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A Comparative Analysis of Selected Demographic Parameters for Evaluating Parity of Women in Poland, Spain, England and Wales for the Period 1996–2011

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A – research concept and design; B – collection and/or assembly of data; C – data analysis and interpretation;
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Abstract

Background. The Central Statistical Offices in Europe indicate an increase of women's parity age and extramarital births.

Objectives. The aim of this study was to analyze the chosen demographics of parity in European countries of Poland, Spain, England and Wales in 1996–2011.

Material and Methods. Statistical packet: women's average age at the time of their first and subsequent births, newborns' average body weight in relation to the age of mother; live marital and extramarital births. The age of mothers giving birth to their first and subsequent children in 1998–2011 in all of the researched countries is presented, and next compared in 1999, 2005 and 2011. An analysis of the births of children in marital and extramarital relationships as well as the body weight of live newborns is presented in detail in 1996–2006, and next in 6 year periods: 1999, 2005 and 2011.

Results. The average age of the mother giving birth to her first baby in 1996–2011 oscillates around: 26–27 years in England and Wales, 28–30 years in Spain and 23–26 years in Poland. In Poland, the highest average children's body weight, 3394 g, was achieved by children born by mothers at the age of 25–29. In Spain, however, at the mothers' age of 20–24, it was 3317 g. In England and Wales, at 30–34 years, it was 3262 g. The number of extramarital births in comparison to marital births is increasing. England and Wales has the lowest percentage of marital births, whereas Poland, the highest. In Spain, England and Wales we can observe an increase of extramarital births, while in Poland this number is stable at around 21.3%.

Conclusions. The age of women having their first baby, the parity of later children, and extramarital births are increasing. In Poland, infant body weight is significantly bigger than in Spain, England and Wales (*Adv Clin Exp Med* 2016, 25, 3, 551–560).

Key words: fertility, parity, birth intervals.

Monitoring the development of the fertility rate around the world has historically been an important means of forecasting the growth rate of future generations. It has also been instrumental in observing the evolution of family models.

One can currently observe numerous changes in the functioning of traditional family models. There is a definite upward trend in parity among unmarried couples. The decision to marry is also being made later than was the case among previous generations. These trends can be understood

as the result of changing social needs. The ongoing process of parity fluctuations is unusually interesting and dynamic. These changes, in turn, bring about new consequences unknown to older generations [1–8]. New patterns in social behavior also always give rise to new questions.

The 1960s in Europe was a period of dynamic development and change in family models. The number of children in families changed as did the age at which women decided to have their first child. Today's parents are increasingly deciding

to enter into informal partnerships. The opening of borders after the fall of communism in Europe prompted a significant increase in the number of people deciding to emigrate or to leave for short term periods for reasons of financial gain [9].

This study will look at changes in selected parameters regarding fertility rates in several European countries: Poland, Spain, England and Wales. We have observed an interesting dependence between the countries under comparison regarding the development of life under democracy, access to education and financial affluence. In Poland, access to these processes began with its entry into the European Union, whereas in Spain the same processes began earlier. Changes in family structure developed at different rates in each of the countries in this study. Certainly an important factor in social migration is the desire to improve one's quality of life. We can observe that access to a better education and a wider job market and professional advancement within the countries of the European Union decidedly influenced dynamic changes in the family model.

The selection of countries studies by the authors is justified by the following reasons. To start with, Poland and Spain are connected by many common features that stem from the similarities in historic context as well as cultural, political, social, demographic and geopolitical factors. England has been selected due to the fact that it creates an interesting contrast to the other countries. In comparison to Poland and Spain, England was relatively untouched by political and social instability in the time period. Statistics were retrieved from the Central Statistical Offices in the respective countries. The information obtained for England and Wales were calculated and presented integrally. Northern Ireland and Scotland were not taken into account by the authors as these countries have separate Central Statistical Offices. Moreover, the statistics covering England and Wales accounted for the majority of the population participating in the study.

The aim of the study was to analyze the chosen demographic indicators of the process of parity in the European countries of Poland, Spain, England and Wales in 1996–2011.

Material and Methods

Our research materials consisted of statistic data collected during the period 1996–2011:

- The Polish Central Statistics Agency – GUS [10],
- The Spanish Central Statistics Agency [11],
- The British Central Statistics Agency [12].

