Economic factors affecting obesity: an application in Italy

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Abstract - **The World Health Organisation has stated that obesity is spreading around the world like a "global epidemic". In 2004 the percentage of obese people in the Italian population was 9%, but the trend is increasing in recent years. Focussing on this country, the purpose of the paper is to analyse the socio-economic variables affecting obesity by means of a survey conducted in a consumer sample.**

Our analysis is based on a survey conducted in Italy, and the sample was composed of 999 consumers. We used a binary logit model and the dependent variable is body mass index (BMI), expressed in a dichotomic way (seriously overweight and obese, value 1, and normal weight, value 0). The results show that the condition of the seriously overweight and obese increases with age, especially in people over 65 of age. Also gender is correlated with the pathology: being seriously overweight and obese is far more likely for men than for women. An inverse relation was shown between obesity and education, and between obesity and the level of food knowledge. The results highlight that disadvantaged social categories are more susceptible to the problem of overweight and obesity. A policy implication of the analysis, to limit the spread of obesity, could lie in programs aimed at improving health and food awareness and focused on these minority groups.

Keywords **-** economics of obesity, BMI and consumer, logit model.

I. INTRODUCTION

The World Health Organisation has stated that obesity is spreading around the world like a "global epidemic" (WHO, 2004). Over the past fifteen years obesity has grown dramatically in the United States where, according to WHO data, the percentage of obese people in the population increased from 12% in 1990 to 32% in 2004. In the European Union, WHO and Eurostat data for 2004 reveal the highest obesity rates to be in the United Kingdom (24%), Malta (23%), Germany (19%) and Hungary (19%), whereas the countries with the lowest rates were Denmark, Italy, Luxembourg, Portugal and Romania (fig. 1, fig. 2).

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II. ECONOMIC ISSUES

From an economic point of view, the spreading of obesity leads to direct and indirect social costs to the economic system. The greater part of these (more of 60%) is due to increased drug expenses and hospital shelters, creating a notable increase in the burden of the national sanitary system (Runge, 2007). Besides direct costs, we can also consider indirect costs: less job productivity and consequent discrimination, greater frequency of disability pensions and higher insurance premiums (Runge, 2007).

A number of economic studies have analysed variables that can affect obesity, like those of age, gender, education, geographic distribution etc. The spread of obesity increases progressively with age: in the United States especially in men over 75 of age and in women between 65 and 74 (Miljkovic *et al*., 2008). With regard to gender, men have more greater prevalence towards overweight than women, however women have greater obesity rates than men (Miljkovic *et al*., 2008).

The majority of the studies agree that obesity is more diffused among the disadvantaged social categories who have lower levels of instruction, and greater difficulties in accessing medical assistance.

