

Original Article

# Diagnosis and Treatment of Obesity among Mexican Adults

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## Key Words

Diagnosis · Treatment · Obesity · Overweight · Inequity · Socioeconomic status · Gender · Mexico

## Abstract

**Objectives:** To quantify the access to diagnosis and treatment of obesity and intentional weight loss among obese adults in Mexico and to identify the sociodemographic factors related to these events. **Methods:** The 2006 Mexican National Health and Nutrition Survey – representative of the adults aged 20 to 64 years – was analyzed. Whether people had received diagnosis and treatment from health professionals and whether they had intentional weight loss were explored. The independent variables were: sex, age, socioeconomic position, locality size, and body weight perception. Analyses were carried out for obese people only (BMI  $\geq 30$  kg/m<sup>2</sup>, N = 8,545). **Results:** Among obese people, just 20.2% were diagnosed with such condition, only 8.0% undertook treatment, and barely 5.6% had lost weight intentionally. Individuals with a higher BMI, older individuals, people with higher education, those living in wealthier households, and those living in metropolitan areas were more likely to receive diagnosis and treatment for obesity. Women and people who had been diagnosed as obese were more likely to lose weight. **Conclusion:** There is an urgent need to increase access to diagnosis and treatment of obesity in Mexico, particularly for men and for lower socioeconomic groups.

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## Introduction

In Mexico, overweight and obesity is a public health crisis. The combined prevalence of overweight and obesity in women increased from 34.5% in 1988 to 69.3% in 2006, and in men from 59.7% in 2000 to 66.5% in 2006 [1]. This problem is of concern because many chronic diseases are associated with obesity and those comorbidities impose substantial health care and social expenditures [2].

A central aspect of the policies aimed at reducing overweight and obesity include population-based strategies that promote and develop environments for healthy eating and physical activity in schools, workplaces, and communities [3, 4]. The implementation and benefits achieved from environmental changes and other community-based approaches is time-consuming, and these types of interventions may have a limited impact at the individual level. Therefore, clinical care is required to address individuals who are already obese. Clinically, the assessment of body weight status and individualized advice, including behavioral interventions aiming to modify dietary habits and physical activity, may be essential in weight management [5]. Indeed, patients who have received advice from a health professional about changing their behaviors to control their body weight are more likely to take action [5, 6]. This is important because overweight and obese individuals can reduce their chronic disease risk with even a modest weight loss (i.e. 10% of initial weight) [7].

Few studies on the rates of diet, physical activity and weight loss counseling within the clinical setting have been conducted [5, 6, 8, 9]. Without exception, these studies were carried out in high-income countries. The findings of these studies suggest that rates of dietary and physical activity advice given to overweight patients attending a primary health care exam or routine checkup are low. Furthermore, in high-income countries only 50% of overweight and obese people have reported some attempt to lose weight, despite recognizing the benefits of weight loss [10, 11].

In low- and middle-income countries the rates of diagnosis and treatment for overweight and obesity may be even lower than what has been reported for high-income countries. However, there are no accurate estimates of such under-diagnosis and the lack of access to treatment. There may also be socioeconomic disparities in access and obesity diagnosis and treatment. Such disparities in access are relevant since people of low socioeconomic position from middle-income countries such as Mexico have higher rates of diabetes, hypertension, and metabolic syndrome [12–16], and a higher risk of weight gain [17]. It is expected that the under-diagnosis and under-treatment observed in low socioeconomic position from high-income countries [6] could also prevail in middle-income countries such as Mexico.

Therefore, the aim of this study was to examine and quantify the frequency of obesity diagnosis, weight loss treatment, and intentional weight loss among adults from Mexico. We also aimed to identify the socioeconomic and demographic factors related to these outcomes.

## Material and Methods

### *Study Sample*

The 2006 Mexican National Health and Nutrition Survey (NHNS) database was analyzed (N = 27,460). The NHNS aimed to obtain information on health and nutrition conditions of the Mexican population. The sample design was probabilistic, multistage, stratified and by cluster. The analysis units were: home, health service users, children, adolescents, and adults. The sample covered all 32 states of the country and had urban and rural representation. The sampling description has been reported elsewhere [1]. Field work was carried out from October 2005 to May 2006. In this report, the study population was limited to adults aged 20 to 64 years.

