Journal of Behavioral Health

available at www.scopemed.org

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Original Research

Obesity and socioeconomic status in Argentina

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Abstract

Background: In 2001 Argentina experienced the worst economic depression in the country's history, yet few researchers have examined the nutritional status of Argentines vis-à-vis key socioeconomic indicators as the country recovered from its economic crisis.

Methods: We used the 2009 National Survey of Risk Factors (ENFR) to examine the association between socioeconomic status (SES) -- income and education -- and risk of being overweight or obese five years after the crisis. We estimated logistic regression models with weight as dependent variable and income, education, age, and gender as independent variables.

Results: About 50% of the Argentine population 18 and older was overweight or obese in 2009. Low weight, while not high, was higher in women than in men. There were gender differences in the association between overweight/obesity and socioeconomic status. Among men, overweight increased as income and education increased, whereas among women the reverse was generally true. With obesity, while rates decreased overall with income and education among both genders, the lowest rates were found among the lowest and second lowest income groups of women and men, respectively.

Conclusion: Findings are compatible with both high-income and low- and middle-income countries. As in high income countries, income and education appear to be overall protective of obesity, although this is not true for overweight. Among certain population subgroups, low weight rather than obesity may be the public health problem to be tackled. Argentina needs to tailor public health and social, including economic policies to fit a complex landscape of wealth and poverty to address the problem of overweight/obesity prevalent across a spectrum of income and educational levels.

INTRODUCTION

Argentina entered the 21st century mired in a deep socioeconomic and political crisis. A neoliberal economic model rooted in the 1976 – 1983 military dictatorship and combining privatizations of state enterprises, reductions of the public sector, implementation of "flexible" labor policies, and trade liberalization in the context of currency appreciation and concomitant loss of the competitiveness of domestic industry, caused a progressive indebtedness of the country and the population and increasing income inequality. With the country mired in debt, Argentina's political leadership implemented severe cuts of public sector jobs and social programs. This

resulted in a fatal mix that together with the collapse of the national currency caused a dramatic increase in the rate of unemployment and the most severe economic depression in the country's history, which threw over 50% of Argentina's population of over 40 million individuals into poverty [1].

A crisis of such monumental proportions was bound to have substantial implications for the health of the Argentine people, including their nutritional status. Yet precisely given the crisis, the resources available to document its health effects were limited. One of the few studies of the nutritional and health statuses of Argentine women and children conducted immediately after the crisis presents a compelling picture of the

significant inequalities in unsatisfied basic needs (NBI)[1] among the population at the time [2]. This study recorded the height, weight, and key biochemical markers of children between the ages of six months and five years, and of women of reproductive age, including pregnant women. It found an overall prevalence of overweight (Body Mass Index -BMI- between 25 and 29.9) and obesity (BMI equal to or greater than 30) among children within that age range of 6.6% on average, yet greater (7.5%) among children with satisfied basic needs than among those with NBI (4.9%). Thus in contrast to middle or high income countries, where the poor, exposed to unhealthier nutrition, bear the brunt of excess weight, in Argentina, up to the 2001 crisis considered a middle-income country, children living in poverty simply did not have enough food, healthy or unhealthy, that could put them at risk of excess weight.

The study also indicated a national prevalence of overweight and obesity among women between the ages of 19 and 49, of 24.9% and 19.4%, respectively. Yet in contrast with young children, among women rates of excess weight were greater among those with NBI, i.e., poorer (overweight 39.6% and obesity 17.7%), than among less poor women (overweight 37%; obesity 14.6%), indicating that at least in the case of women, poverty at that time translated into greater intake of cheap, calorie-dense foods, whatever could keep these women going and of the sort they could afford. The region with the highest prevalence of overweight and obesity among women in this age group was Patagonia, one of the wealthiest regions in the country, and the lowest prevalence was found in the Northeast, one of the poorest regions [3].

