

Geographical Distribution of Elderly People in Croatia

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ABSTRACT

The authors outlined the geographical distribution of individuals displaying longevity in the Republic of Croatia. Elderly people, aged 80 years and older, have been the subject of this study and were viewed in several aspects including the number of elderly people and age-specific mortality rate by districts. Data for the years 1981 and 1991 were reviewed. In 1981 there were 73,052 (1.6%) persons aged 80 or older. Ten years later in 1991 their number had increased to 107,256, which was 2.2% of the whole population. Most of the elderly people live on the islands, in the district of Dubrovnik and in Lika, which is in the continental part of Croatia. There are more women than men among those aged 80 years and older. Age-specific mortality rate in 1981 in Croatia was 170 and in 1991 151 per 1,000 elderly people. In women the rate was 162 in 1981 and 141 in 1991, per 1,000 elderly people. The death rate was higher in men; in 1981 it was 201 and in 1991, 172 per 1,000 elderly people. We can see that the specific mortality rate had fallen in 1991 compared to 1981. The age specific mortality rate varies from district to district. In 1991 the lowest, 110 per 1,000, was in Lika, and the highest in the districts of Varaždin (182 per 1,000), Bjelovar (178 per 1,000) and Zagorje (175 per 1,000). The death rate was higher amongst elderly men (172.31 per 1,000) than elderly women (141.65 per 1,000). The smallest number of those aged 80 years and older with a high death rate is found in Slavonia. The opposite – a high number of elderly people and a low specific mortality rate – can be seen in the district of Lika. On the islands the number of elderly people is high, especially women, and surprisingly, the specific mortality rate is relatively high as well.

Introduction

A constant increase in the number of elderly people in the population can be seen in Croatia just as in many other

countries^{1,2}. The percentage of elderly people, those aged 80 and older, in the population of Croatia in 1981 was 1.2% (2.1% women and 1.1% men). Ten years later, in 1991, the number of elderly

women increased to 3.0% and men to 1.6% of the population. Life expectancy for women in 1952–1954 was 63.2 years and 59.1 years for men. In 1989–1990 it increased to 68.6 years for men, and 76.0 for women³.

Epidemiological studies show that there are differences in the distribution of elderly people among various countries and among regions in each country. We in our study were interested to find out how are elderly people distributed in Croatia and how this distribution can be explained.

Methods

The population being studied comprised those aged 80 years and older in Croatia, in 1981 and 1991. These two years were chosen as they were census years. In 1981 there were 4.601,469 inhabitants, 2.374,579 (51.6%) women and 2.226,890 (48.4%) men. 210,330 people (90,332 women and 119,998 men) lived temporarily abroad. Ten years later in 1991 the population in Croatia had increased to 4.784,265 inhabitants, 2.465,642 (51.5%) women and 2.318,623 (48.5%) men. There were 285,216 (128,748 women and 156,468 men) Croatians working abroad.

We examined the number (percentage) of elderly people by sex in four urban areas: Osijek, Rijeka, Split and Zagreb and in Croatia as a whole. Further, we investigated the percentage of elderly people in 18 districts which have been chosen by their geographical characteristics: the district of Dubrovnik, Split, Šibenik, Zadar, Istra, Lika, Osijek, Goransko primorje, Brod, Vinkovci, Bjelovar, Karlovac, Varaždin, Sisak, Zagorje, Zagreb and its surrounding area, one group of islands in the north and a second group of islands in the south.

In the census there were also data for people of unknown age in the Republic of Croatia. In 1981, 42,559 (0.9%) and in 1991, 72,007 (1.5%). The number refers to the whole population of Croatia so it did

not influence our investigation of elderly people, which is only a small segment of the total population.

In the census there are always two totals of population: those living in the country and Croatian citizens living abroad. The percentages of elderly people in our tables and figures were related to the total number of people. So only a small number of people are not covered in this study: elderly people among those of unknown age.

We compared the percentage of women and men aged 80 and older in 1981 and in 1991 by districts. The differences were tested by chi-square distribution and $p < 0.05$ was considered to be statistically significant.

We examined the specific mortality rate, namely the number of aged (80 and over) who die in relation to the total number of the aged population. For 1981 we could only get data for the whole Republic of Croatia, but for 1991 data for each district were available. We analysed age-specific mortality rate per 1,000 by sex.