### Measurements

Weight and height were measured to the nearest 0.1 kg and 0.1 cm, respectively, as described by Lohman et al. [18]. Field staff were trained and followed standardized protocols [19]. The BMI (weight/height<sup>2</sup>) was calculated, and the participants were divided into the following categories: underweight ( $\leq 18.4$  kg/m<sup>2</sup>), normal weight (18.5–24.9 kg/m<sup>2</sup>), overweight (25.0–29.9 kg/m<sup>2</sup>), and obese ( $\geq 30.0$  kg/m<sup>2</sup>).

To examine the frequency of diagnosis of obesity over the life course by a health care professional, the following question was used (the original Spanish wording appears in parenthesis): ‘Have you ever been told by a doctor/dietician/nutritionist that you have or had obesity?’ (¿Alguna vez le ha dicho un médico/dietista/nutriólogo que tiene o tuvo obesidad?). Among the participants who received diagnosis by a health care professional (according to the NHNS questionnaire), the frequency of treatment of obesity by a health care professional over the life course was estimated with the following question: ‘Did you follow a treatment for weight control?’ (¿Siguió algún tratamiento para controlar su peso?). To examine if people had lost weight intentionally, the question used was: ‘During the last year, have you lost or gained weight?’ (Durante el último año, ¿ha perdido o ganado peso?). For those individuals who reported losing more than 5 kg, a follow-up question was used to determine if the weight loss was intentional or not. For our analyses, we only considered those individuals that answered that they had lost weight intentionally (n = 1,388).

We also considered whether diagnosis, treatment, and intentional weight loss varied by sex, age, household expenditures, education, size of locality, and body weight perception. The age groups were 20–35, 36–50, and 51–64 years. The household expenditure and education were used as proxy measurements of socioeconomic status; the former is considered an indicator of household wealth. Household expenditure quartiles were estimated by adding the resources spent for transport, food and beverages, cigarettes, products for household cleaning, education, health, entertainment, communication, clothing, and furniture and home appliances; the obtained result was divided by the number of family members. Education was categorized into five levels: no formal education/kindergarten, elementary, junior high school, high school/technical degrees, and graduate/postgraduate. Localities were categorized into three groups according to their size: rural ( $\leq 2,499$  inhabitants), urban (2,500–99,999 inhabitants), and metropolitan areas ( $\geq 100,000$  inhabitants). To determine how participants perceived their body weight, we used the following question: ‘Do you consider that you: i) are overweight, ii) are obese, iii) are underweight, or iv) your weight is fine?’ (¿Considera usted que...?: 1) tiene sobrepeso, 2) tiene obesidad, 3) está bajo de peso, 4) está bien de peso). The responses to the weight perception were cross-tabulated with the measured BMI groups to create two weight perception groups: accurate perception, and weight underestimation. In addition, we explored if intentional weight loss was related to having received an obesity diagnosis.

### Statistical Analysis

For the statistical analyses we excluded participants without complete data on BMI (n = 345), pregnant women (n = 386), participants with a BMI  $\geq 58.0$  or  $\leq 10.0$  kg/m<sup>2</sup> (n = 46), and individuals without complete data on the outcomes measures (n = 798). The statistical analyses were performed using STATA 11.0 software. To take into account the complex design of the NHNS, the analyses were completed using the survey commands that accounted for the strata, clustering, and sample weights.

In the overall population, the prevalence of each BMI range was calculated (table 1). To know if differences according to sex, age, house wealth, education, and size of locality exist, the Wald chi-square statistic was estimated.

Then, the prevalences of obesity diagnosis, obesity treatment, and intentional weight loss were estimated among participants with BMI  $\geq 30.0$  kg/m<sup>2</sup>. Given that only people with obesity should receive diagnosis and treatment for such condition and that the wording of the question about diagnosis refers to obesity, only those with BMI  $\geq 30.0$  kg/m<sup>2</sup> (N = 8,286) were included in these analyses. The rates of obesity diagnosis, obesity treatment, and intentional weight loss according to sex, age, house wealth, education, size of locality, body weight perception, and BMI – in the case of intentional weight loss – were estimated. Logistic regression models were used to identify factors associated with the diagnosis and treatment of obesity and intentional weight loss. For these estimations, the reference groups were males, subjects aged 20 to 35 years, people from low-wealth households, people with education of kindergarten or without education, people from rural localities, people with accurate weight perception, people with BMI ranging between 30.0 and 34.9 kg/m<sup>2</sup>, and – in the case of intentional weight loss – those who received

