Published in final edited form as:
Public Health Nutr. 2009 February ; 12(2): 188–196. doi:10.1017/S1368980008002590.

Characteristics of high and low energy reporting teenagers and their relationship to low energy reporting mothers

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Abstract

Objective: To describe the differences in socio-economic characteristics and body measurements between low, adequate and high energy reporting (LER, AER and HER) teenagers; furthermore, to investigate the relationship to misreporting mothers.

Design: Cross-sectional study. Habitual dietary intake was reported in a questionnaire. Classification into LER, AER and HER using the Goldberg equation within three activity groups based on physical activity questionnaire and calculated BMR.

Setting: Stockholm, Sweden.

Subjects: Four hundred and forty-one 16–17-year-old teenagers (57 % girls) and their mothers.

Result: Of the teenagers, 17–19 % were classified as HER, while 13–16 % as LER. There was a highly significant trend from HER to LER in BMI ($P<0{\cdot}001$) and body fat % ($P<0{\cdot}001$). There was also a trend in number of working hours of mother ($P=0{\cdot}01$), family income ($P=0{\cdot}008$) and number of siblings (among boys only) ($P=0{\cdot}02$), but not in educational level of either father or mother. HER teenagers were lean, had mothers working fewer hours with lower income and had siblings. It was more likely that an LER girl had an LER mother than an AER mother (OR=3·32; $P=0{\cdot}002$).

Conclusions: The reasons for the high number of over-reporters could be many: misclassification due to growth, lacking established eating pattern due to young age or method-specific. Nevertheless, the inverted characteristic of HER compared to LER indicates that this is a specific group, worth further investigation.

Keywords

Reporting bias; Adolescents; Socio-economic status; Body mass index; Mother–child

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Most nutrition researchers today would agree that misreporting in self-reported data is a major problem that can seriously distort the interpretation of results. The identification of different characteristics connected to different kind of misreporting is important to increase the understanding of these processes.

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Authorship responsibilities: K.V. wrote the paper, performed the analyses and interpreted the results. A.K.L. contributed with the interpretation of results and revising the paper, while Y.L. revised the paper and initialised the study.

Conflict of interest: There are no conflicts of interest.

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Biases can occur in all kinds of research at any stage, from planning a study to publishing the results. When depending on dietary assessment methods, there are additional problems since the collecting phase in studies of the diet is paved with all sorts of difficulties. Different diet assessment methods are associated with different types of bias(1). The method considered the most accurate is the weighed diet-record method, but it has problems both with compliance and with the risk of changed eating behaviour during the study period. The 24 h recall method, on the other hand, can suffer from limitation of memory. The quality of the outcome is also dependent on the skill of the interviewer. The 24 h recall method is considered to give the highest proportion of under-reporters(2). To use diet histories is labour intensive, even though with usually high-quality outcome. The most convenient method, especially in large populations, is the FFQ, but because of its standardised design the flexibility regarding unusual food intake is limited. In addition, groupings of food items could cause classification problems. Furthermore, there is a risk, regardless of method used, of unacceptability bias, i.e. when some foods are being left out due to embarrassment or invasion of privacy.

The consequence of reporting bias is often that energy intake (EI) is under-reported, but over-reporting exists too. Over-reporting is generally considered a minor problem and the occurrence has been estimated to only a few per cent among adults; for example, 3 % (diet history, Sweden)(3), 5–7 % (FFQ, Sweden)(4), 3–7 % (24 h recall, Iran)(5), and also as high as 16–24 % in a Jamaican study (FFQ)(6). We have found only two studies studying over-reporting among children or adolescents. Both studies showed prevalence figures of 16–17 % using 24 h recall in the USA(7) and diet history in Sweden(8).

It is plausible to think that different groups in the population are more or less likely to under- or over-report their habitual EI. For instance, it is well known that under-reporting is more common among overweight individuals(9,10), and the probability for under-reporting increases as BMI increases(4,11,12). In addition, socioeconomic factors may play a role. Many studies have found an association between under-reporting and low education(9,11,13,14). Income has not been studied to the same extent, but it seems to be unrelated(10,15). Smoking habits have also been studied but with inconclusive result(3,4,16). Besides socio-economic factors, other characteristics such as demographics, type of diet, eating behaviour, social desirability, dieting/weight history and physical activity (PA) have been noticed or hypothesised to be associated with energy under-reporting(17).