Today, the socioeconomic conditions of Argentines have improved substantially – official estimates indicate poverty rates no higher than 6.5% as of the second semester of 2011 (INDEC, 2012), although some private entities have critiqued these estimates as overly optimistic [4]. Whichever the case may be little is known about the nutritional status of Argentines vis-à-vis key socioeconomic indicators as the country recovered from the 2001 economic crisis. However, a relatively up-to-date source of information on overweight and obesity in Argentina is the National

Survey on Risk Factors (ENFR), which collects health and behavioral information about the non-institutionalized adult population (18 years or older). The ENFR indicates an increase in rates of overweight, from 34.5% to 35.4%, between 2005 and 2009, and an even greater increase in obesity rates, from 14.6% to 18%, during that same time period [5].

Thus drawing from this source, we examined the relationship between socioeconomic status (SES) and overweight/obesity among adults in Argentina, a middle-income country, around five years after the major crisis in the country's history. An adequate analysis is lacking despite the fact that the adult population in Argentina (20 years and older) has among the highest rates of obesity in the Americas (close to 30%), only lower than Mexico, Venezuela and the United States, which present the highest rates [6], and despite the well-established health and economic implications of obesity [7-9]. Our paper attempts to fill this gap.

DATA AND METHODS

We used the 2009 National Survey of Risk Factors (ENFR). This cross-sectional survey provides the most up-to-date self-reported information on socio-demographic and health variables such as education, income, age, gender, weight, and chronic disease of the non-institutionalized adult (i.e. 18 or older) population in Argentina. The ENFR was conducted by the Argentine Ministry of Health and Environment and the National Institute of Statistics and Census, with the collaboration of the Provincial Direction of Statistics between October and December 2009. Its objectives were: 1) To determine the distribution of risk factors in the population aged 18 years and over 2) To estimate the prevalence of risk factors in this population and 3) To determine the population risk profile based on demographic, socioeconomic, educational and family/social environment characteristics (INDEC, S / N). The sample design of the ENFR 2009 was a probabilistic, multistage cluster. Departments, areas, and dwellings (in that order) were selected in cities of over 5,000 inhabitants in the totality of the Argentine territory, representing about 90% of the country's population. While the statistical unit was the housing unit, the survey was conducted at the level of the household, and the unit of analysis was the individual. The final sample was composed of 34,732 individuals [10]. In our study, we calculated prevalence of overweight and obesity by gender, age, and SES (income and education).

To classify the population according to weight categories we utilized Body Mass Index (BMI), whereby individuals with BMI <18.5 are categorized as

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[1] NBI stands for 'necesidades basicas insatisfechas" in Spanish, and is a concept used to measure poverty. In Argentina household is labeled as having NBI if it has at least one of the following characteristics: 1) at least three individuals per room (indicates overcrowding); 2) inhabits and inadequate or precarious building; 3) house lacks bathroom; 4) at least one school age child does not attend school; 5) head of household has minimal education (two years or less of elementary education)

"underweight", those with BMI between 18.5 and 24.99 as "normal weight", those with BMI ≥ 25 as "overweight", and those with BMI ≥ 30 as "obese" [11, 12]. We measured income using the ENFR variable for (monthly) household income: 1) category one = no income; 2) category two = 1 to 1750 pesos; category 3 = 1751 through 4000; and category 4 = 4001 and over. We measured education using the variable "Level of Instruction (for each individual)", which included the following categories: 1) no instruction; 2) elementary school incomplete; 3) elementary school complete; 4) some high school; 5) high school complete; 6) some college; 7) college/technical complete or higher; 8) special ed. We collapsed these eight categories into four dichotomous categories: 1) category one = elementary school incomplete or less; 2) category two = elementary school complete; 3) category three = high school partial or complete; 4) category four = some college or more.

