Author's response to reviews

Title: Changes in Dietary Intake during Puberty and their Determinants: Results from the GINIplus birth cohort Study

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Point by point reply

MS: 7700628401730231 - Changes in Dietary Intake during Puberty and their Determinants: Results from the GINIplus birth cohort Study

We thank the editor and the reviewers for their highly constructive comments!
The line numbers refer to the marked version of the manuscript

Reviewer 1 (Maite Verloigne)

Major revisions

1. The background is rather short and is lacking a rationale for conducting this study. For example, in the second paragraph (r. 68-71), it is described that certain factors are associated with 'dietary intake' or 'food choice patterns', but these are vague terms, so please be more specific. Also, the direction of associations is not explained. Further, the authors need also to elaborate on the third paragraph, for example, more information on the results of the review, or, describing the most important findings that have been found in the longitudinal studies that have already been conducted. Also, please describe the added value of this study.

RE: We appreciate the reviewer’s constructive criticisms and have elaborated on the study background to be more specific on associations reported between exposure factors and diet, including the direction of these associations. We have also added the most important findings of the mentioned reviews and currently
available longitudinal studies. As some studies were cited more than once, the order of the paragraph had to be slightly altered to avoid repetition (lines 57-81):

“The maintenance of food intake behaviour over time, relative to the rest of the population, is referred to as “dietary tracking”[6]. The presence and strength of dietary tracking, or lack thereof, can reflect the level of stability of individual long-term eating behaviours. A 2012 review [7], summarizing the results of studies assessing tracking levels of dietary patterns from childhood to adolescence [8-11], reported weak to moderate tracking of intakes including fruit and vegetables, total energy, macronutrients, meat and oils. These findings indicate that although some children maintain a relatively stable dietary behaviour during pubertal maturation, others might notably alter their intakes. Nevertheless, only one of the included studies attempted to identify possible determinants of dietary changes during this time period, where, family income, urban-rural residence and mother education were found to be potential predictors of meat, vegetable, fruit and oil intake changes over 6 years [11]. A review on determinants of fruit and vegetable intakes in children and adolescents reported consistent positive associations with family income, parental education, parental intake and home accessibility; a negative association with age; and higher intakes in girls than in boys. However, most of the included studies were based on cross-sectional data and the authors recognised the need for longitudinal analyses [12]. A 2012 longitudinal study testing the association between parental education and intakes of fruit, vegetables, snacks, soft drinks and squash over 20 months, reported that increases in sugar-sweetened beverages were more likely in children with low parental education [13]. Gebremariam et al. assessed the associations of sedentary behaviour on changing intakes of fruits, vegetables, soft drinks, sugar and snacks, and found evidence that high screen-time sedentary behaviour was longitudinally associated with increased consumption of soft drinks and sweets and lower intakes of vegetables [14]. Early onset of puberty was associated with the development of unhealthy lifestyles, such as lower rates of breakfast routines, in a study assessing longitudinal effects of pubertal timing on health behaviours [15]. Additionally, a study in low income adolescents, observed that overweight adolescents were more likely to reduce their energy, fibre and snack food intakes over time [16].”

We further added some sentences to clarify the purpose and added value of our study (lines 82-105):

“The currently available longitudinal studies suggest that socio-economic environment as well as individual characteristics and behaviours, play an important role in determining food intake changes throughout pubertal maturation. Nevertheless, the available literature is scarce and knowledge in this area is still limited. The need for longitudinal studies assessing differences in dietary behaviours of subjects of both sexes and from different segments of the population has been suggested [12, 17]. To our knowledge, no longitudinal cohort study has yet provided a comprehensive description of habitual dietary intake before and after puberty, assessing both environmental and personal factors as potential determinants of observed changes. Our study aim was hence to examine overall changes in intakes of 17 different food groups representative
of total dietary intake, as well as macronutrients and antioxidant vitamins, during this time period; to evaluate the stability of individuals’ intakes over time, and to determine whether specific changes in diet can be predicted by parental education, family income, child education, BMI, pubertal onset and screen-time sedentary behaviour.”

2. First sentence of the final paragraph of the Background is more related to the Methods section.
RE: We deleted this sentence form the final paragraph (lines 99-100). The study aim now continues on from the previous paragraph introducing the added value of our study as seen above.

