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Secular trend in birth length and birth weight of newborns in Hungary, 1920–1972

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Data of mature newborns of primigravidae 20 to 29 years of age were analysed. In the period 1920 to 1972 the dynamics of neonatal body length showed an increased rate of linear growth. Mean birth length increased from 50.1± 0.1 to 53.5±0.1 cm. The dynamics of birth weight did not show the same secular trend: mean birth weight increased from 3233±29 in 1928 to 3274±20 g in 1972.

Infant mortality in Hungary has been unfavourable ever since the beginning of the century. Although prenatal care has developed considerably during the past 40 years, and in 1960, 65.7%, in 1965 more than 98% of the deliveries took place in maternity hospitals, infant mortality was nevertheless 32.7 per thousand in 1972, and perinatal mortality rate reached the outstandingly high figure of 34 per thousand in 1968, while it was only 18.7 per thousand in the same year in Sweden. It is only natural that the attention of all those concerned has been focussed on the risk factors affecting foetal development and eliciting the high percentage of prematurity in Hungary. (In 1970, 10.7% of the newborns were premature in the whole country, and 11.9% in the capital, Budapest.)

We have investigated the causes of this unfavourable trend in perinatal mortality from several aspects. In this retrospective study data have been collected on the body weight and body length of newborns with the aim to show how foetal development was influenced by the living and working conditions of the mother.

Materials and Methods

The case records from the period 1920 to 1968 of the Second Department of Obstetrics and Gynaecology, Semmelweis University Medical School, Budapest (in the following: Department of Obstetrics) were studied. During that period the number of deliveries was 1100 to 2200 per year. The department being a teaching hospital, the data body for weight and length were more reliable than elsewhere. The area from which the bulk of the pregnant women originated had remained practically unchanged during the whole period of observation. Thus, the disturbing effect of heterogeneity due to migration, etc., was fairly reduced. Furthermore, the samples seem to be representative of the population (at least of the neighbouring

urban districts), as the majority of deliveries in Budapest (56.2% in 1920, 80.1% in 1928, 89.7% in 1932, 96.6% in 1938, 92.8% in 1950, and over 99% from 1955 on) took place in maternity institutions. As a result of this sampling the influence of undue differences in cultural, educational [6], sanitary [22], etc., factors on foetal development was reduced.

In studying the influence of the general economic conditions, six economically favourable and six unfavourable years were chosen for statistical analysis. Economically unfavourable years were represented by 1920, the post-war year preceded by a revolution and a counter-revolution; 1931, 1932 and 1933, the years of the great economic crisis; 1944, the last year of World War II; and 1950, economically still a post-war year. As economically favourable years, 1928, 1938, 1955, 1960, 1965 and 1968 were selected. As in 1960 the mean weight of the newborns was unexpectedly low, the analysis was extended to the material of the two economically similar years 1957 and 1958. Thus, data for 14 years including six economically unfavourable and eight favourable ones were analyzed in detail. The number of deliveries, excluding stillbirths and monsters, totalled 22 640 (Table I). These were included in a pilot analysis. Grouping was according to sex, maturity, birth order, singular or plural birth.

To eliminate the disturbing effects of maternal age, birth order, previous pregnancies, changing frequency of pre- and

TABLE I

Mean birth weight and length for single liveborn infants at the Second Department

Year	1920	1928	1931	1932	1933	1938
Total number of live-births	1661	1603	1939	2002	1866	1451
Number of mature ($\geqq$ 2501 g) newborns	1478	1503	1778	1818	1683	1339
Low-weight ($\leqq$ 2500 g) newborns — number	183	100	161	184	183	112
Low-weight ($\leqq$ 2500 g) newborns — per cent	11.02	6.24	8.30	9.19	9.81	7.72
Number of mature ($\geqq$ 2501 g) first-borns	836	769	947	976	784	796
Mean weight and mean length for all mature first-borns	3149 50.1	3236 50.4	3196 50.6	3210 50.4	3207 50.3	3268 51.8
Mean weight for all singletons	3098	3260	3199	3170	3162	3248

TABLE II

Mean weight and mean length for mature ($\geqq$ 2501 g)

(singletons, boys and

Year	1920	1928	1931	1932	1933	1938
Number of newborns	460	331	430	457	447	327
Mean weight	3137±24	3233±29	3174±25	3214±24	3235±24	3296±28
Mean length	50.1±0.1	50.3±0.1	50.5±0.1	50.5±0.1	50.6±0.1	52.0±0.1

* Gestational age could be determined from the records for the year 1972 only.

dysmaturity, etc., only the subclass of mature singletons over 2500 g birth weight*, born to primigravidae 20 to 29 years of age were included in the analysis. The newborns in these subclasses totalled 5853 (Table II, Figs 1 and 2).