To examine the association between SES and risk of being overweight/obese controlling for potential confounders, we estimated logistic regression models with category of weight as dependent variable, and income, education, age, and gender as independent variables. In this analysis we treated separately rather than combined the categories of overweight and obesity, and left the three remaining weights as reference categories. For example, in the case of the dependent variable 'overweight' reference categories are all other conditions (underweight, normal weight, overweight) because what is being evaluated is the extent to which the characteristic 'overweight' correlates with age, sex, income and education, compared to not having the overweight condition (which includes all other three categories of weight and not merely normal weight). We operated similarly for the dependent variable 'obesity'. Finally, to analyze to what extent a change in the reference group could change the conclusions of the logistic analysis we estimated the models for both dependent variables (separately) leaving as reference group only normal weight individuals. The results confirmed our findings (analysis available upon request). We considered significant a p-value of 0.05 and very significant a p-value of 0.001. The use of coded private information did not meet the definition of a human subject and did not require IRB review.

FINDINGS

According to the estimations from the ENFR, over 50% of men and just below 50% of women age 18 and older in Argentina were overweight or obese in 2009. The prevalence of obesity in this age group was 18% and 16% for men and women, respectively. Of note, the prevalence of low weight, while not high, was higher in women than in men (Table 1).

When looking at the relationship between *overweight* and income, we found that among women the prevalence of overweight decreased overall as income increased, with the exception of the lowest income category, where rates of overweight were lowest (14%). In contrast, among men overweight increased overall with increasing income, reaching the highest prevalence (43.01 %) at the highest income bracket. Similarly, with education overweight among women decreased as education increased, with the lowest levels (21.3%) found among women with highest education. Of note, women with complete elementary school had *higher* (31.4%) rather than lower rates of overweight than those who had not completed elementary school (27.8%). Among men, in contrast, the lowest overweight levels (36.9%) were found in the *lowest* education category, whereas overweight varied little among the rest of the income categories and was generally higher (~ 43%) than among women, and seemingly unrelated to education (Table 2).

Table 1. Sex-stratified prevalence (in %) of underweight, normal weight, overweight and obesity in Argentina among the population 18 years and over (2009).

BMI	Men	Women	Total
Low weight (BMI<18,5)	0.8	3.6	2.3
Normal weight (18,5 ≤ BMI < 25)	35.5	47.3	41.8
Overweight (30 < BMI ≤ 25)	41.6	26.6	33.6
Obese (BMI≥30)	18.4	15.9	17.1

Note: Prevalence calculated considering sampling weights.

Source: Authors' calculations based on ENFR 2009 (INDEC S / N)

Table 2. Sex-stratified prevalence (in %) of overweight by income and education in Argentina among the population 18 years and over (2009).

MONTHLY INCOME	Overweight	
	Men 18+	Women 18+
Income level 1	40.3	14.0
Income level 2	40.0	27.5
Income level 3	42.5	26.6
Income level 4	43.1	25.7
EDUCATION	**Overweight**	
	Men 18+	**Women 18+**
Under complete elementary school	36.9	27.8
Elementary school complete	43.2	31.4
High school complete	41.0	27.4
At least some college	43.1	21.3

Note: Prevalence by education calculated considering sampling weights.

Source: Authors' calculations based on ENFR 2009 (INDEC S / N)

When looking at the relationship between *obesity* and income, rates among women overall decreased as income increased, with the highest income level almost half the prevalence (10.3%) of the 2nd lowest level (19.7%). Notably, the *lowest* level of overweight was found among the *lowest* income women, contrary to the general trend among the other income groups.

Among men rates of obesity were substantially lower (18.2%) in the highest income brackets than in the lowest income bracket (24.1%), yet varied little among other income levels (2nd lowest to highest) and was lowest (17.2%) not at the *highest* income level but rather at the 2nd *lowest* income level. In contrast, the relationship between education and obesity was consistently negative among both men and women, i.e., as educational levels increased rates of obesity decreased, even if the difference in prevalence between the two lowest income categories were minimal for women (22.2% for income level 2 and 25.4 for income level 1) and non-existent for men (levels 1 and 2 at 20.9%). Thus the highest rates of obesity were found among the lowest education groups (men: 20.9%; women: 25.4%) and the lowest rates among the highest education groups (men: 15.1%; women: 9.1%) (Table 3).

