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Like Mother, Like Father? Gender Assortative Transmission of Child Overweight

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Abstract

Parental influences on children health related behaviours are argued to be gender assortative (e.g., that maternal behaviour is more important for daughters), but research devoted to disentangling such effects is still at its infancy. We take advantage of a unique dataset (Health Survey for England) containing records of clinically measured weight and height for a representative sample of English children and their parents for the period 1996-2009. We examine the magnitude and change of the association between maternal and paternal overweight and that of their offspring by gender, alongside the combined parental effect. We aim at identifying the existence and the magnitude of a *gender-assortative transmission of overweight* after controlling for a long list of covariates, including time and survey-wave fixed effects. Our findings point out that the intergenerational transmission is most significant when both parents are obese or overweight, and the effects size increases with child age 0.7 percentage point among infants to 1.3-1.4 percentage points among schooled children and teenagers. However, we find weak evidence of a specific maternal effect on girls' overweight, and more generally gender assortative intergenerational transmission of overweight and obesity.

JEL-Codes: I120.

Keywords: gender assortative parental transmission, child obesity, child overweight, role models, inter-generational transmission.

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1. Introduction

Overweight among children is a growing health and socio-economic concern with far reaching consequences. Estimates from the International Association for the Study of Obesity (EASO) indicate that the rates of overweight (including obesity) children aged 5-17 years in the United Kingdom (UK) are among the highest in Europe. . Figure 1 displays the patterns of increase in child overweight in England, one of the world countries where child obesity has been increasing faster but it tails off around 2005. Specifically, Figure 1 distinguishes obesity rates among 2-10 from 11-15, although the latter exhibit higher obesity the overall trends are comparable.

The mechanisms underpinning the expansion of child obesity and overweight are still not well understood. Overweight and obesity, as many health conditions, can exhibit both a significant hereditary alongside non-negligible shared environmental components. For instance, children's caloric intake, dietary habits and level of physical activity are associated with that of their parents' social norms and culture (Anderson and Butcher, 2006). By the time, children are three or four years old, their eating patterns are already sensitive to environmental cues about food intake (Nicklas *et al*, 2001). Given that children do not make autonomous health and food related choices, one of the most pressing hypotheses underpinning the obesity epidemic lies in the existence of *shifts* in the intergeneration transmission of overweight.

Since genetics are unlikely to have changed dramatically over the past thirty years, if the correlation between parents and children's obesity has changed over time, then it is likely that the environment and/or parental behaviour are responsible for such a change (Anderson et al, 2007). That is, the short-term effects of the so-called obesity epidemic point towards the role of the so-called obesogenic environment. However, it is unclear whether the effect spans over the entire population or those who are genetically predisposed to obesity. If the intergenerational transmission varies, and if, in addition, the

overall correlation has increased overtime, it suggests that the common environment (or decisions made by the family) is affecting all family members' ore intensely than in the past. Thus, understanding the intensity with which such intergenerational transmission takes place is a pressing issue to improve the design of policies to tackle this problem.

[Insert Figure 1 about here]

The role of parental influence is considered to be of prime importance because parents directly shape their children physical and social environment, and indirectly determine habits through socialization and modeling (Richtie *et al*, 2005). Although varying with the child's age, parents exert ample control on the child's lifestyles and behaviours. There are family strongly influences childhood eating practices, including children's attitudes toward food (Nicklas et al, 2001). Hence, one would expect that, unless obesity and overweight were only genetically induced, children raised by overweight parents are more likely to be overweight. The latter would suggest that the spread of obesity and overweight among children is, at least partially, attributed to heterogeneous parental norms (e.g., including unhealthy role modelling). There is some evidence of a significant parent-child association with fruit and vegetable intake (Bere et al, 2004). However, even when parents do not impose strict behavioral rules, children, both consciously or unconsciously observe and model their parents especially about fitness and food consumption.

In addition to documenting the presence of a time specific paternal transmission of overweight, one can hypothesize the presence of differential maternal and paternal influences. A study by Reilly et al (2005) using longitudinal data form ALSPAC in the UK finds as risks of obesity of both parents to be the most significant determinants of childhood obesity, as well as some behavioural factors such predicting sedentary

lifestyles. On the other hand, using data from the Health Survey for England (HSE) for 2001-2006 finds that the mother –child's weight association is higher than the father-child's one (Whitaker *et al*, 2010). However, such an association does not control for a number of confounding covariates, and does not distinguish gender specific transmission effects. Some potential mechanisms include a lower involvement of fathers in food decisions than that of the mothers (Davey et al, 2007). Instead, other recent research suggests there is an increasing correlation of father and children's obesity and a reduction of the maternal link (Ajslev et al, 2014).

Some other work examines whether intergenerational influences are gender assortative (Pérez-Pastor et al, 2015). A study using Danish data shows that the intergenerational during the obesity epidemic was stable for mothers, whereas the father-child BMI resemblance increased (Ajslev et al, 2014) and it has remained stable over time (Ajslev et al, 2015). This recent evidence is in contrast with a study using the Northern Finland Birth Cohort 1986, which was born at the onset of the obesity epidemic, which revealed that paternal and maternal effects were stronger for daughters than for sons (Jääskeläinen *et al*, 2011). Additionally, Costa-Font *et al* (2015) reports high rates of intergenerational transmission of obesity when both parents are obese for both natural and adopted children, suggesting that environmental factors affecting *both parents*' and children's obesity might very important and not so much the assortative element. When *both* parents are overweight, the likelihood of the child being overweight (obese) is increased by about 10% to 30% (10% to 20% for obesity).

Our paper improves upon existing literature on a number of ways. First, by using all years available of the Health Survey for England we are able to examine a sample of children living in homes where parents are both biological by controlling for a number of spatial and time specific effects. Second, unlike previous research we can identify changes in the intergenerational transmission of overweight and obesity over a long

period, with the understanding that this transmission is mainly 'cultural', i.e. it is unlikely that it will reflect genetic changes. Similar research has focussed on the intergenerational transmission of obesity (Classen and Hokayem 2005, Classen, 2010 and Costa-Font and Gil, 2013), but draws upon small number of years. Third, we are able to exploit both parental and maternal clinical measures of overweight and obesity for a long period of time (1997-2009), whilst previous data would typically rely only on the head of the household and examine a small number of years. Finally, and most importantly, unlike previous research we can study the effects gender assortative effects of mother and father on daughters and sons respectively.

The remainder of the paper is as follows: Next section provides the background literature. Section three reports the data and empirical strategy. Section four provides the results and section five contains our conclusion and discussion.

2. Intergenerational Transmission

2.1 Transmission of overweight

The study of the intergenerational transmission of health outcomes is important to empirically test for the influence of parental behaviour on children. Seminal studies such as Coate (1983) found that children with heavier parents tend to produce more adipose tissue, so that the probability of an adolescent (10-16) to be obese increases by 20% if one of the parents is obese, increasing to 40% if both are. A study by Currie et al (2007) finds that children from obese parents tend to be obese themselves but the source of the association call for further research. Hebebrand *et al.*, (2000) found that for the majority of very obese German children, both parents had an age-specific BMI in the top 10 percentile. Martin (2008) measures the intergenerational associations of BMI using data from the National Longitudinal Survey of Adolescent Health, which includes measures of BMI for adolescent children and reports of parental obesity status but not their BMI. She finds that children whose parents are both reported to be obese have BMI levels one

standard deviation above the sample mean. Anderson *et al.* (2007) use data from repeated cross sections of the National Health and Nutrition Examination Survey to find an intergenerational BMI elasticity between women and their children of roughly 0.2.

Classen and Hokayem (2005) use data from the National Longitudinal Survey of Youth-79 and find that adolescents of extremely obese mothers (with BMI greater than 40) are 50% more likely to be obese than their counterparts. Classen's (2010) findings suggest a correlation of BMI between sons and mothers of between 0.32 and 0.38. This association increases at higher levels of the BMI distribution. In general, having an overweight mother significantly increases the likelihood of becoming obese for both white and black females and males, but not for Hispanics. Children of obese mothers are 38% more likely to be overweight or obese. Similarly, Emanuel *et al*. (1992) estimates a positive and significant relation between infant and parents' birth weight using the British Birth Cohort Study. Ahlburg (1998) examines the intergenerational relationships health outcomes and diseases and reports estimates of intergenerational correlations for lifespan in the range of 0.15–0.3. He suggests for further research the need to disentangle causal component.

2.2 Transmission Mechanisms

Food related behavioural is predominantly learned at home (the 'like begets likes'), where-by familial role models influence food intake and health outcomes. The transmission of household norms determines children's eating conduct (e.g., size portions, fitness behaviour, time of sugar intakes, regularity of fat intake etc.). In the particular case of the child obesity epidemic, however, cultural intergenerational transmission of obesity is not the only explanation. Related studies are Goode et al. (2008), which investigates the possibility of intergenerational transmission of unhealthy eating habits from parents to adult children using the 2003 Scottish Health Survey. Their results suggest that paternal history on eating habits has no impact on either sons or

daughters and maternal history on eating habits influences negatively the eating behaviour of daughters. Stunkard *et al* (1990) draw on twins to establish the relative influence of environmental and genetic influences on BMI by comparing those that shared an environment and those that did not, finding a large genetic component of obesity.

One potential explanation of the intergenerational transmission is that it is the result of a common external factor, such as poverty or female employment. Classen (2010) discuss how the circular relationship between increased weight and lower income means that transmission of overweight to children reduces their future economic outcomes. This is due both to genetic predisposition as well as to resource constraints.

There is an extensive literature on the parental role of education in the intergenerational transmission education, income and even health outcomes. Specifically, a recent study found that Korean adoptees in the US exhibit a higher BMI of those adopted by European families (Hruschka and Brewis, 2013), suggesting a socioeconomic vector. Apouey and Geoffard (2016) find evidence that the effect of education follows an inverted U-shape across childhood, with a widening effect up until age 8, and narrowing afterwards. Cavaco et al (2014) find evidence of the role of socio-economic status in explaining child obesity. Costa-Font and Gil (2013) find that the presence of a socio-economic vector in child obesity remains even when controlling for parental transmission. One explanation could be that the intergenerational associations have changed over the last generations as women have increasingly attained higher levels of education.