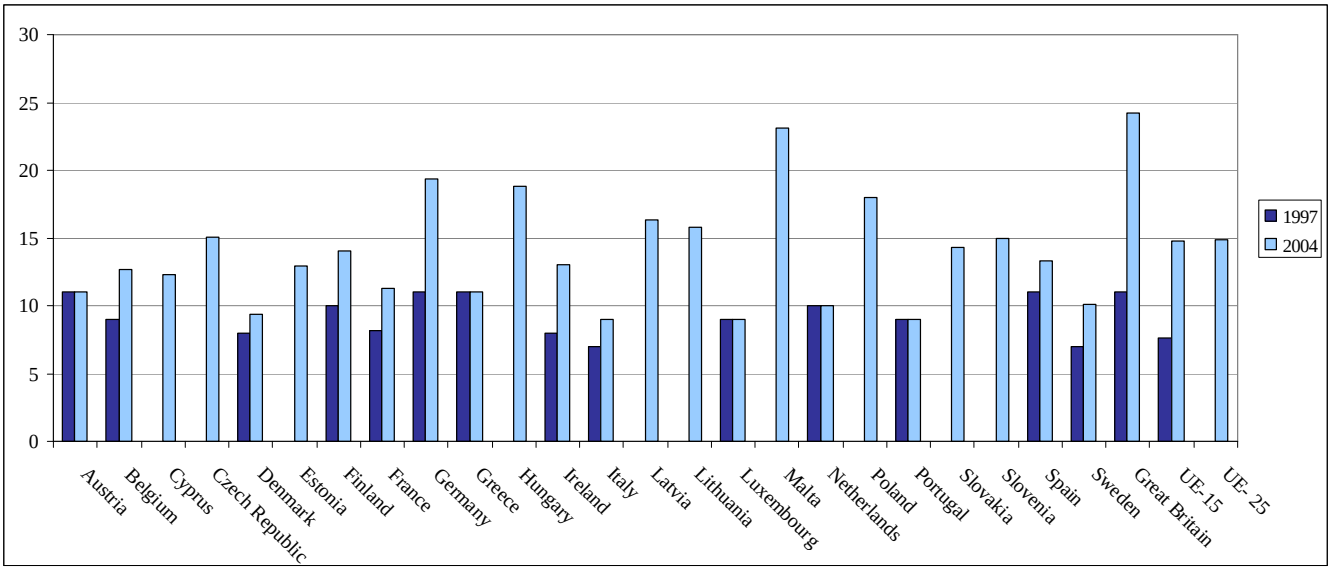

Fig. 1 - Rate (%) of obesity among UE adults in 1997 and 2004

Souce: Own calculation based on WHO data

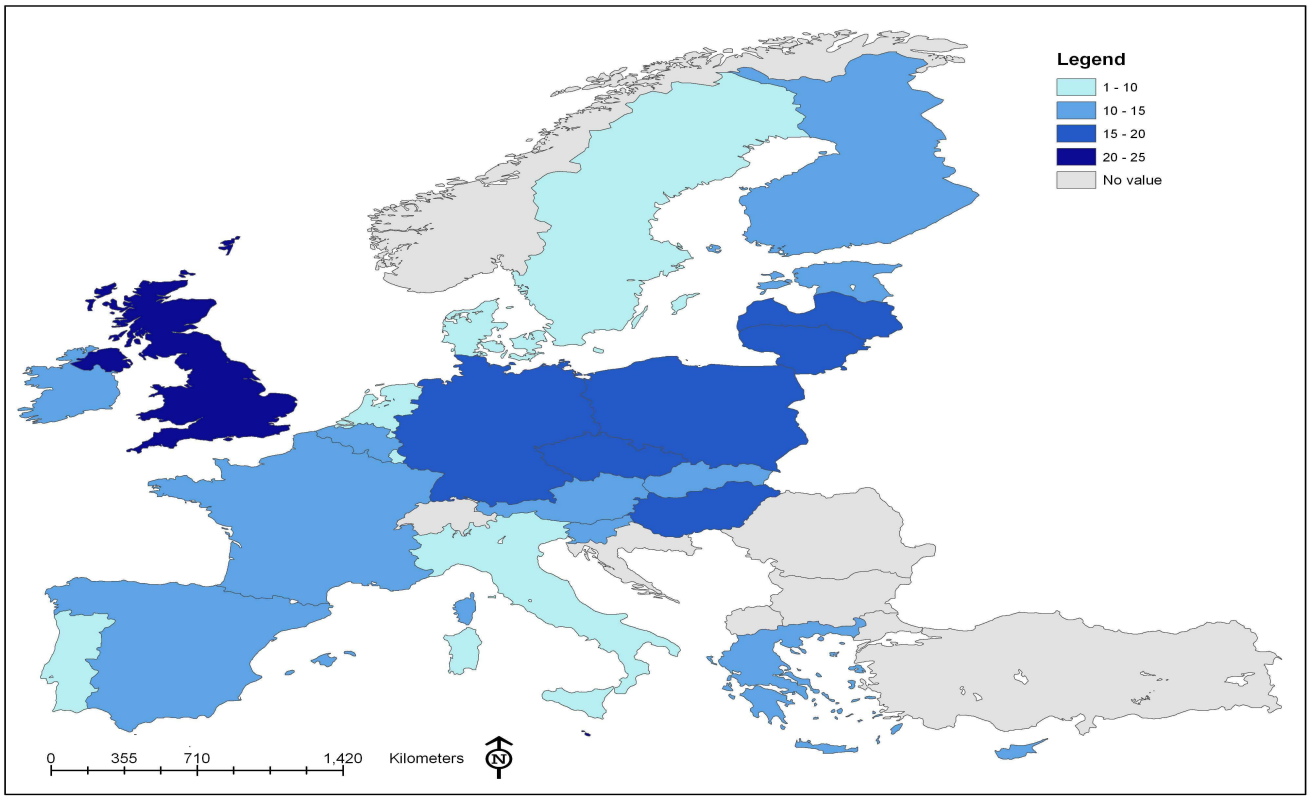

Fig. 2 - Rate (%) of obesity among UE adults in 2004

Souce: Own calculation based on WHO data

Among the educated upper-middle class adults, the percentage of obese individuals is quite low, the percentage increasing notably among adults with only elementary schooling or without any education at all (Loureiro and Nayga, 2005).

Another variable is geographic distribution: for example, in Italy the problem tends to be more evident in the southern regions and in the areas with low-income per capita (Mazzocchi, 2005). Moreover, it is interesting to note that obesity rates are more elevated when consumers have insufficient information to make more aware choices; in fact, the effectiveness of the new food labels has been associated with a decrease in obesity (Variyam and Cawley, 2006; Drichoutis *et al*., 2005).

Another research area concerning obesity is possible intervention to reduce the pathology itself and eliminate the difference between private and social costs (Mazzocchi, 2005). The spectrum of adoptable measures is very wide: the introduction of taxes or subsidies on the nutrients contained in food products; information campaigns to increase consumer awareness and advertising knowledge; regulations to limit the advertising of unhealthy food, programs of nutritional education in schools (Kuchler and Golan, 2004). Incentive policies and the reduction of prices for some food categories could be preferable to a taxation system on caloric products ("fat tax") that would penalize lower income families (Mazzocchi, 2005).

