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Family Ties and Child Obesity in Italy

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Abstract

This paper examines the impact of overweight family members on weight outcomes of Italian children aged 6 to 14 years. We use an original dataset matching the 2012 cross sections of the Italian Multipurpose Household Survey and the Household Budget Survey. Since the identification of within-family peer effects is known to be challenging, we implement our analysis on a partially identified model using inferential procedures recently introduced in the literature and based on standard Bayesian computation methods. We find evidence of a strong, positive effect of both overweight peer children in the family and of overweight adults on children weight outcomes. The impact of overweight peer children in the household is larger than the impact of adults. In particular, the estimated confidence sets associated to the peer children variable is positive with upper bound around one or larger, while the confidence sets for the parameter associated to obese adults often include zero and have upper bound that rarely is larger than one.

Keywords: child obesity; confidence sets; partial identification; peer effects within the family.

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1 Introduction

In the last decades children overweight and obesity prevalence have risen substantially in most countries. According to a new global assessment of child malnutrition by UNICEF (UNICEF, 2019) the most profound increase has been in the 5-19 age group, where the global rate of overweight increased from 10.3% in 2000 to 18.4% in 2018.

Identifying the determinants of child obesity is a compelling issue since obesity is not only a direct threat for children's health and a cost to society, but also has documented consequences for adult life, such as effects on health (Llewellyn et al., 2016), on self-esteem, body image and confidence, and on wages (Schwartz et al., 2011).

It is recognised that child consumption decisions are affected by those of their peers (Dishion & Tipsord, 2011) and that peer effects are more pronounced in children than in adolescents (Nie et al., 2015). While classroom or friends peer effects have been found to explain childhood and adolescents obesity (Asirvatham et al., 2014; Gwozdz et al., 2015; Nie et al., 2015), the role of *within-the-family* peers, e.g. interaction with other overweight and obese peer children in the family, as a determinant of child overweight and obesity has not yet been investigated.[1]

In fact, *within-the-family* social interaction could be an important determinant of child obesity, because children spend most of their time in the family environment. A likely driving mechanism is imitation. Research in experimental psychology (Zmyj, Ascherslebel et al., 2012; Zmyj, N. Daum et al., 2012; Zmyj & Seehagen, 2013) postulates that prolonged individual experience with peers leads children to imitate peers more than adults. Children imitate familiar behaviour for social reasons, such as identification with the role model or to communicate likeness. Adults are the natural model on which children rely in unfamiliar situations while age is an important indicator of likeness. With prolonged contact with peers (i.e. children in the same age group), children are more likely to imitate behaviour

[1] An exception is the famous study by Christakis & Fowler (2007) focusing on adults. One of their main findings was that, among pairs of adult siblings, if one sibling became obese, the chance that the other would become obese increased by 40% and that if one spouse became obese, the likelihood that the other spouse would also become obese increased by 37%.

from them than from adults, because they learn to trust their peers and to refer to them for learning also in unfamiliar situations. In this case imitation serves a cognitive function: prolonged contact with peers leads children to believe that peers are as competent as adults, i.e. a reliable model. Since children plausibly spend extended periods of time with family members, such prolonged contact is reflected in increased levels of peers imitation. If imitation is the driving mechanism through which *within-the-family* social interaction affects child obesity, then the impact of peer children in the family should be larger than the impact of adults.

The purpose of this paper is to investigate whether the presence of other overweight/obese family members, i.e. children in the same age group and adults, has a positive and significant effect on the probability of a child being overweight/obese. To address this research question we use a unique cross-section of Italian households containing detailed information on families' structure, composition, habits, and weight outcomes. We estimate a binary choice model where the dependent variable is a binary indicator for each child being overweight or obese or not. The main explanatory variables of interest are the share of other overweight or obese children in the same age group in the family, and the share of overweight or obese adults in the family.

To assess the impact of children in the same age group and family (our peer effect), we use a narrow peer-group definition that includes all children aged 6 to 14 years belonging to the same family whether siblings or not. While assessing the impact of adults does not pose particular challenges, *within-the-family* peer effects are particularly difficult to identify. Narrow definitions of the peer group, such as ours, have been found to be more endogenous than broad ones, because of shared common traits, habits and environments that may cause simultaneity effects (Black et al., 2017; Trogdon et al., 2008). A shared environment also complicates the problem of controlling for unobserved fixed effects, because the latent heterogeneity that may affect the weight outcome of each child is likely to affect the weight outcome of the other children in the same family and age group.

In order to provide some further intuition on the mechanics of our problem and on the potential causal interpretation of the model, let us consider a simple directed acyclic graph (DAG) (see Figure 1) to represent the relationship among the main variables of our model. Our main problem is to study the relationship of the peer effect variable (*Peer*) on the obesity score (*Obesity*) of a given child in the family. We may reasonably conjecture that *Obesity* would depend on *Exogenous* and *Contextual* variables as well as other *Unobserved* characteristics. Identifying peer effects may be complicated for a number of reasons. First, in the context of a group of siblings the assignment to a given family is nonrandom and it would reasonably depend on the characteristics of the parents.[2] Second, genetic and behavioral characteristics may be important to determine whether an individual is obese or not. The former set of characteristics more than the latter may be difficult to observe. However, there may exist some suitable proxy variables that may work as mediators between the *Unobserved* variables and *Peer*, these may be physical characteristics such as adults' weight and height (or BMI) and history of chronic diseases. If this is the case, by controlling for the *Exogenous* effects and the *Contextual* effects in Figure 1 we may be able to identify the causal relation between *Peer* and *Obesity*. The assumption that *Unobserved* does not affect *Peer* may be difficult to maintain in some applications. In the analysis of peer effects in the classroom context, for example, one would reasonably assume that such unobserved factors may be related to family characteristics and in particular to teacher quality. In this case, i.e. if *Unobserved* affects *Peer*, identifying the causal effect of *Peer* on *Obesity* may be impossible.

[2] The implicit assumption here is that family members are consanguineous.

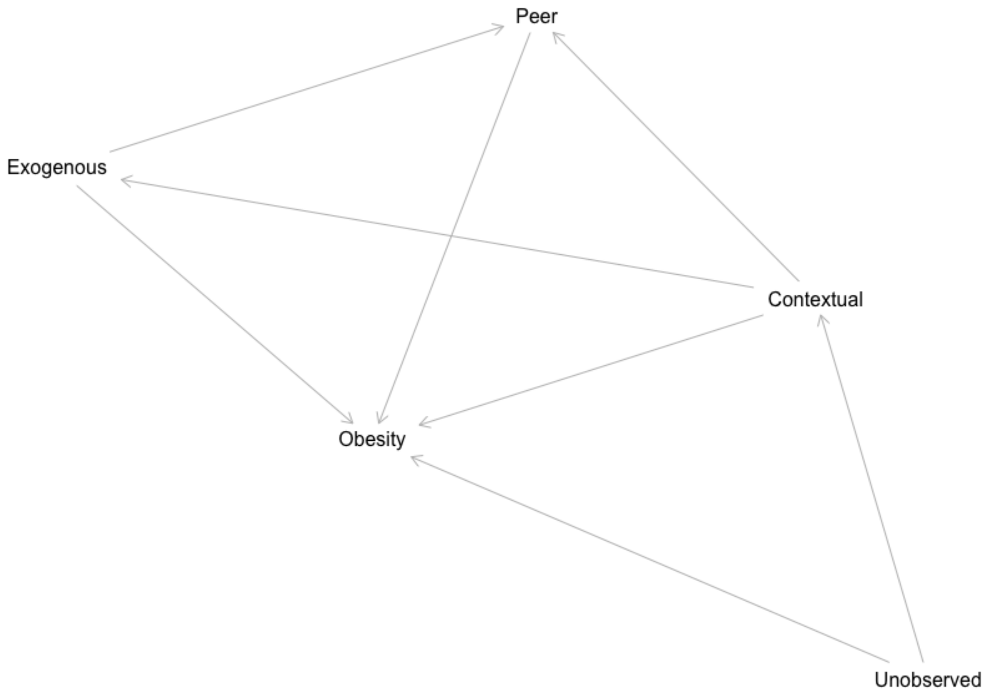


Figure 1: This DAG shows the causal relationship between *Obesity* and the peer effect variable *Peer*. In this model, controlling for *Exogenous* and *Contextual* allows one to identify the causal effect of *Peer* on *Obesity*.

Due to the narrow peer group and to the structure of the data, however, our identification problem remains hard to solve. We resort to a binary choice model and to partial identification results for such models (see Section 4 for further details on the identification problem and, e.g., Blume et al., 2011; Brock & Durlauf, 2001, 2007).

Inferential procedures for partially identified models are often rather complicated. However, the method we use in this paper, introduced by Chen et al. (2018), is computationally rather simple and boils down to calculating confidence sets for the parameters of interest by means of standard Bayesian computation methods. Consistently with the hypothesised driving mechanism, we find evidence of a strong, positive and statistically significant effect of overweight and obese peer children and a smaller positive and generally statistically significant effect of overweight and obese adults in the family on children's obesity.

Our contribution to the existing literature is threefold. First, to our knowledge this is the only paper studying the causal role of within-family peer effects on obesity as a relevant health outcome. If peers in the family have important influences on child weight outcomes, policies affecting one child in the family may have beneficial effects on the other children as well as a social multiplier effect.

Second, as stressed by Blume et al. (2011), the literature on partial identification for social interaction models has evolved separately from that on the estimation of partially identified models via bounds initiated by Tamer (2003) and used in industrial organization. This paper is an attempt to integrate these two bodies of literature in a very specific context.

Finally, this is the only study on social interaction and child obesity in Italy. Obesity rates are low in Italy compared to most OECD countries, but the picture is different for children. According to the fifth wave of the Italian Surveillance System Okkio alla Salute, in 2016 the prevalence rates of overweight (including obese) and obese primary school children were 30.6% and 9.3%, respectively, with southern regions displaying higher rates than northern regions (Lauria et al., 2019). The Surveillance System Okkio alla Salute (`http://www.epicentro.iss.it/okkioallasalute/`) monitors overweight and obesity of Italian children in primary schools (6-11 years of age). The System, promoted and financed by the Italian Ministry of Health, was started in 2007 and participates in the World Health Organization (WHO) European Childhood Obesity Surveillance Initiative (COSI). In addition, family ties are culturally strong in Italy which makes social interaction within the family a particularly interesting issue to explore.

The remainder of the paper unfolds as follows. Section 2 summarizes the literature. Section 3 describes the data. Section 4 discusses our identification strategy. Section 5 presents the estimation methods and main results. Section 6 concludes. Finally, the Appendix contains a description of statistical matching, results for the full sets of parameters and the results of the robustness checks.

2 Child Obesity and Peer Effects

The main recognized cause of the rise in child obesity is an imbalance between calorie intake and calorie expenditure. There is a vast literature on the factors driving this imbalance. One strand has addressed the relationship between maternal employment and child obesity in many developed countries. Maternal employment is usually associated with higher child weight outcomes, because employed mothers may have less time to pay attention to their children's diet (Cawley & Liu, 2012; Champion et al., 2012; Fertig et al., 2009; Gaina et al., 2009; García et al., 2006; Greve, 2011; Gwozdz et al., 2013; Liu et al., 2009; Morrill, 2011, to cite only a few). Overall, these studies find empirical evidence of a positive relationship between maternal employment and childhood obesity. However, there is no evidence of such positive relationship in Italy. In Italy there is a female labor force participation divide and a child obesity divide. The South has a very low female labor force participation compared to the North, but child obesity prevalence is much higher in the South compared to the North (Brilli et al., 2016).

A related factor is the increasing use of non-parental child care (informal care by a relative, care by a baby-sitter and centre-based care) which may increase the likelihood of obesity (Herbst & Tekin, 2011; Hubbard, 2008). The growing use of non-parental care may play a crucial role in shaping children's habits through the quality of the food offered and the level of physical activity. Herbst & Tekin (2011) find that centre-based care is associated with large and stable increases in BMI throughout its distribution, while the impact of other non-parental arrangements appears to be concentrated at the tails of the distribution.

A strand of literature, initiated by Christakis & Fowler (2007), has emerged in health economics that addresses the influence of social interaction, particularly of peers, on health status. In their seminal paper Christakis & Fowler (2007) conducted a study to determine whether adult obesity might spread from person to person. Their starting point was that people embedded in social networks are influenced by the behaviours of those around them such that weight gain in one person might influence weight gain in others. That study focused on social interaction among adults. A follow up study by the same authors (Fowler & Christakis, 2008) produced evidence of person-to-person spread of obesity also in adolescents.

Powell et al. (2015) has identified social contagion, i.e. the phenomenon whereby the network in which people are embedded influences their weight over time, as one of the social processes explaining the rise of adult overweight and obesity. The general finding is that weight-related behaviours of adolescents are affected by peer contacts (Fowler & Christakis, 2008; Halliday & Kwak, 2009; Mora & Gil, 2013; Renna et al., 2008; Trogdon et al., 2008). These studies take adolescents as the relevant age group and the classroom or friends as the relevant network. Much less is known about children as the relevant age group and the family as the relevant network.[3]

To the best of our knowledge only four studies, besides ours, analyse peer effects among children as the relevant population, and child obesity as the relevant outcome. Asirvatham et al. (2014) study peer effects in elementary schools using measured obesity prevalence for children cohorts within schools and using a panel dataset at grade level from Arkansas public schools. They found that changes in the obesity prevalence at the highest level are associated with changes in obesity prevalence at lower grades and the magnitude of the effect is greater in kindergarten to fourth-grade schools than in kindergarten to sixth-grade schools. Nie et al. (2015) analyse peer effects on obesity in a sample of 3 to 18 years old children and adolescents in China. Peer effects are found to be stronger in rural areas, among females and among individuals in the upper end of the BMI distribution. Gwozdz et al. (2015) analyse peer effects on childhood obesity using a panel of children aged 2 to 9 from eight European countries. They show that, compared to the other European countries in the sample, peer effects are larger in Spain, Italy and Cyprus. These studies adopt a fairly broad definition of peer effects, either peers at the same grade level

[3] Nie et al. (2015) report that most of the empirical literature on peer effects and obesity refers to adolescents or adults and uses US data.

within a school or children in a similar age group within a specific community. Finally, Yajuan et al. (2016) estimate peer effects on third grade students' BMI from a childhood obesity intervention program targeted at elementary schools students in Texas. Peer effects were found for students aged 8-11, with gender differences in the psychological and social behavioral motivations.

None of the above studies focuses on the family as the relevant peer group.

The literature on the causal role of siblings on children's outcomes is recent and growing. This literature has focused on the effects of sibling health status on educational outcomes (Black et al., 2017; Fletcher et al., 2012), on the effect of early health shocks on child human capital formation (Yi et al., 2015), on the effects of teen motherhood on their siblings' short and medium term human capital development (Heissel, 2017, 2019), on the effect of siblings on educational choices and early career earnings (Dustan, 2018; Joensen & Nielsen, 2018; Nicoletti & Rabe, 2019; Qureshi, 2018), and on the effects of health shocks to individuals on their family members consumption of preventive care (Fadlon & Nielsen, 2019).

Our study contributes to the latter strand of literature considering children as the relevant population and obesity as the relevant health outcome. We conjecture that the mechanism through which the peer effect plausibly operates is via imitation of good and bad behaviours such as eating habits.

3 Data and Matching

The choice of the family as the relevant network to analyse peer effects complicates the problem of controlling for unobserved fixed effects. Thus, the amount of available information is a crucial issue in our case. Studies of peer effects and childhood obesity usually include information on economic characteristics of the household, such as income, in addition to personal and socio-demographic information, because low-income individuals are more likely to be obese than those with high-income (Trogdon et al., 2008). Moreover, the relationship between income and weight is reported to vary by gender, race/ethnicity and age.[4] Lacking a single Italian cross section containing individual weight outcomes, detailed family characteristics and socio-economic variables, we used statistical matching (SM) to match two datasets. The first is the 2012 cross section of the Multipurpose Survey on Households: Aspects of Daily Life (MSH) containing detailed information on family characteristics and the weight outcome of each member. The second is the 2012 cross section of The Household Budget Survey (HBS) covering details of current and durable expenditures. Both surveys are conducted by the Italian National Statistical Institute (ISTAT).

The MSH for the year 2012 is a large nationally representative sample survey covering 19,330 households and 46,463 family members, including children aged 6 to 14 years.[5] The questionnaire, administered by paper and pencil, contains three blocks of questions: a general questionnaire on individual characteristics of the first six members of the household; a family questionnaire collecting information about household habits and lifestyles; a diary of health and nutritional information for each member of the household. For children and adolescents aged 6-17 a binary indicator for whether the child is overweight or obese is also included. Identification of a child as overweight or obese is based on BMI threshold values for children aged 6 to 17 developed by Cole et al. (2000) and adopted by the International Obesity Task Force (IOTF). The MSH does not contain information on expenditures that could be important covariates in our empirical model. We obtain this information from the 2012 cross section of the HBS which includes monthly consumption expenditures of 22,933 Italian households. ISTAT uses a weekly diary to collect expenditure data on frequently purchased items and a face-to-face interview to collect data on large and durable expenditures. Current expenditures are classified into about 200 elementary goods and services.

The survey also includes detailed information on household structure and socio-demographic

[4] Food Research and Action Center: http://frac.org/obesity-health/relationship-poverty-obesity.

[5] According to both the HBS and the MSH a family or household is defined as the set of cohabiting persons linked by marriage or kinship ties, affinity, adoption, guardianship or affection.

characteristics (such as regional location, household size, gender, age, education and employment condition of each household member). For both surveys, annual samples are drawn independently according to a two-stage design.[6] In addition to having a large set of variables in common, the two surveys share many characteristics such as the target population, sampling method, geographic frame and data collection procedure. These common characteristics allow us to use SM as an ideal method for combining information on households' quality of life and child weight outcomes with information on households' consumption expenditures.[7]

The sample under analysis includes 3,906 observations. The unit of analysis is defined as child aged between 6 and 14 years: the barplot in Figure 2 panel (a) displays how children are distributed across households. The 3,906 children involved in the analysis are distributed across 2,954 households. As shown in Figure 2 panel (a), 2,095 children have no siblings in the target age group: 6 to 14 years; 770 households have two children in the same age group, for a total number of children equal to 1,540; 85 households have three children in the same age group, thus the total number of children is 255; finally, 4 households have four children in the target age group, for a total amount of children equal to 16.

For each individual, a rich set of covariates is available. Table 1 shows summary statistics of the relevant variables in the final SM dataset. We distinguish five sets of variables: individual characteristics of children (panel A), household characteristics (panel B), in some cases related to the household's reference person (RP), behavioural variables (panel C), proxies for genetic characteristics (panel D), regional variables (panel E). More specifically, the individual characteristics are the child overweight/obesity indicator (our dependent variable), gender and age for each child in the household. There are 1,141 overweight/obese children out of 3,906, thus overweight/obese children account for 29% of children aged 6-14

[6] Details on the sampling procedure used to collect data in both surveys can be found in: ISTAT (2012) Indagine Multiscopo sulle Famiglie, aspetti della Vita quotidiana, Anno 2012, for the MSH survey; and in ISTAT (2012) File Standard-Indagine sui Consumi delle Famiglie-Manuale d'uso, anno 2012, for the HBS survey. Downloadable at http://www.istat.it/it/archivio/4021.

