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AGE AND REGIONAL DIFFERENCES IN THE BODY CHARACTERISTICS OF THE ADULT INHABITANTS OF THE WHITE CARPATHIAN REGION

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In the years 1963—1964 the authors carried out anthropological investigation of adult population and school children in the Moravské Kopanice Region, in the adjoining part of the White Carpathians in Moravia, and in three localities of the Dolňácko Region. The results of this investigation represent a contribution to our knowledge of the body characteristics of the individual populations of the White Carpathians, Czechoslovakia.

The investigation covered the region close to the Moravian-Slovak border-line, regions north-east, east and south-east of the town of Uherský Brod, in Moravia below the mountains of Velký Lopeník and Chabová (Fig. 1). In all the investigation was carried out on 18 localities, which were divided from the viewpoint of ethnography and some special and characteristic social features into four geographical regions: (Fig. 2): 1. the Kopanice Region proper, 2. northern regional group, 3. southern regional group, 4. Bojkovice.

While the Kopanice Region has retained, until the time of our investigations, a generally simple system of agriculture on steep mountain slopes, the southern region resembles more the system of rich agriculture as we know it from the Dolňácko Region, and the northern group represents with its system of agriculture a transition to the Valašsko Region. The population of Bojkovice was not included in the northern group, to which it undoubtedly belongs, because this is a municipal population with social conditions that differ from those prevailing at other localities of this geographic group.

The present paper deals with adult populations over 18 years of age.

Because our investigation was a representative one we examined more than 10 % of all living adult population. The selection was carried out in such a fashion that each sample included all decennia up to the age of 90, proportionately to the population numbers established according to statistical data of the Local National Committees. All in all we gained in the course of this investigation, among other things, 22 anthropometric data which served the calculation of 13 indexes in 1261 persons examined. Of the number mentioned 513 were males and 748 females. The oldest male examined was 86 years old, the oldest female 90 years old.

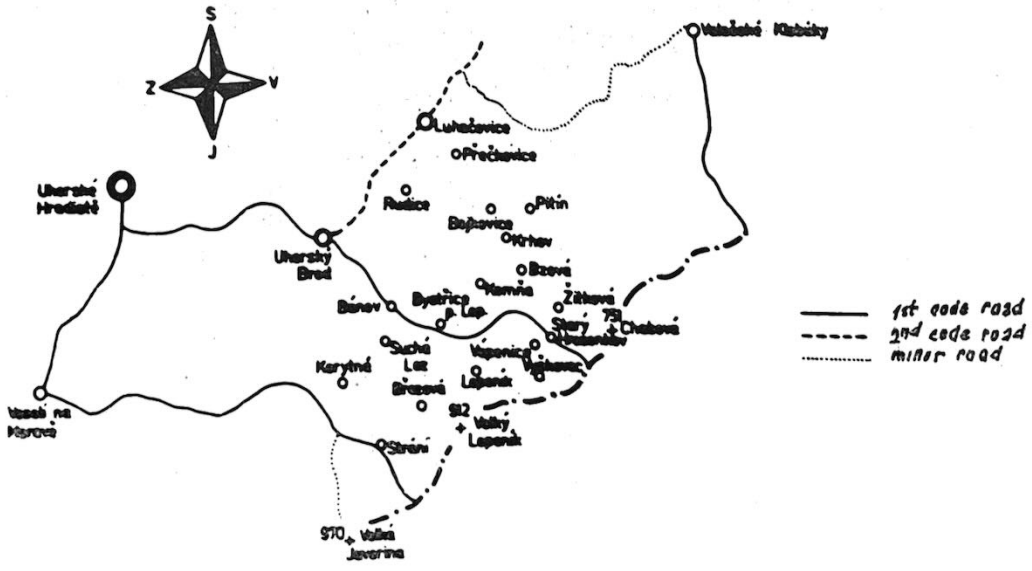

FIG. 1
Investigated localities.

To examine the age differences the adult persons examined were divided into two age groups. The first one was represented by people between 18 and 45 years of age, the second one were people over 45.

