

Prevalence of body weight excess in undergraduate students: analysis of repeated surveys

Prevalências de excesso de peso corporal em universitários: análise de inquéritos repetidos

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ABSTRACT: *Objective:* To compare the prevalence of excess of body weight between the surveys conducted in the years 2010, 2012 and 2014, in college students from the same institution. *Methods:* Three cross-sectional surveys were carried out in representative samples of students of a public institution. The excess of body weight was estimated by the body mass index and compared between the surveys, using the χ^2 test for linear trend, in each of the categories: sociodemographic, link with the university and health-related behaviors. *Results:* There were 1,069, 1,074 and 1,031 participants in the surveys in 2010, 2012 and 2014, respectively. Between surveys, the prevalence of overweight increased in men (2010: 30.1%; 2014: 36.4%), but not in women. There was an increased prevalence of excess body weight for the categories of sociodemographic variables link with the university and health-related behaviors in men and women. *Conclusion:* An increasing prevalence of excess body weight in college students was observed in the surveys. The conduction of interventions aimed at maintaining body weight is essential in order to avoid possible diseases associated with the concentrations of fat in inadequate levels.

Keywords: Overweight. Obesity. Students. Cross-Sectional Studies. Longitudinal Studies.

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Conflict of interests: nothing to declare – **Financial support:** none.

RESUMO: *Objetivo:* Comparar as prevalências de excesso de peso corporal, entre os inquéritos realizados nos anos de 2010, 2012 e 2014, com universitários de uma mesma instituição. *Métodos:* Foi realizada uma pesquisa de monitoramento, com a condução de inquéritos transversais em amostras representativas de universitários de uma instituição do estado da Bahia. O excesso de peso corporal foi estimado pelo índice de massa corporal e comparado entre os inquéritos, por meio do teste do χ^2 para tendência linear, em cada uma das categorias das variáveis sociodemográficas, de vínculo com a universidade e dos comportamentos relacionados à saúde. *Resultados:* Participaram 1.069, 1.074 e 1.031 universitários nos inquéritos de 2010, 2012 e 2014, respectivamente. A prevalência de excesso de peso corporal aumentou entre as investigações, de forma geral, em homens (2010: 30,1%; 2014: 36,4%), mas não em mulheres. Também se elevou em relação às categorias das características sociodemográficas, de vínculo com a universidade e dos comportamentos pertinentes à saúde em homens e mulheres. *Conclusão:* O aumento na prevalência de excesso de peso corporal em universitários foi mostrado entre os inquéritos. A realização de intervenções destinadas à manutenção do peso corporal é essencial para evitar o surgimento de possíveis doenças associadas às concentrações de gordura em níveis inadequados.

Palavras-chave: Sobrepeso. Obesidade. Estudantes. Estudos transversais. Estudos longitudinais.

INTRODUCTION

Excess body weight (EBW) is a serious public health problem and is a risk factor for the emergence of chronic non-communicable diseases (NCDs)¹⁻³. EBW is associated with psychological disorders such as depression¹ and increases the risks of mortality due to cancer² and other causes³.

In developed and developing countries, prevalence of EBW has increased in both young people and adults⁴. It is estimated that, by 2030, the worldwide concentration of people with EBW could be of 3.38 billion⁵. In Brazil, in 2002 and 2003, this occurrence in men was of 50.4%; in 2008, and in 2009, it increased to 62.5%. For women, between 2008-2009, it was of 64.9% - an increase of approximately 10% compared to 2002-2003⁶. Over time, this has also been verified in children and adolescents⁶.

As for the group in the transition phase from adolescence to adulthood (university students), studies pointed to a high prevalence of EBW in undergraduates from universities in Brazil^{7,8}, the United States⁹ and Portugal¹⁰. This situation was observed among men and physical activity practitioners¹¹.

Information on the prevalence and factors associated with EBW in Brazilian university students is limited, since studies, to date, have been limited to the participation of new students entering university^{7,12} and women⁷, as well as not having national coverage^{7,8,12}. In addition, the predominance of cross-sectional studies^{7,8,12} makes it difficult to identify possible temporal trends.

Consistent with the need for research on EBW in this group, it is important to consider the increase in enrollment in higher education¹³. With the exception of the South

and Southeastern regions of the country, between 2001 and 2010, access to universities became more comprehensive for Brazilians, with the highest enrollment growth being in the Northeast, from 15.2% to 19.3%¹³. Considering the above, as well as the need to monitor the prevalence of EBW in this group, especially due to the negative impact of this biological marker on health, this study aimed to compare the prevalence of EBW between the surveys conducted in the years 2010, 2012 and 2014, with university students of the same institution.

