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ORIGINAL ARTICLE / *ARTIGO ORIGINAL*

Factors associated with the evolution of weight of children in a supplementary feeding program

Fatores associados à evolução do peso de crianças em programa de suplementação alimentar

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ABSTRACT: Identifying the influence of socioeconomic, care, and feeding factors on children's nutritional status is important for the evaluation and targeting of public policies based on nutritional interventions. We investigated the sociodemographic and biological factors associated with children aged 6 to 23 months leaving the low weight-for-age condition (weight-for-age z-score < -2) during their participation in a supplementary feeding program (SFP). This is a cohort study with 327 low-income children living in the inland of the state of São Paulo, who joined the SFP with low weight-for-age when they were six months old. The dependent variable was "maintained low weight-for-age during participation in the program" (dichotomous), and the independent variables related to: 1) maternal characteristics: marital status, schooling, age, and work situation; 2) child characteristics: being weaned, gender, birth weight, and age at weighing. We used a multiple multilevel logistic regression for the modeling. Factors positively associated with children's weight gain were higher age at weighing (OR = 1.20; 95%CI 1.08 – 1.34; p = 0.001); higher birth weight (OR = 1.0011; 95%CI 1.0001 – 1.0019; p = 0.022), and being weaned when joining the program (OR = 0.20; 95%CI 0.08 – 0.52; p = 0.001). Actions focused on promoting appropriate birth weight and breastfeeding, and on adequate and timely introduction to healthy complementary feeding are important strategies to maximize the effects of the SFP on weight gain in the first two years of life of children from low-income families.

Keywords: Socioeconomic factors. Supplementary feeding. Poverty. Weight by age. Multilevel analysis.

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RESUMO: Identificar a influência dos fatores socioeconômicos, dos cuidados e da alimentação sobre o estado nutricional infantil são importantes para avaliação e direcionamento de políticas públicas baseadas em intervenções nutricionais. Foram investigados os fatores sociodemográficos e biológicos associados à saída de crianças da faixa de baixo peso-para-idade (escore z de peso-para-idade < -2), nas idades de 6 a 23 meses, durante sua participação em programa de suplementação alimentar (PSA). Trata-se de estudo de coorte com 327 crianças de baixa renda residentes no interior do estado de São Paulo, que ingressaram no PSA aos 6 meses de idade com baixo peso-para-idade. A variável dependente foi "permanecer com baixo peso-para-idade durante a participação no programa" (dicotômica), e as independentes referem-se a: 1) características maternas: condição conjugal, escolaridade, idade, situação de trabalho; 2) características das crianças: estar desmamada, sexo, peso ao nascer e idade nas pesagens. Foram realizadas modelagens com regressão logística múltipla multinível. Maior idade da criança na pesagem (OR = 1,20; IC95% 1,08 – 1,34; p = 0,001), maior peso ao nascer (OR = 1,0011; IC95% 1,0001 – 1,0019; p = 0,022) e estar desmamada ao ingressar (OR = 0,20; IC95% 0,08 – 0,52; p = 0,001) se associaram positivamente ao ganho de peso das crianças. Ações focadas na promoção do peso adequado ao nascer e do aleitamento materno e na introdução adequada e oportuna da alimentação complementar saudável são estratégias importantes para maximizar o efeito de PSA no ganho de peso nos primeiros dois anos de vida em crianças de famílias de baixa renda.

Palavras-chave: Fatores socioeconômicos. Suplementação alimentar. Baixa renda. Peso para a idade. Análise multinível.

INTRODUCTION

Identifying the influence of socioeconomic, care, and feeding factors on children's nutritional status is important for the evaluation and targeting of public policies based on nutritional interventions[1].