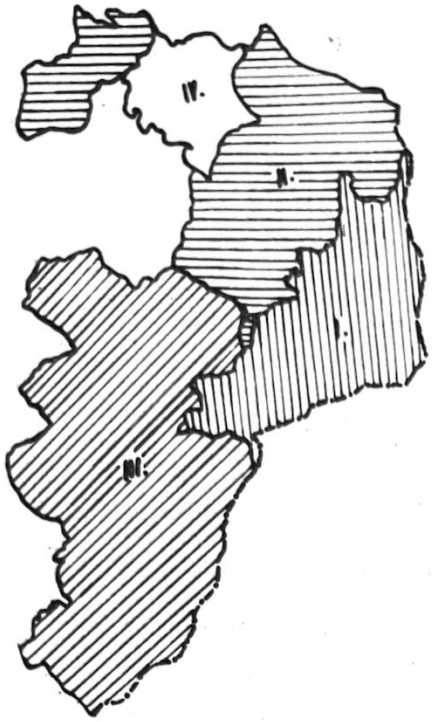

FIG. 2
Territorial groups:
I Kopanice
II Northern locality
III Southern locality
IV Bojkovice

THE RESULTS OF THE ANALYSIS OF AGE AND REGIONAL DIFFERENCES IN THE EXAMINED CHARACTERS

The authors do not think is advisable to include in this paper a number of tables with mean values and other statistical data for both age groups of males and females in the individual geographic regions. However, it is necessary to have a certain basic criterion. Because the authors consider as most interesting the group of people from the presente Kopanice Region they give in all tables of t-tests of the differences of mean values of the most distinct characters of the population — of the individual regions, for both sexes and age groups — at least the calculated mean value of the character and the standard deviation.

Of the basic somatic characters we examined body height, weight, span of arms and the circumference of thorax in normal position, in inspiration and expiration. All of these characters show certain statistically evidenced differences among the individual regions. These differences, of course, vary from one character to another.

The differences in body height have been found only with older males from the Kopanice Region. These males are in the average of lower stature than other groups compared. With these males, like the groups of older females from the same region, we also found a shorter arms span, when compared with other population groups.

TAB. 1
T-test, body weight

Males		A I.	A II.	A III.	A IV.
B	I.	—	0.90	**2.91**	0.16
	II.	2.19	—	2.06	0.41
	III.	**3.28**	2.00	—	1,56
	IV.	**5.21**	**3.56**	**2.65**	—

$\bar{x} = 67.04$ $s = 9.49$
$\bar{x} = 61.39$ $s = 9.92$

Females		A I.	A II.	A III.	A IV.
B	I.	—	1.95	1.79	0.72
	II.	**3.25**	—	0.59	0.64
	III.	**3.74**	0.08	—	0,35
	IV.	2,25	0.32	0.19	—

$\bar{x} = 60.37$ $s = 9.95$
$\bar{x} = 56.48$ $s = 11.44$

In body weight (Tab. 1) we found differences among all regional groups of older males, and also older females from the Kopanice Region differ in this respect from all other groups. The population of the Kopanice Region is clearly lighter than all other populations examined.

Markedly smaller in the population from the Kopanice Region is the circumference of thorax (in normal position, inspiration and expiration) in the older age groups and in both sexes. In this paper we included only *t*-tests of the differences in the mean circumference of thorax in normal position (Tab. 2). In the group of older males we found some statistically significant differences in the males from Bojkovice. These individuals show markedly greater circumferences of thorax (in normal position, in inspiration and expiration).