METHODS

The data in this study were derived from the Monitoring of Health Indicators and Quality of Life of Academics (Monitoramento dos Indicadores de Saúde e Qualidade de Vida de Acadêmicos - MONISA) Research, held at a university in the state of Bahia. The methodological details of this study were presented in a previous publication¹⁴.

The target population was university students enrolled in the second semester of undergraduate courses in the years 2010, 2012 and 2014. E-learning students were excluded, as well those with special enrollment conditions and those entering the institution in the second semester, totaling: in 2010, 5,461 students; in 2012, 5,767; and in 2014, 5,244. In all three surveys, the sample estimates were similar for the adopted parameters (prevalence: 50%; relative error: 3 percentage points, or p.p.; 95% confidence interval; increase of 20 and 15% for losses and refusals). The estimated samples, in the years 2010, 2012 and 2014, were 1,232, 1,243 and 1,223, respectively.

The sample was stratified according to the distribution of the target population in the courses, time of classes and years of entry into the institution. In 2010, 30 courses were included. In 2012, four courses were added to these, resulting in 34 courses. In 2014, the Language Studies courses with qualification in Spanish and with qualification in English were fused into one single "Language Studies course", making 33 courses. The daytime (morning and evening) and night class periods were considered.

In each of the three surveys, the years of entry into the university were organized into four categories (considering the minimum time for completion of most courses in eight semesters):

1. 2010 survey – entrants from 2010, 2009, 2008, 2007 and earlier;
2. 2012 survey – entrants from 2012, 2011, 2010, 2009 and earlier;
3. 2014 survey – entrants from 2014, 2013, 2012, 2011 and earlier.

In each stratum, the university students were randomly selected, with the help of the registration list, in alphabetical order, using the Research Randomizer software.

In all three surveys, the team responsible for data collection received training in the months of July and August. These teams in each survey were composed of students not participating in the sample and by teachers of the institution, 6 in 2010, 27 in 2012 and 39 in 2014.

The university students selected were searched in the institution in up to three attempts, at different days and times; data collection was carried out between September and November in the year of each survey, before or during classes, according to the convenience of the individuals selected. There was no replacement for those who were not found or refused to participate.

The information was obtained through the Health Indicators and Quality of Life of Academics (ISAQ-A) questionnaire, developed for application in research with university students and previously validated regarding face and content, as well as tested for its levels of reproducibility¹⁵. The questionnaires were applied individually or collectively (up to 40 students), being filled by the students themselves in the classroom. The same conditions were guaranteed during collection with only one student or in groups: guidelines were given for the filling of the questionnaires and a member of the team was available to resolve any doubts at the time of collection.

OUTCOME VARIABLE

EBW was estimated by the body mass index (BMI), using the measures of body mass and height included in the ISAQ-A questionnaire and classified according to the criteria established by the World Health Organization (WHO)¹⁶ for adults aged 18 years or older, in $BMI \geq 25 \text{ kg/m}^2$, through the following equation: body mass divided by height squared. University students aged under 18 years were classified according to Cole et al.¹⁷

The analysis of reproducibility of the height and body mass reported, with an interval of one week, was previously published¹⁵. The values obtained were considered satisfactory (height in meters, mean difference of -0.002 , 95%CI - 0.006 – 0.003; body mass in kilograms, mean difference of 0.36, 95%CI - 0.19 – 0.91), according to the plotting of the Bland-Altman scatter plot.

The levels of concurrent validity of the measures of body mass and stature reported in relation to the measurements showed satisfactory agreement for use in the classification of EBW in this group for use in epidemiological studies¹⁸, with *Kappa* values of 0.76 for men and 0.74 for women.¹⁸.