There is not enough information today to draw any conclusions about socio-economic characteristics among over-reporters, but at least one study has analysed these aspects before. Mattisson *et al*. compared low and high energy reporters (LER and HER) with adequate energy reporters (AER) in a large Swedish cancer cohort and showed a tendency for female HER to be of a higher social class while the HER men were of a lower class(3).

The present study is unique not only because of the large number of HER but also because of the teenaged population, an age group not often studied. We have also included previously unstudied socio-economic variables such as number of siblings and the number of working hours of mothers. In addition, we have the possibility to relate these processes in an inter-generation perspective.

The aim of the present study is to describe the differences in socio-economic characteristics and body measurements between LER, HER and AER teenagers; furthermore, to describe the concordance of misreporting between teenagers and their mothers.

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Subjects and measurements

Subjects

Subjects were participants in the Stockholm Weight Development Study (SWEDES)(18) with 481 adolescent children and their mothers from the Stockholm region. The data collection was made in 2001–2002. Of the total 481 teenagers in SWEDES, forty did not complete both questionnaires. This left 441 children (253 girls and 188 boys) and their mothers to be included in this study. For subject characteristics, see Tables 1 and 2.

Body measurements

Weight and height, for the calculation of BMI, and body fat % (BF %) were measured at the Obesity Unit, Huddinge, Stockholm. Weight was measured to the nearest 0?1 kg with subjects standing dressed in underwear. Standing height was measured to the nearest 1·0 cm. BF % was estimated by air-displacement plethysmography measurements using the BodPod® Body Composition System (Life Measurement Instruments, CA, USA).

Energy intake

A dietary questionnaire from the SOS (Swedish Obese Subjects) study was used to assess dietary intake in terms of energy and macronutrient intake(19). In a validation study of the questionnaire, mean EI from the questionnaire did not differ significantly from estimated energy expenditure (EE) in neither normal-weight adults nor in obese adults(19). The questionnaire has also been validated in eighteen (nine boys/nine girls) 15-year-old adolescents using doubly labelled water(20). In both girls and boys, the reported mean EI did not differ significantly from measured EE. The questionnaire is a simplified dietary history, covering the dietary intake during the past 3 months. Emphasis is placed on portion sizes for cooked meals and the questionnaire includes coloured photographs to assist subjects in describing this aspect. In addition, the amount of snack food is quantified using sizes for pre-confectioned packages as sold in Sweden. The amounts of food reported were converted into grams, from which the daily EI was computed using food-tables from the Swedish National Food Administration(21).

Energy expenditure

BMR was estimated using Schofield's equations(22). A questionnaire, SAPAQ (Swedish Adolescent Physical Activity Questionnaire)(23), based on IPAQ (International Physical Activity Questionnaire)(24) but adjusted for adolescents, was used to assess PA. In mothers, IPAQ was used. These questionnaires are designed to collect information on frequency, duration and intensity of PA in three different domains (school/work, self-powered transportation and leisure time) during the last 7 d. Total MET-minutes (metabolic energy turnover) calculated from the SAPAQ questionnaire were significantly correlated to the total amount of PA as assessed by accelerometry, indicating a reasonable validity of the questionnaire for assessing the total volume of PA(23). EE for each mother and child was calculated; EE_q=(MET-min/60) × body weight(25).

PA was also measured by means of the Manufacturing Technology Incorporated (MTI, Fort Walton Beach, FL, USA) activity monitor in a subgroup of forty-seven children and fifty mothers during 7 d. There were no statistically significant differences between the group using accelerometers and the rest in terms of BMI, BF %, EE from questionnaire or EI. Total EE from the accelerometer was calculated; TEE_{acc} (MJ/d)=(0·173 × fat-free mass) + (0·00447 × counts/min) + (0·656 × gender) + 0·74(26) for the children and (174·4 × fat-free mass) + (4·72 × counts/min) + 1051·4 for the mothers. The equation for the mothers was derived from a doubly labelled water study on fifty adults (twenty-four women) with mean age of 34·7 years; SEE=1548 MJ/d, R^2=0·65 (Ekelund U *et al.*, unpublished data).

