,

unlike the adverse trend of mortality in most East European countries during the 1980s, Albania and Yugoslavia looked much better in 1990. Other authors have tried to give some explanations to this different mortality trend and pattern by focusing on particular countries (Watson, 1995; Gjonca et al. 1997).

It is obvious that there is a profound shortage of, and urgent need for, comparative studies of mortality in the Balkans. We need not only to detail the mortality patterns of these countries, but also to try to find plausible explanations for these patterns. In particular the national focus of almost all studies has tended to obscure the mortality differences within the ethnically and culturally diverse countries of the Balkans. This paper tries to avoid this problem, by focusing on regional level analysis whenever possible, and by doing so tries to find the common determinants of these patterns. However, we realise that this is only a first tentative step towards a more serious comparative epidemiology of the Balkans.

3. Data Description.

The overall mortality of the populations studied in this paper is generally well documented; regular censuses and more or less complete death registration data are available for all Balkan countries from the early-twentieth century, or even earlier in the case of Greece and Bulgaria. Until recently, this statement could not be made without the qualification that Albania had to be excluded from this analysis. However, long-run data for that country became available in 1991, and the analysis over the last five years, including our own research (Gjonça et al,1997) has put the final piece into the Balkan data jigsaw. The detail and the quality of the mortality data is of course somewhat varied, and not all data are available classified by region.

This work is based on aggregate level data on mortality of these populations and their cause-specific patterns. The sources of these data are the publications of national statistical offices of these countries, as well as international publications. Thus, for Yugoslavia most of the data are extracted from the *Demographic Statistics* (*Demografska Statistika*), which was an annual publication of the Federal Statistical Office of Yugoslavia. The data on Bulgaria, Greece and Romania are also taken from their annual statistical yearbooks. In order to check on the accuracy of these data, as well as to fill the possible missing data, other international publications are also used, such as estimates of Murray et al. in *The Health of Adults in the Developing World*. (Feachem et al.eds., 1992), and the demographic yearbooks of the United Nations. The data on Albania have been corrected for completeness of death registration and census coverage by the authors (Gjonca et al. 1997). These data were collected from the Albanian National Archives.

When we move on to considering causes of death or the availability of information on the possible determinants of mortality, the data situation is much less satisfactory. There is no standard, comparable basis for the reporting of cause of death by region or age. Moreover, the quality of the reported causes of death is often debatable.

Information on diet and socio-economic variables is often even less adequate. Thus, at present, the data do not permit a truly comprehensive assessment of the question posed in the title of this paper.

Some data related to possible determinants of mortality patterns in the Balkans do exist in national and international publications. However, it is important point to note that individual level data that could conclusively demonstrate the causal mechanisms at work are rarely to be found in the Balkans. Moreover, even when individual level data exist, comparability between nation states and sub-regions is almost impossible. As a consequence the analysis of mortality differences in the Balkans in this paper is primarily based on the aggregate level data.

The analysis in this paper will focus on mortality at the end of the eighties and beginning of the nineties. This focus is determined by several considerations. First, most of the Balkan countries experienced similar social, political and economic systems until 1990. In common with the rest of Eastern Europe, communist governments ruled all Balkan states except Greece until 1990. This shared political and social experience provides a convenient degree of homogeneity, facilitating comparisons. Secondly, after 1990 the Federal Republic of Yugoslavia disintegrated, and the Balkans experienced the formation of new states: Slovenia, Croatia, FYR of Macedonia, Bosnia-Herzegovina and a rump of Yugoslavia made up of Serbia and Montenegro. With the political and economic changes that happened to most of the Balkan countries after 1990, the systems of data collecting changed and consequently the information collected also changed. In some cases, political turbulence and even military action during the 1990s rendered normal data gathering impossible. For all these reasons, at present 1990 is the last date for which comprehensive and comparable data are available.

4. Mortality in the Balkans since World War II.

Over the last 50 years the mortality of Balkan countries has been converging. After World War II, there was a large difference between life expectancy at birth of the Balkan countries. Figure 1a and 1b demonstrate this trend. If Greece is left out (as it already had far lower mortality than the other states), the gap of life expectancy at birth between the best and worst cases was about 7 years for males, and 12 years for females. The especially large difference in e_0 for females is mainly due to the life expectancy at birth in Albania, which was lower than the value for males. Gjonça et al. (1997, p. 598) have argued that this difference was due to the traditional customs of Albanian society, whereby females were very disadvantaged compared with males.

Figure 1a. Life expectancy at birth for males in the Balkans, 1950-1990 (about here).

Figure 1b. Life expectancy at birth for females in the Balkans, 1950-1990 (about here).

The mortality of these countries converged substantially over time. By 1990 the gap between the highest and the lowest life expectancy at birth, (again leaving Greece aside for the moment), was 2.8 years for males, and 2.3 years for females. The most substantial improvement of mortality during this period occurred for Yugoslavia and Albania. Life expectancy at birth for Yugoslavia improved by 14.6 years for males, and by 17.6 years for females. In Albania the gain for males was 16 years, and that for females 23 years.

Improvement of mortality in Romania has been slow compared with other Balkan states, while in Bulgaria mortality has actually worsened since seventies, in particular for males. It is important to note in this context that Bulgaria had already achieved a relatively high life expectancy at birth for both sexes by 1960. This was similar to that of Greece, and even some of the more prosperous countries of Europe, such as France and Great Britain for males, and Italy and Spain for females (Mesle, 1991, p. 600-2). Relative success in the 1950s and 1960s, followed by stagnation or decline in life expectancy during the 1970s and 1980s was seen in several other East European countries, including the Soviet Union.

Even simple graphs such as Figures 1a and 1b make it clear that the experience of Greece differs substantially from that of the other Balkan states. In the period after World War II, life expectancy at birth in Greece was much higher than in the rest of the Balkans. During the following years mortality improved steadily, with no sign of stagnation. The last two decades, in particular, show an increasing gap of life expectancy at birth between Greece and the other Balkan countries, in particular Romania and Bulgaria. This increased gap comes partly as a result of a slow down or even worsening of mortality in these countries, but also because of sustained improvement in Greece. Thus, in 1990 the difference of e_0 between Greece and Bulgaria was about 6.4 years for males, and 4.8 years for females, while in 1960 the mortality in Bulgaria was better for both sexes.