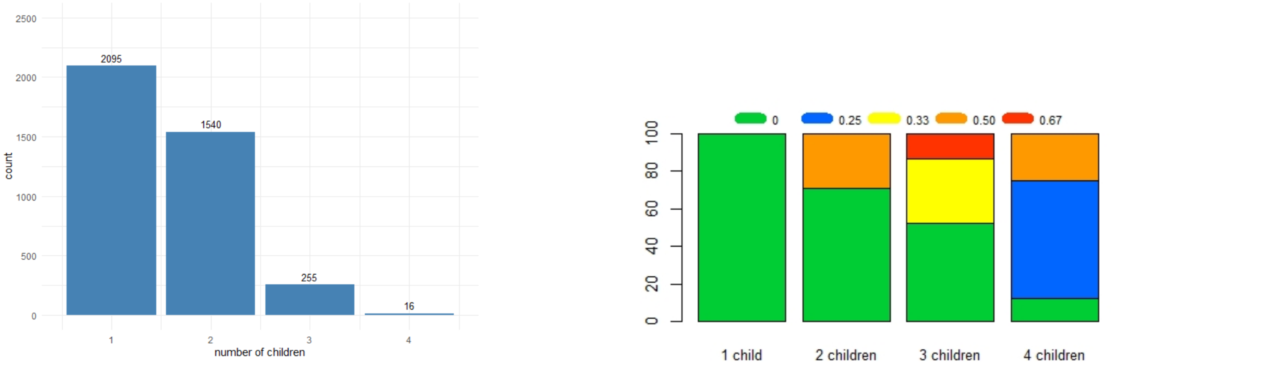
[7] SM of the two data sets is detailed in Appendix A.

Table 1: Summary statistics.†

	Mean	S.d.	Min.	Max.	Obs.
	A. Individual characteristics				
Child obesity	0.292	0.455	0	1	3,906
Age	9.987	2.595	6	14	3,906
Gender (male)	0.495	0.500	0	1	3,906
	B. Household characteristics				
Share of other overweight/obese children	0.072	0.174	0	0.667	3,906
Share of overweight/obese adults	0.420	0.351	0	1	3,906
Household size	4.120	1.018	2	11	3,906
Children born of previous marriage	0.007	0.086	0	1	3,906
Monthly expenditure (Euro)	2,131	1,346	237	16,998	3,906
Employed RP	0.813	0.390	0	1	3,906
Student or housewife RP	0.053	0.225	0	1	3,906
Retired or other emp. status RP	0.023	0.150	0	1	3,906
Mother's education (Master)	0.126	0.331	0	1	3,906
Mother's education (Bachelor)	0.029	0.169	0	1	3,906
Mother's education (High School)	0.348	0.476	0	1	3,906
Mother's education (Junior High)	0.412	0.492	0	1	3,906
Mother's education (Primary School)	0.068	0.252	0	1	3,906
Central or northern region	0.578	0.494	0	1	3,906
	C. Behavioral characteristics				
Siblings (regularly) practising sport	0.176	0.244	0	0.75	3,906
Siblings lunch at home	0.186	0.246	0	0.75	3,906
Siblings walking to school	0.089	0.193	0	0.75	3,906
Siblings TV watching every day	0.810	0.317	0	1	3,906
Parents soda drinks	0.155	0.362	0	1	3,906
Parents smoking	0.372	0.483	0	1	3,906
Children average fruit portions	1.125	0.754	0	5.5	3,906
Adults average fruit portions	1.147	0.778	0	5.5	3,906
	D. Proxies for genetic characteristics				
Mean adult weight (kg)	70.676	9.159	35.5	117.5	3,906
Mean adult height (cm)	168.959	5.694	110	193	3,906
Chronic disease	0.251	0.439	0	1	3,906
Diabetes	0.034	0.181	0	1	3,906
	E. Other characteristics				
CPI (2010=100)	106.022	0.614	104.6	108.1	3,906
% obese adults by region	24.954	5.476	17.7	36.1	3,906

†This table includes summary statistics on individual characteristics of children (panel A), household characteristics (panel B), in some cases related to the household's reference person (RP), behavioural variables (panel C), proxies for genetic characteristics (panel D), regional variables (panel E).

years. The children's mean age is 10 and the percentage of male children is 49.5%.



(a) Distribution of children across families ($6 \leq age \leq 14$). (b) Conditional distribution of obese/overweight children across families ($6 \leq age \leq 14$).

Figure 2: Children's distribution and share of obese children

The peer effect variable is defined as the share of other (overweight and obese) children in the family (excluding the child considered). This variable, $m_{g_{-i}}$, is computed as the ratio between the number of obese children in family g excluding the reference child i, $n^O_{g_{-i}}$, and the total number of children in the family, n_g. Hence,

$$m_{g_{-i}} = \frac{n^O_{g_{-i}}}{n_g}$$

where, in our data set, $1 \leq n_g \leq 4$, $0 \leq n^O_{g_{-i}} \leq 3$ and $0 \leq m_{g_{-i}} \leq \frac{2}{3}$. The minimum value of the variable corresponds to two different cases. The first case occurs when child i has no siblings and the second occurs when child i has no obese siblings. The maximum value occurs when there are two out of three obese children in the family.

Figure 2 (panel b) shows the conditional distribution of the share of other obese/overweight children in the family given the number of children in the target age group within the family. Of course, if the reference child has no siblings, the share is zero. As to the children having siblings in the age group 6-14, we can observe the following picture: the number of children in families with two children in the target age group is 1,540, 71% of them has a sibling with normal weight ($share = 0$) and 21% has an obese/overweight sibling

($share = 1/2 = 0.5$); the number of children in families with three children in the target age group is 255, 52% the of them has siblings with normal weight ($share = 0$), 33% of them has one obese/overweight sibling ($share = 1/3 = 0.33$), and the remaining 13% has two obese/overweight siblings ($share = 2/3 = 0.67$). Finally, the number of children in families with four children in the target age group is 16, 12.5% of them has normal weight siblings ($share = 0$), 62.5% has 1 obese/overweight sibling ($share = 1/4 = 0.25$) and 25% of them has two obese/overweight siblings ($share = 2/4 = 0.5$).

Further characteristics shown in Table 1 include the share of overweight and obese adult family members (42%), household size (4 on average) and a dummy for children born from a previous marriage, the employment status of the RP (three dummies for whether the household RP is employed, a student or housewife, retired or in other employment positions (e.g. military, unable to work, detained)), dummies for the level of education of the mother (five dummies for whether the mother holds a Master's degree, a Bachelor's degree, has attended High School, Junior High, or only Primary School) and a dummy for whether the household lives in a central or northern Italian region. In addition, we include monthly current expenditure, whose average value is 2,131 Euros. This variable is important as it captures contextual effects and we conjecture that its support (237 - 16,998 Euros) is sufficiently large to ensure that a nonlinear relationship with the share of obese children in the family (the endogenous effect) exists. We also include a set of variables capturing behaviors of siblings in a wider age group (6 to 18 years) compared to the target age group, because older siblings could influence the behaviours of younger ones. Such variables include the share of siblings (excluding the child under consideration) aged between 6 and 18 watching TV every day, having lunch at home, practicing physical activities on a regular basis and walking to school, dummies for whether the parents consume soda drinks or smoke. We also include the child's daily average fruit portions and the adults daily average fruit portions. As proxies for the genetic variables we use the mean height and weight of the adult members of the family and two dummy variables for whether the RP or her spouse suffer from a chronic disease or diabetes. Finally, we use two additional variables at the regional level: the 2012 consumer price index (CPI) (2010=100) and the percentage of obese adults by region in 2012.

4 Identification

Our aim is to assess whether the presence of other overweight/obese family members, i.e. children in the same age group and adults, has a positive and significant effect on the probability of a child being overweight/obese. If imitation behaviour is the driving mechanism we also expect that the impact of overweight/obese peer children in the family is larger than the impact of overweight/obese adults. We use a narrow peer-group definition that includes all children aged 6 to 14 years belonging to the same family (whether siblings or not). Narrow definitions of peer groups have been found to be more endogenous than broad ones. In particular Trogdon et al. (2008) report that broader measures of social networks (e.g. grade-level peer groups) are more exogenous than narrow ones (e.g. children in the same family) as they are likely to be determined by different causal mechanisms. While grade-level peer effects may be driven by BMI related social norms and body image concerns, family-level peer effects may also operate through additional channels such as the influence of diets, habits and physical activities. Christakis & Fowler (2007) showed that the influence of the weight of friends, family members and neighbours decreases with increasing degrees of separation from the person under investigation. Despite the large empirical literature on social interaction in a variety of contexts, identifying such effects remains a formidable challenge.

Let us consider the notation and the definitions in Brock & Durlauf (2007). We assume that individual binary weight outcomes are determined by five sets of factors:

(i) observable individual-specific characteristics known also as the exogenous effects, measured by an r-vector X_i;

(ii) unobservable individual characteristics summarized by a scalar ε_i;

(iii) observable group characteristics, measured by an s-vector Y_g; these are known as contextual effects and may directly influence individual decisions: for example, peers' characteristics such as parents' income, education or occupation may influence children's weight;

(iv) unobservable (to the econometrician) group characteristics, measured by a scalar α_g that may affect individual outcomes; these are known as correlated effects: for example, genetic characteristics may affect the weight of all children in the same family;

(v) the average outcome in the peer group excluding the child under consideration, $m_{g_{-i}}$. It is a measure of the share of obese children in the family that could affect each individual outcome (see Section 3 for the definition of $m_{g_{-i}}$).

Thus, our model of social interaction can be described as

$$\omega_i = k + c'X_i + d'Y_g + Jm_{g_{-i}} + \varepsilon_i + \alpha_g \tag{1}$$

where ω_i is a binary indicator that takes value one if, according to a BMI score, individual i is overweight/obese and zero otherwise. One important advantage of using a binary choice model is that, under a large support on Y_g, the data reveal a non-linear relationship between $m_{g_{-i}}$ and Y_g. This implies that the so-called reflection problem Manski (1993) does not arise in the binary choice case[8].

Identification in binary choice models of social interaction has been thoroughly explored in Brock & Durlauf (2007) (see also Blume et al., 2011, for a survey). In their baseline result, with $\alpha_g = 0$ and random assignment, the model parameters are identified up to scale and the reflection effect that typically characterizes linear-in-means models is not present. The main argument relies on the support of the contextual effects Y_g to be sufficiently

[8] A reflection problem arises when the dependent variable (weight outcome of child i) and the explanatory variable of interest (peer variable $m_{g_{-i}}$) are simultaneously determined, causing an endogeneity issue.

large to establish a nonlinear relationship with $m_{g_{-i}}$. In addition to that, they derive identification results also for the case of non random assignment provided that $\alpha_g = 0$.

With respect to our context, the assumption of random assignment is very difficult to justify. Since individuals within a group are consanguineous with high probability, their assignment to a given group g depends on common genetic traits. Unfortunately, our data set does not contain any explicit information on the genetic factors that determine obesity in the group. However, we may proxy it with mean adult height and weight in the household and by adding two dummy variables for whether the household head or her spouse suffers from a chronic disease or diabetes. We can conjecture that our proxies capture sufficient information from the fixed effect to guarantee identification. However, we cannot be sure that all relevant assumptions are met.

When point identification is not possible, Brock & Durlauf (2007) describe a number of situations where at least partial identification can be achieved. In particular, they prove that under non random assignment, provided that $\alpha_g = 0$ and the support on Y_g is sufficiently large to rule out the reflection problem, $J > 0$ and J is large enough to produce multiple equilibria. This means that group g may coordinate on an equilibrium expected average choice level other than the largest of the possible equilibria associated with it while another group g' may coordinate on an equilibrium other than the lowest possible expected average choice level among those it could have attained. One of the situations where this may happen is the case of assortative matching, where higher group quality is related to higher individual quality. In our context, this may refer to the case where individuals within a specific group share common genetic traits or the same eating habits. It is, though, important to stress that the multiple equilibrium results in Brock & Durlauf (2007) hold for large groups. In particular, Krauth (2006) suggests that multiplicity of equilibria for small groups may happen for lower threshold values of J.

We adopt Brock & Durlauf (2007) approach to (partial) identification. In the empirical exercise we need to accommodate the large support assumption on Y_g. More specifically, we consider two cases. In the first case the variable with large support is the log of expenditures. The second specification includes also average adult weight and average adult height. It is interesting to notice, though, that there seem to be no clear theoretical guidelines on how many variables with large support would be necessary to avoid the reflection effect (see e.g. Blume et al., 2011, p. 907).

Dealing with unobservable heterogeneity in the context of social interaction models is generally a very challenging task since, as suggested in Blume et al. (2011), ε_i and α_g are undertheorized.[9] Nonetheless, there are still a number of approaches that can be exploited when sufficient information is available. The most problematic issue in our setting is how to deal with the group fixed effects α_g. The simplest solution here is just to define $\alpha_g = d'Y_g + Jm_{g_{-i}}$ (Blume & Durlauf, 2006). This is, we approximate α_g with observables and change the number of variables in Y_g to assess the stability of the estimates. Our model will include a large number of group characteristics that may reasonably determine obesity and that are either related to genetic factors or to behavioural factors.[10]

Direct estimation of α_g via group dummies would be impossible in our context due to the large number of families (2,954) compared to the number of individuals (3,906). We could however identify a restricted number of groups by clustering families with common characteristics. The resulting number of groups would be considerably smaller than the total number of families. Allocating the families to specific groups may be done via an appropriate clustering algorithm. We give more details on this approach and on the corresponding results in Appendix B (Table B19 and Table B20).

Brock & Durlauf (2007) propose a rather clever way to deal with α_g. They suggest specifying α_g as a linear function of Y_g and constructing an auxiliary variable $W_i = F_\varepsilon^{-1}(P(\omega_i = 1|X_i, Y_g, \alpha_g))$ where F_ε is the distribution of ε_i. This would correspond to $W_i = k + c'X_i + d'Y_g + Jm_{g_{-i}} + \alpha_g$. The construction of the sample analog for W_i would rely on the existence of suitable information.[11] In our case, once again, the limited availabil-

[9] Instrumental variables may be a viable option to deal with fixed effects. However, social interaction models do not generally suggest a theoretical justification to exclude variables from the model itself. This feature is known as *openendedness* (Blume et al., 2011).

[10] A recent strand of literature stresses that any similarity in weight due to shared household environments is undetectable and ignorable (Cawley & Meyerhoefer, 2012; Kinge, 2016; Wardle et al., 2008)

[11] For the problem of social interactions in the classroom example, Brock & Durlauf (2007) suggest using

ity of data does not allow us to consider this alternative. A further interesting possibility is due to Graham (2008), where α_g is interpreted as a random effect. Hence, $Cov[\alpha_g, \varepsilon_i] = 0$, for $i \in g$. This approach is justified, at least in Graham's classroom problem, by the random assignment of teachers to classrooms.

5 Estimation and Inference

It is interesting to notice that the results in Brock & Durlauf (2007) differ from the classical approaches to partial identification. The latter case involves the identification of bounds and their subsequent estimation by means of appropriate statistical procedures. Instead, Brock & Durlauf's (2007) theory-dependent approach studies how introducing unobserved heterogeneity would affect the properties of the model. Furthermore, they do not establish probability bounds (Blume et al., 2011).[12] Hence, we assume that, given a certain parameter space Θ, there exists a subset of Θ, say Θ_I, such that $F_0 = F_\theta$ for $\theta \in \Theta_I$ where F_0 is the true distribution of the data and F_θ is our parametric model. We refer to Θ_I as the identified set for which an appropriate estimator has to be found. In what follows, we focus our attention on confidence sets for individual parameters. In this regard, we find the following decomposition useful: $\theta = (\mu', \eta')'$, where μ is the parameter vector we are interested in and η can be seen as a nuisance parameter. We denote the identified set for the subvector μ as M_I.

We tackle the estimation problem by using a method introduced in Chen et al. (2018). The confidence sets produced using this approach are simple to calculate, work well in finite samples and asymptotically achieve frequentist coverage. The estimated confidence sets can be compared to the confidence intervals produced by standard estimation methods for binary choice models under the assumption of point identification. Intuitively, one may argue that (lack of point) identification may not be an issue if confidence sets and confidence intervals are similar.

test scores to recover a sample analogue for W_i.

[12] See, e.g., Manski (2003) and Molinari (in press) for a comprehensive treatment of partial identification.

In this section we describe how we build valid confidence sets using Procedure 1 and Procedure 3 in Chen et al. (2018). They are both simple to compute but the former tends to produce conservative confidence sets while the latter can only be applied to scalar sub-vectors of the parameter vector of interest. The associated numerical results are collected in Table 2 to Table 9. Appendix B contains the robustness check results.

5.1 Confidence Sets

The methods proposed in Chen et al. (2018) exploit some classical ideas of Bayesian computation. The estimation of the confidence sets is in fact based on sampling from the posterior distribution of the parameters. Here we provide a brief description of the three procedures introduced in their paper. Considering the discussion in Section 4 on the treatment of the fixed effect α_g, the model that we estimate is

$$\omega_i = Z_i'\theta + u_i$$

where $Z_i = (1, X_i', Y_g', m_{g_{-i}})$ and $\theta = (k, c', d', J)'$ is a p-dimensional vector where $p = 2+r+s$.[13] Let us consider a parametric loglikelihood function that depends on a parameter vector θ that takes values in a set Θ and the data Z_i

$$L_N(\theta) = \frac{1}{N}\sum_{i=1}^{N} \log f(\theta, Z_i).$$

Let us denote the identified set as $\Theta_I = \{\theta \in \Theta : F_0 = F_\theta\}$, where F_θ is our parametric model and F_0 is the true distribution of the data. The posterior distribution, say Π_N, of θ given the data Z is

[13]For ease of notation we drop the group index g.

$$d\Pi_N(\theta, Z) = \frac{\exp\left(NL_N(\theta)\right) d\Pi(\theta)}{\int_\Theta \exp\left(NL_N(\theta)\right) d\Pi(\theta)}$$

where $\Pi(\theta)$ is a prior distribution. The $100\alpha\%$ confidence set, say $\widehat{\Theta}_\alpha$ for Θ_I is computed in a three step procedure:

Procedure 1 (whole parameter vector)

(a) draw B samples $\{\theta^{(1)}, \ldots, \theta^{(B)}\}$ from the posterior distribution Π_N via a Monte Carlo Markov chain (MCMC) sampler;[14]

(b) calculate the $(1-\alpha)$ quantile of $\{L_N(\theta^{(1)}), \ldots, L_N(\theta^{(B)})\}$, say $\zeta_{N,\alpha}$;

(c) define $\widehat{\Theta}_\alpha$ as $\widehat{\Theta}_\alpha = \{\theta \in \Theta : L_N(\theta) \geq \zeta_{N,\alpha}\}$.

It is possible to adapt procedure 1 to construct confidence sets for the subset vector μ. The so-called projection confidence set for M_I is defined as $\widehat{M_\alpha^{proj}} = \{\mu : (\mu', \eta')' \in \widehat{\Theta}_\alpha,\ for\ some\ \eta\}$. The projection confidence set is known to be conservative in particular when the dimension of the subvector μ is smaller in comparison with the dimension of θ. Let us now define the set $H_\mu = \{\eta : (\mu', \eta')' \in \Theta\}$ and the profile likelihood for M_I

$$PL_N(M_I) = \inf_{\mu \in M_I} \sup_{\eta \in H_\mu} L_N(\mu, \eta).$$

Let $\Delta(\theta^b), b = 1, \ldots, B$ be an equivalence set, i.e. a set of $\theta \in \Theta$ that produce the same likelihood values and let $M(\theta^b) = \{\mu : (\mu', \eta')' \in \Delta(\theta^b),\ for\ some\ \eta\}$. Then, the profile likelihood for $M(\theta^b)$ is

[14] Chen et al. (2018) suggest using a sequential Monte Carlo sampler as MCMC may be numerically unstable. We do not experience such problems in our application.

$$PL_N(M(\theta^b)) = \inf_{\mu \in M(\theta^b)} \sup_{\eta \in H_\mu} L_N(\mu, \eta).$$

We can now describe the second procedure for a subvector μ of θ:

Procedure 2 (subvector)

(a) draw B samples $\{\theta^{(1)}, \ldots, \theta^{(B)}\}$ from the posterior distribution Π_N via a MCMC sampler;

(b) calculate the $(1-\alpha)$ quantile of $\{PL_N(M(\theta^{(1)})), \ldots, PL_N(M(\theta^{(B)}))\}$, say $\zeta_{N,\alpha}$;

(c) define $\widehat{M}_\alpha$ as $\widehat{M}_\alpha = \{\mu \in M : \sup_{\eta \in H_\mu} L_N(\mu, \eta) \geq \zeta_{N,\alpha}\}$.