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Identifying low and high energy reporters

All study subjects were divided into different EE groups (low, medium and high), based on their estimated EE (EE_{quest} + BMR). The cut-offs were chosen to create three equally large groups (tertiles) among girls, three groups among boys and three among mothers. Within each EE group the CI for EI divided by BMR were calculated using the Goldberg equation (Fig. 1). The PAL values (physical activity level), calculated from total TEE_{acc} divided by BMR, were also divided into three equal groups before used in the equation. The mean PAL values in these groups – 1·45, 1·60 and 1·77 for girls, 1·57, 1·75 and 1·87 for boys and 1·42, 1·58 and 1·70 for mothers – were considered valid for the whole sample. This resulted in three different CI for boys (1·11, 2·22; 1·24, 2·47; 1·32, 2·64), three for girls (1·03, 2·05; 1·13, 2·26; 1·25, 2·50) and three for mothers (1·00, 2·00; 1·12, 2·22; 1·21, 2·41) – which CI to use depended on the EE group of the individual.

Individuals with an EI:BMR estimate under the calculated CI were classified as LER, those with a higher value as HER, and the rest as AER.

Socio-economic data

A basic questionnaire was handed out to all mothers regarding smoking habits (‘Do you smoke regularly?’ Yes/ No; ‘Have you smoked earlier but stopped?’ Yes/No), family income (‘What is your total family income after tax deduction an average month?’ open question), occupation (‘What is your profession/occupation?’ open question), education level (‘What is your highest completed education?’ Five different alternatives presented based on the Swedish school system. These were then combined to create two new variables; low and high education), number of hours at work (‘How many hours per week do you work in your profession?’ open question), marital status (‘How are your current situation?’ Three alternatives: living with a spouse, having a spouse but not sharing household or single. The two last alternatives are combined in the presented results) and number of children (‘How many children do you have?’ open question). The teenagers themselves were asked about his or her smoking habits (identical question as above). Information of the education level of the fathers (*n* 276) (identical question as above) was collected 5 years later in a sub-study of SWEDES.

Statistics

SPSS version 14.0 was used for the statistical analyses. χ^2 test, *t* tests, univariate ANOVA with Bonferroni *post hoc* tests, Pearson's correlation and univariate and multivariate logistic binary regression were used. For testing the trends between reporting groups and quantitative variables, Spearman's correlation was used. Results with a *P* value under 0·05 were considered statistically significant.

Type of occupation was classified using the standardised Swedish socio-economic classification(27) dividing the women into two groups; blue-collar workers and white-collar workers. ‘Other occupation’ includes unemployed, housewives, students and self-employed not stating any specific occupation. In the regression models, family income was categorised into three groups, as equal in size as possible. Number of hours at work was also categorised into three groups using 40 h per week as a cut-off, based on the normal Swedish working week. Age was not included in any analyses, since all teenagers had basically the same age and a *t* test showed no statistically significant difference in age between LER and AER among the mothers (t=−0·4, P=0·6). Because of the low number of mothers being HER (n=5), they were excluded in all analyses where mothers were tested.

There were no differences between boys and girls in most analyses, except in the associations between mother and child and in the analyses of number of children in the

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family. Therefore, the results in Table 4 and Fig. 4 presented boys and girls separately, but are combined in all other results.

Results

There were no significant differences between boys and girls for the socio-economic variables, except for smoking prevalence, 13·3 % of the girls and 3·5 % of the boys were currently smoking (*P*<0·001). Some body measurements differed between boys and girls, but mean BMI and obesity prevalence were similar, as shown in Table 1. The distribution into reporting groups was similar in boys as in girls, with slightly more HER than LER and about two-thirds classified as AER.

There was a significant trend in both BMI and BF % from LER to HER, as shown in Figure 2a and b. Mean BMI for LER was 24·0 (SD 3·6) (min-max 18·5–33·2), for AER 21·2 (SD 3·0) (15·6–36·9) and for HER 19·8 (SD 1·8) (15·8–25·0) kg/m^2. Mean BF % for LER was 29·9 (SD 9·1) (6·2–47·6), for AER 23·4 (SD 9·0) (4·5–53·5) and for HER 20·3 (SD 8·4) (3·6-39·4). Girls had a significantly higher BF % than boys (Table 1), but stratified analysis showed that the trends were similar in boys and girls.

Family income, number of hours at work and number of siblings (boys only) also showed a trend from LER to HER (Figs 3 and 4) with lowest income, less working hours and more siblings among HER. There were no differences between the groups in type of occupation and marital status of mother, smoking habits or parental education as shown in Table 3.