A limitation of the gender assortative transmission hypothesis lies in the role of assortative mating effects, but specific for each gender. Perez-Pastor et al (2009) finds examining data from one city in the UK and fins some weak evidence of an effect. This results is consistent with that of a recent systematic literature review suggesting that the main reasons for a stronger maternal effect exhibits no robust evidence (Pareo et al,

2013). Individuals with similar genotypes and/or phenotypes (body size, cognitive abilities, age, education etc) mate with one another more frequently than what would be expected under a random mating pattern (Silventonen et al, 2003). For instance, studies have reported correlations in spousal BMI values ranging from 0.10 to 0.15 (Allison et al., 1996). If parents exhibit similar characteristics, it might be challenging to distinguish maternal and paternal effects.

Yet, women still bear the burden of cooking for the household, with four out of every five women respondents cooking on most or every day, compared with one in five men (Caraher et al, 1999). Lake et al (2006) find that food responsibility was predominately a female dominated area, with a considerably higher proportion of women responsible for food shopping and preparation compared with men. This means that one could hypothesize that fathers' and children overweight might be more associated than with that of the mother if she prepares food for them but eats herself a different diet.

Anderson *et al.* (2003) using American data suggest that there is a causal linkage from maternal employment to child weight especially for mothers working long hours. Maternal employment is suggested to decrease maternal time available for overseeing children's activities, which generally results in increased sedentary activities as opposed to activities that have the positive effect of spending calories. Specifically, they link it to increased television viewing and decreased participation in active play by the child. However, these studies generally are not examining the intergenerational transmission of obesity and overweight. An exception is Costa-Font and Gil (2013) who find that after accounting for the intergenerational transmission of mother's labor market participation only explains obesity among boys but not among girls.

Hence, it appears income and parental influences are central determinants of obesity among children including education, i.e. Baum II and Ruhm (2007) find that an additional year of maternal education reduces obesity by an average of 0.2 kg/m2.

Finally, the relationship between socioeconomic variables and family functioning suggest that socially disadvantaged people have less autonomy to choose healthy behaviours (Wickrama et al, 1999).

3. Data and Methods

3.1 Data

We exploit the Health Survey for England (HSE). This cross-sectional survey started in 1991 and has been carried out annually since then. However, data on measured height and weight is only available from later waves. The HSE is the representative survey with the most accurate health measurement. It contains health and health-related behaviours, including weight and height, Body Mass Index (BMI), fruit and vegetable consumption, alcohol intake and smoking in adults and children living in private households in England. The measurements of height and weight in the HSE are validated by a nurse, overcoming the problem of measurement error of these values present in other surveys containing children (Cawley et al 2015). The survey also contains the socio-economic status of the household and core information on all its members, including their relationship. Our pooled cross-section panel dataset results from merging information contained in thirteen different waves of the HSE, from 1997 to 2009. The HSE is an annual survey that contains records from adults aged 16 and over, and since 1995 has also included children aged 2-15 and since 2002 infants under 2 have been included. The information on children is reported by their parents, except for children 13 years and older. Upon an interview with each eligible person in the household, a nurse visit allows clinically measuring the height and weight of survey participants alongside other variables.

[Insert Table 1 about here]

Table 1 reports the descriptive statistics if all the variables that we employ in the study. Our two dependent variables are described in the top panel, namely the prevalence of obesity and overweight of children. Importantly, we divide the children in three groups: pre-school, primary schooled children and teenagers. We find that obesity and overweight increase from pre-school to schooled children, and then the prevalence remains unchanged over time. Table 1 includes the summary statistics of control variables such as age, gender and two measures of health long standing illness, passive smoking, and ethnicity. Parental overweight and obesity increase with child age possibly partly due to the aging process of the parents but also possibly partially reflecting the so-called obesity epidemic. Our data contains also information on parental health, full time education of both father (70%) and mother (90%). Other important variables we include based on the literature review include maternal and paternal education, alongside income, flat ownership (80%), the rural nature of the neighbourhood and family size.

3.2 Empirical Strategy

Our empirical strategy is based on a linearized health production function in which the latent overweight of a child is explained by non-genetic factors (age of the parents, their education and employment statuses, household's income, type of dwelling, and, being exposed to passive smoke); the child's own characteristics (age, gender, ethnic group); and, indicator variables taking value 1 if both parents are overweight; if only the mother is overweight; or if only the father is overweight:

$$o_{ij}^{*} = \delta_0 + \delta_b o_{ij}^{b} + \delta_M o_{ij}^{M} + \delta_F o_{ij}^{F} + \theta X_{ij} + \beta Z_j + v_{ij} \quad , (1)$$

where o_{ij}^{*} indicates the latent overweight of child *i* in household *j*; o_{ij}^{b} is an indicator variable for *both parents* of child *i* in household *j* being overweight or obese; o_{ij}^{M} takes value one if *only the mother* of child *i* in household *j* is overweight ; o_{ij}^{F} takes value one if *only the father* of child *i* in household *j* is overweight ; X_{ij} a vector of the child's characteristics including gender; Z_j is a vector with the parents' characteristics and and v_{ij} is the error term. Assuming normality of the error term, v_{ij} , the probability of observing that a child *i* in our sample is overweight ($o_{ij} = 1$) is the probability that the corresponding latent variable is positive, i.e:

$$P\left(o_{ij} = 1\right) = P\left(o_{ij}^{*k} > 0\right) = \mathbf{\Phi}(\delta_0 + \delta_b o_{ij}^{b} + \delta_M o_{ij}^{M} + \delta_F o_{ij}^{F} + \beta\, Z_j + \theta X_{ij}) \qquad (2)$$

Therefore, in this framework, coefficients $\delta_b, \delta_M,$ and δ_F will be estimates of the association between *both parents*, *only the mother* or *only the father* being overweight with the likelihood a child being overweight, respectively.

Further, to be able to examine if the degrees of transmission have changed since the beginning of the sample period, we include the interaction of a time trend, *T*, with the indicators of parental obesity or overweight:

$$o_{ij}^{*} = \delta_0 + \delta_b o_{ij}^{b} + \delta_{bb} o_{ij}^{b} * T + \delta_M o_{ij}^{M} + \delta_{MM} o_{ij}^{M} * T + \delta_F o_{ij}^{F} + \delta_{FF} o_{ij}^{F} * T + \beta\, Z_j + \theta X_{ij} + v_{ij} \quad , (3)$$

In the next section, we describe the results of the benchmark model and then the extensions.

4. Results

Our results are reported in Tables 2 to 5. As indicated in the top rows of all tables, we examine the association with three different parent- children clusters that vary

depending on whether their parents are obese or overweight. The first panel of each table presents the results for the association between parents and children overweight; the second panel relates the parents' obesity and the child overweight; finally, the third panel presents the association of the parents being obese with the child being obese. In the Appendix, we present the naïve OLS results and the full specification estimates. As the dependent variable in all these models is discrete, taking values equal to 1 (when the child is overweight/obese) and to 0 (otherwise), we estimate our models using probit models with robust standard errors clustered by household.

Table 2 presents the coefficients when both girls and boys are included in the sample and gender is included as a control. Table 3, 4 and 5 present the results for Pre-School children, Children and Teenagers, respectively, segregating the samples by gender. Results in Table 2 are consistent with the existence of a strong transmission of overweight and obesity when both parents are overweight or obese. This finding corroborates previous evidence in the literature, but we expand this benchmark result in three dimensions:

[Insert Table 2 about here]

First, we uncover at the intensity of *the intergenerational transmission seems to increase over the course of a child's life*. The strong parental influence -in the form of conscious or unconscious role modelling- increases along the child's age. When examining the transmission of *overweight*, we find a coefficient of 0.19 among pre-school children that jumps to 0.24 among teenagers. This is important given that schoolchildren are typically also influenced by the habits of their classmates. When we

evaluate the effect with *obesity as a dependent variable*, we find a coefficient of 0.08 that increases to 0.22 for teenagers.

Second, we find that the coefficients corresponding to the interaction of the parents' overweight/obesity indicators with the variable, 'Time', are not significant. This is consistent with the idea that, although the parental effects increase with child's age, the intensity of the intergenerational transmission *has not shifted dramatically over time*.

Third, when we examine *maternal or paternal specific effects* we find that for overweight, there are similar effects between parents for *teenagers*, but for schoolchildren, the dad's transmission coefficient is larger than that of the mum. The latter applies as well we examine the transmission of *both parents-obesity* and *both parents-overweight* on child overweight and obesity on obesity.

These results are important and clearly deviate from previous findings that suggest stronger maternal obesity transmission effects. Our preferred interpretation is that previous estimates employ older samples and do not contain a rich set of controls we are able to incorporate here, driving the direction and significance of the associations. Finally, Table 2 suggests that both the prevalence of obesity and overweight are higher among girls than it is among boys. This is consistent with previous evidence from Britain suggesting that girls exercise less and spend more time at home compared to boys of equivalent age.

Next we investigate the existence of gender assortative transmission. Indeed, Table 3 displays the estimates of gender specific associations between parents and children's overweight and obesity among pre-school children. When we split the sample and focus on pre-school children only, we find results consistent with Table 2, but now we are able to distinguish gender specific effects. We find that the intergenerational association on overweight between both parents are overweight to be larger for girls than for boys, but

no significant effects are found for obesity. When we examine child obesity, we only find an effect for maternal obesity but not for paternal or both. The latter suggests a stronger early-years influence of mothers on boys, which we do not find among girls. In contrast, we find a strong association between fathers' overweight and daughters' overweight but no effect on obesity. As before, time trend interactions suggest no effect.

