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PROBLEM OF ESTIMATING THE COINCIDENCE OF THE MONTH OF MENARCHE AND THE MONTH OF BIRTH

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In the course of investigating the bodily acceleratedness of Hungarian children, the physiological maturation has naturally aroused the interest of investigators. As a result of the latter researches, we have today perfectly reliable data, appraised with a modern method, on the basis of a very considerable number of collections from various parts of the country concerning the menarche-age of girls.

In analysing the questionnaires the investigators could simulteneously ascertain also in case of the Hungarian girls the phenomenon observed at first at the examination of Finnish girls (SIMELL, 1951). Namely the fact that the month of birth and the month of menarche do coincide in a higher percentage than expected. VALŠIK found the same with school-girls in BRNO (VALŠIK, 1953). Particularly after the findings of VALŠIK observation of that fact came into the foreground in Hungary. In our investigations performed in Southern Hungary we, too, adverted to the observation of that, furnishing further informations on its occurrence (FARKAS, 1962; 1963; 1964). The results of our data collected in Szeged recently — in 1966/67 — concerning the coincidence of the month of birth and month of menarche unpublished until now, are summarized in Table 1. Similar data of the girls at Kecskemét will also be published soon (FARKAS, 1970. Recently, having asked a very considerable number of young girls in Western Hungary, also other Hungarian authors have treated of the problem in details (EIBEN—BODZSÁR, 1970).

The observations concerning the coincidence of the month of menarche and month of birth are, therefore, the results of a discovery going back some twenty years. In Table 2 we are endeavouring to summarize until now the data that give evidence of the occurrence of this phenomenon. It appears from Table 2 that — considering the 12-month year as 100 per cent — we find in every sample, except the girls in Kecskemét, a higher percentage of coincidence than that corresponding to the monthly 8,33 per cent frequency expected. The question is staged, to which degree this percentual connection can be verified by statistical methods in case of Hungarian girls. Herewith I should like to report on our experiment concerning the investigation of this problem.

In this place I wish to express my thanks to research worker Péter Hunya, for his kind instructions concerning the statistical evaluation.

Materials and Methods

For performing our statistical investigations, our first task was to bring about a greater number of samples that may be considered with high probability to be unitary from several points of view. Concerning this programme we could rely on our earlier publications in which we elaborated the menarche-data of the young girls living in Southern Hungary and belonging to the Hungarian ethnic group. At this statistical test we have not been disturbed by the fact that we took into consideration the menarche-data of young girls from communities lying in different heights above sea level — Szeged, Pécs — however, the time of physiological maturation may be influenced by the height above sea level (VALŠIK—BERNÁTOVÁ, 1964). Our aim was to investigate the coincidence of the month of birth and month of menarche and not the menarche-median. On the basis of these considerations we have contracted our data collected in Szeged in 1958/59 and 1961, as well as in the neighbourhood of Szeged in 1961 (FARKAS, 1962), in Orosháza in 1963 (FARKAS, 1963), in Pécs in 1962 (FARKAS, 1964), in Kecskemét in 1964 (FARKAS, 1970), furthermore, in Szeged in 1966/67 (Table 1, Table 3, Fig. 1). In the following, I shall deal with these tables as data of the young girls from Southern Hungary.

In analysing the values available to me, I followed the method applied earlier by other authors, too (VALŠIK—ŠTUKOVSKÝ, 1963; EIBEN—BODZSÁR, 1970), i. e. I remodelled Table 3 according to DE RUDDER's n-method. The figures regrouped in this way (Table 4) are offering an easier survey about the combination of the month of birth and month of menarche in the contracted pattern investigated by me. Column n of the table is containing the cases in which the months of birth and menarche coincide with each other.

For facilitating a real comparison of similar investigations performed in differenc populations, I normalized Table 3, as well, (Table 6), regrouping it again according to DE RUDDER's n-method (Table 7).

