



## Regular family breakfast was associated with children's overweight and parental education: Results from the ENERGY cross-sectional study



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### ABSTRACT

**Introduction.** This study aims to assess (i) the prevalence of having regular family breakfast, lunch, dinner (i.e. 5–7 days/week together with their family) among 10–12 year olds in Europe, (ii) the association between family meals and child weight status, and (iii) potential differences in having family meals according to country of residence, gender, ethnicity and parental levels of education.

**Methods.** 7716 children (mean age: 11.5 ± 0.7 years, 52% girls) in eight European countries (Belgium, Greece, Hungary, The Netherlands, Norway, Slovenia, Spain, Switzerland) participated in a cross-sectional school-based survey in 2010. Data on family meals were self-reported by the parents and children's height and weight were objectively measured to determine overweight status. Binary regression analyses assessed the associations of having regular family meals (adjusted for potential confounders) with children's overweight/obesity and to assess potential differences in having family meals according to gender, ethnicity and parental education, in the total sample and for each country respectively.

**Results.** The prevalence of regular family meals was 35%, 37% and 76% for breakfast, lunch and dinner respectively. Having regular family breakfast, but not lunch or dinner, was inversely associated with overweight (OR = 0.78 (95% CI 0.67–0.91)). Children of higher educated parents were more likely to have regular family breakfast (1.63 (95% CI 1.42–1.86)) and less likely to have regular family lunch (0.72 (95% CI 0.63–0.82)) compared to children of lower educated parents.

**Conclusion.** This study showed that having regular family breakfast – but not other family meals – was inversely associated with children's weight status.

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### 1. Introduction

Prevalence of overweight and obesity among children and adolescents across Europe is substantial and has grown over the past decades (Han et al., 2010; Kosti and Panagiotakos, 2006; Wang and Lobstein,

2006). Recent reports show signs of a levelling off in prevalence rates of childhood obesity in some countries, (Olds et al., 2011; Rokholm et al., 2010) but there is little dispute that the levels are still too high, thus representing a significant public health challenge (Brug et al., 2012b; Olds et al., 2011; Wijnhoven et al., 2014). The evidence is strong that once obesity is established, it is difficult to reverse through intervention programs (Oude Luttikhuis et al., 2009), thus tracking into adulthood (Singh et al., 2008). Therefore it is important to promote obesity prevention in early childhood.

Determinants of childhood obesity include dietary intake behaviors, meal patterns and physical activity (Brug et al., 2012b). A relevant

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dietary behaviour among children is eating regular meals (Kremers et al., 2006), i.e. breakfast, lunch, and dinner (Mota et al., 2008). Previously published results from the ENERGY (European Energy balance Research to prevent excessive weight Gain among Youth) project reported that children who had breakfast and dinner, and children eating 3 meals (breakfast, lunch and dinner) were less likely to be overweight or obese (Vik et al., 2013). In addition, the context in which these meals are consumed may also play a role; eating meals as a family has been reported to be inversely associated with overweight in children (Hammons and Fiese, 2011; Roos et al., 2014; Taveras et al., 2005; Valdes et al., 2013).

In the present study we refer to family meals as eating breakfast, lunch or dinner together with one or both of the parents/caretakers. Potential underlying mechanisms for the association between family meals and overweight/obesity may be that family meals may be healthier and more varied, resulting in better nutritional health (Hammons and Fiese, 2011), and that family meals may be more supervised, resulting in healthier eating (Videon and Manning, 2003). Frequent family meals may also be an indicator of a health-promoting lifestyle of the whole family. Finally, skipping of meals, e.g. breakfast, which has been associated with overweight among children and adolescents, (Croezen et al., 2009; Szajewska and Ruszczynski, 2010) may be less common if having meals with the family is an established habit (Videon and Manning, 2003). A meta-analysis reported that children and adolescents who shared family meals three or more times per week were more likely to be of normal weight than those who shared fewer than three family meals together (Hammons and Fiese, 2011). However, a recent systematic review found inconsistent and weak evidence of an inverse association between the frequency of family meals and risk of childhood overweight, concluding that further research is needed to establish this possible link (Valdes et al., 2013).

Both the meta-analysis by Hammons (Hammons and Fiese, 2011) and the systematic review by Valdes (Valdes et al., 2013) did not include any European studies. Therefore, the ENERGY dataset provides the opportunity to study the association between family meals and weight status among European children 10–12 year old, during the transition from childhood to adolescence. Also the habit of frequent family meals may vary across countries. Children in some countries, i.e. Switzerland, Hungary and The Netherlands, may come home from school for lunch in the middle of the day, whereas in other countries children eat lunch at school.