3. Background > research question: The authors should define the variables that are included in this study with regard to the socio-economic environment, individual characteristics and behaviours.
RE: we defined the variables as follows (lines 103-105):
“…and to determine whether specific changes in diet can be predicted by parental education, family income, child education, BMI, pubertal onset and screen-time sedentary behaviour.”

4. Methods > FFQ: Please give all nine frequency categories.
RE: we have listed all categories as follows (lines 139-141):
“To estimate how often food was consumed over the previous year, subjects could choose one of nine frequency categories, including ‘never’, ‘once a month’, ‘2-3 times a month’, ‘once a week’, ‘2-3 times a week’, ‘4-6 times a week’, ‘once a day’, ‘2-3 times a day’ and ‘four times a day or more’.”

5. Methods > FFQ: why were ‘tea’ and ‘water’ excluded?
RE: Tea and water were excluded due to their lack of energy content. However, comments from both reviewers (see reviewer 2, comment 3) have led us to reconsider this decision. We understand that water has an important role in stimulating health and hence both tea and water could be of interest in the present study. We have now included water and tea in our analysis, presenting their intakes in g/day. We have further adapted the manuscript results, tables 3 and 4 (previously tables 4 and 5), and Supplementary tables 1a and 1b, and 3a and 3b (Previously Supplementary tables 2a and 2b), where appropriate.

6. Methods > FFQ (second paragraph): the first sentence is really difficult to follow, please consider making short sentences.
RE: Thank you for the recommendation. We have broken down the sentence as requested (lines 151-159):
“A quality control procedure was developed and applied to the FFQ data at both time-points (Fig.1). This was done based on recommendations by Willett et al. for data cleaning in nutritional epidemiology [28]. Subjects were excluded if a complete block of food items, presented together under the same subheading,
was empty (144 at baseline and 134 at follow-up). For each food item, if the intake frequency was provided, but portion size was missing, portion size was replaced by the median obtained from the remaining sex-specific populations. Subjects were excluded if responses to more than 40 food items (50% of the FFQ) were missing (16 at baseline and 4 at follow-up).

7. Methods FFQ: could the authors explain the rationale for defining any remaining information as ‘never’? Is it correct to assume this?

RE: The quality control was carried out following recommendations for data cleaning in nutritional epidemiology by Willett et al. [1]. Based on these recommendations we began by excluding all FFQs where full blocks (list of related food items) were missing. The decision to define any remaining information as ‘never’ is based on evidence suggesting that the presence of intermittent blanks in an otherwise carefully completed FFQ, are best considered as no consumption of the missing food item. We have added some explanation to the text to explain the rationale for this step in the quality control process (lines 160-163):

“Evidence suggests that the presence of intermittent blanks in an otherwise carefully completed FFQ, are best considered as no consumption of the missing food item [28]. Therefore, any remaining missing information on frequency of intake was regarded as “never”, and intake of the specific food item was defined as 0g/d”

8. Methods > Individual characteristics: ‘Screen-time was used as a proxy variable of PA and general lifestyle’ # I think with the current knowledge, it is clear that sedentary behaviour and PA are two different constructs, so please delete this sentence. Also, I don’t understand why there is a different threshold for summer and winter, as the recommendations of spending no more than 2 hours on screen-time behaviours is applicable for the entire year. I would recommend to use one threshold.

RE: We thank the reviewer for the useful suggestions. We agree that screen-time and physical activity should be considered as separate concepts, and have deleted the relevant sentence. Furthermore, we have applied only one threshold for the entire year as recommended (# 2h vs. >2h), and adapted the analysis and text accordingly (lines 212-213):

“…reported in 4 categories (ranging from “less than 1 hour” to “5 or more”) and categorized as low (# 2 hours) or high (>2 hours).”

Following the altered “screen-time” variable definition and the addition of a new “child education” variable (refer to reviewer 2, discretionary comment 2) in the regression models, results of the associations and tables 5a and 5b (previously 6a and 6b) underwent some changes.

In females (lines 325 and 330) all previously significant associations (nuts and whole grain) remained significant; additionally, high family income was significantly associated with whole grain intake changes.

In males (lines 338 and 344), associations of egg and margarine with parental
education and BMI remained significant. However, associations seen previously between vegetables, refined grains, fish and oil with family income, or between sugar-sweetened food and screen-time, were no longer significant. Sugar-sweetened food was however, significantly associated with child education level, both before and after re-allocating the food items in this food group (see reviewer 2, comment 2).

Significant associations were also observed for the newly analysed outcomes protein, n3 PUFA, retinol and vitamin C (see reviewer 2, comment 4).