**Table 1.** Prevalence of the four BMI categories among the Mexican adult population, 2005–2006

	Underweight		Normal		Overweight		Obesity	
	N	%	N	%	N	%	N	%
Total population	277	1.1	7,005	28.5	10,317	39.6	8,286	30.7
Sex								
Male	123	1.3	3,079	30.6	4,565	43.0*	2,657	25.1*
Female	154	1.0	3,926	27.0	5,752	37.0	5,629	34.8
Age, years								
20–35	191	2.0	3,983	37.9	4,317	37.2*	2,923	22.9*
36–50	54	0.5	2,092	21.5	4,189	41.3	3,709	36.7
51–64	32	0.6	930	20.1	1,811	42.0	1,654	37.2
Household wealth								
I (low)	96	1.4	2,028	32.2	2,704	40.4	1,904	26.1*
II	55	1.2	1,785	28.0	2,661	39.9	2,191	30.9
III	76	1.1	1,669	26.9	2,588	39.3	2,179	32.7
IV (high)	50	1.0	1,523	26.9	2,364	38.9	2,012	33.2
Education								
≤Kindergarten	26	1.3	560	28.8	704	39.6	594	30.4*
Elementary	96	0.9	2,682	24.2	4,487	40.3	3,994	34.5
Junior high school	70	1.1	1,837	30.6	2,612	38.8	2,008	29.4
High school	58	1.7	1,194	32.0	1,595	39.4	1,104	26.8
≥Graduate	27	1.0	732	34.5	919	39.4	586	25.1
Size of locality <sup>a</sup>								
Rural	80	1.2	2,230	32.2	3,947	40.3	2,131	26.2*
Urban	68	1.0	1,832	26.5	3,006	39.3	2,537	33.1
Metropolitan	129	1.2	2,943	27.8	4,364	39.5	3,618	31.5

\*There were significant statistically differences among groups ( $p < 0.010$ ) with the adjusted Wald chi-square statistic.

<sup>a</sup>Rural: ≤2,499 inhabitants; urban: 2,500–99,999 inhabitants; metropolitan: ≥100,000 inhabitants.

diagnosis for obesity. First, crude logistic models were calculated; then, in order to adjust the effects of all predictors, logistic multivariate models were estimated. The odds ratios (OR) with their confidence intervals at 95% (95% CI) are reported.

## Results

Almost three quarters of adult participants in the 2005–2006 NHNS were overweight or obese and 1.1% were underweight (table 1). The prevalence of overweight was higher among men and older participants. The prevalence of obesity was higher among women, older participants, participants from wealthier households, individuals with lower education, and participants living in urban areas.

Within the population with obesity, 20.4% reported that they had been diagnosed with obesity ever in their life by a health care professional (table 2). The probability of obesity diagnosis was higher in the group of 51- to 64-year-olds, amongst people with higher household wealth, in individuals with higher education, in the residents of urban and metropolitan areas, and amongst participants with higher BMI who had accurate body perception. After adjusting for covariates, the higher probability of diagnosis remained in the above groups, except for residents of urban areas and those with accurate body perception.

**Table 2.** Diagnosis of obesity ever in life by a health care professional among the Mexican adult population with obesity, 2005–2006