When the different components of overall mortality are considered, a somewhat different picture of mortality differences in the Balkans emerges. Thus, when the infant mortality rate is considered, as shown in Figure 2, it is clear that infant mortality shows a less marked trend to convergence. Albania and Romania, despite the improvements during this period, still in 1990 had relatively high infant mortality rates at 41.6 and 26.9 deaths per thousand live births respectively. In contrast, Greece and Bulgaria had relatively low values of infant mortality at 9.7 and 14.8 per thousand respectively. A high infant mortality rate in the Balkans is not a phenomenon of the nineties; it has been high since World War II compared with other Europeans. Thus, in 1950 for the whole Balkans taken together (excluding Greece), the infant mortality rate was over 100 deaths per thousand. Yugoslavia had the highest infant mortality rate at 139.8, with Albania little better with a value of 134 per thousand. Even in 1990 infant mortality remains high in the Balkan countries, when compared with the rest of Europe and when compared with model life tables with the same level of life expectancy. As with the levels and trends in life expectancy at birth, the difference between Greece and the other Balkan states is also evident in infant mortality trends.

Figure 2. Infant mortality rate of the Balkan countries, both sexes, 1950-1990 (about here).

Moving from infant to adult mortality, Figure 3 shows the changes in life expectancy at age 15 during the period 1950-1990. It is interesting to note that a large amount of the variance in mortality in the Balkans can be attributed to differences in mortality at ages over 15 years. Thus, in 1990, life expectancy at 15 varies from 57.3 years in Romania to 60.6 years in Albania and 63.0 years in Greece. Another very distinctive feature of these ages is that instead of convergence of mortality, what one can see from Figure 3 is a divergence over time.

Figure 3. Life expectancy at age 15 in the Balkans, both sexes, 1950-1990. (about here)

It is interesting to note that Albania shows a somewhat paradoxical mortality pattern in which infant mortality rate is the highest in Europe, while mortality for ages over 15 years is among the lowest in Europe. Previous research has suggested that this unexpected pattern is due to the importance of diet and life style factors in reducing adult deaths, while a poor health system cannot do likewise for infants (Gjonça and Bobak, 1997).

The changes of mortality among adults in the Balkans will be the focus of the next sections of this paper, where a detailed analysis by age and region will be introduced.

5. Analysis of Adult Mortality Differences by Sub-regions.

In attempting to analyse patterns of adult mortality in Europe, scholars to date have focused on two major divisions in Europe. The first is the division between Northern and Southern Europe (or the Mediterranean). The mortality rates of adults in the latter group are often much lower than in the North European countries, especially for particular causes of death. These differences are not just found between nation states, but also within particular countries. Thus, distinctive differences are found in Italy between the South and the North; mortality is lower in the Mediterranean South than in the more continental North (Caselli, 1996). This north-south gradient of mortality differences is found also in other Mediterranean countries, such as France and Portugal (Mesle, 1991) and Albania (Gjonca and Bobak, 1997). Many of these differentials have been attributed to the beneficial effects of the Mediterranean diet and life style.

The second dimension of difference in European adult mortality is that between Western and Eastern Europe (Bobak and Marmot, 1995, 1996; Mesle, 1991, 1995). The collapse of communism in Eastern Europe has been accompanied by an increase in the death rates among adults, and especially among males, since the late eighties. Different authors attribute this worsening of mortality to a range of factors, including the effect of increased stress due to economic, political and social uncertainty, a rise in alcohol

consumption and smoking. However, a relative worsening of health in much of Eastern Europe was evident during the last two decades of communist rule, so that factors related to the transition to the market economy cannot be the sole determinants.

The analysis of adult mortality in the Balkan countries is also broken down to the sub-national level in the following section, starting with a consideration of Albania, which has been the focus of our earlier research. The section goes on to consider sub-national patterns in Greece and the Former Yugoslavia. Analogous data for Romania and Bulgaria had not been traced at the time of writing.

Albania

Figure 4 shows the adult mortality maps in Albania at two points in time: 1960 and 1989. This comparison allows us to gauge the extent to which regional differences are enduring features of mortality. The data on Albania allowed the analysis of regional differences for 26 districts of the country.

Figure 4. Regional Differences in adult mortality ($_{45}q_{15}$) in Albania. (about here)

Albania as a whole has had very low adult mortality since the 1960s. This finding is also true at the regional level. Thus, the worst value of probability of dying at ages 15-60 in 1960 Albania was Pogradec with a $_{45}q_{15}$ of 21.70 per hundred, which is similar to the $_{45}q_{15}$ of Hungary and Soviet Union in the eighties (Feachem et al, 1992, p. 301). The variation at the regional level in adult mortality is marked in Albania. Thus in 1960, the difference between the worst value of $_{45}q_{15}$, Pogradec (21.7) and the best, Sarande (11.0), was almost two to one.

In 1960 the districts with the highest probability of dying among adults are to be found in eastern Albania, such as Pogradec (21.70 per 100), Korca (17.05), Kolonja (17.05), Librazhd (19.44) and Gramsh (17.18), and in the north of the country, Tropoja (20.10), Shkodra (17.11), Diber (18.14), and Puke (16.11). The districts that show relatively low adult mortality in 1960 are the south-western districts of Saranda (11.03), Tepelena (11.28), Lushnja (11.82), Vlora (12.22), Fier (12.45), and Berat (12.84). The capital Tirana also had a low probability of dying in 1960 with 12.48 per 100. It is interesting to note that even though adult mortality improved substantially from 1960 to 1989, the pattern of regional differences does not change much. Thus, Figure 4 shows clearly that the north-east and south-west gradient in adult mortality is still there.

To conclude the assessment of regional differences in adult mortality in Albania, it can be said that the north-east and south-west mortality division found in overall mortality (Gjonca and Bobak, 1997, p. 1816-1817) is also present in adult mortality. We can also note that relative adult mortality worsens in the east of Albania over time, in places such as Korca, Kolonja and Pogradec and improves in the coastal regions of Durres and Kruje.