Data on the number of residents by towns in Croatia, the number of elderly by towns and sex, and the number of deaths were obtained from the Central Bureau of Statistics.

Results

According to the data of the Central Bureau of Statistics in the Republic of Croatia 2.374,579 women and 2.226,890 men were alive in 1981. 73,054 (1.6%) of them were aged 80 years and older. There were more women, 49,476 (2.1% of the total population), than men, 23,578 (1.1% of the total population). The average age in this group of people was 84 years.

The number of elderly differs from district to district depending on the geographical location. Most of the elderly people live on the islands and in the continental part of Croatia in Lika. The

smallest number of elderly is in the big towns of Croatia (Zagreb, Rijeka, Split and Osijek) and in Slavonia.

The percentage of elderly women in Croatia in 1981 was higher than for elderly men. It was 2.1%, the lowest being 1.5 and the highest 5.1%. The lowest percentage of elderly men in the population of Croatia was 0.7% and the highest 3.2%.

The analyses of the elderly were made by districts because in the Republic of Croatia we have, on the one side, regions with a Mediterranean climate and on the other, regions with a continental climate. We have found out that most of the elderly live on the islands, more in the south (3.4%) than in the north (3.1%) of the Adriatic. In the district of Dubrovnik 2.7% of the population were elderly people while in Lika the elderly make up 2.6% of the population. The lowest percentage of the elderly in the population (less than 1.5%) could be found in the districts of Osijek, Brod, Vinkovci, Karlovac and Varaždin and in Zagreb and its surroundings (Figure 1).

In all districts there are more women than men. The percentage of elderly wo-

men on the islands in the south was more than 4%. On the islands in the north and in the district of Dubrovnik the number of women in the ninth and tenth decade was between 3.5 and 4%. The percentage of women of this age in Lika was 3.3%. The districts of Osijek, Vinkovci, Brod, Karlovac, Varaždin and Zagreb and its surroundings have less than 2% elderly women.

Most elderly men also live on the islands (in the north 2.3% and in the south 2.2%). Lika and the district of Dubrovnik follow with about 2.0%. Less than 1.0% of elderly men in the population could be found in the districts of Osijek, Brod, Vinkovci, Varaždin and in Zagreb and its surroundings.

According to the census of the Central Bureau of Statistics in 1991 the population of Croatia was 4,784,265 (2,465,642 women and 2,318,623 men). The number of people 80 years old and over increased compared to 1981 to 107,256 (2.3%). There were more women among the elderly (74,386 which is 3.0% of the population) than men (33,870 which is 1.5% of the population). The average age of the elderly was 84 years, the same as in 1981.

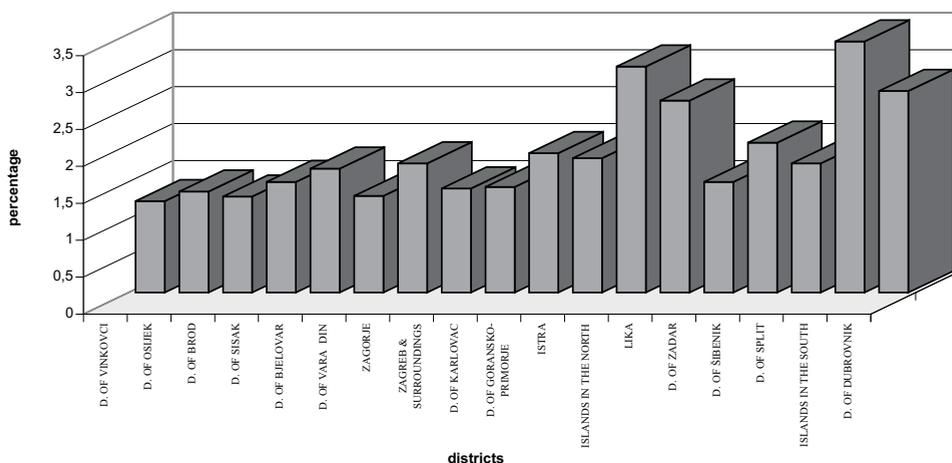


Fig. 1. The percentage of elderly people in the population in Croatia in 1981 by districts.