Since there was no substantial change in the sex ratio of the newborns in the years under study and both weight and length of the two sexes changed similarly, their data have been pooled. To establish the effect of the mother's socio-economic condition, two groups were set up for each year: one of manual workers (Group A) and one of intellectual workers (Group B). The former included women working in factories, printing works and kitchens, further instrument makers, packers, etc., while the latter consisted of teachers, clerks, officials, doctors, laboratory technicians, engineers, newspaper reporters, etc.

Housewives were classified according to the husband's occupation.

The number of agricultural workers, servants, etc., was negligible, so these have not been included in the groups (Table III, Figs 3a and 3b).

For the year 1972 it was possible to study the case records of the Department of Obstetrics from the aspect of maturity according to birth weight and gestational age as well.

In 1972, a parallel nation-wide survey on the effect of anti-D IgG prophylaxis of Rh_0(D)-negative pregnant women organized by one of us (I. S.) has provided opportunity to process data of the babies mature according to gestational age (39—40—41

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1944	1950	1955	1957	1958	1960	1965	1968	Total
1570	2152	2212	1096	1364	1109	1195	1420	22640
1436	1956	2022	1005	1228	977	1051	1278	20552
134	196	190	91	136	132	144	142	2088
8.54	9.11	8.59	8.30	9.97	11.90	12.05	10.00	9.22
819	1097	1051	557	687	584	690	808	11401
3214	3202	3238	3265	3242	3209	3254	3322	—
52.4	53.3	52.8	52.3	52.8	53.1	53.4	53.1	—
3197	3156	3218	3241	3158	3099	3131	3201	—

newborns, born to primigravidae 20 to 29 years of age

girls together)

1944	1950	1955	1957	1958	1960	1965	1968	Total
363	562	608	338	368	311	401	450	5853
3198±30	3213±24	3251±23	3283±31	3250±30	3193±32	3284±31	3316±28	
52.5±0.1	53.4±0.1	52.8±0.1	52.4±0.2	53.0±0.2	53.1±0.2	53.6±0.2	52.9±0.1	

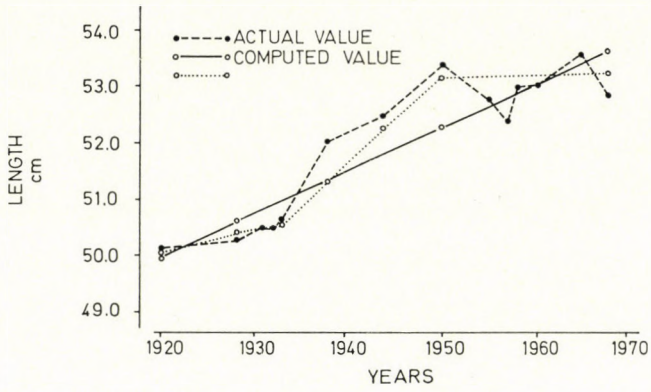

FIG. 1. Mean length of mature ($\geqq$ 2501 g) singletons born to primigravidae 20—29 years of age. (Boys and girls together)

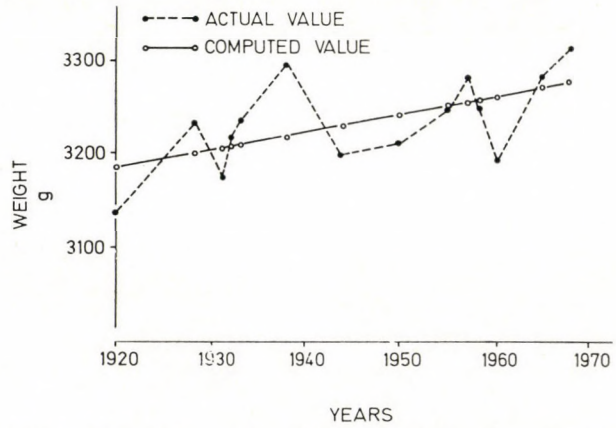

FIG. 2. Mean birth weight of mature ($\geqq$ 2501 g) singletons born to primigravidae 20—29 years of age. (Boys and girls together)

