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Birth weight, birth order, and age at first solid food introduction influence child growth and body composition in 6 to 8-year-old Maya children: the importance of the first 1000 days of life.

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ABSTRACT

Objectives: To analyze the relationship of birth weight, birth order, breastfeeding duration, and age of introduction of solid foods with height, fat mass, and fat-free mass in a sample of Maya children when aged 6 to 8 years old.

Methods: We collected data on anthropometry, body composition, children's birth weight, birth order, early feeding practices, and household socioeconomic characteristics in a sample of 260 Maya children aged 6 to 8 years living in Merida and Motul, two cities in Yucatan, Mexico. Multiple regression models were performed to identify variables associated with height-for-age (HAZ), fat mass index (FMI) and fat-free mass index (FFMI). The predictors included in the models were: birth weight (kg), birth order, duration of breastfeeding (months), age at introduction of solid foods (months), maternal age (years) and height (cm). Models were adjusted for the influence of children's age and sex, maternal educational level, and household overcrowding.

Results: HAZ was positively associated with child birthweight and maternal height and age, but inversely associated with birth order and age of introduction of solid foods. FMI was positively associated with birth weight, maternal age, and height, and negatively associated with birth order. FFMI was positively associated with maternal age and birth weight.

Conclusions: These results are evidence of the importance of the first 1000 days of life for the growth and body composition of Maya children and contributed to understand the development of nutritional dual burden in this population.

Key words: Child growth; Body composition; Environmental factors; First 1000 days of life, Maya Children

INTRODUCTION

Both national and regional studies have reported high rates of stunting and overweight/obesity (OW/OB) among the population of the Yucatan Peninsula, Mexico (Azcorra *et al.*, 2010; Dickinson Bannack, 1997; Mendez *et al.*, 2016). This phenomenon, known as dual-burden of malnutrition, is particularly noteworthy among the Yucatec Maya (Azcorra *et al.*, 2013), which represent 44% of the population of the state of Yucatan (INEGI, 2010).

Ethnic Maya populations have been living for centuries in Mexico, Guatemala, and Belize, both in urban and rural contexts (Bogin *et al.*, 2014). All of them have experienced social and economic oppression that began with the first European contacts in the 16th Century and still is present nowadays. Overall, this oppression, historical racism, and systemic segregation has translated into more than five centuries of negative living conditions for the Maya (Bracamonte, 2007). The Maya people of today experience disadvantageous socioeconomic conditions compared to the rest of population, but are well-integrated into global economic processes in terms of state education, employment, and consumption of foods and national material culture (Bogin *et al.* 2014).

This biocultural history produced a phenotype that was characterized by impaired linear growth status and thinness in Maya children. Beginning in the 1980s the short-thin phenotype began to change into one of short stature with high levels of body adiposity. This double-burden of malnutrition is associated with the current-day high prevalence of adult obesity, type 2 diabetes mellitus, hypertension and other metabolic disorders (Azcorra *et al.*, 2015a; Varela-Silva *et al.*, 2009; Varela-Silva *et al.*, 2012). The change from thinness to fatness of Maya people is associated with nutrition and demographic transitions (Bogin *et al.*, 2014). Our previous research reported that intergenerational effects contribute to perpetuating health problems in this population (Azcorra *et al.*, 2015a; Azcorra *et al.*, 2015b; Azcorra *et al.*, 2013; Varela-Silva *et al.*, 2009). A question remains as to when during the life cycle (fetus, infant, child, adolescent, pregnant woman) the growth of the Maya is most sensitive to these environmental influences.

