Fat and Out in Salerno and Province: Adolescent Obesity and Early School Leaving in Southern Italy*

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Abstract

We examine the determinants of obesity and its role in influencing early school leaving amongst adolescents in the city of Salerno and its province in Southern Italy. A human capital investment model is employed and this provides a framework within which to analyse the interrelated 'decisions' regarding schooling and overeating, taking into account the importance of time preference and the differential effects of adolescent obesity for males and females. We find that: a) there is a strong and robust positive association between obesity and early school leaving; b) there is evidence to support the notion that this association is the consequence of a causal relation running from obesity to school leaving; and, c) there are significant gender differences in the nature of this relationship. These findings have important policy implications. In particular: i) policies aimed at reducing obesity – such as the encouragement of sporting activity or the encouragement of healthier eating habits at school - may also have other beneficial effects through a reduction in early school leaving rates; and, ii) the significant differences identified between male and female adolescents suggest that the adoption of some gender-specific policy measures would be useful.

* With apologies to George Orwell.

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1. Introduction

Over the last decade, both the general public and academics have increasingly focused their attention on the causes and consequences of obesity. Initially, the issue was mainly examined in the medical literature, but more recently a large body of theoretical and literature on obesity from an economic point of view has begun to emerge[1].

We use data from a unique survey of secondary school students in the Province of Salerno in Southern Italy to analyse the causes and consequences of adolescent obesity from an economic perspective. There are numerous analyses of the negative effects of obesity on earnings. One possible long-term channel for this negative impact to operate is through the effect of obesity on scholastic performance. In the USA, for example, Crosnoe (2007) has found a negative relation between adolescent obesity and subsequent college enrollment for young women and Sabia (2007) finds a robust and significant relationship between BMI and the academic performance of adolescent (14-17 year old) white females. The analysis presented here belongs to this line of research, specifically, looking at the effect of adolescent obesity – along with other factors such as family background, previous educational attainment, lifestyle and local context – on early school leaving and thus, by implication, on the long-term earnings potential of individuals. Overweight children and adolescents run a greater risk of becoming obese adults with all the negative labour market (and medical) consequences that this implies but obesity is also likely to affect them through its impact on schooling.

Although the association between obesity and lack of educational attainment has been reported in the medical literature (Mokdad et al., 2001, table 1, p. 1196), relatively few papers have thusfar explicitly analysed this aspect in any detail. We apply a human capital investment framework which allows us to interpret the effects of various factors, including obesity, on school-leaving. Such a framework emphasises the key role of the future consequences of current actions through the relative weight attributed to the future by the individual (Komlos et al., 2004), as well as providing a channel through which obesity makes human capital investment more onerous.

The analysis draws on the health-related literature which has long noted the positive association between health and schooling. Grossman (2000) has identified three basic mechanisms through which health and schooling maybe related. First, more schooling may improve health principally by improving allocative and productive efficiency. Second, better health may facilitate study. Third, other factors, such as physical activity, time preference and parental characteristics,

[1] See, for example, Finkelstein at al. (2005), Suhrcke et al. (2005), Rosin (2008) for general analyses of the issues in addition to the discussion below.

may well influence both health and studying. The analysis here is centred on the second of these – the effect of obesity on schooling - but the analysis also incorporates consideration of the first and third of these mechanisms.

The following section provides an overview of trends in Europe in general and in Italy in particular. Section three briefly reviews the literature on the economic causes and consequences of obesity focusing on the phenomenon of increasing adolescent obesity. Section four outlines a human capital investment model in order to aid interpretation of results and section five discusses the data and variables used in the analysis, whilst section six presents the basic empirical models and the results of estimating them. The final section offers some concluding comments.

2. Causes and Consequences of Obesity

Lobstein et al. (2004) and Wang and Lobstein (2006) show that child and adolescent obesity is increasing in all industrialized countries and Komlos et al. (2009) have identified the timing of trends in child and adolescent adiposity in more detail for the USA. According to the International Obesity Task Force (IOTF, 2005, p. 4), in Europe the problem is particularly acute in the Mediterranean with Italy, Malta, Portugal and Spain (as well as the islands of Gibraltar and Crete) facing a prevalence of overweight and obesity of over 30% amongst 7-11 year old children. Amongst the adolescent group of 13-17 year olds, Italy is only superseded by Crete and England in terms of overweight and obesity, although for obesity in isolation it fares slightly better, being lower than in Ireland, Greece and Spain in addition to Crete and England. In their study of overweight and obesity amongst young Italians (aged 6-17), based on data from the National Statistical Institute[2], Gargiulo et al. (2004) have highlighted the much greater prevalence of obesity in the poorer regions of the South albeit with strong regional variations. A similar pattern is also observable in early school leaving, with the prevalence being higher in Southern Italy (table 1).

(Table 1 about here)

In middle income countries, members of better off households are more likely to be at risk of overweight compared with members of poorer households. As economies develop, higher obesity levels are found among lower income groups. In industrialized, economically developed countries, children in the lowest SES and educational groups are at greatest risk of overweight (see Sanz de Galdeano, 2005, on Europe, Heineck, 2006, on Germany and Baum and Ruhm, 2007, on the USA).

[2] Istat (2002). This is a survey of 17,500 children and adolescents in Italy between 6 and 17 years old.

Obesity is still infrequent in rural parts of many lower income countries and also tends to fall when economic development suffers a reversal as happened in the countries of Central and Eastern Europe following transition. With recovery, however, obesity in the population increased in several of these countries such as Eastern Germany and Croatia. Amendola and Mancini (2005) have found a negative correlation between socioeconomic status and obesity amongst secondary school students (14-19) in Italy while Gargiulo et al. (2004) identify socioeconomic status as one of the three main risk factors associated with child and adolescent obesity. This suggests that the lower per capita income might provide a possible explanation of the higher obesity rates observable in Southern Italy.

The European Commission (Suhrcke et al., 2005) has recently stressed the importance of addressing the issue of socioeconomic inequalities as a central element of strategies to combat obesity, emphasising the fact that food choice is determined by both individual preferences and socioeconomic factors. Social position, income and education are all determinants of diet and physical activity. Income may well affect the ability to access recreation facilities. Lower levels of education, and the consequent poorer access to relevant information, may reduce the capacity of individuals to make informed choices, amongst other things, making them more susceptible to disingenuous and misleading advertising campaigns.