On the neurocranium we examined the following characters: *g-op*, *eu-eu*, *t-t*, *ft-ft*, circumference of brain-case measured across the points *g* and *op*, and the arch *t-v-t*. From these there have been calculated the cephalic index, frontoparietal index, frontobasal index, and the index of the transverse arch and of the breadth of the skull base. Of these characters certain statistically significant differences

TAB. 2
T-test, circumference of thorax

Males	A			
	I.	II.	III.	IV.
I.	—	1.57	**4.07**	1.56
II.	**2.67**	—	2.46	0.23
III.	**4.37**	1.95	—	1.03
IV.	**6.94**	**4.85**	**3.60**	—

B

$\bar{x} = 90.80$ $s = 4.37$
$\bar{x} = 90.89$ $s = 5.97$

Females	A			
	I.	II.	III.	IV.
I.	—	2.56	**3.30**	1.66
II.	**5.66**	—	0.07	0.01
III.	**7.51**	0.83	—	0.05
IV.	**4.97**	0.04	0.56	—

B

$\bar{x} = 86.78$ $s = 6.18$
$\bar{x} = 84.01$ $s = 6.24$

TAB. 3
T-test, arch *t-v-t*

Males	A			
	I.	II.	III.	IV.
I.	—	**3.34**	**9.37**	**3.30**
II.	**6.07**	—	**6.15**	0.53
III.	**13.82**	**7.32**	—	**2.67**
IV.	**6.01**	2.48	2.30	—

B

$\bar{x} = 301.11$ $s = 19.73$
$\bar{x} = 293,79$ $s = 15.60$

Females	A			
	I.	II.	III.	IV.
I.	—	**4.40**	**13.47**	**3.37**
II.	**5.89**	—	**9.68**	0.25
III.	**13.06**	**8,94**	—	**7.28**
IV.	**6.73**	**2.84**	**2.64**	—

B

$\bar{x} = 291.95$ $s = 17.97$
$\bar{x} = 288.65$ $s = 20.42$

may be found in the breadth of the brain-case in younger women of the southern regional group with regard to the other groups, and some differences are also evident in the breadth of the skull base, especially in older males. As proved by *t*-tests of the differences in mean values of the circumference of the brain-case, measured across the points *g* and *op*, we find differences in these characters, as compared with other regional groups, especially in older males and younger females from the town of Bojkovice. It is also interesting that of the characters examined the greatest differences have been found in the transverse arch of the brain-case (*t-v-t*) (Tab. 3). These differences are most pronounced in the population of the Kopanice Region, where the values of this character are considerably lower than in other geographical regions.

In males of the younger as well as of the older age groups we have found virtually no differences in the cephalic index. But certain differences do appear in younger females of the northern geographical group. These individuals have markedly more brachycephalic heads. As a result of the already mentioned great geographical variations of the *t-v-t* arch there also exist, of course, great statistically significant differences in the index of this arch and of the breadth of skull base (Tab. 4).

Of the characters of the facial skull there have been examined the following ones: *n-gn*, *n-sto*, *n-sn*,

TAB. 4
T-test, $\frac{(t\text{-}t) \times 100}{t\text{-}v\text{-}t}$

Males	A			
	I.	II.	III.	IV.
I.	—	**3.34**	**9.16**	**3.86**
II.	**4.50**	—	**5.32**	0.99
III.	**10.44**	**7.73**	—	2.12
IV.	**2.79**	0.83	**3.39**	—

B

$\bar{x} = 47.37$ $s = 3.03$
$\bar{x} = 48.81$ $s = 2.66$

Females	A			
	I.	II.	III.	IV.
I.	—	**3.19**	**13.96**	**3.24**
II.	**4.90**	—	**10,97**	1.16
III.	**11.08**	**7.78**	—	**5.15**
IV.	**5.62**	2.24	**2.84**	—

B

$\bar{x} = 46.39$ $s = 2.95$
$\bar{x} = 46.83$ $s = 3.42$

sto-gn, *zy-zy*, *go-go*, *ex-ex*, *en-en*, *al-al*, *ch-ch*. Of these, and partly also of the appurtenant measurements of the neurocranium, there have been calculated the following indexes: facial, upper facial, nasal, intercanthal, frontozygomatic, frontogonial, jugomandibular, cheilozygomatic, and nasozygomatic. Some more pronounced and frequently appearing regional differences are found, in direct measurements, mainly in the internal bipalpebral breadth (*en-en*) of the older generation from the Kopanice Region. These differences appear in both sexes and the values from the Kopanice Region are on average greater than those in other regions. The measurement is of course small and may be influenced by some mistakes, though it was taken by the same person. Some smaller statistically evidenced differences in *t*-tests in the mean values from the individual regions appear in the height of the nose and, consequently, also in the nasal index, especially in older females. As a result of the greater internal bipalpebral breadth of the older population of the Kopanice Region, these people differ from population of all other regionals also in the intercanthal index.