Physical growth is a complex biological process involving multiple factors during different life stages and their effects are cumulative. This means that the growth status of an individual, at any given moment, is the result of the individual's health and nutrition history (Bogin, 2001; Himes, 2004; Stinson, 2012). A particularly critical life stage impacting human health is first 1000 days of life from conception. This 1000 days includes 270 days of prenatal development + 365 days of first postnatal year + 365 days of second postnatal year. Poor environmental conditions during this period are associated with unhealthy patterns of growth and development in later life and with higher morbidity and mortality rates in adulthood (Chandler-Laney *et al.*, 2013; Gluckman *et al.*, 2008; Hanson and Gluckman, 2014; Kulkarni *et al.*, 2014; Kuzawa, 2005; Martorell and Zongrone, 2012; Sayers *et al.*, 2009; Wells, 2013; Wells, 2009; Wells, 2014).

Growth retardation in the first 1000 days is associated with poor maternal nutritional history, inadequate nutrition to fetus and infant, infectious disease, and inadequate psychosocial stimulation (Stinson, 2012; WHO, 2014). Birth weight is a measure of total intrauterine body growth. Variation in birth weight may be influenced by many factors, and some of these are associated with maternal nutritional history and nutritional and environmental circumstances experienced during gestation (Schell, 1998; Himes, 2004). Breastfeeding overall, and its duration, influence growth because certain nutrients and immune factors are present only in human milk and allow optimal expression of growth (Colen and Ramey, 2014). Breastfeeding also supports intimate mother-infant contact that enhances positive psychosocial and emotional stimulation. Duration of breastfeeding and the age of introduction of solid foods are two interrelated variables that influence nutritional and emotional status during the first 1000 days. According to the World Health Organization (WHO), babies should be exclusively breastfed from birth to 6 months of postnatal life and then begin the transition from maternal milk as the main food to solid foods (OMS, 2015). Breastfeeding and age of introduction of solid foods are modifiable factors, influenced by public health policies, maternal perceptions regarding the importance of breastfeeding, as well as the amount and quality of resources mothers have to be able to properly breastfeed their infant. Early or late solid

food introduction (<4.0 months or >6.9 months) may be linked to conditions such as growth retardation and/or increased adipose tissue accumulation later in life (Kuo *et al.*, 2011).

The purpose of this paper was to analyze the relationship of birth weight, birth order, breastfeeding duration, and age of introduction of solid foods (independent variables) with height, fat mass and fat-free mass (dependent variables) in a sample of Maya children when aged 6 to 8 years old. This age range represents the late childhood and early juvenile phase of growth, a phase of relatively slow growth when the intergenerational and early life influences on body size and composition are established (Bogin, 1999; Bogin and MacVean 1981). We test the overall hypothesis that the first 1000 days of life are a critical period in terms of linear growth and body composition. Our specific hypothesis is that greater birthweight, lower birth order, and greater adherence to WHO recommendations regarding breastfeeding and the introduction of solid foods reduce the risk for the development of the dual burden of malnutrition among the Maya.

METHODS

The study location

We conducted a cross-sectional and retrospective study in two cities in the state of Yucatan, Mexico: 1) Merida, the state capital (population 777,615); and 2) Motul, a smaller city (population 23,240) 45 kilometers northeast of Mérida. In both places there is a numerically and socially important Maya population. In the case of Mérida, its Maya presence is explained by a rural-to-urban migratory process that began at the start of the twentieth century with the decline of the sisal agroindustry (a plant crop used for its fiber) and the eventual collapse of that agroindustry in the second half of this century. The Maya presence in Motul is due to it being a founded in the 11th century AD by a Maya priest named Zac Mutul. Sometime after the year 1440 Motul became the capital of a regional Maya kingdom called Cehpech. The Spanish Conquistador Francisco de Montejo founded Motul as Spanish colonial town by the middle of 16th century (H. Ayuntamiento de Motul).