We carried out a statistical analysis of selected demographic indicators in Poland, Spain, England and Wales. The indicators analyzed in this study are:

1. The average age of women at the time of their first birth and subsequent births.
2. The average body weight of newborns relative to the age of their mother.
3. The rate of live births born to married couples and to informal partnerships.

The age at which women bore their first children and then subsequent children were analyzed for the entire period of 1998–2011, and then comparatively in six-year intervals for the years 1999, 2005 and 2011.

The number of children born to married couples and to informal partnerships as well as the analysis of body mass of live born infants is presented for the years 1996–2006, and then comparatively in six-year intervals for the years 1999, 2005 and 2011.

Statistical Methods

The collected statistical demographic data was analyzed using the STASTICA package, which consists of:

1. A calculation of basic statistics for quantitative variables (averages, standard deviations, medians, upper and lower quartiles); because the analyzed material was available in the form of frequency distribution, in making our calculations we applied the weighted average, where the scales were the cardinalities of each particular age category.
2. Verification of the hypotheses of normal distribution of quantitative variables applying the Kolomogorov-Smirnov test (for level of significance $\alpha = 0.05$);
3. A comparison of average values of quantitative traits for more than two groups using analysis of variance and in the case of rejection of the null hypothesis of equality of mean values (level $p < 0.05$) – carrying out the tests *post-hoc* (Tukey's test and Tukey's HSD Honestly Significant Difference) in pairs;
4. Correlation analysis of quantitative traits in the calendar year, and if it was found that Pearson correlation coefficient r significantly differed from zero – an analysis of regression and estimated parameters of the linear model of the type $y = a + b \cdot x$;
5. A rank distribution containing frequencies in the age groups is illustrated using histograms and graphs, with results from comparisons of box and whiskers plots.

The research was undertaken on the basis of approval from the Commission for Bioethical Research of the Wroclaw Medical University (No. KB-158/2008), issued on April 10th, 2008.

Results

1) In the countries compared in this study, the average age at which women bore their first children oscillated within the following limits:

- from age 26.1 to 27.9 in England and Wales, in 1996–2011;
- from age 28.4 to 30.7 in Spain, in 1999–2011;
- from age 23.1 to 26.3 in Poland, in 1996–2011.

An analysis of parity of subsequent children was made only up to and including the fourth child due to the fact that the full statistical data of the countries compared includes this group statistically.

The age of the mother is also presented in Table 1. Figure 1 presents in detail the age of women giving birth in the given countries and it shows the age division of women according to the birth order of their children in all the countries. Also, the dynamic of the changing age of mothers in the compared countries in 6 year periods, 1999, 2005 and 2011, was presented. The results of the comparison in the chosen years (1999, 2005 and 2011) are presented in Table 2.

2) A detailed analysis of newborns' body weight in 1996–2006 in relation to the mother's age gave the following results:

Fig. 1. The age division of women according to the birth order in all the countries

Table 1. Age of mother (average $\pm$ SD) at time of first and subsequent births in Poland, Spain, England and Wales

Year	Poland				England and Wales				Spain			
	1	2	3	4	1	2	3	4	1	2	3	4
1996	23.1	26.6	29.8	31.9	26.1	28.8	30.4	31.3				
1997	23.2	26.7	29.9	32	26.1	28.9	30.6	31.4				
1998	23.3	26.9	30	32	26.3	29	30.7	31.5				
1999	23.6	26.9	30.1	32.2	26.4	29	30.8	31.6	28.4	31.2	33	34
2000	23.7	27.1	30.2	32.2	26.5	29.1	30.9	31.7	28.5	31.4	33.2	34.1
2001	23.9	27.3	30.3	32.4	26.6	29.2	31	31.9	28.7	31.6	33.2	34.1
2002	24.1	27.5	30.4	32.4	26.8	29.3	31	32.1	28.8	31.7	33.3	34
2003	24.4	27.7	30.6	32.6	27	29.4	31	32.3	29	31.9	33.3	34
2004	24.7	28	30.7	32.7	27.1	29.5	31	32.4	29.1	31.9	33.3	34.1
2005	25	28.3	30.9	32.8	27.2	29.6	31.1	32.5	29.4	32	33.2	34
2006	25.2	28.6	31.1	32.8	27.3	29.7	31.2	32.5	29.3	32.4	33.5	33.9
2011	26.3	29.6	31.9	33.3	27.9	30.1	31.5	32.8	30.7	32.6	33.6	34.1