The number of elderly in various districts and their percentage relative to the total population was the highest on the islands in the south (4.2%), followed by the islands in the north and Lika where the percentage of elderly persons was over 3.5%. The district of Dubrovnik has 3.4% and the district of Šibenik 3.1%. Less than 2.0% of elderly persons can be found in the districts of Osijek, Brod, and Vinkovci (Slavonia) (Figure 2).

In all districts there are more elderly women than men. On the islands in the south more than 5.0%. In the district of Lika, the islands in the north and in the district of Dubrovnik there are about 4.0% elderly women. Followed by the districts of Zagorje, Sisak, Bjelovar, Karlovac, Gornjsko-primorje and Šibenik with about 3.0% of women in their ninth and tenth decade. The districts in Slavonia such as the districts of Osijek, Brod, and Vinkovci have the lowest percentage of elderly women in the population: less than 2.6%.

The percentage of elderly men in the population was the highest on the islands in the south (3.3), on the islands in the north (2.9%) and in the district of Lika

(2.6%). In the districts of Dubrovnik and Šibenik about 2.0% of the population of men are in the ninth and tenth decade, and in the districts of Osijek, Brod, Vinkovci, Varaždin, Sisak and Zagreb and its surroundings less than 1.5%.

The number of elderly persons increased in all districts in Croatia in 1991 compared to 1981. The highest increase of the elderly in the period of ten years can be seen in the districts of Lika, Šibenik, Gornjsko-primorje, Karlovac, Bjelovar, and Zagorje (Figure 3). It is interesting to see that the increase of elderly women was more significant than the increase of elderly men. The most outstanding increase of elderly women was in the districts of Lika, Šibenik, Karlovac ($p < 0.01$), and elderly men on the islands in the south, in the districts of Šibenik and Lika ($p < 0.01$) while the districts of Vinkovci and Osijek had the lowest increase of elderly men.

We compared the number of elderly persons by districts and sex in 1981 and in 1991. In these years the number of elderly women in all districts was higher than elderly men. The situation varies from district to district. In many districts

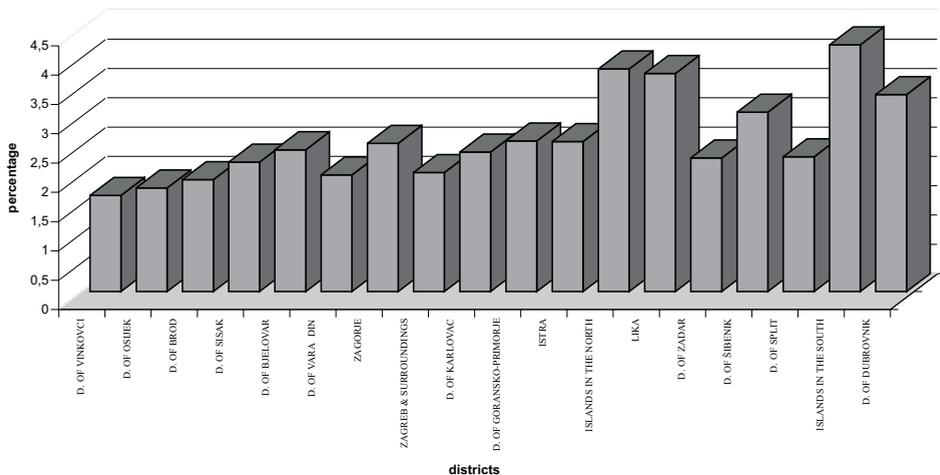


Fig. 2. The percentage of elderly people in the population in Croatia in 1991 by districts.