EXPLORATORY VARIABLES

The independent, sociodemographic variables were: sex; age group in tertiles (1st tertile, 17 to 20 years, 2nd tertile, 21 to 23 years, and 3rd tertile, 24 years or more); marital status (no spouse and spouse). The variables related to the bond with the university were the period of classes (night and day) and years of exposure to the university, being:

- in the 2010 survey – one year for entrants in 2010; two years for entrants in 2009; three years for entrants in 2008; and four years and more for entrants in 2007 and earlier;

- in the 2012 survey – one year for entrants in 2012; two years for entrants in 2011; three years for entrants in 2010; and four years and more for entrants in 2009 and earlier;
- in the 2014 survey – one year for entrants in 2014; two years for entrants in 2013; three years for entrants in 2012; and four years and more for entrants in 2011 and earlier;

The variables referring to health-related behaviors were:

- physical activities during leisure, classified as active (university students who reported practicing physical activity in at least one day of a typical week) and inactive (those who did not practice physical activity, but were interested in doing it, and those who did not practice but had no interest);
- consumption of fruits, referring to the frequency of this intake on typical weekdays, classified in up to four days per week and five days or more per week¹⁹;
- consumption of vegetables, frequency of intake in typical weekdays, classified as up to four days per week and five days or more per week¹⁹;
- consumption of soft drinks, use of soft drinks (including low calorie ones and/or artificial juice) on typical weekdays, classified as up to four days a week and five days or more per week¹⁹;
- consumption of fatty red meat, by reporting the intake of this meat with beef, pork or lamb fat, classified in no (no day per week) and yes (one day or more per week)¹⁹;
- consumption of chicken with fat, which is the intake of chicken with skin (without removing the visible fat) in typical weekdays, categorized in no (no day per week) and yes (one day or more per week)¹⁹.

The information was tabulated in EpiData 3.1 and the analyzes were performed in the Statistical Package for Social Sciences (SPSS) version 15.0. Descriptive analyzes of the absolute and relative frequencies, mean and standard deviation were used. To compare the prevalence of EBW between the surveys, for each independent variable, the χ^2 test was used for linear trend. All analyzes were stratified by sex. The level of significance was 5%.

The design of the MONISA study was approved by the local research ethics committee, under protocol no. 382/2010. Participants signed the informed consent and had their identification information kept confidential.

RESULTS

A total of 1,069, 1,074 and 1,031 university students participated in the surveys in 2010, 2012 and 2014, respectively. The mean age of men was 23.8 years (± 5.5) in 2010, 23.6 years (± 6.5) in 2012, and 24.3 years (± 6.5) in 2014. The mean age of women was 23.3 years (± 5.0) in 2010, 23.6 years (± 6.6) in 2012, and 23.1 years (± 4.9) in 2014. Sociodemographic characteristics, information on the bond with the university and on the health-related behaviors

of men and women are presented in Table 1. In the three surveys, there was a greater participation of women (2010: 54.7%, 2012: 54.9%, 2014: 52.5%).

The prevalence of EBW in university students in each survey is shown in Figure 1. There was an increase in the prevalence of EBW in men ($p < 0.05$), specifically between 2012 and 2014, but not in women.

Table 1. Sociodemographic characteristics, information on university bond and on health-related behaviors of university student samples.

Variables	2010 Survey		2012 Survey		2014 Survey	
	H (n) %	M (n) %	H (n) %	M (n) %	H (n) %	M (n) %
Age group (years)						
17 to 20	(124) 25.6	(161) 27.6	(137) 28.2	(166) 28.3	(147) 30.1	(175) 32.3
21 to 23	(180) 37.1	(220) 37.7	(150) 30.9	(208) 35.4	(162) 33.1	(190) 35.1
24 or more	(181) 37.3	(202) 34.6	(199) 40.9	(213) 36.3	(180) 36.8	(177) 32.7
Marital status						
No spouse	(427) 87.0	(509) 86.0	(415) 85.0	(505) 85.4	(425) 86.2	(480) 88.4
Spouse	(64) 13.0	(83) 14.0	(73) 15.0	(86) 14.6	(68) 13.8	(63) 11.6
Period of classes						
Daytime	(318) 64.8	(416) 70.3	(320) 65.4	(410) 68.9	(350) 70.9	(397) 72.6
Night	(173) 35.2	(176) 29.7	(169) 34.6	(185) 31.1	(144) 29.1	(150) 27.4
Time of exposure to the university (years)						
1	(103) 21.0	(130) 22.0	(104) 21.3	(126) 21.2	(98) 19.8	(102) 18.6
2	(103) 21.0	(164) 27.7	(121) 24.7	(142) 23.9	(96) 19.4	(103) 18.8
3	(114) 23.2	(111) 18.8	(80) 16.4	(135) 22.7	(88) 17.8	(139) 25.4
4 or more	(171) 34.8	(187) 31.6	(184) 37.6	(192) 32.3	(212) 42.9	(203) 37.1
Consumption of fruit (days/week)						
≥ 5	(75) 15.5	(125) 21.7	(88) 18.1	(133) 22.9	(114) 23.3	(159) 29.4
Up to 4	(410) 84.5	(451) 78.3	(399) 81.9	(448) 77.1	(375) 76.7	(381) 70.6
Consumption of vegetables (days/week)						
≥ 5	(188) 39.0	(267) 46.5	(191) 40.7	(272) 47.5	(215) 44.3	(269) 50.2
Up to 4	(294) 61.0	(307) 53.5	(278) 59.3	(301) 52.5	(270) 55.7	(267) 49.8
Consumption of fatty meat						
No	(31) 6.5	(67) 11.8	(39) 8.3	(61) 10.9	(28) 5.8	(71) 13.3
Yes	(449) 93.5	(500) 88.2	(430) 91.7	(499) 89.1	(451) 94.2	(463) 86.7
Consumption of fatty chicken						
No	(205) 42.0	(356) 62.6	(176) 37.4	(316) 56.5	(201) 41.7	(267) 50.5
Yes	(283) 58.0	(213) 37.4	(294) 62.6	(243) 43.5	(281) 58.3	(262) 49.5
Consumption of soft drinks (days/week)						
Up to 4	(379) 77.5	(464) 78.9	(371) 76.7	(467) 80.1	(419) 85.3	(474) 86.8
≥ 5	(110) 22.5	(124) 21.1	(113) 23.3	(116) 19.9	(72) 14.7	(72) 13.2
Physical activity during leisure						
Inactive	(167) 34.6	(372) 64.6	(166) 34.8	(355) 60.2	(170) 35.0	(325) 60.1
Active	(315) 65.4	(204) 35.4	(311) 65.2	(235) 39.8	(316) 65.0	(216) 39.9