In mothers, only five individuals were classified as HER, while 177 were classified as LER (Table 2). No statistically significant differences were found in any of the included variables between LER and AER in mothers, except for mean BMI (LER 25·3(SD 4·7), AER 24·2(SD 4·0), *P* = 0·01) and mean BF % (LER 36·0 (SD 8·7), AER 33·5 (SD 7·8), *P* = 0·002).

Testing the interrelationships between the significant variables above showed that the number of siblings was neither associated with the number of hours at work (*r* = 0·03, *P* = 0·51) nor to the family income (*r* = 0·07, *P* = 0·17), but there was a positive correlation between the family income and the working hours of mother (*r* = 0·20, *P* = 0·001). When the association between reporting capacity (LER, AER or HER) and family income was calculated again, now adjusted for hours at work, the *P* value was 0·06, compared to 0·02 in the unadjusted model. The association between reporting capacity and hours at work, adjusted for income, had a result even further from a significant level (*P* = 0·22 compared to 0·02).

None of the socio-economic variables related to misreporting were associated with the BMI of the child (hours at work, *r* = 0·07, *P* = 0·89; income, *r* = 0·06, *P* = 0·25; siblings, *r* = 0·02, *P* = 0·96) or with the BMI of the mother (hours at work, *r* = −0·03, *P* = 0·56; income, *r* = 0–0.07, *P* = 0·16; siblings, *r* = 0·04, *P* = 0·44).

A significant relationship between LER in daughters and LER in mothers was found, while sons and mothers seemed unrelated in this aspect (Table 4). This association was not distorted by the BMI of the child or any of the socioeconomic variables. The correlation between BMI of mothers and BMI of children was significant in both boys (*r* = 0·21, *P* = 0·003) and girls (*r* = 0·20, *P* = 0·001).

Discussion

The current study of teenagers has presented new information about the characteristics of HER individuals including results from socio-economic variables not studied before. Most

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associations exposed a general trend from LER to HER, somewhat indicating that over-reporters in many aspects are 'inverted' under-reporters. HER children had mothers working fewer hours, having lower income and more children than LER children did. The most predominant finding was the convincing trends in BMI and BF % among both children and mothers. In addition, under-reporting daughters had a higher risk of having a under-reporting mother.

In most dietary surveys, under-reporting is expected. However, in FFQs and diet histories, under-reporting is usually not as bad as in 24 h recall or diet records(1). The questionnaire used in the present study has previously been compared to 4 d weight–diet records in a validation study(19). The questionnaire showed a higher, more plausible, mean EI than the records did, indicating that by using this particular method a certain degree of over-reporting might be expected.

Today most studies neglect to identify over-reporters. Without information on PA, which is often the case, it is impossible to find misreporters who report within a plausible EI. For example, a person with a reported EI of 11·7 MJ/d (2800 kcal/d) would probably be classified as an adequate reporter in most cases. If that particular individual hypothetically has a very low PAL with a total EE of 6·7MJ/d (1600 kcal/d), that person is in fact over-reporting EI.

The most important characteristics of the over-reporters in the present study were the low BMI and low BF %. The leaner someone is, the higher is the tendency to over-report and the more overweight, the higher the tendency to under-report. The fact that over-reporters are leaner than others is very interesting and has also been found previously(3-5), but not in all studies looking at over-reporters(7,28). It is understandable that overweight persons might omit parts of their diet, but why lean individuals would add food items or enlarge the quantities is more intriguing. It is possible that very low weight individuals, including anorectics, want to cover up what they think is considered a too low intake. Very thin children are probably used to being nagged about not eating enough. However, in the present study, we have not analysed eating behaviours or eating disorders, and hence no conclusions could be made in this matter here.

A very interesting fact is, that in spite of 17–19 % over-reporting teenagers, there were almost no over-reporting mothers. Hence, it seems that young age is an important characteristic of over-reporters. We have only found two previous papers studying energy over-reporting in young subjects. Sjoberg *et al.* looked at 16–17-year-old Swedish adolescents classified as mis-reporters using the doubly labelled water method(8) and Ventura *et al.* looked at 11-year-old American girls using EI:EE calculations(7). Both found the over-reporting prevalence to be similar to ours (16–17 %). Over-reporting might be a phenomenon mainly existing among children and adolescents, but why young people seem to over-report more than adults, we can only speculate.

