

## Body height in recruits in bulgaria (1897-1920)

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The data of body height in 910389 recruits in Bulgaria since 1897 until 1920 have been analyzed. Mean body height has been calculated and traced year by year. The results show that there are only small fluctuations in the mean body height around 166 cm with an insignificant decrease by 0.4 cm during this period. This phenomenon has been explained to be due to the controversial effects of the fall of the national income per capita in Bulgaria after the Liberation opposed by the rather significant improvement of educational, dwelling and health standards.

*Key words:* anthropometric history, body height, recruits, Bulgaria, social influence on physical development

### Introduction

The scientific study of human growth begins in the 18<sup>th</sup> century by Montbeillard [12]. Around 1830 the famous medical statisticians Quetelet and Villerme have presented evidence that the human biological development is influenced both from the natural and the social environment (Villerme, 1829; Quetelet, 1831, both cited after [4]). Their results imply that social, temporal and spatial variation of body height is not due to random genetic factors. Untill 1960s the question about the correlation of human stature with social-economic factors is of interest only to a limited number of anthropologists and military historians. Only in 1960s French historians from the circle around the famous journal “Annales. Economies, societes, civilizations” direct their attention to this topic (Le Roy Ladurie, Bernageau, Pasquet, 1969, cited after [4; 5]). In 1970s begins the expansion of the use of the anthropometric in the social sciences and among the so called cliometricians (historians, applying the mathematics to the history, mostly in social history). They are the cliometricians who develop a new scientific field, referred to as “anthropometric history” by some authors [3, 4] or “historical anthropometric” [2, 11]. The results of the investigation in this field, never mind how it is named, are used for solution of important problems of the socio-economic history – for example concerning the situation of the proletarians during the industrial revolution, or of the peas-

ants in the Russian empire before and after their emancipation, for a complex evaluation of the well-being in the Russian Empire and in the USSR and so more [4, 11, 12, 13].

Basic direction in historical anthropometric research is the study of body height in recruits. The reason is simple – the conscripts' height in the states of European civilization has been measured already in the 17<sup>th</sup> century. There are many materials about it preserved, although unprocessed statistically. However, they can be processed and, while taking account of their completeness can be correlated to the events of the socio-economic history or to the social environment of the particular individual – the recruit. The materials for other referent samples, for example slaves or apprentices, are significantly scarcer. In addition they often depend on the age factor, while the conscripts represent more or less the group of the so called young adults, for which no major changes in the stature can be expected in future.

## Materials and Methods

For the present we could not succeed in finding archival materials for particular individuals – recruits, as this has been made in other European countries. However, in the statistical yearbooks data have been found about the stature of all recruits in the end of 19<sup>th</sup> and the beginning of 20<sup>th</sup> century [17]. These materials include the number of young men, conscripted in Bulgaria annually in the period 1897-1920, discriminated by their height in centimeters. They comprise 910389 youngsters, representing in practice all healthy male population of the country, which have reached 21 years (**Table 1**). These materials do not include the youths under a specific height limit, which remains 154 cm in most years of the period. This yields to a small overestimation of the mean height. On the other hand in the beginning of 20<sup>th</sup> century the growth of the males continues after 21 years – about 1 cm in the period of the military service (research of Mihailovski in 2459 soldiers in Pleven, cited by [8]). Thus it can be supposed, that the overestimation of the mean stature, due to exclusion of the shortest young men and its underestimation, due to growth processes, nearly compensate each other and the data about the recruits' height gives a real picture for the mean height of young male adults in Bulgaria in this period.

The archive materials have been processed by the usual variation and correlation analysis [14]. Than the annual sequence of values has been adjusted [14].

## Results and Discussion

It was found that in the examined period there is no significant alteration of the stature, which varies around 166 cm. There is only a small decrease by ca 0.4 cm in the adjusted height values from 166.2 to 165.8 cm (**Table 2, Fig.1**). The mean value of about 166 cm coincides with the one found by St.Vatev in his investigation on 5024 recruits in the beginning of the examined period [8]. This could be expected, since Vatev has used the same original material – the measurements of the recruiting committees.