On the basis of the third contingency table, for investigating the connection supposed between the two phenomena — the month of birth and month of menarche — we have reckoned the value of x^2, as well, by means of the following formula:

$$x^2 = n\left(\sum_{i=1}^{r}\sum_{j=1}^{s}\frac{v^{ij^2}}{v_i v_j} - 1\right)$$

In this formula, n = the number of available cases,

v_{ij} = value of the corresponding heading of the contingency table,
v_i = sum of the corresponding column (month of menarche) of the table,
v_j = sum of the corresponding line (month of birth) of the table (PRÉKOPA, 1962).

We have reckoned the index of interdependence of the two systems of events by the formula: $\frac{x^2}{n(q-1)}$. The contingency coefficient was established on the basis of the formula:

$$r = \sqrt{\frac{x^2}{q-1}},$$

where q = min (r, s).

About the monthly distribution of the month of birth and month of menarche I am getting information from Fig. 2. On the basis of the contingency table remodelled according to the n-method (Table 4), a joint description of three-three adjacent columns (Fig. 3) is given.

Table 1. Contingency table of the month of birth and month of menarche. — Girls in Szeged 1966/67

Month of birth	Month of menarche												Total
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	
I	4	1	1	—	3	2	—	8	2	4	2	2	29
II	2	2	2	1	—	1	1	2	1	1	—	2	15
III	5	1	—	2	1	—	—	5	2	1	1	5	23
IV	4	1	—	1	—	3	1	5	2	2	—	2	21
V	2	2	2	—	2	1	1	1	—	1	1	—	13
VI	1	—	1	—	—	1	—	5	1	4	2	5	20
VII	2	3	2	—	1	—	2	3	1	—	1	2	17
VIII	—	1	—	—	—	—	2	7	1	5	1	2	19
IX	6	2	1	—	4	2	6	2	1	2	2	2	30
X	2	—	—	1	—	1	2	3	3	2	2	3	19
XI	3	—	—	—	1	1	1	3	1	—	3	2	15
XII	3	2	—	1	1	4	1	4	1	1	2	5	25
Total	34	15	9	6	13	16	17	48	16	23	17	32	246

Table 2. Coincidence of the month of birth and month of menarche at various patterns

Place of investigation	Author	Total cases	Coincidence	
			n	per cent
Finland	SIMELL, 1951	5741		11,9
Brno	VALŠIK, 1953	1473	217	14,7
Bratislava	VALŠIK, 1960	156	19	12,2
Szeged	FARKAS, 1962	771	104	13,49
Szeged	FARKAS, 1962	732	77	10,52
Environs of Szeged	FARKAS, 1962	416	36	8,65
Trnava	VALŠIK—ŠTUKOVSKÝ, 1963	894	123	13,7
Orosháza	FARKAS, 1963	222	33	14,86
Cadca	VALŠIK—BERNÁTOVÁ, 1964	538	54	10,04
Pécs	FARKAS, 1964	578	63	10,90
Kecskemét	FARKAS, 1970	282	23	8,15
Western Hungary	EIBEN—BODZSÁR, 1970	8255	946	11,46

Results

As shown by the percentual distribution at the bottom of Table 4, the months of birth and menarche are demonstrating a coincidence of 11,24 per cent, i. e. higher than the expected 8,33 per cent. That would mean, therefore, that the probability of coincidence of the month of birth with that of menarche is in practice much higher than the coincidence of the month of menarche with