It has been described that people with a low energy demand under-report to a larger extent, while those with higher demand tend to over-report more(19). When presented to many different food groups and asked to quantify, it is easy to respond positively in too many places, if you normally have a large and varied diet. That risk is much smaller when you have a limited intake. This might be one explanation to why more children than mothers were identified as HER. Teenagers, especially boys, have a much higher EI than most middle-aged women.

Another explanation could be that young people have no established eating pattern yet. Someone who has different habits on different days has to choose which day to be described

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in the questionnaire. It is understandable if lean subjects choose to describe the habits from high-intake days, while heavier subjects choose the days with a lower EI.

There is also a possibility for misclassification. Some adequately reporting individuals might have been misclassified as HER due to rapid growth, even though the BMR calculations used in the study(22) have been evaluated and considered the most appropriate for subjects 15–18 years of age(29). If a higher than expected proportion of the EE is used for growth, the subsequent higher EI could be interpreted as over-reporting. Some of the boys were still in the middle of puberty and growing rapidly. All the girls, however, had already passed puberty but nevertheless showing the same proportion of HER as boys.

Family income and maternal working hours were related to each other and when the two variables were added in the same model, the result suggested that income might be the main effect, but further strengthened by working hours. Previous studies, if having any significant results at all, have shown an association between low social class and under-reporting prevalence(9,11,13,14), instead of the high income–LER relationship found in the present study. However, comparisons with previous studies are not easy to make, since most of these have only used educational level as a predictor of social class. In addition, they have only studied adults. Interestingly, the results in our study were only significant among the children, not among the mothers.

A difference in overweight prevalence in the different socio-economic variables could have been an easy explanation for these findings, but neither of the variables was correlated to BMI in itself. However, when adding all variables into a multivariate regression model (including BMI), some of the socio-economic results were indeed affected, even though mostly due to the loss of power by dividing boys and girls. Nevertheless, BMI might have been one cause for the weakening of these associations.

It is well established that overweight and obesity runs in the family with close associations between parental and child BMI in both boys and girls(30,31). We have shown that misreporting behaviour also could be inherited or mirrored between mother and daughter. It is interesting that boys misreport independently of their mothers, even though overweight prevalence is as related to the mother as in girls. It has been shown before that mothers and daughters are more related to each other in eating habits, including problematic eating, than mothers and sons(32).

In conclusion, over-reporting of EI is quite common among young individuals, even though the cause is still inconclusive. In the present study, there was a trend in some characteristics from LER to HER, especially in BMI and body fat. A picture of a typical over-reporter emerged as a lean teenager (either boy or girl) with a mother working part-time with low income and, if being a boy, having siblings. The typical under-reporting teenager is most of all overweight, but if the teenager is a boy, has a tendency to lack siblings and, in girls, has an under-reporting mother. Knowledge of the characteristics of over-reporters might be considered of minor interest because of its scarcity, but the trend from LER to HER in some variables found in our study gives some clues also to the processes of misreporting generally.

Acknowledgments

Funding source: The data collection phase of this study was funded by the European Commission, Quality of Life and Management of Living Resources, Key action 1 ‘Food, nutrition and health’ programme as part of the project entitled ‘Dietary and genetic influences on susceptibility or resistance to weight gain on a high fat diet’ (QLK1-2000-00515).

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$$EI/BMR < PAL \times \exp\left[\sqrt{(CV_{BMR}^2 + CV_{EE}^2)} \times SD_{max}\right]$$

$$EI/BMR > PAL \times \exp\left[\sqrt{(CV_{BMR}^2 + CV_{EE}^2)} \times SD_{min}\right]$$

- ➢ CV_{BMR} = 8.5 % and CV_{EE} = 15 % (suggested by Black[(34)])
- ➢ $SD_{min/max} = \pm 2$ (95 % CI)

Fig. 1.
The Goldberg equation(34) (EI, energy intake; PAL, physical activity level; EE, energy expenditure)

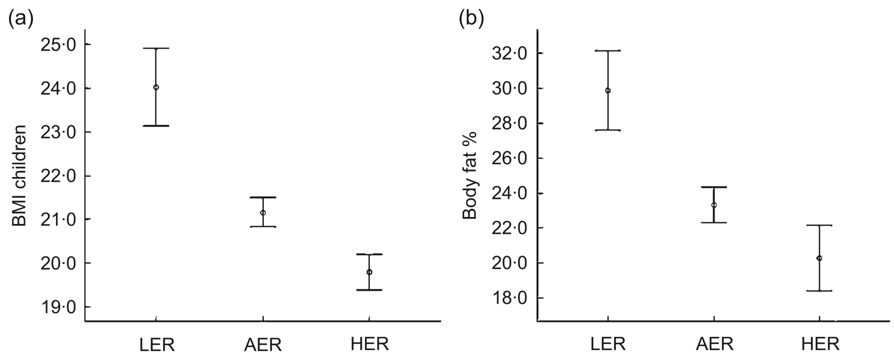

Fig. 2.