We now describe a simple procedure for scalar subvectors. Let us define the likelihood ratio

$$LR_N(\theta) = 2N\left(L_N(\widehat{\theta}) - L_N(\theta)\right)$$

for a maximizer $\widehat{\theta}$. Procedure 3 can be implemented in two simple steps

Procedure 3 (scalar subvector)

(a) calculate a maximizer $\widehat{\theta}$;

(b) define $\widehat{M}_\alpha$ as $\widehat{M}_\alpha = \{\mu \in M : \inf_{\eta \in H_\mu} LR_N(\mu, \eta) \leq q_\alpha^{\chi_1^2}\}$, where $q_\alpha^{\chi_1^2}$ is the α quantile of the χ_1^2 distribution.

As suggested in Chen et al. (2018), the confidence sets are compared to the confidence intervals provided by the standard probit and logit models.

5.2 Results

Table 2 to Table 9 in this Section contain 95% confidence intervals obtained using the standard logit and probit models as if identification were possible and 95% confidence sets obtained using Procedure 1 and Procedure 3 of the approach described in Section 5.1 and denoted as CCT1 and CCT3 respectively. Table 2 to Table 7 show estimates considering families with at least one child (i.e. all the families). In addition to that, we conduct our analysis in subsets of the data based on age. Two subsets are considered $6 \leq age \leq 11$ (Tables 3, 6) and $12 \leq age \leq 14$ (Tables 4, 7). Moreover, each model is estimated using four sets of covariates.[15] Table 8 and Table 9, on the other hand, display the estimates of a parsimonious model that includes the number of children as a regressor as well as the average height and weight of adults in the family. Also for these models we consider the age subsets described above. Appendix B shows similar models for families that include either more than one child or only one child. These results serve the purpose of checking the stability of the confidence sets.

Our dependent variable is a binary variable for a child being overweight/obese. The explanatory variables of interest are the share of other overweight and obese children in the household (the peer effect) and the share of overweight and obese adults in the household. The other covariates introduced in the models are described in Section 3. Specifically, these are the individual characteristics of the child (*gender*, *age* and age^2) and household characteristics, like the share of other overweight and obese children in the household (the key covariate), the share of overweight and obese adults in the household and the household consumption expenditures in logs – the matched variable. As to the effect of

[15]Covariates include household, behavioral and regional characteristics as well as proxies for genetic characteristics. Household characteristics include household size, whether the household lives in a Northern or Central Italian region, the employment status of the RP, the level of education of the mother. Regional characteristics includes a general CPI at the regional level and the regional share of obese adults in 2012. Genetic proxies include the mean height and weight of the adult members of the family and two dummy variables for whether the RP or her spouse suffer from a chronic disease or diabetes. Behavioral variables includes the share of siblings (excluding the child under consideration) aged between 6 and 18 watching TV every day, having lunch at home, practicing physical activities on a regular basis and walking to school, dummies for whether the parents consume soda drinks or smoke. The full set of confidence intervals and confidence sets can be found in Tables B1 to B3 and Tables B10 to B12.

the key covariate, we observe that the presence of other obese children in the family has a positive effect on the probability that a child be obese. This result is robust to all the specifications of the model we considered. The results obtained with the standard binary choice model, either logit or probit, are very similar to the confidence sets computed via CCT3. This may suggest that if there is no point identification, this has only a mild effect on the confidence intervals. The confidence sets obtained via CCT1 are generally larger than those built with CCT3: this is in line with what is suggested in Chen et al. (2018). Furthermore, we find that the effect of obese adults in the family is generally smaller than that of peer children. We also find that by including the genetic proxies and the behavioural variables the confidence sets tend to move to the left and in some cases they include zero. If we look at the results for the two age subsets we notice some differences. However, they may be caused by the difference in sample size. The model specification in Table 8 and Table 9 shows a sizable shift towards the right of the confidence sets associated to the peer effect variable. This result is observed for all age subsets. The confidence sets tend to get larger when we consider the subset of older children; however, also this effect may be caused by the reduced sample size. The effect of the share of obese adults seems to be more ambiguous as it is smaller in comparison with the other model specifications and, for the subset of older children, it includes zero. This result may also depend on the inclusion of average adult weight and height, as they are related to the share of obese adults in the family. As to the variable gender of the child, its effect is significant in almost all the model specifications, with confidence sets defined in a positive subset of the real line, meaning that the probability of being overweight/obese is larger for males than for females. The child age is insignificant in the quadratic polynomial specification in almost all the model specifications. As to the effect of household consumption expenditures, introduced in the model as a logarithmic transformation, its effect is significant, both for the logit and probit models, either for the standard binary choice model or for the one estimated via CCT3, on the set including all children aged 6-14 years and for the subset of children aged 6-11 years, only when the models do not include other household behavioural variables. In such cases, the confidence sets are defined in a negative subset of the real line (see columns (1) and (3) in Tables 2, 3, 5, 6) meaning that the probability of being overweight/obese decreases with household consumption expenditures. It thus seems that the impact of consumption expenditures, viewed as a proxy of the economic status of the household, is mediated by the included household and behavioural covariates. One possible interpretation of this result is that those families in better economic conditions can offer better opportunities for a healthy diet and physical activity. On the other hand, resource constraints lead to a lack of opportunities and to a lack of information on the ingredients of a healthy children's diet and on healthy behaviours.

6 Conclusion

This paper contributes to the literature on child obesity by assessing the effect of peers on children's weight outcomes in the context of a narrow peer group. We assessed whether the presence of overweight and obese family members – other children and adults – affects children's weight outcomes. To the best of our knowledge no study has yet analysed the impact of the obesity status of other members of a family on child obesity. We chose to carry out our analysis not presuming point identification for our models. With respect to that aspect, we contribute to the integration, albeit in a rather specific context, of the literature on partial identification for social interaction models and that on partially identified models in industrial organization (Blume et al., 2011; Tamer, 2003).

We used a data set on Italian children resulting from statistical matching of the 2012 cross sections of two surveys, the Multipurpose Household Survey and the Household Budget Survey, both supplied by ISTAT. To provide valid inference for our partially identified models we use the method proposed by Chen et al. (2018). We found evidence of a strong, positive impact of overweight and obese peer children in the family and of overweight and obese adults on child weight outcomes. Interestingly, in all empirical models we find that the impact of overweight and obese peer children in the household is larger than

Table 2: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.913,1.695]	[0.568,2.046]	[0.925,1.689]	[0.706,1.526]	[0.301,1.991]	[0.711,1.513]	[0.679,1.530]	[0.328,1.956]	[0.690,1.529]
constant	[-1.744,1.173]	[-3.060,2.446]	[-1.744,1.130]	[-3.623,22.087]	[-13.770,19.093]	[-3.292,19.093]	[-3.576,22.700]	[-11.224,19.916]	[-3.329,18.600]
gender	[0.158,0.448]	[0.028,0.579]	[0.158,0.443]	[0.157,0.453]	[0.011,0.578]	[0.160,0.452]	[0.150,0.448]	[0.061,0.545]	[0.154,0.447]
age	[-0.121,0.383]	[-0.310,0.438]	[-0.113,0.375]	[-0.085,0.428]	[-0.415,0.697]	[-0.078,0.428]	[-0.099,0.420]	[-0.218,0.567]	[-0.092,0.416]
age^2	[-0.025,0.001]	[-0.036,0.012]	[-0.024,0.000]	[-0.028,-0.002]	[-0.043,0.015]	[-0.028,-0.002]	[-0.028,-0.001]	[-0.035,0.004]	[-0.027,-0.002]
Share of obese adults	[0.626,1.042]	[0.441,1.228]	[0.628,1.042]	[0.537,0.962]	[0.322,1.224]	[0.541,0.960]	[-0.031,0.651]	[-0.170,0.797]	[-0.023,0.651]
log expenditures (Euro)	[-0.284,-0.054]	[-0.387,0.048]	[-0.283,-0.056]	[-0.136,0.116]	[-0.294,0.269]	[-0.135,0.116]	[-0.117,0.139]	[-0.210,0.184]	[-0.115,0.136]
Households characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	3737, 7	3737, 7	3737, 7	3737, 19	3737, 19	3737, 19	3737, 30	3737, 30	3737, 30

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families.

Table 3: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.949,1.906]	[0.512,2.331]	[0.957,1.905]	[0.723,1.726]	[0.170,2.203]	[0.724,1.710]	[0.671,1.705]	[0.439,2.267]	[0.679,1.695]
constant	[-1.440,3.801]	[-3.805,6.106]	[-1.355,3.768]	[-6.249,24.249]	[-26.552,23.021]	[-5.521,23.021]	[-6.724,24.517]	[-15.053,23.818]	[-6.415,22.378]
gender	[-0.107,0.234]	[-0.263,0.387]	[-0.102,0.233]	[-0.120,0.229]	[-0.302,0.370]	[-0.119,0.228]	[-0.126,0.226]	[-0.259,0.388]	[-0.122,0.225]
age	[-0.784,0.383]	[-1.136,0.384]	[-0.780,0.360]	[-0.752,0.441]	[-1.307,1.015]	[-0.744,0.429]	[-0.776,0.430]	[-1.061,1.007]	[-0.768,0.422]
age^2	[-0.026,0.042]	[-0.058,0.073]	[-0.026,0.042]	[-0.030,0.040]	[-0.062,0.071]	[-0.030,0.039]	[-0.030,0.041]	[-0.061,0.060]	[-0.029,0.040]
Share of obese adults	[0.536,1.025]	[0.319,1.251]	[0.541,1.018]	[0.457,0.959]	[0.265,1.173]	[0.458,0.953]	[0.061,0.872]	[-0.268,1.158]	[0.063,0.870]
log expenditures (Euro)	[-0.307,-0.036]	[-0.431,0.087]	[-0.306,-0.038]	[-0.141,0.157]	[-0.311,0.317]	[-0.140,0.152]	[-0.118,0.185]	[-0.206,0.269]	[-0.115,0.183]
Household characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	2503, 7	2503, 7	2503, 7	2503, 19	2503, 19	2503, 19	2503, 30	2503, 30	2503, 30

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $6 \leq age \leq 11$.

Table 4: Confidence intervals and confidence sets for the logit model.[†]

	Dependent variable: child obesity ($12 \le age \le 14$)								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.439,1.848]	[-0.201,2.439]	[0.444,1.825]	[0.264,1.759]	[-0.542,2.511]	[0.291,1.740]	[0.432,2.036]	[-0.449,2.849]	[0.450,2.016]
constant	[-27.662,72.548]	[-60.429,74.899]	[-26.597,71.677]	[-22.476,89.346]	[-56.280,93.211]	[-13.341,88.440]	[-12.926,102.045]	[-64.176,106.904]	[-10.059,101.666]
gender	[0.659,1.237]	[0.420,1.494]	[0.661,1.229]	[0.683,1.271]	[0.455,1.663]	[0.687,1.260]	[0.681,1.282]	[0.401,1.592]	[0.690,1.279]
age	[-11.176,4.290]	[-12.660,-0.408]	[-11.159,-0.408]	[-10.468,5.271]	[-12.017,1.488]	[-10.298,1.488]	[-12.037,4.041]	[-13.973,0.461]	[-11.947,0.208]
age^2	[-0.173,0.423]	[-0.370,0.434]	[-0.166,0.414]	[-0.211,0.395]	[-0.438,0.436]	[-0.162,0.389]	[-0.164,0.455]	[-0.311,0.532]	[-0.164,0.444]
Share of obese adults	[0.587,1.390]	[0.249,1.734]	[0.602,1.380]	[0.469,1.291]	[0.155,1.763]	[0.480,1.276]	[-0.700,0.63]	[-1.340,1.310]	[-0.671,0.614]
log expenditures (Euro)	[-0.390,0.054]	[-0.581,0.240]	[-0.381,0.049]	[-0.287,0.194]	[-0.584,0.491]	[-0.280,0.187]	[-0.299,0.197]	[-0.524,0.448]	[-0.298,0.193]
Household characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	1234, 7	1234, 7	1234, 7	1234, 19	1234, 19	1234, 19	1234, 30	1234, 30	1234, 30

[†]This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $12 \le age \le 14$.

Table 5: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.560,1.039]	[0.344,1.248]	[0.568,1.035]	[0.435,0.933]	[0.158,1.282]	[0.442,0.930]	[0.421,0.934]	[0.067,1.313]	[0.432,0.923]
constant	[-1.043,0.704]	[-1.822,1.485]	[-1.035,0.698]	[-2.39,13.116]	[-6.889,14.311]	[-2.137,12.849]	[-2.335,13.520]	[-12.436,17.633]	[-2.055,13.337]
gender	[0.101,0.275]	[0.026,0.351]	[0.105,0.271]	[0.100,0.276]	[-0.002,0.389]	[0.101,0.274]	[0.094,0.272]	[-0.017,0.389]	[0.098,0.270]
age	[-0.074,0.226]	[-0.190,0.290]	[-0.072,0.224]	[-0.051,0.254]	[-0.274,0.428]	[-0.047,0.251]	[-0.057,0.251]	[-0.265,0.438]	[-0.052,0.246]
age^2	[-0.015,0.000]	[-0.021,0.007]	[-0.014,0.000]	[-0.016,-0.001]	[-0.026,0.010]	[-0.016,-0.001]	[-0.016,-0.001]	[-0.025,0.009]	[-0.016,-0.001]
Share of obese adults	[0.381,0.629]	[0.269,0.740]	[0.384,0.625]	[0.328,0.582]	[0.153,0.746]	[0.333,0.578]	[-0.021,0.386]	[-0.295,0.677]	[-0.020,0.382]
log expenditures (Euro)	[-0.171,-0.033]	[-0.231,0.029]	[-0.170,-0.036]	[-0.082,0.068]	[-0.204,0.159]	[-0.080,0.067]	[-0.069,0.083]	[-0.179,0.184]	[-0.069,0.082]
Household characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	3737, 7	3737, 7	3737, 7	3737, 19	3737, 19	3737, 19	3737, 30	3737, 30	3737, 30

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families.

Table 6: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.588,1.180]	[0.320,1.449]	[0.599,1.170]	[0.450,1.065]	[0.125,1.464]	[0.450,1.058]	[0.418,1.047]	[-0.032,1.478]	[0.426,1.036]
constant	[-0.868,2.319]	[-2.253,3.691]	[-0.807,2.245]	[-3.827,14.833]	[-13.042,17.507]	[-3.441,14.452]	[-4.026,15.072]	[-18.730,21.992]	[-3.631,14.671]
gender	[-0.064,0.143]	[-0.157,0.236]	[-0.061,0.14]	[-0.070,0.139]	[-0.228,0.292]	[-0.065,0.134]	[-0.074,0.138]	[-0.217,0.279]	[-0.072,0.133]
age	[-0.479,0.230]	[-0.731,0.321]	[-0.464,0.221]	[-0.457,0.262]	[-0.896,0.743]	[-0.449,0.246]	[-0.477,0.248]	[-0.937,0.695]	[-0.476,0.234]
age^2	[-0.016,0.026]	[-0.034,0.044]	[-0.015,0.025]	[-0.018,0.024]	[-0.047,0.051]	[-0.017,0.023]	[-0.017,0.025]	[-0.044,0.053]	[-0.016,0.025]
Share of obese adults	[0.327,0.623]	[0.198,0.758]	[0.330,0.620]	[0.281,0.584]	[0.026,0.833]	[0.287,0.581]	[0.034,0.523]	[-0.480,0.855]	[0.046,0.518]
log expenditures (Euro)	[-0.187,-0.023]	[-0.260,0.048]	[-0.184,-0.024]	[-0.086,0.093]	[-0.201,0.204]	[-0.082,0.090]	[-0.071,0.111]	[-0.185,0.257]	[-0.069,0.110]
Household characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	2503, 7	2503, 7	2503, 7	2503, 19	2503, 19	2503, 19	2503, 30	2503, 30	2503, 30

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $6 \leq age \leq 11$.

Table 7: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity ($12 \leq age \leq 14$)								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.278,1.108]	[-0.097,1.469]	[0.284,1.107]	[0.17,1.048]	[-0.507,1.547]	[0.177,1.028]	[0.254,1.185]	[-0.401,1.766]	[0.256,1.175]
constant	[-16.104,41.695]	[-40.983,66.704]	[-15.856,41.577]	[-14.302,50.206]	[-52.12,77.035]	[-12.982,49.638]	[-8.386,57.715]	[-46.524,86.252]	[-7.63,56.746]
gender	[0.384,0.712]	[0.243,0.860]	[0.391,0.711]	[0.396,0.729]	[0.208,0.945]	[0.402,0.722]	[0.390,0.729]	[0.163,0.975]	[0.393,0.729]
age	[-6.418,2.498]	[-7.634,1.233]	[-6.341,1.233]	[-5.869,3.167]	[-8.744,3.008]	[-5.711,2.818]	[-6.829,2.387]	[-10.177,2.533]	[-6.602,2.335]
age^2	[-0.101,0.243]	[-0.248,0.395]	[-0.099,0.240]	[-0.127,0.221]	[-0.327,0.394]	[-0.123,0.220]	[-0.097,0.258]	[-0.327,0.436]	[-0.096,0.251]
Share of obese adults	[0.350,0.814]	[0.155,1.022]	[0.359,0.808]	[0.280,0.754]	[-0.025,1.054]	[0.291,0.749]	[-0.399,0.367]	[-0.936,0.803]	[-0.392,0.364]
log expenditures (Euro)	[-0.229,0.027]	[-0.344,0.138]	[-0.225,0.024]	[-0.171,0.107]	[-0.357,0.264]	[-0.169,0.101]	[-0.177,0.109]	[-0.355,0.311]	[-0.173,0.102]
Household characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Regional characteristics	NO	NO	NO	YES	YES	YES	YES	YES	YES
Genetic proxies	NO	NO	NO	NO	NO	NO	YES	YES	YES
Behavioral variables	NO	NO	NO	NO	NO	NO	YES	YES	YES
N, p	1234, 7	1234, 7	1234, 7	1234, 19	1234, 19	1234, 19	1234, 30	1234, 30	1234, 30

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $12 \leq age \leq 14$.

Table 8: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity								
	$6 \leq age \leq 14$			$6 \leq age \leq 11$			$12 \leq age \leq 14$		
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[1.005,1.850]	[0.663,2.272]	[1.020,1.849]	[1.013,2.023]	[0.471,2.569]	[1.022,2.018]	[0.652,2.299]	[-0.322,3.169]	[0.666,2.288]
constant	[0.850,6.364]	[-2.339,8.945]	[0.885,6.297]	[1.206,8.854]	[-3.184,13.384]	[1.234,8.782]	[-17.614,84.403]	[-56.297,90.862]	[-17.393,84.096]
gender	[0.156,0.448]	[-0.010,0.583]	[0.159,0.443]	[-0.111,0.232]	[-0.300,0.399]	[-0.109,0.230]	[0.663,1.248]	[0.355,1.581]	[0.664,1.246]
age	[-0.114,0.393]	[-0.404,0.693]	[-0.104,0.381]	[-0.773,0.397]	[-1.312,0.935]	[-0.762,0.385]	[-12.333,3.314]	[-13.643,-0.901]	[-12.315,-1.167]
age^2	[-0.026,0.000]	[-0.041,0.014]	[-0.025,-0.001]	[-0.027,0.041]	[-0.060,0.072]	[-0.026,0.040]	[-0.135,0.467]	[-0.396,0.494]	[-0.130,0.463]
Share of obese adults	[0.020,0.687]	[-0.323,1.073]	[0.034,0.672]	[0.130,0.917]	[-0.268,1.338]	[0.138,0.917]	[-0.691,0.594]	[-1.394,1.326]	[-0.673,0.576]
log expenditures (Euro)	[-0.255,-0.021]	[-0.368,0.104]	[-0.254,-0.025]	[-0.273,0.002]	[-0.433,0.162]	[-0.272,0.001]	[-0.381,0.071]	[-0.559,0.273]	[-0.374,0.063]
number of children	[-0.228,-0.024]	[-0.342,0.092]	[-0.227,-0.028]	[-0.216,0.019]	[-0.329,0.154]	[-0.212,0.018]	[-0.420,0.011]	[-0.693,0.229]	[-0.414,0.008]
average adult weight	[0.013,0.042]	[-0.005,0.059]	[0.013,0.041]	[-0.003,0.032]	[-0.024,0.052]	[-0.002,0.031]	[0.030,0.085]	[-0.001,0.118]	[0.031,0.085]
average adult height	[-0.051,-0.016]	[-0.070,0.004]	[-0.051,-0.016]	[-0.050,-0.008]	[-0.074,0.012]	[-0.049,-0.008]	[-0.078,-0.011]	[-0.118,0.027]	[-0.077,-0.012]
N, p	3737, 10	3737, 10	3737, 10	2503, 10	2503, 10	2503, 10	1234, 10	1234, 10	1234, 10

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models include the number of children in the family as a regressor.

