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Physical Development and Blood Pressure in Adult Bulgarian Population at the End of the XXth Century

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The data from a representative investigation of the Bulgarian population (1989-1993), (2435 males and 2854 females) show that at the end of the XXth century men in Bulgaria are of an average stature — 171.47 cm and weight — 77.67 kg, and women — stature — 158.58 cm and weight — 65.31 kg. Two peaks of accelerating changes about stature from the beginning of the century are established in 1940s and 1980s. During the period 1970-1990, men increase their weight till 1980, after which it remains unchanged. Women increase their weight till 1975, and after that it decreases by 1 kg per every 5 years. The systolic blood pressure in men is 125.68 mm Hg, and in women — 115.43 mm Hg. In both sexes predominate the percentage of the normotonics. The percentage of hypotonics is higher in women, and the percentage of hypertonics — in men. The diastolic blood pressure in men is 79.88 mm Hg, and in women — 73.67 mm Hg.

Key words: stature, weight, systolic blood pressure, diastolic blood presure, secular trend.

The population of each country represents a unique sample of the total world's population which is never repeated with its historical development and the specificity of its natural, geographical and socio-economical conditions of living.

The anthropological characterization of the population of different states is a kind of a biological reflector of history and modernity and may supply rich information of the specificity of the physical development of modern man depending on the concrete conditions and way of life. Traced and evaluated in the course of time and in space (on different territories) anthropological data render a possibility also for characterizing the acceleration and retardation processes, biological maturation and senescence. Besides, representative anthropological data about the population of different countries at the end of the present century serve as a solid basis for comparative studies on similar data from past generations and for undertaking studies on the anthropology of future generations.

During the period 1989-1993 a long-scale and complex study has been carried out in Bulgaria accepted by Bulgarian Academy of Sciences (BAS) and the Ministry of Education and Science as a natural programme under the title of "Anthropological characteristics of the Bulgarian people". The main purpose of the natural programme is to provide anthropological data about Bulgarian population at the end

of the XXth century and about populations having inhabited Bulgarian territories since ancient times till the present day.

In the studies on modern live population, grown-up individuals at the biologically stable age group between 30 and 40 years have been investigated. A total of 5289 individuals (2435 males and 2854 females) from 157 foci of 120 settlements from all regions of the country have been studied. The regions correspond to the nine former administrative districts of Bulgaria as they were during the time of studies.

The anthropological programme consist of: 40 passport - anamnestic data; 145 directly investigated anthropological features (30 somato- and cephaloscopic; 20 cephalometric; 60 somatometric; 6 physiometric and 26 odontological); hand imprints have been taken for a full dermatoglyphic status; photo-documentation was prepared in full face and profile. Indices and proportions on the basis of the original data have been calculated for supplementaring the morphological characterization of the individuals under study. The investigation was carried out by a research team from the department of Anthropology at Institute of Experimental Morphology and Anthropology (IEMA) — BAS, each investigator having studied a strictly defined set of features.

The AIM of the present study is to present and compare the data for stature, weight and blood pressure as basic characteristics of the physical development and health status of the cardio-vascular system of the Bulgarians at the end of the XXth century, as between different districts of the country, so to compare them with literature data about past generations.

Stature is the most typical and constant characteristic of the physical development of the individual throughout his/her entire life. It is basically genetically determined but also display racial and territorial specificity. The data from the National Anthropological Programme (NAP) show that at the end of the XXth century men in Bulgaria are of an average stature of 171.5 cm and women — 158.6 cm respectively (Table 1). According to the M a r t i n - S a l l e r [1] rubrics for European population Bulgarian males are of the category — tall stature, while females are of the category - over the average stature. The greatest value measured for a male is 191.4 cm, whilst the smallest is 150.5 cm. In the female group the tallest measured woman is 178.9 cm, and the shortest — 139.4 cm. The assessment of the intersexual differences shows that generally Bulgarian women are by 7.5% shorter than men, as the intersexual differences for stature are on the world scale (7.6%).

The comparison of data about stature between the nine districts of the country shows that males and females from Sofia are tallest (Table 1, Fig. 1). In the individuals of short stature, statistically significant differences are found only in males from Rousse district. In the female group without displaying any statistical significance in the comparisons between the separate districts women from Bourgas region are relatively shortest. The range of stature differences between separate districts in males is 3.3 cm, and in females — 3.0 cm. These differences render the picture of a relative homogeneity in the Bulgarian population regarding the stature.

The more detailed analysis of the significance of interdistrict differences, however, shows that in males there are no statistically significant differences in stature between the regions of South Bulgaria. This data form a common group of the South Bulgarian men with stature between 171.5 cm and 172.0 cm. (without the ones from the capital). In males from Northern Bulgaria such a uniformity is not found. Two main stature types are established in them. The one encompasses males from Middle and Western North Bulgaria (the regions of Montana and Lovech) who display a height close to the one of Southern Bulgarian men. The second stature type is the one

of males from North-Eastern Bulgaria (the Rousse and Varna districts) who are relatively shorter as nearly all the interdistrict differences are statistically significant.