III. METHODOLOGICAL ISSUES

Our analysis is based on a survey conducted in Lombardy, northern Italy, and employed a telephone questionnaire. The sample was composed of 999 consumers and divided by the variables of gender, age, and residence of the interviewees. Answers to the questions were arranged in a multiple-choice format with rating scales, and processed through a binary logistic regression.

The analysis took as the dependent variable body mass index (BMI), calculated as weight (Kg) divided by height squared (m^2). We make reference to two consumer categories:

- seriously overweight and obese (BMI>27),
- normal weight (18.5<BMI<25),

for this reason the number of consumers considered became 776. We used a binary logit model, as the dependent variable is expressed in a dichotomic way (seriously overweight and obese, value 1, and normal weight, value 0). This model takes the following form (Bohrnstedt and Knoke, 1994):

$$logit(p_i) = \ln\left(\frac{p_i}{1-p_i}\right) = \alpha + \sum_j \beta_j X_{ji} \qquad [I]$$

with:

i= 1,….776; correspondent to number of consumers considered,

p_i= probability of the dependent variable (BMI) taking the value of 1,

j= 1,….28; correspond to number of independent variables,

Xji= independent variables,

α= constant,

βj= regression coefficients

According to recent economic literature concerning consumers and obesity, we assume that the following independent variables (X_{ji}), grouped in five categories, can affect the BMI:

- socio-demographic and individual characteristics, that include variables such as age, gender, work, education, income, components of family and food knowledge;
- nutritional claims, that include the interest for claims introduced by Reg. 1924/2006, like content of energy, fat, sugar, sodium, fibre-vitamin, light and nutritional label, and the use of nutritional labelled information;
- factors affecting purchasing behaviour of food products, that include variables like price, brand, flavour, nutritional properties, origin of products, traceability and quality certifications;
- food safety attitude, that represents variables such as attention to food safety issues, ingredients, freshness, and expiry date;
- healthy life attitude, that represents variables such as dietary habits and smoking status.

IV. RESULTS

Maximum likelihood estimation method was utilised to estimate equation [I] (tab. 1). Adequate goodness of fit is shown by Pearson's Chi-Square Statistics and Nagelkerke's R^2.

The percentage of seriously overweight and obese is 20.4% in the total sample and 26% in respect of consumers considered.

The results show that the condition of the seriously overweight and obese increases with age, especially in people over 65 of age. Also gender is correlated with the pathology: being seriously overweight and obese is far more likely for men than for women, and greater percentages of obesity were found in the male sample. Furthermore, an inverse relation was shown between obesity and education: obesity decreases with increasing level of education, and is higher in people with less education. Interestingly, it was revealed that there is an inverse relation between the level of food knowledge and obesity (though the significance is not very high), underlining the importance of nutritional education programs to limit obesity. Income and work have no significant coefficients.

Moreover, the analysis reveals that most nutritional claims, like "light", "low energy", "high fibre-vitamin", "low sodium-salt" and "low fat", are of no significance. On the other hand, the claim "low sugar" has a positive and weak significant relation, showing interest in this claim, probably due to the perception of a strong link between the sugar content of food and the condition of overweight and obesity. With regard to the variables concerning purchasing behaviour, an inverse and significant relation is shown for flavour and nutritional property, highlighting the low interest obese consumers show for these quality attributes of food products. Finally, food safety attention variables and variables regarding healthy life attitude are of no significance.

V. CONCLUSIONS

Though the Italian situation concerning obesity is not so dramatic as in other European countries and the US, the analysis draws attention to factors that affect the situation of the seriously overweight and obese in Italy, in line with empirical studies carried out in other countries. The results highlight that disadvantaged social categories such as elderly people, and those with a low level of education and low food knowledge are more susceptible to the problem of overweight and obesity. A policy implication of the analysis, to limit the spread of obesity, could lie in programs aimed at improving health and food awareness and focused on these minority groups.

Table 1 Estimates of the logit model

	Body Mass Index (BMI)	
	β	Sig.
α	-1,038	0,000
Socio-demographic and individual characteristics		
age	**0,471**	0,000
gender	**-0,715**	0,000
work	0,340	0,208
education	**-0,352**	0,003
income	0,039	0,677
comp.family	-0,165	0,174
food knowledge	-0,156	0,142
Nutritional claims		
energy	-0,023	0,828
fat	0,075	0,529
sugar	0,186	0,122
sodium	-0,056	0,618
fibre- vitamin	-0,112	0,275
light	0,038	0,669
nutritional label	-0,051	0,587
Factors affecting purchasing behaviour of food products		
price	0,059	0,486
brand	0,077	0,328
flavour	**-0,368**	0,000
nutritional properties	**-0,201**	0,057
origin	0,139	0,156
tracebility	-0,063	0,535
certification	0,086	0,379
Food safety attitude		
food safety	-0,147	0,231
ingredients	0,108	0,597
freshness	-0,563	0,238
expiry date	0,079	0,865
nutritional labelled information use	-0,011	0,957
Healthy life attitudes		
dietary habits	0,086	0,141
smoke	-0,042	0,613
Chi-Square (Sig. 0,000)	130,930	
Nagelkerke R Square	0,220	

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