The World Health Organisation (WHO, 2006a, 2006b) has looked at the socioeconomic determinants of healthy eating habits and physical activity levels amongst young people in Europe. In a survey carried out in five Italian Regions (Lazio, Abruzzo, Molise, Campania and Puglia) during the school year 2002-03, La Torre et al. (2006) found a positive relationship between children's participation in extra-curricular physical activity and their family's Socioeconomic Status. The WHO's Health Behaviour in School aged Children (HBSC) study identifies, in addition to the aforementioned factors, the central importance of another factor: mental health, which includes life satisfaction and body image and which, just like eating habits, is strongly influenced by the mass-media. In this view, childhood and adolescent nutrition, physical exercise and mental health are all influenced by socioeconomic and environmental factors as well as by models of appearance and behaviour aggressively promoted through the media.

Of course, the direction of causation may also be inverted - for example, lower socioeconomic status may also be a consequence of obesity as well as its cause. Indeed, there is a fairly well developed literature, which considers the economic consequences of obesity in terms of the lower earning potential and occupational attainment of overweight adults. More generally several studies have looked at the shorter and longer term health consequences of obesity: the direct health risks associated with child and adolescent excess body weight; and the longer term health

consequences of adult obesity given the strong relation between obesity in childhood and adulthood (Lobstein et al. 2004). Thus, Lake et al. (1997) examine the dual relationship between: a) obesity in parents and their children; and, b) the correlation between obesity in childhood and adulthood. Not only do they find a strong correlation between obesity in childhood and adulthood, they also find that this correlation is significantly greater when the child is born to obese parents. Moreover, the various causative factors underlying obesity may also interact. Thus, various surveys conducted in high income countries show that both adults and children from disadvantaged socioeconomic backgrounds tend to be more sedentary than those enjoying more privileged circumstances, possibly because of the more limited availability and affordability of facilities and activities, less leisure time, poorer knowledge and fewer positive attitudes about the benefits of exercise (Sarlio-Lähteenkorva and Lahelama, 1999). Moreover, the WHO (2006a, 2006b) note that obesity also reduces the number of social relationships among adolescents and their perceived popularity amongst peers and increases time off school leading to lower educational and occupational attainment which may in turn further reinforce the relationship between lower socioeconomic status and obesity.

In general, reductions in the strenuousness of jobs (Philipson, 2001, Lakdawalla and Philipson, 2002 and Lakdawalla et al., 2005), technological innovation in food processing and preparation (Cutler and al., 2003), the growing availability of fast-food restaurants (Chou et al., 2004, Rashad et al., 2005), increasing urban sprawl (Ewing at al., 2003), greater discounting of the future (Fuchs, 1982, 2004, Komlos et al., 2004, Smith et al., 2005, Borghans and Golsteyn, 2006, Zhang and Rashad, 2008), time inconsistent preferences (O'Donoghue and Rabin, 1999, 2000, Cutler et al., 2003), having health insurance (Rashad and Markowitz, 2007), higher unemployment (Ruhm, 2000) and maternal employment[3] (Anderson et al., 2003, Cawley and Liu, 2007), TV viewing and advertising (Smith, 2004) have all been found to have a positive impact on obesity.

As to the economic consequences of obesity, there is a large literature analyzing the lower earning potential of overweight adults in the labour market[4]. One consistent result is that the income penalty associated with obesity is greater for women than for men; more often than not, there appears to be no corresponding penalty for men. Register and Williams (1990) find a statistically significant wage penalty (of 12%) for obese young American women (compared to non-obese women) but no statistically significant penalty for obese men. Harper (2000) obtains a similar result for British women. Averett and Korenman (1999) find statistically significant negative effects of

[3] Cawley and Liu suggest that maternal employment has an effect on the mother's allocation of time to activities related to their children's diet and physical activity increasing the risk of childhood obesity.
[4] There is also a developing literature on the role played by height in determining earnings. See, for example, Heineck (2005) and Hübler (2009).

obesity early in life on income later on for both men and women, although the effect is much lower for the former. Moreover, taking the analysis a little further (and using an IV approach to control for the endogeneity of the BMI), Pagan and Davila (1997) again find a statistically significant wage penalty for women but not for men[5], explaining this in terms of the fact that obese women tend to work in relatively low-paid occupations and are largely excluded from higher income managerial, professional and technical occupations. Morris (2006) analyses gender differences in the effects of obesity on occupational attainment. Here too, the findings confirm a more detrimental effect of obesity on women than on men. Brunello and D'Hombres (2007) find similar differential effects for women and men in a range of European countries, with the effect being more pronounced in Southern European countries than in the Northern part of the continent. Cawley (2000, 2004) finds that the female weight penalty applies principally to white women (as opposed to black or Hispanic women or white, black or Hispanic men) explaining this in terms of a larger negative self esteem effect of greater weight for that 'ethnic group'. Tosini (2008) finds that a substantial part of the observed negative relation between female obesity and wages can be accounted for by unobserved permanent characteristics. That is, the type of women who are likely to become obese tend to receive wage (and spousal income) offers which are much lower than those received by women who do not share this tendency. Lempert (2007) has further found that the weight penalty for white women has increased over time notwithstanding the fairly rapid growth in average weight in the US over the last two decades. Conley and Glauber (2005) find that the negative effects of obesity extend to a wide range of economic outcomes for women, but again not for men.

In sum: i) numerous studies have found a negative wage penalty associated with obesity; and, ii) usually, this penalty is found to be larger for women than men. One channel through which these effects may arise is through a negative impact of obesity on human capital accumulation. In this regard, Sargent and Blanchflower (1994) find that adolescent obesity at age 16 in Britain was associated with lower educational attainment for both young men and young women and with lower earnings at age 23 for young women. Taras and Potts-Datema (2005) have reviewed nine papers examining the link between obesity among school-aged children and school performance, demonstrating that overweight and obesity are associated with poorer levels of academic achievement. Moreover, Karnehed et al. (2006) find that young obese men have a much lower chance of completing three years of tertiary education than normal-weight individuals even after adjustment for intelligence and socioeconomic position. According to the authors, a possible explanation for this result is discrimination in the educational system and other sectors of the society.

[5] Indeed, Pagan and Davila (1997) actually find an albeit small net positive effect of obesity on wages for men.

Sabia (2007), building on the work of Cawley (2004), has analyzed the relationship between adolescent body weight and academic performance. The analysis suggests robust evidence of the existence of a negative causal relationship between body weight and academic attainment amongst white females, but not among males and non-white women. The author suggests that this negative effect might have three possible explanations: a) differences in human capital accumulation; b) a common unobserved factor, such as self-esteem, which is influenced by body weight and influences both academic attainment and wages; and/or, c) discrimination against obese white females at school and market-level.