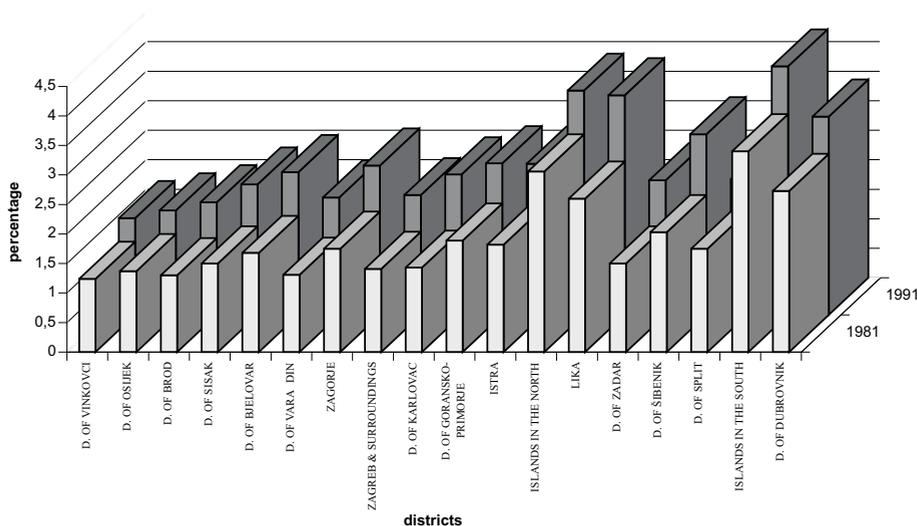


Fig. 3. The comparison of elderly people in Croatia in 1981 and 1991 by districts.

(the islands in the south, Istra, the district of Goransko-primorje, Sisak, Osijek, Varaždin, Zagorje etc) in 1981 the number of elderly women was twice as great as elderly men. It is interesting that in 1991 the differences between sexes decreased in some districts. This is especially seen on the islands in the south where the ratio women/men in 1981 was 2 to 1 and in 1991, changed to 1.4 to 1 (Figures 4 and 5).

The specific mortality rate for those aged 80 years and over in 1981 was 170.18 per 1000. It was 161.57/1000 for women and 201.07/1000 for men. In 1991 the specific mortality rate in Croatia decreased to 151.33/1000 (141.65 in women and 172.31 in men).

The lowest specific mortality rate was recorded in the district of Lika, and the highest in the districts of Varaždin, Bjelovar and Zagorje. Other districts such as the district of Osijek and Brod, Zagreb etc. have also a high specific mortality rate (Figure 6).

The specific mortality rate, as we expected, was higher in elderly men than in elderly women. The lowest mortality rate (105.31/1000) for women was in Lika, and the highest in the district of Varaždin, (172.85/1000).

The lowest mortality rate in elderly men was in Lika (118.5/1000), and the highest (231.0/1000) in Zagorje. A high mortality rate, above 200 per 1000 elderly men could be found in the districts of Bjelovar and Varaždin.

Discussion

All epidemiological studies reveal that there has been an explosion of elderly people in the world in the last decades of the twentieth century. This phenomenon has not missed our country. Statistical data show that in 1981 in the Republic of Croatia there were 73,054 elderly people (80 and over), which is 1.6% of the total population. Ten years later in 1991 their number increased to 107,256, which was 2.2% of the whole population.

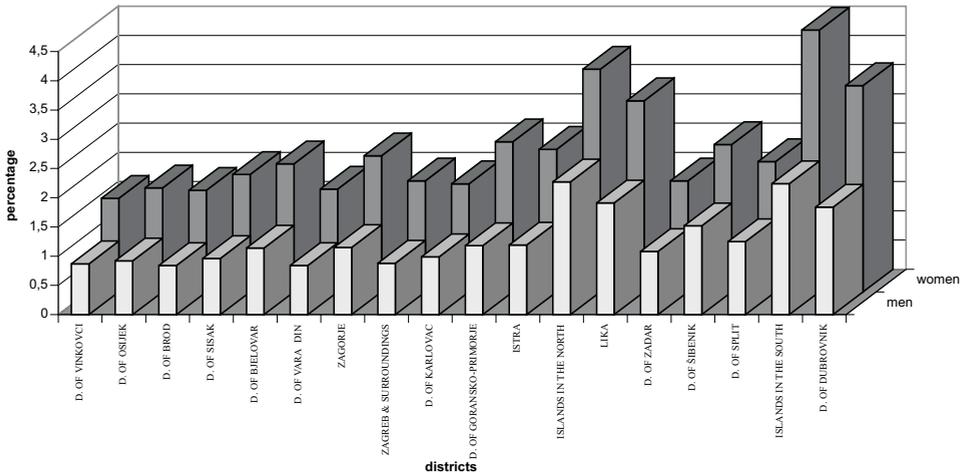


Fig. 4. The comparison of elderly women and men in Croatia in 1981 by districts.