Differences in body measurements between low (LER), adequate (AER) and high energy reporters (HER), with 95 % CI. (a) BMI (kg/m^2): all pairwise comparisons, $P < 0{\cdot}001$; P for trend ,0·001. (b) Body fat %: significant difference in AR *v.* OR, $P = 0{\cdot}02$; all other pairwise comparisons, $P < 0{\cdot}001$; P for trend <0·001

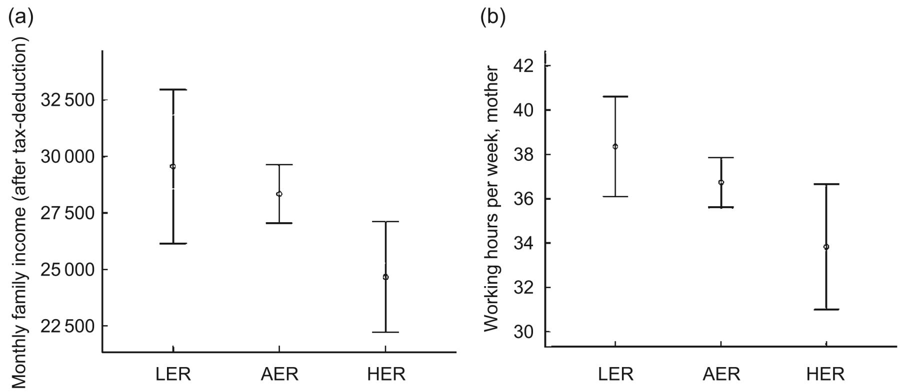

Fig. 3.

Differences in socio-economic variables between low (LER), adequate (AER) and high energy reporters (HER), with 95 % CI. (a) Monthly family income (in Swedish krona; 9 SEK ≈ 1 Euro): significant difference in HER *v.* AER, $P = 0{\cdot}04$, and HER *v.* LER, $P = 0{\cdot}04$; LER *v.* AER, NS; *P* for trend = 0·008. (b) Number of working hours of mother: significant difference in HER *v.* LER, $P = 0{\cdot}03$; all other pairwise comparisons, NS; *P* for trend = 0·01

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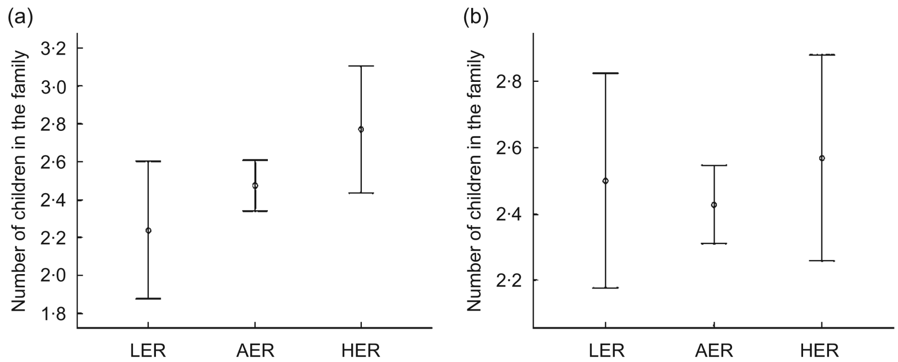

Fig. 4.
Differences in number of children in the family between low (LER), adequate (AER) and high energy reporters (HER), with 95 % confidence intervals. (a) Boys: significant difference in HER *v.* LER, *P* = 0·04; *P* for trend = 0·02. (b) Girls: no significant differences

Table 1

Description of the included SWEDES (Stockholm Weight Development Study) teenagers with comparisons between girls and boys