Greece

The analysis for Greece considers 1981 and 1990. This relatively brief time span was necessitated because of data availability problems at the time of writing. Figure 5 shows the adult mortality differences in Greece in 1981 and 1990, for both sexes combined. Greece is divided into eight sub-regions here, leaving out all the groups of islands, such as the Ionian Islands and the Aegean Islands. Central Greece is divided into Athens, the Greek capital and the Rest of Central Greece.

Figure 5. Regional Differences in adult mortality ($_{45}q_{15}$) in Greece. (about here)

All regions of Greece have very low adult mortality by the standards of almost any other country. However, regional differences do still exist. If 1981 is considered, it is interesting to note that the two regions with extreme values of adult mortality are the far-south region of Crete, with 45q15 of 8.2 and the north-east region of Thrace with $_{45}q_{15}$ of 12.5 per hundred. As in Albania, the regions in the south-west have lower mortality than those in the north-east. Thus, Epirus (with $_{45}q_{15}$ of 8.9), The Rest of Central Greece (8.5), Peloponnesus (8.9) and the Island of Creete (8.2) have a better mortality than Thessaly (9.2), Athens (10.1), Greek Macedonia (9.8) and Thrace (12.5).

In 1990 the pattern still remains the same: the south-west having lower mortality than the north-east. Thrace still has the worst mortality in the country with a $_{45}q_{15}$ of 10.1 per hundred. Athens still has worse mortality than the rest of central Greece. Again, the regions with the lowest adult mortality are Crete (7.7), the Rest of Central Greece (7.3), Peloponnesus (7.9) and Epirus (7.8). Thus in Greece, as in Albania, a south-west to north-east gradient in adult mortality can be clearly seen.

Former Yugoslavia

Another Balkan country for which the data allow the analysis of adult mortality by region is the Former Yugoslavia. As previously explained, this analysis for Yugoslavia deals with the last available year before the disintegration of this country. The last year with detailed information on each republic and autonomous province of Yugoslavia was 1988. Figure 6 shows the probability of dying for ages 15-60 for all the Yugoslav republics and one of its autonomous provinces, Kosova,[1] for the years 1980 and 1988.

Figure 6. Regional Differences in adult mortality ($_{45}q_{15}$) in Yugoslavia. (about here).

[1] Kosova and Vojvodina were the only two autonomous provinces in former Yugoslavia. Results for Kosova are presented separately from Serbia in order to compare its mortality pattern with Albania. The reason for this, as recent political events have made well-known, is because Kosova's population is predominantly of Albanian ethnicity. Vojvodina is analysed within the Serbian republic.

Both 1980 and 1988 show the same pattern of adult mortality in Yugoslavia. Thus, the regions with the best adult mortality are those bordering Albania: Macedonia, Kosova and Montenegro. In contrast, the worst mortality is in the north Yugoslav republics of Croatia and Slovenia. This is in spite of the fact that Croatia and Slovenia were the richest and generally most advanced of the Yugoslav republics. In both years the regions with the highest mortality is Slovenia in the north, with a ${}_{45}q_{15}$ respectively of 17.7 and 16.9 per hundred. Montenegro in the south-west consistently had the lowest values, with a ${}_{45}q_{15}$ of 12.2 and 10.9 per hundred. So, for Yugoslavia, as we saw in Albania and Greece, we can see a north-south gradient of mortality. The further south one goes, the lower is adult mortality (Kosova, Montenegro and Macedonia have values of 12.2, 10.9 and 11.8 in 1988). While the further north one moves, the higher is adult mortality (Bosnia-Herzegovina, Croatia and Slovenia have 45q15 values of 14.6, 16.5 and 16.9 in 1988 respectively). However, any east-west gradient is harder to detect.

A Balkan sub-regional analysis

The marked regional differences in all these three countries naturally lead us to ask how the picture of adult mortality will look like if the countries and regions are put together in one map. Figure 7 shows the adult mortality differences by region for all Balkan countries, including Bulgaria and Romania as national units because their regional detailed information is lacking.

Figure 7. Regional Differences in adult mortality (${}_{45}q_{15}$) in the Balkans. (about here).

Figure 7, in which adult mortality differences are put in one scale, shows clearly the north-east south-west gradient of mortality in the Balkans. Thus the areas with the lowest adult mortality are south-west regions of Greece, such as Crete, Peloponnesus, Central Greece and Epirus. South-west Albania, and the Greek regions of Thessaly, Macedonia and Athens do slightly worse, but better than the rest of the Balkans. The regions that follow are north-east Albania, Greek Thrace, FYR of Macedonia, and Montenegro. The central Balkans (Bulgaria and Serbia) follow this group, and the worst adult mortality is found in the extreme north-east - in Romania, and in the extreme north-west - in Croatia and Slovenia.

Just looking at this map it is clear that mortality differences in the Balkans are closely related to the geographical position of its regions. However, the deeper factors that shape this geographical pattern is not obvious, so further of the age pattern of mortality is presented below.

The comparison of the values of ${}_{45}q_{15}$ as a single index of adult mortality can sometimes hide variation of mortality rates within this large age-group. In order to see the differences in the patterns of mortality in the Balkan regions, a different approach is followed here: the assessment of how far each age group differs from a standard pattern. Albania is chosen as the country whose mortality pattern will be the base of comparison.

There are three reasons for selecting Albania as a standard. Firstly, it has been the subject of our previous analysis and thus we are most familiar with its detailed pattern (Gjonça et al 1997). Secondly, Albania occupies an intermediate position in terms of adult mortality, between the lowest values of Greece and the higher rates of other mainland Balkan states. And thirdly, Albania itself sits across a major contour of mortality, dividing the north-east and south-west of the country, and thus Albania contains within it both Mediterranean and continental mortality patterns.

The regions selected for this comparison are made up as follows. There are four which border Albania: Kosova, FYR Macedonia, Greek Epirus and Greek Macedonia, as well as three further regions one in the very north of the Balkans, Croatia, one in the very south Peloponnesus, and one in the south-east Balkans, Thrace. This selection of regions captures the main variants of mortality patterns within the Balkans.