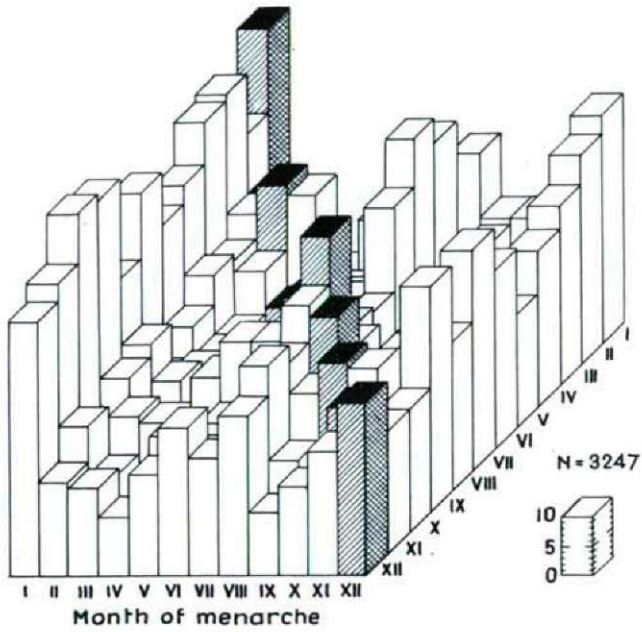

Fig. 1. Combinations of the month of menarche and month of birth at the girls in Southern Hungary

a month different from the month of birth, and vice versa. This phenomenon in our pattern is not influenced by that, some seasonal rhythmicity is also shown by the incidence of menarche (VALŠIK–ŠTUKOVSKÝ, 1964). In the winter months — as referred to earlier (FARKAS, 1962) — in case of the Hungarian girls, as well, the first menstruation occurs in a high percentage. In our present pattern menarche appears in 35,97 per cent in winter months. At the same time — i. e., in December, January and February — the percentage of births is 24,24 per cent altogether. That is to say, while the ratio of births is at about the expected value, the incidence of menarche in this season is considerably higher than the value expected. If the percentual value of the coincidence of the month of birth and of that of menarche depended unequivocally upon each other, so in that season also the percentual frequency of births ought to be higher. There may, however, be a great difference between the monthly percentual occurrence of the two phenomena what can be observed very well in the two coincidence

maxima of our pattern, in the months January and August. In these months the percentual frequency of births is approximately 7, resp. 4 per cent lower than the percentual incidence of menarche.

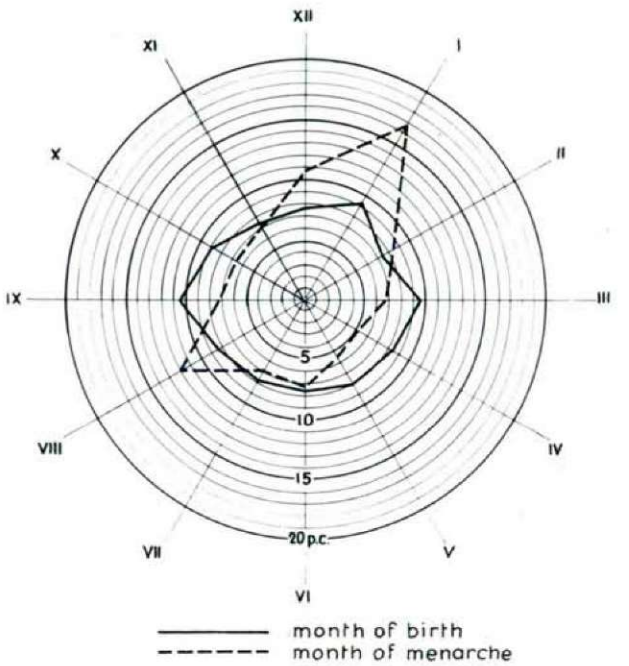

Fig. 2. Comparison of the percentile distribution of the months of birth and menarche in the pattern investigated

In Table 5, on the basis of one pattern from Czechoslovakia and two from Hungary, we can make a percentual comparison. It this table we find the empirical monthly percentual incidences as compared with the monthly mean incidences to be expected after the total case-number of the corresponding patterns having been divided by 12. It is striking at first sight that the empirical ratio of coincidence as compared with the average according to these values is 165,1 per cent in the pattern of Trnava (VALŠIK—ŠTUKOVSKÝ, 1963) while in the from Hungary it is about 30 per cent lower than that. The minimum value has been found at the girls in Southern Hungary.