Table 2. Results of comparison in 6-year periods (1999, 2005 and 2011 years) and standard deviation

Year	Poland		England and Wales		Spain	
	mean	SD	mean	SD	mean	SD
First child						
1999	23.5	4.1	26.4	4.4	28.6	4.9
2005	25	4.3	27.2	4.5	29.4	5.1
2011	26.3	4.7	27.9	4.6	30.7	5.6
Second child						
1999	26.9	4.5	29	4.3	31.4	4.3
2005	28.3	4.4	29.6	4.4	32.4	4.7
2011	29.6	4.5	30.1	4.5	32.6	5
Third child						
1999	30.1	5	30.8	4.2	33.2	4.6
2005	30.9	4.8	31.1	4.3	33.5	4.8
2011	31.9	4.9	31.5	4.5	33.6	5.1
Fourth child						
1999	32.2	5	31.6	4.1	34.1	4.9
2005	32.8	4.9	32.5	4.2	33.9	5
2011	33.3	5	32.8	4.3	34.1	5.1

Table 3. Average body mass of newborns in the compared countries at given time intervals (1999, 2005 and 2011)

Year	Poland	England and Wales	Spain	ANOVA
1999	3530 ± 640	3270 ± 520	2610 ± 540	p < 0.001
2005	3350 ± 600	3270 ± 520	3220 ± 540	p < 0.050
2011	3370 ± 590	3350 ± 610	3270 ± 550	p < 0.001
ANOVA:	ns.	p < 0.05	p < 0.01	

- in Poland, the highest weight was found in infants born to women in the age group 25–29 years old at 3394 g. The body weight of infants born to women in their fourth decade of life was as follows: body weight for the age group 40–44 years old was 3245 g; for the age group 45–49 years old it was 3190 g.

- in Spain, however, the highest body weight was found in infants born to mothers in the age group 20–24 years old at 3317 g; the body weight of infants born to women in the age group over 40 years old fell into the following ranges: 40–44 years old – 3288 g, and in the age group 45–49 years old – 3198 g.

- In England and Wales, the highest body weight was reached by infants born to mothers in the age group 30–34 years old, whereas in the age group 40–44 years old, the average body mass of newborns

was 3184 g; and in the age group 45–49 years old it was 3141 g. This data is shown in Fig. 5.

In Poland, infant body weight is significantly bigger (one-dimensional analyses of variance: $F = 318$; $p < 0.001$) than in England, Wales and Spain. The comparison of the data of average body weight in the given countries in 1996–2006 is presented in Fig. 2 and Table 3.

Comparison research was performed for the given periods 1999, 2005 and 2011. The birth mass of infants born in Spain in 2011 was lower than the weight of infants born in Poland by 100 g. This difference is statistically significant on the level $p < 0.001$ (Fig. 3). Table 3 and Fig. 4 present the comparative development of infant body mass in the six-year periods (1999, 2005 and 2011).

3) Live births to married couples and extra-marital couples:

Fig. 2. Histograms of children's birthweight in the age groups of women giving birth in the analysed countries in the years 1996–2006

In the research presented, the number of live births was examined in relation to marital and extramarital status. A detailed analysis was presented in 1996–2006 and the data can be seen in Table 4. Next, comparative analyses were made in the periods 1999, 2005 and 2011.

The lowest percentage of children born to married couples was noted in England and Wales, with the highest percentage noted in Poland. We observed in England and Wales an increasing tendency in the rise of children born to extramarital couples, while in Poland this trend has stabilized at a level of 21.3%. The comparable characteristics of marital and extramarital births in the given periods of time (1999, 2005 and 2011) are shown in Fig. 5.