It is known that Greece has some of the lowest death rates in Europe, in particular for adult ages. In 1990, Greece had a life expectancy for males of 74.6 years and 79.7 for females. Looking at the previous decades, mortality in Albania and Yugoslavia was much higher than Greece. Thus, in 1951 Greece had an e_0 of 63.5 years for males and 66.7 for females, while Albania and Yugoslavia had an e_0 of respectively 51.9 and 55.0 years for males, and 51.3 and 58.7 for females. This difference in the level of overall mortality makes the comparison of mortality patterns difficult. However, in order to facilitate comparison of mortality this approach is followed.

First, for the same level of life expectancy at birth (e_0 in 1989 Albania is taken), the ${}_nq_x$ values of selected Greek and Yugoslav regions were interpolated for both sexes. Then, the differences between the patterns are calculated as ratios of the ${}_nq_x$ values between each region and Albania. The standard deviations of all ages and ages 15-60 are calculated to see the variation of each pattern (Greek and Yugoslav region) from the Albanian pattern. The values of standard deviations are given in Table 6.7. In other words, the values of Table 6.7 show the standard deviation of the ratios between the mortality rates (${}_nq_x$ values) of these regions and Albania. The higher the value of the standard deviation, the larger the differences between the age-mortality patterns of these regions and Albanian standard.

Table 1 generally shows more variation for females than for males, when comparing each population with the Albanian pattern (Croatia is the only exception). This means that the Albanian mortality pattern for females is more distinctive than the male pattern when compared with these regions. The other noteworthy point of this table is that the Albanian pattern is similar (the SD is lower) to the Greek regions, but not especially close to those of Yugoslavia. For example, the comparison of males for all ages shows that the lowest variation from the Albanian pattern is in the Greek regions of Epirus, Macedonia, and Peloponnesus. A similar result holds for females, but in this case the variation is lowest between the Albanian pattern and Greek Epirus and Peloponnesus. It is also clear that the more one moves towards the north of the Balkans, the greater is the standard deviation, implying that the patterns are more distinct from each other. Thus, the

variation for Croatia is the highest for both sexes, but especially for males - three or four times higher than the Greek regions of Epirus and Peloponnesus. The regions located in the east of the Balkans, FYR of Macedonia, Greek Macedonia, and Thrace also show more differences from Albania, though to a lesser extend than Croatia.

Table 1 Variation from Albanian mortality pattern of some selected regions in the Balkans. (about here)

These differences within the patterns are even more clear-cut, when ages 15 to 60 are considered. The most similar age patterns to Albania again are those of Greek Epirus and Greek Peloponnesus. The further one moves in north or east, the greater the divergence from the Albanian pattern. Thus, for males, comparison with the Greek regions shows that in Greek Macedonia, and further east, in Thrace, the standard deviation is higher than in the southern regions of Greece. This is also true the further one moves north. Thus, the difference between the FYR of Macedonia and Albania is greater than the Greek comparisons, but is lower than Kosova, and much lower than Croatia. For females, once more Albania has a similar pattern to Greek Epirus and Peloponnesus, and a rather different one from Croatia, FYR of Macedonia and Greek Macedonia. It is interesting to note that Kosova, although mostly made up of ethnic Albanians, does not have a particularly close fit in the age-pattern of its adult mortality with Albania itself.

When the regional differences were considered at the beginning of this section, adult mortality was compared for both sexes combined. Table 2 shows the values of ${}_{45}q_{15}$ for these regions and for Albania for males and females separately. The comparison now includes all the Yugoslav republics, all Greek regions, as well as Romania and Bulgaria. Albania is sub-divided into two main mortality patterns found at the beginning of this section, north-east and south-west regions.

Table 2 Adult mortality measured by ${}_{45}q_{15}$ of Albania and other regions in the Balkans (about here)

Looking at the values of ${}_{45}q_{15}$ in Table 2, it is clear that for both sexes, Albania has slightly higher adult mortality than Greece and its regions, but much lower rates than Yugoslavia, Romania or Bulgaria. The worst adult mortality in 1990 is found in the north east of the Balkans, in Slovenia, Croatia, Romania, Bulgaria, Serbia and Bosnia-Herzegovina. Moving further south, adult mortality improves even within Yugoslavia. Thus, the southern regions have lower adult mortality than the northern regions. This “north-east rule” is true even within Albania. The north-east of the country has a level of adult mortality that is similar to its northern neighbour, Montenegro, while south-west Albania has lower mortality than any region to its north or east, but it has slightly higher adult mortality than the southern Greek regions of Epirus Peloponnesus or Crete. This is particularly true for male adult mortality.

Concluding this section of adult mortality comparisons in the Balkans, one can reasonably conclude that a south-west to north-east gradient of mortality is present. This

was shown by the regional analysis of individual nation states (Albania, Greece, the Former Yugoslavia), and by the analysis of the Balkans as one entity. In order to begin to assess the possible reasons behind this very distinctive geographical pattern, the causes of death need to be considered. The following section, therefore, concentrates on one of the main causes of death for all of Balkan countries - cardiovascular disease.

6. Regional Differences in Cardiovascular Mortality in the Balkans.

All the Balkan countries in general have relatively low mortality, and in such circumstances the cardiovascular diseases take on great importance. Thus, previous research (Murray et al, 1992, p. 302-50) shows clearly that for countries such as Greece, Bulgaria, Yugoslavia and Romania, the leading cause of death in mid-eighties was cardiovascular disease (especially for men). Thus, the ${}_{45}q_{15}$ value for males for cardiovascular diseases in Bulgaria was 7.8 per hundred, while the next major killers were the neoplasms, with a values of 4.6. While for Yugoslavia these values were 6.2 for cardiovascular diseases, and 4.6 for neoplasms.

Unlike the data on mortality in general, the data on causes of death differ substantially between Balkan countries in terms of details and availability. Thus, for the Former Yugoslavia cause specific data are available for 5-year age groups, allowing the calculation of multiple decrement life tables for all regions of this country. In contrast, in Albania these data were available for larger age intervals, allowing us to calculate only the standardised mortality rates (SMRs), instead of net probabilities of dying. While for the other three countries at the time of writing regional cause-specific information by age was missing entirely, making it impossible to build comparable indicators. However, for Bulgaria some limited published data on cardiovascular diseases are available. In such circumstances putting together a general comparison for all the Balkan is impossible. Nevertheless, these data allow us to see if the mortality differences from cardiovascular diseases follow the regional pattern of adult mortality from all causes in each of these three countries.