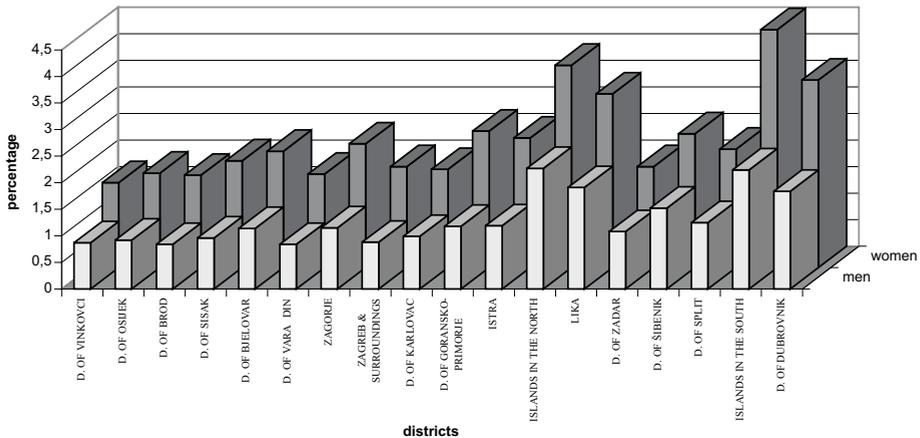


Fig. 5. The comparison of elderly women and men in Croatia in 1991 by districts.

In all districts in Croatia the number of aged women and men increased. The differences were statistically significant. The percentage of elderly women in the population in 1981 was 2.1% (49,476) and in 1991 it increased to 3.0% (73,386) ($p < 0.01$). The highest increase of elderly women was in Lika ($p < 0.01$), and of elderly men on the islands in the south of

the Adriatic ($p < 0.01$). The same has happened in many developed countries^{1,2}.

While the number of women, in the age group 80 and over, is increasing the number of men is decreasing. In 1981 the ratio women / men in the age group 80 to 84 was 66% to 34%. In the group of centenarians this was even more significant: 73% were women and only 27% were men.

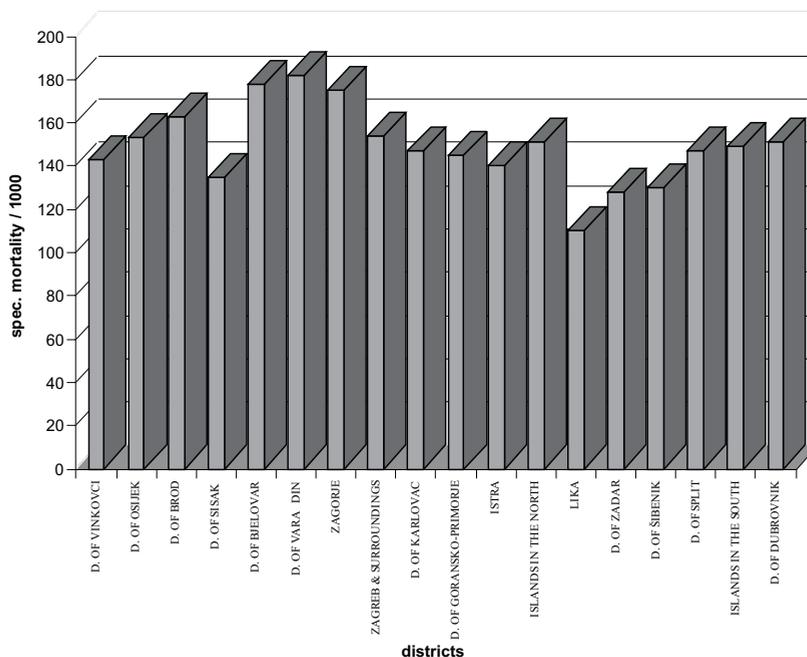


Fig. 6. Specific mortality rate of elderly people in Croatia in 1991 by districts.

This ratio has risen even more to the benefit of women in 1991, so in the group of centenarians 77% were women and only 23% were men³.

