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Nutritional evaluation follow-up of the 1982 birth cohort, Pelotas, Southern Brazil

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Abstract

OBJECTIVE—To estimate the prevalence of over/underweight and its association with demographic and socioeconomic factors.

METHODS—Longitudinal cohort study of youths born in 1982 in Pelotas, Southern Brazil. In 2004-5 we interviewed 4,198 of the 5,914 cohort subjects, obtaining weight and stature measurements that were used to calculate body mass index (BMI). Underweight was defined as BMI lower than 18,5 kg/m^2; overweight as BMI between 25 and 30kg/m^2; and obesity as BMI IMC ≥ 30kg/m^2. The effects of socioeconomic (family income and schooling) and demographic (skin color) variables, birthweight, and breastfeeding on underweight, overweight, and obesity were analyzed separately for men and women using Poisson regression.

RESULTS—Prevalence of underweight, obesity, and overweight were 6.0%, 8.2%, and 28.9%, respectively. In adjusted analysis, only birthweight remained associated with underweight among men and women. Poor men showed higher risk of underweight, but were protected from obesity and overweight. By contrast, risk of obesity and overweight was higher among poor women.

CONCLUSIONS—The present results underscore the importance of socioeconomic determinants on nutritional status, with special emphasis on the distinct effects these factors have among men and women in different nutritional conditions.

Keywords

Adult; Nutrition Assessment; Obesity, epidemiology; Deficiency Diseases, epidemiology; Socioeconomic Factors; Cohort Studies; Brazil

INTRODUCTION

Beginning in the 1960's, the World Health Organization (WHO) has proposed nutritional evaluation systems for the early detection of nutritional problems highly prevalent in different settings as a basis for developing preventive and control measures.5

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In 1995, WHO proposed the use of the body mass index (BMI) as a definition of various degrees of underweight, overweight, and obesity.21

Nutritional evaluation across long time periods and in different populations has provided evidence of a nutritional transition, linked to the processes of demographic and epidemiologic change. In contrast to developed countries, however, increased occurrence of obesity and overweight in several developing countries is taking place alongside the persistence of problems related to underweight.12

Global estimates for 2005 indicated that 1.6 billion adults were classified as overweight, and 400 million as obese. Although these problems were initially described only among adults, they currently affect also children and adolescents, with an estimated 20 million overweight children aged up to five years worldwide.[a] Almost one-half of the global burden of disease is due to problems related to nutritional status, be it over or underweight, as determined both by BMI and diet.[b]

The aim of the present article was to estimate the prevalence of malnutrition - either by over or underweight - and determine its associated factors in a cohort of subjects followed since their birth in 1982.

METHODS

The present analysis refers to the birth cohort study initiated in Pelotas, Southern Brazil, in Southern Brazil, in 1982. Detailed methodological information on this study has been published previously (Victora et al17,18 2003 e 2006; Barros et al2).

In 2004-5, 4,297 of the 5,914 youths born in 1982 were visited for nutritional evaluation. We excluded from this analysis 90 women in the third to ninth months of pregnancy, representing 4.3% of the women in the sample. Therefore, our results pertain to 4,198 youths whose anthropometric information allowed for nutritional evaluation. Weight was measured using portable electronic scales (Seca uniscale®, Alemanha) with 100g precision. Aluminum anthropometers were used to obtain height measures. Weight and height measures were obtained following the recommendations of Lohmann et al,8 and all interviewers were trained in obtaining these measures. Underweight, overweight, and obesity were defined based on BMI (weight divided by height in meters squared), according to criteria established by WHO.21 Subjects with BMI<18.5 kg/m^2 were classified as underweight; those with BMI between 25 and 30kg/m^2, as overweight, and those with BMI≥30 kg/m^2, as obese.

Independent variables included demographic factors (sex and skin color); socioeconomic factors (family income in 1982, change in income from 1982 to 2004-5, and schooling); birthweight, and duration of breastfeeding. The variable change in income was constructed based on the distribution in terciles of income distribution in 1982 and 2004-5; subjects were classified into the following categories: always poor (those in the lowest family income tercile in both 1982 and 2004-5); poor → non poor (lowest tercile in 1982 to middle or upper tercile in 2004-5); non poor → poor (middle or upper tercile in 1982 to lower tercile in 2004-5); and never poor (middle or upper tercile in both 1982 and 2004-5).

