

PROGNOSTIC METHOD FOR THE DETERMINATION OF THE MENARCHE-AGE

GY. L. FARKAS

*Department of Anthropology, Attila József University
H—6701 Szeged, P.O.B. 660. Hungary*

(Received: October 15, 1986)

Abstract

A report is given of a procedure by which the time of the first menstruation (menarche) can be prognosticated with the help of the so-called predictive additive method. Such factors are taken into account by the method that are easily recognizable in primary school practice. The procedure is considered valid in case of the Hungarian girls, nevertheless on its basis, a similar prognostic possibility can be elaborated in respect to other ethnic groups.

Key words: prognosis of menarche, predictive additive method

Introduction

One of the most authentic indicators of the puberty of girls is the first menstruation, or menarche. This phenomenon has been studied in numerous countries from several viewpoints. However, no example can be found in the international literature in respect to the accomplishment of a simultaneous multiple data collection in the case of a high number of girls belonging to the same population.

This recognition prompted us to organise a large-scale data collection in Hungary in 1981 to attempt the characterization of the relationships detectable between partly the biological, partly the social factors and the menarche (FARKAS et al. 1983). The partial results have already been reported on several occasions (FARKAS, 1982, 1985; FARKAS et al. 1983, 1983a, 1985; FARKAS and NAGY, 1981, FARKAS and SZEKERES, 1982, 1982a; FARKAS and TAKÁCS, 1986) and are presently under publication, resp. (FARKAS, in press 1, 2; FAZEKAS et al. 1983).

Our aim was to provide concrete help to the sexual-hygienic educational work in primary schools.

Material and method

The data collected by means of questionnaires were evaluated by R-55 type computer following uniform coding. Since our sample is based on the data of girls living at various regions of the country — but firstly in county Csongrád — it is found suitable for making generalization on its basis in regard to the Hungarian girls. Our sample involves approximately 30 thousand girls.

As the final outcome of the evaluation, a so-called additive predictive model was elaborated with the help of which it is possible to prognosticate, the age at which the first menstruation takes place in case of a given girl.

The basis of the method is as follows:

Relationship can be concluded between the time of the first menstruation of the girls and the factors studied by us (e.g. the size of the settlement where the girl lives, her order of birth, number of sibs, school achievements, occupation and educational level of parents, etc.). The connection can be characterized numerically; namely, if it promotes puberty, this correlation value is negative, if it retards, the value is positive.

Table 1. Coefficients applicable for the estimation of the absolute menarche-age according to the girl's domicile, year of birth and the father's occupation

Girl's county of domicile	Coefficient
Baranya	0.036
Bács-Kiskun	-0.076
Békés	0.075
Borsod-Abaúj-Zemplén	0.029
Csongrád	-0.008
Héves	-0.156
Komárom	-0.110
Nógrád	0.261
Pest	0.172
Somogy	-0.081
Szabolcs	0.006
Szolnok	-0.213

Girl's year of birth	Coefficient
1963	0.623
1964	0.495
1965	0.429
1966	0.287
1967	0.155
1968	-0.039
1969	-0.274
1970	-0.708
1971	-1.222
1972	-1.808

Occupation of father	Coefficient
Industrial manual worker	0.030
Agricultural manual worker	0.044
Manual worker in other sphere	0.012
Intellectual (education of higher grade)	-0.026
Intellectual (secondary education)	0.016
Pensioner	0.044
Deceased	0.056
Other	0.092

On the other hand, in knowledge of the precise data of a girl's birth and her first menstruation, her absolute menarche-age can be calculated, i.e. the difference between her dates of birth and menarche. This age was determined in the case of approximately 20 thousand girls and since the calculation was performed on the basis of the decimal table (FARKAS et al., 1983), its arithmetic mean was also determinable. This is called the main-average of menarche of the population, which is 12.534 years in case of our sample.

If we wish to estimate the probable time of the first menstruation in case of a girl not menstruating yet, this can be achieved by the following formula, with the application of the predictor coefficients shown in Tables 1.—3.:

$y = \bar{y} +$ the coefficients of the appropriate predictors, where y = the estimated menarche-age, \bar{y} = the main-average of menarche of the population.

Results

Let us assume that a girl's domicile is county Csongrád, she was born in 1967, her father is an agricultural manual worker, her mother is an industrial manual worker, the mother was 25 years old when her girl was born, the girl's hair-colour is

Table 2. Coefficients applicable for the estimation of the absolute menarche-age according to mother's occupation, age and the girl's hair colour

Occupation of mother	Coefficient
Industrial manual worker	0.030
Agricultural manual worker	-0.022
Manual worker in other sphere	0.027
Intellectual (education of higher grade)	0.027
Intellectual (secondary education)	-0.025
Pensioner	0.051
Deceased	-0.051
Housewife	0.109

Mother's age at time of girl's birth years	Coefficient
15-19 years	-0.058
20-24 years	0.021
25-29 years	0.068
30-34 years	0.042
35-39 years	-0.030
40-44 years	-0.012
45-49 years	0.077

Girl's hair colour	Coefficient
Light blonde	-0.156
Blonde	0.052
Dark blonde	0.013
Brown	0.025
Dark brown—black	0.010
Red	-0.079

brown, 69 air kilometres is the distance between the place of birth of the parents, the size of the domicile of the girl is under 5 thousand inhabitants, she has two living sisters and one living brother, and she was born fourth. Using the above formula as the appropriate coefficients of Tables 1.—3., her menarche-age would be the following: $y = 12.534 - 0.008 + 0.155 + 0.044 + 0.030 + 0.068 + 0.025 + 0.046 - 0.083 + 0.114 + 0.024 - 0.024 = 12.925$ years.