Cawley and Spiess (2008) have investigated the association between obesity and skill attainment in early childhood (aged 2-3 years). They found that, already at this age, obesity is associated with lower skill attainment, but in this case the association is stronger for boys than girls. These two findings are also in line with the results reported by Datar et al. (2004) on the association between test scores and obesity in children attending kindergarten and first grade. Furthermore, Wendt and Kinsey (2009) find a relation between obesity and academic achievement for children at elementary school (between ages 5 and 12). In common with the studies of adolescents and young adults, they find a stronger association for females. Finally, Kaestner and Grossman have also examined this question for US children (5-12) however, finding no such association.

Thus, the vast bulk of the studies looking at the issue have found a negative relation between obesity and academic performance. In very young children, this negative association is stronger for boys than girls, whereas the studies looking at this relation in amongst slightly older children and amongst adolescents and young adults have found the relation to be stronger for young women than young men. Cawley and Spiess (2008), suggest that discrimination is not sufficient to explain the negative relation and, moreover that explaining the reasons for such gender differences in adulthood is an important area for future research. Here, we attempt to make a contribution to this line of research, in particular focussing on the association between obesity and dropping out of school differentiating between males and females.

4. Analytical framework

A human capital investment model is employed here to help guide the analysis and interpretation of the results reported subsequently. Clearly, such a model is an oversimplification but does aid in clarifying some of the issues involved. We are concerned here with the relationship between anthropometric and school outcomes. The model proposed makes explicit the notion that

current behavioural 'choices' have longer term consequences and thus relates behaviour in one period to effects later on in life, thus emphasising the role played by time preference (Komlos et al., 2004). As is well known, the individual rate of time preference, r, plays an important role in human capital investment decisions (Becker, 1964). This has been confirmed by empirical analyses such as that of Fersterer and Winter-Ebmer (2003) who find, as one would expect, a negative relationship between the rate of time preference and the duration of educational participation amongst young people. However, it has been suggested that healthy behaviour may also be thought of as an investment in human capital (Grossman 1972) thus differences in time preference may also explain variations in health outcomes even though, from the empirical point of view, the relation between time preference and healthy behaviour is not very robust (Fuchs 1982). Moreover, study and healthy behaviour may well be complementary. The basic idea is captured by the old Latin saying "*mens sana in corpore sano*"[6]. From this viewpoint, the ideal strategy for an adolescent is to mix both types of activity because study and sport complement each other. Such a strategy may raise the probability of finding a better job because better health due to sport activities could lead one to invest more in education. Several studies have found evidence that the effect of sport on educational attainment and labour market outcomes is statistically significant and positive (Long and Caudill, 1991, Barron and al., 2000 and Pfeifer and Corneliβen, 2007, particularly for the first effect).

The model incorporates three central elements: a) the importance of current decisions on future income; b) the consequent central role played by time preference; and, c) the direct relation between overweight/obesity and schooling outcomes. To keep things simple we first express the model in terms of the dichotomous distinction between obesity and 'normal' weight. Thus, we employ a 2 period (let's say adolescence and adulthood) human capital model in which adolescents:

a) are either obese (E=1) or not (E=0) according to their past behaviour and characteristics; and,

b) decide whether to leave school early (S=0) or not (S=1).

As regards point a), weight gain, and consequently (overweight and) obesity, depend on an individual's calorific intake (C) as well as her physical activity (A), mediated by a person's physical constitution. Specifically, one may think in terms of an unobserved variable, E*, representing a person's tendency to gain weight:

$$E^* = \phi C - \gamma A \qquad (1)$$

[6] Which may be roughly translated as, "a sound mind in a sound body". However, the Latin phrase also carries the implication of association between the two which does not carry over into English.

This formulation, which we assume for simplicity to be linear, is closely related to the concept of energy balance (specifically E = C – A) used by, for example, Rashad (2006). The slight difference here arises because we wish to emphasise the role of physical and therefore genetic differences in the tendency to gain weight. Thus, we observe whether adolescents are obese (E=1) or not (E=0), and this occurs if and only if E* >0. Thus, obesity is determined by factors affecting C and A, but also variables related to adolescents' physical constitution which determine the values of ϕ and γ.

As regards point b), the decision to stay on at school or leave early depends on the costs and benefits of the two options, and specifically, we hypothesise that, in line with the previous empirical literature discussed above, the net gains from remaining at school will be lower for the obese.

More formally, during adolescence, individuals decide whether to remain in school or not. They will remain in school if the net present value of the benefits of doing so exceeds the costs. The net present values of the two options are as follows:

$$\begin{cases} W_u + \delta W_u & if\ S = 0 \\ -T_s + \delta W_s & if\ S = 1 \end{cases} \qquad (2)$$

That is, if the person leaves school they earn the unskilled wage, W_u in both periods (discounted in the second by $\delta = 1/(1+r)$; if they remain in school they earn nothing in the first period and indeed pay to do so – including consumption costs, T_s,– whilst in the second period they earn the skilled wage W_s.

Thus an adolescent will remain in school if:

$$\delta(W_s - W_u) \geq W_u + T_s \qquad (3)$$

and will leave school otherwise. We suppose that the differential between skilled and unskilled wages depends on the growth of an individual's human capital consequent on staying on at school, h, so that,

$$W_s = (1 + h)W_u \qquad (4)$$

with,

$$h = ae \qquad a > 0 \qquad (5)$$

and

$$e = \frac{\theta}{1+\mu E} \qquad \theta, \mu \geq 0 \qquad (6)$$

That is, being obese reduces the returns to education. Underlying this expression is the notion that the human capital gain, h, associated with remaining in school depends positively on the combination of the individual's scholastic effort, e, and her 'ability', a. If the person is obese (E=1), the efficiency of her scholastic effort will be reduced according to the size of the individual specific parameter μ. That is, obesity may interfere with scholastic effort and consequently reduce the returns to education. This is consistent with the findings reported above of a negative impact of obesity on test scores in early childhood reported above as well as with any of the three mechanisms suggested by Sabia (2007) and noted above to explain the negative relation between BMI and academic performance. The formulation may be thought of as a simplified version of the education production function suggested by Hanushek (1986) although the focus there is on school quality rather than individual effort and ability. "Ability" as used here may include other factors, such as family connections or income, indeed any of the many factors which affect an individual's earnings power but which don't depend on (but are complementary to) the individual's effort. This could also include school quality as in Hanushek.