The percentage of women in all districts in the Republic of Croatia was higher than men in both observed years – 1981 as well as in 1991. What are the reasons for that? The mortality rate of women is lower than that of men². Furthermore, specific mortality rates show that men die at a younger age of circulatory diseases more often than women because women are in the generative age protected by estrogens. Many studies have proved that there are clear differences in the mortality of coronary heart disease between sexes⁴. The results of the MONICA project, which included the population between 25 and 64 years (investigating ischemic heart disease), show that the death rate in men is much higher

than in women. It is three times higher for men than for women⁵. This ratio male – female varies from country to country. In Israel it is 2.9 : 1 and in Finland 5.9 : 1⁶. The data from our Community-based Myocardial Infarction Register of Zagreb show that this ratio is 4 males to 1 female until the age of 65. After that age the ratio male/female is nearly 1 : 1⁷. There are also more elderly women because men are more exposed to the so-called external causes of death: accidents, homicides, suicides, dangers at work etc. It is calculated that death rates among men from external causes are three and more times female rates. Furthermore, men are more exposed to other risk factors such as smoking and alcohol abuse. Waldron⁸ thinks that smoking is the major risk factor that increases the mortality rate of men, but other risk factors play an important role as well.

According to the data of the Central Bureau for Statistics the life expectancy in Croatia has increased for both women and men. In 1951 life expectancy for men was 59.1 and for women 63.2. Twenty years later, in 1971, it had increased to 65.7 for men and 72.3 for women. In 1991 there is a further increase, so life expectancy was 68.6 for men and 76.0 for women. We can see that the difference between female and male life expectancies in Croatia was once smaller than today. The gap in 1951 was 4.1 years and 40 years later in 1991 it was 7.4 years.

Life expectancy has increased in many countries. How can that be explained? There are many explanations. Vaccination, the arrival of antibiotics, improvement of living standards and better health care⁹ have certainly caused these changes in the human life span. The changes have also to do with the changing causes of death. Infant mortality has decreased in developed countries. In the last 30 years there was a further decrease in the mortality rate from circulatory diseases in developed countries (USA, Australia, Canada etc.)¹⁰. This can be explained by preventive medicine in terms of healthier life style in which people change their diet and eat healthier food, smoke less, increase their physical activity, control and treat hypertension etc.^{5,11,12}. Among major cardiovascular diseases the death rate from ischemic heart disease under the age of 65 years declined. This, unfortunately, does not mean that the disease was eliminated as a cause of death but it was postponed to older age². An even greater decline in mortality rate has been achieved from cerebro-vascular diseases. The effective treatment of hypertension has contributed to that decline¹³. Unfortunately, this was not the case in the former Eastern European countries^{5,14}.

As we have seen the number of elderly people in Croatia varies from district to district, depending on the geographical

location. The greatest number of the elderly live on the islands in the south and in the district of Dubrovnik. In the continental part of Croatia, Lika is the district where the greatest number of the elderly in the population was recorded.

There is not just one answer to the question why do the greatest number of elderly people live on the islands but there are various explanations. These explanations are partly known and partly unknown. We consider that one of the important reasons is the migration of young people going to urban areas on the continent to finish school. When they finally finish school they stay there because the opportunities to get jobs in the continental part of Croatia are much better than on the islands. The second reason is economic emigration of young people at the beginning of this century, between the two wars and after the World War II. Some of those who once left returned as elderly people to their homeland. This fluctuation of people contributed to the change of the age structure of the islands residents. On the other hand most of the islands residents displaying longevity have spent their whole life on the islands. It is difficult to say what are the reasons that influenced their longevity. There are several explanations; healthy diet, physical activity, heredity, living standards etc. The characteristic diet of the island residents has contributed to their longevity. This diet is based on cooked food with a lot of vegetables, fish and the use of olive oil, which is rich in unsaturated fats¹⁵. The research performed in Croatia by Sučić et al. showed the effect of dietary fish supplementation on lipoprotein levels in patients with hyperlipoproteinemia. The results suggested that dietary intake of 0.5–1 kg fish per week may decrease the level of atherogenic lipoprotein fractions and thus reduce or at least delay the development of atherosclerosis¹⁶.