[Insert Table 3 about here]

Table 4 shows the gender specific association between parents and children overweight and obesity among schoolchildren. Here we observe some important differences compared to Table 3. First, we find a strong association of having both parents being overweight or obese and the overweight/obesity of girls, whilst for boys this association only exists for boys being overweight but not for obese. Nevertheless, the association of both parents' being obese with the obesity of the boys has changed, i.e. the interaction of the time trend time with both obese is significant. Second, unlike Table 3, for (primary) school girls, the interaction terms of the mother being overweight or obese with a time trend are significant and large in the specifications of the girl being overweight herself. Thus, these associations have changed overtime for girls (but curiously this is not the case not for boys). Finally, as in Table 3, the effect of dad's alone is significant, but for this age group, the association with dad's overweight is stronger for boys than for girls.

[Insert Table 4 about here]

Finally, Table 5 contains the estimates the gender specific association between parents' and children overweight and obesity for teenagers. These estimates magnify the results of Table 2 for girls, namely that having *both parents obese or overweight* is significantly and more importantly associated to *teenagers' overweight* than it is for younger kids. Nonetheless, most remarkably, the effect extends to explain obesity for teenage girls but not for that of boys. We also find a strong association of mothers and fathers' overweight

alone with obesity with overweight for both boys and girls. Evidence indicates that the coefficient of father's only obesity is stronger than that of mother's only. Finally, or the boys, there is an association of overweight with the overweight of one parent alone but this does not happen for the boy being obese.

[Insert Table 5 about here]

5. Conclusion

The transmission of overweight is one of the important drivers of the expansion of an epidemic of obesity and overweight. However, we know little about whether the magnitude of the intergenerational transmission has changed in the last decades, whether it is gender assortative. This study has built up on pooling all available waves of the Health Survey for England at the time of the analysis to examine the existence of robust associations between parental obesity and overweight and those of their children, controlling for a potential covariate that could be running the association (see Appendix). In addition, we examine the existence of a change over time in the intensity of the transmission.

Our results confirm previous findings suggesting overweight and obesity of fathers and mothers as the main potential driver for the association, and consistently the effects is stronger when both parents are obese or overweight. One interpretation is that when both parents are overweight it has a reinforcing effect within the household members. The child 'obesogenic environment' might be stronger when both parents are obese or overweight, especially under weak evidence of role modelling or gender specific effects. Another potential mechanism is that of an expansion of assortative mating between the parents, which explains some levels of clustering of both genetic and environmental influences.

Our findings do not suggest evidence of a gender assortative transmission of overweight. Unexpectedly, we find that the association between mother and child overweight does not exceed that of father and child. Furthermore, we uncover some evidence of differential transmission effects between children's gender, as the transmission is more robust for girls across different age groups than it is for boys. However, the effect changes with the child's age. Teenagers appear to be more receptive to parental transmission when both parents are overweight or obese, which is consistent with the fact that, at that age, children are more sensitive to social cues (Fehr et al, 2008) although this is due also possibly to a cumulative pattern in the transmission of health behaviours from parents to their children.

The implications of the study are that policies aimed at reducing children's obesity should especially focus on families where both parents are obese or overweight as they are likely to influence their children up and above the obvious genetic influence. Second, our findings do not replicate the evidence suggesting that maternal effects are stronger. The latter might well result from the fact that environmental pressures influencing child weight might require a certain level of reinforcement, or simply that when maternal overweight does not drive up paternal overweight then it might be an indication of a weaker obesogenic influence, more likely to be determined by genetic effects. Hence, in identifying families that need special attention, one should focus on couples where both are obese.

References

Ahlburg, D., 1998. Intergenerational transmission of health. *The American Economic Review Papers and Proceedings* 88 (2), 265–270.

Ajslev TA, Ängquist L, Silventoinen K, Baker JL, Sørensen TIA (2014) Trends in Parent-Child Correlations of Childhood Body Mass Index during the Development of the Obesity Epidemic. PLoS ONE 9(10): e109932

Ajslev, T. A., Ängquist, L., Silventoinen, K., Baker, J. L., & Sørensen, T. I. (2015). Stable intergenerational associations of childhood overweight during the development of the obesity epidemic. *Obesity*, *23*(6), 1279-1287

Anderson, P, Butcher, K and Levine, P (2003). Maternal Employment and Overweight Children. *Journal of Health Economics*, 22(3): 477-504.

Anderson, P., Butcher, K., Schanzenbach, D. (2007). Childhood disadvantage and obesity: is nature trumping nurture? *NBER Working Paper No*. 13479.

Anderson, PM and Butcher, KF (2006). Childhood obesity: trends and potential causes. *The Future of Children*, 16(1): 19-45.

Amelia A. Lake, Robert M. Hyland, John C. Mathers, Andrew J. Rugg-Gunn, Charlotte E. Wood, Ashley J. Adamson, (2006) "Food shopping and preparation among the 30-somethings: whose job is it? (The ASH30 study)", *British Food Journal*, Vol. 108 Iss: 6, pp.475 – 486

Apouey, B. H., & Geoffard, P. Y. (2016). Parents' education and child body weight in France: The trajectory of the gradient in the early years. *Economics & Human Biology*, *20*, 70-89.

Baranowsky, T D.K. Rassin, J.A. Harrison, J.C. Henske (1990). Ethnicity, infant-feeding practices and childhood adiposity. *J Dev Behav Pediatr*, 11 (1990), pp. 234–239

Bere, E and K.I. Klepp (2004). Correlates of fruit and vegetable intake among Norwegian schoolchildren: parental and self-reports. Public Health Nutr, 7 (8) (2004), pp. 991–998.

Cavaco, S., Eriksson, T., & Skalli, A. (2014). Life cycle development of obesity and its determinants in six European countries. *Economics & Human Biology*, *14*, 62-78.

Cawley, J., Maclean, J. C., Hammer, M., & Wintfeld, N. (2015). Reporting error in weight and its implications for bias in economic models. *Economics & Human Biology*, *19*, 27-44.

Chia, Yee Fei. 2008. "Maternal labour supply and childhood obesity in Canada: evidence from the NLSCY" *Canadian Journal of Economics*, 41(1):217-242.

Classen, T., Hokayem, C., (2005). Childhood influences on youth obesity. *Economics and Human Biology* 3(2), 165–187.

Classen, Y (2010). Measures of the intergenerational transmission of body mass index between mothers and their children in the United States, 1981–2004. Economics and Human Biology 8 30-43.

Coate, D (1983). *The relationship between diet, parent's fatness and obesity in children and adolescence*. NBER Working Paper, 1072.

Costa-Font, Joan , Jofre-Bonet, M and Legrand, J (2016) Vertical Transmission of Overweight: Evidence from English Adoptees, *working paper*.

Costa-Font, Joan and Gil, Joan (2013) Intergenerational and socioeconomic gradients of child obesity *Social Science and Medicine*, 93. 29-37.

Currie J and Moretti E (2007) 'Biology as Destiny? Short- and Long-Run Determinants of Intergenerational Transmission of Birth Weight' *Journal of Labour Economics*, Vol 25 No. 2, pp 231–264.

Davey Smith G, Steer C, Leary S, Ness A (2007). Is there an intrauterine influence on obesity? Evidence from parent child associations in the Avon Longitudinal Study of Parents and Children (ALSPAC). Arch Dis Child 2007;**92**:876–80.

Emanuel I, Filakti H, Alberman E, Evans SJ.(1992) Intergenerational studies of human birthweight from the 1958 birth cohort. 1. Evidence for a multigenerational effect. *Br J Obstet Gynaecol* 1992;99:67–74.

Fehr, Ernst, Helen Bernhard, and Bettina Rockenbach. "Egalitarianism in young children." *Nature* 454, no. 7208 (2008): 1079-1083.

Goode, A., Mavromaras, K. G. and Smith, M. (2008). *Intergenerational Transmission of Healthy Eating Behaviour and The Role of Household Income*, IZA Discussion Paper No. 3535

Hamermesh, D (2010). Incentives, time use and BMI: The roles of eating, grazing and goods. *Economics and Human Biology* 8 , 2–15.

Hebebrand J., Wulftange H., Goerg T., Ziegler A., Hinney A., Barth N., Mayer H., Remschmidt H. (2000). Epidemic obesity: are genetic factors involved via increased rates of assortative mating? *Int. J. Obes. Relat. Metab. Disord*. 24, 345–353

Hruschka, D.J and AA. Brewis (2013). Intercontinental differences in overweight of adopted Koreans in the United States and Europe', *Economics and Human Biology* 11 (3), 2013, pp. 345-350.

Jääskeläinen, A., Pussinen, J., Nuutinen, O., Schwab, U., Pirkola, J., Kolehmainen, M., ... & Laitinen, J. (2011). Intergenerational transmission of overweight among Finnish adolescents and their parents: a 16-year follow-up study. *International journal of obesity*, *35*(10), 1289-1294.

Lee, Y D. Mitchell, H. Smiciklas-Wright, L.L. Birch (2001). Diet quality, nutrient intake, weight status, and feeding environments of girls meeting or exceeding the AAP recommendations for total dietary fat. Pediatrics, 107 (2001), pp. 95–101.

Llewellyn CH, Trzaskowski M, Plomin R, Wardle J (2013). Finding the missing heritability in pediatric obesity: the contribution of genome-wide complex trait analysis. *Int J Obes* 37(11):1506-9.

Martin, M., (2008). The intergenerational correlation in weight: how genetic resemblance reveals the social role of families. *American Journal of Sociology* 114, S67–S105.

Nicklas TA, Baranowski T, Baranowski J, Cullen K, Rittenberry L, Olvera N (2001). Family and child-care provider influences on pre- school children's fruit, juice, and vegetable consumption. *Nutr Rev* 59:224–235.

Perez-Pastor, E. M., Metcalf, B. S., Hosking, J., Jeffery, A. N., Voss, L. D., & Wilkin, T. J. (2009). Assortative weight gain in mother–daughter and father–son pairs: an emerging source of childhood obesity. Longitudinal study of trios (EarlyBird 43). *International Journal of Obesity*, *33*(7), 727-735.