An adolescent will remain in school if the discounted gains ($\delta h W_u$) are greater than the (opportunity and direct) costs ($T_s + W_u$) involved in doing so. Expressed algebraically, S = 1, if:

$$\frac{\delta a \theta}{1+\mu E} W_u \geq T_s + W_u \qquad (3')$$

If the expression is not true, the adolescent will leave school early. Obesity has a positive impact on the probability of leaving school because it reduces the returns to education. Although the model is simple, it serves to emphasise several aspects of the school leaving decision on which we wish to focus in the empirical section: in particular, the role of time preference, the role of obesity in increasing the probability of early school leaving as well as the interaction between obesity and other factors in affecting that decision. In order to make the link to the empirical model more transparent, it is useful to take natural logarithms and use the approximation, $Ln(1+c) \cong c$, for small c, so that the choice criterion (3') may be re-arranged as:

$$Ln(W_u) - Ln(W_u + T_s) + Ln(a) + Ln(\theta) - \mu E - r \geq 0 \qquad (3'')$$

Thus, higher ability or effort both increase the likelihood of remaining in school, whilst higher education costs, unskilled wages (assuming the direct costs of education are positive) or discount rate along with obesity all increase the likelihood that an individual will leave school early. In the statistical analysis, we distinguish between 'normal' weight individuals, the overweight and the obese. Thus, the condition (3'') must be slightly modified to become:

$$Ln(W_u) - Ln(W_u+T_s) + Ln(a) + Ln(\theta) - \mu_1(E_1 + E_2) - \mu_2 E_2 - r \geq 0 \qquad (3''')$$

Where $E_1 = 1$ if the individual is overweight but not obese (and $E_1 = 0$ otherwise) and $E_2 = 1$ if the individual is obese ($E_2 = 0$ otherwise). For the empirical counterpart we may think of two latent index functions, E* representing unobserved energy balance as defined by equation (1), and S*, representing the left-hand side of condition (3'''), an indicator of likelihood of remaining in school:

$$E^* = X_E\beta_E + \varepsilon_E \qquad \varepsilon_E \sim N(0,1) \qquad (7)$$

$$S^* = X_S\beta_S + \gamma_1(E_1 + E_2) + \gamma_2 E_2 + \varepsilon_S \qquad \varepsilon_S \sim N(0,1) \qquad (8)$$

We observe whether adolescents are normal weight (E_1=0, E_2=0) which occurs if $E^* \leq \alpha_1$, overweight (E_1=1, E_2 = 0) if $\alpha_1 < E^* \leq \alpha_2$, or obese (E_1=0, E_2 = 1) if $E^* > \alpha_2$, where α_1 and α_2 are unknown constants; and, whether they leave school early (S=0) which occurs if S*<0, or not (S=1). Unobserved factors affecting obesity and early school leaving, ε_E and ε_S, are assumed to be randomly distributed with zero mean, are normalised to have unit variance and are initially assumed to be uncorrelated with each other. Such a framework leads naturally to estimation of an ordered probit model for overweight and obesity and a univariate probit model for early school leaving.

Estimation of (7) enables us to test whether contextual factors are indeed associated with an excess energy balance. On the assumption that obesity and overweight are exogenous to early school leaving, estimation of (8) provides an estimate of the impact of overweight and obesity on the likelihood of leaving school.

One potentially important issue regards the possible endogeneity of energy balance, and consequently overweight and obesity, with respect to the early school leaving decision. In terms of the theoretical model, if E* is the outcome of utility maximising choices made by adolescents, then they will always be thin since there are only costs and no benefits associated with obesity. However, we start from the proposition that E* is not endogenous. In the first place, an adolescent becomes

obese over an extended period of time – it does not happen instantaneously – largely as a result of genetic factors and choices made during childhood (Lake et al., 1997 and Lobstein et al., 2004). Such choices are, by their nature, principally made (or at least determined) by a child's parents and other family members[7]. Thus, we think it reasonable to exclude the possibility that the direction of causation is inverted, that is, that early school leaving increases the tendency towards obesity. It may well do so in the longer term, but not reasonably in the time frame considered here. However, this does not exclude the possibility that the two phenomena are jointly determined by unobserved influences such as genetic factors or the unobserved – or imperfectly captured - discount rate. This too will lead to the endogeneity of overweight and obesity in the school leaving decision. It might be observed that if unobserved genetic factors affect both energy balance and the second outcome variable – in this case early school leaving – the approach commonly employed in studies, the use of family members' characteristics as instruments, will not resolve the endogeneity problem. In practical terms, the assumption of endogeneity translates to the proposition that ε_E and ε_S in (7) and (8) are uncorrelated. This is of course testable and the empirical implementation includes such tests.

5. Data and variables

Data for this analysis are drawn from a stratified survey of school age adolescents in the province of Salerno carried out in 2004 by CELPE (Centro Interdipartimentale di Economia del Lavoro e di Politica Economica, University of Salerno) on behalf of the Province of Salerno, and supplemented in 2005. The main purpose of the survey was to investigate the phenomenon of early school leaving amongst adolescents (aged 14-17) in the province. The survey collected a wide range of information from young people, including information on family background as well as on a number of health issues which were used to derive the dependent and most of the explanatory variables used here.

The sample was constructed on the basis of information, provided by the local CSA (Centro per i Servizi Amministrativi – the local educational administration), on the distribution of enrollment in the secondary public school in the Province during the school year 2003-2004. As regards students regularly attending school, a two stage procedure was employed in which 21 of the

[7] Further support to the "exogenous obesity" hypothesis comes from the medical literature regarding compulsive eating disorders. In regard to both of these considerations – the role of family members and the addictive qualities of (some types of) food - one is reminded of the attempts to introduce more healthy school meals in England in 2006. In several well-publicised incidents, parents were photographed passing burgers and chips through school fences to satisfy their children's junk(-food) habits (*The Guardian*, 3/10/2006, "The Healthy School Dinners Revolt", http://www.guardian.co.uk/society/2006/oct/03/health.schoolmeals).

total of 85 schools in the province were first extracted taking into account the distribution of schools across geographical areas and school type. Secondly around 600 students were randomly drawn from the 21 schools' records. As far as early school leavers in our sample are concerned, a list of names of persons identified as "dropouts" by schools was provided by the local CSA and contained information on around 900 individuals born between 1987 and 1989 inclusive. From these, 178 individuals were interviewed in June/July 2004. In early 2005, a refreshment sample of early school leavers was added through renewed requests for lists of such individuals from all the schools and further attempts were made to contact the members of this enlarged group of early school leavers (1326 as opposed to 900) including also those born in 1990.

Thus, the empirical sampling base consisted of a sample of students along with the entire population of early school leavers identified by the CSA. In other words, relatively speaking, early school leavers are deliberately overrepresented in the sample. This was necessary in order to ensure a group of early school leavers sufficiently large to compare with students[8]. However, of this group of 1326 'officially identified' early school leavers, one-fifth (or 274) were excluded because at the time of the interview, they were discovered to not have interrupted their education (i.e. they were misclassified) and around one-half (or 672) because the contact details given by the CSA were incorrect or because there was no reply to three telephone contact attempts. This left a group of 380 early school leavers, 51 (or 13.4%) of whom explicitly refused to be interviewed.