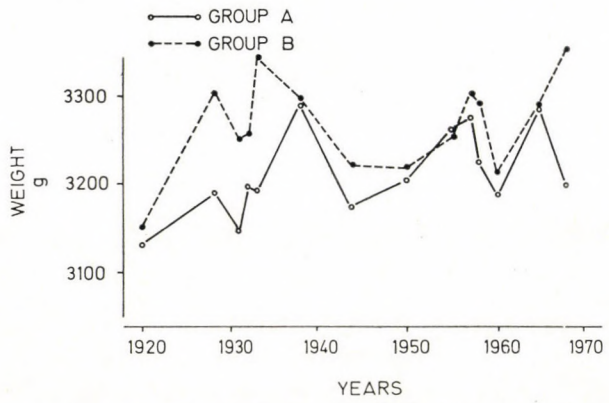

FIG. 3a. Socio-economical status of primigravidae 20 to 29 years of age, and mean weight of their mature ($\geqq$ 2501 g) singletons. (Boys and girls together)

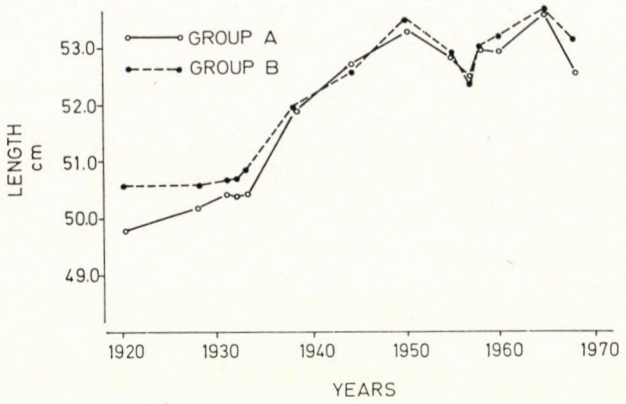

FIG. 3b. Socio-economical status of primigravidae 20—29 years of age, and mean length of their mature (≧ 2501 g) singletons. (Boys and girls together)

weeks) born to 20—29-year-old primigravidae, who have been given anti-D IgG. Thus, we could establish how far the body size of neonates delivered at the Department of Obstetrics represents that of babies delivered at other institutions in Budapest and Hungary (Table VI).

RESULTS

1. Of the 5853 newborns under study (Table II), 2719 were born in the six economically unfavourable years and 3134 in the eight favourable years. The grand average birth weights were 3196 ± 10 g and $3275 \pm \pm 9$ g, respectively. The pooled difference in birth weight was highly significant statistically ($t = 5.8$, $p < 0.001$).

2. In each year except 1955, mean birth weight for the socio-economic group A (manual workers) was lower than for group B (intellectuals). For the years selected from the period 1920—1944, the mean weights were 3181 ± 8 and 3259 ± 12 g, respectively: the difference was highly significant: $t = 5.49$, $p < 0.001$. From 1950 on, the difference tends to be ambiguous though still significant for the period, the corresponding values being 3234 ± 14 g and 3280 ± 10 g ($t = 2.6$, $p < 0.01$) (Table III, Fig. 3a). For the babies born to primigravidae 20 to 24 years of age in the latter period, the difference was very slight and not significant statistically ($3230 \pm \pm 17$ g and 3262 ± 13 g, $t = 1.6$).

3. Analysis of the data for body length pointed to an increased rate of linear growth. Table II shows that mean birth length fluctuated in a very narrow range (between $50.1 \pm \pm 0.1$ and 50.6 ± 0.1 cm) in the period 1920 to 1933. After the mid-thirties, a substantial rise was, however, observable. This was most pronounced between 1933 and 1950, while mean birth length increased steadily from 50.6 ± 0.1 cm to 53.4 ± 0.1 cm (dotted line in Fig. 1). For the subsequent years, birth length seems to have stabilized around the 1950 level (extreme values: 52.4 and 53.6 cm).