Among the three patterns in case of the frequency above average, too, an essential difference is manifested (Tables 4 and 5). In the material of Southern Hungary, the average case number of incidence to be expected monthly is: $\bar{x} = 3247/12 = 270{,}6$. In the pattern from Trnava the frequency above the average is:

in case n—5	0,5	0,7 per cent
in case n—1	1,5	2,0 per cent
in case n+3	4,5	6,0 per cent
in case n	48,5	65,1 per cent

in the pattern from Western Hungary (EIBEN—BODZSÁR, in press):

in case n—1	31,1	4,5 per cent
in case n+1	42,1	6,1 per cent
in case n	258,1	37,5 per cent

in the pattern from Southern Hungary:

in case n—6	5,4	2,0 per cent
in case n—2	2,4	0,9 per cent
in case n+1	14,4	5,3 per cent
in case n+5	1,4	0,5 per cent
in case n	94,4	34,9 per cent

It would not be right of course to compare the absolute numbers with one another as the number of components is different in individual patterns. Nevertheless, it is remarkable that the percentage of frequency above average is similarly not equal in the three patterns (Trnava: 73,8 per cent, Western Hungary: 48,1 per cent, Southern Hungary: 43,6 per cent). The pattern from Trnava has the lowest number of components, nevertheless, the coincidence is the greatest in this pattern while it is considerably smaller in the other two patterns although, they have much more components. This renders probable the establishment that in observing this phenomenon the number of the experimental subjects has a particularly important role (VALŠIK—ŠTUKOVSKÝ, 1963). We may add, too, that in case of smaller patterns the percentage of coincidence is usually higher, although I am aware of other opinions, as well (EIBEN—BODZSÁR, 1970).

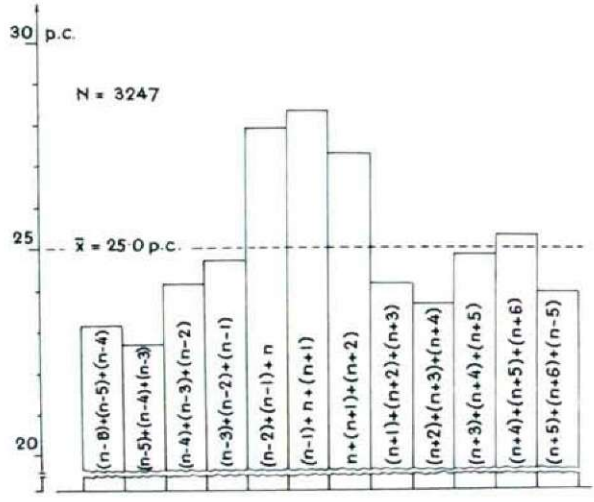

Fig. 3. Percentile comparison of three-three adjacent columns of the contingency Table elaborated according to De Rudder's *n*-method

Table 3. Contingency table of the month of birth and month of menarche on the basis of data from Southern Hungary

Month of birth	Month of menarche												Total	Per cent
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.		
I	*53*	23	17	12	21	20	22	32	21	21	20	38	300	9,24
II	39	*29*	16	11	10	18	19	19	20	12	10	35	238	7,33
III	49	29	*34*	32	16	13	17	41	17	14	17	30	309	9,52
IV	48	25	23	*17*	14	17	11	45	14	20	13	26	273	8,41
V	41	26	16	13	*21*	17	13	37	16	19	21	19	259	7,98
VI	38	21	16	8	7	*26*	18	23	16	20	19	30	242	7,45
VII	47	16	17	11	13	15	*26*	24	16	13	14	37	249	7,67
VIII	36	25	19	11	8	18	15	*43*	25	16	24	25	265	8,16
IX	53	23	11	12	23	29	29	35	*33*	24	23	38	333	10,25
X	54	17	20	19	9	19	21	29	24	*29*	28	21	290	8,93
XI	46	22	14	7	20	17	11	32	16	9	*25*	21	240	7,39
XII	43	16	15	10	17	25	20	27	11	15	21	*29*	249	7,67
Total	547	272	218	163	179	234	222	387	229	212	235	349	3247	—
Per cent	16,84	8,38	6,71	5,02	5,51	7,21	6,84	11,92	7,05	6,53	7,24	10,75	—	100,00

Table 4. Distribution of the combinations of the month of birth and month of menarche according to DE RUDDER's n-method