If we evaluate in a comprehensive fashion the age differences in the characters examined, that is differences in mean values of the younger and older age groups in the individual regions, we may observe that with respect to the basic characters these differences are mainly in the body height, which is a rule, and also in the span of arms (Tables 5 and 6). However, greater generation differences in body height are found in the northern and southern regional groups, rather than in the Kopanice Region proper, and this applies especially to females. The body weight and circumference of thorax do not show, as may be seen from the tables, any major differences in both age categories. No differences in this respect have been found as well on the neurocranium. Of the measurements of the facial part of the skull there appeared some marked age differences in the morphological height of the face (Tab. 7), which is naturally caused by the loss of dentition. Very interesting is the fact that the decrease in value mentioned is much less pronounced in the height of the upper face, especially in males. In all regional groups, with the exception of females from the town of Bojkovice, there have been found

TAB. 5
T-test, age differences

	Body height		Body weight		
	Males	Females		Males	Females
I.	**4.09**	**4.61**	I.	2.52	1.94
II.	2.46	**7.00**	II.	1.92	0.80
III.	**5.84**	**8.11**	III.	**4.36**	0.59
IV.	0.11	2.58	IV.	1.31	0.11

TAB. 6
T-test, age differences

	Arm span		Circumference of thorax		
	Males	Females		Males	Females
I.	**4.26**	**4.92**	I.	0.08	2.39
II.	1.88	**4.84**	II.	0.36	0.69
III.	**4.89**	**3.88**	III.	0.79	2.04
IV.	0.77	0.46	IV.	**2.67**	0.43

TAB. 7
T-test, age differences

	n-gn		*n*-sto		
	Males	Females		Males	Females
I.	2.50	**3.07**	I.	1.76	2.10
II.	0.87	**2.67**	II.	0.30	1.56
III.	**4.05**	**4.84**	III.	0.34	**3.78**
IV.	1.29	1.79	IV.	1.01	2.08

TAB. 8
T-test, age differences

	al-al		*en-en*		
	Males	Females		Males	Females
I.	**2.62**	**5.19**	I.	**3.20**	**3.59**
II.	**3.50**	**3.88**	II.	2.43	1.55
III.	**6.25**	**9.62**	III.	**5.51**	**3.93**
IV.	**2.86**	1.50	IV.	0.46	1.07

TAB. 9
T-test, age differences

	$\frac{(n-gn)\times 100}{zy-zy}$		$\frac{(al-al)\times 100}{n-sn}$		
	Males	Females		Males	Females
I.	**2.63**	**2.90**	I.	2.38	**3.71**
II.	2.17	2.42	II.	1.83	0.70
III.	**4.13**	**6.25**	III.	**3.45**	**6.97**
IV.	**3.30**	2.36	IV.	2.20	1.45

TAB. 10

T-test, age differences

	$\frac{(en - en) \times 100}{ex - ex}$		$\frac{(t - t) \times 100}{t - v - t}$		
	Males	Females		Males	Females
I.	3.85	5.29	I.	2.12	0.73
II.	3.77	3.47	II.	3.49	1.02
III.	8.00	6.15	III.	3.19	2.87
IV.	1.22	1.04	IV.	2.62	1.22

differences in the nasal breadth on 1% level of probability (Tab. 8). With increasing age there also increases the breadth of nose, and similar changes have also been observed in some of the regional groups in the internal bipalpebral breadth.

Of the indexes examined the highest number of differences and at the same time the greatest age differences appear in the morphological height of the face (Tab. 9), in the nasal index, in the index intercanthalis, and in the index of transverse arch of the skull and of the breadth of the skull base (Tab. 10).