The females from the capital display the greatest values for stature, while the females from all remaining districts of the country are of relatively equal stature (no statistically significant differences between the comparisons, except the one between the Montana and Varna regions).

According to the Martin - Saller [1] for the European population in Bulgaria predominate the individuals of high stature (Figs. 2, 3). In males they are 51.9% for the entire country. The highest per cent of tall men is found in the capital where is the greatest per cent of the very tall men. Only 3.4 per cent of the males from the entire country are of short stature. In the females the per cent distribution according to stature categories is similar to that of the males. The women of tall stature for the whole country amount to 41.1 per cent, in the capital alone they are up to 53.5 per cent where is the greatest per cent of the very tall women. Only 4.4 per cent of the women in the country are short. The data from the per cent distribution of Bulgarian population into stature standard categories give us grounds to define Sofia population as consisting of individuals of a markedly higher stature than the rest of the country.

In order to trace the acceleration changes of the Bulgarians during the last century a comparative analysis of the data from NAP with literature data from similar studies from the beginning of the century was performed [2 — 8], (Table 2, Fig. 4). It was established that both in men and women stature increase marks two peaks - 1940 and 1980. Certain amplitude fluctuations are outlined. They probably reflect the most important exogeneous factor during the above mentioned periods - the socio-economical conditions of life (World War II and the great socio-economical changes around the 1980s). At the end of the century (1993) men in Bulgaria are taller than men from the beginning of the century by 5.1cm and for women this difference is 2.9 cm. The analysis of stature increase for the Bulgarian population in the different periods of the century shows that by the 1940s the increase of stature in men is 4.5 cm, around the 1980s it is already 6.4 cm, after which the difference between the beginning and the end of the century decreases to 5.1 cm. The stature increase in women by the 1940s is 4.7 cm, in the 1980 s it is already 4.2 cm after which the difference between the beginning and the end of the century decreases to 2.9 cm. The established fluctuations in stature values for the Bulgarian population from the beginning till the end of this century show an intensive secular growth till the 1940s and a stop of stature acceleration around and after the 1980s of this century.

Body weight is the next important feature for the physical development of the individual. As in stature it is also a strongly genetically determined feature but its ecosensitivity is much higher. The ecosensitivity of body weight determine its importance for the assessment of the influence over the organism of the socio-economical life conditions, the individual peculiarities in the life style and nutrition, and the specificity of physical activities at home and work. The data from NAP show that at the end of the XXth century men in Bulgaria weigh on the average 77.67 kg and women 65.31 kg (Table 3, Fig. 5). The greatest weight measured in men is 133.00 kg and the smallest — 47.00 kg. in women the highest value is 125.00 kg and the lowest one — 37.00 kg. The assessment of the intersexual differences shows that Bulgarian women are by 15.9 per cent lighter that men on the average.

The comparative analysis of the variation-statistical data about the nine districts of the country shows that men from the Sofia region and the city of Sofia are relatively the heaviest, the differences between them and the males from Rousse and Varna districts being only statistically significant. For the whole country, men from Rousse dis-

trict are with statistically significant lowest mean weight. The women from Montana district are with statistically significant highest value for weight and women from Bourgas district are with the lowest one. The rest of the regions do not show statistically significant differences in body weight of the studied individuals. The range of the differences between mean values for the nine district of the country in the males is 3.5 kg and in the females — 4.0 kg.

Literature data about the tracement of secular changes of body weight in Bulgarians (30-40 years of age) can be found only for 1970 and the years after [2, 4, 6 — 8] (Table 4, Fig. 6). Regardless of the short period of time — 20 years, the great ecosensitivity of body weight random the opportunity of finding out specific changes that can be connected to the concrete socio-economical conditions of life. After the year 1970 the body weight increase till 1980, after which it remains unchanged till 1990. In women the tendencies of the secular changes of body weight are different from the ones in men.

The women body weight increases till 1975 and after that it decreases by 1kg per every 5 years in the 1980s and 1990s. The intersexual differences in the secular changes of the body weight can be connected to the greater resistance of the male organism to physical and psychological loading. Hence in the period 1970-1990, the women are more often occupied with unsuitable professions for the female organism and cumbersome responsibilities for the household and upbringing of posterity.

Blood pressure is a major physiometric feature for the health status of the cardiovascular system. The mean value of the systolic blood pressure for the whole country are 125.7 mm Hg in men and 115.4 mm Hg in women (Table 5, Fig. 7). The comparison between the two sexes shows that systolic blood pressure in females is by 9.1 per cent lower than the one in men. Comparative analysis of the data for the nine districts of the country shows that with the greatest significant values (but in the norm) are the men and the women from Montana district and the men from Bourgas district. With lower values of the systolic blood pressure are the men and women from the Rousse district compared to the other districts. From the 36 T-criteria calculated for comparing the different districts, the statistically significant differences are 22 for men and 23 for women. The difference between the highest and lowest values for the systolic blood pressure in men is 10.8 mm Hg and 11.6 mm Hg in the women.