The assessment of the nutritional status of children younger than two years is most commonly conducted using three anthropometric indexes: weight-for-age (W/A), length-for-age (L/A), and weight-for-length (W/L). The difficulty in measuring the length of small children in the routine of health care services is one of the main obstacles in using the W/L and L/A indexes. Also, body weight is a measure more easily changeable than length since short-term dietary restrictions promptly reduce its value, and weight deficits can be corrected more quickly with dietary adjustments than length ones[2]. Therefore, the W/A index is the most appropriate to evaluate the effect of dietary interventions on the nutritional status of children in a short period of time[3].

In 2004, approximately 2.2 million children in the world had their deaths attributed to low W/A[4]. Data from the National Demographic and Health Survey[5] showed that low W/A in children younger than five years decreased from 4.2 to 1.8% between 1996 and 2006. However, socioeconomic and demographic differences persist, as younger children with lower purchasing power have worse nutritional status, and low W/A is about five times higher among them.

This situation was strongly evident in the past three decades, with successive changes in the determinants of health and disease conditions. Among the reasons for the progress reached are socioeconomic changes, interventions external to the healthcare sector (such as income transfer programs), vertical health programs (e.g., promotion of breastfeeding and immunization), creation of the Public Health System (*Sistema Único de Saúde* – SUS) and the Family Health Program, and implementation of several national and state programs to improve health, child nutrition, and food security[6]. In this context, we have the State Milk Program "Vivaleite," established in December 1999 to improve the nutritional status of low-income children.

A previous study[3] measured the effectiveness of Vivaleite on the growth of participants (children exposed to the program), using newcomers (children not exposed to any action of the project and who did not consume food supplement) as a control group, and revealed that participants showed higher mean W/A z-score than newcomers, with this effect being as high as their nutritional deficiency when joining the program. From then on, there was an interest in investigating whether sociodemographic and biological factors interfere in the weight gain of children participating in the Supplementary Feeding Program (SFP), in order to find elements that promote the discussion of intervention actions to maximize the results obtained. Thus, we aimed to study the factors associated with children aged 6 to 23 months leaving the low W/A condition during their participation in the governmental program for fortified milk distribution "Vivaleite." The study concerns children living in the inland of the state of São Paulo, who were six months old and had low W/A when they joined the program.

METHODS

DATA DESIGN AND SOURCE

Previously[3], a cohort study was conducted with data from 25,433 low-income children living in 311 cities in the inland of the state of São Paulo, who entered the Vivaleite SFP from January 2003 to September 2008, with age ranging from 6 to 24 months when they joined the program, complete data record, no report of health issues, no diarrhea in the prior 15 days, no hospitalization in the previous 3 months, no twins, and at least one weight measurement, besides the one held when they started in the program. Out of all children assessed, 88.7% (22,556 subjects) were active in the system, and the others had already left the SFP when the database was obtained.

Data were collected from the Children Record of the Vivaleite Project and the Quarterly Follow-up Worksheet on Anthropometric Data, both forms implemented in January 2003 by the Vivaleite coordination. The forms included information about household composition, characteristics of the mother/guardian and the child, and weight and height measures. For data collection, all managers in the cities periodically received training and printed information compiled by the Vivaleite nutrition team about the content of each item of the form, and the care needed to measure weight and height.

STUDY SAMPLE CHARACTERIZATION

The present study worked with a dynamic cohort sample of all 327 children who joined the SFP at six months of age and had low W/A (z-score < -2) on their first weighing, based on the growth standards of the World Health Organization[1]. The children were weighed every four months, and, for this research, we decided to monitor them until they reached 23 months of age. The schedule was not always followed over time, with children being weighed in the unscheduled ages of 9, 11, 13, 15, 17, 19, 21, and 23 months, as well as the scheduled 10, 14, 18, and 22 months, so we opted to work with the child's actual ages at weighing. Since we worked with a dynamic cohort, some natural losses occurred over time. Each child had at least two and no more than five weighings, with weighing "1" corresponding to their measure when they joined the program.

VARIABLES

The dependent variable was "maintained low W/A" (W/A z-score < -2) during the weighing after starting in the SFP. This variable adopted a value of zero (0) for "yes" and one (1) for "no." The comparisons with each independent variable used ratios of the result "no" (did not maintain low W/A), according to age at weighing.