The present study aimed to assess (i) the prevalence of eating breakfast, lunch, dinner together with family (family meals) among 10–12 year olds in Europe, (ii) the association between family meals and weight status of these children, and (iii) potential differences in having family meals according to country of residence, gender, ethnicity and parental levels of education.

## 2. Materials and methods

The ENERGY-project (Brug et al., 2010) includes a cross-sectional, school-based survey of anthropometrics and energy balance related behaviors across eight European countries. The design and conceptual framework of the project (Brug et al., 2010), as well as the description of the cross-sectional survey (van Stralen et al., 2011), have been previously published. The present study was conducted according to the guidelines in Declaration of Helsinki and all procedures involving human subjects were approved by the relevant ethical committees and ministries in each participating country (van Stralen et al., 2011).

### 2.1. Sample and procedure

Eight countries were included in the school-based survey (Belgium, Greece, Hungary, The Netherlands, Norway, Slovenia and Spain), conducted between March and July 2010, and Switzerland were included later i.e. the last questionnaires were distributed in December 2010. A

national sample frame was used in Greece, Hungary, The Netherlands and Slovenia, while schools from specific regions were sampled in Spain, Belgium, Norway and Switzerland. Pupils in their final years of primary education (aged 10 to 12 years), and one of their parents, were included in the study. Based on previous cross-European studies, we aimed for a sample of 1000 schoolchildren per country and one parent for each child.

A school recruitment letter was sent to the headmaster of the sampled schools, followed by a personal telephone call. Following the school's agreement, parents received a letter explaining the study's purpose and were asked to provide a written consent for their child's participation in countries where active informed consent (opt in) was required (Belgium, Hungary, Norway, Spain, Greece, Slovenia and Switzerland). In The Netherlands where medical ethical approval required passive informed consent (opt out), the parents were provided with study information and a form that they could return to the school to declare that their child was not to be included in the study. The children were provided with an information letter prior to the study and a statement that participation was voluntary. The children completed a questionnaire in the classroom in the presence of a trained project worker (approx. 45 min). Children participating in the study received a questionnaire to take home for completion by one of their parents. Completed parent questionnaires were brought back to the school in a closed envelope by the children and were collected by the teacher. A total of 199 schools participated, with 7716 children (response rate 59%) and 6419 parents (response rate 54%) completing the items of interest in this study's questionnaires. There were mostly mothers (82%) who filled in the parent questionnaire. The 7716 children and the 6419 parents constitute the study sample in the present study.

### 2.2. Measures

All measures were conducted according to standardized protocols (van Stralen et al., 2011), and questionnaires were translated and back translated to ensure consistency across languages. Further information regarding the procedures and training of research staff are published elsewhere (van Stralen et al., 2011).

### 2.3. Family meals

Prevalence of family meals was assessed in the parent questionnaire by three questions. "How often do you and/or your spouse/partner have breakfast together with your child?" "How often do you and/or your spouse/partner have lunch together with your child?" How often do you and/or your spouse/partner have dinner together with your child? All of the three questions had response options: "Never", "Once a week", "2–4 days a week", "5–6 days a week" and "every day". The three family meals items were dichotomized into 5–7 days per week vs. 2–4 days or less per week. Test-retest reliability of the family meals items was 0.79 for "how often do you have breakfast with you child", 0.80 for "how often do you have lunch with you child" and 0.70 for "how often do you have dinner with you child", examined in a separate study, expressed by intra-class correlation coefficient (ICC) (Singh et al., 2012). ICCs were calculated for the original scale of the questions that included 5 answering options.

### 2.4. Weight status

Body height and weight were measured by trained research assistants. The children were measured in light clothing without shoes. Body height was measured with a Seca Leicester Portable stadiometer (accuracy of 0.1 cm), weight with a calibrated electronic scale SECA 861 (accuracy of 0.1 kg). Two readings of each measurement were obtained. If the two readings differed >1%, a third measurement was taken. All three measurements were recorded and the outlier was excluded during the data cleaning process and the mean of the two

remaining recordings was calculated. BMI was calculated for each child and the definition of weight status (normal weight and overweight including obesity) was based on the International Obesity Task Force criteria (Cole et al., 2000).