[a]Word Health Organization. Obesity and overweight [internet]. Sept. 2006. (Fact sheet, 311) [cited 2007 Jul 13]. Available from: http: www.who.int/mediacentre/factsheets/fs311/en/index.html

[b]Word Health Organization. Challenges [internet]. [cited 2007 May 20]. Available from: http: www.who.int/nutrition/challenges/en/index.html

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We used Poisson regression to investigate the effect of these variables on the occurrence of underweight, overweight, and obesity. Prevalence ratios and their respective confidence intervals were presented as estimates of risk. Risks were compared using the Wald test for heterogeneity or linear trend when applicable. Analysis was stratified by sex and adjusted according to a hierarchic analysis model including skin color and family income in 1982 (or, in an alternative analysis, change in income in the period) in the first level; birthweight in the second level; and breastfeeding and youth's schooling in the third level. Results were adjusted for any variables in the preceding level associated with the outcomes with $p<0.20$.

Verbal informed consent was obtained from guardians in study phases between 1982 and 1986, following common practice at the time, when an ethics committee was not available at the Federal University of Pelotas. In more recent stages, the study received the approval of the university's Research Ethics Committee, affiliated to the *Conselho Nacional de Ética em Pesquisa* (National Research Ethics Committee - CONEP), and written informed consent was obtained.

RESULTS

Mean BMI was 23.6±4.4 kg/m^2 for the entire sample, and differed significantly between men (23.8±4.1 kg/m^2) and women (23.4±4.7 kg/m^2). Prevalence of underweight, obesity, and overweight were, respectively, 6.0%, 8.2%, and 28.9% in the entire sample, and also varied according to sex.

Prevalence of underweight was not associated with skin color, family income, or youth's schooling (Table 1), but was inversely associated with birthweight. Though not statistically significant, there was an association between underweight and change in income between 1982 and 2004-5 among men, with higher prevalence among those whose families showed socioeconomic improvement. On the other hand, an association between underweight and duration of breastfeeding was found only among women, with higher prevalence among those weaned within the first month after birth. Adjusted analysis (Table 2) for men showed that the crude effect of lower birthweight on prevalence of nutritional deficit at age 23 years remains. Regarding income-related variables, whereas differences in categories of income change lost statistical significance ($p=0.06$) after adjustment for skin color, this same adjustment showed a linear effect of lower family income in 1982 on greater prevalence of underweight among men.

Tables 3 and 4 present crude prevalences of obesity and overweight, respectively, for each independent variable. Associations differed according to sex. For skin color, prevalences of obesity and overweight were greater among black or mixed women, but showed no difference among men. Prevalence of obesity and overweight was greater among men of high socioeconomic level and poor women. Greater prevalence of overweight and obesity were also seen among subjects with higher birthweight (with the exception of obesity among women). Obesity and overweight were more prevalent among men who were breastfed for 6 to 8.9 months ($p=0.05$) and women who were breastfed for 9 to 11.9 months ($p=0.03$), respectively. These prevalences were also higher among women with lesser schooling, whereas overweight was more frequent among men with greater schooling.

Adjusted results for obesity and overweight were similar. Table 5 presents only the results of crude and adjusted analysis of the effects of independent variables on overweight. In the hierarchic analysis, associations with skin color, family income, change in income, and birthweight were maintained. The association between breastfeeding and overweight observed among women disappeared after control for the effect of the distal variable socioeconomic conditions at birth or of the intermediate variable birthweight. The

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association between schooling and overweight among men vanished after adjustment for a hierarchically superior socioeconomic variable, such as family income, and for birthweight. This same association was inverse among women, and remained significant after adjustment.

In the case of obesity, adjusted analyses showed similar associations, with the exception of birthweight, which was positively associated with obesity only among men (data not shown).

In adjusted analysis, risk of obesity or overweight fell by half among poorer men. Poorer women showed two to ten-fold greater risk of overweight or obesity when compared to those coming from families who earned over ten minimum wages.

DISCUSSION

Our results show that over one-third of young adults from the 1982 birth cohort are malnourished, defined as BMI below (6% of the cohort) or above (29%) levels considered normal.