The independent variables related to maternal and child characteristics were:

- mother's marital status: whether the mother had (1) or not (0) some kind of stable conjugal situation when the child joined the SFP;
- maternal schooling: years of schooling of the mother, stratified into three categories: 0 to 4 years (1); 5 to 8 years (2); and 9 or more years (3);
- mother's age: whether the mother was an adolescent (0: age range from 10 to 19 years) when the child started in the SFP or not (1: aged 20 years or older);
- mother's working situation: whether the mother had a paid work (1) or not (0) when the child joined the SFP;
- weaned child: whether the child was weaned (0) or not (1) when they entered the SFP;
- gender: male (0) or female (1);
- birth weight in kilograms (kg): continuous variable; a minimum weight of 1.4 kg and a maximum of 4.4 kg;
- age at weighing (in months): a minimum of 6 and a maximum of 23 months of age; a continuous variable that reflects the period of participation of each child in the SFP. We used the age at weighing - 16 for modeling, which consists of the age of the child minus 16 months, without changing the coefficients of interest, providing faster interactions to obtain these values, and avoiding a possible lack of convergence during the modeling in Stata;
- interaction child's age - 16 x variable: interaction between the child's age at weighing - 16 and each explanatory variable.

STATISTICAL ANALYSIS

The dependent variable is dichotomous with the repeated observation of the same child, leading to modeling with multiple multilevel logistic regression, directly producing individual level odds ratios (OR). Estimates of average probabilities allowed us to calculate marginal (crude and Mantel-Haenszel) OR, considering the explanatory variables separately.

The statistical model is:

$$logito(\pi_{ij})=(\beta_0+\varsigma_{0j})+\beta_1.x_{1j}+(\beta_{idadej}+\varsigma_{idadej}).idade_j+\beta_{interaçãoj}.interação_j=$$

$$=\text{In}\frac{\left[\dfrac{\exp\{(\beta_0+\varsigma_{0j})+\beta_1.x_{1j}+(\beta_{idadej}+\varsigma_{idadej}).idade_j+\beta_{interaçãoj}.interação_j\}}{1+\exp\{(\beta_0+\varsigma_{0j})+\beta_1.x_{1j}+(\beta_{idadej}+\varsigma_{idadej}).idade_j+\beta_{interaçãoj}.interação_j\}}\right]}{1-\left[\dfrac{\exp\{(\beta_0+\varsigma_{0j})+\beta_1.x_{1j}+(\beta_{idadej}+\varsigma_{idadej}).idade_j+\beta_{interaçãoj}.interação_j\}}{1+\exp\{(\beta_0+\varsigma_{0j})+\beta_1.x_{1j}+(\beta_{idadej}+\varsigma_{idadej}).idade_j+\beta_{interaçãoj}.interação_j\}}\right]} \quad (1)$$

In which:

$\pi_{ij}=\dfrac{e^{\beta_0+\Sigma\beta_{ij}x_{ij}}}{1+e^{\beta_0+\Sigma\beta_{ij}x_{ij}}}$ is the probability (low weight = $1|x_{ij}$) = probability ("not having low weight" $|x_{ij}$);

β_0 = fixed intercept coefficient;

ς_{0j} = random factor of child *j* connected to the intercept coefficient;

β_1 = fixed slope coefficient (effect) of the variable x_1;

ς_{idadej} = random factor of child *j* connected to the slope coefficient of the variable x_1;

$\beta_{interaçãoj}$ = interaction coefficient of the variable $idade_x x_1$ of child *j*;

$idade_j$ = age at weighing of child *j*;

x_{1j} = value of the variable $idade_x x_1$ observed in child *j*; and

$interação_j$ = value of interaction x for child *j*;

The modeling sequence was:

- multiple multilevel logistic regression for each explanatory variable with child's age - 16 and the respective interaction age - 16 x variable;
- multiple multilevel logistic regression for each explanatory variable with child's age - 16 and without interaction if, on step 1, its descriptive p > 5%;
- multiple multilevel logistic regression with child's age - 16 and explanatory variables with descriptive P ≤ 5% on step 2.