2.5. Demographic variables

Information on gender (boy or girl) and ethnicity (“which language do you most often speak at home?” with response options: “native language”, “three country specific language options tailored to the different countries” and “other” and dichotomized into ‘native’ or ‘non-native’), and parental education (‘low’; both parent/caregiver with fewer than 14 years of education, or ‘high’; at least one parent/caregiver with 14 years or more of education) was obtained (Brug et al., 2012a).

2.6. Statistics

All data were analyzed using SPSS version 22 (SPSS Inc. Chicago, IL). Descriptive analysis and cross tabulations were performed to calculate proportions classified as normal weight and overweight (including obese), according to gender, ethnicity, level of parental education and country of residence. Proportions of family meals were calculated according to weight status, gender, ethnicity, level of parental education and country of residence. Binary logistic regression analyses for being overweight including obesity as dependent variable and having a regular family meal as independent variables were conducted to study the association between family meals and weight status in the total sample. Separate models were run for each meal (i.e. breakfast, lunch and dinner) and all models were adjusted for country, gender, ethnicity and parental education as potential confounding factors. Intake of meals per se might affect the association between family meals and children’s weight status. Unfortunately, the total number of meals per week was only available for breakfast and not for lunch and dinner. In order to adjust for children’s total number of breakfasts per week, two child reported variables were combined: “how many days do you usually eat breakfast

on weekdays?” and “how many days to you usually eat breakfast on weekend days?”

Therefore, additional analyses with family breakfast as an independent variable were performed to adjust for total number of breakfasts per week as proxy for eating regular breakfast per se. Binary logistic regression analyses for having regular family meals (i.e. separate models for breakfast, lunch, dinner) as dependent variable and gender, ethnicity and parental education as independent variables were conducted to study differences in having family meals according to these socio-demographics. These analyses were conducted for the whole sample and for each of the countries.

3. Results

The study sample included 7716 children; mean age 11.5 ± 0.7 years; 52% girls and 92% native ethnicity and 6419 parents; 65% with higher parental education. As previously published, 23% of the children were categorized as overweight including obese (Brug et al., 2012b). Parents reported eating breakfast, lunch, dinner together with their child 5–7 times per week were 35%, 37%, and 76% respectively (Table 1).

Children who ate breakfast together with their parents 5–7 times per week had lower odds of being overweight (OR = 0.78 (95% CI 0.67–0.91)) compared to those who ate breakfast with their parents 2–4 times or less per week (Table 2). Having lunch and dinner together with the family 5–7 times per week was not associated with overweight status. Country specific analyses showed that only in Hungary (OR = 0.61 (95% CI 0.39–0.94) and Switzerland (OR = 0.48 (95% CI 0.28–0.84) having breakfast with the family was statistically significantly associated with overweight status, but the odds ratios were similar and <1.0 in each country as in the total sample (Table 2). None of the country-specific analyses showed any significant association between having lunch and dinner 5–7 times per week with the family and overweight status.

Regarding potential socio-demographic determinants, children of higher educated parents were more likely to have breakfast together

Table 1

Sample size, descriptive analysis of the proportion of children classified as normal weight, and overweight and obese, as well as children who had breakfast, lunch, dinner 5–7 times/week with their family, related to weight status, gender, parental education, ethnicity and country.

	N (Children)	Normal weight %	Overweight incl. obese %	N (Parents)	Breakfast with family 5–7 days/week %	Lunch with family 5–7 days/week %	Dinner with family 5–7 days/week %
Total	7716	77	23	6419	35	37	76
Normal weight	5953				38	36	78
Overweight incl. obese	1763				25	38	70
p-Value					≤0.001	0.17	≤0.001
Girls	4012	79	21		34	36	76
Boys	3704	75	25		35	37	76
p-Value		≤0.001	0.001		0.42	0.90	0.63
Low education		73	27	2006	27	46	72
High education		80	21	3698	40	33	78
p-Value		≤0.001	0.002		≤0.001	≤0.001	≤0.001
Non-native	433	74	26		33	51	76
Native	5945	77	23		35	35	76
p-Value		0.12	0.64		0.38	≤0.001	0.77
Belgium		85	15	745	47	21	79
Greece		59	40	994	17	55	56
Hungary		75	25	918	22	15	69
The Netherlands		84	16	401	73	52	97
Norway		86	14	838	47	2	92
Slovenia		73	27	1004	17	40	60
Spain		75	25	958	38	46	87
Switzerland		86	14	561	53	79	88
p-Value		≤0.001	≤0.001		≤0.001	≤0.001	≤0.001

Proportions are calculated using cross tabulations. p-Values are derived from Chi square testing. Sample size may vary due to missing values on education and ethnicity variables. Time/place of the study: 2010/Belgium, Greece, Hungary, The Netherlands, Norway, Slovenia, Spain, Switzerland.