TABLE III

Socio-economical status of primigravidae 20 to 29 years of age and mean weight and mean length for their mature ($\geq$ 2501 g) single liveborn infants (boys and girls together)

	Year	1920	1928	1931	1932	1933	1938	1944
Group A, manual workers	Number of newborns	307	202	312	327	320	157	173
	Mean weight	3132±18	3189±24	3146±17	3196±19	3192±17	3289±25	3174±25
	Mean length	49.8±0.1	59.2±0.1	50.4±0.1	50.4±0.1	50.4±0.1	51.9±0.1	52.7±0.2
Group B, intellectual workers	Number of newborns	142	128	117	122	127	170	190
	Mean weight	3151±30	3304±34	3252±31	3257±35	3344±31	3298±30	3222±30
	Mean length	50.6±0.2	50.6±0.2	50.7±0.2	50.7±0.2	50.9±0.2	52.0±0.2	52.6±0.2

	Year	1950	1955	1957	1958	1960	1965	1968
Group A, manual workers	Number of newborns	300	211	122	123	101	145	112
	Mean weight	3205±19	3262±26	3277±30	3224±30	3188±33	3287±31	3200±30
	Mean length	53.3±0.1	52.8±0.1	52.5±0.2	53.0±0.2	52.9±0.2	53.6±0.2	52.5±0.1
Group B, intellectual workers	Number of newborns	250	338	164	182	163	240	331
	Mean weight	3219±26	3257±22	3304±30	3293±29	3216±32	3291±30	3354±29
	Mean length	53.5±0.1	52.9±0.1	52.4±0.2	53.0±0.2	53.2±0.2	53.6±0.1	53.1±0.1

TABLE IV

Mean birth weight and birth length reported in different countries

Year	Hungary[1] Mature first-borns		Germany				Soviet Union[5]	
	weight, g	length, cm	weight, g	length, cm	weight, g	length, cm	weight, g	length, cm
1920	3149	50.1						
1930	1928 3236	1928 50.4	1932—35[2] 3400	1932—35[2] 51.5				
1935	1933 3207	1933 50.3						
1940	1938 3268	1938 51.8				1942—43[4] 53.5 (boys) 52.5 (girls) (first-born)		
1945	1944 3214	1944 52.4						
1950	3202	53.3						
1955	3238	52.8	1955—57[3] 3493	1955—57[3] 51.8			1956 3494 (boys) 3348 (girls)	1956 50.8 (boys) 50.2 (girls)
1960	3209	53.1	1959/60[3] 3410	1959/60[3] 52.4				
1965	3254	53.4	1964/65[3] 3425	1964/65[3] 53.5			1963/64 3518 (boys) 3418 (girls)	1963/64 51.6 (boys) 51.0 (girls)

[1] SIMONOVITS et al. [19], Budapest, Table I
[2] WAHL, 1937 [21], Cologne
[3] OSTER, 1966 [17], Nuremberg
[4] BICKENBACH [4], Göttingen
[5] KOGAN, 1969 [12], Moscow

Approximating the trend of the whole observation period by linear regression, the computations yielded $Y_{(cm)} = 49.9 + 0.08\, x_{(yr)}$. This means that mean length increased by 0.8 mm/year (Fig. 1). Even in this crude approximation by an overall linear trend, 85% of the variance proved to be due to linear regression and only 15% of it to deviation from linearity. The about-the-regression-line variance (s^2) of the points was 4.27.

The distinct Z-shape of the line allowed to fit the data to three distinct straight lines (dotted line in Fig. 1). The computations performed accordingly yielded 1.97 for s^2 instead of the former 4.27.

4. The dynamics of mean birth weight is shown in Table II and Fig. 2. The overall tendency seems to suggest a slight increase. The pronounced zig-zag shape of the line, however, differs from the monotonous tendency found for the length data. Obviously, regression analysis yielded a rather flat slope, viz. $Y_{(g)} = 3180 + 2\, x_{(yr)}$. In addition, only 40% of the variance could be ascribed to linear regression, leaving 60% for deviation.

5. Table VI illustrates that mean weight and body length of babies mature according to birth weight, born at the Department of Obstetrics to 20 to 29-year-old primigravidae in 1972, are in good agreement with the data of babies mature according to gestational age (39—40—41 weeks) delivered at the same Department. The results were compared to the data of 452 babies delivered in other maternity hospitals of Budapest, and with those of 1756 neonates delivered in other maternity hospitals of Hungary. Both groups consisted of babies mature according to gestational age, and selected at random. Table VI shows that the sample of the Department of Obstetrics may be regarded as valid for the whole of Hungary.