The software Stata 10.1 (StataCorp LP, 2007) processed the data.

The commands, using the variable mother's working situation as an example, were:

- cc baixopeso trab if idadeinicial==6 & criidadpes>6, by(criidadpes) woolf → to calculate crude OR (average crude OR for each age at weighing) and Mantel-Haenszel OR (adjusted for all ages at weighing)
- gen cons=1
- eq inter: cons
- eq slope: peso16

  } To inform the program that there is an equation
- gllamm baixopeso peso16 trab peso16Xtrab if idadeinicial==6 & peso16>-10, i(codunico) eform nip(15) adapt fam(bin) link(logit) nrf(2) eqs(inter slope) → for multiple multilevel logistic regression (individual OR and final model);
- gllapred margtrab if idadeinicial==6 & peso16>-10, mu marginal → to predict the values added to the graphics;

In which:
i(codunico) = controls the repetition of observation of a same child over time;
margtrab = estimates global marginal probabilities, according to age[7].

ETHICAL ASPECTS

The Committee for Ethics in Research (Brazil Platform) approved this research, under a Certificate of Presentation for Ethical Consideration (*Certificado de Apresentação para Apreciação Ética* – CAAE) number 01383612.3.0000.5421. The research was conducted with data collected from the database of the State Milk Program – Vivaleite Interior, formally granted by the Secretariat of Agriculture and Food Supply of the state of São Paulo, and it was not possible to use the Informed Consent Form.

RESULTS

Table 1 presents maternal and child characteristics at the time the 6-month-old infant with low W/A joined the SFP, according to categories of sociodemographic and biological variables included in this study. Regarding maternal characteristics, 76% were in a stable conjugal situation, 46% had between 5 and 8 years of schooling, 77% were aged 20 years or older, and 85% did not have a paid work. Among the children assessed, 61% were male, 53% were weaned when they joined the program, and 66% had a birth weight greater than or equal to 2.5 kg.

Table 2 shows that the interactions between the child's age and other variables studied in isolation were not statistically significant and were removed from subsequent modelings. Modeling 2 revealed that the results of the variables mother's marital status, maternal schooling, mother's age, mother's working situation, and gender were not statistically significant, and were removed from the next modeling. Based on the statistical significance decision and considering a confidence interval of 95%, the selected variables for the final modeling were being weaned when joining the program (95%CI 0.09 – 0.58) and birth weight (95%CI 1.00 – 5.96), from which we found that:

- the adjusted OR of not having low W/A among children weaned when they joined the program was 5 times the OR of breastfeeding children (1 ÷ 0.20), that is, the group of children breastfeeding at the time they entered the SFP had a smaller reduction in the proportion of "low W/A" throughout their participation in the program;
- the adjusted OR of not having low W/A among children was 2.82 times the OR of those whose birth weight was 1 kg lower;

Table 1. Maternal and child characteristics when the infant joined Vivaleite at six months of age with low weight-for-age, according to categories of sociodemographic and biological variables.

Variable	n	%
Mother's marital status		
Without partner	79	24.2
With partner	248	75.8
Maternal schooling (years)		
0 to 4	74	22.6
5 to 8	149	45.6
9 or more	104	31.8
Mother's age		
Adolescent	75	22.9
Non-adolescent	252	77.1
Mother's working situation		
Does not have paid work	279	85.3
Has paid work	48	14.7
Gender		
Male	198	60.6
Female	129	39.4
Weaned child		
Yes	172	52.6
No	155	47.4
Birth weight (kg)		
< 2.5	110	33.6
≥ 2.5	217	66.4

Table 2. Odds ratio estimates of the association between maintaining low weight-for-age and maternal and child variables.