9. Methods > Dietary tracking: is it a common method to use tertiles to measure tracking? Are there any other papers using the same method?

RE: Gender and age-specific tertiles (or other quantiles) are commonly used to measure tracking [2-5]. As in the present study, ranks are typically preferred, at the cost of certain loss of information, in order to overcome non-normal distribution of the dietary data, or problems of under- or over-reporting. The following paragraph was added to the text to explain the use of tertiles (lines 525-529):

“Unfortunately, categorisation of data implies certain loss of information. However, using tertile categories rather than actual intakes, is commonly used to measure tracking [11, 16, 31, 32] and was preferred, in order to overcome the non-normal distribution of the dietary data, as well as possible problems of under- or over-reporting.”

10. Methods > Associations with dietary changes: Study intervention arm was included as a covariate; this is new information in this section and could have important consequences for the results, as some of the participants has received an intervention which could affect dietary changes? Please elaborate on this.

RE: Our analyses were based on data from the GINIplus birth cohort study (German Infant Nutritional Intervention plus environmental and genetic influences on allergy development). Study participants were assigned upon birth to an intervention arm (randomized to one of three hydrolysed formulae or to conventional cow’s milk), or to the non-intervention arm. Intervention arm is included as a covariate to avoid bias due to selective attrition (this variable is typically included in models involving the GINIplus data, although no significant difference in participation was seen for study arm in the present study). Details on the GINIplus study design, recruitment and exclusion criteria have been described in earlier publications; however, we agree that this is not entirely clear in the text. Therefore, to avoid confusion we have rearranged the paragraph under “Study Participants”, including an additional sentence to introduce the intervention concept earlier in the manuscript (lines 115-120):

“The present analysis was based on data collected at the 10- and 15-year follow-ups of the ongoing German birth cohort study GINIplus (German Infant Nutritional Intervention plus environmental and genetic influences on allergy development). Details on the GINIplus study design, recruitment and exclusion criteria have been described previously and can be found elsewhere [18]. In short, healthy full-term new-borns (n=5991) were recruited from obstetric clinics
in two different regions of Germany (Munich and Wesel). Infants were allocated to the study intervention arm (randomized to one of three hydrolysed formulae or to conventional cow’s milk) or to the non-intervention arm. Data on health outcomes and covariates were collected by means of identical questionnaires, completed by parents of all children at various time-points. Information on the relevant exposure variables and covariates is given below.

11. Results > associations with dietary changes: ‘those with high family income and low baseline intakes’ # did the authors examine interaction effects between the independent variables?

RE: We thank the reviewer for this suggestion. However, we did not test formal interactions between the independent variables. In table 4 (previously table 5) we observed significant tracking for all investigated food groups, macronutrients and antioxidants. We carried out the regression analyses in order to characterize those participants maintaining or changing their intakes. The categorization of the dietary intake in tertiles was kept in order to meet the model assumptions and facilitate interpretability. The models analyse whether a participant remains in the same tertile or changes to a lower or higher tertile. As the possible changes are dependent on the baseline tertile (ie. a participant in the highest tertile cannot increase intake by definition), we decided to stratify by baseline tertile.

We are afraid that further interaction analyses would add complexity to the already comprehensive analyses, which would lead to difficulties in interpretation and reporting of results. Furthermore, stratification by baseline intake levels and sex, leads, despite the large sample size, to partly small groups, and so the data does not provide enough power for more thorough interaction analyses. We included a sentence in the limitations section to explain this issue (lines 491-494).

“Furthermore, thorough analyses of interaction effects between independent variables were not possible. Despite our large sample size, analyses by baseline intake levels and sex already resulted in partly small groups, and hence the data could not provide enough power for further stratification.”

12. Discussion: To explain the lack of effects for some of the independent variables, the authors state several times that there are possible earlier influences of the exposure variable on dietary intake. What does this imply for this study or for further research? Please elaborate on this, as it is used often to explain the results.

RE: We propose that significant associations observed between baseline exposures and baseline food intakes, may reflect an intake threshold which is reached before puberty, which could partly explain the lack of effects for some of the independent variables (sometimes contradicting previous findings). Our study investigated dietary changes, and hence, we considered it important to take into account that previous associations may be present in order to draw fair conclusions. We note that earlier influences must be interpreted with caution, as reverse causality cannot be excluded as there is no previous dietary data available for longitudinal analyses before 10 years. Therefore, we highlight the importance of longitudinal studies in investigating associations with dietary
intake. We have elaborated on this in the discussion in order to make this point clear (lines 448-462).