**Table 2**  
Odds ratios (95% confidence intervals) of being overweight and obese (compared to normal weight) for children eating breakfast together with family, lunch together with family, dinner together with family, in the total ENERGY-sample and for each country. Separate models for breakfast, lunch and dinner.

Total N =	OW and OB vs. normal weight	OR <sup>a</sup> (95% CI)	p-Value	Belgium OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Greece OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Hungary OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	The Netherlands OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Norway OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Slovenia OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Spain OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value	Switzerland OW and OB vs. normal weight	OR <sup>b</sup> (95% CI)	p-Value
Breakfast with family	0.78	(0.67, 0.91)	0.002	0.92	(0.61, 1.55)	0.92	0.94	(0.64, 1.38)	0.74	0.61	(0.39, 0.94)	0.03	0.52	(0.24, 1.14)	0.10	0.76	(0.49, 1.19)	0.23	0.77	(0.49, 1.21)	0.26	0.99	(0.71, 1.38)	0.96	0.48	(0.28, 0.84)	0.01
Lunch with family	0.93	(0.80, 1.07)	0.31	0.93	(0.54, 1.59)	0.78	0.62	(0.71, 1.22)	0.62	0.75	(0.45, 1.22)	0.25	1.50	(0.72, 3.13)	0.28	n.a.	n.a.	n.a.	0.87	(0.64, 1.20)	0.41	1.01	(0.74, 1.39)	0.94	0.77	(0.44, 1.37)	0.38
Dinner with family	0.95	(0.81, 1.10)	0.46	0.85	(0.50, 1.42)	0.53	0.49	(0.69, 1.19)	0.49	0.81	(0.57, 1.15)	0.24	n.a.	n.a.	n.a.	0.78	(0.36, 1.68)	0.53	1.01	(0.73, 1.38)	0.98	1.31	(0.80, 2.15)	0.29	0.90	(0.43, 1.87)	0.77

Breakfast with family: additional adjusted for total number of breakfast intake per week. OW: overweight. OB: obese. n.a.: not applicable due to <5 cases. Time/place of the study: 2010/Belgium, Greece, Hungary, The Netherlands, Norway, Slovenia, Spain, Switzerland. **Bold** – statistically significant association ( $p < 0.05$ ).

<sup>a</sup> Adjusted for gender, ethnicity, parental education and country.

<sup>b</sup> Adjusted for gender, ethnicity and parental education.

with their parents (OR = 1.63 (95% CI 1.42–1.86)) and less likely to have lunch together with their parents (OR = 0.72 (95% CI 0.63–0.82)) compared to children of lower educated parents (Table 3). The associations between parental education and family breakfast remained statistically significant in a number of country-specific analyses, and the OR's for parental education associated with breakfast with family were in the same direction for all the eighth countries. The most pronounced association with parental education was observed in The Netherlands (OR = 2.70 (95% CI 1.56–4.67)). A similar country-specific pattern was observed for parental education and lunch with family as the total sample, with the exception of Greece. Regarding ethnicity, native children from Switzerland were more likely to have breakfast and lunch with family (OR = 1.85 (95% CI 1.20–2.85) and OR = 2.31 (95% CI 1.45–3.68) respectively), and native children from Hungary (OR = 0.26 (95% CI 0.09–0.70)) and Norway (OR = 0.08 (95% CI 0.01–0.44)) were less likely to have lunch with family. No significant associations of having family meals with gender were observed.