According to our estimation the first menstruation of the girl in question should have taken place at the age of 12.925. Our example is related to a concrete girl, who was born on 6th November, 1967 and the date of her first menstruation was 9th January, 1981. On the basis of the decimal table, her absolute menarche-age was at 13.175 years, i.e. 0.25 years — quasi four months — later than estimated by means of our method.

Studying the formula in the case of 100, absolutely randomly selected, already menstruating girls, a deviation of 0.2546 years was found between the empiric and estimated menarche-age, i.e. the occurrence of the menarche was averagely estimated later.

The individual comparison of the empiric and estimated menarche-age showed deviation between the two values mainly in the case of girls reaching maturity at very early or very late age. With the method, besides 95% probability level, 51% of the real menarche time fell below the confidence interval of the estimated menarche time (estimation to earlier date), 34% fell into the interval and 15% above the upper limit value (estimation to a later date). This means that with the method, with 95% probability, the menarche-age can be estimated to an earlier, or to the same time in 85%, and to a later time in 15% of the cases as compared to the actual occurrence of the menarche-age.

Discussion

It might seem as if the method can only be applied with fairly great error. It is a fact, however, that the genetically defined time of the menarche may considerably be modified by environmental factors; among these, mainly by the social ones, and this also influences the accuracy of our estimation.

The demonstration of the method did not have the purpose of giving an infallible solution to the estimation of the menarche-age, since based on the above mentioned things it seems to be impossible — at least for the time being. Our primary aim was to demonstrate that in the possession of appropriate information the opportunity presents itself to obtain a fairly exact approach to the time of occurrence of the menarche, as an indicator of puberty. Nevertheless, it should be emphasized that the application of this model in cases of another (not Hungarian) population is possible only if the correlation values characteristic to the given population are at disposal, based on similar surveying.

Table 3. Coefficients applicable for the estimation of the absolute menarche-age according to the air-distance of the place of birth of parents, size of girl's domicile, number of living brothers and sisters, and order of birth

Air-distance of parent's place of birth		Coefficient	
0 km			0.024
1— 25 km			0.015
26— 50 km			0.023
51—100 km			0.046
101—200 km			-0.023
201—440 km			0.040

Size of girl's domicile		Coefficient	
100.000—200.000			-0.320
50.000—100.000			-0.077
10.000— 50.000			-0.106
5.000— 10.000			-0.071
below 5000			-0.083

Number of living sisters		Coefficient		Number of living brothers		Coefficient	
0		-0.032		0		-0.048	
1		0.049		1		0.024	
2		0.114		2		0.051	
3		0.098		3		0.104	
4		0.213		4		-0.001	

Girl's order of birth		Coefficient	
1			-0.006
2			0.064
3			-0.036
4			-0.024

References

- FARKAS, GY. (1982): On social and natural factors exerting influence on maturation of girls. — *Anthrop. Közl.* 26, 135-139.
- FARKAS, GY. (1985): A leányok serdülését befolyásoló tényezők ismeretének jelentősége a szexuális nevelésben (Significance of knowledge on the factors influencing the puberty of girls in sexual education. In Hungarian.) — *Módszertani Közl.* 25, 227-235.
- FARKAS, GY. (in the press 1.): Die Größe des Menarche-Medians und die Zusammenhänge mit endogenen und exogenen Faktoren in Ungarn. — *Ärztl. Jugendkde.*

- FARKAS, Gy. (in the press 2.): Relationship between the different factors and menarche-age in Hungary. — *Anthrop. Közl.*
- FARKAS, Gy., FAZEKAS, A. and SZEKERES, E. (1983): The fluoride content of drinking water and the menarcheal age. — *Acta Biol. Szeged.* 29, 159-167.
- FARKAS, Gy., HUNYA, P., HERENDI I. and SZEKERES, E. (1983a): Studies on the menarcheal age of the girls of county Csongrád (Southern Hungary). — *Acta Biol. Szeged.* 29, 169-178.
- FARKAS, Gy., HUNYA, P. and SZEKERES, E. (1985): Relationship of the menarcheal age of city girls with socio-economic factors. — *Acta Biol. Szeged.* 31, 183-190.
- FARKAS, Gy. and NAGY, J. (1981): Über das Menarchealter von Mädchen aus Komárom. — *Acta Biol. Szeged.* 27, 223-227.
- FARKAS, Gy. and SZEKERES, E. (1982): On the puberty of girls in Szeged, Hungary. — *Acta Biol. Szeged.* 28, 155-165.
- FARKAS, Gy. and SZEKERES, E. (1982a): Eine vergleichende Untersuchung der körperlichen Entwicklung und der körperlichen Reifung von Mädchen aus Szeged (Ungarn). — *Humanbiol. Budapest.* 12, 237-243.
- FARKAS, Gy. and TAKÁCS, T. (1986): Comparison of somatic characters in menstruating and not menstruating girls. — *Acta Biol. Szeged.* 32, 183-189.
- FAZEKAS, A., FARKAS, Gy., SZEKERES, E. and KOCSIS, S.G. (1983): A gyermekek testi fejlettsége különböző fluorid koncentrációjú ivóvizű településeken (The somatic development of children consuming drinkwater with different fluoride concentrations in two Hungarian settlements). — *Anthrop. Közl.* 27, 119-127.