Since the mean values of the systolic blood pressure do not render information about the deviations from the norm, a per cent distribution was performed into three categories — hypotonia — up to 109.0 mm Hg, normotonia — from 110.0 mm Hg up to 140.0 mm Hg and hypertonia — over 140.0 mm Hg (Fig. 8). This distribution shows that for the country as a whole and the different districts in particular in the individuals of both sexes predominate the normotonic systolic blood pressure. The highest per cent of male — normotonics is found in Sofia and Lovech districts, and the lowest one — in Bourgas district. In women the per cent of normotonics is considerably lower than that of men. The per cent of the male hypotonics is comparatively low in all nine districs from 2.1 per cent up to 10.6 per cent while in women it is significantly higher from 15.1 up to 47.8 per cent. The greatest number of male and female hypotonics is found in Rousse district, followed by Varna district. The situation about the frequency of the hypertonics in both sexes is reverse. This frequency is much higher in males compared to females, as for the whole country so for the different regions. The greatest number of men with systolic blood pressure — over 140.0 mm Hg are recorded in the regions of Bourgas and Montana. The overlapping limits are between 3.2 per cent and 16.5 per cent. In all districts the per cent of women with a systolic blood pressure over 140.8 mm Hg is low as a whole — from 1.5 per cent in the Rousse district to 6.8 per cent in the Plovdiv one.

The mean values of the diastolic blood pressure in males for the entire country are 79.9 mm Hg and in females — 73.7 mm Hg (Table 5, Fig. 9). The comparison between both sexes shows that the diastolic blood pressure in males is by 9.2 per cent higher. The comparative analysis of the data for the nine districts shows that men from the city of Sofia are with highest values and as in the case of the systolic blood pressure this is true for women from Montana district. With considerably lower values of the diastolic blood pressure are the men and women from Rousse district compared to the rest of the country. It is noteworthy that the mean values of the diastolic blood pressure in women from six regions are comparatively equal. From the calculated T-criteria for comparison between the different districts, the statistically significant differences are 25 in males and considerably less — 17 in females. The difference between the highest and lowest values of the diastolic blood pressure in males is 8.8 mm Hg and in females — 7.2 mm Hg.

The per cent distribution of the diastolic blood pressure was also calculated and divided into three categories — up to 69.0 mm Hg, from 70.0 mm Hg to 90.0 mm Hg and over 90.0 mm Hg (Fig. 10). The data show that for the whole country and the separate regions as well, the individuals of both sexes with diastolic blood pressure values from 70.0 mm Hg to 90.0 mm Hg are prevalent. In women the frequency of individuals with diastolic blood pressure values from 70.0 mm Hg to 90.0 mm Hg is significantly lower when compared to men (males 85.0 per cent; females 70.2 per cent). In males this per cent is highest in Plovdiv district and lowest in the city of Sofia. In women it is with highest values in the capital and with lowest ones in Rousse region. The per cent of diastolic blood pressure values lower than 69.0 mm Hg in the males is comparatively low from 1.9% to 11.7%. In women both for the whole country and the separate regions this frequency is much higher from 19 per cent to 45.8 per cent. The tendency for diastolic blood pressure over 90 mm Hg is the opposite. For the whole country the per cent of the men with such values is almost twice higher than that of the women. This per cent is highest in the males from Sofia and it is lowest in the Rousse region. The differences in women are not so great and range between 1.7% for Varna district and 6.2% for Plovdiv district.

Summarizing the results about blood pressure of the Bulgarian population at the end of the XXth century can be concluded that the normotonics prevail in both sexes. Of a special interest for the protection of health is the greater frequency of hypotonics in females and the greater frequency of hypertonics in males.

The data presented in this paper are only an example of the wealth of representative information about the complex anthropological characteristics of the Bulgarian population at the end of the XXth century. These data can be used for the creation of anthropological criteria for the health status of the individual and as norms for physical development, for the determination of the nutritional status and obesity, and the important socio-economical diseases related to it. On the basis of the data from NAP anthropological standards for ergonomic design in various areas of material production can be developed.

Last but not least, the data from NAP are addressed to the future anthropological investigators who will have data for a comparative analysis of the physical development of the future Bulgarian population with this data from the end of the XXth century.