Albania

Figure 8 shows the regional differences in mortality from cardiovascular diseases in Albania for males and females separated. Ages considered here are the same as in the all cause mortality - 15-60 years. In 1989 cardiovascular diseases in Albania accounted for about 38% of all deaths. From Figure 8 it is clear that both sexes show the same pattern of differences in cardiovascular mortality for adults. Thus, the worst mortality from cardiovascular diseases is in the north-east area of the country. For both sexes the coastal district of Shkodra in the north has a low rate from cardiovascular mortality. It is interesting to note that the coastal districts, starting from the north, with Lezha and Kruja, to the south, with Vlora and Saranda have the lowest cardiovascular mortality rates in the country for both sexes. The cardiovascular mortality map shows similar patterns to the overall adult mortality map for Albania. The only marked difference here is that the main

urban centres, such as Tirana, Durres, and the industrial city of Elbasan are among the cities with the highest cardiovascular mortality in the country. Apart from this urban exception, Figure 8 shows the same south-west to north-east gradient in mortality as the all causes mortality in Albania.

Figure 8. Regional differences in adult mortality from cardiovascular diseases (measured by SMRs), Albania 1989. (about here)

Former Yugoslavia

Figure 9a shows the cardiovascular mortality differences in the former Yugoslavia in 1988, measured by the net probability of dying. Looking at the map, the values show a relatively similar pattern to that seen in all cause mortality. Again, the regions with low cardiovascular mortality are Montenegro with a net probability of dying of 3.1 %, followed by Macedonia and Kosova with ${}_{45}q_{15}$ respectively of 4.4 and 4.6 %. The only difference here is that Slovenia and Croatia have a somewhat lower cardiovascular rate than one would expect from their high rate of all cause mortality for adults. If the cardiovascular mortality for these two regions is analysed by sex (not presented graphically here), than the reason for the divergence is clear; females in both republics have very low cardiovascular rates, of 2.1 and 2.7% respectively. If the male cardiovascular rates are considered, the map of cardiovascular mortality closely resembles the map of all cause mortality. Serbia and Bosnia-Herzegovina in central Yugoslavia have similar cardiovascular mortality with each other and Croatia, but still lower than the rest of the country, including Slovenia. Overall, for the former Yugoslav republics, it can be said that the regional differences in cardiovascular mortality are relatively similar to the differences in all cause mortality for ages 15 to 60 years. The only really large exception to this is Slovenia, which has a very low cardiovascular mortality for females.

Figure 9a. Regional differences in cardiovascular mortality for Former Yugoslavia (measured by SMR for ages 0-60) (about here)

Bulgaria

Figure 9b shows the cardiovascular mortality differences for Bulgaria in 1993. Different from all previous data, that are own calculations, these data were abstracted from the *Atlas of Leading and 'Avoidable' Causes of Death in Countries of Central and Eastern Europe* (WHO, KSH. 1997). The data allow the comparison of mortality only for ages 0 to 60 years. Mortality differences are measured by standardised mortality ratios. Despite the fact that Bulgaria is located in the far east of the Balkans, one can still find a clear north-east south-west gradient of cardiovascular diseases. Mortality from cardiovascular diseases in the south-west regions of Sofia, Plovdiv and Haskovo is very low compared with the northern regions of Razdrag, Varna, Burgas, Lovetch and Michailovgrad. One distinctive feature of cardiovascular mortality in Bulgaria is that the capital, Sofia, has the lowest cardiovascular death rate in the country.

Figure 9b. Regional differences in cardiovascular mortality for Bulgaria (measured by ${}_{45}q_{15}$) (about here)

Concluding this section on cardiovascular mortality differences, despite the fact that we are only able to consider three countries, it can be said that the north-east south-west gradient of mortality persists. The maps of mortality from cardiovascular diseases to a large degree parallel the all cause mortality differences for the adult ages.

7. Mediterranean versus Continental - Is Diet a Possible Explanation?

When data were discussed at the beginning of this paper, it was stated that the individual data to accurately assess the possible causal mechanisms involved are lacking, not just for the Balkans as a whole, but even for individual countries. Moreover, if one wants to look at determinants of mortality patterns at the regional level, these data are all but non-existent. In such circumstances any effort to try to identify causal mechanism for deciding on the influence of different factors to mortality pattern must inevitably be cautious. The discussion of this section is based on existing evidence on both individual and aggregate level data for this area.

Different authors have tried to find a correlation between socio-economic development of these countries and their levels of mortality. Thus, in the former Yugoslavia one can possibly relate the level of development of different regions with the level of infant mortality rate. Kosova and FYR of Macedonia had the highest rate of infant mortality in 1990, and they are the least developed regions of Yugoslavia. Moving on to mortality at old ages (60+) we might expect to find a similar relationship. The old are clearly susceptible to the ill effects of economic decline (and the resultant decline in health care services) and environmental hazards. Kunitz, for example, has argued that this was the case in former Yugoslavia (Kunitz, 1996).However, it is impossible to find any correlation between the level of adult mortality as a whole in the regions of former Yugoslav and their level of developments. Kosova and FYR of Macedonia, although the least developed regions, have some of the lowest levels of adult mortality, especially of cardiovascular mortality, in the former Yugoslavia.

Considering Greece, Matsaganis (1992) has pointed out that there is no relationship between the social and economic development of Greek regions and their level of overall mortality. Thus, the two extreme regions in terms of income, Athens (the wealthiest) and Thrace (the poorest) have similar mortality. As the analysis in this paper has shown, these two regions have the worst levels of adult mortality in Greece over the long run.

The case of Albania is similar. It has been shown that there is no relation between the regional differences of overall mortality in general, and adult mortality in particular, and the level of education. In Albania education can be taken as a good indicator of

development. Similarly, no relation was found between the level of urbanisation and industrialisation and the mortality differences (Gjonca, 1998, p. 134-135).

In such circumstances, where the socio-economic differences cannot account for regional mortality differences, one has to turn to the possible life-style factors. It is been suggested for some time that the low adult mortality in the Mediterranean countries can be attributed to the positive effects of the Mediterranean diet. A high intake of monounsaturated fats and a low intake of saturated fats, high consumption of fresh fruits and vegetables and of wine have been most often proposed to account for the differences between the northern and southern European mortality.