Table 3. Sex-stratified prevalence (in %) of obesity by income and education in Argentina among the population 18 years and over (2009).

MONTHLY INCOME	Obesity	
	Men 18+	Women 18+
Income level 1	24.1	8.7
Income level 2	17.2	19.7
Income level 3	19.4	15.7
Income level 4	18.2	10.3
EDUCATION	**Obesity**	
	Men 18+	**Women 18+**
Under complete elementary school	20.9	25.4
Elementary school complete	20.9	22.2
High school complete	18.4	14.5
At least some college	15.1	9.1

Note: Prevalence by education calculated considering sampling weights.

Source: Authors' calculations based on ENFR 2009 (INDEC S / N)

To analyze to what extent the results of Tables 2 and 3 are robust, we estimated a set of logistic regression models for the probability of being overweight and obese according to educational level and household income, controlling for potential confounders such as the age of the individual or household size. The latter control is important because the variable income was measured at the household, rather than the individual level, and it was not possible to estimate the per capita household income since we worked with income ranges and not specific values. Model 1 considers the range of income as an explanatory variable in addition to age and gender. Model 2 considers education level, and Model 3 includes both variables (income and education) in order to assess the existence of confounding effects between these variables.

Table 4 presents the odds ratios, standard errors and p-values of the models for the dependent variable "overweight." Under the three models, age and gender are statistically very significant, suggesting that the risk of being overweight increased with age (odds ratio> 1) and was lower among women (odds ratio <1). As the table shows, being from a household in the *highest* income category *increased* the risk of being overweight (model 1; p: 0.048), and education, including having some or complete high school, did not lower that risk (model 2; p: 0.008). Including both income and education did not change these patterns (model 3; p: 0.030). However, as noted earlier this was not true for women, whose *highest* rates of overweight were found among the *lower* income categories, with the exception of the lowest-income group, where rates of overweight were lowest (14%).

Table 5 presents the odds ratios, standard errors and p-values of the models for the dependent variable "obesity". As with overweight, under the three models age and gender were very statistically significant, suggesting that the risk of obesity increased with age (odds ratio> 1) and was lower among women (odds ratio <1). In addition, models 1 and 2 show that both income and education were negatively and very statistically significantly associated with obesity (OR for income: 0.857; p: 0.001 and education: 0: 0.813; p: 0.001), suggesting that both factors are protective of the risk of being obese.

However, model 3 shows that when controlling for education, the relationship between income and obesity ceases to be statistically significant at the highest levels of income (Level 4). Interestingly, it is also reversed, i.e., becomes positive (OR: 1.093; p: 0.009) at lower income levels (Level 3), thus reversing the protective effect observed for income in model 1. As with overweight, with obesity we note important differences in the income subgroups, with the *lowest* rates of obesity seen among the *lowest* income women (8.7%). In contrast, among men the reverse is true, i.e., the lowest-income group has the highest (24.1%) rates of obesity, even as it is the second lowest income group (Level 2) rather than the highest income group (Level 4) which has the lowest rate of obesity among men (17.2% for level 2 vs. 18.2% for level 4).

Table 4. Logistic regression analysis predicting overweight, controlling for age and gender, in Argentina among the population 18 years and over (2009).

OVERWEIGHT	**Model 1**			**Model 2**			**Model 3**		
	Odds Ratio	Robust SE	P>z	Odds Ratio	Robust SE	P>z	Odds Ratio	Robust SE	P>z
Income level 3	1.043	0.028	0.110				1.046	0.029	0.106
Income level 4	1.076	0.040	0.048				1.095	0.043	0.023
Persons per household	1.022	0.007	0.001				1.020	0.007	0.003
High school complete				1.082	0.032	0.008	1.071	0.034	0.030
At least some college				0.962	0.031	0.237	0.965	0.036	0.337
Age	1.015	0.001	<0.001	1.015	0.001	<0.001	1.015	0.001	<0.001
Gender	0.543	0.013	<0.001	0.535	0.013	<0.001	0.546	0.013	<0.001

Source: Authors' calculations based on ENFR 2009 (INDEC S / N)

Table 5. Logistic regression analysis predicting obesity, controlling for age and gender, in Argentina among the population 18 years and over (2009).