Phipps, S A., P Burton , Lynn Lethbridge, and Lars Osberg. 2004. "Measuring Obesity in Young Children." *Canadian Public Policy*. 30(4):349-364.

Patro, B., Liber, A., Zalewski, B., Poston, L., Szajewska, H., & Koletzko, B. (2013). Maternal and paternal body mass index and offspring obesity: a systematic review. *Annals of Nutrition and Metabolism*, *63*(1-2), 32-41.

Reilly, John J., Julie Armstrong, Ahmad R. Dorosty, Pauline M. Emmett, A. Ness, I. Rogers, Colin Steer, and Andrea Sherriff. 2005. "Early Life Risk Factors for Obesity in Childhood: Cohort Study". *BMJ: British Medical Journal* 330 (7504). BMJ: 1357–59

Silventoinen K., Kaprio J., Lahelma E., Viken R. J., Rose R. J. (2003). Assortative mating by body height and BMI: Finnish twins and their spouses. *Am. J. Hum. Biol*. 15, 620–627.

Sorensen, T, I.A , Price, RA, Stunkard, AJ and Schulsinger, F (1989). Genetics of obesity in adult adopted and their biological siblings. *BMJ,* 298, 87-90.

Stunkardt, AJ, Thorkild I.A. Sørensen, Dr.med., Craig Hanis, Ph.D., Thomas W. Teasdale, M.A., Ranajit Chakraborty, Ph.D., William J. Schull, Ph.D., and Fini Schulsinger (1986). An adoption study of human obesity, *NEJM*, 314, 193-8.

Stunkard, AJ J R. Harris, N L. Pedersen, and GE. McClearn(1990). The Body-Mass Index of Twins Who Have Been Reared Apart. *N Engl J Med* 1990; 322:1483-1487

Townsend N (2009) *Obesity and Overweight Surveillance in England: what is measured and where are the gaps?* Oxford: National Obesity Observatory, 2009

Thomson, O (2014). Genetic mechanisms in the intergenerational transmission of health. *Journal of Health Economics*, 35: 132-145.

Wardle J., Carnell S., Haworth C.M.A, Farooqi I.S., O'Rahilly S., and Plomin R. (2008), "Obesity associated genetic variation in FTO is associated with diminished satiety," *Journal of Clinical Endocrinology and Metabolism*, vol. 93, no. 9, pp. 3640–3643.

Whitaker, R., Wright, J., Pepe, M., Seidel, K., Dietz, W., (1997). Predicting obesity in young adulthood from childhood and parental obesity. *The New England Journal of Medicine* 337 (13), 869–873

WHO (1999). Definition, diagnosis and classification of diabetes mellitus and its complications: Report of the WHO consultation. Geneva, World Health Organization (WHO), 1999.

Wickrama, KAS Rand D. Conger, Lora Ebert Wallace, Glen H. Elder, Jr (1999). The Intergenerational Transmission of Health-Risk Behaviours: Adolescent Lifestyles

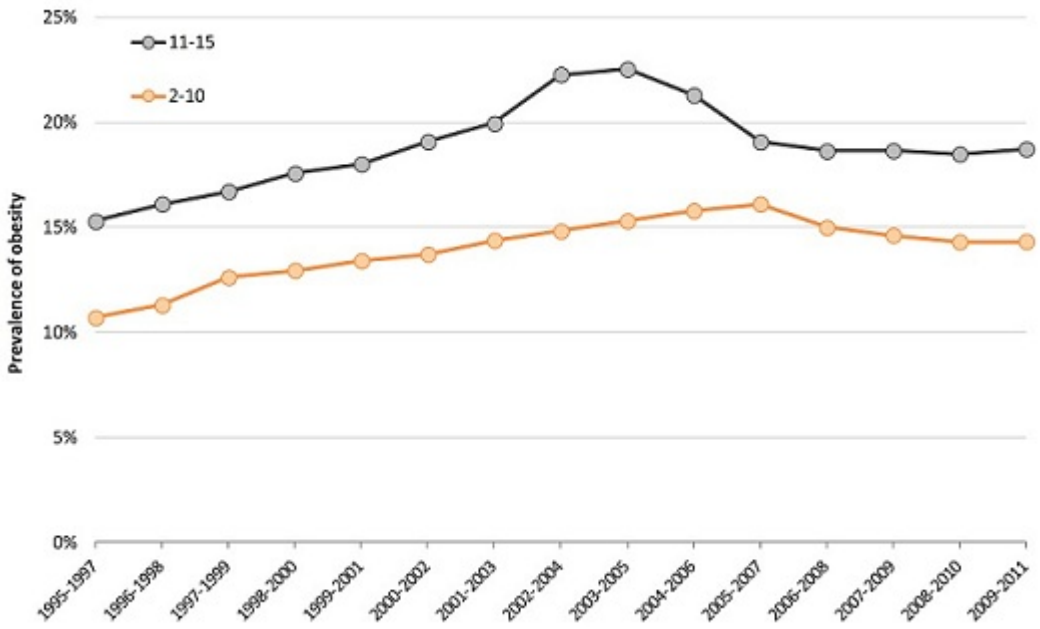
and Gender Moderating Effects. *Journal of Health and Social Behaviour*, 40(3): 258-272.

Wilcox-Gok, V (1983). The Determination of Child Health: An Application of Sibling and Adoption Data. *Review of Economics and Statistics*, 65(2): 266-73

Whitaker, K. L., Jarvis, M. J., Beeken, R. J., Boniface, D., & Wardle, J. (2010). Comparing maternal and paternal intergenerational transmission of obesity risk in a large population-based sample. *The American journal of clinical nutrition*, *91*(6), 1560-1567.

Figures and Tables

Figure 1. Patterns of child obesity in England 1995- 20011



Source: Public Health England, 2013
http://www.noo.org.uk/NOO_about_obesity/child_obesity/UK_prevalence

Table 1. Descriptive Statistics

		Child Type			
		Pre-School	Child	Teenager	Total
	Number of observations	(2907)	(7423)	(4071)	(14401)
Overweight	Obese (%)	4.9	6.1	5.8	5.8
	Overweight (%)	19.3	24.8	24.8	23.7
Age	Mean number of years	4.02	9.01	14.46	9.55
	Standard Deviation number of years	(0.80)	(1.98)	(1.10)	(3.95)
Gender	Girl (%)	50.2	49.3	48.4	49.2
	Boy (%)	49.8	50.7	51.6	50.8
Health	Long Standing Illness (%)	18.1	19.4	21.5	19.7
	Passive Smoking (%)	21.5	25.5	27.9	25.4
Ethnicity	White (%)	78.1	79.2	79.4	79
	Black (%)	5	4.2	3.6	4.2
	Ind/Pak/Bang (%)	4.1	3.9	3.8	3.9
	Other (%)	12.8	12.6	13.2	12.8
Parents	Mother Obese (%)	18	21.8	24.4	21.8
	Dad Obese (%)	20.4	22.9	25.2	23
	Mum Overweight (%)	48.5	53	59	53.8
	Dad Overweight (%)	68.4	71.7	74.6	71.9
Parents' Mental Health	Mother (%)	2.8	2.6	3	2.8
	Dad (%)	1.8	1.7	2.3	1.9
Parents' Full Time	Mother Works Full Time (%)	59	70.8	77.4	70.3
	Dad Works Full Time	90.57	90.04	89.04	89.86
Parents' Education	MumEd:NA	9.6	13.2	17.1	13.6
	MumEd:Nvq5-HE	33.1	29.6	27.5	29.7
	MumEd:A/O Level	48.8	49.4	46.7	48.5
	MumEd:CSE	6.5	6	6.3	6.2
	MumEd:Foreign	1.9	1.8	2.3	2
	Dad_Ed:NA	12.3	14.5	19.5	15.5
	DadEd:Nvq5-HE	42.1	40.1	38.7	40.1
	DadEd:A/O Level	38.4	38.7	35.2	37.7
	DadEd:CSE	6.1	5.5	5.1	5.5
	DadEd:Foreign	1.1	1.2	1.4	1.2
Nuclear Family	Family of 3	14.1	8.8	13.6	11.2
Rural	Living in Rural Area	19.7	22.1	23	21.9
Dwelling	Own the flat	77.9	81	83.1	81
Income	Mean	£ 34,906.63	£ 36,462.20	£ 35,361.18	£ 35,836.94
	Standard Deviation	(41459.61)	(43,203.12)	(48,846.61)	(41,459.61)

Summary statistics of main variables by children's age group.
Source: Health Survey for England.

Table 2: Probit Model of the vertical transmission of obesity and overweight over time by age group (Marginal effects)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-School	S Child	Teenagers	Pre-School	S Child	Teenagers	Pre-School	S Child	Teenagers
Child is	Overweight			Overweight			Obese		
Parents are	Overweight			Obese			Obese		
Both Obese	0.725***	0.763***	0.936***	0.748***	0.835***	1.407***	0.639**	0.709***	1.311***
	(0.210)	(0.129)	(0.202)	(0.245)	(0.163)	(0.210)	(0.302)	(0.197)	(0.243)
Time §	0.025	-0.005	0.026	0.040	0.041*	0.054*	0.006	0.028	0.068
	(0.069)	(0.045)	(0.073)	(0.034)	(0.021)	(0.030)	(0.053)	(0.032)	(0.050)
Both*Time	-0.001	0.037	0.005	-0.002	0.037	-0.159**	0.030	0.088	-0.102
	(0.077)	(0.049)	(0.076)	(0.090)	(0.057)	(0.071)	(0.109)	(0.068)	(0.085)
Only Mum obese	0.239	0.069	0.535**	0.487**	0.390***	0.712***	0.344	0.534***	0.475**
	(0.259)	(0.158)	(0.241)	(0.198)	(0.110)	(0.143)	(0.291)	(0.157)	(0.214)
Only Mum ob*Time	0.024	0.148**	-0.026	-0.093	0.065	-0.050	-0.040	0.015	0.017
	(0.095)	(0.059)	(0.091)	(0.072)	(0.040)	(0.052)	(0.107)	(0.056)	(0.077)
Only Dad Obese	0.276	0.285**	0.561***	0.302*	0.579***	0.799***	0.209	0.642***	0.711***
	(0.214)	(0.136)	(0.215)	(0.179)	(0.110)	(0.145)	(0.271)	(0.160)	(0.205)
Only Dad Ob*Time	-0.003	0.041	-0.060	0.002	-0.054	-0.138***	-0.013	-0.122**	-0.108
	(0.079)	(0.052)	(0.081)	(0.066)	(0.040)	(0.051)	(0.102)	(0.059)	(0.074)
Girl	0.162***	0.209***	0.145***	0.158***	0.214***	0.149***	0.188**	0.203***	0.141**
	(0.055)	(0.033)	(0.044)	(0.055)	(0.033)	(0.044)	(0.081)	(0.049)	(0.067)
Observations	2903	7418	4068	2903	7418	4068	2903	7418	4068

Source: Our own using Health Survey for England.
Note: Robust Standard Errors in Parentheses.