Sample

The recruitment process was conducted in the primary schools and only targeted our population of interest – the Maya. The Maya have characteristic surnames that are, generally, distinct from Mestizo and other non-Maya ethnic groups. Following the surname methodology of Relethford (1995) we used Maya surnames as a proxy of ethnic ancestry to select the participants for our study. We included all children meeting the inclusion criteria, which were: (i) aged 6.00-8.99y and (ii) maternal Maya surname. In the case of Merida we focused recruitment on areas of the city with relatively high numbers of Maya population, based on census data from the National Institute of Geography and Statistics. The final sample consisted of 260 children (128 girls); 180 residing in Merida and 80 in Motul. In Merida, participants were recruited from 47 schools in low-income neighborhoods, with a high concentration of Maya speakers, located in several areas of the city. To allow for maximum socioeconomic variability in the sample, we selected no more than 10 children from each school. In schools where more than 10 children met the inclusion criteria, 10 were randomly selected. In the case of Motul, mother-child dyads were recruited in all public primary schools of the city ($n = 12$).

Data collection

The fieldwork took place between 2011-2014 in Merida, and 2014-2015 in Motul. Identical data collection methods were used in both locations. The children were measured at school, in the morning, before the recess and two hours after food consumption. Anthropometric measures collected were height (cm), weight (kg), waist circumference (cm) and subscapular skinfolds (mm) following the Anthropometric Standardization Reference Manual (Lohman *et al.*, 1988). We used a Martin anthropometer, a SECA scale, a SECA measuring tape, and a Harpenden skinfold caliper. Anthropometric data collected were then converted into z-scores against the Comprehensive Reference Data published by Frisancho (2008), which were based on the United States NHANES III survey. The cut-off points to define nutritional status variables were: stunting <5th percentile of height-for-age; OW/OB >85th percentile of body mass index (BMI) for-Age; excessive centralized fat >85th percentile of waist circumference-for-age; excessive trunk fat >85th percentile subscapular

skinfold-for-age. We estimated body composition from bio-electric impedance analysis using a Bodystat 1500 Monitoring Unit (Bodystat LTD). The Body Composition Monitoring Unit passes a very low current (50HZ) through the body tissues. Each body tissue has a different resistance. To estimate fat-free mass (FFM) we used the resistance value, plus the height and weight, with the prediction equation developed by Ramirez *et al.* (2012). This equation is based on a sample of Mexican school children from different geographical regions and ethnicities within the country. Then fat mas (FM) was indirectly calculated ($FM = \text{body weight [kg]} - FFM \text{ [kg]}$). Finally, we converted the absolute values of FFM and FM into indices using the formula of Frisancho (2008). Each index is calculated by dividing the FFM or the FM, in kilograms, by height in metres squared.

Children's mothers were visited at their houses and interviewed to obtain biologic and socioeconomic data. Children's birth weight was obtained from birth certificates. We asked the mother to tell us the names and ages of all their children, so we could calculate the birth order of the studied child. This variable was then categorized as: 1 = first born, 2 = second born, 3 = third or later born. Mother's height was obtained by anthropometry during home visits. We used a questionnaire designed by the research staff of the Somatology Laboratory at Cinvestav-Mérida to collect information on breastfeeding duration, first solid food introduction, and maternal educational level (years of formal education). Maternal age at childbirth was estimated by subtracting the child's age from current maternal age. Household overcrowding during the first 1000 days was not known. We measured current household overcrowding as an estimate of conditions the study child may have experienced earlier in life. Current household overcrowding was calculated by the number of persons sleeping per room. A value ≥ 2.5 denoted household overcrowding (CONEVAL, 2015).

Ethical approval

The project was approved by the Bioethics Committee for the Study of Human Beings of the Centre for Research and Advanced Studies of the National Polytechnic Institute (Cinvestav-IPN) and by the Ethical Advisory Committee of Loughborough University. Mothers who accepted taking part on the study had

to signed informed consent forms. The children provided verbal consent from the before measurements started.