Variable	Modeling 1*		Modeling 2**		Modeling 3***	
	OR	95%CI	OR	95%CI	OR	95%CI
Mother's marital status						
Without partner (reference)	1		1			
With partner	0.82	0.25 – 2.63	1.24	0.45 – 3.38		
Child's age - 16	1.40	1.16 – 1.69	1.30	1.13 – 1.49		
Child's age - 16 x mother's marital status	0.90	0.77 – 1.05				
Maternal schooling						
0 to 4 years (reference)	1		1			
5 to 8 years	0.82	0.23 – 2.93	1.06	0.35 – 3.21		
9 or more years	0.82	0.21 – 3.18	1.20	0.37 – 3.93		
Child's age - 16	1.37	1.14 – 1.64	1.29	1.13 – 1.49		
Child's age - 16 x 5 to 8 years	0.93	0.79 – 1.11				
Child's age - 16 x 9 or more years	0.91	0.76 – 1.08				
Mother's age						
Adolescent (reference)	1		1			
Non-adolescent	1.02	0.32 – 3.31	1.23	0.45 – 3.39		
Child's age -16	1.34	1.11 – 1.61	1.29	1.13 – 1.48		
Child's age - 16 x mother's age	0.95	0.82 – 1.11				
Mother's working situation						
Does not have paid work (reference)	1		1			
Has paid work	2.54	0.57 – 11.25	1.96	0.55 – 7.03		
Child's age - 16	1.28	1.12 – 1.33	1.28	1.12 – 1.46		
Child's age - 16 x mother's working situation	1.08	0.87 – 1.33				
Gender						
Male (reference)	1		1			
Female	0.87	0.32 – 2.35	0.87	0.36 – 2.08		
Child's age - 16	1.29	1.12 – 1.49	1.29	1.12 – 1.48		
Child's age - 16 x gender	1.00	0.88 – 1.13				
Weaned child						
Yes (reference)	1		1		1	
No	**0.17**	**0.06 – 0.48**	**0.23**	**0.09 – 0.58**	**0.20**	**0.08 – 0.52**
Child's age - 16	1.36	1.14 – 1.65	1.24	1.10 – 1.39	1.20	1.08 – 1.34
Child's age - 16 x weaning	0.90	0.78 – 1.04				
Birth weight (kg)	**3.45**	**1.29 – 9.18**	**2.43**	**1.00 – 5.96**	**2.82**	**1.14 – 6.95**
Child's age - 16 (months)	0.96	0.69 – 1.34	1.25	1.09 – 1.42	1.20	1.08 – 1.34
Child's age - 16 x birth weight	1.11	0.97 – 1.27				

OR: odds ratio; 95%CI: confidence interval of 95%; *modeling 1: multiple multilevel logistic regression for each explanatory variable with child's age - 16 and the respective interaction age - 16 x variable; **modeling 2: multiple multilevel logistic regression for each explanatory variable with child's age - 16 and without interaction if, on step 1, its descriptive $P > 5\%$; ***modeling 3: multiple multilevel logistic regression with child's age - 16 and explanatory variables with descriptive $P \leq 5\%$ on step 2.

- the adjusted OR of not having low W/A for each age was 1.20 times the OR of not having low W/A in the immediately preceding age.

Figure 1 exemplifies the modeled average probabilities related to modeling 3. The dotted black curve represents the situation of a child born with 3.25 kg, who was weaned when joining the program, used to illustrate the more favorable situation to leave the low W/A condition. The solid gray curve represents a child breastfeeding at the time he or she entered the SFP, with a birth weight of 2.5 kg, exemplifying the less favorable situation to leave the low W/A condition.

Table 3 shows the crude and adjusted values of children's ages at weighing for each variable of the study, in which the crude OR values (average of all ages at weighing) and Mantel-Haenszel OR values (adjusted for ages at weighing) were close or equal to 1. The exception was the breastfeeding variable.