M: males; F: females; %: proportion.

The comparison between the prevalence of EBW between the surveys, according to the independent variables, is presented in Table 2. In men, there was an increase among the investigations for university students in the lowest age group, in the night period, in their first year of exposure to the university, which reported fruit consumption of up to four days a week, fatty meat and fatty chicken consumption, of soft drink consumption in up to four days a week, as well as being physically active during leisure.

For females (Table 2), over time, the increase in the prevalence of EBW occurred for those in the highest age tertile, who had a spouse, who studied in the daytime with four years and more of exposure to the university, who reported consuming fruits on five or more days of the week, who reported not ingesting chicken with fat and who did not engage in physical activity during leisure.

DISCUSSION

The prevalence of EBW has generally increased over time in men and not in women. In both groups, this increase was evidenced in different categories of sociodemographic characteristics and bond with the university, as well as health-related behaviors.

The males analyzed in this study had an increase in EBW similar to Harvard undergraduates¹¹, during the years of the investigations, and it appears that this follows the trend estimated in the surveillance of risk and protection factors for chronic diseases by phone survey (VIGITEL)^{19,20}. However, in this study, there were no differences in the prevalence of EBW among women, which did not occur for the female students of Havard¹¹. It is important to consider the interval between the surveys: the largest

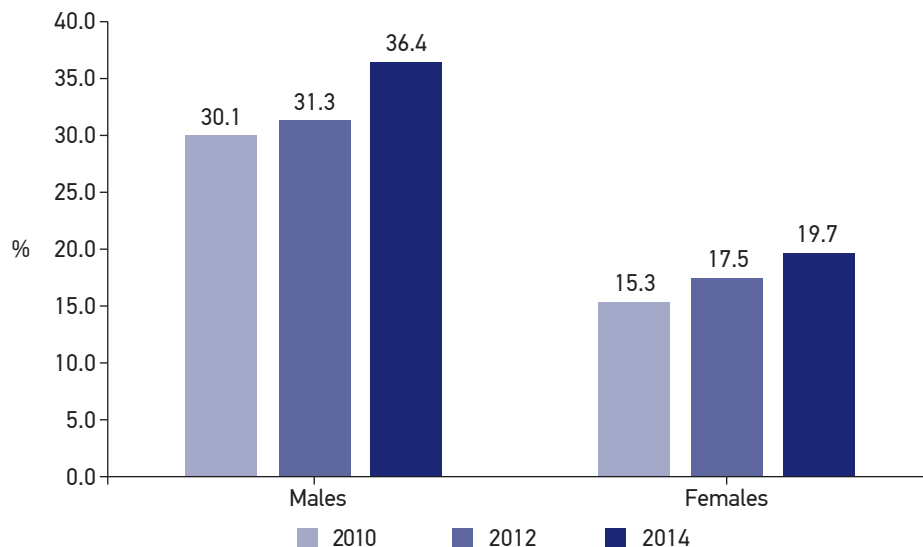


Figure 1. Prevalence of excess body weight among university students.