Statistical analysis

Multiple linear regression models were applied to each outcome: height (cm), FMI (kg/m^2) and FFMI (kg/m^2). We log-transformed FMI and FFMI to achieve normal distribution. The main independent explanatory variables were birth weight (kg), birth order (1st reference, 2nd, 3rd or higher), duration of breastfeeding (months), and age at first food introduction (months). We also included maternal age and height as variables associated with birthweight and offspring's postnatal growth. Models were adjusted for maternal level of formal education (years) and household overcrowding (reference = no), as proxies for household socioeconomic conditions. The FMI and FFMI models were adjusted by age (years) and sex (reference = boys). Model validity was confirmed when the residuals met the assumptions of normality. We used the variance inflation factor (VIF) to confirm absence of collinearity between predictors. We estimated the standardized coefficient (beta weights) to identify the most important explanatory factors in each model. Significance level was $\alpha=0.05$ in all models. Statistical analyses were completed with Stata/IC 11.1 for Windows (StataCorp LP 2009).

RESULTS

Basic descriptive statistics and a summary of children's nutritional status are shown in Table 1. The prevalence of stunting and OW/OB were slightly higher in boys, but girls showed a higher mean value of waist circumference or central adiposity; nevertheless, none of these sex differences were statistically significant.

Seventy-three percent of mothers had a stature below 150cm (Table 2). Almost half of children were first-born, and most (87.6%) had a birth weight within the normal range (2,500-3,999 g). Only 8% were low birth weight. The median breastfeeding duration was 8 months and 74.2% were breastfed for at least 6 months. Median age of introduction of solid foods was 6 months. Maternal schooling was low, since most of the mothers had only nine years of formal

education (72.7%). The majority (68%) of the households were classified as overcrowded.

TABLE 1 HERE

TABLE 2 HERE

Early life factors and child growth

Results of the regression models for the three outcomes are showed in Table 3. Significant predictors for children’s height were greater birth weight, being first-born, and a younger age at first solid food introduction. Also older maternal age and greater maternal height were shown to have a positive influence on height at age 6-8 years. The model for FMI indicated that children have more fat if they had a higher birthweight and if their mother was older and taller. They tended to have less body fat if they were third-born (or subsequent). Finally, the FFMI model indicated that children’s fat-free mass increased as their birthweight and maternal height increased. Beta weights (standardized coefficients) showed that maternal height was the most influential factor on children’s height, while maternal age and birth weight were most influential for FMI and FFMI, respectively.

TABLE 3 HERE

DISCUSSION

The majority of children in this study (88%) had a healthy birth weight, similar to that reported by Azcorra *et al.* (2016) for all births in Yucatan in 2013. However, during post-natal development, a high proportion of children exhibited stunting and overweight, the dual-burden condition that can lead them to compromised health later in life. The presence of stunting and overweight in these children suggest that some factors experienced in postnatal life are playing a role. These results agree with previous published studies (Bogin *et al.*, 2014; Varela-Silva *et al.*, 2009; Varela-Silva *et al.*, 2012), but the previous research focused on the same sample addressed the effects of later childhood (i.e., post age 3 years

old) environmental factors on growth (Azcorra *et al.*, 2015a). Here we focused on the first 1000 days of growth and development.

The three regression models all suggest that birth weight positively influenced the three outcomes of interest (Table 3). Birth weight is a good indicator of uterine environmental quality and a good predictor of risk for neonatal morbidity and mortality. A healthy birth weight functions as a protective factor for linear growth when exposed to environmental stressors (Schell, 1998; Himes, 1998; Himes, 2004). The positive association between birth weight and height is well known (Datta Gupta *et al.*, 2013; Ibáñez *et al.*, 2000; Li *et al.*, 2003; Opdahl *et al.*, 2008). Prior work among Maya populations has shown that birth weight is positively related to future stature (Varela-Silva *et al.*, 2009).

Our literature review shows positive associations between birth weight and overweight/obesity (Danielzik *et al.*, 2004; Glavin *et al.*, 2014; Panagiotakos *et al.*, 2008). This needs to be approached with caution because these findings are based on body mass index (BMI) as a measure of adiposity. BMI generally increases with greater adiposity, but it is not possible to establish whether relationships with the BMI are primarily driven by fat or fat-free mass (Rogers, 2003). We found a positive association between FMI and birth weight, but our results also show a positive association between birth weight and FFMI, which agrees with results reported by Kulkarni *et al.* (2014) and Singhal *et al.* (2003). Furthermore, the standardized coefficients in FFMI model show that birth weight is the variable with higher influence over the outcome in this sample (Table 3).