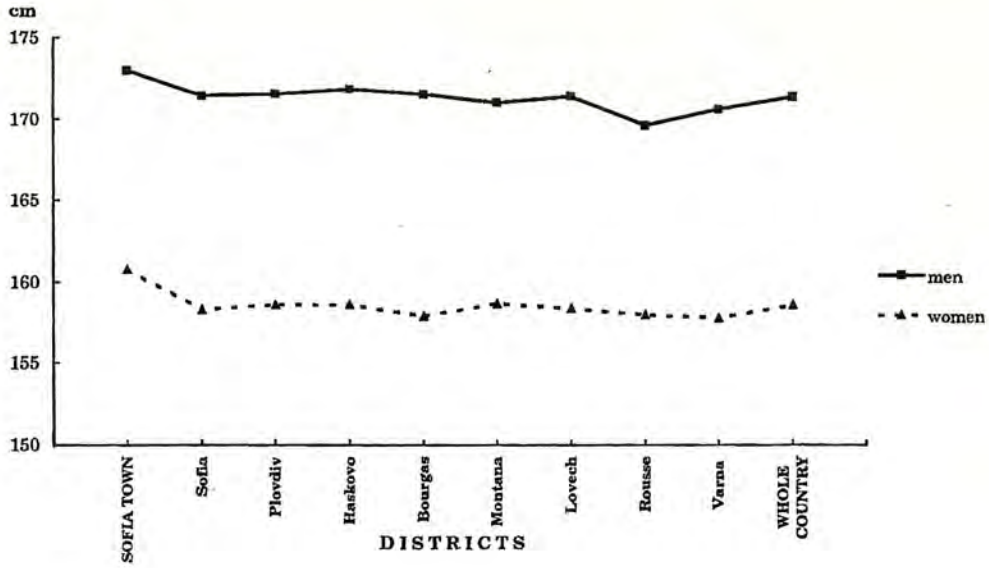


Fig. 1. Stature (1990)

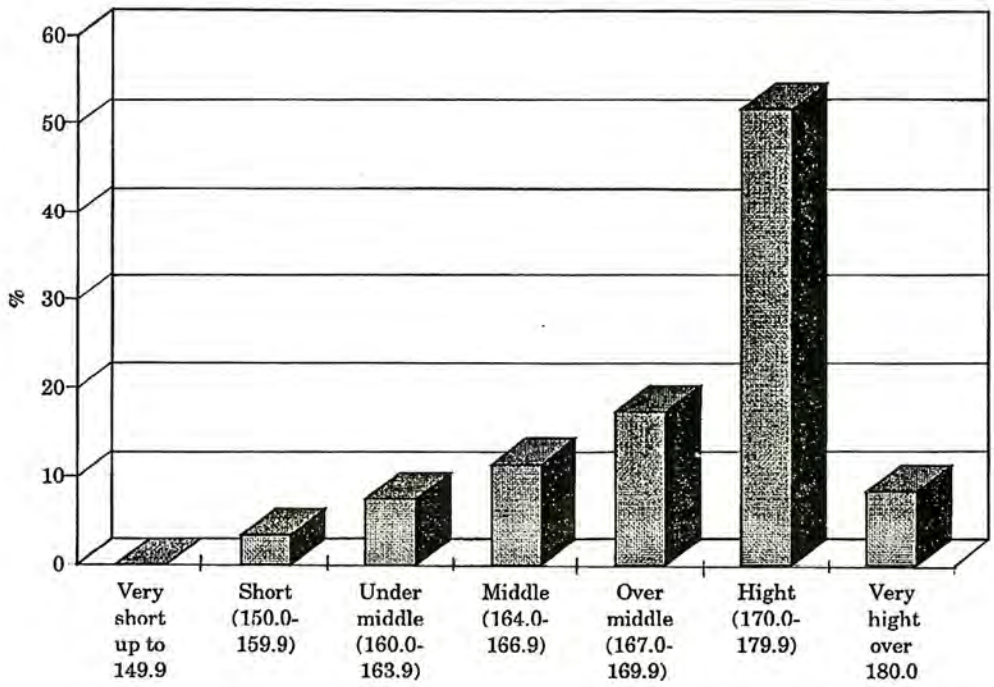


Fig. 2. Percentage distribution of the individuals according to the categories of stature — men