	Girls (*n* 253)			Boys (*n* 188)			
	Mean	**SD**	**Range (min–max)**	**Mean**	**SD**	**Range (min–max)**	***P*** *
Age (years)	16·8	0·4	15·9–17·8	16·9	0·4	16·1–17·7	0·07
Weight (kg)	59·6	9·1	43·8–94·2	68·7	12·0	46·8–116·2	<0·001
Height (cm)	167·0	6·0	152·0–185·0	180·0	6·0	161·0–195·0	<0·001
BMI (kg/m^2)	21·5	3·1	15·8–36·9	21·1	3·2	15·6–33·2	0·22
Waist circumference (cm)	71·0	7·0	57·0–100·0	75·0	8·0	61·0–109·0	<0·001
Lean body mass (kg)	41·8	4·7	31·5–55·8	56·9	7·0	37·7–79·2	<0·001
Fat mass (kg)	17·8	6·4	5·1–47·1	11·8	7·7	2·0–42·8	<0·001
Body fat %	29·3	6·3	10·6–53·5	16·3	7·4	3·6–40·7	<0·001
Reported energy intake (MJ)	10·5	4·3	3·0–43·3	14·6	5·4	5·7–44·0	<0·001
		n	%		*n*	%	
Number of LER		40	16		25	13	
Number of AER		169	67		128	68	0·75
Number of HER		44	17		35	19	
Prevalence of overweight (including obesity), IsoBMI>25 kg/m^2 †		27	11		28	15	0·19
Prevalence of obesity, IsoBMI>30 kg/m^2		7	3		5	3	0·95

LER, low energy reporters of energy intake; AER, adequate energy reporters; HER, high energy reporters IsoBMI, age-specific BMI.

* *P* value either for *t* test between girls and boys or for χ^2 test for distribution into different groups.

† Classification system recommended by the International Obesity Task Force(33).

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Table 2

Description of the included SWEDES (Stockholm Weight Development Study) mothers (*n* 441)

	Mean	SD	Range (min–max)
Age (years)	46·8	4·4	34·7–61·5
Weight (kg)	68·4	12·5	41·9–133·2
Height (cm)	167·0	6·0	147·0–183·0
BMI (kg/m^2)	24·6	4·3	16·8–50·1
Waist circumference (cm)	82·0	12·0	63·0–143·0
Lean body mass (kg)	44·1	5·0	26·6–60·6
Fat mass (kg)	24·4	10·2	5·8–75·3
Body fat %	34·5	8·4	10·3–60·9
Reported energy intake (MJ)	8·2	2·2	3·8–16·7
	n	%	
Number of LER	177	43	
Number of AER	234	56	
Number of HER	5	1	
Prevalence of overweight (including obesity), BMI>25 kg/m^2	151	34	
Prevalence of obesity, BMI>30 kg/m^2	40	9	

LER, low energy reporters of energy intake; AER, adequate energy reporters; HER, high energy reporters.

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Table 3

Distribution of low, adequate and high energy reporting children within different variables

	LER (*n* 65)		AER (*n* 297)		HER (*n* 79)		
	n	**%**	***n***	**%**	***n***	**%**	***P*** χ^2
Education level of mother							0·88
Compulsory school with/without high school (*n* 174)	26	15	115	66	33	19	
College or university degree (*n* 267)	39	15	182	68	46	17	
Education level of father							0·69
Compulsory school with/without high school (*n* 135)	19	14	91	67	25	19	
College or university degree (*n* 141)	19	13	101	72	21	15	
Type of occupation, mother							0·92
Blue-collar workers (*n* 72)	9	12	48	67	15	21	
White-collar workers (*n* 335)	51	15	226	68	58	17	
Others (*n* 30)	5	17	19	63	6	20	
Marital status of mother							0·22
Living with a spouse (*n* 323)	49	15	222	69	52	16	
Living without a spouse (*n* 116)	16	14	73	63	27	23	
Smoking habits, child							0·50
Smokers (*n* 37)	3	8	25	68	9	24	
Non-smokers (*n* 384)	58	15	260	68	66	17	
Former smokers (*n* 18)	4	22	10	56	4	22	
Smoking habits of mother							0·46
Smokers (*n* 61)	7	12	38	62	16	26	
Never smoked (*n* 202)	30	15	139	69	33	16	
Former smokers (*n* 178)	28	16	120	67	30	17	
Overweight prevalence, child							<0·001
IsoBMI<25 kg/m^{2*} (normal weight) (*n* 386)	41	11	267	69	78	20	
IsoBMI=25–30 kg/m^2 (overweight) (*n* 43)	17	40	25	58	1	2	
IsoBMI>30 kg/m^2 (obese) (*n* 12)	7	58	5	42	0		

LER, low energy reporters; AER, adequate energy reporters; HER, high energy reporters IsoBMI, age-specific BMI.