In our models, the second and later-born children had lower height, while the third born children had a lower FMI compared to first-born. Similar results were reported by Savage *et al.* (2013a) in their study of a sample of 3 to 7-year-olds in New Zealand. In the light of these results, the seminal question is: What are the causes for first-born children to have a greater height than their later-born siblings, even if they had a lower birth weight? We attempted to explain this by looking for differences in early nutrition practices according to birth order, but we found no evidence for this. Parents of first-born children may be relatively inexperienced in infant care but have only one offspring requiring attention. This combination may drive them to invest more effort and resources into caretaking

than they do with any subsequent children. In addition, for at least a certain period, first-born children do not have to share time, parental attention or any other resources with siblings. In a phenomenon known as the dilution hypothesis, the opposite occurs with second-born and later children (Becker and Tomes, 1976; Lundberg and Svaleryd, 2016). Nonetheless, the greater experience of parents with subsequent siblings may also function as a buffer against the lack of singular attention. Another important aspect to consider in future analysis is the elapsed period between births. This could let us know if the mother had enough time to recover the biological resources invested in the previous birth. The lack of data about intergenesic period in those children with an older sibling is a limitation of this study.

In addition to the dilution hypothesis other explanations could be in play. The presence of an older sibling may have negative effects on the growth of younger siblings due to psychosocial competition (Hermanussen and Scheffler, 2016). Sibling competition occurs even in families with good socioeconomic conditions in which there is no resource competition. The Avon Longitudinal Study of Parents and Children, a study of a sample in the UK, reported that with each additional older sibling, the studied child was up to 3 cm shorter by age ten (Lawson and Mace, 2008). Neither the economic conditions of the family nor the sex of the older sibling influenced this finding. These families were relatively wealthy, the children were well-fed, and all had universal health care and education, with extra benefits to those in need. Bogin (2016) proposed that sibling rivalry may have impacts on the hypothalamic–pituitary–adrenal (HPA) axis, cortisol reactivity, and GH/IGF-1 levels (Fey and Trillmich, 2008; Huchard *et al.*, 2016), which can all impact growth and final size. Overall, the data on the association between birth order and child health is limited (Lundberg and Svaleryd, 2016). Differences in height and other sibling phenotypes seem to be best explained by a matrix of complexly interacting biocultural factors (Barclay, 2015).

The association between age at solid food introduction and obesity risk is not clear; we did not find any association in our regression models. We found a negative association with child height. Early food introduction (before 4 months of age) has been associated with a higher risk of gastrointestinal illness and

infections that could lead to growth faltering (Huh *et al.*, 2011; Kramer *et al.*, 2003; Kuo *et al.*, 2011), but, continued breastfeeding is a protective factor for infants who begin solid food consumption at an early age, an advantage not available to those who were never breastfed or stopped breastfeeding before 4 months of age (Huh *et al.*, 2011). Our results do not fit with the previous published literature. This poses the question: What age is too early for food introduction, and what age is too late to allow maximum expression of growth?