When considering only the child's age at weighing, the OR of not having low W/A for each age was 1.29 times the OR of not having low W/A in the immediately preceding age (95%CI 1.13 – 1.47). Figure 2 demonstrates that most children who left the condition

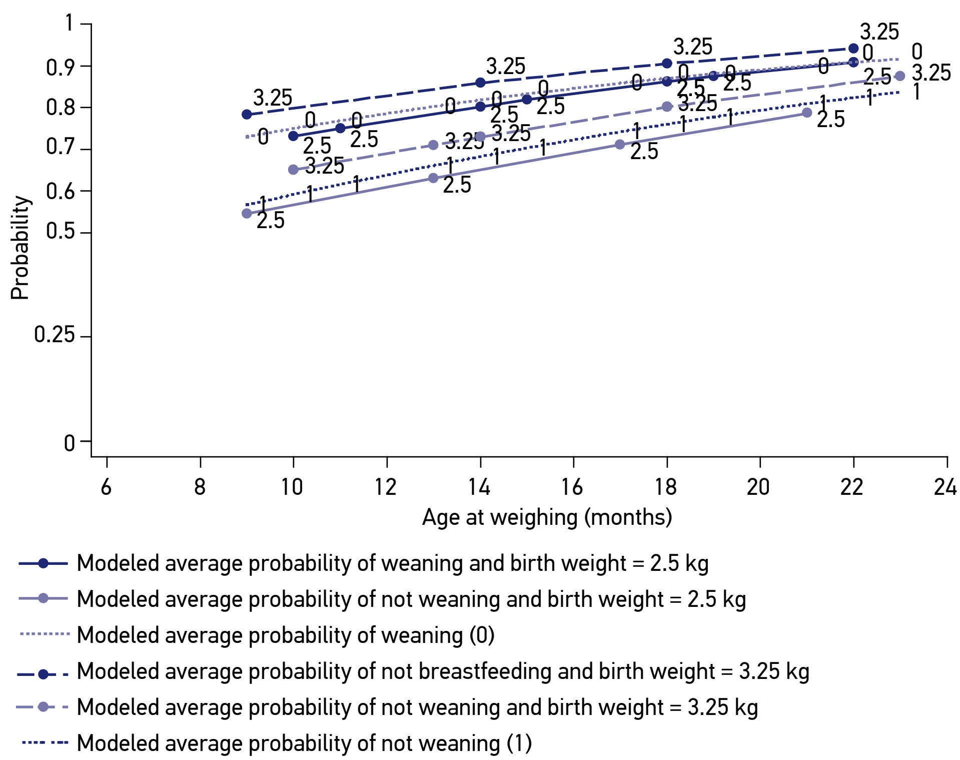

Figure 1. Modeled average probability of leaving the nutritional risk range, according to breastfeeding and birth weight.

of low W/A did so after participating in the SFP for 3 to 4 months (66.2%), regardless of sociodemographic and biological variables. After this period, the reduction was constant and happened in lower intensity.

Table 3. Crude and adjusted (Mantel-Haenszel) odds ratio of children's ages at weighing for each categorical variable of the study.

Variable	OR_{crude}	$OR_{Mantel\text{-}Haenszel}$
Mother with partner	1.04	1.03
Maternal schooling (years)		
5 to 8	0.93	0.92
9 or more	0.97	1.00
Non-adolescent mother	1.17	1.17
Mother with paid work	1.43	1.40
Non-weaned child	0.48	0.46
Female	0.96	0.94

OR: odds ratio.