Furthermore, elderly people have been left on their own because the young ones have left the islands. They were forced to take care of themselves. They lived modestly and worked physically hard. This is especially true for women on the islands who worked hard and were physically active to a very old age^{17,18,19}. It is believed that heredity as well has great influence on their longevity. Finch and Tanzi²⁰ believe that the role of genes in human longevity is rather complex and paradoxical so it is difficult to be sure of anything. In the mosaic of different factors that act to prolong life, most authors agree that heredity has an important role. However, their views differ on what is the contribution of heredity and what of other factors such as the way of life and other factors in their surroundings^{20,21,22}. Many studies have been performed, from very simple ones where they examined only the age of parents when they died, to the more complicated investigations of genes in humans as well as in animals. Harrison and Roderick²³ believe that longevity is not determined by one gene or one mechanism, but with a series of genes that have yet to be discovered. Smith² believes that, when we talk about heredity, genes affecting cholesterol levels are much more important determinants of longevity. It should be pointed out that investigations of genes are very expensive so only rich countries can afford to finance such investigations. As far as we know such investigations of genes, on a bigger sample, have not been performed in our country. I. Rudan et al. developed objectives and strategies for a long-term genetic epidemiological research of isolate island populations such as Krk, Mljet, Susak, Brač, Hvar, Korčula, Vis and Lastovo²⁴. Those islands represent a particularly helpful model for genetic epidemiological studies and will probably help in revealing the causes of common and some rare diseases.

The highest percentage of elderly was found on the island of Vis, especially women. In the 1991 on the island of Vis 5.7% of the island's residents were elderly people. Of the women population 7.0% were 80 and over. They were always poor and their diet consisted of fish and vegetables. Most of the young people emigrated and after World War II a military base was established on the island so tourism and the local economy could not develop which resulted in poverty. A very similar situation was found on the island of Lastovo.

There is a question why do more elderly people live on the islands in the south than on the islands in the north? One of the reasons is probably greater emigration from the islands in the south than in the north. There were also better communications for the islands in the north with the continental part of Croatia, better living conditions and opportunities to find jobs. These were the reasons why more people living on the islands in the north did not leave their homes. So, the percentage of the elderly in relation to the total population of the islands in the north was lower.

In order to find out how many elderly people die out of the total number of elderly people (80 and over) in different parts of our country, we analysed specific mortality. Our aim was to eliminate various factors such as emigration and general fluctuation of people, which could influence the fact that in one part of our country there are more elderly people than in another. We wanted to find out in which parts of our country people live longer.

Although on the islands in the south we recorded a high percentage of old people in the population it is surprising that specific mortality was relatively high. According to the kind of diet they have (fish, olive oil with unsaturated fats, a lot of vegetables etc.) and good climate one may

expect that the specific mortality is low. It is hard to explain why that is so but a similar example was found in Norway. Laake et al.²⁵ have found that the number of elderly varies from region to region but these differences were not accompanied by a corresponding specific mortality rate.

The lowest specific mortality rate in the elderly is in the district of Lika. Further analyses using local authority data showed that this was also the case in the former Krajina²⁶. These are the poorest regions of our country where most of the people live in poverty. It is hard to say why more elderly people live in these regions. Certainly, apart from the climate, the way of life, heredity, a restricted diet, physical activity till late in life all speak in favour of the longevity of people living in Lika and the former Krajina. One of the above-mentioned reasons – dietary restriction – appears to prolong life in rodents, as proved in some experimental studies. Rich Weindruch, scientist at Madison University, Wisconsin, has a slogan: »Eat less«! He and his colleagues speculate, that dietary restrictions will extend human longevity simply because it does so in animals^{27,28}.

The analyses of other districts with regard to the specific mortality rate, which reflects death, in our case, of the very old (80 years and over) showed us that the death rate is higher in men than in women. The highest death rates are in the districts of Zagorje, Bjelovar and Varaždin. Among them there are differences related to sex. The highest death rate for men was 231 per 1,000 elderly men in the district of Zagorje. Followed by the districts of Bjelovar and Varaždin. The highest death rate, 172 per 1,000 for women was in the district of Varaždin followed by the district of Bjelovar probably due to their lifestyle (unhealthy diet). The lowest for both women and men was in Lika (105 for women and 118 for men per

1,000). It is interesting that the death rate on the islands does not differ much from that in the districts of Brod and Osijek, which needs further investigation. Based on these observations we can conclude that it would be best to live in Lika and the former Krajina if we want to live long. The districts of Varaždin, Bjelovar and Zagorje would be less recommended. Other studies² also confirmed these observations that rural residents and people living in the mountains live longer. They are forced to be on a poor diet by our standards today, but to a certain degree, a healthy one²⁹.

