The size of obesity differences associated with educational level in Spain, 1987 and 1995/97

J L Gutiérrez-Fisac, E Regidor, J R Banegas Banegas, F Rodríguez Artalejo

METHODS
Source of data
The data were taken from the national health surveys carried out by the Ministry of Health in the adult population in 1987, 1995, and 1997. In these surveys interviews were held with a household sample of persons representative of the non-institutionalised Spanish population aged 16 years and above. The number of persons interviewed in each survey was 29647, 6395, and 6396, respectively. The 1987 sample was made up of 50 provincial subsamples, each of which was selected using a multistage procedure and stratified by size of locality. Because the sampling fraction was not the same in each province, each person in the sample was assigned a weighting coefficient as a function of the province of origin. In contrast, in 1995 and 1997 the samples were self weighted, as in both of those years a single sample was selected at the national level, also using a multistage procedure and stratified by size of locality. To compensate for the difference in sample size, the 1995 and 1997 surveys were combined, so that the estimates in the first period were obtained with the data from the 1987 survey, while the estimates for the second period are based on the data taken from combining the 1995 and 1997 surveys. This study is limited to the population aged 25–64 years, so that the final samples for analysis, after eliminating persons with missing information for some of the variables considered, was 14676 in 1987 and 7004 in 1995/97.

Study variables
We calculated the BMI as weight in kg divided by height in m², using information on weight and height obtained by asking the following two questions: “Can you tell me about how much you weigh without your shoes or clothes on? (in kg)” and “Can you tell me about how tall you are without your shoes on? (in cm).” The response rate to the question about weight and height was 77.8% in the 1987 sample and 86.8% in the 1995/97 sample. Subjects with a BMI ≥30 kg/m² were considered to be obese.

Persons were classified by educational level into three categories: elementary level (no education or education completed at 14–15 years), secondary level (education completed at 16–19 years or subsequent non-university studies), and third level (university education). We calculated the obesity prevalence by educational level and the percentage of persons
in each educational category in men and women for two age groups: 25 to 44 and 45 to 64 years.

**Analysis**

The proportion of obesity attributable (PA) to less than third level education were calculated using the following formula:

\[
PA = \frac{\sum_{j=1}^{n} (P_{ij} \times PR_{ij} - 1)}{\sum_{j=1}^{n} 1 + [(P_{ij} \times PR_{ij} - 1)]}
\]

where Pij is the proportion of persons in each category i of less than third level education and in each age group j, and PRij is the measure of the effect of the association between the risk factor and the disease (obesity) in each educational level stratum i and each age stratum j. The measure of effect used was the obesity prevalence ratio (PR) among persons with an elementary or secondary education with respect to those with third level studies. These ratios were calculated with a binomial regression model for each age and sex group, using the SAS GENMOD procedure. The prevalence ratios were adjusted for age. They were not adjusted for other variables and risk factors because these were considered intermediate variables in the association between education and obesity. We calculated 95% confidence intervals for PA using substitution method taking into account lower and higher confidence limits of both, PR and prevalences of risk factor (elementary and secondary educational level).

PA can be interpreted as the proportion of obesity associated with a less than third level of education, that is, the amount of obesity that we could expected to eliminate if all the population attained a third level of education.

**RESULTS**

Table 1 shows the distribution of persons included in the analysis and the prevalence of obesity by age, sex, and educational level in 1987 and 1995/97. Most of the population was concentrated in the category of elementary education; this percentage was higher in the 45–64 year age group, which included 78% of men and 88% of women. In 1995/97 the percentage of the population with elementary education decreased in all age and sex groups with respect to 1987. The prevalence of obesity was larger in persons with elementary education for both men and women. In the 25–44 year age group, the proportion of obese persons was larger in men than in women, whereas in the 45–64 year age group the opposite was the case. In both sexes the prevalence of obesity was higher in the older age group.

In both 1987 and 1995/97, the PRs were higher in women. A differential trend by sex was also seen: whereas in men the PR for those with elementary education decreased between 1987 and 1995/97, in women it increased, rising from 4.53 to 5.73 in the 25–44 year age group and from 2.42 to 3.47 in those aged 45–64.