To summarize, the final full sample consisted of 922 individuals responding to the questionnaire, however, 123 of these subsequently returned to school and are excluded from the analysis here[9], leaving a sample of 799 adolescents who responded to a questionnaire through direct interview. A further 21 adolescents were removed from the sample due to incomplete questionnaire responses leaving a final group of 197 early school leavers and 581 school students.

Following standard practice we determine a respondent's obesity status by computing their body mass index (BMI) on the basis of self-reported height and weight[10]. The thresholds for overweight and obesity are determined by the scale for adolescents reported in Cole et al. (2000). In general, one would expect the BMI to be somewhat underreported, both because of the tendency to overestimate height as well as to under-report weight. This tendency has been identified by numerous authors. Danubio et al. (2008) review existing studies as well as providing estimates of

[8] On the basis of the data provided by the CSA, "dropouts" comprised around 2.7% of the registered school student population in Salerno Province.

[9] O'Higgins et al. (2007) uses the full sample in order to identify the factors which determine the return to school of those who initially interrupt their formal education.

[10] Although this is the standard measure of obesity used ubiquitously throughout the medical, sociological and economic literature, it is not without its critics. For a discussion of the issues, see, for example, Burkhauser and Cawley (2008). From a theoretical point of view, an interesting recent paper by Burke and Frank (2006) has included the definition of obesity itself as an endogenously determined social norm which in itself has implications for the empirical model discussed below.

the underestimation in a sample of Italian students. In common with the studies reviewed, the paper finds statistically significant under-reporting of weight and over-reporting of height. However, the only characteristic systematically related to BMI misreporting amongst Italian University students is gender. Himes and Farcy (2001) similarly find systematic differences in misreporting between adolescent boys and girls in the US, but also that age and ethnicity play a role. In the absence of information on the objective measures in the survey, we follow the suggestion of Danubio et al. (2008) in adjusting the self-reported values in order to take this misreporting into account. In the absence of direct estimates for Italian adolescents, we use the estimated relations between self-reported and measured height and weight reported by Himes and Farcy (2001) excluding the dummies for ethnicity[11].

A number of explanatory variables were also employed and may be grouped as follows:

- *Family Background* – Several variables were included to capture the impact of various aspects of adolescents' family background on overweight/obesity and early school leaving. **Family Permanent Income,** was proxied by three variables: a) whether the individual lived in an owner occupied home; b) the size of the immediate family (inversely related to FPI)[12]; and, c) the number of domestic appliances (broadly defined) available in the household. This includes such items as computers, washing machines but also means of transport. We use this approach due to the extreme unreliability of reported income – here increased by the fact that it would be reported by the children of those actually earning it and the fact that it is permanent not current income that is the main factor of interest. This approach is actually akin to that adopted by the tax authorities to identify tax evaders – the so-called 'redditometro' – a measure of imputed income based on ownership of houses, boats, cars and so on[13]. **Parental Employment,** where a dummy was included to represent whether both parents were working (given that both parents live in the household). **Complete Family Unit**, was also represented by a dummy to capture the presence in the home of two parents (either natural or step). Finally, **Maternal Education** was captured by the inclusion of two dummies according to whether the mother had obtained a lower secondary diploma

[11] Specifically, the estimated relations employed are:
Male Height = 196.6 + .959Age – 1.23 SRH + .006(SRH)^2
Female Height = 312.7 + .131Age – 2.61 SRH + .010(SRH)^2
Male Weight = 3.67 - .239Age + 1.01SRW
Female Weight = 4.37 - .358Age + 1.04SRW
Where SRH and SRW are self-reported height (cm) and weight (kg) respectively. Using different adjustment mechanisms or indeed, not adjusting self-reported height and weight affects the number of overweight and obese adolescents but does not greatly influence the substantive results. The 'Himes and Farcy' adjustment is preferred on a priori grounds, since, although by no means perfect, it is estimated for adolescents from a high income country.

[12] The inverse relation between family permanent income or wealth and household size is well established in the literature (for example, Greenwood, 1987, and Brandolini et al., 2004, on Italy).

[13] See, for example, Agenzia delle Entrate, Circolare n. 49/E, 2007.

(including a vocational diploma) or at least an upper secondary education. Also included was a dummy to identify whether or not the individual was **First-Born** as well as two variables to capture **Parental Attention** during early childhood – whether the individual was read to often by their parents and/or given help with their homework (in earlier childhood).

- *Health Status*– a variable was introduced to control for whether the adolescent stated that they had **Permanent Health Problems** which would affect their ability to study or work[14]**.**
- *Previous Educational Attainment* – Two variables were introduced to control for **School Failure** as a means of capturing early educational attainment - failing (at least) a year during either lower secondary (middle) or upper secondary school.
- *Educational experiences/relationship to the school* – several variables were included here: whether the individual played truant often which we suppose reflects the adolescent's attitude to the school; whether they were enrolled in a Liceo (the more academically oriented educational stream); and whether they went to school by either bus or on foot (as opposed to in private transport).
- *Lifestyle variables* - whether the adolescent smokes – taken as a proxy for the discount rate, r, and whether they often undertook the following activities: sports, going to the cinema, and, reading.
- *Local context* – three variables were included here – the local unemployment rate, a dummy for residents in Salerno and also a dummy indicating residency in a coastal area- The local unemployment rate was defined at the level of the local labour market system (SLL) as defined by ISTAT (the Italian National Statistical Agency). Intuitively, this identifies an area (usually smaller than cities, e.g. Salerno but larger than towns in the province, e.g. Eboli or Amalfi) within which the majority of the working population live and work. In the current analysis there were 24 distinct local labour markets[15]. Similarly, residency in a coastal area was identified with respect to the local labour market systems. Thus, for example, some but not all those residing in Salerno were defined as living on the coast by this criterion whereas all those residing in Amalfi were defined as living on the coast. In any event, these are all factors which we suppose may affect the (opportunity and/or direct) costs/benefits of studying.

Table 2 reports descriptive statistics on all the variables used in the analysis.

[14] The possible responses were: yes, temporary; yes, permanent; none; or, no reply.
[15] For further details on the definition of local labour markets, see, for example, ISTAT (1997).

(Table 2 about here)

6. Empirical results

We at first consider separately the determinants of overweight and obesity, and, their impact on early school leaving. Given the preceding discussion, each model is estimated independently for male and female adolescents. We use a large number of explanatory variables for both obesity and school leaving equations principally to reduce the risk that the obesity variable is picking up the effect of some other unobserved factor responsible for determining both phenomena thus leading to endogeneity problems. Such an approach, however, is itself open to the objection that some of the explanatory variables, above-all in the obesity equation, may well themselves be endogenous (to obesity). Estimation of probit models of obesity and early school leaving using a more parsimonious specification are reported in the appendix. In this case, all variables which might reasonably be the results of adolescents' choices are excluded from the obesity equation, whilst one or two (type of school and school year failure) are included in the school leaving equation since these 'choices' temporally precede the school leaving 'decision'. It will be observed that, apart from reducing goodness of fit somewhat, the results – and above all the impact of obesity on school leaving - change very little using this specification. Subsequently, in section 6.3, the issue of endogeneity is treated in more detail and the estimates are subject to formal endogeneity tests.