Fig. 3. Comparison of the infants' body mass in 2011 in the countries analysed in the research

Fig. 4. Average body weight of live newborns born in compared countries in given time periods (1999, 2005 and 2011)

Fig. 5. Number of births to marital couples in 1999–2011

Table 4. Number of live births in compared countries in 1996–2006 divided into marital (M) and extramarital (EM), and the percentage of extramarital children compared to the total (W_{EM})

Year	Poland			England and Wales			Spain		
	M	EM	W_{EM} (%)	M	EM	W_{EM} (%)	M	EM	W_{EM} (%)
1996	384,655	43,548	11.30	416,822	232,663	55.80	305,590	30,530	10.00
1997	367,349	45,286	12.30	404,873	238,222	58.80	309,864	40,848	13.20
1998	349,923	45,696	13.10	395,290	240,611	60.90	312,217	52,976	17.00
1999	337,314	44,688	13.20	379,983	241,889	63.70	318,155	61,975	19.50
2000	332,451	45,897	13.80	365,836	238,605	65.20	327,103	70,529	21.60
2001	319,879	48,326	15.10	356,548	238,086	66.80	326,221	80,159	24.60
2002	302,756	51,009	16.80	354,090	242,032	68.40	327,631	91,215	27.80
2003	295,530	55,542	18.80	364,244	257,225	70.60	338,435	103,446	30.60
2004	295,136	60,995	20.70	369,997	269,724	72.90	340,571	114,020	33.50
2005	297,144	67,239	22.60	369,330	276,505	74.90	342,433	123,938	36.20
2006	303,556	70,688	23.30	378,225	291,376	77.00	348,328	133,716	38.40
Median (number)	325,972	52,629	16.50	377,749	251,540	66.80	326,959	82,123	24.70

Discussion

The research presented in this study analyzes several factors defining fertility in several European countries, viz., Poland, Spain, England and Wales. Source material was taken from annual demographic reports prepared by the individual countries. These factors alone do not give a complete picture of the development of the processes connected with fertility. They do, however, represent certain important factors that allow one to follow these developments.

The patterns according to which relations are formed have undergone a transformation in Western societies over the past few decades. The number of divorces is rising; the age of people getting married is getting higher; the number of children born to extramarital couples is increasing [1–8]. Since the 1980s, there have been dramatic changes in terms of the family. Many factors have contributed to the fact that the institution of marriage and the number of children born to married couples has significantly changed. Because these changes are dynamic, we are convinced that it is of the essence to constantly study this particular sphere of human activity in order to keep abreast of the meaning of structural changes, of new trends and new tendencies for their impact on our social life. It is also important that we endeavor to foresee what consequences these dynamic changes could have for this sector of human existence.

The statistical analyses performed in the given research confirm the above-mentioned authors' results. In England, Wales or Spain in 1996–2011,

we can observe the tendency of the number of extramarital birth to increase in comparison to marital birth. In England and Wales in 1999, the percentage of extramarital children was 38.9%, in 2005 it was 42.8% and in 2011 – 74.3%. In Spain in 1999, the number of extramarital children was 16.3%, in 2005 it was 26.6% and in 2011 – 37.3%. In Poland in 1999, the number of extramarital children was 14.4%, and in later years the number was stable at around 21.3%.

The age at which women decide to have their first child is a turning point in their lives. The material presented in this study clearly points to a dynamic shift in the age at which women give birth to their first child. The comparative analysis of the age of mothers giving birth for their first time, in 6 year periods, 1999, 2005 and 2011, in Poland, indicated 23, 25 and 26 years old ($p < 0.0001$). In Spain in the compared years, the ages were 28, 29 and 30 ($p < 0.0001$). In England and Wales, they were 26, 27 and 27, respectively ($p < 0.0001$). These results are supported by an overview of the extant literature as well as of research reports carried out by numerous authors. In general, in developed and developing countries, one can observe a definite trend by women to put off the decision to give birth to their first child until a later age [3, 8, 13, 14]. The results of the analyses presented in this study allow us to assume that this trend of putting off the decision to have a first child to a later age will continue in the same direction.

Another very interesting development that has been discernible for many years is sexual acceler-

ation [7, 15, 16]. The fact that fertility occurs earlier compared to data from the beginning of the 20th century does not, however, support statistical proof for the significant dominance of parity during this period.