Table 9: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity								
	$6 \leq age \leq 14$			$6 \leq age \leq 11$			$12 \leq age \leq 14$		
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.616,1.129]	[0.316,1.431]	[0.619,1.128]	[0.629,1.251]	[0.287,1.607]	[0.631,1.249]	[0.379,1.328]	[-0.169,1.878]	[0.393,1.316]
constant	[0.562,3.851]	[-1.325,5.781]	[0.585,3.795]	[0.764,5.397]	[-1.863,8.142]	[0.827,5.345]	[-10.883,47.714]	[-43.759,75.346]	[-10.606,47.104]
gender	[0.099,0.273]	[-0.001,0.376]	[0.100,0.271]	[-0.066,0.141]	[-0.188,0.261]	[-0.065,0.138]	[0.381,0.711]	[0.195,0.903]	[0.386,0.705]
age	[-0.070,0.231]	[-0.244,0.405]	[-0.065,0.225]	[-0.473,0.236]	[-0.887,0.648]	[-0.467,0.228]	[-6.954,2.038]	[-8.481,0.929]	[-6.944,0.929]
age^2	[-0.015,0.000]	[-0.024,0.009]	[-0.015,0.000]	[-0.016,0.025]	[-0.040,0.050]	[-0.016,0.025]	[-0.083,0.263]	[-0.278,0.441]	[-0.078,0.263]
Share of obese adults	[0.012,0.411]	[-0.215,0.642]	[0.020,0.407]	[0.074,0.552]	[-0.206,0.825]	[0.084,0.546]	[-0.379,0.363]	[-0.802,0.777]	[-0.376,0.351]
log expenditures (Euro)	[-0.153,-0.013]	[-0.232,0.067]	[-0.151,-0.014]	[-0.166,0.001]	[-0.262,0.099]	[-0.165,-0.003]	[-0.223,0.037]	[-0.376,0.183]	[-0.221,0.035]
number of children	[-0.135,-0.015]	[-0.206,0.055]	[-0.133,-0.016]	[-0.130,0.011]	[-0.213,0.091]	[-0.129,0.010]	[-0.230,0.008]	[-0.373,0.145]	[-0.226,0.004]
average adult weight	[0.008,0.025]	[-0.002,0.036]	[0.008,0.025]	[-0.002,0.020]	[-0.014,0.032]	[-0.001,0.020]	[0.017,0.049]	[0.000,0.067]	[0.017,0.049]
average adult height	[-0.031,-0.010]	[-0.043,0.003]	[-0.031,-0.010]	[-0.030,-0.005]	[-0.045,0.009]	[-0.030,-0.005]	[-0.045,-0.007]	[-0.068,0.016]	[-0.045,-0.007]
N, p	3737, 10	3737, 10	3737, 10	2503, 10	2503, 10	2503, 10	1234, 10	1234, 10	1234, 10

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models include the number of children in the family as a regressor.

the impact of adults. We also find that, when genetic proxies and behavioral variables are added, the impact of the presence of overweight and obese adults is driven to zero while the impact of overweight and obese peer children remains positive. Our results are consistent with studies on child imitation behaviour and the role model age (Zmyj, Aschersleben et al., 2012; Zmyj, N. Daum et al., 2012; Zmyj & Seehagen, 2013), where prolonged contact with peers led children to imitate peers more than adults.

Despite growing rates of child obesity, empirical evidence on the factors affecting Italian child weight outcomes remains poor. Further exploration of causal pathways linking social interaction within the family and child obesity is therefore desirable. We show that the presence overweight/obese parents and/or peer siblings is an important factor affecting child obesity in Italy. In particular, we show that the presence of other overweight and obese children in the family is the most important factor affecting child obesity. Indeed, when the richest model specification is used, i.e. when we include proxies for genetic variables (columns 7, 8, 9 in Tables 2, 4, 5, 7), the share of obese adults is no longer significant, while the peer effect variable is still significant. This result suggests that within-the-family obesity is driven more by peer siblings interaction than by interactions between the parent and the child. In general, it seems that family characteristics and behaviours affect children habits and their probability of being obese. In this context, family-based programmes, based on collaborative approaches, may help preventing child obesity. Particular attention should be paid to households with more than one overweight child where a collaborative approach could have much more impact. Moreover, since siblings relationships are the longest lasting ones, the use of a true family-based approach in taking action against childhood obesity will increase the likelihood that changes in child health behaviours will be sustainable (see, e.g., Berge & Everts, 2011).

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Appendix for "Family Ties and Child Obesity in Italy"

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Appendix A Statistical Matching

Matching procedures impute the target variables from a donor to a recipient survey. In the basic framework SM integrates two data sources $\mathcal{A}$ and $\mathcal{B}$ drawn from the same target population (Cohen, 1991; Radner et al., 1980; Rodgers, 1984). $\mathcal{A}$ contains vector-valued variables (X, Y), whereas $\mathcal{B}$ contains vector-valued variables (X, Z) such that X is shared by both sources. The X variables common to both surveys are used as a bridge to create records containing (X, Y, Z) which can then be used to investigate the relationship between Y and Z (D'Orazio et al., 2006). Our purpose was to integrate households' total current consumption expenditure from the HBS (denoted survey $\mathcal{A}$) into the MSH dataset (survey $\mathcal{B}$).

The first step was to identify the vector of matching variables X. Since $\mathcal{A}$ and $\mathcal{B}$ are representative samples of the same population, the common variables are expected to share the same marginal/joint distribution. This check was performed using the Cramer's V association measures. Potentially, all the variables identified and chosen according to this check could be used. In actual fact, only the most relevant ones were identified and selected

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according to a linear model for predicting the logarithm of total current consumption expenditure, our target variable. Table A1 shows the set of matching variables used to predict/impute the target variable. The listed common variables explained 70% of the total variability of the target variable. In addition to these, we included a number of interaction terms in the specification.

Table A1: Final matching variables.

$Northwest$	Household living in the North West
$Northeast$	Household living in the North East
$Central$	Household living in the Centre
$Single\_parent$	Family type: single parent
$Parents\_both$	Family type: both parents
$Singleton$	Family type: Single
$Household\ size$	Household size
$\#\_members0\_5$	# persons 0-5 years old
$\#\_members6\_17$	# persons 6-17 years old
$\#\_members18\_34$	# persons 18-34 years old
$\#\_members35\_65$	# persons 35-65 years old
$Gender\_RP$	Gender of the reference person
$Mstatus\_RP$	Marital status of the reference person
$Employment\_RP$	Professional position of the reference person
$Home$	Home ownership
$Rooms$	# of rooms
$Ec\_resource$	Adequacy of economic resources
CPI	Consumer Price Index at the regional level
CPI_food	Food Price Index at the regional level

The next step was imputation from the donor to the recipient. The chosen imputation method was the Sequential Regression Multiple Imputation (Raghunathan et al., 2001) implemented through `IVEware` software that enables imputation of missing data in the recipient variables and in the set of matching variables. `IVEware` has a number of desirable properties that make it particularly well suited for imputing missing data in large datasets. For example, imputation models can be specified according to the nature of the variable to be imputed. The software easily handles arbitrary missing data patterns with categorical and continuous variables. Finally, a sequential method is used to impute missing values: the variable with the least amount of missing data is imputed first and then used in subsequent imputations; the next variable with the second least amount of missing data is then imputed and used in subsequent imputations. The resulting quality of the matching can be assessed by comparing the marginal distribution of the target variable in the observed data (i.e. in the donor dataset) and in the dataset obtained from the matching. The distributions of the observed and imputed data were very close (see Figure A1) given the high explanatory power of the predictors included in the model of the target variable. This closeness increased the reliability of the statistical matching. In addition, it reduced the problem of conditional independence (CI), a required hypothesis for the validity of SM.

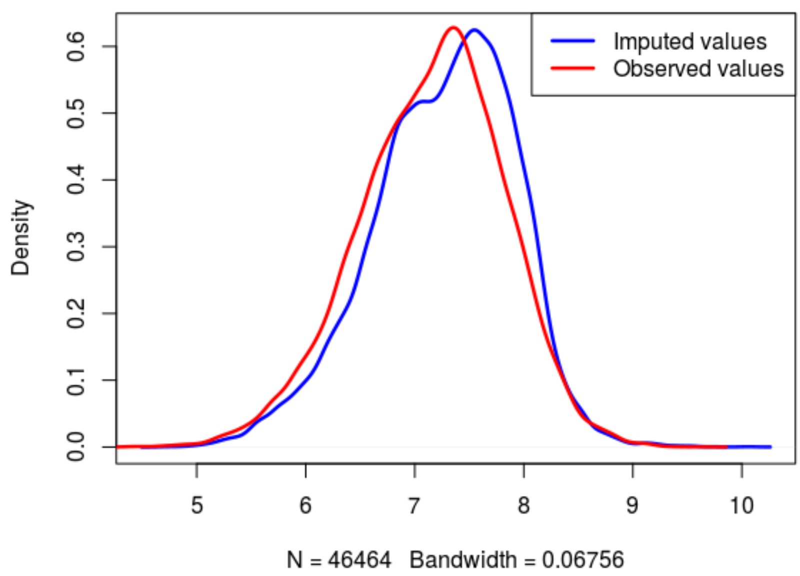

Figure A1: Probability density function of the observed target variable (*log expenditure*) from the HBS survey (2012) and probability density function of the imputed target variable in the final dataset.

The CI condition implies that, given three random variables (X, Y, Z) and the model defined by (XY, XZ), any relationship between Y and Z can be explained by the set of matching variables X.

In our study, the CI condition implied that any existing relationship between Y (household consumption expenditure) and Z (the binary indicator of child obesity) can be explained by the set of matching variables X. In other words, Y and Z may appear to be related if X is not considered. In order to meet this assumption, a third data set with complete information on (X, Y, Z) is needed. Since this dataset is normally not available, we checked the CI assumption using a variable that expresses a subjective evaluation regarding the household's economic condition ($Ec\_resource$, introduced in Table A1) as a proxy for the household's total consumption expenditure. This is a binary indicator equal to 1 if the household's economic condition is considered to be "very good" or "adequate" and equal to 0 if it is "scarce" or "absolutely insufficient".

The odds ratio of the logit model for obesity given $Ec\_resource$ indicated a statistically significant relationship (see column 1 in Table A2), implying that good or adequate economic resources at household level reduce the probability of child obesity. In Table A2 column 2 we consider a second model including $Ec\_resource$ and a subset of our matching variables as explanatory variables. All covariates were significant, but the variable $Ec\_resource$ had an odds ratio close to one implying a statistically insignificant effect on obesity. A similar check was conducted considering $Ec\_resource$ as the dependent variable and the obesity binary indicator as an independent variable, obtaining similar results [1]. We are therefore confident that the CI assumption is not violated.

Appendix B Robustness Checks

This Section collects the results for the full set of parameters and the robustness checks as described in Section 5.2. In particular, Tables B1 and B10 show results for the whole sample, while Tables B2 and B11 and Tables B3 and B12 consider families with $6 \leq age \leq 11$ and $12 \leq age \leq 14$ respectively. We consider similar subsets of data for families that have more than one child (see Tables B4 and B13 for the age group $6 \leq age \leq 14$, Tables B5 and B14 for the age group $6 \leq age \leq 11$ and Tables B6 and B15 for the age group $12 \leq age \leq 14$). The last subset of data considers families with only one child. The corresponding results are found in Tables B7 and B16 for the age group $6 \leq age \leq 14$,

[1] Available from the authors on request.

Table A2: Check on the CI assumption.†

	Dependent variable:	
	child obesity	
	Logit	*Logit*
	(1)	(2)
constant	0.442***	$1.61e+07$**
	(0.022)	$(1.06e+08)$
Ec_resource	0.876*	0.934
	(0.062)	(0.070)
Central or Northern region		0.526***
		(0.040)
age		1.256*
		(0.154)
age2		0.983***
		(0.006)
CPI		0.847***
		(0.052)
Observations	3,906	3,906
Pseudo R^2	0.001	0.030
Log Likelihood	-2,357.584	-2,288.024
LR Statistic	3.550* (df = 1)	126.220*** (df = 5)

†Standard errors in parentheses; *p<0.1; **p<0.05; ***p<0.01.

Tables B8 and B17 for the age group $6 \leq age \leq 11$ and Tables B9 and B18 for the age group $12 \leq age \leq 14$. If peers imitation increases with prolonged peer contact we should observe, as we do, a smaller peer effect for the second sub-group ($12 \leq age \leq 14$) as pre-adolescents spend more time than their younger counterpart outside the family environment. It is worth noticing that some specifications display some issues of multicollinearity. For such a reason in some cases we drop one regressor (Tables B6, B7, B8, B15, B16, B17) or two regressors (Tables B9, B18).

In addition, we consider a *fixed effect* approach where families are clustered in a restricted number of groups. The number of groups is chosen a priori (10 and 20) and for each group we introduce a dummy variable. The clusterisation is based on the characteristics of the adults in terms of occupational status, mother's education, presence of diabetes or chronic diseases, some characteristics about eating behaviours and the number of individuals in the family. Since most variables involved are binary we cannot use, for example, standard k-means algorithms. Hence, we resort to apply an approach that works for mixed data types based on Huang's k-prototypes algorithm (Szepannek, 2018). The results, reported in Table B19 and Table B20, match to a large extent the results displayed in the main text.

Table B1: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.913,1.695]	[0.568,2.046]	[0.925,1.689]	[0.706,1.526]	[0.301,1.991]	[0.711,1.513]	[0.679,1.530]	[0.328,1.956]	[0.690,1.529]
constant	[-1.744,1.173]	[-3.060,2.446]	[-1.744,1.130]	[-3.623,22.087]	[-13.77,19.093]	[-3.292,19.093]	[-3.576,22.700]	[-11.224,19.916]	[-3.329,18.600]
gender	[0.158,0.448]	[0.028,0.579]	[0.158,0.443]	[0.157,0.453]	[0.011,0.578]	[0.160,0.452]	[0.150,0.448]	[0.061,0.545]	[0.154,0.447]
age	[-0.121,0.383]	[-0.310,0.438]	[-0.113,0.375]	[-0.085,0.428]	[-0.415,0.697]	[-0.078,0.428]	[-0.099,0.420]	[-0.218,0.567]	[-0.092,0.416]
age^2	[-0.025,0.001]	[-0.036,0.012]	[-0.024,0.000]	[-0.028,-0.002]	[-0.043,0.015]	[-0.028,-0.002]	[-0.028,-0.001]	[-0.035,0.004]	[-0.027,-0.002]
Share of obese adults	[0.626,1.042]	[0.441,1.228]	[0.628,1.042]	[0.537,0.962]	[0.322,1.224]	[0.541,0.960]	[-0.031,0.651]	[-0.170,0.797]	[-0.023,0.651]
log expenditures (Euro)	[-0.284,-0.054]	[-0.387,0.048]	[-0.283,-0.056]	[-0.136,0.116]	[-0.294,0.269]	[-0.135,0.116]	[-0.117,0.139]	[-0.210,0.184]	[-0.115,0.136]
Household size				[-0.160,-0.002]	[-0.224,0.065]	[-0.159,-0.005]	[-0.158,0.007]	[-0.225,0.060]	[-0.156,0.005]
Central or Northern region				[-0.317,0.186]	[-0.557,0.442]	[-0.315,0.180]	[-0.262,0.251]	[-0.393,0.433]	[-0.259,0.249]
Employed RP				[-0.508,-0.037]	[-0.702,0.175]	[-0.507,-0.037]	[-0.530,-0.056]	[-0.666,0.157]	[-0.525,-0.059]
Student or housewife RP				[-0.963,-0.152]	[-1.425,0.214]	[-0.961,-0.167]	[-1.014,-0.192]	[-1.291,-0.034]	[-1.011,-0.199]
Retired or other emp. status RP				[-0.202,0.860]	[-0.687,1.554]	[-0.189,0.852]	[-0.264,0.818]	[-0.539,1.215]	[-0.256,0.808]
Mother's education (Master)				[-0.729,0.440]	[-1.292,1.048]	[-0.725,0.433]	[-0.742,0.446]	[-1.253,0.799]	[-0.735,0.426]
Mother's education (Bachelor)				[-1.291,0.194]	[-2.152,0.822]	[-1.281,0.191]	[-1.406,0.110]	[-1.889,0.655]	[-1.401,0.090]
Mother's education (High School)				[-0.803,0.315]	[-1.369,0.960]	[-0.781,0.301]	[-0.864,0.274]	[-1.444,0.610]	[-0.863,0.258]
Mother's education (Junior High)				[-0.623,0.493]	[-1.212,1.093]	[-0.607,0.488]	[-0.710,0.427]	[-1.225,0.772]	[-0.700,0.409]
Mother's education (Primary School)				[-0.482,0.749]	[-1.167,1.405]	[-0.466,0.729]	[-0.554,0.703]	[-1.018,1.080]	[-0.552,0.698]
CPI (2010=100)				[-0.226,0.011]	[-0.341,-0.018]	[-0.223,-0.018]	[-0.209,0.029]	[-0.297,0.010]	[-0.206,-0.007]
% obese adults by region				[0.032,0.077]	[0.010,0.113]	[0.032,0.076]	[0.035,0.080]	[0.017,0.097]	[0.035,0.080]
Mean adult weight (kg)							[0.008,0.038]	[-0.004,0.044]	[0.008,0.038]
Mean adult height (cm)							[-0.043,-0.006]	[-0.053,0.003]	[-0.042,-0.006]
Diabetes							[-0.304,0.530]	[-0.549,0.748]	[-0.300,0.526]
Obese children previous marriage							[1.476,3.398]	[0.813,4.446]	[1.510,3.382]
Chronic disease							[-0.205,0.155]	[-0.323,0.282]	[-0.200,0.154]
Siblings walking to school							[-0.763,0.041]	[-1.040,0.272]	[-0.762,0.034]
Siblings TV watching every day							[0.006,0.515]	[-0.132,0.697]	[0.011,0.513]
Parents soda drinks							[-0.139,0.271]	[-0.316,0.424]	[-0.137,0.267]
Parents smoking							[-0.028,0.288]	[-0.162,0.429]	[-0.025,0.286]
Children average fruit portions							[-0.534,0.266]	[-0.780,0.678]	[-0.530,0.251]
Adults average fruit portions							[-0.229,0.548]	[-0.589,0.793]	[-0.226,0.542]
N	3737	3737	3737	3737	3737	3737	3737	3737	3737

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families.