CONCLUSION

From the investigation that has been carried out it is evident that in basic body measurements there appear some fundamental differences among the individual regions. These differences are especially apparent on older age groups. According to these differences it might be possible to establish, on the territory examined, two types of population. The first type is characterized by less robust build and predominates in the inhabitants of the present Kopanice Region, the second type would be represented by the population of the southern geographical region, which is marked by the greatest body height and circumferences of thorax.

As regards the head measurements, we have seen in the preceding passages that there do not exist any great differences among the persons examined from the individual geographical regions. These differences are certainly less significant than those found in the basic body characters. Despite this fact, the differences found point to the possibility that the physical character of the population of the territory under investigation was influenced by other population types, most probably from regions lying to the west in the hinterland of Moravia.

It is interesting, that the most pronounced age differences in the basic physical characters were found in the population of the villages in the Kopanice Region. This fact confirms the original presupposition of the authors, based on purely visual impressions, that the middle generation of this region aged between 18 and 45 differs from the oldest generation, whose members were born for the most part at the end of the last and the beginning of this century and also in the course of World War I. The explanation lies undoubtedly in improved nutrition, social, hygienic and health situation and some other changes in the present Kopanice Region after World War II. In the majority of basic body characters, as we have already seen, the younger age group of the Kopanice Region does not differ from comparable groups of the other regions.

However, body height does show some significant differences among the age groups, with the exception of the population of the town of Bojkovice and of the males in the northern geographical region. The older generation is marked, as a rule, by a lower body height. This is, of course, in connection with age-induced changes on the spine and on the joints of distal limbs, but it cannot be ruled out that the shorter stature of the older generation was influenced by some other originally perhaps genetically fixed qualities and, for example, also by nutrition. In regions marked by differences in body height we find also some differences between the younger and the older generation in the span of arms.

Of the main measurements and indexes on the facial part of the head, the most important and interesting are, as already mentioned, the values of the morphological height of the face, of nasal breadth, internal bipalpebral breadth and perhaps also external bipalpebral breadth and their respective indexes. In the older age groups the morphological height of the face shows lower values, the nose is broader and greater is also the internal bipalpebral breadth.

The absolute and relative increase in the breadth of the nose and in the internal bipalpebral breadth may be related and may also point to some structural changes in the soft parts of the face connected with the age. The decrease in the morphological height of the face is caused by loss of teeth and the resulting sagging of processus alveolaris .maxillae et mandibulae.

SUMMARY

In the years 1963—1964 the authors investigated anthropologically 1261 adults (513 males and 748 females) from the Kopanice Region in the White Carpathian Mountains in Moravia and in three localities from the Dolňácko Region.

The population was divided into two age groups (18 to 45 years and over 45) and at the same time into four geographical regions.

The purpose and objective of the investigation was to study the regional and age differences in the body build.

From the investigation it is evident that there appeared some significant differences in body measurements among the persons from the different geographical regions. These differences were especially pronounced in older age groups.

These differences point to the existence of two types of population in the investigated territory. The first type is characterized by a less robust body build and may be found mainly in the Kopanice

Region. The second type may be represented by the population of the southern geographical region. These people are characterized by higher stature and high values of the circumferences of thorax.

In head measurements there do not appear any great differences among the individuals from the respective geographical regions. Still, these differences show that the physical character of the population under examination may have been influenced by some other population types, coming perheps from regions west of the examined one, from the central part of Moravia.

It is interesting that the most significant age differences in the basic body characters are found in the population of the Kopanice Region. This fact affirms the original presupposition of the authors, originally based on visual impression only, that the middle generation of the territory, that is people between 18 and 45 years of age, shows considerable differences when compared with the older generation, whose members were born for the most part at the end of the last and the beginning of the present century, and some of them in the course of World War I. The cause of these changes are better nutrition, better social, hygienic and sanitary conditions in the present Kopanice Region after World War II. In most of the investigated body characters the younger age group of the Kopanice Region does not differ from comparable samples from other regions.