	N	%	Crude model		Adjusted model <sup>a</sup>	
			OR	CI	OR	CI
Total population	8,286	20.4				
Sex						
Male	2,657	19.5	1.00		1.00	
Female	5,629	20.8	1.08	0.87–1.34	1.15	0.91–1.44
Age, years						
20–35	2,923	18.3	1.00		1.00	
36–50	3,709	20.6	1.15	0.94–1.42	1.18	0.94–1.47
51–64	1,654	23.0	1.33	1.03–1.71	1.55	1.18–2.03
Household wealth						
I (low)	1,904	14.8	1.00		1.00	
II	2,191	16.3	1.11	0.82–1.51	0.96	0.70–1.32
III	2,179	20.1	1.44	1.07–1.92	1.05	0.76–1.47
IV (high)	2,012	29.6	2.41	1.83–3.18	1.49	1.08–2.05
Education						
≤Kindergarten	594	10.4	1.00		1.00	
Elementary	3,994	17.7	1.85	1.28–2.66	1.79	1.21–2.65
Junior high school	2,008	21.3	2.34	1.62–3.36	2.37	1.57–3.57
High school	1,104	24.1	2.74	1.83–4.10	2.37	1.50–3.72
≥Graduate	586	34.6	4.56	2.98–6.96	3.73	2.31–6.00
Size of locality <sup>b</sup>						
Rural	2,131	12.1	1.00		1.00	
Urban	2,537	16.8	1.46	1.15–1.87	1.18	0.92–1.52
Metropolitan	3,618	25.1	2.43	1.93–3.05	1.80	1.39–2.32
Body weight perception						
Accurate	2,084	16.6	1.00		1.00	
Underestimation	6,202	21.6	0.72	0.58–0.90	0.83	0.66–1.05
BMI, kg/m <sup>2</sup>						
30.0–34.9	5,742	15.7	1.00		1.00	
≥35.0	2,544	30.9	2.40	2.02–2.85	2.41	2.01–2.88

<sup>a</sup>Adjusted for all variables included in the table.

<sup>b</sup>Rural: ≤2,499 inhabitants; urban: 2,500–99,999 inhabitants; metropolitan: ≥100,000 inhabitants.

In the same population, 8.1% reported that they had ever received treatment from a health care professional to control their body weight (table 3). The probability of having undergone weight loss treatment was higher amongst individuals from wealthier households, participants with higher education, residents of urban and metropolitan areas, those with accurate body perception, and amongst participants with higher BMI. After adjusting for covariates, the higher probability of this event remained in the above groups, except for residents of urban areas. However, the differences related to body weight perception and locality size were marginal. In the adjusted model, it was made evident that the group of 51- to 64-year-olds had higher probability of having undergone weight loss treatment.

The prevalence of intentional weight loss – defined as ≥5 kg weight loss in the past 12 months – was of 5.7% (table 4). The probability of intentional weight loss was higher among participants from wealthier households, individuals with higher education, residents of metropolitan areas, and those who had been diagnosed with obesity. After adjusting for covariates, the higher probability of the event remained amongst those who had been diagnosed with obesity. In addition, women had higher probability of intentional weight loss.

**Table 3.** Treatment to control body weight ever in life among the Mexican adult population with obesity, 2005–2006

	N	%	Crude model		Adjusted model <sup>a</sup>	
			OR	CI	OR	CI
Total population	8,286	8.1				
Sex						
Male	2,657	7.4	1.00		1.00	
Female	5,629	8.5	1.16	0.86–1.57	1.34	0.98–1.84
Age, years						
20–35	2,923	6.8	1.00		1.00	
36–50	3,709	8.5	1.26	0.93–1.70	1.33	0.96–1.85
51–64	1,654	9.1	1.36	0.96–1.93	1.68	1.15–2.47
Household wealth						
I (low)	1,904	3.6	1.00		1.00	
II	2,191	6.5	1.87	1.17–3.00	1.67	1.05–2.65
III	2,179	8.6	2.53	1.62–3.96	1.87	1.17–2.98
IV (high)	2,012	13.1	4.09	2.63–6.17	2.44	1.48–4.01
Education						
≤ Kindergarten	594	4.2	1.00		1.00	
Elementary	3,994	5.9	1.42	0.84–2.38	1.31	0.77–2.24
Junior high school	2,008	8.7	2.15	1.23–3.74	2.04	1.13–3.69
High school	1,104	10.9	2.75	1.55–4.88	2.25	1.21–4.16
≥ Graduate	586	17.0	4.63	2.60–8.23	3.62	1.83–7.16
Size of locality <sup>b</sup>						
Rural	2,131	4.4	1.00		1.00	
Urban	2,537	6.8	1.58	1.11–2.25	1.09	0.75–1.58
Metropolitan	3,618	10.1	2.40	1.74–3.32	1.42	1.00–2.02
Body weight perception						
Accurate	2,084	5.7	1.00		1.00	
Underestimation	6,202	8.8	0.62	0.45–0.85	0.73	0.53–1.00
BMI, kg/m <sup>2</sup>						
30.0–34.9	5,742	6.6	1.00		1.00	
≥35.0	2,544	11.5	1.83	1.43–2.34	1.77	1.38–2.25

<sup>a</sup>Adjusted for all variables included in the table.