Szamotołska, Chazan [17] have produced an interesting study regarding the process behind child-planning. In 2002 they canvassed approx. 4,000 women in Poland between the ages of 18 and 44. Childless women who were not in a steady relationship were twice as likely not to want children as childless women in steady relationships. The childless women were primarily under thirty years old. The group of women with one child were largely between the ages of 20 and 39. Women with one child in a difficult financial situation were three times as likely as the remaining group of women with one child to not want a second child. Women with two children (largely between the ages of 25 and 44) living in a difficult financial situation were five times as likely not to want another child compared to other women with two children but being in a better financial situation. In the case of women with three or more children (largely between 30 and 44 years old), a very good financial situation meant a much smaller reluctance to have more children. The authors of the cited study concluded that the most important factor in having children was the individual's financial situation. The authors suggest that changes in government policy aimed at improvements in people's material standing could correlate positively with their readiness to have larger families.

Coppola and Di Cesare [18] presented a study of Spain in which they posited that the country has reached the highest percentage of decreasing level of births accompanied by a growing rate in life expectancy. According to some researchers, the low level of fertility, increasing life expectancy and high immigration rates have contributed to a new development which they call "the new demography" [19].

Researchers have also found a convergence between the growing level of education of women and the declining number of marriages. Studies show that women with a higher education tend to delay the decision to marry but do not entirely reject marriage [2].

The high level of education of women in Spain significantly influences the delay in the age at which they enter into marital relationships. According to Dominguez-Folgueras and Castro-Martin [2], the level of education also affects the decision to enter into concubinage. The results of this study showed that the largest percentage of births to extramarital relations occurred in Spain, then next in England, then Wales, and in last place Poland.

Peristera and Kostaki [20] presented various fertility models and pointed to the causes that determine these models. In modern societies, such as Great Britain, according to the authors, these determinants included marital status, the level of education and the social status of the mother. Other significant factors included widowhood as well as divorce and subsequent marriage.

Frejka and Sardon [21] published their first article in Los Angeles in 2000 on the topic of "The cohort fertility story: industrialized countries in the second half of the 20th and in the early 21st century", which was the result of years of research. They headed a research project examining the developing tendencies regarding births in developed countries. Since that time, same authors have published updates on the study. The researchers focused, for example, on the age of women giving birth to their first child. Their research supports the results presented in our study. Specifically, it supports the fact that the age of women giving birth to their first child has risen significantly over the past few decades in industrialized countries. The age at which the first child is born is approximately 30, with small fluctuations in certain countries. In England and Wales, the fertility of young women has decreased at the expense of the fertility of older women. This trend has an increasing tendency. Researchers have emphasized that any further delays in the age at which women give birth to their first child could result in a drop in fertility due to the fact that this also decreases the possibility of multiple births. The authors cited above point to the fact that the tendency to put off the first birth in Western countries began in the 1930's and 1940's, whereas in socialist countries it began in the 1960's.

Certain researchers, upon analyzing the developments and trends regarding fertility, also find that societies are currently in the process of creating new forms of relationships. These new forms are primarily relationships that are not formally legalized but do lead to parenthood. Sexual relations before marriage have become widespread, which is an especially big change in a country like Poland, which is generally considered to have a strong Catholic tradition [4, 8, 16]. These changes are occurring gradually throughout Europe. According to Surkyn and Lesthaeghe [9], the above-mentioned social changes began to appear in Scandinavia in the 1960's, and spread out over Europe during the 1970's, reached the Iberian peninsula in the mid-1980's and finally began affecting Central Europe in the 1990's. These researchers found that, on the basis of their studies, childless cohabitants were generally more skeptical regarding the ethical and moral values of their societies. Similarly,

younger people who had not been in relationships previously tended to be more critical. The conclusions of these researchers could serve as the basis for the causes of developing childbearing tendencies in Europe.

Under socialist rule, fertility was higher in East-Central Europe when compared to Western Europe. The average age of women giving birth to their first child was low, as was the age of subsequent births. The level of childlessness was also low. These social behavior patterns were generated by factors such as the social organization of labor, comprehensive resource base for employing women, and the social care system offered by social governments. These behavior patterns were, according to Neyer and Andersson [5], the same in all of Eastern Europe. The transformation of a different style of behavior of women applied only to a very narrow group. The authors also stated that the Polish government's policy was pro-family. Government policy allowed women to work and to fulfill the role of the mother in the family, which contributed to the equality of sexes in the workplace. Kantorová [5] stated that an essential contributing factor was the fact that the state guaranteed work contracts and pensions. After the transition to a market economy, we can observe that the system of economic opportunity has become a source of both advance and limitations. The limitations include a significant time delay in the making of the decision to bear the first child as well as a drop in fertility among highly educated women. Kantorová even states that the influence of education on fertility in women is closely linked to the manner in which women's education is evaluated by the job market. Zdrojewski and Cychowska [8] state unambiguously that "for the first time in post-war history (World War II) in Poland, economic factors had a greater impact on the processes of demographic change than did demographic factors." Kopacz and Woźniak [4] and other authors added that the decline in fertility is a reflection of the growing awareness of the costs related to bearing and raising children. Additionally, one cannot ignore the development of the contraceptives market, which gives women more control over fertility issues [13, 14].