6.1 Determinants of Overweight and Obesity

Table 3 reports the results of estimating equation (7) by ordered probit. Relatively few of the variables included seem to be important in determining overweight and obesity amongst adolescents in Salerno.

a) Parental education is important for boys but not for girls in determining overweight and obesity. Specifically, possessing a mother with completed secondary or tertiary education appears to reduce the likelihood of obesity in boys.
b) Being involved in sport also seems to be more important for boys than girls in reducing the likelihood of overweight and obesity. For girls, although the coefficient is also negative, it is somewhat smaller than for boys and the coefficient is not statistically significant.
c) The place of residence is important for both boys and girls. Interestingly, living in Salerno city is associated with a higher probability of overweight and obesity for girls but a lower

one for boys, whilst living on the Coast seems to be particularly important in reducing the probability of overweight and obesity in girls but not in boys – although again the male coefficient is also negative, it is not statistically significant. The importance of coastal residence for girls may arise because the area is touristic and so physical appearance may be more obviously important to adolescents females either through its direct impact on earnings and/or through peer pressures, but may also be due to well-established differences in eating habits between coastal and inland areas – more fish on the coast and more meat inland – inherited from the past when the costs and difficulties of transport of foodstuffs were much greater. In as much as such eating habits are the consequence of established localised habits rather than instantaneous choices, the latter interpretation is more in the line with the idea of obesity as being 'pre-determined'.

d) In general, different factors seem to affect obesity in boys as compared with girls.

(Table 3 about here)

6.2 Effects of obesity and other factors on early school leaving

Table 4 reports the results of a univariate probit model of the probability of early school leaving. In line with the theoretical model above, the effect of variables may be interpreted in terms of their influence on either the returns to education, the (direct and opportunity) costs of remaining in school or the discount rate.

(*Table 4 about here)*

The determinants of leaving school include overweight and obesity and other important determinants of this choice are in particular:

1) *family background* - the level of family permanent income and higher levels of maternal education are both negatively associated with early school leaving as is, for girls, being the first born in the family;

2) *Educational attainment and experience* - previous academic performance and attitudes to school as well as the type of school attended are all influential determinants of early school leaving. In general, these factors related to relations with the school – reflecting some aspects of the direct and opportunity 'costs' of schooling – are stronger for boys than for girls.

3) *Lifestyle* - participating in sport is an important determinant of remaining in school for girls, although it is not statistically significant for boys. On the other hand, smoking is positively correlated with early school leaving for boys but the association is not statistically significant for girls.

4) *Local context* - One would expect the unemployment rate, as an indicator of the opportunity costs of remaining in school to be negatively correlated with early school leaving. This is indeed observable, however, interestingly, it is only (just) statistically significant for boys.

5) *Overweight and obesity* – one may observe rather different results between boys and girls also as regards the association between early school leaving and overweight and obesity. For girls the coefficient on obesity is large and strongly statistically significant. For boys, the coefficient on obesity is not statistically significant but the coefficient on overweight is. Recalling form equation (8) that the two coefficients are cumulative – the 'effect' of obesity (compared to being normal weight) on school leaving is the sum of the coefficients on both overweight and obesity, the implication is that the effect of excess body mass is smaller for boys than for girls but begins to have an effect at a lower body mass.

6) *Boys vs. girls* – in general, there are important differences in the results for boys and girls. In particular, the results suggest that boys attach more importance to the direct and opportunity costs of remaining in education.

6.3 Testing for endogeneity

An obvious potential problem in terms of identifying the **causal** effect of obesity on early school leaving concerns the possible endogeneity of obesity. As noted above, however, we think that on *a priori* grounds endogeneity is unlikely to be a serious problem in the current context. The well established and strong link between obesity and family background; the immediacy of the negative consequences of obesity compared to the much longer run negative consequences of early school leaving arising from reduced returns to education; and, the fact that one does not become obese overnight, it takes time to develop, all tend to support the idea that the direction of causation is from obesity to school-leaving and not the other way around. However, this type of reasoning is not sufficient to exclude the possibility of endogeneity arising from the joint determination of overweight and obesity and early school leaving. As a first step, to attempt to control also for this, we estimated a quasi-reduced form model employing the same (and numerous) explanatory variables in both equations with the intention of reducing the likelihood of correlation between obesity and the unobserved component of the school leaving equation. Second, in table 5 we report the results of a series of exogeneity tests. These are based on a simple extension of the bivariate

probit test suggested by Monfardini and Radice, (2008). The test involves the joint estimation of a reduced form equation for the determinants of overweight and obesity and a 'structural' equation for the determinants of early school leaving allowing for correlation between error terms in the two equations (Roodman, 2009). The degree of statistical significance of the estimated correlation between error terms in the two equations constitutes the test. The intuition is that if unobserved factors affecting overweight and obesity also influence early school leaving then these will be manifested by a correlation between unobserved factors in the two equations. Several such tests were undertaken employing different instruments because: any test of endogeneity relying on instruments is likely to be sensitive to the specific instruments chosen; and, the choice of instruments is not at all obvious in our context – the usual instruments employed – obesity amongst relatives for example - are not available and it is not obvious which other variables might be correlated with obesity but not with school leaving apart from through their influence on body mass.

(*Table 5 about here)*

The results support the notion that obesity is exogenous to early school leaving in the current context. The tests are never statistically significant at a 5% significance level and only once at 10%. Thus, formal tests add support to our a priori reasoning that exogeneity appears not to be a serious problem in the results presented here. We might add that endogeneity is in line with the findings of Kenkel et al. (2006) who do not find support for the notion that high school (or GED) completion affects obesity. Moreover, the recent study by Sabia (2007) on the effect of obesity on scholastic performance, finds that OLS, Lewbel IV and fixed effects models all provide similar estimates of the effects of obesity on academic performance. Although, in the absence of more convincing instruments, we cannot conclude definitively that obesity is exogenous to early school leaving, the evidence presented in table 5 support such a conclusion.

7. Concluding comments

We have examined the causes of overweight and obesity and their association with early school leaving. We considered the role of various factors, such as family background, previous educational attainment, lifestyle and local context in determining overweight and obesity and found that above all, place of residence is important in determining the phenomena for both male and female adolescents. Being involved in sport and maternal education are also important for adolescent males but much less so for girls.