More strange is something else – the stagnation of the height during about a quarter of a century and even its deceleration. It is strange on the general European background, because in the beginning of 20<sup>th</sup> century the average acceleration of the height is 0.9 cm per decade in Europe [16]. This gives about 2.1 cm for the whole period. In Russia an increase can be traced of the recruits' stature even in the heavy period of the First World War! But in Bulgaria instead of increase of the height there is a decrease in present sample, which is in essence exhaustive.

Table 1. Number of recruits, approved for military service

Year	Recruits	Recruits, unknown height		Minimal height (cm)
		n	%	
1897	22827	93	0.4	154
1898	27732	26	0.1	154
1899	25586	75	0.3	154
1900	27301	451	1.7	154
1901	26455	368	1.4	154
1902	31700	75	0.2	154
1903	33811	4079	12.1	154
1904	35534	4338	12.2	154
1905	43540	1734	4.0	154
1906	56016	2596	4.6	154
1907	46967	3451	7.3	154
1908	39056	1944	5.0	154
1909	34949	1435	4.1	154
1910	35138	1688	4.8	154
1911	33159	1032	3.1	154
1912	35792	1310	3.7	153
1913	45872	1579	3.4	153
1914	40611	2441	6.0	153
1915	41573	1511	3.6	153
1916	51091	1648	3.2	153
1917	60796	972	1.6	153
1918	52198	972	1.9	152
1919	54538	1355	2.5	152
1920	45799	2479	5.4	153
1897-1900	1034460	645	0.6	154
1901-1905	171040	10594	6.2	154
1906-1910	212126	11114	5.2	154
1911-1915	197007	7873	4.0	153-154
1916-1920	264422	7426	2.8	152-153
Total (1897-1920)	948041	37652	4.0	152-154

Source: (17)

Table 2. Annual dynamics of recruits' height, 1897-1920

Year	Recruits (n)	Height (cm)			
		Mean (M)	SE	SD	adjusted
1897 <sup>a</sup>	22734	166.17	0.037	5.62	166.19
1898	27706	166.18	0.034	5.63	166.08
1899	25511	165.74	0.034	5.37	165.91
1900	26850	165.92	0.034	5.56	165.87
1901	26087	165.77	0.034	5.48	165.83
1902	31625	165.83	0.031	5.52	165.84
1903	29732	165.99	0.032	5.54	165.84
1904	31196	165.66	0.031	5.47	165.88
1905	41806	165.69	0.027	5.61	166.00
1906	53420	166.95 <sup>b</sup>	0.026	5.99	166.23
1907	43516	166.06	0.027	5.65	166.01
1908	37112	165.34	0.028	5.49	165.70
1909	33514	165.55	0.030	5.55	165.59
1910	33450	165.47	0.031	5.61	165.63
1911	32127	166.04	0.032	5.68	165.83
1912	34482	165.85	0.031	5.77	165.87
1913	44293	165.90	0.028	5.88	165.92
1914	38170	165.97	0.030	5.79	165.97
1915	40062	165.96	0.029	5.73	166.04
1916	49443	166.23	0.026	5.89	166.03
1917	59824	166.29	0.024	5.77	165.90
1918	51226	164.93	0.026	5.97	165.58
1919	53183	165.59	0.025	5.94	165.63
1920	43320	166.06	0.028	5.79	165.80
1897-1900	102801	166.00	0.017	5.55	166.01 <sup>c</sup>
1901-1905	160446	165.78	0.014	5.53	165.88 <sup>c</sup>
1906-1910	201012	165.98	0.013	5.72	165.83 <sup>c</sup>
1911-1915	189134	165.94	0.013	5.78	165.93 <sup>c</sup>
1916-1920	256996	165.83	0.012	5.90	165.79 <sup>c</sup>
Total (1897-1920)	910389	165.90	0.006	5.73	165.88 <sup>c</sup>

Source: Proper calculation, based on (17).

Notes: <sup>a</sup> The primary information only in three-centimeter groups. Recruits in them have been distributed on the base of distribution in the same three-centimeter groups in 1898.

<sup>b</sup> This exceptional jump of the mean value remains for the present without explanation. May be a new measurement instruction have been introduced for one year only with return to the old one in the next year.

<sup>c</sup> Adjusted values – arithmetic means of the adjusted annual height values.