Table 2. Prevalence of excess body weight between the surveys with university students, according to sociodemographic variables, bond with the university and health-related behaviors.

Variables	Males			p-value*	Females			p-value*
	2010 (n) %	2012 (n) %	2014 (n) %		2010 (n) %	2012 (n) %	2014 (n) %	
Age group (years)								
17 to 20	(16) 13.2	(27) 20.3	(42) 28.6	< 0.01	(17) 10.8	(17) 10.8	(23) 13.4	0.46
21 to 23	(47) 26.1	(36) 24.2	(47) 29.4	0.51	(24) 11.4	(35) 16.9	(24) 13.2	0.56
24 or more	(82) 45.3	(87) 44.2	(88) 49.2	0.46	(45) 23.2	(47) 23.4	(56) 33.1	0.04
Marital status								
No spouse	(110) 26.3	(112) 27.6	(131) 31.3	0.11	(66) 13.5	(74) 15.3	(78) 16.9	0.15
Spouse	(35) 54.7	(38) 52.1	(45) 68.2	0.12	(20) 27.0	(24) 31.6	(25) 43.9	0.05
Period of classes								
Daytime	(88) 28.5	(90) 28.8	(108) 31.5	0.39	(53) 13.3	(61) 15.6	(70) 18.4	0.05
Night	(57) 32.9	(60) 35.9	(69) 48.3	< 0.01	(33) 20.1	(38) 21.8	(33) 23.1	0.53
Time of exposure to the university (years)								
1	(17) 16.8	(31) 30.4	(41) 42.3	< 0.01	(23) 19.0	(23) 19.3	(14) 14.3	0.38
2	(34) 33.3	(26) 21.8	(24) 25.3	0.19	(18) 11.4	(28) 21.1	(16) 15.7	0.24
3	(34) 30.6	(26) 33.3	(36) 41.4	0.12	(22) 20.2	(18) 13.7	(25) 18.9	0.86
4 or more	(60) 35.7	(67) 37.2	(76) 36.7	0.85	(23) 13.1	(30) 16.5	(48) 25.1	< 0.01
Consumption of fruit (days/week)								
≥ 5	(29) 39.2	(32) 37.6	(38) 33.9	0.45	(21) 17.8	(20) 15.9	(32) 20.9	0.47
Up to 4	(115) 28.6	(116) 29.6	(139) 37.7	< 0.01	(63) 14.6	(77) 18.1	(70) 19.1	0.09
Consumption of vegetables (days/week)								
≥ 5	(58) 31.5	(63) 33.9	(82) 38.5	0.14	(38) 14.9	(46) 17.8	(56) 21.6	0.05
Up to 4	(85) 29.4	(80) 29.3	(94) 35.6	0.12	(46) 15.8	(50) 17.5	(43) 17.0	0.70
Consumption of fatty meat								
No	(4) 12.9	(11) 28.9	(5) 17.9	0.60	(6) 9.2	(8) 14.3	(10) 14.5	0.36
Yes	(137) 31.1	(132) 31.4	(170) 38.3	0.02	(78) 16.4	(86) 18.1	(91) 20.6	0.10
Consumption of fatty chicken								
No	(68) 34.0	(54) 31.4	(76) 38.0	0.40	(43) 12.7	(58) 19.4	(50) 19.5	0.02
Yes	(76) 27.2	(89) 30.9	(97) 35.3	0.04	(40) 19.5	(36) 15.4	(46) 18.5	0.82
Consumption of soft drinks (days/week)								
Up to 4	(109) 29.3	(119) 32.8	(150) 36.3	0.04	(67) 15.2	(80) 18.0	(86) 19.0	0.14
≥ 5	(36) 33.3	(30) 27.0	(27) 38.6	0.60	(19) 16.0	(17) 15.3	(16) 23.2	0.26
Physical activity during leisure								
Inactive	(48) 29.6	(58) 35.6	(57) 34.1	0.39	(53) 15.1	(57) 17.0	(66) 21.2	0.04
Active	(95) 30.4	(85) 28.0	(119) 38.3	0.04	(31) 15.9	(42) 18.7	(35) 16.9	0.80

%; Prevalence; * χ^2 test for linear trend.

interval in the present study was four years; at Harvard, it was seven years¹¹ — which may have contributed to the identification of differences between the prevalence of EBW among women.