Table B2: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.949,1.906]	[0.512,2.331]	[0.957,1.905]	[0.723,1.726]	[0.170,2.203]	[0.724,1.710]	[0.671,1.705]	[0.439,2.267]	[0.679,1.695]
constant	[-1.440,3.801]	[-3.805,6.106]	[-1.355,3.768]	[-6.249,24.249]	[-26.552,23.021]	[-5.521,23.021]	[-6.724,24.517]	[-15.053,23.818]	[-6.415,22.378]
gender	[-0.107,0.234]	[-0.263,0.387]	[-0.102,0.233]	[-0.120,0.229]	[-0.302,0.370]	[-0.119,0.228]	[-0.126,0.226]	[-0.259,0.388]	[-0.122,0.225]
age	[-0.784,0.383]	[-1.136,0.384]	[-0.78,0.360]	[-0.752,0.441]	[-1.307,1.015]	[-0.744,0.429]	[-0.776,0.430]	[-1.061,1.007]	[-0.768,0.422]
age^2	[-0.026,0.042]	[-0.058,0.073]	[-0.026,0.042]	[-0.030,0.040]	[-0.062,0.071]	[-0.030,0.039]	[-0.030,0.041]	[-0.061,0.060]	[-0.029,0.040]
Share of obese adults	[0.536,1.025]	[0.319,1.251]	[0.541,1.018]	[0.457,0.959]	[0.265,1.173]	[0.458,0.953]	[0.061,0.872]	[-0.268,1.158]	[0.063,0.870]
log expenditures (Euro)	[-0.307,-0.036]	[-0.431,0.087]	[-0.306,-0.038]	[-0.141,0.157]	[-0.311,0.317]	[-0.140,0.152]	[-0.118,0.185]	[-0.206,0.269]	[-0.115,0.183]
Household size				[-0.176,0.011]	[-0.248,0.126]	[-0.172,0.009]	[-0.173,0.022]	[-0.305,0.061]	[-0.172,0.021]
Central or Northern region				[-0.405,0.178]	[-0.664,0.457]	[-0.403,0.174]	[-0.339,0.256]	[-0.634,0.459]	[-0.336,0.249]
Employed RP				[-0.599,-0.02]	[-0.888,0.199]	[-0.592,-0.021]	[-0.616,-0.034]	[-0.838,0.217]	[-0.614,-0.039]
Student or housewife RP				[-1.141,-0.175]	[-1.774,0.230]	[-1.126,-0.175]	[-1.209,-0.227]	[-1.530,0.131]	[-1.194,-0.238]
Retired or other emp. status RP				[-0.670,0.678]	[-1.208,1.522]	[-0.656,0.667]	[-0.711,0.666]	[-1.265,1.300]	[-0.695,0.652]
Mother's education (Master)				[-1.091,0.372]	[-1.665,1.043]	[-1.091,0.359]	[-1.150,0.344]	[-1.423,0.929]	[-1.138,0.335]
Mother's education (Bachelor)				[-1.763,0.049]	[-2.674,0.722]	[-1.748,0.036]	[-1.880,-0.030]	[-2.645,0.950]	[-1.846,-0.030]
Mother's education (High School)				[-1.155,0.261]	[-1.838,1.132]	[-1.148,0.232]	[-1.253,0.197]	[-1.666,0.773]	[-1.247,0.182]
Mother's education (Junior High)				[-1.027,0.390]	[-1.547,1.107]	[-1.011,0.383]	[-1.159,0.296]	[-1.640,0.926]	[-1.148,0.278]
Mother's education (Primary School)				[-0.860,0.712]	[-1.505,1.562]	[-0.854,0.695]	[-0.979,0.636]	[-1.443,1.270]	[-0.977,0.612]
CPI (2010=100)				[-0.230,0.048]	[-0.392,0.058]	[-0.225,0.046]	[-0.209,0.071]	[-0.269,0.083]	[-0.208,0.062]
% obese adults by region				[0.031,0.084]	[0.006,0.109]	[0.032,0.084]	[0.036,0.089]	[0.012,0.118]	[0.037,0.089]
Mean adult weight (kg)							[-0.007,0.030]	[-0.015,0.043]	[-0.007,0.029]
Mean adult height (cm)							[-0.042,0.002]	[-0.055,0.013]	[-0.041,0.002]
Diabetes							[-0.284,0.732]	[-0.454,1.088]	[-0.282,0.730]
Obese children previous marriage							[1.864,5.025]	[1.301,8.052]	[1.915,4.984]
Chronic disease							[-0.311,0.125]	[-0.489,0.320]	[-0.309,0.124]
Siblings walking to school							[-0.627,0.330]	[-1.125,0.693]	[-0.611,0.326]
Siblings TV watching every day							[-0.103,0.471]	[-0.308,0.771]	[-0.101,0.466]
Parents soda drinks							[-0.188,0.285]	[-0.362,0.438]	[-0.184,0.284]
Parents smoking							[-0.041,0.333]	[-0.146,0.449]	[-0.038,0.328]
Children average fruit portions							[-0.943,0.16]	[-1.282,0.436]	[-0.935,0.158]
Adults average fruit portions							[-0.148,0.93]	[-0.436,1.264]	[-0.144,0.921]
N	2503	2503	2503	2503	2503	2503	2503	2503	2503

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $6 \leq age \leq 11$.

Table B3: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity $12 \leq age \leq 14$								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.439,1.848]	[-0.201,2.439]	[0.444,1.825]	[0.264,1.759]	[-0.542,2.511]	[0.291,1.74]	[0.432,2.036]	[-0.449,2.849]	[0.450,2.016]
constant	[-27.662,72.548]	[-60.429,74.899]	[-26.597,71.677]	[-22.476,89.346]	[-56.28,93.211]	[-13.341,88.44]	[-12.926,102.045]	[-64.176,106.904]	[-10.059,101.666]
gender	[0.659,1.237]	[0.420,1.494]	[0.661,1.229]	[0.683,1.271]	[0.455,1.663]	[0.687,1.260]	[0.681,1.282]	[0.401,1.592]	[0.690,1.279]
age	[-11.176,4.290]	[-12.660,-0.408]	[-11.159,-0.408]	[-10.468,5.271]	[-12.017,1.488]	[-10.298,1.488]	[-12.037,4.041]	[-13.973,0.461]	[-11.947,0.208]
age^2	[-0.173,0.423]	[-0.370,0.434]	[-0.166,0.414]	[-0.211,0.395]	[-0.438,0.436]	[-0.162,0.389]	[-0.164,0.455]	[-0.311,0.532]	[-0.164,0.444]
Share of obese adults	[0.587,1.390]	[0.249,1.734]	[0.602,1.380]	[0.469,1.291]	[0.155,1.763]	[0.480,1.276]	[-0.700,0.630]	[-1.340,1.310]	[-0.671,0.614]
log expenditures (Euro)	[-0.390,0.054]	[-0.581,0.240]	[-0.381,0.049]	[-0.287,0.194]	[-0.584,0.491]	[-0.280,0.187]	[-0.299,0.197]	[-0.524,0.448]	[-0.298,0.193]
Household size				[-0.209,0.093]	[-0.362,0.234]	[-0.205,0.090]	[-0.202,0.115]	[-0.405,0.267]	[-0.195,0.111]
Central or Northern region				[-0.401,0.610]	[-0.938,1.202]	[-0.376,0.597]	[-0.376,0.652]	[-0.830,1.134]	[-0.354,0.638]
Employed RP				[-0.675,0.164]	[-1.083,0.678]	[-0.674,0.162]	[-0.735,0.126]	[-1.222,0.620]	[-0.719,0.118]
Student or housewife RP				[-1.176,0.371]	[-2.523,1.163]	[-1.146,0.344]	[-1.211,0.358]	[-2.425,1.325]	[-1.175,0.340]
Retired or other emp. status RP				[-0.024,1.734]	[-1.423,2.433]	[0.018,1.693]	[-0.274,1.538]	[-1.429,2.736]	[-0.251,1.516]
Mother's education (Master)				[-0.828,1.315]	[-1.914,2.852]	[-0.807,1.263]	[-0.737,1.468]	[-1.945,2.658]	[-0.689,1.403]
Mother's education (Bachelor)				[-1.324,1.447]	[-3.441,2.782]	[-1.304,1.399]	[-1.560,1.352]	[-3.202,2.845]	[-1.553,1.318]
Mother's education (High School)				[-0.868,1.108]	[-1.665,2.272]	[-0.830,1.079]	[-0.920,1.112]	[-1.632,2.348]	[-0.909,1.102]
Mother's education (Junior High)				[-0.544,1.411]	[-1.322,3.039]	[-0.530,1.365]	[-0.581,1.429]	[-1.328,2.657]	[-0.564,1.409]
Mother's education (Primary School)				[-0.477,1.636]	[-1.326,2.930]	[-0.466,1.598]	[-0.506,1.666]	[-1.523,3.027]	[-0.466,1.602]
CPI (2010=100)				[-0.411,0.060]	[-0.627,0.271]	[-0.409,0.054]	[-0.415,0.061]	[-0.578,0.322]	[-0.415,0.058]
% obese adults by region				[0.006,0.093]	[-0.035,0.129]	[0.007,0.093]	[0.003,0.092]	[-0.035,0.145]	[0.004,0.091]
Mean adult weight (kg)							[0.021,0.079]	[-0.006,0.111]	[0.022,0.078]
Mean adult height (cm)							[-0.069,0.002]	[-0.108,0.041]	[-0.068,0.001]
Diabetes							[-0.818,0.724]	[-1.905,1.451]	[-0.786,0.705]
Obese children previous marriage							[-0.236,2.715]	[-1.696,4.366]	[-0.227,2.712]
Chronic disease							[-0.226,0.437]	[-0.681,0.754]	[-0.217,0.435]
Siblings walking to school							[-1.754,-0.172]	[-3.000,0.554]	[-1.744,-0.200]
Siblings TV watching every day							[-0.034,1.147]	[-0.681,1.818]	[-0.025,1.136]
Parents soda drinks							[-0.401,0.466]	[-0.893,0.862]	[-0.397,0.454]
Parents smoking							[-0.181,0.436]	[-0.509,0.748]	[-0.179,0.431]
Children average fruit portions							[-0.426,0.800]	[-1.071,1.389]	[-0.400,0.793]
Adults average fruit portions							[-0.655,0.524]	[-1.180,1.134]	[-0.642,0.503]
N	1234	1234	1234	1234	1234	1234	1234	1234	1234

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $12 \leq age \leq 14$.

Table B4: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[1.103,1.953]	[0.713,2.345]	[1.112,1.946]	[0.794,1.670]	[0.385,2.008]	[0.795,1.663]	[0.716,1.612]	[0.507,1.977]	[0.729,1.606]
constant	[-1.660,2.054]	[-3.345,3.745]	[-1.593,1.993]	[-8.226,23.641]	[-25.045,18.736]	[-8.158,18.736]	[-8.456,24.196]	[-17.171,21.069]	[-8.304,18.853]
gender	[0.089,0.457]	[-0.078,0.626]	[0.090,0.450]	[0.076,0.452]	[-0.123,0.594]	[0.080,0.449]	[0.069,0.449]	[-0.029,0.581]	[0.070,0.445]
age	[-0.253,0.391]	[-0.537,0.473]	[-0.242,0.388]	[-0.212,0.444]	[-0.550,0.902]	[-0.198,0.433]	[-0.220,0.445]	[-0.398,0.733]	[-0.215,0.436]
age^2	[-0.026,0.007]	[-0.041,0.021]	[-0.026,0.006]	[-0.030,0.004]	[-0.052,0.022]	[-0.029,0.003]	[-0.029,0.004]	[-0.045,0.012]	[-0.029,0.004]
Share of obese adults	[0.566,1.094]	[0.333,1.329]	[0.573,1.089]	[0.456,0.999]	[0.207,1.258]	[0.462,0.993]	[-0.015,0.840]	[-0.263,1.377]	[-0.014,0.831]
log expenditures (Euro)	[-0.344,-0.049]	[-0.476,0.083]	[-0.343,-0.050]	[-0.190,0.133]	[-0.359,0.318]	[-0.188,0.127]	[-0.188,0.141]	[-0.315,0.242]	[-0.186,0.135]
Household size				[-0.140,0.083]	[-0.271,0.162]	[-0.135,0.079]	[-0.130,0.099]	[-0.194,0.182]	[-0.129,0.098]
Central or Northern region				[-0.404,0.255]	[-0.707,0.657]	[-0.404,0.244]	[-0.355,0.319]	[-0.649,0.569]	[-0.354,0.310]
Employed RP				[-0.569,0.021]	[-0.877,0.306]	[-0.566,0.019]	[-0.592,0.004]	[-0.906,0.196]	[-0.583,-0.005]
Student or housewife RP				[-1.291,-0.242]	[-1.762,0.381]	[-1.286,-0.247]	[-1.335,-0.273]	[-1.697,0.000]	[-1.320,-0.274]
Retired or other emp. status RP				[-1.403,0.589]	[-2.489,1.504]	[-1.400,0.576]	[-1.448,0.568]	[-2.144,1.335]	[-1.441,0.562]
Mother's education (Master)				[-1.263,0.693]	[-2.142,2.147]	[-1.232,0.674]	[-1.372,0.631]	[-1.857,1.321]	[-1.344,0.614]
Mother's education (Bachelor)				[-1.668,0.577]	[-2.750,1.886]	[-1.627,0.574]	[-1.831,0.470]	[-2.643,1.046]	[-1.823,0.450]
Mother's education (High School)				[-1.256,0.659]	[-2.012,2.489]	[-1.239,0.625]	[-1.415,0.548]	[-1.853,1.023]	[-1.389,0.529]
Mother's education (Junior High)				[-1.068,0.849]	[-1.872,2.556]	[-1.067,0.812]	[-1.239,0.728]	[-1.713,1.26]	[-1.232,0.720]
Mother's education (Primary School)				[-0.979,1.060]	[-1.972,2.707]	[-0.932,1.053]	[-1.119,0.977]	[-1.912,1.691]	[-1.111,0.963]
CPI (2010=100)				[-0.237,0.055]	[-0.362,0.028]	[-0.232,0.028]	[-0.221,0.072]	[-0.300,0.054]	[-0.221,0.032]
% obese adults by region				[0.031,0.089]	[0.008,0.115]	[0.031,0.088]	[0.035,0.094]	[0.003,0.116]	[0.035,0.093]
Mean adult weight (kg)							[-0.001,0.037]	[-0.013,0.050]	[0.000,0.037]
Mean adult height (cm)							[-0.044,0.003]	[-0.062,0.018]	[-0.043,0.003]
Diabetes							[-0.664,0.420]	[-1.044,0.751]	[-0.645,0.407]
Obese children previous marriage							[1.224,3.658]	[0.220,4.908]	[1.262,3.629]
Chronic disease							[-0.328,0.144]	[-0.438,0.342]	[-0.328,0.137]
Siblings walking to school							[-0.768,0.078]	[-1.020,0.288]	[-0.756,0.076]
Siblings TV watching every day							[-0.064,0.581]	[-0.300,0.869]	[-0.052,0.574]
Parents soda drinks							[-0.169,0.358]	[-0.319,0.536]	[-0.164,0.355]
Parents smoking							[-0.127,0.282]	[-0.259,0.461]	[-0.121,0.279]
Children average fruit portions							[-0.115,1.089]	[-0.472,1.579]	[-0.099,1.082]
Adults average fruit portions							[-1.054,0.126]	[-1.549,0.445]	[-1.046,0.123]
N	2319	2319	2319	2319	2319	2319	2319	2319	2319

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child.

Table B5: Confidence intervals and confidence sets for the logit model.†

	Dependent variable: child obesity $6 \leq age \leq 11$								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[1.090,2.101]	[0.640,2.567]	[1.099,2.085]	[0.794,1.840]	[0.224,2.411]	[0.798,1.837]	[0.715,1.789]	[0.519,2.140]	[0.715,1.780]
constant	[-1.080,5.432]	[-3.989,8.418]	[-0.995,5.423]	[-12.764,23.615]	[-31.300,24.304]	[-11.993,21.987]	[-11.813,25.514]	[-20.675,25.353]	[-11.360,22.613]
gender	[-0.127,0.292]	[-0.315,0.477]	[-0.126,0.289]	[-0.161,0.268]	[-0.331,0.472]	[-0.161,0.261]	[-0.175,0.260]	[-0.315,0.371]	[-0.169,0.254]
age	[-1.083,0.358]	[-1.595,0.318]	[-1.067,0.318]	[-1.119,0.360]	[-1.665,1.172]	[-1.092,0.341]	[-1.183,0.313]	[-1.599,0.594]	[-1.178,0.306]
age^2	[-0.026,0.059]	[-0.065,0.098]	[-0.024,0.058]	[-0.026,0.061]	[-0.075,0.096]	[-0.025,0.060]	[-0.023,0.065]	[-0.040,0.088]	[-0.022,0.065]
Share of obese adults	[0.492,1.09]	[0.223,1.358]	[0.497,1.085]	[0.372,0.991]	[0.147,1.255]	[0.382,0.987]	[0.057,1.042]	[-0.221,1.346]	[0.064,1.029]
log expenditures (Euro)	[-0.389,-0.054]	[-0.539,0.099]	[-0.383,-0.057]	[-0.202,0.167]	[-0.383,0.367]	[-0.201,0.162]	[-0.185,0.191]	[-0.310,0.280]	[-0.179,0.190]
Household size				[-0.172,0.084]	[-0.285,0.188]	[-0.170,0.083]	[-0.157,0.106]	[-0.317,0.198]	[-0.156,0.104]
Central or Northern region				[-0.503,0.234]	[-0.787,0.728]	[-0.496,0.223]	[-0.430,0.325]	[-0.743,0.440]	[-0.420,0.321]
Employed RP				[-0.742,-0.048]	[-1.079,0.325]	[-0.739,-0.058]	[-0.760,-0.059]	[-0.961,0.237]	[-0.756,-0.066]
Student or housewife RP				[-1.567,-0.343]	[-2.149,0.180]	[-1.561,-0.361]	[-1.615,-0.375]	[-2.173,-0.110]	[-1.611,-0.381]
Retired or other emp. status RP				[-1.742,0.408]	[-2.846,1.328]	[-1.708,0.4]	[-1.789,0.396]	[-2.799,1.104]	[-1.774,0.355]
Mother's education (Master)				[-1.860,0.291]	[-3.223,1.211]	[-1.835,0.271]	[-2.015,0.192]	[-2.770,0.806]	[-2.011,0.192]
Mother's education (Bachelor)				[-2.066,0.370]	[-3.334,1.703]	[-2.062,0.330]	[-2.245,0.253]	[-3.448,1.148]	[-2.241,0.220]
Mother's education (High School)				[-1.752,0.349]	[-2.900,1.400]	[-1.727,0.315]	[-1.962,0.197]	[-2.628,0.902]	[-1.950,0.189]
Mother's education (Junior High)				[-1.595,0.510]	[-2.876,1.455]	[-1.564,0.492]	[-1.817,0.349]	[-2.576,1.098]	[-1.797,0.319]
Mother's education (Primary School)				[-1.442,0.812]	[-2.860,1.716]	[-1.427,0.792]	[-1.632,0.692]	[-2.580,1.419]	[-1.610,0.652]
CPI (2010=100)				[-0.210,0.119]	[-0.390,0.112]	[-0.204,0.112]	[-0.196,0.136]	[-0.298,0.143]	[-0.191,0.120]
% obese adults by region				[0.027,0.093]	[-0.001,0.127]	[0.027,0.092]	[0.032,0.099]	[0.006,0.124]	[0.033,0.099]
Mean adult weight (kg)							[-0.014,0.029]	[-0.022,0.041]	[-0.014,0.029]
Mean adult height (cm)							[-0.049,0.004]	[-0.067,0.014]	[-0.048,0.004]
Diabetes							[-0.799,0.479]	[-1.149,0.867]	[-0.783,0.460]
Obese children previous marriage							[1.86,6.522]	[1.153,10.009]	[1.868,6.520]
Chronic disease							[-0.357,0.189]	[-0.479,0.337]	[-0.355,0.189]
Siblings walking to school							[-0.663,0.334]	[-0.960,0.585]	[-0.648,0.320]
Siblings TV watching every day							[-0.146,0.568]	[-0.252,0.825]	[-0.144,0.564]
Parents soda drinks							[-0.190,0.404]	[-0.430,0.586]	[-0.184,0.402]
Parents smoking							[-0.112,0.357]	[-0.279,0.561]	[-0.109,0.349]
Children average fruit portions							[-0.271,1.407]	[-0.854,2.028]	[-0.243,1.388]
Adults average fruit portions							[-1.367,0.284]	[-1.971,0.748]	[-1.367,0.281]
N	1694	1694	1694	1694	1694	1694	1694	1694	1694

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child $6 \leq age \leq 11$.