§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Controls: Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).

Table 3 : Probit Models of the vertical transmission of overweight and obesity over time by gender - Pre-School (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)
		Boy			Girl	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both Obese	0.587**	0.550	0.643	0.870***	1.040***	0.684
	(0.287)	(0.351)	(0.457)	(0.289)	(0.360)	(0.423)
Time §	0.049	0.077	0.160*	-0.004	-0.003	-0.122*
	(0.094)	(0.049)	(0.088)	(0.097)	(0.047)	(0.066)
Both*Time	-0.025	-0.021	0.007	0.017	-0.013	0.068
	(0.106)	(0.131)	(0.159)	(0.107)	(0.129)	(0.152)
Only Mum obese	0.187	0.530*	1.267***	0.287	0.405	-0.823*
	(0.359)	(0.279)	(0.412)	(0.353)	(0.272)	(0.481)
Only Mum ob*Time	0.011	-0.111	-0.305*	0.035	-0.069	0.303*
	(0.134)	(0.102)	(0.158)	(0.130)	(0.099)	(0.156)
Only Dad Obese	-0.041	0.266	0.407	0.523*	0.347	0.108
	(0.300)	(0.256)	(0.428)	(0.291)	(0.249)	(0.359)
Only Dad Ob*Time	0.059	-0.012	-0.056	-0.040	0.007	-0.006
	(0.111)	(0.097)	(0.155)	(0.110)	(0.091)	(0.135)
Observations	1448	1448	1414	1455	1455	1455

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.

§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Controls: Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).

Table 4 : Probit Models of the vertical transmission of overweight and obesity over time by gender – Primary Schooled Children (Marginal Effects)

	Boy			.Girl		
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both Obese	0.921***	0.616***	0.390	0.637***	1.102***	0.990***
	(0.198)	(0.213)	(0.298)	(0.169)	(0.230)	(0.268)
Time §	0.103	0.075**	0.070	-0.100*	0.007	-0.005
	(0.067)	(0.031)	(0.050)	(0.058)	(0.028)	(0.042)
Both*Time	-0.056	0.080	0.194*	0.118*	-0.016	0.001
	(0.072)	(0.075)	(0.100)	(0.065)	(0.081)	(0.094)
Only Mum obese	0.122	0.440***	0.555**	0.010	0.342**	0.545***
	(0.248)	(0.153)	(0.226)	(0.206)	(0.159)	(0.210)
Only Mum ob*Time	0.072	0.025	0.031	0.223***	0.103*	-0.003
	(0.089)	(0.056)	(0.082)	(0.078)	(0.057)	(0.075)
Only Dad Obese	0.519**	0.560***	0.876***	0.083	0.575***	0.400*
	(0.208)	(0.162)	(0.228)	(0.178)	(0.149)	(0.222)
Only Dad Ob*Time	-0.041	-0.060	-0.162*	0.112	-0.038	-0.074
	(0.076)	(0.059)	(0.087)	(0.068)	(0.054)	(0.079)
Observations	3759	3759	3759	3659	3659	3659

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.

§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Controls: Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).

Table 5 : Probit Models of the vertical transmission of overweight and obesity over time by gender – Teenagers (Marginal Effects)

	(1)	(2)	(3)	(4)	(5)	(6)
	Boy			Girl		
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both Obese	1.113***	1.187***	0.635*	0.770***	1.574***	1.904***
	(0.297)	(0.297)	(0.359)	(0.253)	(0.287)	(0.337)
Time §	0.140	0.051	0.010	-0.091	0.053	0.134*
	(0.101)	(0.041)	(0.069)	(0.095)	(0.042)	(0.070)
Both*Time	-0.096	-0.095	0.111	0.108	-0.208**	-0.298**
	(0.106)	(0.099)	(0.123)	(0.100)	(0.098)	(0.119)
Only Mum obese	0.954***	0.517**	-0.226	0.121	0.857***	0.998***
	(0.345)	(0.203)	(0.331)	(0.315)	(0.197)	(0.290)
Only Mum ob*Time	-0.214*	-0.027	0.169	0.167	-0.050	-0.080
	(0.125)	(0.072)	(0.113)	(0.124)	(0.074)	(0.105)
Only Dad Obese	0.643**	0.521**	0.162	0.514*	1.063***	1.238***
	(0.314)	(0.204)	(0.311)	(0.278)	(0.212)	(0.288)
Only Dad Ob*Time	-0.110	-0.070	0.060	-0.014	-0.202***	-0.270**
	(0.112)	(0.071)	(0.106)	(0.108)	(0.074)	(0.105)
Observations	2099	2099	2099	1969	1969	1947

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.
§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.
Controls: Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).

Appendix (not for publication)

Table A2: OLS Parental transmission of obesity and overweight over time by age group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-School	Child	Teenager	Pre-School	Child	Teenager	Pre-School	Child	Teenager
Child is	Overweight			Overweight			Obese		
Parents are	Overweight			Obese			Obese		
Both	0.195***	0.219***	0.240***	0.238***	0.274***	0.484***	0.084	0.082**	0.229***
	(0.048)	(0.031)	(0.041)	(0.091)	(0.061)	(0.078)	(0.056)	(0.042)	(0.059)
Time §	0.008	0.002	0.004	0.010	0.012**	0.013*	0.000	0.002	0.006*
	(0.013)	(0.009)	(0.013)	(0.008)	(0.006)	(0.008)	(0.004)	(0.003)	(0.003)
Both*Time	-0.002	0.009	0.006	0.001	0.017	-0.055**	0.008	0.026*	-0.025
	(0.017)	(0.011)	(0.015)	(0.033)	(0.022)	(0.026)	(0.021)	(0.015)	(0.019)
Only Mum	0.053	0.009	0.109**	0.134**	0.113***	0.215***	0.032	0.057**	0.043*
	(0.056)	(0.036)	(0.053)	(0.060)	(0.036)	(0.048)	(0.036)	(0.023)	(0.026)
Only Mum*Time	0.005	0.039***	-0.004	-0.026	0.025*	-0.012	-0.004	0.006	0.005
	(0.021)	(0.014)	(0.020)	(0.021)	(0.013)	(0.018)	(0.013)	(0.009)	(0.010)
Only Dad	0.063	0.067**	0.118***	0.080	0.177***	0.243***	0.013	0.071***	0.073***
	(0.042)	(0.030)	(0.041)	(0.052)	(0.036)	(0.047)	(0.027)	(0.021)	(0.024)
Only Dad*Time	-0.002	0.009	-0.013	0.001	-0.016	-0.042***	0.001	-0.014**	-0.012
	(0.016)	(0.011)	(0.015)	(0.020)	(0.013)	(0.016)	(0.010)	(0.007)	(0.008)
Girl	0.044***	0.063***	0.044***	0.042***	0.064***	0.046***	0.019**	0.022***	0.016**
	(0.015)	(0.010)	(0.013)	(0.015)	(0.010)	(0.013)	(0.008)	(0.006)	(0.007)
Observations	2903	7418	4068	2903	7418	4068	2903	7418	4068

Note. This table contains the OLS estimates of the effect of parental obesity and overweight on child obesity by child age groups (pre-school, schooled and teenagers). § Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009. The estimates result from regressions with a number of controls including child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms). Note: Robust Standard Errors in Parentheses **Source:** Our own using Health Survey for England.