Discussion

The question whether foetal development is influenced by the pregnant mother's life and working conditions and her nutrition has unequivocally been answered by the severe trials during World War I and especially World War II, and the privations during peacetime [1, 2, 3, 5, 7, 8, 9, 13, 14, 20]. It has repeatedly been shown that if the privations during pregnancy exceed a certain level, the foetus will be retarded in weight and in this process the main factor is starvation or deficient nutrition in both peace and wartime. In the investigations referred to, low birth weight was mainly used as the indicator of retardation.

The present study, extending over nearly half a century, seems to reveal that intrauterine development is considerably influenced even by minor changes in the life and working conditions of the pregnant mother. Foetal weight is affected not only by the severe privations during wartime [1, 20]. Even in economically favourable years (1955, 1965, 1968), differences were observed between the

TABLE V

Mean caloric and protein intake in Hungary* and Sweden
(Mean per person)

		Means for		1955/56	1960/61	1965/66	1969/70
		1934—38	1948/49 1950/51				
Hungary	Calories/day	2805	2839	3115	3024	3055	3194
	Animal protein g/day	29	30	28	37.3	37.9	43.4
Sweden	Calories/day	3120	3110	3030	2925	2942	2750
	Animal protein g/day	59	52	56	53.9	53.6	54.8

* Report No. 257 of the Central Statistical Office, Budapest 1972.

TABLE VI

Body size of neonates mature according to gestational age (39 to 41 weeks) and according to birth weight ($\geq$ 2501 g) born in 1972 to 20 to 29-year-old primigravidae

Maturity and birth place	Number	Neonates of manual and intellectual workers	
		Body weight, g	Body length, cm
Mature, birth weight 2nd Dept. Obstetrics, Budapest	398	3274±20	53.5±0.1
Mature, gestational age 2nd Dept. Obstetrics, Budapest	438	3304±20	53.5±0.1
Mature, gestational age Budapest obstetrical institutions other than 2nd Dept. Obstetrics	452	3285±16	53.8±0.2
Mature, gestational age Born in the country excluding Budapest	1756	3256±13	52.4±0.1
Total	3044		

newborns of parents in groups A and B, of approximately the same income.

Data are scarce concerning the mother's life and working conditions on the longitudinal growth of the foetus, as even this may be retarded by unfavourable conditions [5, 13, 16, 20].

Papers concerning the question of an acceleration of intrauterine development are also scarce. Wahl [21], in a retrospective analysis of the records for 5901 mature babies born in the Cologne Obstetric Hospital in the years 1932 to 1935, found a mean birth length of 51.47 cm and a mean birth weight of 3404 g. Subsequently, similar data have been published by a number of authors [11, 12, 17, 18, 19] who refer to this increased rate of linear growth as "intrauterine acceleration".

Taking into consideration these data (Table IV), it is remarkable that the secular change, first of all its manifestation in birth length, was observed in different countries in different periods of time. As mentioned above, WAHL [21] observed in Cologne an increase in both length and weight as early as in the period 1932—1935. According to our preliminary data [19], in Budapest an acceleration was first perceptible in 1938, mean body length for mature live-born babies having been 50.3 cm in 1933 and 51.8 cm in 1938. BICKENBACH [4] reported a mean birth length of 52.5 cm and 53.5 cm for girls and boys, respectively, born in Göttingen in 1942—1943. Figures suggestive of an increased rate of intrauterine growth in both length and weight were observed in Nuremberg in 1955—1957 [17], and in Moscow in 1963—1964 [12].

An attempt was made to analyze the interdependence of birth weight and birth length. WAHL [21] found a length per weight ratio of 51.5 cm/3400 g while the usual quotient quoted in textbooks is 50.0 cm/3250 g. A similar tendency was noted by OSTER [17] and KOGAN [12] (Table IV).

On the other hand, our own data yielded the unexpected information that the two parameters are in a loose interrelation, both with each other and with the socio-economic status of the parents. We have emphasized this fact in an earlier study [19] based on the measurements of 22 640 newborns (Table I). The phenomenon has been confirmed by our present data for the newborns of a more homogeneous group of mothers (primigravidae, 20—29 years of age). Accordingly, the bulk of the increase in length (from 50.6 to 53.4 cm) occurred in the period 1933 to 1950, just when the population of Hungary was afflicted by World War II and burdened by the costs of the subsequent reconstitution. In the same period, mean birth weight remained at an approximately constant level (see Table II).