We found a strong and robust positive association of overweight and obesity with early school leaving. We rationalise this in terms of the interaction between overweight and obesity and the returns to education leading to a causal effect of excess body mass on early school leaving. The nature of the relationship is rather different for boys compared to girls. For boys the effect is weaker and kicks in at a lower level of excess body mass.

We also considered the possible endogeneity of obesity. In principle, obesity may cause poor scholastic performance or vice versa. Alternatively other factor(s) may determine both obesity and early school leaving, such as genetic factors or an imperfectly measured discount rate. If either of the latter situations prevails, obesity will be endogenous in the estimation of school leaving. We offered a priori discussions and formal statistical tests of exogeneity. Both of which add some support to the idea that the association identified between overweight/obesity and early school leaving is causal; however, we are unable in the context of our analysis to make a definitive judgement on the issue.

We analysed data on adolescent boys and girls separately which proved fruitful inasmuch as there are significant differences in the causes and consequences of obesity across the sexes even at this early age. Taken as a whole, the findings suggest that obese girls suffer more serious consequences than do overweight/obese boys.

The findings presented here have significant implications for policies aimed at reducing both obesity and early school leaving. First, evidence on the positive association between overweight/obesity and early school leaving suggests that action aimed at reducing obesity, such as policies to encourage sport in school, may also have beneficial effects in terms of reducing early school leaving rates, particularly for girls. The inverse relation between family permanent income and/or family educational level and early school leaving points towards the provision of financial incentives to remain in school. In this regard, one might observe that measures in this direction have recently been introduced in Italy. A number of items which may contribute to the costs of education, such as season tickets for public transport and school registration fees have recently been made tax deductable. The findings concerning the differences between adolescent boys and girls suggest policies, particularly for boys, aimed at making the longer run benefits of education more evident to them. Given the aforementioned limitations of the analysis presented here, together with the strong relation identified between obesity and early school leaving, we would hope that this paper might serve as a stimulus for further work investigating this link.

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Table 1: Overweight (including obesity) and Early School-Leaving by Macro-Region for Adolescents (aged 14-17) in Italy.

	Overweight (including obese) adolescents as a % of all adolescents aged 14-17.			Secondary School leavers (14-17) as a % of 14-17 year old enrolled Secondary School students
	Males	**Females**	**Males & Females**	**Males & Females**
North-East	14.0	11.4	12.7	1.3
North-West				1.1
Centre	17.3	8.4	12.8	1.4
South	21.8	11.2	16.6	1.9
Islands (Sardinia & Sicily)				2.7
Italy	18.2	10.8	14.5	1.6

Source: Overweight and obesity – Gargiulo et al (2004); Early school leavers – Ministero della Pubblica Istruzione (2008) .

Notes: Data for Overweight and obesity refers to 1999-2000 and for early school leavers to 2006-7. More recent data for adolescent obesity is not available.

Table 2: Descriptive statistics of the variables used in the analysis

	Female		Male	
	Mean	Std. Dev. (continuous variables)	Mean	Std. Dev. (continuous variables)
1. Early School Leaver	0.270		0.240	
2. Overweight or Obese	0.383		0.209	
3. Obese	0.054		0.029	
4. Live in owner occupied home	0.796		0.806	
5. No. of household members (in natural log.s)	1.501	0.243	1.467	0.233
6. No. of domestic appliances (in natural log.s)	2.627	0.265	2.694	0.264
7. Both parents working	0.332		0.356	
8. Both parents live in household	0.904		0.917	
9. Mother has lower secondary education	0.485		0.437	
10. Mother has upper secondary or tertiary education	0.368		0.374	
11. Individual is the first born in the family	0.353		0.403	
12. Parents often read to individual when as a child	0.129		0.061	
13. Parents helped often with homework	0.237		0.207	
14. Individual has permanent health problems	0.039		0.025	
15. Individual attends a 'Liceo'	0.299		0.203	
16. Individual failed a year during middle school	0.027		0.070	
17. Individual failed a year during secondary school	0.117		0.203	
18. Individual often skips school	0.093		0.137	
19. Individual travels to school on foot	0.296		0.216	
20. Individual travels to school by bus	0.512		0.480	
21. Individual smokes	0.240		0.259	
22. Individual often does sport	0.207		0.363	
23. Individual often goes to the cinema	0.054		0.063	
24. Individual often reads books	0.132		0.041	
25. Individual lives in Salerno (City)	0.389		0.387	
26. Individual lives on the coast	0.383		0.412	
27. Local unemployment rate (%)	11.833	1.951	11.796	1.946
N	334		444	

Note: All the variables except for variable no.s 5, 6 and 27 are dichotomous. Variables 5 and 6 are integer values transformed by natural logarithms. The local unemployment rate is defined at the level of the local labour market system (SLL) as defined by ISTAT (the Italian National Statistical Agency). Further description and discussion of the variables is included in section 5 of the text.

Table 3: Ordered Probit model of the determinants of overweight and obesity in Salerno and province amongst adolescents (15-18 years old), 2004

	Overweight and Obesity			
	Female		Male	
	Coeff.	Std Err.	Coeff.	Std Err.
Live in owner occupied home	-0.261	0.176	0.141	0.183
No. of household members (in natural log.s)	0.220	0.332	-0.120	0.330
No. of domestic appliances (in natural log.s)	-0.030	0.297	-0.011	0.281
Both parents working	-0.173	0.156	-0.161	0.156
Both parents live in household	-0.172	0.264	0.043	0.279
Mother has lower secondary education	0.037	0.207	-0.102	0.184
Mother has upper secondary or tertiary education	-0.019	0.238	-0.461**	0.221
Individual is the first born in the family	-0.046	0.149	0.026	0.141
Parents often read to individual when as a child	-0.079	0.218	-0.038	0.312
Parents helped often with homework	-0.200	0.175	0.099	0.182
Individual has permanent health problems	-0.039	0.362	-0.105	0.459
Individual attends a 'Liceo'	-0.012	0.172	-0.110	0.216
Individual failed a year during middle school	0.372	0.403	0.023	0.264
Individual failed a year during secondary school	0.024	0.230	-0.066	0.178
Individual often skips school	-0.088	0.256	-0.257	0.217
Individual travels to school on foot	-0.017	0.208	-0.148	0.208
Individual travels to school by bus	0.084	0.196	0.141	0.167
Individual smokes	0.229	0.169	-0.113	0.170
Individual often does sport	-0.239	0.186	-0.357**	0.159
Individual often goes to the cinema	-0.103	0.331	0.224	0.278
Individual often reads books	0.279	0.212	0.093	0.346
Individual lives in Salerno (City)	0.307*	0.165	-0.288*	0.162
Individual lives on the coast	-0.379**	0.176	-0.168	0.162
Local unemployment rate (%)	0.004	0.037	0.027	0.036
α_1	0.175	0.990	0.534	0.932
α_2	1.552	0.994	1.688	0.939
N	334		444	
Pseudo R-squared	0.04		0.06	