Given the data difficulties that plague the systematic analysis of these issues in the Balkans, it is ironic that one of the first important studies supporting the positive effects of Mediterranean diet and life style came from research which involved Mediterranean populations of the Balkans. The "Seven Countries" longitudinal study, involving 16 cohorts from different populations and countries, included six cohorts from Balkan populations. Thus, in Greece two cohorts of men aged 40-59 were enrolled in the study: one from the island of Crete and the other from the island of Corfu. In the former Yugoslavia, there were four cohorts in the study: two Croatia - Dalmatia and Slavonia, and two in Serbia - Velika Krsna and Zrenjanin. (Keys et al., 1980, 1986).

The full study involved 16 male cohorts (11 of them rural) drawn from populations in northern Europe, the United States, Japan, and Mediterranean populations. The cohorts were males, aged 40-59 at entry, and were followed for 20 years (some cohorts for 25 years). The size of the cohorts mostly varied from 500 to 1000 men (Vershuren et al. 1995). The aim of the study was to find out if the death rate and the incidence of coronary heart diseases were related to any risk factors, and to what extent these populations differ from each other in terms of these risk factors. Our particular interest in this research arises because the populations chosen in the Balkans are representative of the range of Balkan experience. Thus, the two Croatian cohorts (Dalmatia on the sea coast and Slavonia in inland Croatia) were chosen because the diet of one group (Dalmatia) is based on olive oil and the other on lard (Keys et al. 1980, p. 72). The two cohorts in Serbia are part of the central Balkans, and the Greek islands of Crete and Corfu are located in the south and north of Greece. The evaluation of evidence from this study was followed up to 20 years after the first entry, but because the two Croatian cohorts dropped out, here we consider the results of the 15 years evaluation (Menotti et al., 1989, p. 175-179).

Keys et al. found marked differences in the 15 years death rates and coronary heart diseases rates for the cohorts under the study. The results for the six Balkan cohorts are shown in Table 3. Death rates are low in Corfu and Crete, most notably the death rates from coronary heart diseases. Another interesting piece of evidence is that the death rate for all causes and, especially, for coronary heart diseases in Dalmatia is much lower than in Slavonia.

Table 3. 15 year death rates, violence excluded, per 10000 “healthy” men aged 40-59 years at entry, for all causes, coronary heart diseases (CHD): Seven Country Study. (about here)

Keys et al. also looked at the relation between the death rate from coronary heart disease and the calorific intakes in diet from total fats, unsaturated and saturated fats. Some of the results are given in Table 4. The study showed high correlations between the average percentage of dietary energy from saturated fatty acids and the incidence and death rate from CHD. Thus, the correlation coefficients were r=0.80 for incidence of CHD and r=0.84 for the death from CHD. These are very marked associations, given the relatively small samples sizes in the study, and the resultant scope for random effects.

Table 4. Mean % of calories in the diet from total fats, saturated fats, monounsaturated and polyunsaturated fats in 10000 “health” men aged 40-59 years at entry: Seven Country Study. (about here)

Among a range of other findings, one of the most important was the major differences found among the cohorts in the percentage of monounsaturated fatty acids in the diet, which reflects the use of olive oil. The olive oil used in the diet of Italy, Greece, and Dalmatia (Croatia) is around 80% oleic acid. It is possible that the benefits attributed to monounsaturated fatty acids in the diet of these cohorts may well be simply due to the oleic acid. Of the six cohorts, three are Mediterranean populations and are similar to each other in that olive oil provides from 15-30 % of total energy, with wine also an important part of their meals. In contrast, in the other cohorts of Yugoslavia the main energy comes from milk and meat fats, and the main alcoholic beverages are beer and distilled liquors, often not taken with meals (Keys et al. 1986, p. 912).

Perhaps the most important findings of this study for the present paper is that in two cases the use of olive oil can explain regional patterns of mortality. First, the difference in coronary heart disease mortality between Crete, in the south of Greece, and Corfu, in the north, can be explained by the use of olive oil in the two cohorts. Secondly, the differences between Dalmatia in West Croatia and Slavonia in East Croatia also bear the same interpetation. Thus, most of the research coming from this study supports the positive effects of Mediterranean diet in explaining the regional differences in mortality.

This evidence is also supported by the case of Albania. We have argued in a previous work (Gjonça et al. 1997) that the low mortality in Albania (which occurs in spite of its poverty) could be attributed to the traditional forms of the Mediterranean diet existing in the country. Moreover, Gjonca and Bobak have argued that even the regional differences within Albania can be explained by different regional dietary patterns of the country (Gjonça and Bobak, 1997). Thus, the north east has a more continental dietary pattern, in which animal fats are widely used. It experiences higher mortality than the south-west of Albania, where a Mediterranean dietary pattern, based on a large-scale use of olive oil and fruits and vegetables is predominant. Figure 10 shows the regional mortality pattern compared with the regional differences in the production and

consumption of olives. Overall, Albania, a country with 3.2 million people, cultivates 5.8 million olive trees (INSTAT 1992). The olives and their oil are mainly consumed by the two-thirds of the country's population located in the south-west.

Figure 10. Geographical distribution of olive production and regional mortality in Albania (about here).

8. Conclusions and an Agenda for Future Research

As we mentioned at the start of this paper, the research reported here is only a first tentative step towards a thorough comparative epidemiology of the Balkans. In order to make further progress we need more consistent and detailed aggregate information as well as a greater body of individual level data. However, we feel that in this paper we have been able to sketch out the beginnings of a comparative analysis and to advance a hypothesis to form the basis of future research: that diet does indeed play a major role in determining regional mortality patterns. On what basis do we make this assertion?

When considering trends over time, diet may be an important consideration in understanding why some south-east European countries, such as Albania and Yugoslavia did not experience worsening mortality during the 1980s and 1990s. However, in general, our research on the impact of diet on mortality trends is far from conclusive.