The results showed the increase in the prevalence of EBW over time in males of the lowest age group and the first year of exposure to university. The occurrence of EBW among the categories of university exposure time in Harvard students was verified for those in the fifth year, from 28.7% in 1993 to 37.2% in 1999¹¹. In this study, the difference between the prevalence observed for the youngest men and the first year of university exposure may represent a trend in the increase on EBW in adolescence¹³, and thus, university students have entered with a higher EBW each year. In addition, it is important to consider the occurrence of BMI increase in the first few months of university, as verified in Canadian university students²¹.

For women, the increase in the prevalence of EBW (2010 to 2014) occurred for those in the highest age group and with four years or more of exposure to the university. Adult women from the Brazilian capitals, aged 24 to 54 years, also presented higher prevalence of EBW in 2014²⁰, when compared to 2006¹⁹. In a meta-analysis, it was verified that, at the end of the university period, there was an increase of 1.55 kg in body weight, and 1.17% in fat percentage. This accumulation was higher than at the beginning²², which possibly explains the results shown here for females.

In relation to the females with a spouse, a predominance of EBW was evidenced over the years of the surveys. Studies have indicated that the same occurs with married adults of both sexes, regardless of age^{23,24}, schooling and health-related behaviors²³. In relation to married women, this may represent less involvement in behaviors related to maintaining body weight, such as physical activity in leisure²³.

The results showed that the prevalence of EBW in men who studied at night increased during the surveys; however, in women, the fact was evidenced for the daytime period. Students attending night classes are usually engaged in occupational activities that require little energy expenditure and which favor an inadequate diet during the day²⁵. The characteristics related to the higher prevalence of EBW in university students attending night classes are not conclusive^{8,26}, which raises the need for scientific research on the occurrence of EBW in students of different periods.

Regarding health-related behaviors, such as eating habits and the practice of physical activities, these components have a direct impact on maintaining body weight²⁷. In the present study, the increase in the prevalence of EBW was verified in men who reported the consumption of meat and chicken with fat and the irregular intake of fruits. Studies have shown that inadequate feeding may be positively related to increased body weight^{8,28}.

The results showed that the prevalence of EBW for males who are active during leisure increased between the surveys; however, for females, this occurred for those who reported being inactive during leisure. One possibility to explain this is that college students with EBW, seeking to control their weight, may become more active than their peers with normal weight¹²; another hypothesis is that men who are active during

leisure may have practiced modalities that favor the increase of muscle mass, resulting in classification as EBW²⁹. The increase in the prevalence of EBW in women who are inactive during leisure may be related to the female habits, which characterize them with a higher prevalence of physical inactivity during leisure, thus, with greater possibilities of presenting EBW.

The article presents limitations that should be mentioned. First, the overlap of subjects among the surveys, which was of approximately 7% between the investigations every two years (2010 and 2012; 2012 and 2014) and 3% between 2010 and 2014. The second limitation is related to the use of a questionnaire for the investigation of health-related behaviors, in view of the possible memory bias; on the other hand, the variables employed in this study presented satisfactory levels of reproducibility¹⁵. Although the use of reported measures of body mass and height for BMI estimation may be seen as a limitation, some validation studies of these measures have shown the possibility of use in epidemiological surveys with university students^{18,30}.

Among the strengths of this study are its methodological rigor, using a simple random selection process, in a stratified sample that is proportional to the different characteristics of the bond to the university. The short period of data collection may have avoided possible seasonal academic interference, such as the finals period. Finally, the monitoring aspect contributes to the surveillance of this information in university students.

CONCLUSION

The information from this study allow the conclusion that there has been an increase in the prevalence of EBW over the years between men and women. The estimates herein have pointed to this increase among men:

- in the age group of 17 to 20 years;
- attending night classes;
- in the first year of exposure to the university;
- who ate fruits up to four days a week;
- who reported the consumption of fatty meats and fatty chicken;
- in addition to the consumption of soft drinks up to four days a week; and
- who are active during leisure.

In females, this increase was shown for women who:

- were aged 24 years or over;
- who had a spouse;
- who attended the daytime classes;
- with four years and more of university exposure;
- who ate fruit on five or more days per week;
- who did not consume fatty chicken; and
- who did not practice physical activities during leisure.

The implementation of interventions focused on the maintenance of body weight in university students is essential, as it may prevent the emergence of diseases associated with fat concentrations at inadequate levels.

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Received on: 09/17/2016

Final version presented on: 01/23/2017

Accepted on: 05/18/2017