Body height, however, does show some significant differences, in all regions, among the age groups. The only exception are the inhabitants of the town of Bojkovice and the males in the northern region. The older generation shows, as a rule, lower height values. This is caused by changes on the spine and on the joints of distal limbs. The lower height of the older generation may still be influenced by some other, conditions such as factors related to nutrition. In the regions where we find differences in body height between the older and the younger generation, we also come across differences in the span of arms between these two generations.

Of the main measurements and indexes of the facial part of the skull the most interesting are the values of the morphological height of the face, breadth of nose and the internal bipalpebral breadth, but maybe also the external bipalpebral breadth, and their respective indexes. In the older age groups we find lower values of the morphological height of the face, broader nose and also longer internal bipalpebral breadth. The absolute and relative increase in the nose breadth and the internal bipalpebral breadth point to some structural changes in the soft tissue of the face in the course of the process of aging. Decrease in the values of the morphological height of the face is caused by loss of teeth and the resulting sagging of processus alveolaris maxillae et mandibulae.

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FIG. 3
Man of the younger age group from the Kopanice region.

FIG. 4
Man of the older age group from the Kopanice region.

FIG. 5
Women of the younger age group from the Kopanice region.

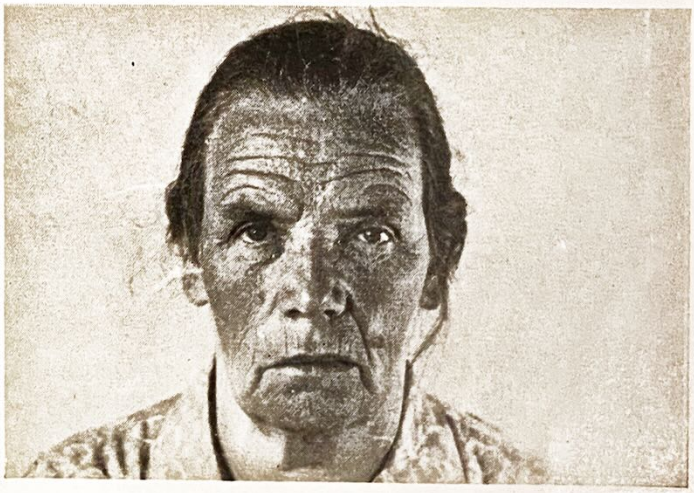

FIG. 6
Women of the older age group from the Kopanice region.

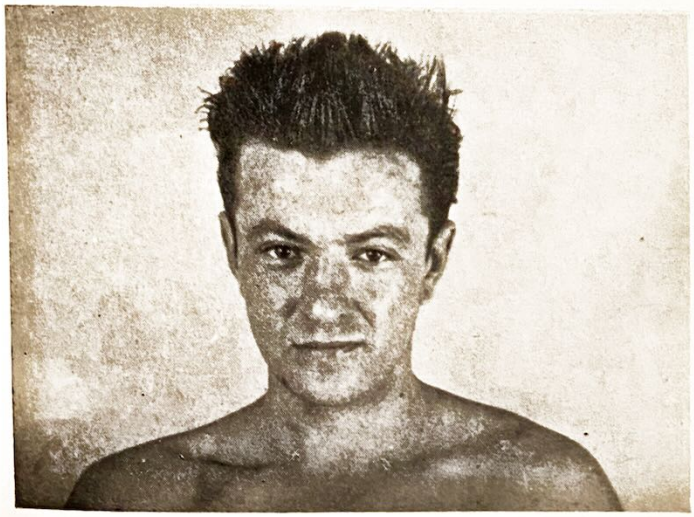

FIG. 7
Man of the younger age group of the northern region.

FIG. 8
Man of the older age group of the northern region.

FIG. 9
Women of the younger age group of the northern region.

FIG. 10
Women of the older age group of the northern region.

FIG. 11
Man of the younger age group of the southern region.