Among women, prevalence of underweight (7.5%) was similar to that seen in the state of Rio Grande do Sul (6.7%), but lower than the national prevalence (12.0%) reported for women aged 20-24 years in the 2002-2003 *Pesquisa Nacional de Orçamentos Familiares* (National Household Budget Survey - POF).[a] Obesity was more frequent among cohort subjects than among women from Rio Grande do Sul (7.4%) or from Brazil as a whole (4.7%).[a]

Among men aged 20-24 years, prevalence of underweight reported by the POF was 4.4% for Brazil and 3.4% for the state of Rio Grande do Sul, compared to 4.9% in the cohort. Prevalence of obesity was higher in the cohort (7.5%) than in the state (5.2%) or the country (3.1%).[a]

The results of the POF[a] for the Brazilian population show an inverse relation between family income and weight among women. Prevalence of underweight was always higher among women with per capita family income below one-quarter of a minimum wage (8.5%). Among men, prevalence was below 5% across all socioeconomic groups.[a] However, in the present study, we found no association between income and underweight in women, but an inverse trend for this relationship was seen among men.

The association between birthweight and underweight among cohort subjects confirmed the results of studies showing a positive correlation between birthweight and adult BMI. 11,13,15 As to duration of breastfeeding, we are unable to present comparative data, since the literature reviewed is deficient in this particular aspect.

Regarding factors associated to obesity and overweight, the higher risk found among black and mixed women confirms results reported in the United States.4,9 Studies carried out in Brazilian cities show contradictory results. A cross-sectional, population-based study of adults from Pelotas6 failed to detect an association between obesity and skin color. In Rio de Janeiro, gain of weight across a ten-year period was found to be greater among black and mixed women than among white women, even after adjustment for socioeconomic conditions throughout life.3

[a]Instituto Brasileiro de Geografia e Estatística. Pesquisa de orçamentos familiares: análise de disponibilidade domiciliar de alimentos do estado nutricional no Brasil. Rio de Janeiro; 2004

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In less developed countries, overweight or obesity were historically more frequent among those of higher socioeconomic level.14 However, Monteiro et al10 (2004) showed that, in middle-income countries, overweight is becoming increasingly frequent among the poor, and that this inversion occurs earlier for women than for men.

In Brazil, in 1989, overweight and obesity were more prevalent among rich men and women.[b] Results from the POF[a] show a direct relationship between income and obesity among men, but not among women; however, greater prevalences among women are found in the intermediate income groups. Increased prevalence of overweight has been observed among men from all of the country's Regions and of all income levels between 1989 and 2003.[a] Among women, prevalence has increased in the country's Northeast Region and among families with lower monthly income, whereas in the remaining regions and in higher-income classes prevalence of overweight has either remained stable or declined (IBGE 2004).[a]

Birthweight was positively associated with overweight among men and women from our cohort, and with prevalence of obesity among men, confirming previous findings.1,16 The same association was also reported for our cohort when subjects were 15 and 18 years old. 11,15

A hypothesis has been proposed according to which weight at birth would contribute mostly to the acquisition of lean mass rather than fat mass.15,16,20 However, we do not have sufficient data on the evolution of body composition among members of our cohort to allow us to identify the time of onset of this nutritional disorder. We thus chose to use Poisson regression in order to estimate risks associated with the studied outcomes in terms of prevalence ratios.

The inverse association between schooling and overweight or obesity among women corroborates previous findings.6,10 For men, however, data in the literature are controversial. Positive associations have been observed in seven of the studies included in a review of surveys from developing countries,10 but another seven studies did not detect such association, as was the case for our cohort. In the hierarchic analysis model used in the present study, the effect of a distal socioeconomic variable such as family income at birth would be related to the level of schooling of the youth. However, one must also consider the effect of current income, given that risk of overweight was greater among those whose income decreased between 1982 and 2004-5.

A meta-analysis study has shown that subjects who were breastfed showed lower frequency of overweight and obesity, irrespective of duration of breastfeeding.7 In the present study, no association was detected, confirming previous analyses of this same cohort carried out when subjects were acolescents.17

The high prevalence of overweight and obesity among young adults shows a pressing need for adequate prevention and control measures in order to prevent the emergence of morbidities related to nutritional status. Intervention priority should be given to subgroups among which nutritional problems are more frequent, namely men of all income levels and poor women. Although obesity and overweight were more frequent among men from higher-income families, no association was found with respect to schooling. This aspect should be considered when planning intervention at the educational level.

[b]Instituto Nacional de Alimentação e Nutrição. Pesquisa Nacional de Saúde e Nutrição - PNSN-1989. Brasília: Instituto Brasileiro de Geografia e Estatística; 1990.