“The lack of associations with BMI could also be explained by possible earlier influences of the exposure variable on food intake at baseline. Dietary behaviours already established before the baseline assessment could indicate an intake threshold was reached before puberty, impeding further change in that direction, e.g. higher BMI was associated with high starchy vegetable, meat, water and protein intakes at baseline (see Supplementary Tables 1a and 1b, Additional file 1). Similarly, parental education level, child education and screen-time also showed significant differences in intakes of a number of food groups at baseline (e.g. higher parental education associated with higher intakes of grains, butter and oil and lower intakes of starchy vegetables and margarine; higher child education with higher fruit, wholegrain and butter intakes and lower intakes of starchy vegetables, meat and sugar-sweetened foods; and higher screen-time associated with lower fruit, vegetables, wholegrain and beta-carotene in both females and males). However earlier influences must be interpreted with caution, as these were cross-sectional associations and reverse causality cannot be excluded as there is no previous dietary data available for longitudinal analyses before the 10 year assessments. We hence highlight the importance of longitudinal analyses in investigating associations with dietary intake changes.”

13. Discussion: similar as to the previous comment, it is difficult to understand why the association between lower intakes of fruit, vegetables, whole grain and nuts in subjects with higher baseline screen-time are a possible explanation for the fact that screen-time was high in males most likely to reduce sugar-sweetened food intakes.

RE: We thank the reviewer for noting this, and fully agree with the comment. The association cannot explain why the intake of sugar sweetened foods decreased over time (as no association was observed with sugar sweetened foods at baseline). The effect observed was inconsistent with previous literature, in which sedentary behaviour has been associated with increased unhealthy dietary intakes. Given that higher intakes of fruit, vegetables, whole-grain and nuts are all under the scope of what is widely considered “healthy” dietary behaviours, these associations somewhat reflected the presence of less healthy tendencies (lower intakes) in highly sedentary children at baseline. We hence pointed this out to note that, despite the effect observed, other associations seem to be in line with previous findings. Nevertheless, this association was no longer observed following the altered cut-offs for “screen-time” and the inclusion of “child education level” in the models. This section was hence deleted from the manuscript and associations at baseline were mentioned only to suggest an explanation for the lack of associations observed for some factors (please refer to previous comment).

14. The conclusion is rather vague ‘may have influenced’, ‘were less clear’ # please be more specific. Also, elaborate on the last sentence a bit more.

RE: We thank the reviewer for the suggestions and have adapted the conclusion
accordingly, taking into account differences in results obtained due to altered regression models and addition of new outcome variables (lines 560-569).

“Average dietary intakes changed significantly from childhood to adolescence. Nevertheless a fair degree of tracking was observed, suggesting the presence of general, sex-specific trends in dietary behaviour during this period. Dietary intake changes were most frequently associated with socio-economic environment, where females with high SES tended towards healthier dietary behaviours. Associations with child education and BMI were also observed for some food groups and nutrients, while no effect was seen between intake changes and screen-time or pubertal onset. Our results support the rationale for dietary interventions targeting children in order to positively influence dietary changes during puberty. We suggest that sex-specific subpopulations, such as children with lower SES, or lower education levels, should be considered for further impact. We further highlight the need for longitudinal studies in this topic given its relevance in the development of public health nutrition strategies.”

15. Tables: Why do the authors describe the group that only had data at baseline, this is less important for this paper? (except for the additional analyses maybe?)

RE: The table referred to by the reviewer (Additional file 2, previously Table 2), was developed to compare characteristics of participants lost to follow-up (data only at baseline) to those who adhered to the study at follow-up and who were included in our study analyses (data at baseline and follow-up). This was done to account for possible attrition bias when interpreting results. Our descriptive table (Table 2, previously Table 3) provides descriptive characteristics of all children with data at both time-points (N=1232), separately for females (N=643) and males (N=589). We have included a paragraph under the subheading “statistical analysis” to describe the need for comparing participants and non-participants and the tests carried out to obtain p-values (lines 216-220).

“To test for differences due to attrition bias, we compared characteristics of participants lost to follow-up (data only at baseline) to those included in the present study analyses, who adhered at follow-up (data at both baseline and follow-up). Categorical variables, presented as percentages, were tested by Fisher’s exact test, and continuous variables, presented as means (standard deviation), were tested by Student’s t-test.”