	Model 1			Model 2			Model 3		
OBESITY	Odds Ratio	Robust SE	P>z	Odds Ratio	Robust SE	P>z	Odds Ratio	Robust SE	P>z
Income level 3	0.986	0.032	0.669				1.093	0.037	0.009
Income level 4	0.857	0.041	0.001				1.069	0.055	0.190
Persons per household	1.099	0.008	<0.001				1.077	0.008	<0.001
High school complete				0.813	0.029	<0.001	0.825	0.031	<0.001
At least some college				0.545	0.023	<0.001	0.568	0.028	<0.001
Age	1.021	0.001	<0.001	1.013	0.001	<0.001	1.016	0.001	<0.001
Gender	0.845	0.025	<0.001	0.847	0.025	0.000	0.871	0.026	<0.001

Source: Authors' calculations based on ENFR 2009 (INDEC S / N)

DISCUSSION

Our analysis showed that Argentina has relatively high rates of obesity – among the highest in Latin America, after Mexico and Venezuela. Furthermore, it showed a lower prevalence of overweight and obesity among women than among men, particularly among women with higher income and education levels. Our analysis also showed important differences between overweight and obesity vis-à-vis income and educational categories, and between genders. While among women income and education had overall a protective effect on overweight and obesity rates, with the notable exception of lowest income women, this was not quite true for men, especially with overweight. Thus men in the lower income categories and in the lowest education category had the lowest rates of overweight. With obesity, in contrast, the relationship was inverse, with the highest rates of obesity among men found among the lowest income and education categories.

When calculating odds ratio, we found that age and gender were statistically very significant, suggesting that the risk of being overweight increased with age and was lower among women. We also confirmed that overall income increased rather than decreased the risk of being overweight, and that education didn't reverse this effect. In contrast both income and education appeared to be protective of the risk of being obese, yet the protective effect of income disappeared when controlling for education, and was even reversed at lower income levels.

These patterns are compatible with both high-income and low- and middle-income countries. As in high income countries, income and education appear to be overall protective of obesity, although the same is not true for overweight. However, as in low-income countries, we found the lowest rates of obesity among

the lowest income groups (with the exception of very low income men). With overweight the relationship was nuanced, with the lowest rates found among the lowest categories of income, yet higher categories of education, albeit only among men.

The high prevalence of overweight and obesity in the Argentine population may be partly due to a combination of increased physical inactivity and unhealthy diets. Recent studies indicate that more than a third of Argentina's population reported no intake of fruits or vegetables in the five days prior to the study interview [13], and more than half of the population engages very little in physical activity, a trend that is increasing [14]. It may also be the result of poverty and high socioeconomic inequalities, known to drive differences in obesity rates [15].

Gendered patters in the distribution of both overweight and obesity could be related to gender roles and imperatives in Argentine society that, as many societies, imposes greater aesthetic demands, including a greater drive towards thinness, on women. Research has shown that a range of cultural factors shape the experience of women and men vis-à-vis body weight [16]. Patterns could also be related to gender-based, occupationally-driven differences in lifestyles. For instance, as Linetzky et al. have suggested, the differential patterns in obesity rates among women and men could be due in part to decreased physical inactivity among low-income women [14] that we could be attributed to the types of jobs that low-income women and men in developing-countries tend to hold (e.g. domestic service vs. construction). Also, the protective effect of income, and particularly, of education, may be stronger for women than for men, for reasons that require further investigation.