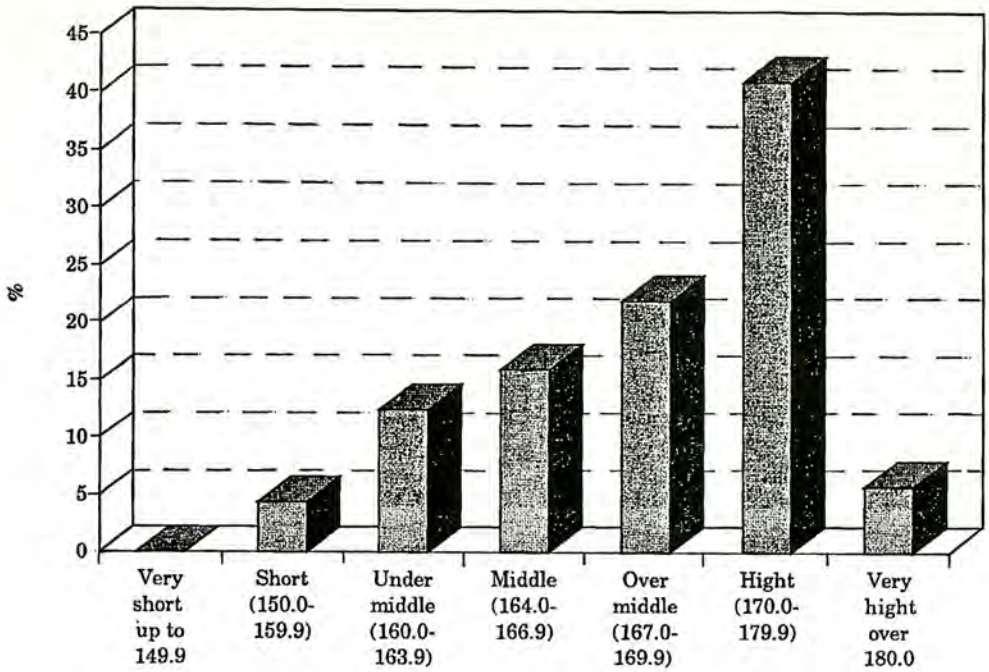
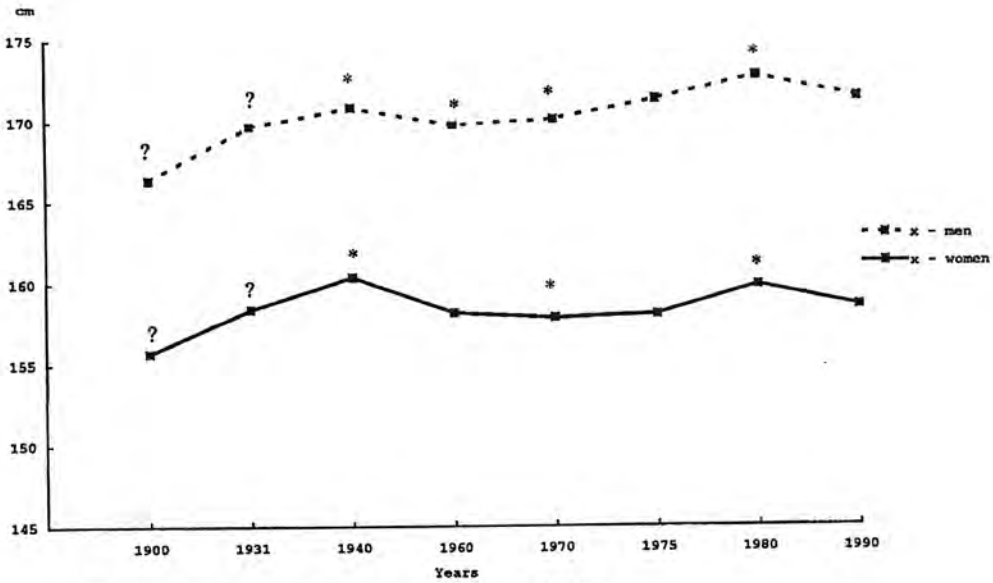


Fig. 3. Percentage distribution of the individuals according to the categories of stature — women



* - statistically significant differences to the data of 1990 ($P < 0.05$)

Fig. 4. Secular changes in stature (1900-1990)

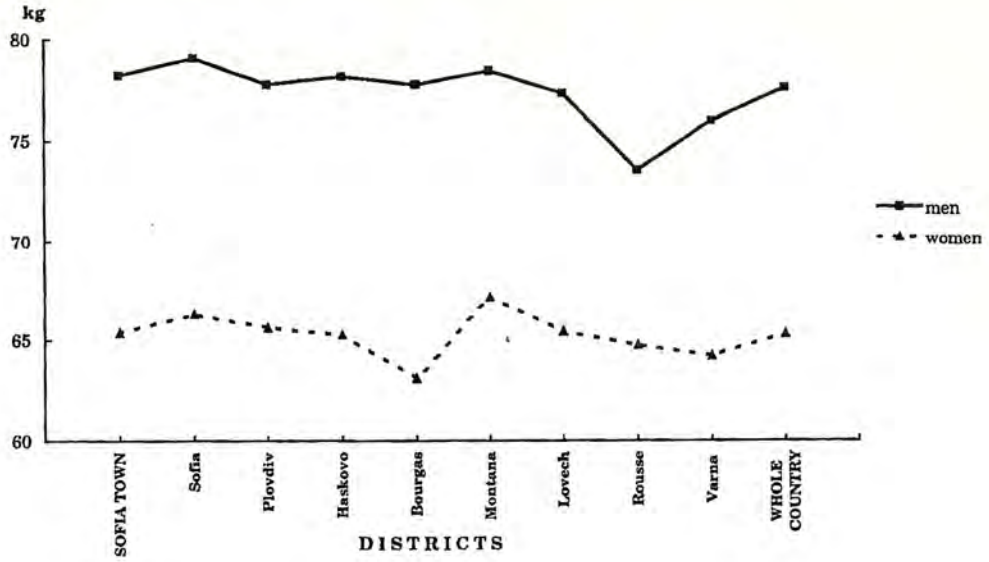
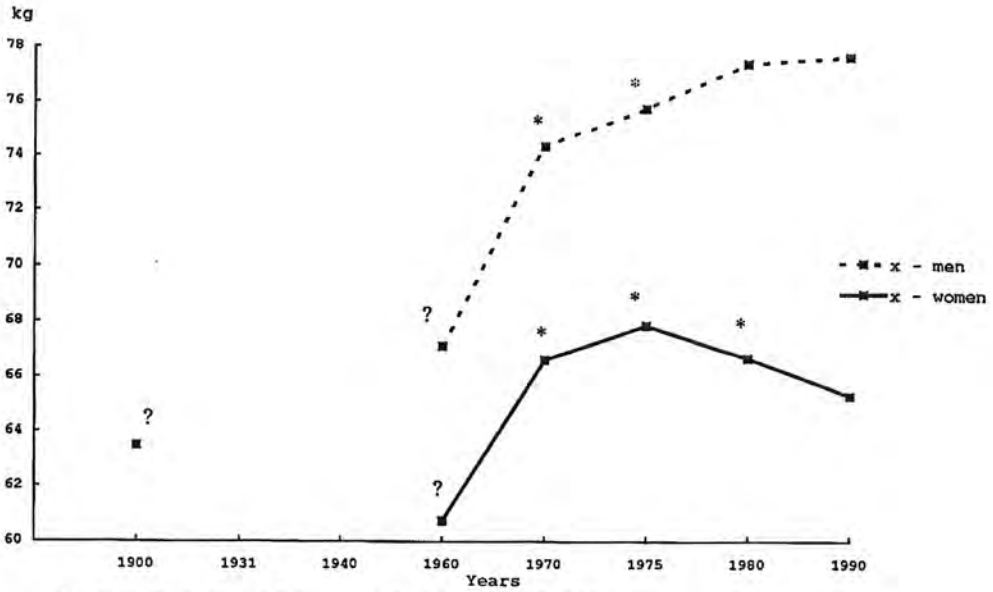