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As to underweight, the need for interventions aimed at preventing this condition among the poor is questionable, especially given the possibility of consequent increases in overweight and obesity, especially among women.

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Table 1

Prevalence of underweight (BMI<18.5 kg/m^2) according to demographic and socioeconomic variables, birthweight, and breastfeeding. Pelotas, Southern Brazil, 1982 to 2004-5

Variable	Total		Men		Women	
	n	%	n	%	n	%
Skin color		p = 0.09 *		p = 0.72 *		p = 0.16 *
White	3170	6.4	1653	5.0	1517	7.9
Black or Mixed	882	5.7	469	4.7	413	6.8
Family income -1982 (MW)		p = 0.33 **		p = 0.09 **		p = 0.92 **
≤1	826	6.1	438	4.6	388	7.7
1.1 - 3	2079	6.6	1092	5.9	987	7.4
3.1 - 6	788	5.6	415	3.9	373	7.5
6.1 - 10	244	5.3	128	3.9	116	6.9
>10	240	5.0	123	1.6	117	8.5
Change in income (1982 → 2004-5)		p = 0.45 **		p = 0.05 *		p = 0.61 **
Always poor	682	6.6	334	4.5	348	8.6
Non poor → poor	697	7.0	340	2.8	357	7.3
Poor → non poor	649	4.8	360	7.4	289	6.7
Never poor	2170	6.1	1172	4.9	998	7.5
Birthweight (grams)		p <0.001 **		p <0.001 **		p <0.001 **
<2500	295	10.8	135	8.1	160	13.1
2500 - 2999	994	8.1	450	6.9	544	9.2
3000 - 3499	1588	6.4	846	4.8	742	8.1
3500 - 3999	1081	3.5	610	3.6	471	3.4
≥4000	239	2.1	165	1.2	74	4.1
Breastfeeding (months)		p = 0.04 **		p = 0.42 **		p = 0.03 **
<1.0	885	7.3	482	5.2	403	9.9
1.0 - 2.9	1049	5.9	542	4.6	507	7.3
3.0 - 5.9	934	6.5	484	5.6	450	7.6
6.0 - 8.9	380	6.8	201	6.0	179	7.8
9.0 - 11.9	157	5.1	83	2.4	74	8.1

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Variable	Total		Men		Women	
	n	%	n	%	n	%
≥12.0	661	4.4	335	3.9	326	4.9
Youth's schooling (years)		p = 0.51 **		p = 0.30 **		p = 0.53 **
0 - 4	337	7.7	206	6.3	131	9.9
5 - 8	1172	6.0	716	4.7	456	7.9
9 - 11	2028	5.9	1010	5.0	1018	6.9
≥12	661	6.2	274	3.6	387	8.0
Total	4198	6.0	2206	4.9	1992 ***	7.5

MW: Minimum wages

* Chi-square test for heterogeneity

** Chi-square test for linear trend

*** Excluding 90 women with 3 or more months of pregnancy

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Table 2

Crude and adjusted analysis of the effect of independent variables on occurrence of underweight. Pelotas, Southern Brazil, 1982 to 2004-5