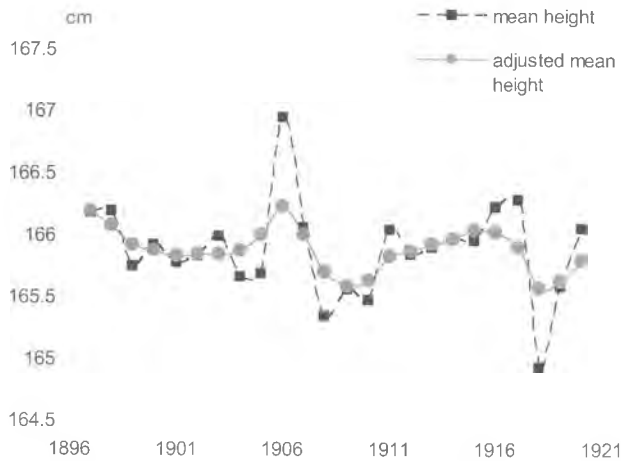


Fig.1. Changes in height of conscripts in Bulgaria since 1897 to 1920 – despite the yearly variations the weak decreasing trend is well visible.

The last studies on the socio-economic history of Bulgaria in late 19<sup>th</sup> and early 20<sup>th</sup> century indicate, that after the Liberation there is an agrarization of the country and the crude domestic product per capita decreases by about 29% as to 1910 [6, 10]. This explains the stagnation of the height and the deceleration tendency. Something more, given such decrease of the national income a question arises - why isn't there a more significant decrease of the stature.

A first line of reasoning should encounter the fact that although Bulgaria's economy returns back and the majority of European countries go forward in this period, the national income per capita in Bulgaria remains significant. Around 1910 it is 38% of the national income per capita in Great Britain, 55% - of that in Germany and 60% of that in France [10, 15]. Today, after 100 years efforts to overtake Europe, the difference is bigger – in 2007 the real gross domestic product per capita in Bulgaria was 31% of that in Great Britain, 33% - in Germany and 34% – in France [18].

Further, as Janos Komlos notes, there are no conventional measures of well-being of the families of the self-sufficient peasants [4] but the biological status (anthropometric). But in Bulgaria in the mentioned period about 80% of the population lives in villages and they give about 85% of the recruits (because of the higher birth rate there). Thus it seems that the decrease of the incomes has affected their monetary part, but has not affected the production for self-consumption. The last clearly has not decreased, especially in the conditions of agrarization.

Next, the Bulgarian society in the mentioned period is comparatively socially homogenous. There is no landlord aristocracy, nor well developed stratum of great bourgeoisie, wide strata of landless peasants and of urban proletariat. It follows from historic anthropometric evaluations that a decrease of the income inequality by 10%, as measured by the so called Gini coefficient, yields an increase of the mean stature by 14 mm in the same mean income value per capita [7].

At last, the biological status is not determined only by the incomes. It is influenced by the education, public health and housing. In all these three fields Bulgaria after the Liberation has experienced a real revolution. In 1880 there were only 3.5% literates in

the Bulgarian population, which means that only about 7-8% of the adult male population were literate [15]. In 1910 the proportion of the literates among recruits is ten times higher – 78.4% [17]. In the field of literacy Bulgaria surpasses all Balkan countries, despite its delayed liberation from Ottoman rule. In the first decade of 20<sup>th</sup> century (when the demographic statistics of Bulgaria are sufficiently complete) the mean life expectancy in Bulgaria is the highest in comparison with all Balkan countries (whenever data exist) [17]. It is higher also in comparison with the Hungarian part of Austro-Hungary, with Polish lands, with European Russia, excluding Baltic countries. Only in 5 years, from 1887 census to 1892 census the proportion of the wattle and clay houses and dug-out houses decrease from 91% to 44%; they are replaced by better buildings – of sun-dried bricks, really, but better [2].

## Conclusion

The research in historic anthropometric in Bulgaria is only in its beginning. Here have been presented only the first results. They present only small fluctuations in the mean height around 166 cm with a small deceleration of about 0.4 cm in a quarter of century. These results are in good coincidence with the results of the last investigations on Bulgarian socio-economic history, presenting an agrarization of the economic, fall of the monetary incomes, but very significant improvements in education, public health and housing on the background of a small social differentiation.

*Acknowledgements:* To prof. B.Mironov, prof. Y.Yordanov and doc. D.Stavrev, which have directed my attention on this research field.

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