A further proof of the difference between the dynamics of weight and length was obtained by studying the secular change in weight–length relation. Mean length for all the newborns weighing 3000 to 3050 g born to primigravidae was computed and plotted (Fig. 4). The curve thus obtained exhibited a striking similarity to that in Fig. 1.

As to the cause of weight retardation, data in the literature as well as our own investigations pointed to the main role of nutritional deficiency. In this respect, only data for the country as a whole are available (Table VI). These show that in the last two decades nutrition has been constantly improving both in caloric value and in quality and has attained a satisfactory level. Thus, the less intensive rise in weight cannot be attributed to an insufficient nutrition.

With respect to weight, the year 1960 was an unexpected exception. Though it was economically favourable, mean birth weight in 1960 was less than in all the other observed

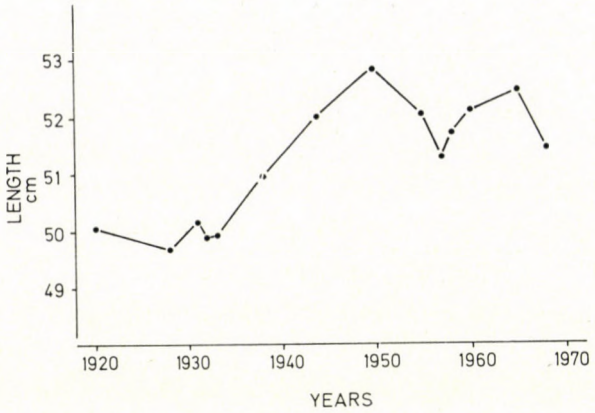

FIG. 4. Mean length of singletons 3000 to 3050 g in weight (boys and girls together)

years but 1931 and 1944. No explanation could be found for this aberrant figure. Nutritional factors could be excluded, as the average caloric intake was 3024 cal/person/day, and meat consumption, 47.8 kg/person/year.

GRIFFITH et al. [10] have ascribed an embryopathic effect to influenza epidemics. Early in 1960, Hungary experienced a wide-spread influenza A_2 epidemic. During the epidemic period, more than 1 million cases were notified (more than 10% of the population). However, even larger epidemics caused by the same virus occurred in 1965 and 1968 without being followed by any decrease in birth weight. In respect to length, 1957 was a rather similar, though less aberrant year.

In connection with our results the reliability of the methods used for length measurement is to be closely examined. In other words, is it permissible to regard data for such a long period reliable and suitable for comparison?

It is always difficult to estimate the newborn's length. More recently ZHELOKHOVTSEVA [23] has questioned the reliability and comparability of the methods used in different countries for estimating the degree of development of newborns, especially of those of length measurement.

To support our belief that the observed increase in birth length was real and not a sham effect of systematic errors in measuring the babies, the following must be emphasized.

1. All the data originated from the same institution, where in the last 40 years the newborns have been measured by skilled midwives using the same method: the newborns were laid on the side, duly stretched and measured with a tape from the nodule on the back of the head to the nodule on the heels.

2. The samples were acceptably homogeneous as shown under Materials and Methods.

3. The increase in length of the newborns in Hungary is supported

by the preliminary results of our current nation-wide study (Table VI).

Summing up, the results of the present study emphasize the important influence on foetal development of the life and working conditions of the mother.

The data for the mature (over 2500 g birth weight) newborns of primigravidae 20 to 29 years of age were analyzed in detail.

1. An increased rate of linear growth was suggested by the dynamics of neonatal body length. In the period of observation, mean birth length increased from 50.1 ± 0.1 to 53.5 ± 0.1 cm. The dynamics of birth weight did not show the same kind of secular trend.

2. Mean birth weight for the 3134 newborns in eight economically favourable years was 3275 ± 9 g; that for the 2719 newborns in six economically unfavourable years was 3196 ± 10 g ($t = 5.8$, $p < 0.001$).

3. The results show that even minor changes in the living conditions and cultural status of pregnant women are reflected in foetal weight: babies born to mothers classified as manual workers were up to 1944 lighter and subsequently less light than those born to intellectual workers. Since 1950, the difference tends to be ambiguous.