Different total *n* in some variables due to missing data.

* Classification system recommended by the International Obesity Task Force(33).

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Table 4

Risk (OR) of girls and boys being high or low energy reporters compared to being adequate energy reporters in SWEDES (Stockholm Weight Development Study)

	HER *v.* AER								LER *v.* AER							
	Girls				Boys				Girls				Boys			
	OR	95% CI	*P*	*n* *	OR	95% CI	*P*	*n* *	OR	95% CI	*P*	*n* *	OR	95% CI	*P*	*n* *
Model 1																
Mother's reporting accuracy																
AER	1·00			128	1·00			83	1·00			157	1·00			119
LER	0·61	0·28, 1·31	0·20	70	1·00	0·46, 2·18	0·99	69	3·32	1·55, 7·14	0·002	36	1·53	0·64, 3·65	0·34	25
Model 2																
Mother's reporting accuracy																
AER	1·00			128	1·00			83	1·00			157	1·00			119
LER	0·49	0·22, 1·10	0·08	70	1·06	0·48, 2·31	0·89	69	3·76	1·67, 8·47	0·001	36	1·50	0·56, 3·99	0·42	25
BMI, children	0·72	0·60, 0·86	<0·001	198	0·88	0·74, 1·04	0·12	152	1·23	1·10, 1·38	<0·001	193	1·39	1·20, 1·61	<0·001	144
Model 3																
Mother's reporting accuracy																
AER	1·00			112	1·00			76	1·00			100	1·00			72
LER	0·61	0·25, 1·50	0·28	65	1·26	0·52, 3·01	0·61	64	3·43	1·40, 8·39	0·007	76	1·20	0·38, 3·81	0·76	62
BMI, children	0·70	0·57, 0·86	0·001	177	0·90	0·74, 1·09	0·29	140	1·29	1·12, 1·47	<0·001	176	1·46	1·23, 1·73	<0·001	134
Number of children in the family																
One	1·53	0·32, 7·33	0·59	13	3·24	0·40, 26·05	0·27	6	3·49	0·85, 14·38	0·084	15	8·75	1·15, 66·62	0·036	8
Two	1·00			90	1·00			72	1·00			89	1·00			70
Three or more	1·59	0·67, 3·79	0·29	74	1·96	0·79, 4·86	0·14	62	1·49	0·59, 3·76	0·40	72	1·64	0·46, 5·80	0·44	56
Working hours per week of mother																
<30 h	2·81	0·88, 8·96	0·08	25	2·39	0·67, 8·55	0·18	18	0·19	0·02, 2·50	0·21	17	1·65	0·29, 9·32	0·57	16
30–40 h	1·01	0·33, 3·12	0·98	39	1·17	0·40, 3·41	0·77	41	2·65	0·89, 6·25	0·08	44	0·08	0·01, 0·94	0·04	34
40 h	1·00			87	1·00			61	1·00			91	1·00			62
>40 h	2·43	0·76, 7·72	0·13	26	0·67	1·34, 0·34	0·67	20	1·45	0·42, 5·09	0·56	24	2·27	0·53, 9·66	0·27	22
Family income																
Low	1·50	0·56, 3·96	0·42	59	0·79	0·29, 2·17	0·65	43	0·57	0·17, 1·86	0·35	50	1·59	0·33, 7·69	0·56	39
Medium	1·00			58	1·00			49	1·00			60	1·00			41

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	HER *v.* AER								LER *v.* AER							
	Girls				Boys				Girls				Boys			
	OR	**95% CI**	***P***	***n*** *	**OR**	**95% CI**	***P***	***n*** *	**OR**	**95% CI**	***P***	***n*** *	**OR**	**95% CI**	***P***	***n*** *
High	0·62	0·21, 1·87	0·40	60	0·18	0·05, 0·64	0·01	48	1·02	0·38, 2·73	0·96	66	0·62	0·15, 2·49	0·50	54

LER, low energy reporters; AER, adequate energy reporters, HER, high energy reporters.

* Different total *n* in some variables due to missing data.