Table A3. OLS Estimates of gender specific parental transmission of obesity and overweight - Pre-School

	(1)	(2)	(3)	(4)	(5)	(6)
		Boy			Girl	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.153**	0.152	0.036	0.236***	0.366***	0.156
	(0.066)	(0.115)	(0.050)	(0.068)	(0.139)	(0.106)
Time §	0.013	0.019	0.010*	0.001	-0.001	-0.011*
	(0.019)	(0.012)	(0.006)	(0.017)	(0.012)	(0.006)
Both*Time	-0.008	-0.003	0.012	0.002	-0.008	-0.002
	(0.024)	(0.043)	(0.022)	(0.024)	(0.050)	(0.036)
Only Mum	0.040	0.140*	0.129**	0.059	0.117	-0.065*
	(0.080)	(0.081)	(0.061)	(0.076)	(0.084)	(0.035)
Only Mum*Time	0.003	-0.028	-0.032	0.008	-0.021	0.025*
	(0.031)	(0.029)	(0.020)	(0.027)	(0.029)	(0.014)
Only Dad	-0.005	0.064	0.021	0.122**	0.103	0.009
	(0.059)	(0.068)	(0.032)	(0.058)	(0.079)	(0.042)
Only Dad*Time	0.013	-0.002	-0.001	-0.013	0.001	-0.000
	(0.022)	(0.026)	(0.013)	(0.021)	(0.029)	(0.015)
Observations	1448	1448	1448	1455	1455	1455

Note: This table reports OLS gender specific regressions between parental obesity and child obesity by gender. § Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009. : Robust Standard Errors in Parentheses Controls include Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).
Source: Our own using Health Survey for England

Table A4. OLS Estimates of gender specific parental transmission of obesity and overweight – School Children

	Boy			Girl		
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.223***	0.171**	0.004	0.217***	0.397***	0.180**
	(0.040)	(0.075)	(0.045)	(0.045)	(0.086)	(0.071)
Time §	0.022*	0.020***	0.005*	-0.017	0.003	-0.001
	(0.012)	(0.008)	(0.003)	(0.012)	(0.008)	(0.004)
Both*Time	-0.008	0.036	0.045**	0.023	-0.007	0.002
	(0.015)	(0.027)	(0.018)	(0.016)	(0.031)	(0.025)
Only Mum	0.016	0.116**	0.045	0.004	0.108*	0.070*
	(0.046)	(0.046)	(0.028)	(0.055)	(0.057)	(0.037)
Only Mum*Time	0.021	0.013	0.008	0.058***	0.038*	0.002
	(0.018)	(0.018)	(0.011)	(0.021)	(0.020)	(0.013)
Only Dad	0.102**	0.156***	0.090***	0.030	0.193***	0.049*
	(0.040)	(0.050)	(0.029)	(0.043)	(0.052)	(0.029)
Only Dad*Time	-0.004	-0.016	-0.018*	0.021	-0.015	-0.009
	(0.015)	(0.018)	(0.010)	(0.015)	(0.018)	(0.010)
Observations	3759	3759	3759	3659	3659	3659

Note: This table reports OLS gender specific regressions between parental obesity and child obesity by gender. § Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009. : Robust Standard Errors in Parentheses Controls include Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).
Source: Our own using Health Survey for England

Table A5. OLS Estimates of gender specific parental transmission of obesity and overweight – Teenager

	(1)	(2)	(3)	(4)	(5)	(6)
		Boy			Girl	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.241***	0.399***	0.102	0.240***	0.547***	0.335***
	(0.053)	(0.112)	(0.081)	(0.059)	(0.105)	(0.083)
Time §	0.022	0.011	0.001	-0.012	0.014	0.010**
	(0.017)	(0.010)	(0.005)	(0.017)	(0.011)	(0.005)
Both*Time	-0.008	-0.032	0.015	0.018	-0.074**	-0.060**
	(0.021)	(0.037)	(0.028)	(0.021)	(0.036)	(0.026)
Only Mum	0.183***	0.142**	-0.024	0.031	0.275***	0.108**
	(0.069)	(0.065)	(0.026)	(0.076)	(0.069)	(0.045)
Only Mum*Time	-0.040	-0.004	0.017	0.034	-0.014	-0.006
	(0.026)	(0.023)	(0.010)	(0.029)	(0.026)	(0.017)
Only Dad	0.105**	0.143**	0.009	0.141**	0.348***	0.140***
	(0.052)	(0.061)	(0.028)	(0.062)	(0.073)	(0.042)
Only Dad*Time	-0.015	-0.018	0.007	-0.015	-0.068***	-0.031**
	(0.020)	(0.021)	(0.010)	(0.021)	(0.025)	(0.013)
Observations	2099	2099	2099	1969	1969	1969

Note: This table reports OLS gender specific regressions between parental obesity and child obesity by gender. § Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009. : Robust Standard Errors in Parentheses Controls include Child's long standing illness; Passive Smoking; Ethnicity; Age; Mother Working Full Time; Natural Mother; Natural Father; Mother's education; Father's Education; Only Child; Rural Area; Ownership of Flat; Income (in logarithms).
Source: Our own using Health Survey for England

Table A2b: Probit Model of vertical transmission of obesity and overweight over time by age group

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Pre-School	Child	Teenager	Pre-School	Child	Teenager	Pre-School	Child	Teenager
Child is	Overweight			Overweight			Obese		
Parents are	Overweight			Obese			Obese		
Both	0.725***	0.763***	0.936***	0.748***	0.835***	1.407***	0.639**	0.709***	1.311***
	(0.210)	(0.129)	(0.202)	(0.245)	(0.163)	(0.210)	(0.302)	(0.197)	(0.243)
Time §	0.025	-0.005	0.026	0.040	0.041*	0.054*	0.006	0.028	0.068
	(0.069)	(0.045)	(0.073)	(0.034)	(0.021)	(0.030)	(0.053)	(0.032)	(0.050)
Both*Time	-0.001	0.037	0.005	-0.002	0.037	-0.159**	0.030	0.088	-0.102
	(0.077)	(0.049)	(0.076)	(0.090)	(0.057)	(0.071)	(0.109)	(0.068)	(0.085)
Only Mum	0.239	0.069	0.535**	0.487**	0.390***	0.712***	0.344	0.534***	0.475**
	(0.259)	(0.158)	(0.241)	(0.198)	(0.110)	(0.143)	(0.291)	(0.157)	(0.214)
Only Mum*Time	0.024	0.148**	-0.026	-0.093	0.065	-0.050	-0.040	0.015	0.017
	(0.095)	(0.059)	(0.091)	(0.072)	(0.040)	(0.052)	(0.107)	(0.056)	(0.077)
Only Dad	0.276	0.285**	0.561***	0.302*	0.579***	0.799***	0.209	0.642***	0.711***
	(0.214)	(0.136)	(0.215)	(0.179)	(0.110)	(0.145)	(0.271)	(0.160)	(0.205)
Only Dad*Time	-0.003	0.041	-0.060	0.002	-0.054	-0.138***	-0.013	-0.122**	-0.108
	(0.079)	(0.052)	(0.081)	(0.066)	(0.040)	(0.051)	(0.102)	(0.059)	(0.074)
Girl	0.162***	0.209***	0.145***	0.158***	0.214***	0.149***	0.188**	0.203***	0.141**
	(0.055)	(0.033)	(0.044)	(0.055)	(0.033)	(0.044)	(0.081)	(0.049)	(0.067)
longill==2	-0.100	-0.045	0.002	-0.083	-0.040	-0.009	0.031	-0.139**	-0.108
	(0.071)	(0.041)	(0.054)	(0.070)	(0.041)	(0.055)	(0.107)	(0.059)	(0.080)
Passive Smoking	0.131*	0.275***	0.145***	0.121*	0.285***	0.156***	0.153	0.292***	0.200**
	(0.072)	(0.042)	(0.054)	(0.072)	(0.042)	(0.054)	(0.103)	(0.058)	(0.078)
ethnic2==1	0.038	-0.103	0.082	0.014	-0.132	0.055	-0.304	-0.300**	-0.054
	(0.145)	(0.090)	(0.125)	(0.145)	(0.089)	(0.127)	(0.190)	(0.121)	(0.184)
ethnic2==2	-0.156	0.052	0.199	-0.154	-0.002	0.201	-0.355	0.027	0.005

	(0.190)	(0.116)	(0.164)	(0.190)	(0.117)	(0.167)	(0.267)	(0.153)	(0.239)
ethnic2==4	-0.072	-0.189*	0.066	-0.095	-0.240**	0.068	-0.273	-0.242*	-0.180
	(0.169)	(0.105)	(0.143)	(0.168)	(0.105)	(0.146)	(0.227)	(0.142)	(0.212)
age last birthday	0.001	0.034***	-0.027	0.004	0.036***	-0.025	0.027	-0.022*	0.008
	(0.034)	(0.008)	(0.020)	(0.033)	(0.008)	(0.020)	(0.051)	(0.012)	(0.031)
Mother FT	-0.073	-0.034	-0.007	-0.053	-0.017	0.016	0.009	0.024	-0.124
	(0.060)	(0.040)	(0.059)	(0.060)	(0.040)	(0.059)	(0.087)	(0.059)	(0.085)
natmom	-0.266	0.238	0.308	-0.269	0.251	0.392*	0.067	0.044	0.367
	(0.328)	(0.181)	(0.207)	(0.339)	(0.184)	(0.202)	(0.524)	(0.274)	(0.328)
Natural Dad	0.033	0.108*	0.149**	0.033	0.116**	0.139*	-0.063	0.198**	0.327***
	(0.103)	(0.058)	(0.070)	(0.103)	(0.058)	(0.071)	(0.141)	(0.087)	(0.119)
Mom Mental Health	0.368*	0.204*	0.078	0.317*	0.186*	0.057	0.119	0.070	-0.024
	(0.193)	(0.108)	(0.133)	(0.191)	(0.110)	(0.132)	(0.258)	(0.151)	(0.188)
Father Mental Health	0.035	-0.058	-0.348**	0.068	-0.002	-0.255*	-0.251	0.109	-0.067
	(0.216)	(0.127)	(0.141)	(0.211)	(0.126)	(0.139)	(0.258)	(0.203)	(0.205)
m_ed==0	0.006	-0.177**	-0.027	-0.004	-0.156*	0.009	0.445**	0.086	0.131
	(0.137)	(0.084)	(0.108)	(0.136)	(0.083)	(0.106)	(0.220)	(0.125)	(0.143)
m_ed==1	-0.072	-0.134*	0.038	-0.101	-0.100	0.059	0.237	0.092	-0.071
	(0.124)	(0.078)	(0.106)	(0.124)	(0.077)	(0.103)	(0.215)	(0.119)	(0.150)
m_ed==2	-0.023	-0.065	-0.017	-0.041	-0.045	0.011	0.305	0.130	0.074
	(0.113)	(0.073)	(0.098)	(0.113)	(0.072)	(0.096)	(0.197)	(0.111)	(0.132)
m_ed==4	-0.191	-0.230	-0.408**	-0.197	-0.233	-0.371*	-0.250	0.016	0.046
	(0.228)	(0.148)	(0.191)	(0.225)	(0.144)	(0.198)	(0.426)	(0.220)	(0.249)
f_ed==0	0.102	-0.348**	-0.367**	0.120	-0.319**	-0.306*	0.323	0.059	0.318
	(0.283)	(0.155)	(0.172)	(0.291)	(0.154)	(0.181)	(0.481)	(0.211)	(0.290)
f_ed==1	0.116	-0.352**	-0.523***	0.143	-0.313**	-0.434**	0.396	-0.001	0.150
	(0.281)	(0.152)	(0.170)	(0.290)	(0.152)	(0.179)	(0.476)	(0.209)	(0.290)
f_ed==2	0.066	-0.355**	-0.457***	0.099	-0.323**	-0.395**	0.411	-0.067	0.239
	(0.279)	(0.152)	(0.168)	(0.288)	(0.151)	(0.177)	(0.475)	(0.209)	(0.288)
f_ed==3	0.114	-0.461***	-0.437**	0.171	-0.411**	-0.347*	0.685	0.112	0.385