Table B6: Confidence intervals and confidence sets for the logit model.[†]

	Dependent variable: child obesity $12 \leq age \leq 14$								
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)	Logit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.679,2.309]	[-0.018,2.987]	[0.694,2.276]	[0.793,1.669]	[0.411,2.095]	[0.803,1.653]	[0.714,1.609]	[0.325,2.102]	[0.720,1.600]
constant	[-49.534,93.726]	[-94.087,86.266]	[-49.529,86.266]	[-8.615,23.148]	[-18.642,19.116]	[-8.289,19.116]	[-9.136,23.345]	[-25.313,22.703]	[-8.869,22.046]
gender	[0.536,1.345]	[0.237,1.700]	[0.549,1.342]	[0.076,0.452]	[-0.115,0.601]	[0.080,0.449]	[0.069,0.449]	[-0.086,0.634]	[0.074,0.445]
age	[-14.560,7.564]	[-14.277,0.684]	[-14.277,0.684]	[-0.210,0.446]	[-0.468,0.695]	[-0.210,0.436]	[-0.217,0.447]	[-0.589,0.806]	[-0.208,0.440]
age^2	[-0.298,0.554]	[-0.554,0.519]	[-0.292,0.519]	[-0.030,0.004]	[-0.042,0.017]	[-0.030,0.004]	[-0.030,0.004]	[-0.049,0.022]	[-0.029,0.004]
Share of obese adults	[0.334,1.479]	[-0.151,1.988]	[0.346,1.465]	[0.460,1.003]	[0.143,1.315]	[0.462,0.995]	[-0.004,0.850]	[-0.433,1.411]	[0.014,0.834]
log expenditures (Euro)	[-0.431,0.202]	[-0.705,0.467]	[-0.419,0.195]	[-0.188,0.134]	[-0.422,0.312]	[-0.185,0.134]	[-0.185,0.143]	[-0.365,0.314]	[-0.180,0.143]
Household size				[-0.143,0.079]	[-0.285,0.190]	[-0.141,0.075]	[-0.135,0.093]	[-0.308,0.241]	[-0.131,0.091]
Central or Northern region				[-0.399,0.260]	[-0.737,0.577]	[-0.392,0.259]	[-0.351,0.323]	[-0.706,0.691]	[-0.339,0.310]
Employed RP				[-0.57,0.020]	[-0.884,0.318]	[-0.568,0.014]	[-0.594,0.002]	[-0.925,0.312]	[-0.588,0.000]
Student or housewife RP				[-1.293,-0.244]	[-2.008,0.124]	[-1.276,-0.264]	[-1.337,-0.276]	[-2.020,0.291]	[-1.319,-0.292]
Retired or other emp. status RP				[-1.367,0.619]	[-2.563,1.551]	[-1.358,0.596]	[-1.390,0.616]	[-2.526,1.791]	[-1.349,0.613]
Mother's education (Master)				[-0.302,0.308]	[-0.700,0.559]	[-0.293,0.305]	[-0.260,0.358]	[-0.611,0.741]	[-0.256,0.345]
Mother's education (Bachelor)				[-0.899,0.368]	[-1.759,0.989]	[-0.899,0.351]	[-0.920,0.378]	[-1.888,1.087]	[-0.896,0.366]
Mother's education (Junior High)				[-0.037,0.399]	[-0.229,0.606]	[-0.035,0.395]	[-0.057,0.391]	[-0.297,0.609]	[-0.050,0.390]
Mother's education (Primary School)				[-0.081,0.749]	[-0.424,1.244]	[-0.070,0.739]	[-0.067,0.780]	[-0.674,1.209]	[-0.065,0.771]
CPI (2010=100)				[-0.236,0.055]	[-0.379,0.007]	[-0.234,0.007]	[-0.220,0.073]	[-0.408,0.085]	[-0.219,0.059]
% obese adults by region				[0.031,0.089]	[0.006,0.108]	[0.032,0.088]	[0.035,0.094]	[0.009,0.129]	[0.035,0.094]
Mean adult weight (kg)							[-0.001,0.037]	[-0.020,0.058]	[0.000,0.036]
Mean adult height (cm)							[-0.042,0.004]	[-0.067,0.03]	[-0.041,0.004]
Diabetes							[-0.660,0.424]	[-1.215,0.859]	[-0.650,0.419]
Obese children previous marriage							[1.217,3.649]	[0.055,5.994]	[1.255,3.594]
Chronic disease							[-0.335,0.137]	[-0.589,0.379]	[-0.325,0.135]
Siblings walking to school							[-0.765,0.081]	[-1.152,0.566]	[-0.753,0.080]
Siblings TV watching every day							[-0.071,0.572]	[-0.417,0.894]	[-0.060,0.563]
Parents soda drinks							[-0.170,0.357]	[-0.440,0.723]	[-0.169,0.347]
Parents smoking							[-0.123,0.286]	[-0.301,0.486]	[-0.118,0.279]
Children average fruit portions							[-0.119,1.092]	[-0.781,1.721]	[-0.099,1.089]
Adults average fruit portions							[-1.060,0.126]	[-1.696,0.735]	[-1.057,0.121]
N	625	625	625	625	625	625	625	625	625

[†]This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child and $12 \leq age \leq 14$.

Table B7: Confidence intervals for the logit model.[†]

	Dependent variable: child obesity		
	Logit (1)	Logit (2)	Logit (3)
constant	[-3.946,0.878]	[-9.973,34.586]	[-7.155,39.029]
gender	[0.111,0.588]	[0.124,0.609]	[0.105,0.597]
age	[-0.149,0.682]	[-0.137,0.71]	[-0.183,0.677]
age^2	[-0.039,0.002]	[-0.041,0.001]	[-0.040,0.003]
Share of obese adults	[0.520,1.197]	[0.443,1.138]	[-0.457,0.711]
log expenditures (Euro)	[-0.264,0.112]	[-0.161,0.251]	[-0.144,0.277]
Household size		[-0.180,0.105]	[-0.227,0.069]
Central or Northern region		[-0.456,0.332]	[-0.449,0.356]
Employed RP		[-0.651,0.139]	[-0.678,0.121]
Student or housewife RP		[-0.897,0.416]	[-0.948,0.389]
Retired or other emp. status RP		[-0.199,1.180]	[-0.286,1.137]
Mother's education (Master)		[-0.709,0.825]	[-0.648,0.920]
Mother's education (Bachelor)		[-1.879,0.398]	[-1.985,0.347]
Mother's education (High School)		[-0.938,0.481]	[-0.916,0.534]
Mother's education (Junior High)		[-0.797,0.613]	[-0.843,0.602]
Mother's education (Primary)		[-0.629,1.001]	[-0.627,1.050]
CPI (2010=100)		[-0.351,0.062]	[-0.357,0.063]
% obese adults by region		[0.006,0.079]	[0.002,0.076]
Mean adults weight (kg)			[0.007,0.060]
Mean adults height (cm)			[-0.064,-0.002]
Diabetes			[-0.140,1.24]
Obese children previous marriage			[1.182,4.561]
Chronic disease			[-0.190,0.380]
Siblings watching TV every day			[-0.110,0.746]
Parents soda drinks			[-0.279,0.388]
Parents smoking			[-0.070,0.441]
Children average fruit portions			[-1.140,-0.067]
Adults average fruit portions			[0.133,1.157]
N	1418	1418	1418

[†]This table provides 95% confidence intervals using the standard logit model as if it were identified. The models are estimated using families with one child.

Table B8: Confidence intervals for the logit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)		
	Logit (1)	Logit (2)	Logit (3)
constant	[-5.800,3.224]	[-8.079,50.447]	[-10.416,50.707]
gender	[-0.274,0.322]	[-0.287,0.324]	[-0.325,0.298]
age	[-0.838,1.180]	[-0.816,1.271]	[-0.753,1.378]
age^2	[-0.072,0.045]	[-0.078,0.044]	[-0.086,0.038]
Share of obese adults	[0.330,1.185]	[0.322,1.205]	[-0.416,1.092]
log expenditures (Euro)	[-0.260,0.212]	[-0.186,0.343]	[-0.183,0.359]
Household size		[-0.198,0.172]	[-0.266,0.125]
Central or Northern region		[-0.600,0.372]	[-0.598,0.401]
Employed RP		[-0.648,0.428]	[-0.685,0.399]
Student or housewife RP		[-0.989,0.66]	[-1.083,0.603]
Retired or other emp. status RP		[-0.542,1.377]	[-0.737,1.295]
Mother's education (Master)		[-0.861,1.208]	[-0.775,1.368]
Mother's education (Bachelor)		[-3.762,-0.098]	[-3.694,0.051]
Mother's education (High School)		[-1.286,0.689]	[-1.206,0.851]
Mother's education (Junionr High)		[-1.264,0.714]	[-1.273,0.800]
Mother's education (Primary)		[-1.167,1.178]	[-1.09,1.373]
CPI (2010=100)		[-0.497,0.039]	[-0.477,0.069]
% obese adults by region		[0.005,0.096]	[0.003,0.097]
Mean adults weight (kg)			[-0.016,0.053]
Mean adults height (cm)			[-0.059,0.022]
Diabetes			[0.124,2.052]
Obese children previous marriage			[0.882,5.666]
Chronic disease			[-0.484,0.269]
Siblings watching tv every day			[-0.298,0.705]
Parents soda drinks			[-0.408,0.410]
Parents smoking			[-0.203,0.445]
Children average fruit portions			[-2.023,-0.356]
Adults average fruit portions			[0.353,1.972]
N	1694	1694	1694

†This table provides 95% confidence intervals using the standard logit model as if it were identified. The models are estimated using families with one child and $6 \leq age \leq 11$.

Table B9: Confidence intervals for the logit model.†

	Dependent variable: child obesity ($12 \leq age \leq 14$)		
	Logit (1)	Logit (2)	Logit (3)
constant	[-44.303,96.891]	[-56.468,104.276]	[-49.543,117.459]
gender	[0.540,1.376]	[0.547,1.406]	[0.524,1.406]
age	[-14.882,6.902]	[-14.413,7.953]	[-14.962,8.133]
age^2	[-0.274,0.564]	[-0.314,0.547]	[-0.322,0.567]
Share of obese adults	[0.515,1.656]	[0.381,1.558]	[-1.084,0.899]
log expenditures (Euro)	[-0.498,0.134]	[-0.410,0.274]	[-0.413,0.304]
Household size		[-0.302,0.161]	[-0.351,0.132]
Central or Northern region		[-0.624,0.764]	[-0.582,0.840]
Employed RP		[-0.994,0.207]	[-1.048,0.198]
Student or housewife RP		[-1.331,1.011]	[-1.323,1.068]
Retired or other emp. status RP		[-0.313,1.661]	[-0.516,1.534]
Mother's education (Master)		[-1.554,0.531]	[-1.456,0.670]
Mother's education (High School)		[-0.908,1.606]	[-1.215,1.528]
Mother's education (Junior high)		[-0.183,0.746]	[-0.227,0.735]
Mother's education (Primary)		[-0.175,1.348]	[-0.237,1.361]
CPI (2010=100)		[-0.378,0.297]	[-0.423,0.267]
% obese adults by region		[-0.028,0.095]	[-0.032,0.095]
Mean adults weight (kg)			[0.011,0.098]
Mean adults height (cm)			[-0.106,-0.002]
Diabetes			[-1.157,1.076]
Obese children previous marriage			[0.013,5.400]
Chronic disease			[-0.061,0.860]
Siblings watching TV every day			[-0.234,1.519]
Parents soda drinks			[-0.292,0.945]
Parents smoking			[-0.190,0.686]
Children average fruit portions			[-0.811,0.829]
Adults average fruit portions			[-0.610,0.940]
N	625	625	625

†This table provides 95% confidence intervals using the standard logit model as if it were identified. The models are estimated using families with one child and $12 \leq age \leq 14$.

Table B10: Confidence intervals and confidence sets for the probit model.[†]

	Dependent variable: child obesity								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.560,1.039]	[0.344,1.248]	[0.568,1.035]	[0.435,0.933]	[0.158,1.282]	[0.442,0.930]	[0.421,0.934]	[0.067,1.313]	[0.432,0.923]
constant	[-1.043,0.704]	[-1.822,1.485]	[-1.035,0.698]	[-2.390,13.116]	[-6.889,14.311]	[-2.137,12.849]	[-2.335,13.520]	[-12.436,17.633]	[-2.055,13.337]
gender	[0.101,0.275]	[0.026,0.351]	[0.105,0.271]	[0.100,0.276]	[-0.002,0.389]	[0.101,0.274]	[0.094,0.272]	[-0.017,0.389]	[0.098,0.270]
age	[-0.074,0.226]	[-0.190,0.290]	[-0.072,0.224]	[-0.051,0.254]	[-0.274,0.428]	[-0.047,0.251]	[-0.057,0.251]	[-0.265,0.438]	[-0.052,0.246]
age^2	[-0.015,0.000]	[-0.021,0.007]	[-0.014,0.000]	[-0.016,-0.001]	[-0.026,0.010]	[-0.016,-0.001]	[-0.016,-0.001]	[-0.025,0.009]	[-0.016,-0.001]
Share of obese adults	[0.381,0.629]	[0.269,0.740]	[0.384,0.625]	[0.328,0.582]	[0.153,0.746]	[0.333,0.578]	[-0.021,0.386]	[-0.295,0.677]	[-0.020,0.382]
log expenditures (Euro)	[-0.171,-0.033]	[-0.231,0.029]	[-0.170,-0.036]	[-0.082,0.068]	[-0.204,0.159]	[-0.080,0.067]	[-0.069,0.083]	[-0.179,0.184]	[-0.069,0.082]
Household size				[-0.096,-0.003]	[-0.160,0.052]	[-0.094,-0.004]	[-0.094,0.003]	[-0.159,0.070]	[-0.092,0.001]
Central or Northern region				[-0.186,0.115]	[-0.383,0.316]	[-0.185,0.111]	[-0.153,0.153]	[-0.362,0.332]	[-0.152,0.150]
Employed RP				[-0.308,-0.022]	[-0.502,0.171]	[-0.305,-0.026]	[-0.322,-0.035]	[-0.511,0.129]	[-0.317,-0.039]
Student or housewife RP				[-0.562,-0.085]	[-0.847,0.295]	[-0.559,-0.086]	[-0.593,-0.111]	[-1.000,0.185]	[-0.581,-0.114]
Retired or other emp. status RP				[-0.115,0.530]	[-0.488,0.911]	[-0.106,0.530]	[-0.153,0.505]	[-0.600,0.952]	[-0.145,0.497]
Mother's education (Master)				[-0.442,0.258]	[-0.856,0.746]	[-0.435,0.244]	[-0.448,0.26]	[-0.885,0.713]	[-0.433,0.245]
Mother's education (Bachelor)				[-0.766,0.105]	[-1.329,0.617]	[-0.759,0.086]	[-0.840,0.047]	[-1.382,0.583]	[-0.826,0.027]
Mother's education (High School)				[-0.486,0.184]	[-0.848,0.698]	[-0.473,0.183]	[-0.522,0.155]	[-0.920,0.591]	[-0.508,0.148]
Mother's education (Junior High)				[-0.382,0.287]	[-0.761,0.776]	[-0.373,0.279]	[-0.436,0.242]	[-0.842,0.686]	[-0.426,0.238]
Mother's education (Primary School)				[-0.296,0.444]	[-0.815,0.988]	[-0.287,0.442]	[-0.340,0.411]	[-0.798,0.887]	[-0.338,0.411]
CPI (2010=100)				[-0.134,0.008]	[-0.190,0.021]	[-0.132,0.007]	[-0.124,0.020]	[-0.207,0.070]	[-0.121,0.018]
% obese adults by region				[0.019,0.046]	[0.001,0.064]	[0.020,0.046]	[0.021,0.048]	[0.003,0.065]	[0.021,0.048]
Mean adult weight (kg)							[0.005,0.023]	[-0.008,0.038]	[0.006,0.023]
Mean adult height (cm)							[-0.026,-0.004]	[-0.039,0.010]	[-0.026,-0.005]
Diabetes							[-0.183,0.318]	[-0.539,0.610]	[-0.179,0.308]
Obese children previous marriage							[0.890,1.964]	[0.320,2.855]	[0.909,1.959]
Chronic disease							[-0.122,0.091]	[-0.275,0.239]	[-0.119,0.088]
Siblings walking to school							[-0.454,0.022]	[-0.813,0.324]	[-0.445,0.014]
Siblings TV watching every day							[0.007,0.305]	[-0.172,0.532]	[0.013,0.304]
Parents soda drinks							[-0.082,0.162]	[-0.250,0.316]	[-0.078,0.161]
Parents smoking							[-0.018,0.170]	[-0.146,0.285]	[-0.015,0.167]
Children average fruit portions							[-0.296,0.165]	[-0.593,0.481]	[-0.289,0.156]
Adults average fruit portions							[-0.145,0.302]	[-0.467,0.575]	[-0.141,0.301]
N	3737	3737	3737	3737	3737	3737	3737	3737	3737

[†]This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families.