**Table 1** Study subjects, percentage of obese persons by educational level, age, and sex and prevalence ratios (PR) by educational level in men and women aged 25–64 years in 1987 and 1995/97

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Age Group</th>
<th>Education Level</th>
<th>Men (%</th>
<th>% Obese</th>
<th>PR (95% CI)</th>
<th>Women (%</th>
<th>% Obese</th>
<th>PR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>Third</td>
<td>25–44</td>
<td>918 (20.3)</td>
<td>3.7</td>
<td>1.00</td>
<td></td>
<td>408 (19.2)</td>
<td>5.1</td>
<td>1.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1407 (31.1)</td>
<td>3.7</td>
<td>1.12 (0.72 to 1.75)</td>
<td>772 (36.3)</td>
<td>9.5</td>
<td>1.72 (1.07 to 2.75)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2203 (48.7)</td>
<td>8.1</td>
<td>2.15 (1.47 to 3.15)</td>
<td>944 (44.4)</td>
<td>11.0</td>
<td>1.94 (1.23 to 3.06)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45–64</td>
<td>4528 (100)</td>
<td>5.9</td>
<td></td>
<td></td>
<td>2124 (100)</td>
<td>9.3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Secondary</td>
<td>25–44</td>
<td>355 (10.8)</td>
<td>6.3</td>
<td>1.00</td>
<td></td>
<td>142 (10.7)</td>
<td>12.3</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td>369 (11.2)</td>
<td>7.7</td>
<td>1.35 (0.77 to 2.37)</td>
<td>266 (17.5)</td>
<td>10.2</td>
<td>0.85 (0.49 to 1.49)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2564 (78.0)</td>
<td>11.1</td>
<td>1.85 (1.18 to 2.89)</td>
<td>1093 (71.9)</td>
<td>18.5</td>
<td>1.47 (0.95 to 2.30)</td>
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<tr>
<td></td>
<td></td>
<td>45–64</td>
<td>3288 (100)</td>
<td>10.2</td>
<td></td>
<td></td>
<td>1521 (100)</td>
<td>16.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elementary</td>
<td>25–44</td>
<td>660 (16.0)</td>
<td>1.4</td>
<td>1.00</td>
<td></td>
<td>384 (19.2)</td>
<td>2.1</td>
<td>1.00</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>1134 (27.4)</td>
<td>2.6</td>
<td>2.52 (1.08 to 5.89)</td>
<td>634 (31.7)</td>
<td>4.6</td>
<td>2.82 (1.18 to 6.75)</td>
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<td></td>
<td></td>
<td></td>
<td>2339 (56.6)</td>
<td>6.2</td>
<td>4.53 (2.06 to 9.95)</td>
<td>982 (49.1)</td>
<td>10.4</td>
<td>5.73 (2.53 to 12.99)</td>
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<td></td>
<td></td>
<td>45–64</td>
<td>4133 (100)</td>
<td>4.5</td>
<td></td>
<td></td>
<td>2000 (100)</td>
<td>7.0</td>
<td></td>
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<tr>
<td></td>
<td>Secondary</td>
<td>25–44</td>
<td>124 (4.5)</td>
<td>1.0</td>
<td>1.00</td>
<td></td>
<td>81 (6.0)</td>
<td>6.2</td>
<td>1.00</td>
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<td></td>
<td></td>
<td></td>
<td>206 (7.6)</td>
<td>1.2</td>
<td>1.12 (0.47 to 2.63)</td>
<td>165 (12.1)</td>
<td>6.7</td>
<td>0.95 (0.33 to 2.73)</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>2397 (87.9)</td>
<td>16.4</td>
<td>2.42 (1.20 to 4.86)</td>
<td>1113 (81.9)</td>
<td>22.7</td>
<td>3.47 (1.48 to 8.17)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45–64</td>
<td>2727 (100)</td>
<td>15.2</td>
<td></td>
<td></td>
<td>1359 (100)</td>
<td>19.8</td>
<td></td>
</tr>
</tbody>
</table>

**Table 2** Proportion (in %) and 95% confidence intervals of obesity attributable to less than third level education in men and women aged 25–64 years in 1987 and 1995/97

<table>
<thead>
<tr>
<th>Year</th>
<th>Category</th>
<th>Age Group</th>
<th>Men (%)</th>
<th>% Obese</th>
<th>PR (95% CI)</th>
<th>Women (%)</th>
<th>% Obese</th>
<th>PR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1987</td>
<td>Third</td>
<td>25–44</td>
<td>23.0 (6.6 to 39.0)</td>
<td>25.3 (5.7 to 44.9)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45–64</td>
<td>26.0 (5.4 to 45.5)</td>
<td>13.5 (−6.1 to 34.6)</td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td>Total</td>
<td>24.3 (6.0 to 42.8)</td>
<td>19.8 (0.2 to 40.2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1995/97</td>
<td>Third</td>
<td>25–44</td>
<td>23.4 (6.7 to 39.7)</td>
<td>26.5 (5.9 to 43.5)</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>45–64</td>
<td>26.0 (5.4 to 45.5)</td>
<td>13.5 (−6.1 to 34.6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>24.5 (6.0 to 42.8)</td>
<td>19.8 (0.2 to 40.2)</td>
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</tbody>
</table>
Table 2 shows the proportions (in percentages) of obesity attributable to less than third level education. In 1987, 24.3% and 47.9% of obesity could be attributed to less than third level education in men and women, respectively. In 1995/97 these PAs were 19.8% and 55.1%.