Variable	Men				Women			
	Crude		Adjusted*		Crude		Adjusted**	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Skin color		p = 0.77***		p = 0.46***		p = 0.45***		p = 0.39***
White	1	-	1	-	1	-	1	-
Black or Mixed	0.93	0.59;1.48	0.86	0.54;1.38	0.86	0.58;1.27	0.85	0.57;1.26
Family income -1982 (MW)		p = 0.06****		p = 0.04****		p = 0.92****		p = 0.89****
≤1	2.80	0.67;11.85	3.01	0.71;12.82	0.90	0.46;1.80	0.95	0.49;1.94
1.1 - 3	3.60	0.89;14.55	3.75	0.93;15.16	0.87	0.46;1.63	0.91	0.48;1.71
3.1 - 6	2.37	0.55;10.17	2.39	0.56;10.26	0.88	0.44;1.75	0.90	0.45;1.80
6.1 - 10	2.40	0.47;12.16	2.40	0.47;12.14	0.81	0.33;1.97	0.82	0.33;2.00
>10	1	-	1	-	1	-	1	-
Change in income (1982 → 2004-5)		p = 0.05***		p = 0.06***		p = 0.73****		p = 0.48****
Always poor	0.92	0.53;1.61	0.95	0.54;1.69	1.15	0.76;1.72	1.26	0.83;1.92
Non poor → poor	1.51	0.96;2.38	1.52	0.97;2.40	0.89	0.57;1.39	0.92	0.59;1.43
Poor → non poor	0.57	0.29;1.11	0.59	0.30;1.15	0.97	0.61;1.54	1.04	0.65;1.67
Never poor	1	-	1	0.53;1.89	1	-	1	-
Birthweight (grams)		p <0.001****		p <0.001****		p <0.001****		p <0.001****
<2500	6.72	1.52;29.82	6.28	1.44;27.49	3.24	1.00;10.52	3.24	1.00;10.52
2500 - 2999	5.68	1.38;23.49	5.47	1.33;22.39	2.27	0.73;7.09	2.27	0.73;7.09
3000 - 3499	4.00	0.98;16.37	3.88	0.95;15.82	1.99	0.64;6.21	1.99	0.64;6.21
3500 - 3999	2.98	0.71;12.53	2.92	0.70;12.26	0.84	0.25;2.81	0.84	0.25;2.81
≥4000	1	-	1	-	1	-	1	-
Breastfeeding (months)		p = 0.41****		p = 0.67****		p = 0.03****		p = 0.07****
<1.0	1.34	0.69;2.57	1.21	0.63;2.35	2.02	1.15;3.54	1.86	1.07;3.25
1.0 - 2.9	1.19	0.62;2.29	1.12	0.58;2.15	1.49	0.84;2.63	1.44	0.81;2.54
3.0 - 5.9	1.44	0.75;2.75	1.41	0.74;2.70	1.54	0.86;2.74	1.53	0.86;2.72
6.0 - 8.9	1.54	0.72;3.31	1.57	0.73;3.38	1.59	0.80;3.19	1.53	0.76;3.07
9.0 - 11.9	0.62	0.14;2.70	0.68	0.16;2.96	1.65	0.67;4.08	1.80	0.73;4.44

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Variable	Men				Women			
	Crude		Adjusted*		Crude		Adjusted**	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
≥12.0	1	-	1	-	1	-	1	-
Youth's schooling (years)		p = 0.30****		p = 0.93****		p = 0.55****		p = 0.77****
0 - 4	1.76	0.77;3.87	1.25	0.49;3.22	1.24	0.67;2.30	0.97	0.51;1.84
5 - 8	1.30	0.65;2.60	1.00	0.45;2.24	0.99	0.62;1.56	0.81	0.51;1.30
9 - 11	1.36	0.70;2.64	1.15	0.54;2.45	0.86	0.57;1.29	0.78	0.52;1.17
≥12	1	-	1	-	1	-	1	-

MW: Minimum wages

*Variables in the first level (skin color, family income in 1982) adjusted for each other. Change in income adjusted for skin color. Breastfeeding and youth's schooling adjusted for birthweight.

**Variables in the first level (skin color, family income in 1982) adjusted for each other. Change in income adjusted for skin color. Breastfeeding adjusted for birthweight and youth's schooling adjusted for breastfeeding and birthweight.

***Wald's test for heterogeneity

****Test for linear trend

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Table 3

Prevalence of obesity (BMI≥30 kg/m^2) according to demographic and socioeconomic variables, birthweight, and breastfeeding. Pelotas, Southern Brazil, 1982 to 2004-5

Variable	Total		Men		Women	
	n	%	n	%	n	%
Skin color		p = 0.18 *		p = 0.17 *		p = 0.001 *
White	3170	7.7	1653	7.6	1517	7.8
Black or Mixed	882	9.1	469	5.8	413	12.8
Family income -1982 (MW)		p = 0.19 **		p = 0.03 **		p = 0.001 **
≤1	826	7.9	438	5.9	388	10.1
1.1 - 3	2079	8.8	1092	7.1	987	10.7
3.1 - 6	788	8.4	415	9.4	373	7.2
6.1 - 10	244	5.3	128	7.0	116	3.4
>10	240	6.3	123	11.4	117	0.9
Change in income (1982 → 2004-5)		p = 0.04 **		p = 0.02 **		p <0.001 **
Always poor	682	10.3	334	4.8	348	15.5
Non poor → poor	697	8.6	340	7.9	357	9.2
Poor → non poor	649	7.1	360	5.6	289	9.0
Never poor	2170	7.7	1172	8.8	998	6.4
Birthweight (grams)		p = 0.006 **		p = 0.002 **		p = 0.31 **
<2500	295	3.4	135	0.7	160	5.6
2500 - 2999	994	8.0	450	6.4	544	9.4
3000 - 3499	1588	8.5	846	8.0	742	9.0
3500 - 3999	1081	8.2	610	8.0	471	8.5
≥4000	239	12.1	165	11.5	74	13.5
Breastfeeding (months)		p = 0.11 **		p = 0.05 *		p = 0.10 **
<1.0	885	8.4	482	8.7	403	7.9
1.0 - 2.9	1049	6.7	542	6.5	507	6.9
3.0 - 5.9	934	8.1	484	5.8	450	10.7
6.0 - 8.9	380	9.5	201	12.4	179	6.1
9.0 - 11.9	157	10.2	83	7.2	74	13.5