	(0.296)	(0.167)	(0.190)	(0.304)	(0.166)	(0.200)	(0.491)	(0.227)	(0.308)
Only Child	0.106	0.223***	0.122*	0.104	0.205***	0.130**	0.228**	0.292***	0.165*
	(0.078)	(0.057)	(0.065)	(0.078)	(0.057)	(0.065)	(0.105)	(0.076)	(0.094)
rural	0.068	-0.060	0.021	0.043	-0.061	0.035	0.165*	-0.009	-0.109
	(0.071)	(0.044)	(0.055)	(0.071)	(0.044)	(0.055)	(0.100)	(0.065)	(0.084)
ownflat	-0.048	0.035	-0.054	-0.014	0.095*	0.013	-0.185*	-0.014	0.027
	(0.072)	(0.048)	(0.064)	(0.072)	(0.048)	(0.065)	(0.106)	(0.065)	(0.095)
Log Income	-0.024**	0.001	0.000	-0.027***	0.000	0.002	-0.026*	-0.007	0.019*
	(0.010)	(0.006)	(0.007)	(0.010)	(0.006)	(0.007)	(0.014)	(0.008)	(0.011)
_cons	-1.894**	-1.969***	-0.760	-1.629**	-1.980***	-0.875	-2.118*	-2.363***	-3.182***
	(0.747)	(0.435)	(0.597)	(0.739)	(0.426)	(0.572)	(1.104)	(0.639)	(0.882)
Observations	2903	7418	4068	2903	7418	4068	2903	7418	4068

Source: Our own using Health Survey for England.
Note: Robust Standard Errors in Parentheses.

§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Table A3b : OLS Models over time by gender - Pre-School

	(1)	(2)	(3)	(4)	(5)	(6)
		Boy			Girl	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.153**	0.152	0.036	0.236***	0.366***	0.156
	(0.066)	(0.115)	(0.050)	(0.068)	(0.139)	(0.106)
Time §	0.013	0.019	0.010*	0.001	-0.001	-0.011*
	(0.019)	(0.012)	(0.006)	(0.017)	(0.012)	(0.006)
Both*Time	-0.008	-0.003	0.012	0.002	-0.008	-0.002
	(0.024)	(0.043)	(0.022)	(0.024)	(0.050)	(0.036)
Only Mum	0.040	0.140*	0.129**	0.059	0.117	-0.065*
	(0.080)	(0.081)	(0.061)	(0.076)	(0.084)	(0.035)
Only Mum*Time	0.003	-0.028	-0.032	0.008	-0.021	0.025*
	(0.031)	(0.029)	(0.020)	(0.027)	(0.029)	(0.014)
Only Dad	-0.005	0.064	0.021	0.122**	0.103	0.009
	(0.059)	(0.068)	(0.032)	(0.058)	(0.079)	(0.042)
Only Dad*Time	0.013	-0.002	-0.001	-0.013	0.001	-0.000
	(0.022)	(0.026)	(0.013)	(0.021)	(0.029)	(0.015)
longill==2	-0.016	-0.015	0.002	-0.053*	-0.044	-0.004
	(0.026)	(0.026)	(0.014)	(0.030)	(0.029)	(0.017)
Passive Smoking	0.008	0.005	-0.001	0.058*	0.053*	0.027
	(0.028)	(0.028)	(0.014)	(0.030)	(0.030)	(0.018)
ethnic2==1	0.007	0.009	-0.057	-0.002	-0.004	-0.004
	(0.050)	(0.050)	(0.039)	(0.059)	(0.061)	(0.031)
ethnic2==2	-0.078	-0.073	-0.077*	0.009	0.013	0.006
	(0.060)	(0.061)	(0.043)	(0.078)	(0.079)	(0.041)
ethnic2==4	-0.038	-0.035	-0.074*	-0.012	-0.009	0.023
	(0.060)	(0.060)	(0.043)	(0.068)	(0.068)	(0.034)
age last birthday	-0.004	-0.001	0.001	0.004	0.000	0.004
	(0.012)	(0.012)	(0.006)	(0.013)	(0.013)	(0.008)
Mother FT	-0.014	-0.011	0.001	-0.027	-0.019	0.000
	(0.021)	(0.021)	(0.010)	(0.023)	(0.023)	(0.013)
natmom	0.082	0.098	0.060***	-0.211	-0.215	-0.027
	(0.152)	(0.158)	(0.020)	(0.145)	(0.155)	(0.096)
Natural Dad	0.005	0.001	0.014	0.009	0.013	-0.030
	(0.038)	(0.039)	(0.018)	(0.043)	(0.042)	(0.028)
Mom Mental Health	0.085	0.067	0.026	0.105*	0.085	0.006
	(0.052)	(0.051)	(0.024)	(0.064)	(0.063)	(0.041)
Father Mental Health	0.053	0.071	-0.014	-0.035	-0.071	-0.074
	(0.065)	(0.062)	(0.045)	(0.099)	(0.099)	(0.076)
m_ed==0	-0.018	-0.022	0.033	0.017	0.023	0.059*
	(0.053)	(0.053)	(0.029)	(0.057)	(0.056)	(0.032)
m_ed==1	-0.058	-0.069	-0.001	0.011	0.016	0.050**

	(0.046)	(0.046)	(0.021)	(0.050)	(0.050)	(0.024)
m_ed==2	-0.022	-0.028	0.012	0.004	0.008	0.042*
	(0.044)	(0.044)	(0.019)	(0.046)	(0.045)	(0.022)
m_ed==4	-0.070	-0.083	-0.024	-0.003	0.010	0.025
	(0.073)	(0.074)	(0.021)	(0.081)	(0.083)	(0.039)
f_ed==0	0.098	0.090	0.069***	-0.105	-0.065	-0.033
	(0.081)	(0.084)	(0.023)	(0.134)	(0.142)	(0.085)
f_ed==1	0.077	0.070	0.073***	-0.066	-0.033	-0.018
	(0.078)	(0.081)	(0.018)	(0.134)	(0.143)	(0.084)
f_ed==2	0.045	0.037	0.048***	-0.059	-0.020	0.014
	(0.077)	(0.080)	(0.017)	(0.134)	(0.143)	(0.085)
f_ed==3	0.100	0.097	0.074***	-0.095	-0.050	0.055
	(0.086)	(0.089)	(0.028)	(0.139)	(0.149)	(0.091)
Only Child	0.005	0.003	0.005	0.052*	0.048	0.040**
	(0.030)	(0.030)	(0.016)	(0.032)	(0.032)	(0.020)
rural	0.031	0.029	0.008	0.012	-0.007	0.019
	(0.027)	(0.027)	(0.014)	(0.027)	(0.027)	(0.016)
ownflat	-0.041	-0.033	-0.021	0.023	0.036	-0.017
	(0.028)	(0.027)	(0.016)	(0.030)	(0.030)	(0.020)
Log Income	-0.003	-0.003	0.001	-0.010**	-0.012**	-0.007**
	(0.004)	(0.004)	(0.002)	(0.005)	(0.005)	(0.003)
_cons	-0.225	-0.220	-0.111	0.315	0.483	0.273
	(0.231)	(0.234)	(0.094)	(0.328)	(0.334)	(0.239)
Observations	1448	1448	1448	1455	1455	1455

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.
§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Table A4b: OLS Models over time by gender - Child