<sup>b</sup>Rural: ≤2,499 inhabitants; urban: 2,500–99,999 inhabitants; metropolitan: ≥100,000 inhabitants.

## Discussion

Although the majority of Mexican adults are overweight or obese (70.3%), only a small percentage is being diagnosed or treated for obesity by a health care professional. Even amongst the population with BMI ≥ 30.0 kg/m<sup>2</sup>, only 20.4% have been diagnosed, just 8.1% have been treated, and barely 5.7% have, within the past year, lost a significant amount of weight. In this study, the importance of being diagnosed with obesity is demonstrated by the fact that compared to those who had not been diagnosed, overweight and obese individuals who were diagnosed with obesity by a health care professional were 3.53 times more likely to have lost weight intentionally within the past year. Older participants, individuals with lower education, those from household with lower wealth, rural residents, and participants who have lower BMI were less likely to receive diagnosis and have undergone treatment.

In high-income countries, it has been reported that four out of ten obese patients who visited a primary care physician received advice for weight management [6, 8, 20]. Although

**Table 4.** Intentional weight loss in the past 12 months among the Mexican adult population with obesity, 2005–2006

	N	%	Crude model		Adjusted mode <sup>1a</sup>	
			OR	CI	OR	CI
Total population	8,286	5.7				
Sex						
Male	2,657	4.8	1.00		1.00	
Female	5,629	6.2	1.31	0.94–1.82	1.44	1.02–2.03
Age, years						
20–35	2,923	5.3	1.00		1.00	
36–50	3,709	5.9	1.11	0.79–1.56	1.09	0.78–1.51
51–64	1,654	6.1	1.15	0.77–1.71	1.11	0.72–1.71
Household wealth						
I (low)	1,904	4.2	1.00		1.00	
II	2,191	4.1	0.98	0.54–1.77	0.93	0.51–1.69
III	2,179	5.6	1.34	0.76–2.36	1.14	0.63–2.07
IV (high)	2,012	8.8	2.19	1.26–3.79	1.49	0.81–2.74
Education						
≤Kindergarten	594	3.7	1.00		1.00	
Elementary	3,994	4.9	1.34	0.74–2.42	1.17	0.64–2.14
Junior high school	2,008	5.7	1.57	0.84–2.91	1.29	0.68–2.46
High school	1,104	6.6	1.84	0.97–3.49	1.35	0.69–2.62
≥Graduate	586	10.7	3.12	1.59–6.09	1.94	0.90–4.20
Size of locality <sup>b</sup>						
Rural	2,131	3.9	1.00		1.00	
Urban	2,537	5.1	1.33	0.84–2.10	1.08	0.66–1.75
Metropolitan	3,618	6.7	1.77	1.15–2.73	1.16	0.69–1.93
Body weight perception						
Accurate	2,084	5.9	1.00		1.00	
Underestimation	6,202	5.7	1.03	0.69–1.54	1.20	0.81–1.77
BMI, kg/m <sup>2</sup>						
30.0–34.9	5,742	5.23	1.00		1.00	
≥ 35.0	2,544	6.95	1.35	1.00–1.82	1.00	0.73–1.36
Diagnosed with obesity						
No	6,798	3.76	1.00		1.00	
Yes	1,488	13.6	4.02	2.91–5.55	3.53	2.49–5.00

<sup>a</sup>Adjusted for all variables included in the table.

<sup>b</sup>Rural: ≤2,499 inhabitants; urban: 2,500–99,999 inhabitants; metropolitan: ≥100,000 inhabitants.

this could be considered a low rate of advice, things appear to be worse in middle-income countries such as Mexico. In the present study, only two out ten of the population with a BMI  $\geq 30.0$  kg/m<sup>2</sup> had ever been diagnosed as obese by a health care professional, and only 8.1% had been treated. These findings suggest that most health care professionals in Mexico are not diagnosing obesity to their patients and are not counseling for weight management. In Mexico media campaigns have been focused on informing the population about the health risks associated with obesity and promoted self-assessment of body weight. We suggest that the budgets for these campaigns should be redirected i) to involve, motivate, or educate health professionals, and ii) for research on how to incorporate health promotion strategies into treatment and how to implement a health care standard on obesity care.