Fig. 5. Weight (1990)



* -statistically significant differences to the data of 1990 ($P < 0.05$)

Fig. 6. Secular changes in weight (1960-1990)

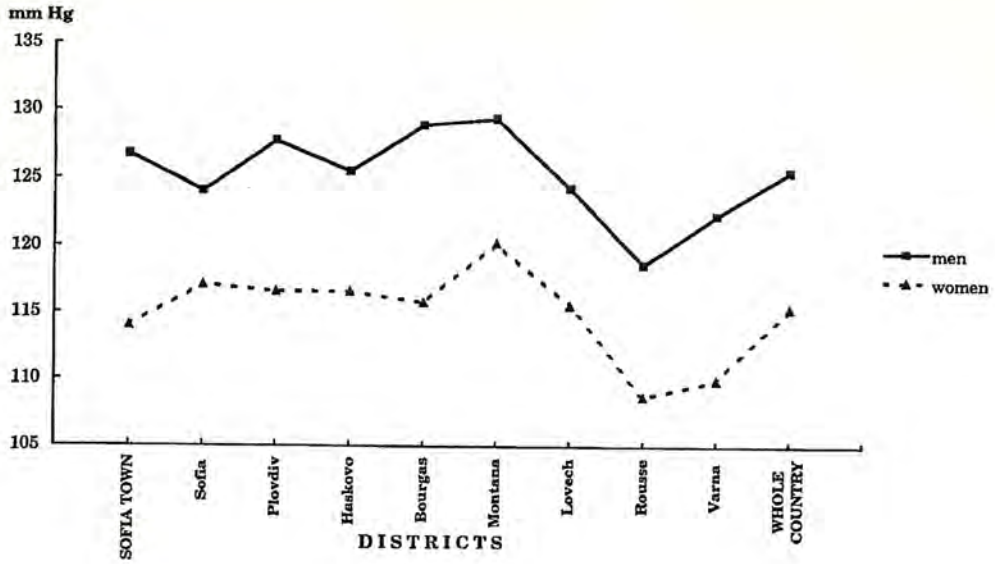


Fig. 7. Systolic blood pressure (1990)