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Variable	Total		Men		Women	
	n	%	n	%	n	%
≥12.0	661	9.4	335	8.4	326	10.4
Youth's schooling (years)		p = 0.003**		p = 0.32*		p <0.001**
0 - 4	337	10.4	206	7.3	131	15.3
5 - 8	1172	9.7	716	8.2	456	12.1
9 - 11	2028	7.4	1010	6.5	1018	8.3
≥12	661	6.7	274	9.5	387	4.7
Total	4198	8.2	2206	7.5	1992***	8.9

MW: Minimum wages

* Chi-square test for heterogeneity

** Chi-square test for linear trend

*** Excluding 90 women with 3 or more months of pregnancy

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Table 4

Prevalence of overweight (≥ 25 kg/m^2) according to demographic and socioeconomic variables, birthweight, and breastfeeding. Pelotas, Southern Brazil, 1982 to 2004-5

Variable	Total		Men		Women	
	n	%	n	%	n	%
Skin color		p = 0.002 *		p = 0.97 *		p <0.001 *
White	3170	27.1	1653	30.5	1517	23.4
Black or Mixed	882	32.7	469	30.5	413	35.1
Family income -1982 (MW)		p = 0.14 *		p <0.001 **		p = 0.001 **
≤1	826	25.5	438	22.1	388	29.4
1.1 - 3	2079	29.1	1092	31.0	987	27.1
3.1 - 6	788	30.8	415	35.4	373	25.7
6.1 - 10	244	28.3	128	32.8	116	23.3
>10	240	25.8	123	39.8	117	11.1
Change in income (1982 → 2004-5)		p = 0.95 **		p <0.001 **		p <0.001 **
Always poor	682	28.3	334	20.4	348	35.9
Non poor → poor	697	28.4	340	30.6	357	26.3
Poor → non poor	649	28.7	360	28.8	289	28.0
Never poor	2170	28.4	1172	34.0	998	21.8
Birthweight (grams)		p <0.001 **		p <0.001 **		p = 0.03 **
<2500	295	24.7	135	26.7	160	23.1
2500 - 2999	994	26.0	450	25.1	544	26.7
3000 - 3499	1588	26.1	846	29.1	742	22.6
3500 - 3999	1081	33.0	610	35.2	471	30.1
≥4000	239	38.5	165	39.4	74	36.5
Breastfeeding (months)		p = 0.22 **		p = 0.99 **		p = 0.03 **
<1.0	885	27.8	482	31.7	403	23.1
1.0 - 2.9	1049	27.3	542	30.3	507	24.1
3.0 - 5.9	934	28.4	484	28.7	450	28.0
6.0 - 8.9	380	28.4	201	32.8	179	23.5
9.0 - 11.9	157	33.1	83	32.5	74	33.8

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Variable	Total		Men		Women	
	n	%	n	%	n	%
≥12.0	661	29.5	335	30.7	326	28.2
Youth's schooling (years)		p = 0.04 *		p = 0.004 **		p <0.001 **
0 - 4	337	26.7	206	21.8	131	34.4
5 - 8	1172	30.1	716	29.6	456	30.9
9 - 11	2028	29.1	1010	32.3	1018	26.0
≥12	661	24.2	274	33.6	387	17.6
Total	4198	28.9	2206	30.6	1992 ***	26.1

MW: Minimum wages

* Chi-square test for heterogeneity

** Chi-square test for linear trend

*** Excluding 90 women with 3 or more months of pregnancy

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Table 5

Crude and adjusted analysis of the effect of independent variables on occurrence of overweight. Pelotas, Southern Brazil, 1982 to 2004-5