Table B11: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.588,1.180]	[0.320,1.449]	[0.599,1.17]	[0.450,1.065]	[0.125,1.464]	[0.450,1.058]	[0.418,1.047]	[-0.032,1.478]	[0.426,1.036]
constant	[-0.868,2.319]	[-2.253,3.691]	[-0.807,2.245]	[-3.827,14.833]	[-13.042,17.507]	[-3.441,14.452]	[-4.026,15.072]	[-18.730,21.992]	[-3.631,14.671]
gender	[-0.064,0.143]	[-0.157,0.236]	[-0.061,0.140]	[-0.070,0.139]	[-0.228,0.292]	[-0.065,0.134]	[-0.074,0.138]	[-0.217,0.279]	[-0.072,0.133]
age	[-0.479,0.23]	[-0.731,0.321]	[-0.464,0.221]	[-0.457,0.262]	[-0.896,0.743]	[-0.449,0.246]	[-0.477,0.248]	[-0.937,0.695]	[-0.476,0.234]
age^2	[-0.016,0.026]	[-0.034,0.044]	[-0.015,0.025]	[-0.018,0.024]	[-0.047,0.051]	[-0.017,0.023]	[-0.017,0.025]	[-0.044,0.053]	[-0.016,0.025]
Share of obese adults	[0.327,0.623]	[0.198,0.758]	[0.330,0.620]	[0.281,0.584]	[0.026,0.833]	[0.287,0.581]	[0.034,0.523]	[-0.480,0.855]	[0.046,0.518]
log expenditures (Euro)	[-0.187,-0.023]	[-0.260,0.048]	[-0.184,-0.024]	[-0.086,0.093]	[-0.201,0.204]	[-0.082,0.090]	[-0.071,0.111]	[-0.185,0.257]	[-0.069,0.110]
Household size				[-0.106,0.006]	[-0.174,0.073]	[-0.104,0.003]	[-0.105,0.011]	[-0.183,0.079]	[-0.104,0.010]
Central or Northern region				[-0.244,0.109]	[-0.496,0.335]	[-0.244,0.100]	[-0.206,0.154]	[-0.405,0.399]	[-0.202,0.147]
Employed RP				[-0.365,-0.010]	[-0.586,0.241]	[-0.360,-0.018]	[-0.376,-0.020]	[-0.583,0.209]	[-0.375,-0.023]
Student or housewife RP				[-0.673,-0.099]	[-1.126,0.237]	[-0.672,-0.107]	[-0.711,-0.131]	[-1.077,0.216]	[-0.699,-0.137]
Retired or other emp. status RP				[-0.405,0.423]	[-1.020,0.928]	[-0.391,0.416]	[-0.437,0.413]	[-0.982,0.937]	[-0.420,0.394]
Mother's education (Master)				[-0.664,0.229]	[-1.274,0.883]	[-0.664,0.208]	[-0.699,0.205]	[-1.232,0.76]	[-0.689,0.197]
Mother's education (Bachelor)				[-1.071,0.016]	[-1.726,0.687]	[-1.068,0.004]	[-1.148,-0.042]	[-1.878,0.717]	[-1.144,-0.043]
Mother's education (High School)				[-0.702,0.162]	[-1.184,0.738]	[-0.699,0.155]	[-0.761,0.116]	[-1.275,0.663]	[-0.747,0.115]
Mother's education (Junior High)				[-0.630,0.236]	[-1.236,0.883]	[-0.615,0.219]	[-0.709,0.172]	[-1.226,0.721]	[-0.695,0.171]
Mother's education (Primary School)				[-0.527,0.432]	[-1.109,1.161]	[-0.513,0.427]	[-0.599,0.379]	[-1.223,1.039]	[-0.583,0.377]
CPI (2010=100)				[-0.141,0.029]	[-0.239,0.066]	[-0.138,0.028]	[-0.128,0.043]	[-0.226,0.123]	[-0.127,0.042]
% obese adults by region				[0.019,0.052]	[0,0.075]	[0.020,0.052]	[0.022,0.054]	[0.004,0.081]	[0.022,0.054]
Mean adult weight (kg)							[-0.004,0.018]	[-0.018,0.035]	[-0.003,0.018]
Mean adult height (cm)							[-0.025,0.001]	[-0.041,0.02]	[-0.025,0.001]
Diabetes							[-0.166,0.448]	[-0.591,0.851]	[-0.154,0.443]
Obese children previous marriage							[1.136,2.735]	[0.303,4.555]	[1.162,2.708]
Chronic disease							[-0.184,0.076]	[-0.347,0.262]	[-0.181,0.071]
Siblings walking to school							[-0.374,0.201]	[-0.722,0.594]	[-0.363,0.195]
Siblings TV watching every day							[-0.06,0.281]	[-0.244,0.498]	[-0.056,0.273]
Parents soda drinks							[-0.113,0.172]	[-0.313,0.345]	[-0.107,0.165]
Parents smoking							[-0.027,0.199]	[-0.185,0.371]	[-0.022,0.197]
Children average fruit portions							[-0.563,0.093]	[-1.050,0.521]	[-0.558,0.093]
Adults average fruit portions							[-0.086,0.555]	[-0.461,1.023]	[-0.071,0.544]
N	2503	2503	2503	2503	2503	2503	2503	2503	2503

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $6 \leq age \leq 11$.

Table B12: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity ($12 \leq age \leq 14$)								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.278,1.108]	[-0.097,1.469]	[0.284,1.107]	[0.17,1.048]	[-0.507,1.547]	[0.177,1.028]	[0.254,1.185]	[-0.401,1.766]	[0.256,1.175]
constant	[-16.104,41.695]	[-40.983,66.704]	[-15.856,41.577]	[-14.302,50.206]	[-52.120,77.035]	[-12.982,49.638]	[-8.386,57.715]	[-46.524,86.252]	[-7.630,56.746]
gender	[0.384,0.712]	[0.243,0.860]	[0.391,0.711]	[0.396,0.729]	[0.208,0.945]	[0.402,0.722]	[0.390,0.729]	[0.163,0.975]	[0.393,0.729]
age	[-6.418,2.498]	[-7.634,1.233]	[-6.341,1.233]	[-5.869,3.167]	[-8.744,3.008]	[-5.711,2.818]	[-6.829,2.387]	[-10.177,2.533]	[-6.602,2.335]
age^2	[-0.101,0.243]	[-0.248,0.395]	[-0.099,0.240]	[-0.127,0.221]	[-0.327,0.394]	[-0.123,0.220]	[-0.097,0.258]	[-0.327,0.436]	[-0.096,0.251]
Share of obese adults	[0.350,0.814]	[0.155,1.022]	[0.359,0.808]	[0.280,0.754]	[-0.025,1.054]	[0.291,0.749]	[-0.399,0.367]	[-0.936,0.803]	[-0.392,0.364]
log expenditures (Euro)	[-0.229,0.027]	[-0.344,0.138]	[-0.225,0.024]	[-0.171,0.107]	[-0.357,0.264]	[-0.169,0.101]	[-0.177,0.109]	[-0.355,0.311]	[-0.173,0.102]
Household size				[-0.122,0.051]	[-0.247,0.168]	[-0.121,0.05]	[-0.116,0.065]	[-0.255,0.166]	[-0.115,0.064]
Central or Northern region				[-0.228,0.361]	[-0.670,0.726]	[-0.219,0.360]	[-0.206,0.392]	[-0.520,0.853]	[-0.201,0.382]
Employed RP				[-0.397,0.098]	[-0.732,0.501]	[-0.396,0.090]	[-0.430,0.074]	[-0.814,0.454]	[-0.417,0.070]
Student or housewife RP				[-0.657,0.222]	[-1.241,0.732]	[-0.643,0.214]	[-0.694,0.204]	[-1.285,0.833]	[-0.686,0.191]
Retired or other emp. status RP				[-0.014,1.044]	[-0.637,1.796]	[0.002,1.034]	[-0.158,0.926]	[-0.863,1.659]	[-0.150,0.920]
Mother's education (Master)				[-0.470,0.737]	[-1.145,1.494]	[-0.452,0.721]	[-0.405,0.842]	[-1.133,1.609]	[-0.385,0.806]
Mother's education (Bachelor)				[-0.726,0.814]	[-1.936,1.652]	[-0.704,0.782]	[-0.819,0.783]	[-1.858,1.797]	[-0.788,0.763]
Mother's education (High School)				[-0.504,0.608]	[-1.176,1.544]	[-0.489,0.583]	[-0.525,0.623]	[-1.264,1.439]	[-0.499,0.593]
Mother's education (Junior High)				[-0.327,0.775]	[-0.955,1.759]	[-0.324,0.745]	[-0.346,0.792]	[-0.953,1.522]	[-0.328,0.772]
Mother's education (Primary School)				[-0.283,0.920]	[-1.118,1.977]	[-0.274,0.883]	[-0.297,0.946]	[-0.964,1.696]	[-0.265,0.917]
CPI (2010=100)				[-0.233,0.039]	[-0.402,0.204]	[-0.230,0.033]	[-0.233,0.041]	[-0.395,0.216]	[-0.228,0.037]
% obese adults by region				[0.004,0.055]	[-0.039,0.091]	[0.004,0.054]	[0.003,0.055]	[-0.028,0.091]	[0.003,0.054]
Mean adult weight (kg)							[0.013,0.046]	[-0.007,0.070]	[0.013,0.046]
Mean adult height (cm)							[-0.040,0.000]	[-0.071,0.026]	[-0.040,-0.001]
Diabetes							[-0.499,0.413]	[-1.185,0.912]	[-0.486,0.403]
Obese children previous marriage							[-0.098,1.562]	[-1.195,2.798]	[-0.065,1.548]
Chronic disease							[-0.131,0.251]	[-0.349,0.515]	[-0.122,0.244]
Siblings walking to school							[-0.968,-0.076]	[-1.627,0.502]	[-0.961,-0.079]
Siblings TV watching every day							[-0.018,0.629]	[-0.395,1.116]	[-0.013,0.613]
Parents soda drinks							[-0.232,0.269]	[-0.559,0.594]	[-0.221,0.268]
Parents smoking							[-0.097,0.26]	[-0.322,0.469]	[-0.091,0.253]
Children average fruit portions							[-0.212,0.481]	[-0.669,0.851]	[-0.209,0.467]
Adults average fruit portions							[-0.403,0.262]	[-0.8,0.673]	[-0.398,0.257]
N	1234	1234	1234	1234	1234	1234	1234	1234	1234

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using all the families with children with $12 \leq age \leq 14$.

Table B13: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.676,1.192]	[0.448,1.424]	[0.679,1.18]	[0.489,1.018]	[0.107,1.391]	[0.496,1.015]	[0.444,0.982]	[0.112,1.332]	[0.445,0.974]
constant	[-0.951,1.271]	[-1.937,2.254]	[-0.929,1.246]	[-5.057,14.259]	[-11.986,15.823]	[-4.916,13.938]	[-5.132,14.663]	[-16.074,18.245]	[-5.074,14.285]
gender	[0.059,0.279]	[-0.038,0.380]	[0.061,0.275]	[0.052,0.276]	[-0.117,0.420]	[0.057,0.274]	[0.047,0.273]	[-0.094,0.405]	[0.047,0.269]
age	[-0.160,0.223]	[-0.327,0.328]	[-0.155,0.216]	[-0.135,0.254]	[-0.448,0.510]	[-0.128,0.249]	[-0.138,0.255]	[-0.350,0.514]	[-0.132,0.252]
age^2	[-0.015,0.004]	[-0.024,0.013]	[-0.015,0.004]	[-0.017,0.003]	[-0.030,0.017]	[-0.017,0.003]	[-0.017,0.003]	[-0.031,0.014]	[-0.017,0.003]
Share of obese adults	[0.349,0.664]	[0.208,0.809]	[0.350,0.659]	[0.278,0.602]	[0.063,0.826]	[0.279,0.595]	[-0.008,0.501]	[-0.393,0.874]	[0.004,0.490]
log expenditures (Euro)	[-0.208,-0.031]	[-0.286,0.048]	[-0.208,-0.034]	[-0.115,0.077]	[-0.236,0.212]	[-0.114,0.076]	[-0.111,0.084]	[-0.256,0.231]	[-0.108,0.084]
Household size				[-0.082,0.050]	[-0.170,0.146]	[-0.081,0.047]	[-0.076,0.059]	[-0.155,0.140]	[-0.074,0.057]
Central or Northern region				[-0.237,0.157]	[-0.494,0.450]	[-0.236,0.154]	[-0.207,0.194]	[-0.476,0.427]	[-0.203,0.190]
Employed RP				[-0.343,0.017]	[-0.569,0.245]	[-0.339,0.015]	[-0.358,0.005]	[-0.603,0.244]	[-0.355,0.004]
Student or housewife RP				[-0.735,-0.129]	[-1.123,0.267]	[-0.730,-0.140]	[-0.766,-0.153]	[-1.194,0.219]	[-0.766,-0.166]
Retired or other emp. status RP				[-0.814,0.374]	[-1.630,1.091]	[-0.805,0.349]	[-0.848,0.361]	[-1.545,1.238]	[-0.842,0.338]
Mother's education (Master)				[-0.761,0.411]	[-1.542,1.186]	[-0.743,0.387]	[-0.827,0.363]	[-1.512,1.203]	[-0.826,0.353]
Mother's education (Bachelor)				[-1.011,0.326]	[-1.800,1.310]	[-0.983,0.305]	[-1.118,0.241]	[-2.078,1.19]	[-1.088,0.233]
Mother's education (High School)				[-0.756,0.392]	[-1.544,1.134]	[-0.733,0.377]	[-0.856,0.310]	[-1.540,1.132]	[-0.838,0.296]
Mother's education (Junior High)				[-0.649,0.500]	[-1.405,1.261]	[-0.624,0.480]	[-0.757,0.412]	[-1.448,1.216]	[-0.748,0.409]
Mother's education (Primary School)				[-0.594,0.629]	[-1.384,1.409]	[-0.594,0.619]	[-0.687,0.561]	[-1.420,1.616]	[-0.684,0.543]
CPI (2010=100)				[-0.143,0.034]	[-0.231,0.046]	[-0.143,0.033]	[-0.133,0.045]	[-0.248,0.085]	[-0.133,0.041]
% obese adults by region				[0.019,0.054]	[-0.002,0.077]	[0.020,0.053]	[0.021,0.057]	[-0.002,0.076]	[0.022,0.056]
Mean adult weight (kg)							[0.000,0.023]	[-0.016,0.037]	[0.000,0.022]
Mean adult height (cm)							[-0.027,0.001]	[-0.043,0.017]	[-0.026,0.001]
Diabetes							[-0.389,0.252]	[-0.831,0.643]	[-0.384,0.241]
Obese children previous marriage							[0.743,2.119]	[-0.053,3.149]	[0.756,2.114]
Chronic disease							[-0.197,0.082]	[-0.413,0.268]	[-0.193,0.082]
Siblings walking to school							[-0.453,0.047]	[-0.765,0.359]	[-0.447,0.041]
Siblings TV watching every day							[-0.029,0.348]	[-0.240,0.610]	[-0.025,0.344]
Parents soda drinks							[-0.097,0.217]	[-0.290,0.424]	[-0.095,0.215]
Parents smoking							[-0.081,0.163]	[-0.227,0.322]	[-0.078,0.161]
Children average fruit portions							[-0.045,0.655]	[-0.475,1.108]	[-0.043,0.645]
Adults average fruit portions							[-0.638,0.048]	[-1.163,0.490]	[-0.629,0.039]
N	2319	2319	2319	2319	2319	2319	2319	2319	2319

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child.

Table B14: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity ($6 \le age \le 11$)								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.675,1.297]	[0.394,1.581]	[0.683,1.292]	[0.493,1.132]	[0.104,1.605]	[0.498,1.120]	[0.441,1.092]	[-0.062,1.560]	[0.446,1.085]
constant	[-0.625,3.312]	[-2.356,5.082]	[-0.611,3.246]	[-7.838,14.443]	[-19.410,18.235]	[-7.709,14.166]	[-7.235,15.607]	[-20.379,24.328]	[-7.018,15.592]
gender	[-0.075,0.178]	[-0.187,0.290]	[-0.070,0.174]	[-0.093,0.164]	[-0.268,0.323]	[-0.089,0.162]	[-0.102,0.158]	[-0.286,0.323]	[-0.102,0.157]
age	[-0.660,0.211]	[-0.936,0.321]	[-0.657,0.202]	[-0.676,0.210]	[-1.275,0.752]	[-0.661,0.199]	[-0.715,0.179]	[-1.301,0.679]	[-0.701,0.179]
age^2	[-0.015,0.036]	[-0.038,0.058]	[-0.015,0.036]	[-0.015,0.037]	[-0.046,0.072]	[-0.015,0.037]	[-0.013,0.039]	[-0.043,0.075]	[-0.012,0.039]
Share of obese adults	[0.303,0.665]	[0.142,0.826]	[0.309,0.659]	[0.229,0.600]	[-0.021,0.864]	[0.229,0.596]	[0.033,0.624]	[-0.330,0.984]	[0.042,0.612]
log expenditures (Euro)	[-0.237,-0.035]	[-0.328,0.053]	[-0.235,-0.035]	[-0.124,0.097]	[-0.281,0.253]	[-0.119,0.097]	[-0.110,0.115]	[-0.251,0.262]	[-0.106,0.112]
Household size				[-0.103,0.050]	[-0.191,0.145]	[-0.099,0.050]	[-0.095,0.062]	[-0.200,0.169]	[-0.092,0.061]
Central or Northern region				[-0.299,0.145]	[-0.556,0.466]	[-0.298,0.136]	[-0.254,0.200]	[-0.564,0.470]	[-0.251,0.199]
Employed RP				[-0.451,-0.024]	[-0.698,0.251]	[-0.449,-0.027]	[-0.463,-0.032]	[-0.721,0.238]	[-0.460,-0.033]
Student or housewife RP				[-0.916,-0.200]	[-1.449,0.249]	[-0.900,-0.214]	[-0.947,-0.222]	[-1.510,0.240]	[-0.945,-0.238]
Retired or other emp. status RP				[-1.038,0.260]	[-1.882,1.049]	[-1.023,0.250]	[-1.067,0.255]	[-1.948,1.113]	[-1.051,0.248]
Mother's education (Master)				[-1.134,0.173]	[-1.945,0.983]	[-1.117,0.155]	[-1.218,0.104]	[-1.993,1.002]	[-1.206,0.094]
Mother's education (Bachelor)				[-1.269,0.206]	[-2.162,1.092]	[-1.242,0.205]	[-1.378,0.119]	[-2.430,1.012]	[-1.353,0.108]
Mother's education (High School)				[-1.067,0.210]	[-1.863,1.021]	[-1.047,0.206]	[-1.187,0.106]	[-1.919,0.966]	[-1.161,0.092]
Mother's education (Junior High)				[-0.978,0.302]	[-1.754,1.013]	[-0.971,0.286]	[-1.104,0.194]	[-1.885,1.11]	[-1.099,0.172]
Mother's education (Primary School)				[-0.887,0.483]	[-1.776,1.342]	[-0.862,0.460]	[-0.997,0.398]	[-1.929,1.304]	[-0.982,0.390]
CPI (2010=100)				[-0.129,0.073]	[-0.245,0.126]	[-0.126,0.071]	[-0.120,0.083]	[-0.247,0.171]	[-0.119,0.081]
% obese adults by region				[0.017,0.057]	[-0.009,0.085]	[0.018,0.057]	[0.020,0.061]	[-0.001,0.086]	[0.021,0.061]
Mean adult weight (kg)							[-0.008,0.018]	[-0.024,0.037]	[-0.008,0.018]
Mean adult height (cm)							[-0.030,0.002]	[-0.053,0.021]	[-0.030,0.002]
Diabetes							[-0.461,0.296]	[-0.972,0.820]	[-0.447,0.295]
Obese children previous marriage							[1.115,3.297]	[0.182,5.388]	[1.128,3.284]
Chronic disease							[-0.212,0.113]	[-0.423,0.318]	[-0.206,0.108]
Siblings walking to school							[-0.389,0.207]	[-0.816,0.606]	[-0.385,0.204]
Siblings TV watching every day							[-0.081,0.342]	[-0.317,0.634]	[-0.077,0.336]
Parents soda drinks							[-0.113,0.243]	[-0.381,0.481]	[-0.111,0.237]
Parents smoking							[-0.072,0.210]	[-0.338,0.377]	[-0.070,0.204]
Children average fruit portions							[-0.158,0.83]	[-0.790,1.614]	[-0.135,0.812]
Adults average fruit portions							[-0.810,0.162]	[-1.588,0.853]	[-0.799,0.138]
N	1694	1694	1694	1694	1694	1694	1694	1694	1694

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child and $6 \le age \le 11$.