The lowest percentage of the elderly is recorded in big towns such as Zagreb, Rijeka, Split and Osijek. There are many reasons that can explain that. Maybe the reasons lie in the busy way of life of urban residents; they are under continuous stress, exposed to pollution (traffic and industry pollute the air) which can be the cause of respiratory diseases. People work in factories and are exposed to various carcinogenic and other substances that effect peoples' health. Urban residents are further exposed to accidents at work and in the traffic. In addition, they often smoke and drink too much. In urban areas there is a great number of young people so the proportion – young and very old residents – is changing and the percentage of elderly in the population is much smaller.

In Slavonia there is the smallest number of those 80 years and over with a relatively high death rate. This is economically the richest agricultural region of Croatia, which proves that wealth doesn't necessarily mean that people live longer. It is known that the diet in this area consists of plenty of red meat and animal fats. This surely implies that such a diet is not healthy and has a negative effect on the health of the population. Data on genetic factors are, unfortunately, not available.

The same differences in longevity in different parts of Croatia can also be found within other countries of the world. In Okinawa the rate of centenarians is 3.8 times higher than in other parts of Japan. The lowest rate of centenarians is in Akita³⁰. In Russia there are regions with a lot of very old people such as Kavkaz,

Azerbejdžan²⁹ and Abkhazija in contrast to other parts of Russia where a much smaller number of elderly people live. Similar differences occur within other countries^{2,25}.

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ZEMLJOPISNA RASPROSTRANJENOST STARIH LJUDI U HRVATSKOJ

SAŽETAK

U ovom je radu prikazana zemljopisna rasprostranjenost osoba koje su doživjele duboku starost na području Republike Hrvatske. Dugovječne osobe, tj. žitelji stari 80 i više godina su obrađene s raznih stajališta i to prema broju po subregijama te specifičnom mortalitetu. Navedeni podaci dani su za dvije kalendarske godine, i to za

1981. i 1991. godinu. U 1981. godini na području Republike Hrvatske bile su ukupno 73.052 osobe stare 80 i više godina što je iznosilo 1,6% od sveukupnoga stanovništva. Deset godina poslije, tj. 1991. godine broj dugovječnih je porastao na 107.256 osoba što je iznosilo 2,2% od cjelokupne populacije. Analize su pokazale da najviše dugovječnih osoba živi na otocima, dubrovačkoj subregiji i u gorskoj subregiji u Lici. Najmanje dugovječnih najstarije dobi nalazi se u većini općina Slavonije i u velikim gradovima Hrvatske. To vrijedi za obje promatrane godine. U populaciji najstarijih osoba dominiraju žene. U razdoblju od deset godina, tj. između 1981. i 1991. godine povećao se broj dugovječnih osoba na cijelom području Republike Hrvatske. Prema podacima za 1981. godinu koji se odnose na cijelu Republiku, specifični je mortalitet svih osoba starih 80 i više godina iznosio 170,18. Specifični mortalitet žena bio je 161,57, a muškaraca 201,07 na 1.000 dugovječnih osoba. U 1991. godini specifični mortalitet u Republici Hrvatskoj bio je 151,33 na 1.000 dugovječnih osoba. Specifični mortalitet je bio viši u muškaraca i iznosio je 172 na 1.000, dok je u žena iznosio 141 na 1.000. Vidi se da je u 1991. godini došlo do pada specifičnoga mortaliteta s obzirom na 1981. godinu. Specifični mortalitet je varirao od subregije do subregije pa je najniži bio u Lici gdje je iznosio 110 na 1.000 osoba, dok je najviši nađen u varaždinskoj (182/1.000) i bjelovarskoj (178/1.000) subregiji i u Zagorju (175/1.000). Najmanje dugovječnih osoba uz visoki specifični mortalitet živi u Slavoniji dok najviše dugovječnih osoba uz niski specifični mortalitet živi u Lici. Na otocima je ustanovljen veliki broj dugovječnih osoba, ali začuđuje specifični mortalitet u tom kraju, koji je relativno visok.