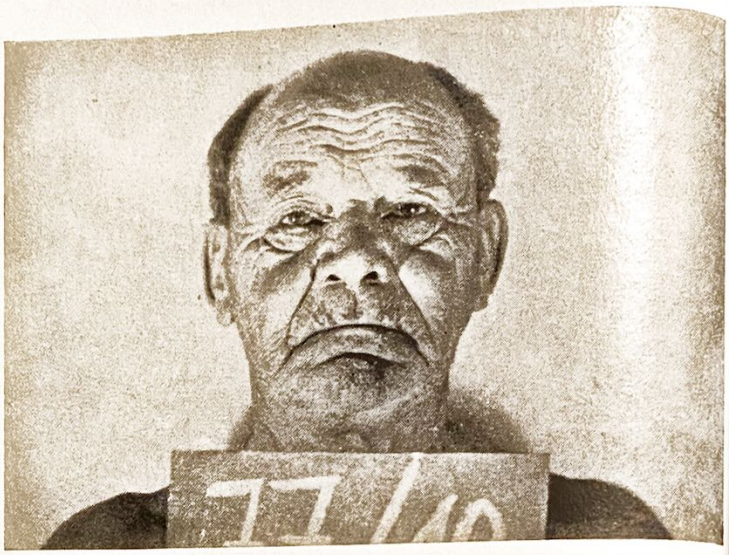

FIG. 12
Man of the older age group of the southern region.

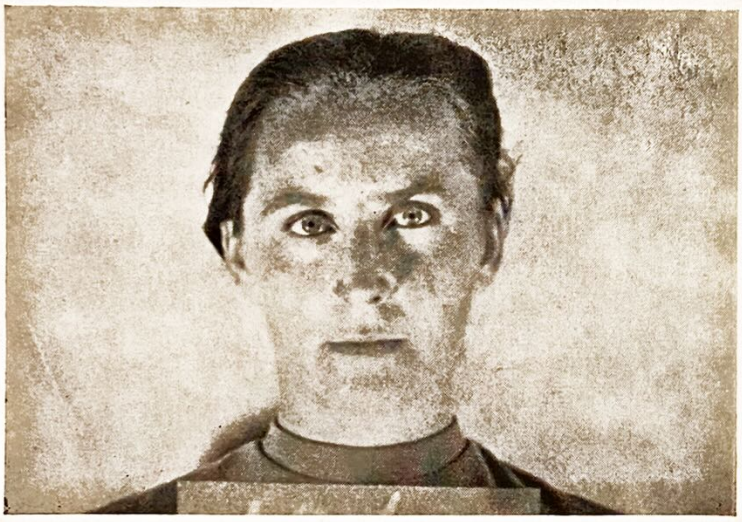

FIG. 13
Women of the younger age group of the southern region.

FIG. 14
Women of the older age group of the southern region.

FIG. 15
Man of the younger age group from the town Bojkovice.

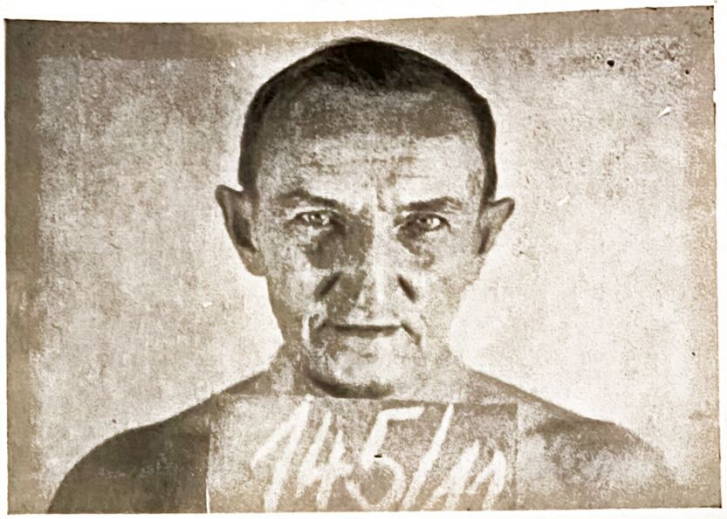

FIG. 16
Man of the older age group from the town Bojkovice.

FIG. 17
Women of the younger age group from the town Bojkovice.

FIG. 18
Women of the older age group from the town Bojkovice.