Among Mexican obese adults, the probability of being diagnosed with obesity or receiving treatment increased with higher BMI. Similarly, other authors [6, 21] have reported

that health care professionals are more likely to provide advice on weight loss to patients with a BMI  $\geq 35$  kg/m<sup>2</sup>. Nonetheless, within this representative sample of Mexican adults, there was a large disconnection between the prevalence of obesity as measured by BMI (30.7%) and the prevalence of those who were diagnosed with obesity (20.4%) as well as the percentage of those who had undergone weight loss treatment (8.1%). This suggests that both health care professionals and the typical Mexican adult underestimate their adiposity status and obesity-related health risks. In the latter case, health care professionals may not be informing overweight and obese patients about the implications of the excess of their body weight [22]. The lack of diagnosis and treatment in the early stages of obesity might contribute to additional weight gain and a greater risk in the development of obesity-related diseases. In addition, weight loss in the early stages of overweight would be easier to maintain [23]. On the contrary, more severe levels of obesity require more radical treatments [24], implicating higher costs to individuals and health institutions.

Our findings showed that, compared to men, women were more likely to lose weight intentionally, although there were no differences in diagnosis and treatment according to sex. Women from high-income countries are more likely to receive counseling on weight loss from a health professional [6, 9] and to attempt weight loss, even if they are not overweight [10, 25]. It is possible that women are more successful in the management of their weight because they are more concerned with their body image (probably due to sociocultural pressures) and because they are less likely to underestimate their body weight [26]. It is also possible that health care professionals are more likely to advise women on weight control because they think they will be more likely to implement their advice.

In contrast to other data [6, 9], we found that older adults (51–64 years) were more likely to have been diagnosed with obesity and to have undergone weight loss treatment than adults aged 50 years or younger. This may reflect some of the following aspects: a higher prevalence of obesity in this age group, the fact that health care professionals are more likely to diagnose obesity in people with a longer history of the condition, or the fact that obesity is not routinely diagnosed until patients are suffering from its related comorbid conditions.

Among Mexican adults, the probability of being diagnosed with obesity and undertaking treatment increased with socioeconomic position. This socioeconomic inequality finding is consistent with those observed in high-income countries [9, 25, 27, 28]. Similar to many countries, poor people within Mexico have less access to health care services. Another factor that may explain these socioeconomic disparities is that people with a lower socioeconomic position are less aware or concerned about their health [29]. That is, there may be cultural norms that contribute to people of low socioeconomic position perceiving their obesity status as healthy or perhaps a sign of success. This last issue is important because the perception of health risks has been associated with increased probability of trying to lose weight [30] and with actions to prevent weight gain [31]. Also, people of lower socioeconomic position have more obstacles to implement weight management treatment because healthy diets and recreational physical activities tend to be more expensive than energy-dense diets and sedentary activities [29, 32, 33].

This study has some noteworthy limitations. First, the response options to the diagnosis and treatment questions were ‘yes’ or ‘no’ only, the time frame considered in these questions was ‘ever in life’, and the responses did not take into consideration the quality of health services, the type of medical institution where the services were obtained (i.e., public vs. private), or participants’ adherence to prescribed treatments. Second, while the 2006 NHNS asked about the diagnosis of obesity, it did not ask about the diagnosis of overweight. Furthermore, the used questionnaire asked if the weight loss was intentional only to those who had lost more than 5 kg.

In conclusion, among Mexican obese adults, there is a reduced access to diagnosis and treatment of obesity. In individuals who had received a diagnosis of obesity by a health care professional, the probability of intentional weight loss was higher. This is the first work that quantifies the rate of under-diagnosis and under-treatment in a middle-income country. Our results reflect the need to increase the diagnosis and treatment of overweight and obesity by health care professionals, particularly on people of low socioeconomic position, rural residents, and those who are obese.

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### Disclosure Statement

The authors declare that they do not have conflicts of interest.

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