Months	Combinations of the month of birth and month of menarche													
	n−6	n−5	n−4	n−3	n−2	n−1	n	n+1	n+2	n+3	n+4	n+5	n+6	
I	22	32	21	21	20	38	*53*	23	17	12	21	20	22	300
II	19	20	12	10	35	39	*29*	16	11	10	18	19	19	238
III	17	14	17	30	49	29	*34*	32	16	13	17	41	17	309
IV	20	13	26	48	25	23	*17*	14	17	11	45	14	20	273
V	21	19	41	26	16	13	*21*	17	13	37	16	19	21	259
VI	30	38	21	16	8	7	*26*	18	23	16	20	19	30	242
VII	47	16	17	11	13	15	*26*	24	16	13	14	37	47	249
VIII	25	19	11	8	18	15	*43*	25	16	24	25	36	25	265
IX	11	12	23	29	29	35	*33*	24	23	38	53	23	11	333
X	19	9	19	21	29	24	*29*	28	21	54	17	20	19	290
XI	20	17	11	32	16	9	*25*	21	46	22	14	7	20	240
XII	25	20	27	21	15	21	*29*	43	16	15	10	17	25	274
Per cent	8,50	7,05	7,58	8,10	8,41	8,25	11,24	8,78	7,24	8,16	8,31	8,38	8,50	
ΣN	276	229	246	263	273	268	365	285	235	265	270	272	276	3247

Table 5. Percentual frequency of menarche as compared with the average in three patterns

	n−6	n−5	n−4	n−3	n−2	n−1	n	n+1	n+2	n+3	n+4	n+5	n+6
$\frac{n \cdot 100}{\bar{x}}$	Trnava												
	95,3	100,7	91,3	89,9	95,3	102,3	165,1	84,6	76,5	106,0	99,3	94,0	95,3
	Western Hungarian												
	90,6	89,0	95,1	99,9	94,8	104,5	137,5	106,1	92,2	98,0	94,6	97,8	90,6
	Southern Hungarian												
$x = \frac{\Sigma n}{12}$	102,0	84,6	90,9	97,2	100,9	99,0	134,9	105,3	86,8	97,9	99,8	100,5	102,0

Table 6. Normalized contingency table of the month of birth and month of menarche

Month of birth	Month of menarche												Total
	I.	II.	III.	IV.	V.	VI.	VII.	VIII.	IX.	X.	XI.	XII.	
I	*0,1767*	0,0767	0,0567	0,0400	0,0700	0,0666	0,0733	0,1067	0,0700	0,0700	0,0666	0,1267	1,0000
II	0,1639	*0,1219*	0,0672	0,0462	0,0420	0,0756	0,0978	0,0798	0,0841	0,0504	0,0420	0,1471	1,0000
III	0,1586	0,0939	*0,1100*	0,1035	0,0518	0,0421	0,0550	0,1327	0,0550	0,0453	0,0550	0,0971	1,0000
IV	0,1758	0,0916	0,0842	*0,0623*	0,0513	0,0623	0,0403	0,1648	0,0513	0,0733	0,0476	0,0952	1,0000
V	0,1583	0,1004	0,0618	0,0502	*0,0811*	0,0656	0,0502	0,1429	0,0618	0,0733	0,0811	0,0733	1,0000
VI	0,1570	0,0868	0,0661	0,0331	0,0289	*0,1074*	0,0744	0,0950	0,0661	0,0827	0,0785	0,1240	1,0000
VII	0,1887	0,0643	0,0683	0,0442	0,0522	0,0602	*0,1044*	0,0964	0,0643	0,0522	0,0562	0,1486	1,0000
VIII	0,1359	0,0943	0,0717	0,0415	0,0302	0,0679	0,0566	*0,1623*	0,0943	0,0604	0,0906	0,0943	1,0000
IX	0,1591	0'0691	0,0330	0,0360	0,0691	0,0871	0,0871	0,1051	*0,0991*	0,0721	0,0691	0,1141	1,0000
X	0,1862	0,0586	0,0690	0,0655	0,0310	0,0655	0,0724	0,1000	0,0828	*0,1000*	0,0966	0,0724	1,0000
XI	0,1917	0,0917	0,0583	0,0292	0,0833	0,0708	0,0458	0,1333	0,0667	0,0375	*0,1042*	0,0875	1,0000
XII	0,1727	0,0643	0,0602	0,0402	0,0683	0,1005	0,0803	0,1084	0,0442	0,0602	0,0843	*0,1165*	1,0000
Total	2,0246	1,0136	0,8065	0,5919	0,6592	0,8716	0,8196	1,4274	0,8397	0,7474	0,8718	1,2968	12,0000