Note: statistical significance of coefficients is indicated as follows: *** for $p < 0.01$, ** for $.01 < p < 0.05$ and * for $.05 < p < 0.1$

Table 4: Probit model of the determinants of early school leaving in Salerno and province amongst adolescents (15-18 years old), 2004

	Early School Leaving			
	Female		Male	
	Coeff.	Std Err.	Coeff.	Std Err.
Overweight	-0.139	0.223	0.402**	0.204
Obese	0.954**	0.458	0.049	0.481
Live in owner occupied home	0.131	0.264	0.021	0.213
No. of household members (in natural log.s)	0.660	0.468	0.580	0.376
No. of domestic appliances (in natural log.s)	-1.136***	0.418	-0.837**	0.330
Both parents working	0.086	0.246	-0.071	0.194
Both parents live in household	-0.569	0.376	0.089	0.324
Mother has lower secondary education	-0.544**	0.273	-0.455**	0.201
Mother has upper secondary or tertiary education	-0.463	0.336	-0.868***	0.249
Individual is the first born in the family	-0.622**	0.236	-0.279	0.178
Parents often read to individual when as a child	-0.214	0.372	-0.519	0.400
Parents helped often with homework	-0.314	0.257	-0.130	0.232
Individual has permanent health problems	0.533	0.506	0.557	0.534
Individual attends a 'Liceo'	-1.690***	0.433	-1.403***	0.456
Individual failed a year during middle school	0.761	0.483	1.104***	0.310
Individual failed a year during secondary school	0.632**	0.291	0.884***	0.194
Individual often skips school	0.666**	0.321	1.062***	0.242
Individual smokes	-0.103	0.256	0.486**	0.193
Individual often does sport	-1.630***	0.481	-0.227	0.197
Individual often goes to the cinema	0.447	0.504	-0.250	0.377
Individual often reads books	-0.267	0.385	-0.289	0.519
Individual lives in Salerno (City)	-0.108	0.249	0.039	0.194
Individual lives on the coast	0.224	0.244	-0.023	0.189
Local unemployment rate (%)	-0.061	0.056	-0.080*	0.047
Intercept	3.179**	1.345	1.691	1.060
N	334		444	
Pseudo R-squared	0.43		0.41	

Note: statistical significance of coefficients is indicated as follows: *** for $p < 0.01$, ** for $.01 < p < 0.05$ and * for $.05 < p < 0.1$

Table 5: Correlated Probit tests of Exogeneity (p-values)

	Females		Males	
	Separate	**Cumulative**	**Separate**	**Cumulative**
Travels to school on foot & Travels to school by bus	.96	.96	.95	.95
Lives in Salerno City	.31	.15	.98	.95
Both parents working & Both parents live in HH	.09	.20	.92	.95
Individual often does sport	.94	.97	.20	.30

Note: The table reports probability values for the exogeneity test outlined in the text using a variety of different instruments both separately and cumulatively. In the cumulative test, variables are added to the list of instruments in the order in which they appear in the first column. Thus for example, looking at the row labelled 'Salerno', the second column indicates that the exogeneity test using just the dummy variable 'Salerno' as an instrument in the probit model for females produces a p-value of .31, the third column indicates that an analogous test using 'Travel to school on foot', 'Travel to school by bus' **and** 'Salerno' as instruments gives a probability value of .15. The ordering of the variables was determined by a priori judgements on their likely validity as instruments, however, in practice the ordering makes no difference to the overall result. Specifically, the exogeneity test is never statistically significant at a 5% significance level and only once – using just "both parents working" and "both parents living in the household" at 10%.

Appendix: Ordered and Univariate probit models of the determinants of overweight/obesity and early school leaving with a reduced set of explanatory variables

	Overweight and Obesity				Early School Leaving			
	Females		Males		Females		Males	
	Coeff.	Std Err.	Coeff.	Std Err.	Coeff.	Std Err.	Coeff.	Std Err.
Overweight	-	-	-	-	-0.076	0.207	0.299*	0.173
Obese	-	-	-	-	0.821**	0.409	-0.013	0.447
Live in owner occupied home	-0.236	0.170	0.179	0.179	0.137	0.241	-0.009	0.198
No. of household members (in natural log.s)	0.169	0.318	-0.149	0.323	0.528	0.450	0.723**	0.367
No. of domestic appliances (in natural log.s)	-0.030	0.273	-0.161	0.262	-1.477***	0.379	-0.895***	0.302
Both parents working	-0.179	0.153	-0.130	0.152	0.027	0.229	-0.036	0.177
Both parents live in household	-0.195	0.250	0.064	0.272	-0.553*	0.321	0.029	0.311
Mother has lower secondary education	0.012	0.204	-0.037	0.177	-0.471*	0.257	-0.351*	0.191
Mother has upper secondary or tertiary education	-0.052	0.231	-0.445**	0.204	-0.378	0.317	-0.782***	0.235
Individual is the first born in the family	-0.060	0.145	0.023	0.138	-0.629***	0.218	-0.232	0.165
Parents often read to individual when as a child	-0.095	0.212	-0.061	0.301	-0.347	0.333	-0.734*	0.398
Parents helped often with homework	-0.226	0.171	0.120	0.176	-0.237	0.238	-0.160	0.211
Individual failed a year during middle school	-	-	-	-	0.809*	0.467	1.230***	0.287
Individual failed a year during secondary school	-	-	-	-	0.642**	0.262	1.059***	0.179
Individual attends/attended a 'Liceo'	-	-	-	-	-1.703***	0.423	-1.211***	0.395
Individual lives in Salerno (City)	*0.273*	0.161	-0.296*	0.161	-0.106	0.227	0.072	0.182
Individual lives on the coast	-0.378**	0.172	-0.157	0.158	0.099	0.227	-0.096	0.176
Local unemployment rate	0.000	0.036	0.028	0.034	-0.057	0.054	-0.085**	0.043
α_1	-0.084	0.937	0.356	0.873	-	-	-	-
α_2	1.265	0.939	1.484	0.880	-	-	-	-
Intercept	-	-	-	-	4.095***	1.295	1.907*	1.016
N	334		444		334		444	
Pseudo R-Squared	0.026		0.041		0.363		0.334	

Note: statistical significance of coefficients is indicated as follows: *** for $p < 0.01$, ** for $.01 < p < 0.05$ and * for $.05 < p < 0.1$