Variable	Men				Women			
	Crude		Adjusted*		Crude		Adjusted**	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Skin color		p = 1.00***		p = 0.26***		p <0.001***		p <0.001***
White	1	-	1	-	1	-	1	-
Black or Mixed	1.00	0.86;1.17	1.12	0.95;1.31	1.50	1.28;1.76	1.43	1.21;1.68
Family income -1982 (MW)		p <0.001****		p <0.001****		p <0.001****		p = 0.007****
≤1	0.56	0.42;0.74	0.53	0.40;0.71	2.64	1.55;4.52	2.30	1.34;3.95
1.1 - 3	0.78	0.61;0.98	0.76	0.60;0.96	2.43	1.44;4.11	2.23	1.32;3.78
3.1 - 6	0.89	0.69;1.15	0.88	0.68;1.14	2.32	1.35;3.98	2.21	1.29;3.80
6.1 - 10	0.82	0.59;1.15	0.82	0.59;1.14	2.09	1.14;3.86	2.07	1.13;3.80
>10	1	-	1	-	1	-	1	-
Change in income (1982 → 2004-5)		p <0.001****		p <0.001****		p <0.001****		p <0.001****
Always poor	0.60	0.48;0.75	0.57	0.45;0.72	1.64	1.37;1.97	1.47	1.21;1.79
Non poor → poor	0.85	0.70;1.02	0.84	0.70;1.01	1.28	1.05;1.57	1.25	1.02;1.53
Poor → non poor	0.90	0.75;1.07	0.85	0.71;1.03	1.20	0.96;1.51	1.08	0.86;1.37
Never poor	1	-	1	-	1	-	1	-
Birthweight (grams)		p <0.001****		p <0.001****		p = 0.007***		p = 0.002***
<2500	0.68	0.48;0.95	0.72	0.52;1.01	0.63	0.42;0.96	0.60	0.40;0.91
2500 - 2999	0.64	0.50;0.82	0.68	0.53;0.87	0.73	0.52;1.02	0.70	0.50;0.97
3000 - 3499	0.74	0.59;0.92	0.76	0.61;0.95	0.62	0.45;0.86	0.62	0.45;0.86
3500 - 3999	0.89	0.72;1.11	0.91	0.74;1.14	0.83	0.59;1.15	0.86	0.62;1.19
≥4000	1	-	1	-	1	-	1	-
Breastfeeding (months)		p = 0.88***		p = 0.62****		p = 0.05****		p = 0.16****
<1.0	1.03	0.84;1.27	1.06	0.87;1.31	0.82	0.64;1.05	0.88	0.69;1.13
1.0 - 2.9	0.98	0.80;1.21	1.00	0.82;1.23	0.85	0.68;1.08	0.88	0.70;1.11
3.0 - 5.9	0.93	0.75;1.16	0.93	0.75;1.15	0.99	0.79;1.25	1.07	0.85;1.34
6.0 - 8.9	1.07	0.83;1.38	1.02	0.79;1.31	0.83	0.61;1.14	0.90	0.66;1.24
9.0 - 11.9	1.06	0.75;1.50	0.98	0.69;1.40	1.20	0.83;1.72	1.21	0.84;1.75

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Variable	Men				Women			
	Crude		Adjusted*		Crude		Adjusted**	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
≥12.0	1	-	1	-	1	-	1	-
Youth's schooling (years)		p = 0.003****		p = 0.15***		p <0.001****		p = 0.006****
0 - 4	0.65	0.48;0.88	0.85	0.61;1.19	1.95	1.42;2.69	1.61	1.10;2.34
5 - 8	0.88	0.72;1.08	1.11	0.88;1.40	1.76	1.36;2.27	1.49	1.09;2.03
9 - 11	0.96	0.80;1.16	1.13	0.92;1.39	1.48	1.17;1.88	1.32	1.01;1.73
≥12	1	-	1	-	1	-	1	-

MW: Minimum wages

*Variables in the first level (skin color, family income in 1982) adjusted for each other. Change in income adjusted for skin color. Birthweight adjusted for family income. Breastfeeding adjusted for family income and birthweight. Youth's schooling adjusted for income and birthweight

**Variables in the first level (skin color, family income in 1982) adjusted for each other. Change in income adjusted for skin color. Birthweight adjusted for skin color and family income. Breastfeeding adjusted for skin color, income, and birthweight. Youth's schooling adjusted for skin color, income, birthweight, and breastfeeding.

***Wald's test for heterogeneity

****Test for linear trend