Table 7. Normalized distribution of combinations of the month of birth and the month of menarche accordint to De Rudder's n-method

Months	Connection of the months of birth and menarche												
	n−6	n−5	n−4	n−3	n−2	n−1	n	n+1	n+2	n+3	n+4	n+5	n+6
I	0,0733	0,1067	0,0700	0,0700	0,0666	0,1267	0,1767	0,0767	0,0567	0,0400	0,0700	0,0666	0,0733
II	0,0798	0,0841	0,0504	0,0420	0,1471	0,1639	0,1219	0,0672	0,0462	0,0420	0,0756	0,0798	0,0798
III	0,0550	0,0453	0,0550	0,0971	0,1586	0,0939	0,1100	0,1035	0,0518	0,0421	0,0550	0,1327	0,0550
IV	0,0733	0,0476	0,0952	0,1758	0,0916	0,0842	0,0623	0,0513	0,0623	0,0403	0,1648	0,0513	0,0733
V	0,0811	0,0733	0,1583	0,1004	0,0618	0,0502	0,0811	0,0656	0,0502	0,1429	0,0618	0,0733	0,0811
VI	0,1240	0,1570	0,0868	0,0661	0,0331	0,0289	0,1074	0,0744	0,0950	0,0661	0,0827	0,0785	0,1240
VII	0,1887	0,0643	0,0683	0,0442	0,0522	0,0602	0,1044	0,0964	0,0643	0,0522	0,0562	0,1486	0,1887
VIII	0,0943	0,0717	0,0415	0,0302	0,0679	0,0566	0,1623	0,0943	0,0604	0,0906	0,0943	0,1359	0,0943
IX	0,0330	0,0360	0,0691	0,0871	0,0871	0,1051	0,0991	0,0721	0,0691	0,1141	0,1591	0,0691	0,0330
X	0,0655	0,0310	0,0655	0,0724	0,1000	0,0828	0,1000	0,0966	0,0724	0,1862	0,0586	0,0690	0,0655
XI	0,0833	0,0708	0,0458	0,1333	0,0667	0,0375	0,1042	0,0875	0,1917	0,0917	0,0583	0,0292	0,0833
XII	0,1005	0,0803	0,1084	0,0442	0,0602	0,0843	0,1165	0,1727	0,0643	0,0602	0,0402	0,0683	0,1005
Total	1,0518	0,8681	0,9143	0,9628	0,9929	0,9743	1,3459	1,0583	0,8844	0,9684	0,9766	1,0023	1,0518
Per cent	8,77	7,23	7,62	8,02	8,27	8,12	11,22	8,82	7,37	8,07	8,14	8,35	8,77

From the above enumeration it is apparent at once that a frequency greater than average can be found in the three patterns not in the same months.

Comparing the percentual values of Tables 4 and 7 with one another, we have found the greatest difference — 0,27 per cent — at column marked n—6. It also appears from the normalized contingency table that the percentual sum of column n considerably rises above the other values.

The value of the reckoned x^2 is 171, 539. The number of degrees of freedom is: $f = (r-1)\ (s-1) = 121$. The value of x^2, determined by extrapolation, lies on a 0,1 per cent level between degrees of freedom 100 and 121; therefore, the hypothesis of independence can not be rejected. The index of the interdependence of the two event-system is 0,004802. In order that an event exerts an influence on another, its value must be four orders of magnitude greater. We have to draw the consequence, therefore, that the month of menarche is not determined by the month of birth but, owing to the facts mentioned above, they cannot be considered as independent of each other, either.