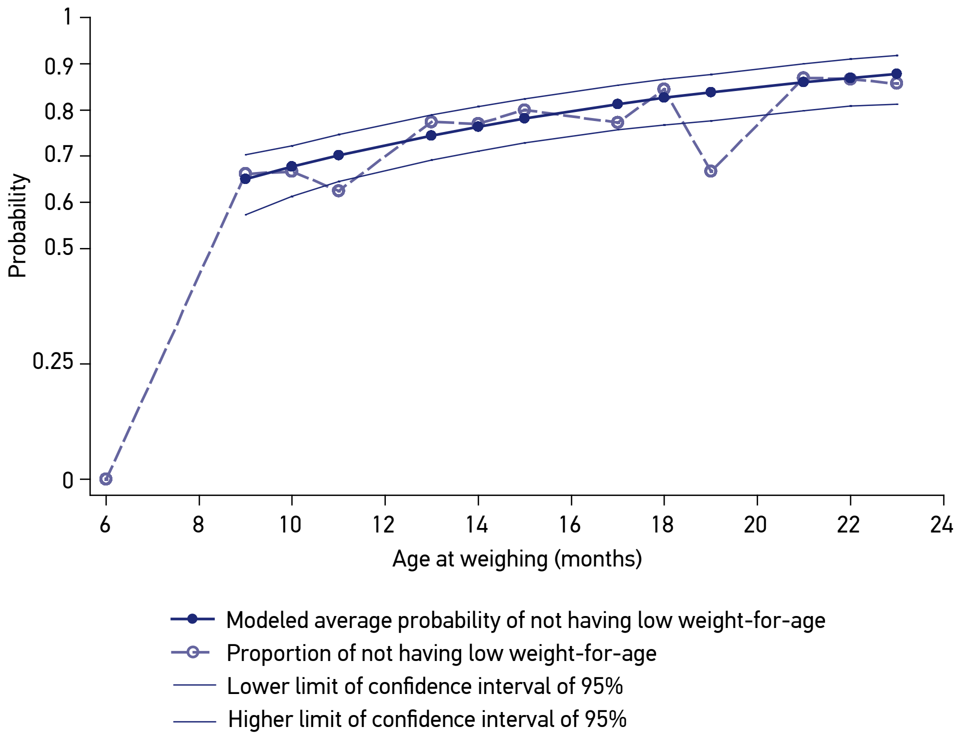

Figure 2. Modeled average probability and respective confidence interval of 95%, and proportion of not having low weight-for-age, according to the child's age at weighing.

DISCUSSION

The results of other studies that evaluated milk distribution SFPs[3,8,9] indicated a positive impact on the growth of children who benefited from them. Despite these programs having different characteristics, and adopting distinct analytical methods, anthropometric indexes, and growth reference standards, their results point to the same direction: the SFP on its own leads to weight gain for participating children. The present study confirmed this result during the program.

The progression of weight gain in participating children did not depend on socioeconomic characteristics. On the other hand, higher birth weight and early weaning were favorable conditions to weight gain in an observation period of fewer than 18 months, with a sharper effect during the first 4 months. These results corroborate other studies[10,11], which revealed a higher weight gain among weaned children born with greater weight, highlighting the increased risk of overweight in the long term. Therefore, the associations found in the present study should be interpreted with caution since even though they show a positive short-term effect in the recovery of underweight children, these conditions could favor excessive weight gain over time, and should not be promoted for children's health.

It is noteworthy the lack of interaction between the variables studied and the increase in children's age at weighing. For each variable, the marginal effect, expressed by crude or Mantel-Haenszel OR, was the same in all ages. In other words, after the initial increase observed in the second weighing (after three or four months of participating in the program), the ratio of children who did not have low W/A remained stable in all ages until the end of monitoring.

The case observed in the present study in which a "lower proportion of children breastfeeding at the time they joined the program left the condition of low W/A" should be interpreted with care, as it does not allow the questioning of the positive effects of breastfeeding, but suggests the hypothesis that early weaning might be associated with higher weight gain in childhood, a situation being investigated in other studies[10,11]. According to Victora et al.[12], the first two years of life are a window of opportunity to promote the healthy growth of children through appropriate eating habits, with exclusive breastfeeding until the infant reaches six months of age, and, after that, the timely and adequate introduction to healthy complementary feeding.

With respect to birth weight, although studies[13,14] indicate its direct relationship with the future nutritional status of the child, publications that evaluate its influence in the nutritional recovery of children participating in supplementary feeding programs are rare.