This study also presents a comparison of the influence of the age of the mother on the body mass of the newborn in the countries under study. The increase in the age of the women deciding to give birth to their first child gives rise to greater obstetric and neonatal complications. This risk is even greater in women over 40 years old. Due to the fact that, statistically, there is a rise in births in this age group, this is a group of patients that cannot be ignored. In the research, being a part

of this article, the infants' body mass born by women older than 40 years was physiological (2500–4000 g).

The mother's age is only one of the factors that impact the development of pregnancy and the child's health. Other major factors are the general state of the health of the woman, her lifestyle and levels of stress [22]. Women who decide to give birth at a later age tend to begin preparations for motherhood much earlier. However, the rate of morbidity increases with age. Witek and Bojdys-Szyndler [23] identified five factors that increased the risk of complications during pregnancy in view of the increased risk with age of miscarriages, chromosomal irregularities, gestational hypertension, gestational diabetes and still births. These same authors state that "the risk of hypertension complications during gestation steadily increases as the woman's body ages. This complication is twice as frequent in women 40 years old and over compared to younger mothers" Women 40 and over also have an increased risk of having a premature birth or a newborn with low body mass. There are also reports of a higher prevalence of intrauterine growth in this age group. The risk of pre-eclampsia and premature detachment of the placenta in women with hypertension before pregnancy increases.

The findings of certain researchers point to the problem of excessive weight gain in women planning a pregnancy as well as during the pregnancy itself. Zaręba-Szczudlik, Romejko and Achmed [24, 25] found that women with a BMI over 40 have a three times greater risk of giving birth to an overweight newborn. Macrosomia is variously defined in the pertinent literature. Different definitions set the limits at 4000 g, 4200 g and 4500 g. High body mass can be caused by diabetes in pregnant women, which in turn occurs more frequently after 40 years of age. In addition, women who have had an oversized newborn face a greater risk of their next birth being complicated by the excessive weight of their fetus. There is also the fact that the rise in births is accompanied by a parallel increase in overweight mothers and in macrosomia in fetuses. Sex most certainly plays an essential role due to the fact that male fetus body mass is greater than female fetus body mass. There is currently a noted tendency of growth in the number of cases of macrosomia. Some researchers interpret this as stemming from a decrease in the percentage of pregnant women who are smokers.

Genetic factors must also be taken into consideration, factors that could indirectly influence the newborn's body mass – such as the body weight and height of the parents. Another important as-

pect is the ethnic origins and race of the child's parents. In Poland the predominant race is Caucasian, whereas in Spain as well as in England and Wales the mixing of races is greater. Spanish women have a greater tendency to give birth to children with macrosomia than do white American women or Asian women [26]. The results presented in this study do not show a clear increase of cases of macrosomia in the age group of women 40 years and older in the countries under study.

The results of the newborns' body weight in the given 6-year groups indicated that in each group, among mothers from 19 years old to 50 years old and more, the average body weight was in the norm and it did not go beyond 4000 g. In 1999, the calculated numbers were $p < 0.001$, in 2005 $p < 0.05$ and in 2011 $p < 0.001$.

Of all the various factors that have an impact on the development of at-birth body mass, one can distinguish socio-economic conditions. Higher social status allows one better access to medical services, which in turn allows one to identify possible risk factors and/or other irregularities [26]. Women who decide to enter motherhood after achieving a satisfactory level of socio-economic status (generally linked to higher education as well as achievement of a higher level in one's professional life) definitely have better medical options even in the case of a complicated pregnancy [27, 28].

The body mass at birth of newborns is recommended as a health indicator by the WHO. There are numerous studies that indicate the influence of body mass at birth on the health of the individual in later life [27].

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