Other previous studies of Argentina show inverse

socioeconomic patterns of obesity similar to those in our study [14, 17]. However, according to our findings these patterns are far less clear in the case of overweight and for the lowest categories of income. Moreover, the work of Fleisher et al. [17] shows that even with obesity, socio-economic patterns vary according to "urbanicity" and that the inverse relationship becomes stronger in more urban areas.

Our results are compatible with the notion that education, through the acquisition of certain beliefs and knowledge, enables people to incorporate healthy habits into their everyday lives [18], and confers some protection against obesity, at least at the income levels we assessed (which, we note, are rather low to begin with). These results contrast however with studies in the United States, which show no gender differences in the association between education and obesity [19, 20].

A limitation of our study is that anthropometric data were self-reported, yet high correlations have been found between self-reported and directly measured weight and height [21]. Furthermore, the ENFR includes questions that allow researchers to gauge to what extent respondents report their true weight. Supplementary questions were: a) In the last year a doctor, has nurse or other health professional told you have to lose weight? and b) When was the last time you measured your weight? Response categories were: less than one year; between 1 and 2 years; more than two years; and never. Extrapolated results show that less than 8% of normal weight people classified by self-report indicate that a doctor, nurse or health professional told them to lose weight in the past year, while for overweight or obese individuals the percentage is 32% and 72%, respectively. In addition, almost 90% of individuals in the sample indicated that they had weighed themselves less than a year earlier, whereas the percentage was higher, over 90%, for individuals classified as overweight or obese through self-report.

Another limitation is that our data does not allow us to relate the current nutritional health landscape to specific features of Argentina's past depressed or current recovering economy. Yet a wealth of literature supports the proposition that economic conditions have critical implications for population health, including nutritional health, particularly in those middle-income countries faced with the combined burden of obesity and under nutrition [22] and of important economic inequalities. Given the difficult financial times current or predicted in many countries and the ongoing implementation of austerity policies at least in some of them, understanding the implications of economic factors for body weight in particular and for health more generally will likely become more relevant to other countries as well.

CONCLUSION

There is little doubt that in high-income countries obesity disproportionately affects the poor -- the seminal review by Sobal and Stunkard showed that in all industrialized nations, individuals of lower SES were at greater risk of becoming obese [23]. Since then, socioeconomic inequalities in obesity have been found to be systematic in countries as different as France, Spain, Austria, and the United States, with obesity rates 2.5 times greater in the lowest socio-economic groups than in the highest [15]. However, in low- and middle-income countries the nature of the relationship between socioeconomic status and obesity is far less clear. In countries as diverse as Cuba, Chile, Brazil, India, Samoa, Lithuania, China, South Africa, and Russia, researchers have observed that while prior to 1989 overweight and obesity were more prevalent among the elites, between 1989 and 2003, and as GDP in these countries increased, rates of obesity became more prevalent among the poor [24]. This seems to be the case with Argentina, with some notable exceptions along gender lines. It is far less clear that the patterns obtain for overweight, where the distribution along SES categories is more nuanced.

This shift in obesity rates from the better off to the worse off as societies industrialize, captured by the concept of "epidemiological transition", indicates the phenomenon of "plump poverty" of urban industrialized economies, whereby poor persons may not lack food, yet often have access only to foods of poor nutritional quality that increase their risk of obesity and related disorders [25]. A few studies have addressed the problem of obesity in Argentina [26, 27], yet to our knowledge none have attempted an in-depth analysis of the nature of the relationship between both overweight and obesity and socioeconomic indicators. It is important to understand how disparities in these variables differ in high- and low and middle-income countries because this understanding can inform public health and social policy interventions.

In conclusion, Argentina needs to tailor public health and social policies to fit a complex landscape of wealth and poverty to address the problem of obesity, which appears to be a problem across a spectrum of income and educational levels. Policymakers should also be mindful that for certain population subgroups maybe it is low weight, rather than obesity, the problem to be tackled. Further research should examine how overweight and obesity relate to the host of chronic conditions that are ultimately the source of public health concern.

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