	(1)	(2)	(3)	(4)	(5)	(6)
		Male			Female	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.223***	0.171**	0.004	0.217***	0.397***	0.180**
	(0.040)	(0.075)	(0.045)	(0.045)	(0.086)	(0.071)
Time §	0.022*	0.020***	0.005*	-0.017	0.003	-0.001
	(0.012)	(0.008)	(0.003)	(0.012)	(0.008)	(0.004)
Both*Time	-0.008	0.036	0.045**	0.023	-0.007	0.002
	(0.015)	(0.027)	(0.018)	(0.016)	(0.031)	(0.025)
Only Mum	0.016	0.116**	0.045	0.004	0.108*	0.070*
	(0.046)	(0.046)	(0.028)	(0.055)	(0.057)	(0.037)
Only Mum*Time	0.021	0.013	0.008	0.058***	0.038*	0.002
	(0.018)	(0.018)	(0.011)	(0.021)	(0.020)	(0.013)
Only Dad	0.102**	0.156***	0.090***	0.030	0.193***	0.049*
	(0.040)	(0.050)	(0.029)	(0.043)	(0.052)	(0.029)
Only Dad*Time	-0.004	-0.016	-0.018*	0.021	-0.015	-0.009
	(0.015)	(0.018)	(0.010)	(0.015)	(0.018)	(0.010)
longill==2	-0.006	-0.002	-0.010	-0.023	-0.026	-0.023*
	(0.017)	(0.016)	(0.009)	(0.019)	(0.019)	(0.012)
Passive Smoking	0.068***	0.070***	0.032***	0.107***	0.110***	0.039***
	(0.018)	(0.018)	(0.010)	(0.019)	(0.019)	(0.012)
ethnic2==1	-0.072*	-0.074*	-0.039	0.001	-0.012	-0.030
	(0.038)	(0.038)	(0.024)	(0.037)	(0.037)	(0.023)
ethnic2==2	-0.047	-0.053	-0.006	0.069	0.043	0.017
	(0.051)	(0.051)	(0.032)	(0.051)	(0.052)	(0.033)
ethnic2==4	-0.098**	-0.104**	-0.045*	-0.024	-0.050	-0.012
	(0.044)	(0.044)	(0.027)	(0.044)	(0.043)	(0.026)
age last birthday	0.013***	0.014***	-0.000	0.006*	0.007**	-0.004**
	(0.003)	(0.003)	(0.002)	(0.004)	(0.004)	(0.002)
Mother FT	-0.014	-0.007	-0.004	-0.006	-0.005	0.008
	(0.016)	(0.016)	(0.008)	(0.017)	(0.017)	(0.010)
natmom	0.109*	0.097*	0.027	0.011	0.029	-0.025
	(0.058)	(0.059)	(0.027)	(0.084)	(0.078)	(0.072)
Natural Dad	0.044*	0.046**	0.024**	0.030	0.030	0.024*
	(0.023)	(0.023)	(0.011)	(0.026)	(0.026)	(0.014)
Mom Mental Health	0.050	0.046	0.007	0.076	0.080*	0.022
	(0.040)	(0.041)	(0.024)	(0.048)	(0.047)	(0.028)
Father Mental Health	-0.024	-0.019	-0.011	-0.010	0.019	0.048
	(0.054)	(0.054)	(0.036)	(0.061)	(0.058)	(0.030)
m_ed==0	-0.053	-0.051	-0.001	-0.063	-0.050	0.025
	(0.036)	(0.035)	(0.020)	(0.039)	(0.038)	(0.020)
m_ed==1	-0.029	-0.023	0.001	-0.058	-0.040	0.027
	(0.033)	(0.033)	(0.018)	(0.036)	(0.035)	(0.018)
m_ed==2	-0.025	-0.024	0.001	-0.019	-0.007	0.031*

	(0.032)	(0.031)	(0.017)	(0.034)	(0.033)	(0.017)
m_ed==4	-0.030	-0.033	0.017	-0.123**	-0.110*	-0.014
	(0.059)	(0.058)	(0.036)	(0.061)	(0.060)	(0.024)
f_ed==0	-0.094	-0.081	0.019	-0.139*	-0.127	0.001
	(0.073)	(0.073)	(0.040)	(0.081)	(0.079)	(0.045)
f_ed==1	-0.115	-0.103	-0.003	-0.117	-0.100	0.007
	(0.072)	(0.071)	(0.039)	(0.080)	(0.078)	(0.044)
f_ed==2	-0.118*	-0.105	-0.008	-0.120	-0.105	-0.007
	(0.071)	(0.071)	(0.039)	(0.080)	(0.078)	(0.044)
f_ed==3	-0.169**	-0.151**	0.016	-0.125	-0.101	0.019
	(0.076)	(0.075)	(0.042)	(0.086)	(0.084)	(0.048)
Only Child	0.082***	0.087***	0.043***	0.049*	0.036	0.033*
	(0.026)	(0.026)	(0.016)	(0.027)	(0.027)	(0.018)
rural	0.000	0.003	0.011	-0.036**	-0.041**	-0.016
	(0.017)	(0.017)	(0.009)	(0.018)	(0.018)	(0.010)
ownflat	0.026	0.041**	0.013	-0.004	0.016	-0.016
	(0.019)	(0.019)	(0.011)	(0.021)	(0.021)	(0.013)
Log Income	0.002	0.002	-0.000	-0.001	-0.002	-0.002
	(0.002)	(0.002)	(0.001)	(0.003)	(0.003)	(0.001)
_cons	-0.107	-0.074	0.003	0.114	0.023	-0.020
	(0.177)	(0.174)	(0.101)	(0.196)	(0.190)	(0.119)
Observations	3759	3759	3759	3659	3659	3659

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.
§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.

Table A5b: OLS Models over time by gender - Teenager

	(1)	(2)	(3)	(4)	(5)	(6)
		Boy			Girl	
Child is	Overweight	Overweight	Obese	Overweight	Overweight	Obese
Parents are	Overweight	Obese	Obese	Overweight	Obese	Obese
Both	0.241***	0.399***	0.102	0.240***	0.547***	0.335***
	(0.053)	(0.112)	(0.081)	(0.059)	(0.105)	(0.083)
Time §	0.022	0.011	0.001	-0.012	0.014	0.010**
	(0.017)	(0.010)	(0.005)	(0.017)	(0.011)	(0.005)
Both*Time	-0.008	-0.032	0.015	0.018	-0.074**	-0.060**
	(0.021)	(0.037)	(0.028)	(0.021)	(0.036)	(0.026)
Only Mum	0.183***	0.142**	-0.024	0.031	0.275***	0.108**
	(0.069)	(0.065)	(0.026)	(0.076)	(0.069)	(0.045)
Only Mum*Time	-0.040	-0.004	0.017	0.034	-0.014	-0.006
	(0.026)	(0.023)	(0.010)	(0.029)	(0.026)	(0.017)
Only Dad	0.105**	0.143**	0.009	0.141**	0.348***	0.140***
	(0.052)	(0.061)	(0.028)	(0.062)	(0.073)	(0.042)
Only Dad*Time	-0.015	-0.018	0.007	-0.015	-0.068***	-0.031**
	(0.020)	(0.021)	(0.010)	(0.021)	(0.025)	(0.013)
longill==2	0.007	0.007	-0.006	-0.009	-0.008	-0.015
	(0.022)	(0.021)	(0.011)	(0.024)	(0.025)	(0.015)
Passive Smoking	0.001	0.003	-0.005	0.083***	0.086***	0.052***
	(0.022)	(0.022)	(0.012)	(0.025)	(0.025)	(0.015)
ethnic2==1	0.017	0.001	0.001	0.019	0.037	0.001
	(0.050)	(0.049)	(0.027)	(0.050)	(0.051)	(0.033)
ethnic2==2	0.053	0.042	0.039	0.072	0.100	-0.018
	(0.073)	(0.072)	(0.044)	(0.072)	(0.074)	(0.042)
ethnic2==4	-0.004	-0.011	-0.011	0.039	0.056	-0.006
	(0.057)	(0.056)	(0.031)	(0.059)	(0.061)	(0.037)
age last birthday	-0.014*	-0.014*	-0.003	-0.004	-0.003	0.004
	(0.008)	(0.008)	(0.004)	(0.009)	(0.008)	(0.005)
Mother FT	-0.022	-0.022	-0.027*	0.016	0.032	0.002
	(0.025)	(0.024)	(0.014)	(0.025)	(0.025)	(0.015)
natmom	0.053	0.067	-0.009	0.118	0.154*	0.091***
	(0.075)	(0.061)	(0.048)	(0.076)	(0.080)	(0.017)
Natural Dad	0.034	0.025	0.013	0.054*	0.052*	0.052***
	(0.027)	(0.028)	(0.014)	(0.030)	(0.029)	(0.013)
Mom Mental Health	-0.003	-0.002	-0.002	0.054	0.033	-0.012
	(0.057)	(0.055)	(0.031)	(0.053)	(0.055)	(0.037)

Father Mental Health	-0.004	0.031	-0.019	-0.194***	-0.175**	0.011
	(0.061)	(0.060)	(0.040)	(0.069)	(0.071)	(0.042)
m_ed==0	0.004	0.007	0.031	-0.033	-0.018	-0.007
	(0.042)	(0.041)	(0.023)	(0.052)	(0.050)	(0.028)
m_ed==1	0.038	0.036	0.006	-0.022	-0.016	-0.025
	(0.040)	(0.039)	(0.019)	(0.050)	(0.048)	(0.027)
m_ed==2	0.023	0.024	0.013	-0.040	-0.030	-0.002
	(0.037)	(0.036)	(0.018)	(0.047)	(0.045)	(0.025)
m_ed==4	-0.069	-0.084	-0.012	-0.138*	-0.116	0.021
	(0.061)	(0.062)	(0.029)	(0.073)	(0.074)	(0.048)
f_ed==0	-0.070	-0.066	0.060***	-0.197**	-0.146*	0.001
	(0.087)	(0.092)	(0.017)	(0.087)	(0.086)	(0.058)
f_ed==1	-0.126	-0.114	0.040***	-0.236***	-0.179**	-0.021
	(0.085)	(0.090)	(0.012)	(0.086)	(0.086)	(0.057)
f_ed==2	-0.121	-0.114	0.048***	-0.204**	-0.160*	-0.020
	(0.085)	(0.090)	(0.012)	(0.085)	(0.085)	(0.057)
f_ed==3	-0.071	-0.066	0.090***	-0.236**	-0.181*	-0.016
	(0.094)	(0.098)	(0.029)	(0.094)	(0.095)	(0.061)
Only Child	0.070**	0.076***	0.036**	0.002	0.002	-0.005
	(0.028)	(0.028)	(0.017)	(0.029)	(0.029)	(0.014)
rural	-0.017	-0.005	-0.008	0.032	0.025	-0.013
	(0.022)	(0.022)	(0.010)	(0.025)	(0.024)	(0.012)
ownflat	-0.018	0.006	0.009	-0.019	0.003	-0.001
	(0.027)	(0.027)	(0.016)	(0.030)	(0.030)	(0.019)
Log Income	-0.000	0.001	0.002	0.001	0.000	0.002
	(0.003)	(0.003)	(0.001)	(0.003)	(0.003)	(0.002)
_cons	0.268	0.255	0.051	0.494*	0.362	-0.188
	(0.237)	(0.227)	(0.126)	(0.261)	(0.262)	(0.154)
Observations	2099	2099	2099	1969	1969	1969

Source: Our own using Health Survey for England.

Note: Robust Standard Errors in Parentheses.
§ Time takes 4 values: Range 1 corresponds to years 1997-1999, range 2 to 2000 to 2002, range 3 to 2003 to 2005 and 4 to the final years 2006 to 2009.