#### 4. Discussion

The present study indicates that children from parents who report to often eat breakfast together with their children had lower odds of being overweight compared to children who had breakfast with their parents less frequently, also after adjustment for eating breakfast as such. This was not the case for the two other family meals studied; lunch and dinner. This is in line with the observation that the countries with the highest overweight rates are the ones with the lowest rates of family breakfast. To some extent this is also true for dinner, whereas lunch is influenced by the fact that in some countries children go home for lunch and others have school lunches. Berge et al. studied the predictive role of family meals for youth obesity and found a 10-year longitudinal association, i.e. family meals during adolescence predicted lower likelihood of overweight and obesity in young adulthood (Berge et al., 2015). In earlier research, Northern European children, compared with Southern and Eastern European children, were significantly more likely to be overweight if they had fewer family breakfasts (Roos et al., 2014). Roos et al. focused on the same age group in a cross European sample, however, our present study used objectively measured height and weight (Roos et al., 2014). A study among Finnish schoolchildren 9–11 years of age found that more frequent family meals (breakfast and dinner) predicted a lower BMI two years later (Lehto et al., 2012). Our findings are thus also in line with these two studies.

While the lack of an association of family dinner with overweight may be explained by the assumption that dinner will be prepared by one of the parents even if they do not eat together, whereas children can prepare their own breakfast with what is available when they are alone. We have previously reported associations between eating dinner and the likelihood of being overweight and/or obese among children using ENERGY data (Vik et al., 2013), but we cannot distinguish between dinner as such or dinner in a family context. However, there are evidence-based reasons to presume that the family context is important with regards to having regular meals together (Neumark-Sztainer et al., 2003; Woodruff et al., 2010). One variable that may affect the relationship between family meals and children's overweight is whether the family meal was eaten while TV was turned on (Roos et al., 2014). The children included in this present study were also asked how frequent they ate their meals in front of TV, and the results showed that the odds of being overweight was lower for children who reported to never watch TV at lunch and dinner compared to those who did (Vik et al., 2013). However, we do not have data to determine if the children watch more TV if they eat alone, or if family meals are eaten in front of the TV. Family meals may be more varied and the presence of a parent may also lead to a healthier food intake (Videon and Manning, 2003).

Children of higher educated parents were more likely to have breakfast together with their parents and less likely to have lunch together

**Table 3**

Odds ratios (95% confidence intervals) children eating breakfast, lunch and dinner together with family, in the total ENERGY-sample and for each country related to gender, ethnicity and parental education in the total ENERGY-sample and for each country. Separate models for gender, ethnicity and parental education.