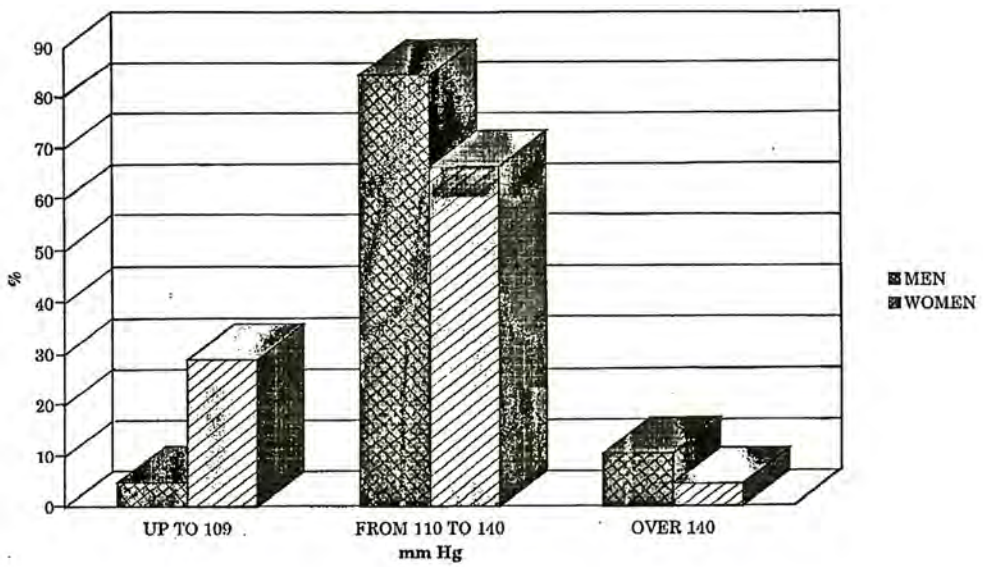


Fig. 8. Percentage distribution of the individuals according to the categories of systolic blood pressure

Fig. 9. Diastolic blood pressure (1990)

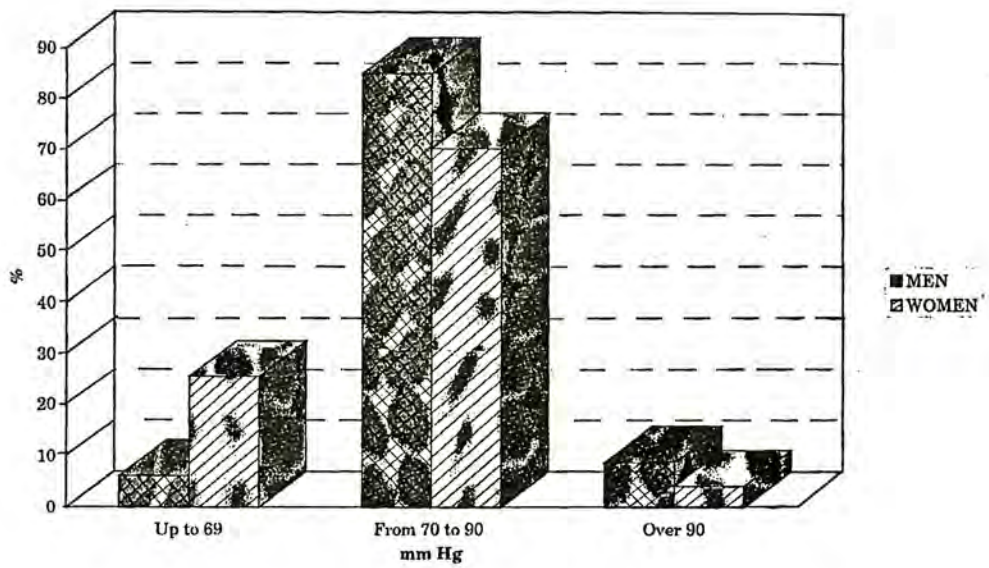


Fig.10. Percentage distribution of the individuals according to the categories of diastolic blood pressure

T a b l e 1. Stature of Bulgarian Population (1990)

SEX	Parameter	Sofia-city	Sofia	Plovdiv	Haskovo	Bourgas	Montana	Lovech	Rousse	Varna	Whole country
		DISTRICTS									
	n	234	310	278	288	248	345	266	188	262	2419
MEN	*X*	173.0	172.0	172.0	172.0	172.0	171.0	172.0	170.0	171.0	171.5
	SD	64.87	64.08	59.47	60.35	60.18	59.93	58.28	63.25	61.56	61.61
	n	276	370	340	352	336	358	319	205	294	2850
WOMEN	*X*	161.0	158.3	158.6	158.6	157.9	158.7	158.5	158.0	157.8	158.6
	SD	58.09	58.32	58.13	56.97	60.25	55.88	57.32	59.08	54.86	58.10

Statistical Significance of the Interdistricts' Differences (P<0.05)

Sex	Comparative districts																							
	Sofia-city/Sofia district	Sofia-city/Plovdiv district	Sofia-city/Haskovo district	Sofia-city/Bourgas district	Sofia-city/Montana district	Sofia-city/Lovech district	Sofia-city/Rousse district	Sofia-city/Varna district	Sofia district/Bourgas district	Sofia district/Rousse district	Sofia district/Varna district	Plovdiv district/Bourgas district	Plovdiv district/Rousse district	Haskovo district/Bourgas district	Haskovo district/Montana district	Haskovo district/Rousse district	Haskovo district/Varna district	Bourgas district/Montana district	Bourgas district/Lovech district	Bourgas district/Rousse district	Montana district/Rousse district	Montana district/Varna district	Lovech district/Rousse district	Rousse district/Varna district
Men	2.72	2.49		2.49	3.49	2.69	5.20	4.02		2.96	2.02		3.22			3.79	2.38			3.08	2.49		3.03	
Women	5.40	4.65	4.75	6.04	4.54	4.93	5.18	6.27														2.04		