Duration of breastfeeding was not associated with the outcome variables, but age at initial food introduction was an important event for later growth. Some studies maintain that effects of breastfeeding on child health are unclear (Colen and Ramey, 2014; Hediger *et al.*, 2001). Evidence for an association between breastfeeding and obesity risk has been inconsistent (Rios-Castillo *et al.*, 2015). Even though many studies suggest breastfeeding as a protective factor against obesity, those that include direct measurements of adiposity report no association (Gale *et al.*, 2007). For example, Yan *et al.* (2014), Jarpa M. *et al.* (2015) and Bell *et al.* (2018) concluded that breastfeeding is a protective factor against obesity risk, but their outcome variables were BMI or weight-for-age which do not assess fatness directly. Discrepancies between studies could be attributed to differences in the parameters measured or to social patterns of breastfeeding (Ramirez-Silva *et al.*, 2015). In the present study, the participants' socioeconomic levels were almost uniformly low, and all were Maya, an indigenous population that share a set of cultural patterns, including some related to infant care. For example, both grandmothers and aunts provide advice to the mother, based on their beliefs or experience. In many cases, this family advice is the main reason for stopping exclusive breastfeeding and starting to offer solid food before the 6th month of life (Briceño Medina, 2017; Reyes Gutiérrez and Cervera Montejano, 2013). To understand the influence of age at initial food introduction requires further research, especially on the type of food initially offered to infants (Morgen *et al.*, 2018).

Maternal age was shown to be associated with the three outcomes and was the most important factor explaining FMI in children according to the standardized coefficients in this sample. In previous research, this variable has been positively associated with offspring's growth status (Chandler-Laney *et al.*,

2013; Savage *et al.*, 2013b). We suggest that older women have on average healthier offspring and this could be a result of social and economic benefits that accrue with age, rather than due to a direct effect of the mother's biological status. In some groups, birth of the first child is delayed as potential parents strive to attain better living conditions (Barclay and Myrskylä, 2016; Frejka and Sardon, 2006; Martínez *et al.*, 2012; Mathews and Hamilton, 2009; Mathews and Hamilton, 2014). Older first-time mothers may therefore have achieved several conditions that contribute to a healthier and less stressful home environment for their children when compared to younger mothers. There is also some evidence that older women get more social support than younger women, and dote more on their children (Kim *et al.*, 2017).

Maternal height was positively associated with child height and FMI, which agrees with reports that maternal somatic characteristics are associated with offspring growth (Addo *et al.*, 2013; Ferreira *et al.*, 2009). In addition, the standardized coefficients of our child height models revealed maternal height as the most important factor explaining FFMI. Varela-Silva *et al.* (2009) found that children of low stature mothers (< 150 cm) had a greater risk of obesity than children of taller woman, but that study defined obesity using BMI. Using height-for-age and weight-for-age, Machado Amorim *et al.* (2011) reported maternal height as one of the most important determinants of nutritional status of offspring in a cohort of 8-year olds Brazilian children.

Current overcrowding in the home was not associated with the outcomes, even though this variable is commonly reported as an important factor in child health, growth and development (Kuh and Wadsworth, 1989). Possible reasons for this result is that we did not assess overcrowding during the first 1000 days and we characterized overcrowding as a dichotomous variable (i.e. those who lived in overcrowded housing versus those who did not). It may be better to consider overcrowding as a continuous variable. Overcrowding during the 1000 days was not known.

Previous research reported that the main factors related to obesity in Mexican children and adolescents are exposure to the nutrition transition, sedentary lifestyles and children's patterns of physical activity, lack of leisure spaces,

erroneous beliefs about health, socioeconomic limitations, low breastfeeding rates and quality of maternal diet (Aceves-Martins et al., 2016; Woo and Martin, 2015). Data from a representative sample of elementary school students in Merida supports these conclusions (Mendez Dominguez, 2013). In the present study we add early life factors associated to changes in fat mass in children: maternal age, maternal height, birth order and birth weight.

In conclusion, the explanatory variables we used in this study were restricted to factors during the first 1000 days of life and current home overcrowding. We found that children's birth weight was positively associated with children's height, FMI and FFMI. Birth order was negatively related with height, and FMI during childhood. An earlier age at solid food introduction was related with greater child height. In addition, greater maternal height and age seems to be associated with higher values in the outcome variables. Our findings suggest that factors experienced during early development have an influence on the presence of nutritional dual burden among Maya children in Yucatan.

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The authors declare no conflict of interest.