Total (N = 7915)	Breakfast with family		Lunch with family		Dinner with family	
	OR <sup>a</sup> 95% CI	p-Value	OR <sup>a</sup> 95% CI	p-Value	OR <sup>a</sup> 95% CI	p-Value
Gender (boys vs. girls)	1.03 (0.91, 1.15)	0.67	0.95 (0.84, 1.08)	0.43	1.00 (0.87, 1.13)	0.94
Ethnicity (native vs. non-native)	1.26 (0.98, 1.63)	0.08	1.02 (0.79, 1.31)	0.89	0.85 (0.65, 1.12)	0.26
Education (high vs. low)	<b>1.63 (1.42, 1.86)</b>	<b>≤0.001</b>	<b>0.72 (0.63, 0.82)</b>	<b>≤0.001</b>	1.05 (0.91, 1.21)	0.50
<i>Belgium<sup>b</sup></i>						
Gender (boys vs. girls)	1.30 (0.95, 1.78)	0.10	1.09 (0.74, 1.58)	0.67	0.99 (0.68, 1.45)	0.95
Ethnicity (native vs. non-native)	1.84 (0.93, 3.64)	0.08	0.57 (0.29, 1.14)	0.11	0.52 (0.20, 1.34)	0.18
Education (high vs. low)	<b>2.27 (1.45, 3.57)</b>	<b>≤0.001</b>	0.92 (0.56, 1.52)	0.75	0.80 (0.46, 1.38)	0.42
<i>Greece<sup>b</sup></i>						
Gender (boys vs. girls)	1.15 (0.80, 1.65)	0.46	1.07 (0.82, 1.40)	0.60	1.16 (0.89, 1.52)	0.26
Ethnicity (native vs. non-native)	0.58 (0.32, 1.06)	0.08	0.97 (0.59, 1.59)	0.91	<b>0.55 (0.33, 0.93)</b>	<b>0.03</b>
Education (high vs. low)	1.12 (0.78, 1.63)	0.54	1.01 (0.77, 1.31)	0.96	1.03 (0.79, 1.35)	0.83
<i>Hungary<sup>b</sup></i>						
Gender (boys vs. girls)	0.94 (0.67, 1.33)	0.74	1.11 (0.73, 1.67)	0.63	0.83 (0.61, 1.13)	0.24
Ethnicity (native vs. non-native)	0.94 (0.30, 2.92)	0.91	<b>0.26 (0.09, 0.70)</b>	<b>0.01</b>	0.66 (0.21, 2.05)	0.47
Education (high vs. low)	1.33 (0.94, 1.89)	0.11	<b>0.51 (0.34, 0.77)</b>	<b>0.001</b>	1.26 (0.92, 1.72)	0.15
<i>The Netherlands<sup>b</sup></i>						
Gender (boys vs. girls)	1.32 (0.81, 2.15)	0.27	0.84 (0.55, 1.29)	0.43	0.64 (0.14, 3.07)	0.58
Ethnicity (native vs. non-native)	1.84 (0.55, 6.20)	0.33	1.40 (0.43, 4.60)	0.58	n.a.	n.a.
Education (high vs. low)	<b>2.70 (1.56, 4.67)</b>	<b>≤0.001</b>	0.66 (0.39, 1.12)	0.13	0.22 (0.02, 2.53)	0.22
<i>Norway<sup>b</sup></i>						
Gender (boys vs. girls)	1.10 (0.81, 1.48)	0.55	0.39 (0.07, 2.07)	0.27	0.89 (0.50, 1.59)	0.69
Ethnicity (native vs. non-native)	0.91 (0.39, 2.13)	0.83	<b>0.08 (0.01, 0.44)</b>	<b>0.004</b>	2.42 (0.77, 7.61)	0.13
Education (high vs. low)	<b>2.24 (1.57, 3.19)</b>	<b>≤0.001</b>	0.53 (0.11, 2.45)	0.41	<b>2.66 (1.47, 4.79)</b>	<b>≤0.001</b>
<i>Slovenia<sup>b</sup></i>						
Gender (boys vs. girls)	1.01 (0.71, 1.43)	0.97	0.90 (0.68, 1.18)	0.44	1.11 (0.85, 1.46)	0.45
Ethnicity (native vs. non-native)	1.11 (0.53, 2.33)	0.79	0.78 (0.47, 1.30)	0.34	0.82 (0.48, 1.41)	0.47
Education (high vs. low)	<b>1.80 (1.24, 2.63)</b>	<b>0.002</b>	<b>0.62 (0.47, 0.81)</b>	<b>0.001</b>	0.83 (0.63, 1.09)	0.17
<i>Spain<sup>b</sup></i>						
Gender (boys vs. girls)	0.87 (0.66, 1.15)	0.32	0.89 (0.68, 1.17)	0.40	1.08 (0.72, 1.60)	0.72
Ethnicity (native vs. non-native)	0.65 (0.27, 1.56)	0.34	0.94 (0.39, 2.26)	0.88	1.11 (0.32, 3.85)	0.87
Education (high vs. low)	1.19 (0.84, 1.69)	0.33	<b>0.52 (0.37, 0.73)</b>	<b>≤0.001</b>	1.07 (0.65, 1.75)	0.79
<i>Switzerland<sup>b</sup></i>						
Gender (boys vs. girls)	0.80 (0.57, 1.13)	0.21	0.82 (0.54, 1.24)	0.34	<b>0.59 (0.34, 1.00)</b>	<b>0.05</b>
Ethnicity (native vs. non-native)	<b>1.85 (1.20, 2.85)</b>	<b>0.01</b>	<b>2.31 (1.45, 3.68)</b>	<b>≤0.001</b>	1.63 (0.90, 2.92)	0.11
Education (high vs. low)	<b>1.71 (1.20, 2.44)</b>	<b>0.003</b>	0.96 (0.63, 1.48)	0.87	1.25 (0.72, 2.17)	0.42

n.a.: not applicable due to <5 cases. Time/place of the study: 2010/Belgium, Greece, Hungary, The Netherlands, Norway, Slovenia, Spain, Switzerland.

<sup>a</sup> Adjusted for gender, ethnicity, parental education and country.

<sup>b</sup> Adjusted for gender, ethnicity and parental education.

with their parents compared to children of lower educated parents. Children of highly educated parents have been reported to be more likely to eat breakfast compared to children of lower educated parents (Vik et al., 2013). If parents believe that breakfast is important to eat before school (and work), and are aware of the positive implications this may have for their child's health, this may influence the habit of eating together to make sure that the child eat a healthy breakfast. Higher levels of parental education, in particular the mother's education has been shown to be associated with healthier dietary habits among adolescents (Nilsen et al., 2010). It has also been well-documented that higher educated parents are more likely to engage in healthful behaviors (Vereecken et al., 2004; Wang and Lim, 2012). Furthermore, lower educated parents are more difficult to reach with health messages (O'Malley et al., 1999). A regular family meal pattern may therefore be an indicator of a health-promoting lifestyle of the family. Our finding that children of higher educated parents had lower odds of having lunch together with their parents compared to children of lower educated parents is difficult to explain. It is more likely that employment status may influence this relationship rather than the number of years of parental education.