The contingency coefficient is 0,0693. That refers to, as well, that statistically there cannot be demonstrated any verified connection between the two phenomena. This fact, perfectly agrees with an earlier observation of VALŠIK (1953) i. e. there is no mathematical correlation between the month of birth and that of menarche. We cannot expect, therefore, any result for interpreting this phenomenon from the calculation of correlation coefficients, either.

At the same time, we have experienced concerning the intensity of coincidence the fact referred to by VALŠIK, namely that the frequency of coincidence may be influenced to some degree by the size of the community investigated. In Table 2, we have found very similar coincidence percentages in two towns of approximately equal in size, Szeged and Pécs, while at the girls of some villages in the neighbourhood of Szeged the degree of coincidence is considerably lower. This fact is not at variance with that in case of a comparatively large town, Kecskemét, where the value of coincidence is similarly low. The inhabitants of that town belong even today to those engaged first of all in agricultural production.

Discussion

On the basis of our investigations we have established that the coincidence of the months of birth and menarche, even if showing a higher frequency than the average, cannot be verified statistically, after all, and therefore, we must look for other determinants. The statements of VALŠIK and ŠTUKOVSKÝ are greatly supported by our calculations.

In our opinion, with this phenomenon we must take into consideration, as well, that menarche is purely a biological phenomenon while the month of birth is greatly influenced by several social factora (customs, family planning separation owing to seasonal work, etc.). We mention for example that in the pattern of Trnava the most birth fall on the month of June, in the pattern of Southern Hungary, however, they fall in a very high degree on the month

of September and in the pattern of Western Hungary they fall on the month of September and March. We only wanted to illustrate with these data that the social factors cannot be disregarded when interpreting this problem.

For studying this phenomenon by any method, it would first of all be necessary to ascertain that the dates declared by the girls correspond to truth. It is, however, shown by the experiences gained so far that we may be impeded by several factors in reaching this purpose. The first task is, therefore, to eliminate this disturbing factor.

References

EIBEN, O.—BODZSÁR, É. (1970): A menarche-hónap és a születési hónap egybeesése egy nyugat-magyarországi mintában (Coincidence of the month of menarche and the month of birth in a pattern of Western Hungary). — Anthrop. Közl. *14*, 169—180.

FARKAS, GY. (1962): Az első havi vérzés (menarche) ideje Csongrád megyei leányoknál (Time of first mentsruation [menarche] of girls from Csongrád County). — Anthrop. Közl. *6*, 83—105.

FARKAS, GY. (1963) Orosházi lányok menarche-kora (Menarche-age of girls in Orosháza). — Anthrop. Közl. *7*, 129—138.

FARKAS. Gy. (1964): Das menarche-Alter der Mädchen von Südungarn. — Acta Biol. Szeged *10*, 163—176.

FARKAS, GY. (1970): Neuere Angaben zur Pubertät der tiefländischen Mädchen. — Acta Biol. Szeged *16*, 109—115.

PRÉKOPA, A. (1962) Valószínűségelmélet (Probability theory). — Budapest.

SIMELL, G. A. (1951): On Factors Influencing the Menarche Age in Finland. — Acta pediatrica *40*, Suppl. 83, 63.

VALŠIK, J. A. (1953): K otázce pohlavního dospívání brněnských dorostenek. — Leták Antropologické společnosti prosinec. 29—31.

VALŠIK, J. A.—BERNÁTOVA, L. (1964): Menarche, Berg- und Tiefland und Geschwisterzahl. — Acta F. R. N. Univ. Comen. Anthrop. *9*, 153—174.

VALŠIK, J. A.—ŠTUKOVSKÝ, R. C. (1963): Die Koinzidenz von Menarchemonat und Geburtsmonat. — Anthrop. Közl. *7*, 105—112.

VALŠIK, J. A.—ŠTUKOVSKÝ, R. C. (1964): Influence of maturation rate upon the seasonal rhytm of menarche. — Acta F. R. N. Comen. Anthrop. *9*, 147—151.

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