We are much more certain of the cross-sectional regional differences. There is ample evidence of a north-east to south-west gradient of mortality across the Balkans. Both within individual countries and in the region as a whole, adult mortality is lower in the south-west and higher in the north-east. The role of diet in shaping these differences is still conjectural, but seems to us highly plausible. One reason to argue this is the fact that both impoverished Albania and relatively wealthy Greece are part of the low mortality south-west zone, while relatively rich Slovenia experiences high mortality. Clearly the main causes of the regional patterns must transcend conventional definitions of the level of development. In this regard, the lessons from the Balkans may be of much wider relevance than might at first be imagined.

Finally, we believe that the present paper sets the agenda for future research. We hope to overcome the data deficiencies that prevent us reaching a definitive conclusion here. Better aggregate information, especially on cause-specific mortality, and more individual level information on diet and health will enable us to reach firm conclusions. Even this limited analysis, however, has clearly shown the value of a comparative perspective. We hope that this can also serve as an example for future epidemiological and demographic work.

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Table 1 Variation from Albanian mortality pattern of some selected regions in the Balkans.

Countries and Regions	Standard Deviation (in%)			
	for all ages		ages 15-60	
	Males	Females	Males	Females
Greek Epirus	17.6	32.0	8.2	22.4
Greek Macedonia	17.8	50.9	8.6	36.4
Greek Peloponnesus	17.6	32.0	8.3	22.0
Greek Thrace	20.5	35.0	10.5	23.0
FYR of Macedonia	26.4	38.2	22.0	33.5
Kosova	29.4	29.6	30.8	23.1
Croatia	68.9	48.4	48.5	42.5

Note: 1.The level of e_0 on which these calculations are based is for males 67.92 years and females 73.84 years (e_0 of Albania in 1989).

2. The standard deviations are shown in per hundred.

Table 2 Adult mortality measured by ${}_{45}q_{15}$ of Albania and other regions in the Balkans.

Countries and Regions	**Year**	**Male**	**Female**
Albania	1989	13.1	6.9
Albania, north-east	1989	14.1	7.5
Albania, south-west	1989	12.1	6.3
Greece	1990	11.8	5.6
Greek Crete	1990	10.0	5.8
Greek Epirus	1990	10.9	4.6
Greek Peloponnesus	1990	10.7	4.9
Athens	1990	12.8	6.1
Rest of Central Greece	1990	10.3	4.1
Greek Thessaly	1990	11.9	5.4
Greek Macedonia	1990	11.0	5.9
Greek Thrace	1990	13.8	6.4
Yugoslavia	1990	19.2	9.0
Slovenia	1988	24.3	9.3
Croatia	1988	23.6	9.4
Serbia	1988	18.7	9.6
Bosnia-Hercegovina	1988	19.5	9.7
Macedonia	1988	15.1	8.5
Montenegro	1988	14.6	7.1
Kosova	1988	15.6	9.1
Romania	1990	23.9	11.4
Bulgaria	1990	21.6	9.7

Note: The division of Albania into north-east and south-west is based on results shown in Figure 4.

Table 3. 15 year death rates, violence excluded, per 10000 “healthy” men aged 40-59 years at entry, for all causes, coronary heart diseases (CHD)..: Seven Country Study.

Cohort	**No. of men at risk**	**All causes**	**CHD**
Dalmatia (Croatia)	622	1,561	216
Slavonia (Croatia)	680	2,365	389
Velika Krsna, (Serbia)	487	1,406	67
Zrenjamin (Serbia)	476	1,515	297
Crete (Greece)	655	855	38
Corfu (Greece)	525	1,317	202

Source: Keys et al. 1986, p.905, Table 1

Table 4. Mean % of calories in the diet from total fats, saturated fats, monounsaturated and polyunsaturated fats in 10000 “health” men aged 40-59 years at entry: Seven Country Study.

Cohort	Mean % of calories in the diet from			
	Total Fats	Saturated fatty acids	Monounsatu. Fatty acids	Polyunsatura. Fatty acids
Dalmatia (Croatia)	25.6	9.1	13.4	6.9
Slavonia (Croatia)	31.9	13.6	13.3	3.4
Velika Krsna, (Serbia)	21.9	5.7	14.6	1.9
Zrenjamin (Serbia)	32.6	9.7	20.1	3.1
Crete (Greece)	36.1	7.7	25.8	2.5
Corfu (Greece)	33.0	6.4	18.3	3.5