The prevalence of family dinner in the present study was comparable to the results from the Nurses' Health Study II (Gillman et al., 2000), where 40% of 9–14 year olds reported to eat dinner with members of their family on most days, and 43% every day. Greece and Slovenia were the two countries with the lowest percentage of frequent family dinners in our study (56% and 60%). The reason for this in Greece may be that parents usually have long work hours and see their children at bed time.

The results of this present study suggest that family meals may be important for children's weight status. These result combined with those of other studies suggest that promoting family meals may contribute to improved weight status in children. A recent review on promoting family meals (Dwyer et al., 2015) reported that important strategies were goal setting and interactive group activities, and that intervention targets included cooking and food preparation, cost, shopping, and adolescent influence. Furthermore, key correlates of family meals were employment, socioeconomic and demographic factors, family structure, and psychosocial constructs. Increasing youth involvement in mealtime, tailoring interventions to family characteristics, and providing support for families experiencing time-related barriers are

suggested strategies for promoting family meals among children and adolescents (Dwyer et al., 2015).

#### 4.1. Study limitations and strengths

The large multinational sample from different regions across Europe and the standardized data collection protocol across the different countries represent strengths in this study. Weight and height were objectively measured. The self-reported measures were test-retested and validated in a separate study (Singh et al., 2012). Limitations include the cross-sectional design of the study, and therefore we cannot draw any inferences about causality. The self-reported measures were single items, and social desirability may occur in parental answers. Also, mothers are over-represented in parent responses and this might cause bias to the data because it is likely that mothers are more aware of when and with whom meals are consumed. There are probably many aspects of socioeconomic and cultural differences, i.e. family income, that are not covered by the variables included in the present study. Pubertal development can be associated with body composition and overweight status, but is not known if pubertal development is associated with family meals. It may be the case that children who have developed into puberty are less willing to participate in family meals, since puberty is associated with more need for independence and opposition to parental control (Moretti and Peled, 2004), however pubertal development was not measured in the study and thereby could not be included as a possible confounder. Although experiences from the data collection process indicated that there were few cases of siblings (e.g. twins) entered in the study, a “sibling variable” lacked in the dataset, and therefore could not be accounted for in the analyzes. The association between family meals and overweight is likely to be more similar among siblings than between other children, and therefore it could not be ruled out that this might cause a small effect despite the large sample. Finally, we were only able to adjust for the potential ‘effect’ of having breakfast as such from having breakfast with a parent present. We did not have available data to do this for lunch and dinner. Therefore, any conclusion regarding the potential effects of the family context should be taken with caution, and needs further research.

## 5. Conclusion

In conclusion, results of this study indicate that the likelihood of being overweight was lower for children who ate breakfast regularly together with their parents compared to those who did not. Children of higher educated parents were more likely to have breakfast together with their parents and less likely to have lunch together with their parents compared to children of lower educated parents. Since this study is based on cross sectional data, longitudinal- and intervention studies are needed to gain a better understanding of this relationship in addition to exploring other possible factors that may explain this relationship.

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#### Declaration of conflict of interest

The authors declare that there are no conflicts of interest.

## Ethical committees

The relevant ethical committees and ministries in the participating countries were as follows:

Belgium: The Medical Ethics Committee of the University Hospital Ghent.

Greece: The Bioethics Committee of Harokopio University and the Greek Ministry of Education.

Hungary: The Scientific and Ethics Committee of Health Sciences Council.

The Netherlands: The Medical Ethics Committee of the VU University medical center.

Norway: The National Committees for Research Ethics in Norway.

Slovenia: The National Medical Ethics Committee of the Republic of Slovenia.

Spain: The Clinical Research Ethics Committee of the Government of Aragón.

Switzerland: The Ethical committee Basel, The Ethical committee St. Gallen, The Ethical committee Aargau and The Ethical committee Bern.

## Transparency document

The [Transparency document](#) associated with this article can be found, in the online version.

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