4. Preliminary analysis of the 1972 case records of the Department of Obstetrics shows that the observed changes in body size of the babies mature according to birth weight are in good agreement with those of babies mature according to gestational age (39—40—41 weeks). Furthermore, the data concur with the body size of babies selected at random and mature according to gestational age and born at other maternity institutions of Budapest. The same trend was found in the changes of body size of babies born in all the other institutions of Hungary.

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References

1. Antonov, A. N.: Children born during the siege of Leningrad in 1942. J. Pediat. **30,** 250 (1947).
2. Baird, D., Thomson, A. M.: Background to the perinatal mortality survey. In: Perinatal Problems. Livingstone, Edinburgh 1969, pp. 1—15.
3. Baird, D., Thomson, A. M.: The effects of obstetric and environmental factors on perinatal mortality by clinico-pathological causes. In: Perinatal Problems, Livingstone, Edinburgh 1969, pp. 211.
4. Bickenbach, cit. Oster [17], p. 102.
5. Dávid, M.: Über Kriegsneugeborene. Zbl. Gynäk. **20,** 795 (1922).
6. Donelly, J. F.: Etiology of prematurity. Clin. Obset. Gynec. **7,** 647 (1964).
7. Duncan, E. H. L., Baird, D., Thomson, S. M.: The causes and prevention of stillbirth and first week death. Part I. J. Obstet. Gynec. Brit. Emp. **59,** 183 (1952).
8. Gerschenson, A. O.: Zur Frage des Einflusses einiger Faktoren auf das Gewicht der Neugeborenen. Z. Kinderheilk. **51,** 20 (1931).
9. Gibson, J. R., McKeown, Tl.: Observations on all births (23,970) in Birmingham, 1947. V. Birth weight related to economics. Brit. J. soc. Med. **5,** 259 (1951).

10. Griffith, G. M., Adelstein, A. M., Lambert, P. M., Weatherall, J. A. C.: Influenza and infant mortality. Brit. med. J. **3,** 553 (1972).
11. Kirchhof, H.: Die Akzeleration des Neugeborenen. Geburtsh. u. Frauenheilk. **27,** 565 (1967).
12. Kogan, R. B., Коган, Р. Б.: К вопросу оценки высокого уровня физического развития детей раннего возраста. Здрав. Росс. Фед. **13,** 29 (1969).
13. Kontsek, B.: Körpermaße und Proportionen Neugeborener. Anthropol. Anz. **17,** 103 (1940).
14. McKeown, T., Record, R. G.: Influence of prenatal environment on correlation between birth weight and perinatal weight. Amer. J. hum. Genet. **6,** 457 (1954).
15. Naeye, R. I., Diener, M. M., Dellinger, W. S., Blanc, W. A.: Urban poverty: effects on prenatal nutrition. Science **166,** 1026 (1969).
16. Naeye, R. L., Diener, M. M., Harcke, H. T., Blanc, W. A.: Relation of poverty and race to birth weight and organ and cell structure in the newborn. Pediat. Res. **5,** 17 (1971).
17. Oster, H.: Hat sich die Körperlänge der Neugeborenen in dem vergangenen Jahrzehnt verändert? Gesundheitsfürsorge **16,** 102 (1966).
18. Sälzler, A.: Vergleichende Messungen von Länge und Gewicht bei Kindern aus Familien und Kindereinrichtungen und der Einfluß der sozialen Herkunft auf die körperliche Entwicklung. Z. ärztl. Fortbild. **53,** 1430 (1959).
19. Simonovits, I., Csobánczi, Gy., Böröcz, I.: Der Entwicklungszustand der Neugeborenen und einige die intrauterine Entwicklung beeinflussende Faktoren. Vorträge der II. Ungarischen Biometrischen Konferenz 1968. Akadémiai Kiadó, Budapest 1970, pp. 192—200.
20. Smith, C. A.: Effects of maternal undernutrition upon the newborn infants in Holland in 1944—45. J. Pediat. **30,** 229 (1947).
21. Wahl, F. A.: Sind die Kinder größer und dauert die Schwangerschaft länger als früher? Dtsch. med. Wschr. **65,** 769 (1937).
22. Wiener, G., Hilton, T.: Demographic correlates of low birth weight. Amer. J. Epidem. **91,** 260 (1970).
23. Zhelokhovtseva, I. N.: About the method of studying problems of acceleration in groups of newborn babies. Santé publ. (Buc.) **14,** 145 (1971).

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