Table B15: Confidence intervals and confidence sets for the probit model.†

	Dependent variable: child obesity $12 \le age \le 14$								
	Probit (1)	CCT1 (2)	CCT3 (3)	Probit (4)	CCT1 (5)	CCT3 (6)	Probit (7)	CCT1 (8)	CCT3 (9)
Share of other obese children	[0.419,1.368]	[0.005,1.766]	[0.428,1.364]	[0.208,1.195]	[-0.405,1.847]	[0.209,1.187]	[0.220,1.241]	[-0.383,1.917]	[0.244,1.220]
constant	[-28.499,53.912]	[-62.739,83.057]	[-27.065,53.588]	[-21.970,70.565]	[-69.871,102.298]	[-21.176,69.256]	[-21.549,73.364]	[-78.215,105.578]	[-20.663,72.161]
gender	[0.312,0.772]	[0.115,0.977]	[0.314,0.767]	[0.310,0.780]	[0.0270,1.049]	[0.316,0.770]	[0.309,0.794]	[0.012,1.121]	[0.315,0.785]
age	[-8.377,4.348]	[-8.973,2.514]	[-8.255,2.514]	[-7.673,5.315]	[-10.838,5.246]	[-7.519,4.990]	[-8.102,5.240]	[-12.189,5.320]	[-7.945,4.790]
age^2	[-0.171,0.319]	[-0.377,0.498]	[-0.165,0.314]	[-0.209,0.291]	[-0.514,0.457]	[-0.200,0.290]	[-0.205,0.308]	[-0.483,0.533]	[-0.196,0.297]
Share of obese adults	[0.212,0.869]	[-0.071,1.151]	[0.227,0.868]	[0.117,0.795]	[-0.384,1.209]	[0.131,0.791]	[-0.554,0.512]	[-1.229,1.215]	[-0.538,0.499]
log expenditures (Euro)	[-0.257,0.111]	[-0.414,0.272]	[-0.251,0.109]	[-0.224,0.181]	[-0.482,0.415]	[-0.219,0.180]	[-0.257,0.159]	[-0.569,0.416]	[-0.251,0.157]
Household size				[-0.111,0.158]	[-0.275,0.335]	[-0.109,0.156]	[-0.104,0.172]	[-0.310,0.346]	[-0.098,0.167]
Central or Northern region				[-0.373,0.506]	[-0.921,1.074]	[-0.357,0.489]	[-0.448,0.453]	[-1.002,1.192]	[-0.426,0.439]
Employed RP				[-0.381,0.331]	[-0.806,0.804]	[-0.367,0.316]	[-0.413,0.316]	[-0.844,0.828]	[-0.405,0.304]
Student or housewife RP				[-0.829,0.364]	[-1.654,1.218]	[-0.813,0.347]	[-0.907,0.328]	[-1.917,1.258]	[-0.891,0.296]
Retired or other emp. status RP				[-1.492,1.705]	[-4.675,3.344]	[-1.435,1.643]	[-1.654,1.655]	[-4.642,4.423]	[-1.621,1.584]
Mother's education (Master)				[-0.170,0.633]	[-0.879,1.189]	[-0.169,0.625]	[-0.071,0.753]	[-0.678,1.290]	[-0.062,0.733]
Mother's education (Bachelor)				[-1.822,0.494]	[-4.082,1.428]	[-1.800,0.482]	[-1.777,0.514]	[-4.220,1.508]	[-1.732,0.467]
Mother's education (Junior High)				[-0.096,0.449]	[-0.486,0.815]	[-0.092,0.447]	[-0.074,0.497]	[-0.383,0.888]	[-0.062,0.490]
Mother's education (Primary School)				[-0.322,0.665]	[-1.119,1.267]	[-0.300,0.640]	[-0.271,0.752]	[-1.164,1.393]	[-0.260,0.747]
CPI (2010=100)				[-0.371,0.020]	[-0.637,0.284]	[-0.367,0.014]	[-0.371,0.028]	[-0.623,0.291]	[-0.365,0.024]
% obese adults by region				[-0.001,0.073]	[-0.052,0.126]	[0.000,0.072]	[-0.009,0.068]	[-0.055,0.126]	[-0.007,0.066]
Mean adult weight (kg)							[0.005,0.052]	[-0.022,0.083]	[0.006,0.051]
Mean adult height (cm)							[-0.041,0.017]	[-0.080,0.055]	[-0.040,0.016]
Diabetes							[-0.673,0.633]	[-1.627,1.483]	[-0.653,0.604]
Obese children previous marriage							[-0.661,1.684]	[-2.541,3.413]	[-0.617,1.669]
Chronic disease							[-0.367,0.205]	[-0.714,0.601]	[-0.356,0.202]
Siblings walking to school							[-0.983,-0.017]	[-1.665,0.622]	[-0.972,-0.025]
Siblings TV watching every day							[-0.157,0.742]	[-0.709,1.372]	[-0.142,0.720]
Parents soda drinks							[-0.448,0.281]	[-0.948,0.686]	[-0.436,0.273]
Parents smoking							[-0.275,0.249]	[-0.602,0.631]	[-0.265,0.245]
Children average fruit portions							[-0.213,0.825]	[-0.861,1.510]	[-0.190,0.816]
Adults average fruit portions							[-0.785,0.216]	[-1.530,0.950]	[-0.779,0.199]
N	625	625	625	625	625	625	625	625	625

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. The models are estimated using families with more than one child and $12 \le age \le 14$.

Table B16: Confidence intervals for the probit model.†

	Dependent variable: child obesity		
	Probit	Probit	Probit
	(1)	(2)	(3)
constant	[-2.397,0.491]	[-6.614,19.885]	[-5.026,22.394]
gender	[0.076,0.360]	[0.081,0.369]	[0.067,0.358]
age	[-0.085,0.412]	[-0.072,0.433]	[-0.095,0.417]
age^2	[-0.024,0.001]	[-0.025,0.000]	[-0.024,0.001]
Share of obese adults	[0.313,0.718]	[0.272,0.685]	[-0.278,0.417]
log expenditures (Euro)	[-0.157,0.066]	[-0.098,0.146]	[-0.085,0.163]
Household size		[-0.108,0.060]	[-0.136,0.038]
Central or Northern region		[-0.269,0.203]	[-0.262,0.219]
Employed RP		[-0.394,0.080]	[-0.410,0.067]
Student or housewife RP		[-0.535,0.251]	[-0.567,0.230]
Retired or other emp. status RP		[-0.115,0.723]	[-0.167,0.695]
Mother's education (Master)		[-0.436,0.482]	[-0.398,0.534]
Mother's education (Bachelor)		[-1.045,0.243]	[-1.111,0.212]
Mother's education (High School)		[-0.571,0.275]	[-0.552,0.308]
Mother's education (Junior High)		[-0.491,0.351]	[-0.515,0.343]
Mother's education (Primary School)		[-0.389,0.590]	[-0.384,0.620]
CPI (2010=100)		[-0.203,0.043]	[-0.205,0.044]
% obese adults by region		[0.004,0.048]	[0.002,0.046]
Mean adult weight (kg)			[0.005,0.036]
Mean adult height (cm)			[-0.039,-0.002]
Diabetes			[-0.086,0.750]
Obese children previous marriage			[0.721,2.535]
Chronic disease			[-0.113,0.225]
Siblings TV watching every day			[-0.069,0.427]
Parents soda drinks			[-0.166,0.230]
Parents smoking			[-0.036,0.267]
Children average fruit portions			[-0.663,-0.028]
Adults average fruit portions			[0.066,0.674]
N *N*	1418	1418	1418

†This table provides 95% confidence intervals using the standard probit model as if it were identified. The models are estimated using families with one child.

Table B17: Confidence intervals for the probit model.†

	Dependent variable: child obesity ($6 \leq age \leq 11$)		
	Probit (1)	Probit (2)	Probit (3)
constant	[-3.572,1.956]	[-4.800,30.691]	[-6.167,30.890]
gender	[-0.164,0.198]	[-0.175,0.195]	[-0.194,0.181]
age	[-0.511,0.722]	[-0.495,0.773]	[-0.471,0.818]
age^2	[-0.044,0.028]	[-0.047,0.026]	[-0.051,0.024]
$Share\, of\, obese\, adults$	[0.199,0.718]	[0.201,0.736]	[-0.254,0.662]
$log\, expenditures\, (Euro)$	[-0.157,0.130]	[-0.113,0.205]	[-0.111,0.214]
Household size		[-0.121,0.101]	[-0.157,0.074]
Central or Northern region		[-0.366,0.222]	[-0.358,0.245]
Employed RP		[-0.397,0.256]	[-0.420,0.236]
Student or housewife RP		[-0.582,0.408]	[-0.632,0.374]
Retired or other emp. status RP		[-0.331,0.849]	[-0.463,0.785]
Mother's education (Master)		[-0.527,0.736]	[-0.486,0.805]
Mother's education (Bachelor)		[-2.090,-0.080]	[-2.102,-0.015]
Mother's education (High School)		[-0.783,0.418]	[-0.739,0.496]
Mother's education (Junior High)		[-0.776,0.429]	[-0.787,0.458]
Mother's education (Primary School)		[-0.711,0.720]	[-0.670,0.815]
CPI (2010=100)		[-0.302,0.023]	[-0.290,0.041]
% obese adults by region		[0.003,0.058]	[0.002,0.059]
Mean adult weight (kg)			[-0.010,0.032]
Mean adult height (cm)			[-0.035,0.013]
Diabetes			[0.071,1.227]
Obese children previous marriage			[0.549,3.038]
Chronic disease			[-0.288,0.163]
Siblings TV watching every day			[-0.180,0.414]
Parents soda drinks			[-0.247,0.245]
Parents smoking			[-0.118,0.273]
Children average fruit portions			[-1.178,-0.202]
Adults average fruit portions			[0.201,1.154]
N N	1694	1694	1694

†This table provides 95% confidence intervals using the standard probit model as if it were identified. The models are estimated using families with one child and $6 \leq age \leq 11$.

Table B18: Confidence intervals for the probit model.†

	Dependent variable: child obesity ($12 \leq age \leq 14$)		
	Probit (1)	Probit (2)	Probit (3)
constant	[-26.257,55.215]	[-35.447,56.664]	[-30.197,65.458]
gender	[0.316,0.788]	[0.313,0.795]	[0.298,0.790]
age	[-8.467,4.092]	[-7.973,4.870]	[-8.467,4.783]
age^2	[-0.163,0.321]	[-0.193,0.302]	[-0.189,0.321]
Share of obese adults	[0.304,0.964]	[0.221,0.897]	[-0.610,0.528]
log expenditures (Euro)	[-0.287,0.075]	[-0.239,0.154]	[-0.237,0.173]
Household size		[-0.174,0.094]	[-0.203,0.077]
Central or Northern region		[-0.352,0.459]	[-0.324,0.509]
Employed RP		[-0.588,0.122]	[-0.618,0.105]
Student or housewife RP		[-0.761,0.604]	[-0.765,0.631]
Retired or other emp. status RP		[-0.181,1.006]	[-0.302,0.917]
Mother's education (Master)		[-0.727,0.340]	[-0.693,0.412]
Mother's education (Bachelor)		[-0.479,0.962]	[-0.610,0.931]
Mother's education (Junior High)		[-0.106,0.427]	[-0.129,0.421]
Mother's education (Primary School)		[-0.123,0.789]	[-0.160,0.790]
CPI (2010=100)		[-0.205,0.184]	[-0.232,0.163]
% obese adults by region		[-0.015,0.057]	[-0.017,0.057]
Mean adult weight (kg)			[0.006,0.056]
Mean adult height (cm)			[-0.060,-0.001]
Diabetes			[-0.682,0.628]
Obese children previous marriage			[0.020,2.806]
Chronic disease			[-0.045,0.490]
Siblings TV watching every day			[-0.114,0.849]
Parents soda drinks			[-0.173,0.541]
Parents smoking			[-0.094,0.412]
Children average fruit portions			[-0.472,0.489]
Adults average fruit portions			[-0.367,0.541]
N	625	625	625

†This table provides 95% confidence intervals using the standard probit model as if it were identified. The models are estimated using families with one child and $12 \leq age \leq 14$.

Table B19: Confidence intervals and confidence sets for the logit model with group dummies.†

	Dependent variable: child obesity					
	Logit (1)	CCT1 (2)	CCT3 (3)	Logit (4)	CCT1 (5)	CCT3 (6)
Share of other obese children	[0.467,0.952]	[0.163,1.261]	[0.474,0.951]	[0.487,0.973]	[0.224,1.267]	[0.488,0.972]
gender	[0.107,0.282]	[0.004,0.403]	[0.109,0.278]	[0.106,0.281]	[0.009,0.389]	[0.109,0.281]
age	[-0.076,0.226]	[-0.299,0.410]	[-0.070,0.224]	[-0.076,0.227]	[-0.261,0.432]	[-0.072,0.222]
age^2	[-0.015,0.000]	[-0.024,0.012]	[-0.015,0.000]	[-0.015,0.000]	[-0.026,0.010]	[-0.015,0.000]
Share of obese adults	[0.020,0.421]	[-0.236,0.705]	[0.021,0.420]	[0.012,0.414]	[-0.234,0.715]	[0.015,0.408]
log expenditures (Euro)	[-0.126,0.020]	[-0.22,0.126]	[-0.126,0.017]	[-0.137,0.008]	[-0.225,0.096]	[-0.134,0.005]
average adult weight	[0.007,0.024]	[-0.004,0.037]	[0.007,0.024]	[0.007,0.024]	[-0.008,0.037]	[0.007,0.024]
average adult height	[-0.029,-0.008]	[-0.042,0.007]	[-0.029,-0.008]	[-0.029,-0.008]	[-0.042,0.006]	[-0.029,-0.008]
group 1	[-0.157,3.202]	[-2.009,5.206]	[-0.114,3.165]	[0.222,3.602]	[-2.15,5.641]	[0.29,3.595]
group 2	[-0.065,3.290]	[-1.850,5.345]	[-0.033,3.238]	[0.109,3.504]	[-2.532,5.584]	[0.173,3.452]
group 3	[-0.178,3.217]	[-2.196,5.315]	[-0.148,3.191]	[0.327,3.680]	[-2.160,5.866]	[0.353,3.677]
group 4	[-0.036,3.347]	[-1.855,5.369]	[-0.030,3.326]	[-0.246,3.190]	[-2.753,5.395]	[-0.202,3.173]
group 5	[0.032,3.377]	[-1.821,5.333]	[0.058,3.310]	[0.127,3.541]	[-2.519,5.660]	[0.207,3.512]
group 6	[0.234,3.559]	[-1.675,5.573]	[0.302,3.523]	[-0.078,3.312]	[-2.519,5.380]	[-0.076,3.263]
group 7	[-0.138,3.209]	[-2.046,5.163]	[-0.080,3.197]	[-0.042,3.348]	[-2.729,5.438]	[-0.007,3.293]
group 8	[0.162,3.494]	[-1.841,5.672]	[0.208,3.471]	[-0.171,3.261]	[-2.948,5.413]	[-0.161,3.218]
group 9	[0.026,3.38]	[-1.837,5.419]	[0.069,3.367]	[-0.136,3.271]	[-2.558,5.500]	[-0.116,3.221]
group 10	[-0.024,3.337]	[-1.837,5.436]	[0.000,3.305]	[0.190,3.585]	[-2.411,5.679]	[0.204,3.554]
group 11				[0.023,3.406]	[-2.490,5.477]	[0.085,3.385]
group 12				[0.078,3.490]	[-2.617,5.790]	[0.101,3.412]
group 13				[-0.213,3.288]	[-2.986,5.667]	[-0.189,3.220]
group 14				[-0.002,3.384]	[-2.175,5.595]	[0.022,3.319]
group 15				[-0.030,3.343]	[-2.633,5.385]	[-0.015,3.340]
group 16				[0.092,3.460]	[-1.787,5.625]	[0.107,3.402]
group 17				[-0.275,3.200]	[-3.005,5.305]	[-0.235,3.123]
group 18				[0.015,3.422]	[-2.528,5.575]	[0.035,3.342]
group 19				[-0.040,3.350]	[-2.582,5.468]	[0.020,3.272]
group 20				[0.395,3.842]	[-2.071,6.180]	[0.429,3.763]
N	3737	3737	3737	3737	3737	3737

†This table provides 95% confidence intervals using the standard logit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. Each family is assigned to a group via a k-prototypes algorithm, for each group we include a dummy variable.

Table B20: Confidence intervals and confidence sets for the probit model with group dummies.†

	Dependent variable: child obesity					
	Probit	CCT1	CCT3	Probit	CCT1	CCT3
	(1)	(2)	(3)	(4)	(5)	(6)
Share of other obese children	[0.756,1.552]	[0.237,1.953]	[0.757,1.537]	[0.793,1.592]	[0.485,1.844]	[0.801,1.583]
gender	[0.169,0.462]	[0.054,0.621]	[0.174,0.460]	[0.167,0.461]	[0.082,0.583]	[0.168,0.456]
age	[-0.131,0.376]	[-0.364,0.605]	[-0.129,0.370]	[-0.124,0.385]	[-0.288,0.571]	[-0.115,0.379]
age^2	[-0.025,0.001]	[-0.036,0.012]	[-0.025,0.001]	[-0.025,0.000]	[-0.038,0.009]	[-0.025,0.000]
Share of obese adults	[0.041,0.711]	[-0.278,1.019]	[0.050,0.705]	[0.023,0.695]	[-0.193,0.910]	[0.030,0.687]
log expenditures (Euro)	[-0.210,0.033]	[-0.331,0.148]	[-0.210,0.032]	[-0.229,0.013]	[-0.287,0.084]	[-0.227,0.009]
average adult weight	[0.010,0.040]	[-0.003,0.052]	[0.011,0.039]	[0.010,0.040]	[0.004,0.054]	[0.011,0.040]
average adult height	[-0.048,-0.012]	[-0.065,0.000]	[-0.048,-0.013]	[-0.048,-0.012]	[-0.057,-0.002]	[-0.048,-0.012]
group 1	[-0.316,5.327]	[-3.352,7.938]	[-0.273,5.315]	[0.274,5.950]	[-1.893,7.583]	[0.309,5.860]
group 2	[-0.156,5.482]	[-3.178,8.151]	[-0.088,5.405]	[0.114,5.817]	[-2.436,7.313]	[0.125,5.738]
group 3	[-0.343,5.361]	[-3.168,7.947]	[-0.249,5.253]	[0.480,6.114]	[-2.144,7.964]	[0.511,6.024]
group 4	[-0.110,5.576]	[-3.265,7.969]	[-0.088,5.473]	[-0.468,5.308]	[-2.889,7.083]	[-0.370,5.270]
group 5	[0.001,5.621]	[-3.021,8.157]	[0.027,5.560]	[0.150,5.884]	[-2.379,7.396]	[0.188,5.816]
group 6	[0.336,5.923]	[-2.550,8.450]	[0.339,5.895]	[-0.196,5.498]	[-2.712,7.028]	[-0.154,5.454]
group 7	[-0.276,5.347]	[-3.067,7.818]	[-0.208,5.289]	[-0.127,5.571]	[-2.767,7.214]	[-0.045,5.500]
group 8	[0.207,5.804]	[-2.807,8.426]	[0.257,5.703]	[-0.346,5.419]	[-3.036,7.181]	[-0.250,5.323]
group 9	[-0.006,5.629]	[-2.784,8.013]	[0.052,5.614]	[-0.292,5.430]	[-2.775,6.868]	[-0.242,5.407]
group 10	[-0.095,5.553]	[-3.141,8.177]	[-0.054,5.548]	[0.249,5.954]	[-2.240,7.834]	[0.304,5.900]
group 11				[-0.021,5.665]	[-2.925,7.195]	[0.039,5.662]
group 12				[0.073,5.811]	[-2.443,7.652]	[0.107,5.715]
group 13				[-0.426,5.467]	[-2.566,7.094]	[-0.419,5.435]
group 14				[-0.067,5.623]	[-2.686,7.286]	[0.034,5.573]
group 15				[-0.106,5.56]	[-2.494,7.140]	[-0.061,5.486]
group 16				[0.084,5.742]	[-2.441,7.309]	[0.120,5.734]
group 17				[-0.522,5.330]	[-2.963,7.085]	[-0.426,5.258]
group 18				[-0.038,5.687]	[-2.500,7.262]	[-0.035,5.684]
group 19				[-0.129,5.567]	[-2.953,7.140]	[-0.098,5.508]
group 20				[0.587,6.366]	[-1.911,8.061]	[0.607,6.349]
N	3737	3737	3737	3737	3737	3737

†This table provides 95% confidence intervals using the standard probit model as if it were identified and 95% confidence sets using the approach described in Chen et al. (2018). CCT1 and CCT3 denote Procedure 1 and Procedure 3 respectively. Each family is assigned to a group via a k-prototypes algorithm, for each group we include a dummy variable.

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