AUTHOR CONTRIBUTIONS

SSE and FD wrote the first draft of the manuscript. SSE and HA analyzed the data. HA, BB, AH, RS, and IVS, read, revised and added intellectual content the manuscript. BB, HA, and SSE, worked on the final version of the manuscript.

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For Peer Review

TABLES

Table 1. Child growth status

		Stunting	OW/OB	Central adiposity excess	
	n			Waist circumference	Subscapular skinfold
Total	260	11.9%	36.5%	32.3%	29.0%
Boys	132	13.6%	39.4%	28.8%	21.2%
Girls	128	12.5%	33.6%	35.9%	28.3%

Stunting <5° percentile; OW/OB (overweight/obesity) >85° percentile; waist circumference >85° percentile; subscapular skinfold >85° percentile.

Table 2. Descriptive statistics of early life factors

	n	Median	Min	Max
Maternal age (years)	260	24.9	15	43
Maternal height (cm)	260	147.8	132.5	163.3
Birth order	260	2	1	6
Birth weight (g)	258	3200	1200	4300
Duration of breastfeeding (months)	259	8	0	72
Age at initial food introduction (months)	259	6	2	24
Maternal schooling (years)	260	9	0	19
Household overcrowding (index)	258	2.5	1	10

SD: Standard deviation.

Table 3. Regression models for height, fat mass index and fat-free mass index, and childhood growth parameters

Variables	Coefficient	p	CI (95%)		B
<i>Height</i>					
Maternal age (years)	0.026	0.022	0.004	0.049	0.161
Maternal height (cm)	0.069	0.000	0.048	0.089	0.391
Birth order 2 nd	-0.273	0.025	-0.512	-0.034	-0.144
3 rd	-0.239	0.122	-0.542	0.064	-0.113
Birth weight (kg)	0.216	0.038	0.012	0.420	0.124
Duration of breastfeeding (months)	0.004	0.399	-0.005	0.013	0.051
Age at initial food introduction (months)	-0.045	0.030	-0.086	-0.005	-0.128
Maternal education level (years)	-0.036	0.030	-0.068	-0.003	-0.131
Overcrowding	-0.154	0.161	-0.369	0.062	0.088
Constant	-11.318	0.000	-14.56	-8.078	
<i>Fat mass index</i>					
Maternal age (years)	0.013	0.003	0.005	0.022	0.216
Maternal height (cm)	0.009	0.026	0.001	0.018	0.140
Birth order 2 nd	-0.078	0.108	-0.173	0.017	-0.107
3 rd	-0.037	0.026	-0.256	-0.017	-0.170
Birth weight (kg)	0.112	0.006	0.032	0.192	0.168
Duration of breastfeeding (months)	-0.001	0.514	-0.005	0.002	-0.041
Age at initial food introduction (months)	-0.012	0.130	-0.028	0.004	-0.092
Maternal education level (years)	-0.008	0.175	-0.021	0.004	-0.084
Overcrowding	-0.054	0.215	-0.139	0.031	-0.081
Constant	-0.702	0.239	-2.117	0.531	
<i>Fat-free mass index</i>					
Maternal age (years)	0.003	0.027	0.0004	0.006	0.161
Maternal height (cm)	0.002	0.126	-0.0006	0.005	0.096
Birth order 2 nd	-0.005	0.747	-0.036	0.026	-0.022
3 rd	-0.039	0.052	-0.078	0.003	-0.148
Birth weight (kg)	0.043	0.001	0.017	0.069	0.197
Duration of breastfeeding (months)	0.0006	0.292	-0.0005	0.002	0.066
Age at initial food introduction (months)	-0.001	0.632	-0.007	0.004	-0.029
Maternal education level (years)	-8.49e-06	0.992	-0.004	0.004	-0.000
Overcrowding	-0.006	0.658	-0.034	0.021	-0.029
Constant	1.880	0.000	1.446	2.314	

CI: confidence interval; B: beta coefficient.