Source: Keys et al. 1986, p.907, Table 2

Figure 1a. Life expectancy at birth for males in the Balkans, 1950-1990

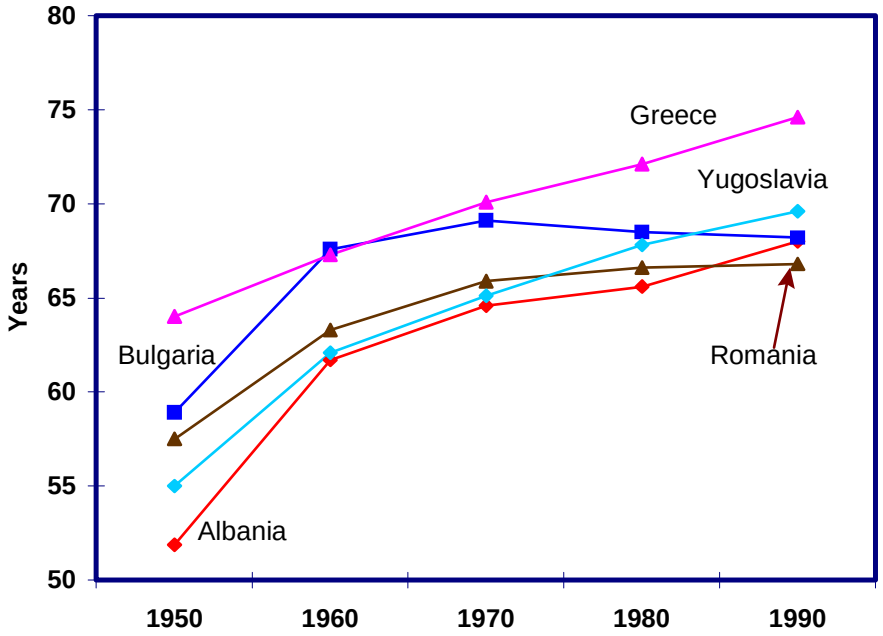
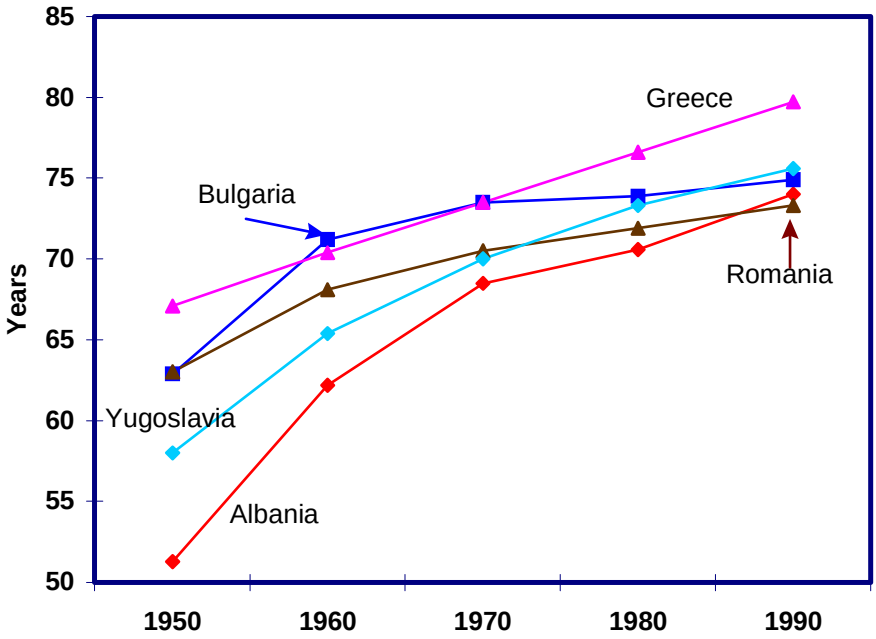


Figure 1b. Life expectancy at birth for females in the Balkans, 1950-1990



SOURCES: Statistical Yearbooks of each country, and UN Demographic Yearbooks.
NOTE: Data on Albania are corrected for the completeness of death registration.

Figure 2. Infant mortality rate in the Balkans, both sexes, 1950-1990

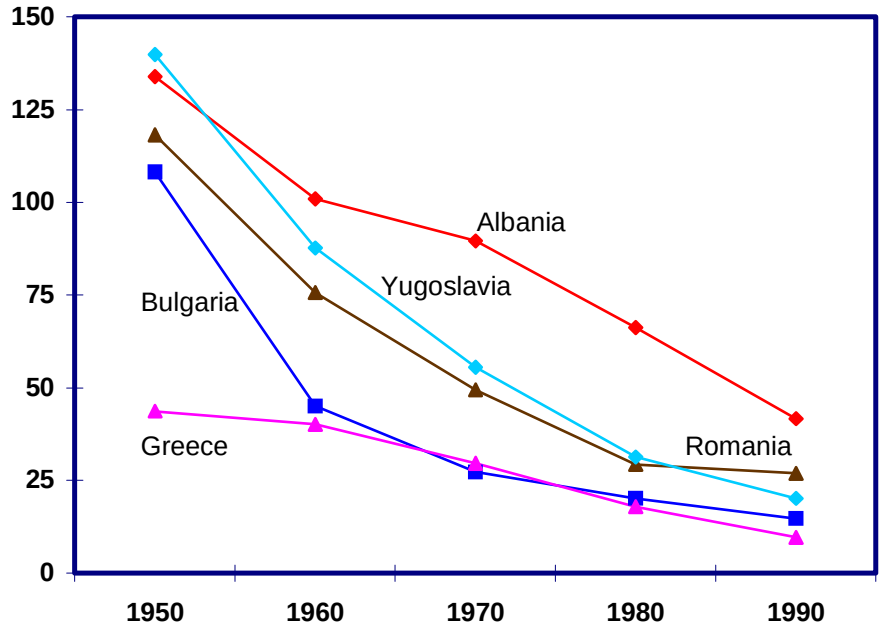
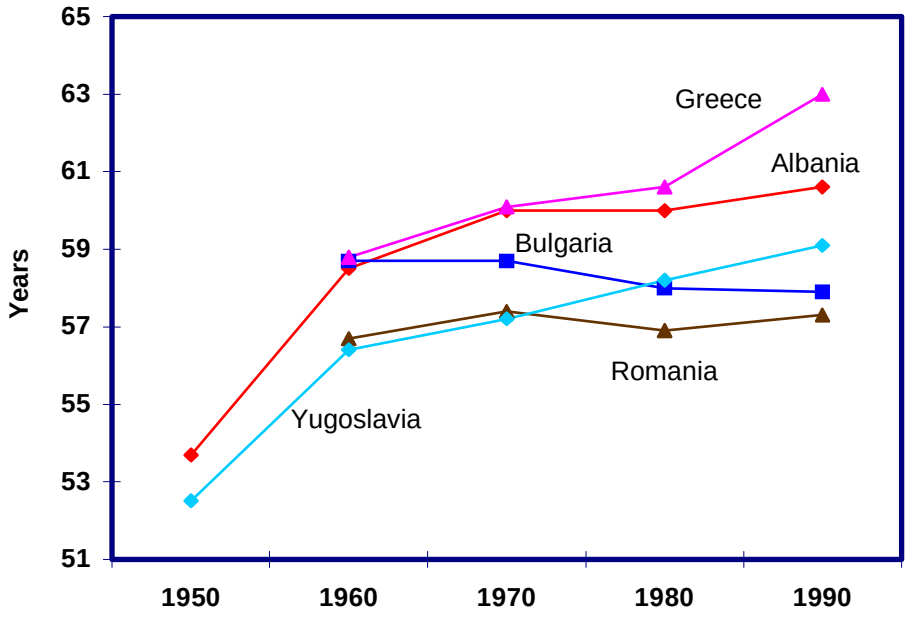


Figure 3. Life expectancy at age 15 in the Balkans, both sexes, 1950-1990



SOURCES: Statistical Yearbooks of each country, and UN Demographic Yearbooks.
NOTE: Data on Albania are corrected for the completeness of death registration.