T a b l e 2. Comparative data about stature (cm) 1900-1990

Author and year of investigation	Age group	MEN				WOMEN			
		n	*X*	SD	*t* - criterion to the data from 1990	*n*	*X*	SD	*t* - criterion to the data from 1990
Vatev, 1900-1907 (1900)	19-25	2459	166.4		?	211	155.7		?
Mateev, 1931	20		169.7		?		158.4		?
Popov, 1937-1943 (1940)	20-40	5751	170.9	6.11	4.00*	2157	160.4	5.46	11.25*
Janev, Shterev, Boev, 1960	25	259	169.8	6.7	3.95*	228	158.2	6.07	0.95
Janev, Shterev, Boev, 1970	30-39	1211	170.2	6.3	5.91*	1212	157.9	5.45	3.68*
Mutafov, Goranov et al., 1975-76 (1975)	31-40	425	171.4	6.11	0.31	425	158.1	5.51	1.72
Slanchev, Janev et al., 1980	30-39	744	172.8	6.85	4.64*	741	159.9	6.1	5.40*
National anthropological programme 1989-1992 (1990)	30-39	2419	171.5	6.16	*	2850	158.6	5.81	*

* Statistically significant differences ($P<0.05$)

T a b l e 4. Comparative data about weight (kg) 1900-1990

Author and year of investigation	Age group	MEN				WOMEN			
		n	*X*	SD	*t* - criterion to the data from 1990	*n*	*X*	SD	*t* - criterion to the data from 1990
Vatev, 1900-1907 (1900)	19-25	2459	63.49		?				
Janev, Shterev, Boev, 1960	25	252	67.14	8.81	?	222	60.73	9.58	?
Janev, Shterev, Boev, 1970	30-39	1201	74.37	11.05	8.21*	1199	66.62	10.35	3.54*
Mutafov, Goranov et al., 1975-76 (1975)	31-40	425	75.79	10.0	3.48*	425	67.87	10.98	4.41*
Slanchev, Janev et al., 1980	30-39	744	77.42	11.45	0.51*	741	66.69	11.15	2.95*
National anthropological programme 1989-1992 (1990)	30-39	2413	77.67	12.46	*	2843	65.31	11.98	*

*Statistically significant differences ($P<0.05$)

Table 3. Weight of Bulgarian population (1990)

SEX	Parameter	Sofia city	Sofia	Plovdiv	Haskovo	Bourgas	Montana	Lovech	Rousse	Varna	Whole country
		DISTRICTS									
MEN	*n*	234	310	276	288	247	344	266	186	262	2413
	X	78.97	79.08	77.83	78.22	77.81	78.49	77.39	73.57	76.03	77.67
	SD	12.85	12.70	12.15	10.69	13.09	13.64	12.10	10.98	12.43	12.46
WOMEN	*n*	276	370	339	351	336	357	319	204	294	2843
	X	65.37	66.29	65.62	65.26	63.13	67.13	65.44	64.75	64.22	65.31
	SD	12.94	12.81	11.28	10.87	10.90	13.08	12.15	11.39	11.62	11.98

Statistical Significance of the Interdistricts' Differences ($P<0.05$)

Sex	Comparative districts																							
	Sofia-city/Sofia district	Sofia-city/Plovdiv district	Sofia-city/Haskovo district	Sofia-city/Bourgas district	Sofia-city/Montana district	Sofia-city/Lovech district	Sofia-city/Rousse district	Sofia-city/Varna district	Sofia district/Bourgas district	Sofia district/Rousse district	Sofia district/Varna district	Plovdiv district/Bourgas district	Plovdiv district/Rousse district	Haskovo district/Bourgas district	Haskovo district/Montana district	Haskovo district/Rousse district	Haskovo district/Varna district	Bourgas district/Montana district	Bourgas district/Lovech district	Bourgas district/Rousse district	Montana district/Rousse district	Montana district/Varna district	Lovech district/Rousse district	Rousse district/Varna district
Men	2.72	2.49		2.49	3.49	2.69	5.20	4.02		2.96	2.02		3.22			3.79	2.38			3.08	2.49		3.03	
Women	5.40	4.65	4.75	6.04	4.54	4.93	5.18	6.27														2.04		

T a b l e 5. Mean Values of the blood pressure

Feature	Sex	DISTRICTS									
		Sofia-city	Sofia	Plovdiv	Haskovo	Bourgas	Montana	Lovech	Rousse	Varna	Whole country
n	Men	236	311	280	288	248	345	269	188	263	2428
Systolic BP	Men	126.8	124.1	127.8	125.6	129.0	129.5	124.4	118.7	122.4	125.7
Diastolic BP	Men	83.9	78.9	80.7	79.4	81.4	81.8	78.9	75.1	77.6	79.9
n	Women	277	372	340	351	336	358	319	205	293	2851
Systolic BP	Women	114.0	117.1	116.6	116.6	115.8	120.3	115.6	108.7	110.0	115.4
Diastolic BP	Women	75.0	74.6	74.4	74.3	73.3	76.0	74.1	68.8	70.3	73.7

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