Puccini et al.[15], after assessing the Nutrition Recovery Program of the city of Embu (metropolitan area of São Paulo), found that children with lower birth weight had worse anthropometric evolution regarding W/A, including those monitored by the program. Spyrides et al.[16] evaluated childhood growth in the first months of life of infants living in the city of Rio de Janeiro and revealed that those with low birth weight had lower weight development than others. The present study found the same results: lower birth weight positively associated with a smaller proportion of children who left the condition of low W/A.

The lack of statistical significance between the categories of the variables mother's marital status, maternal schooling, mother's age, mother's working situation, and gender, and the proportion of children who left the condition of low W/A during their involvement in the SFP indicated that the maternal characteristics assessed and the child's gender do not influence the weight gain process while the children participate in the program. The homogeneity of socioeconomic conditions of the population who benefited from Vivaleite was an important factor when considering the non-significance of the variables analyzed, as, for instance, among the mothers registered in the program, adolescents did not differ from non-adolescents.

We worked with existing data from SFP forms, which did not bring information about the eating habits of the children. The lack of data about eating habits could be a possible limitation in the evaluation of factors associated with the nutritional improvement of children. Thus, we suggest that the SFP includes this type of information in the routine of nutritional follow-up of participants. In addition, it could be argued that the option of working only with children who were 6 months old when joining the program and monitoring them until they reached 23 months of age is restrictive. Nonetheless, using other ages simultaneously could lead to a confusing epidemiological situation, which would require a much more complex statistical analysis, with results potentially less precise. By adopting this age range, the possible confounding effect of other ages was controlled. We expect similar studies with different starting ages, e.g., 12 months old, to compare the results. After comparing the final model (Modeling 3) with the results from Table 2 related to the variables breastfeeding and birth weight of modelings 2 and 3, we found that the values (OR, p, 95%CI) remained similar, that is, each of these variables was not a confounding factor for the other.

Since this research included only children from low-income families, participating in a governmental program, with a social focus, it is not possible to extrapolate these results to the general population. However, similar results could be expected in realities close to that of participants of Vivaleite, regarding socioeconomic, biological, and environmental characteristics.

From a public health viewpoint, the follow-up on nutritional status and the identification of factors that lead to changes in it are essential, so interventions can be carried out aimed at reducing risks and improving the quality of life of the child population. For this reason, public policies should invest in: improving prenatal care to decrease rates of low birth weight, intensifying their efforts in measures that stimulate proper intrauterine weight gain and postnatal nutrition[17]; promoting actions directed at food security, including the availability of food in natura or minimally processed fortified and access to adequate and healthy foods to prevent malnutrition and obesity in mothers and children; and developing educational actions to advocate the importance of breastfeeding and adequate eating habits, particularly in the first thousand days of life (from pregnancy until the child reaches two years of age), a crucial period that establishes eating habits and growth, and will last throughout life[18].

CONCLUSION

Although eradicating nutritional deficiencies has always been a priority in the agenda of international organizations, this issue persists. In the past decades, several countries adopted numerous strategies to prevent and control nutritional deficiencies and promote healthy growth. Among them, it is noteworthy the fortification of foods, which had positive results in some regions[19,20] and limited ones in others, often due to the kind of supplement used, the amount of the food vehicle effectively consumed[21], and the lack of integrated health and nutrition care actions[14].

We underline that, in low- and middle-income countries, a considerable prevalence of children with growth deficits and micronutrient deficiencies, mainly iron and vitamin A, persists, and is among the ten main preventable risk factors related to child morbimortality[4]. In this context, and based on recent evidence, the World Health Organization[14] recommends food fortification as a public policy action to prevent nutritional deficiencies in children younger than two years, by adding multiple micronutrients to complementary feeding, in addition to basic healthcare actions.

Supplementary feeding programs focusing on the nutritional recovery of children should associate maternal-child healthcare strategies with adequate eating habits.

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