**DISCUSSION**

The results obtained indicate that in the second period studied the burden of obesity attributable to less than third level education was 20% in men and 55% in women aged 25–64 years. It was also estimated that between 1987 and 1995/97 the burden of obesity attributable to less than third level education decreased in men and increased in women.

There are two possible reasons for the change in the burden of obesity attributable to less than third level education: a change in the population at risk, that is, an increase or decrease in the proportion of the population with elementary or secondary education, and/or a modification of the effect of education on obesity. The results presented show that between 1987 and 1995/97 the proportion of those with secondary studies rose and the proportion of those with elementary studies declined. On the other hand, the effect of secondary level education on obesity increased slightly in the 25–44 year age group, but decreased in those aged 45–64 years, with the result that its impact on the global burden or PA must have been insignificant. Thus, it is probable that the increased PA in women and the decreased PA in men was attributable to the fact that the effect of elementary education on obesity was higher in the second period than in the first in women, whereas just the opposite occurred in men.

One of the factors postulated to explain the association between socioeconomic variables and obesity is social mobility. Several studies have shown that the social level attained by obese persons is lower than that of the non-obese and that this phenomenon is more clearly seen in women. There is evidence that the social handicap due to obesity seems to be larger than that produced in other chronic conditions, perhaps because obesity is a visible defect, a stigma, that results in a greater degree of discrimination. It has been shown that obese adolescent females attain a lower educational level, marry less often, and earn less than the non-obese, and that these results are of lesser magnitude in men. The influence of social mobility may have increased for unknown reasons between 1987 and 1995/97, which would explain the increased effect of low educational level on obesity, mainly in the 25–44 year age group.

Certain social and cultural factors have also frequently been included in the explanatory models of the socioeconomic differences in obesity, and these factors, together with social mobility, may explain the results found. It has been suggested that social and family pressures to maintain a body image in accordance with reigning social values, where beauty is associated with a slim figure, would exercise a stronger effect in women and the decreased PA in men was attributable to the fact that the effect of elementary education on obesity was higher in the second period than in the first in women, whereas just the opposite occurred in men.

Among the study's limitations, the self reported nature of the obesity data means that its effect measures, it is unlikely that the main results would be attenuated by the fact that heavier persons with a high educational level could lead them to go on reducing diets or take other measures to lose weight in larger proportions than women with elementary level education. It should also be noted that more highly qualified women have greater access to reducing treatments as these entail a certain cost. The small impact on men of each factor mentioned in the association between educational level and obesity may explain the decreased PA observed in this group. Another factor that mediates this relation in women, but not in men, is reproductive history. This factor has been related with the social gradient in obesity in women because of the cumulative effect of weight gain in successive births, as weight gain during pregnancy is not completely lost at term. In view of the evidence of an association between socioeconomic status and parity, such that women with lower social level have more children, and at an earlier age, this fact may be important in explaining the social differences in obesity among women. An increase of 15% has been observed in the percentage of Spanish women with secondary or third level education born since 1950 who have no children, which could explain the increased effect of elementary level education on obesity in women aged 25–44 years.

Key points

- The burden of obesity attributable to less than third level of education was 20% in men and 50% in women aged 25–64 years.
- Obesity prevalence could be reduced by 20% in men and 50% in women if people with different levels of education had the same prevalence than those with a third level of education.
- The proportion of obesity associated with less than third level of education increased in women and decreased in men between 1987 and 1997.
- The increase in the proportion of obesity attributable to less than third level of education in women could be attributable to an increase in the risk of obesity in women of less than third level of education.
variable and PA could have been presented for every educational level, on behalf of clarity we have presented the results having the upper category of the variable as reference. The results presented may have some policy implications. The important effect of educational level on obesity showed suggests the need to include education, together with the classic risk factors, among the main factors associated to obesity. The reduction of inequalities in obesity may need, together with actions at the population levels, some other actions directed to people with less educational levels. On the other hand, we need to identify the intermediate factors most strongly implicated in this relation, not only in the attempt to reduce the prevalence of obesity in the population, but also to try to reduce the differences among different socioeconomic groups.

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