We changed the title of the comparison table to “Comparison of lost-to-follow-up and not-lost-to-follow-up participants” and adapted the captions, in order to differentiate it from the descriptive characteristics table. Nevertheless, the information is rather supplementary and significant differences are also mentioned in the results text. Therefore, we have moved the table to Additional files (Additional file 2). Hence all tables in the manuscript except table 1 are now numbered differently: Table 1 (previously table 1), table 2 (previously table 3), table 3 (previously table 4), table 4 (previously table 5), tables 5a and 5b (previously tables 6a and 6b). Additional files have been re-numbered in the order of appearance in the text: Additional file 1 (previously Additional file 1), Additional file 2 (previously table 2), Additional file 3 (previously Additional file 3).
Minor revisions
1. Abstract and Method: ‘Data were..’ instead of ‘Data was…’
RE: We have changed “data was” to “data were” in all occurrences.

2. Abstract: Define socio-economic environment, individual characteristics and behaviours already in the Background section in order to give immediately specific information to the reader
RE: We thank the reviewer for the suggestion and have changed the text accordingly (lines 5-7):
“The present study describes dietary changes from childhood to adolescence, and their associations with parental education, family income, child education, BMI, pubertal onset and screen-time sedentary behaviour.”

3. Abstract Results: First sentence reads difficult; consider to make short sentences.
RE: We have followed the suggestion to make shorter sentences as well as adapted the text to the new outcomes obtained for additional outcome variables, as follows (lines 17-20):
“Both sexes increased average intakes of water and decreased starchy vegetables, margarine and dairy. Females decreased meat and retinol intakes and increased vegetables, grains, oils and tea. Males decreased fruit and carbohydrates and increased average intakes of meat, caloric drinks, water, protein, fat, PUFAs, vitamin C and alpha-tocopherol.”

4. Methods > study participants: ‘…completed by parents’ (r. 93) # but also by children themselves at follow-up? Also, how were the questionnaires delivered to the participants?
RE: The FFQ was self-administered, and in order to maximise reporting accuracy at both time-points, it was completed by parents along with their children at baseline [6] and by the children themselves at follow-up, encouraging them to ask for support from whomever cooked at home. We have added some sentences under “Dietary intake” to explain this (lines 128-136):
“Dietary assessment at baseline and follow-up was carried out using a self-administered FFQ, designed and validated to measure 10-year-old children’s usual food and nutrient intake over the past year, and more specifically to estimate energy, fatty acid and antioxidant intake [19]. Due to the uncertain quality of dietary information collected from young children, the FFQ at baseline was addressed to the parents, who completed it along with their children. This was done in order to maximise accuracy by obtaining mutual impact from both the child and the parent [19]. At follow-up, the FFQ was addressed directly to the participants, who were asked to complete it themselves with support of whoever cooked at home, if needed.”
We are aware of the limitations associated with possible bias due to different respondents and have elaborated on these points in the limitations section (lines
521-539). For further explanations regarding the use of parents to carry out child dietary reporting at baseline, please refer to reviewer 2, Reviewer’s report.

5. Methods > FFQ: I would change this subtitle into Dietary data (or something similar), as the authors need to describe what have been measured instead of the measurement method.

RE: We thank the reviewer for noting this. We have changed the heading “FFQ” to “Dietary intake”

Reviewer 2 (Nathalie Michels)

Reviewer’s report:

This study examines the 5-year change of dietary intake between childhood and adolescence and explores possible determinants of this change. This is helpful knowledge for prevention and intervention designs. Nevertheless, a major limitation is that the FFQ at baseline and follow-up was filled in by a different responder (parent vs child). As the authors already mention, this might explain some of the detected time trends.

RE: We thank the reviewer for addressing this important limitation. Due to the uncertain quality of dietary information collected from young children, it was deemed necessary upon the development of the FFQ [6], to request that one parent (preferably the one most regularly involved in meal preparation) complete the FFQ along with the participant. This was expected to maximize response accuracy through obtaining a mutual impact from both the child and the parent.

As children at age 15 tend to be more independent, it was important to allow them to be the main respondent at follow-up. It was made clear however, that the participant was encouraged to seek help from whomever cooked at home if needed. We have adapted the text giving further detail on the administration of the FFQ at each time-point, the reasoning behind, and providing reference to the FFQ development and validation (lines 128-136):

“Dietary assessment at baseline and follow-up was carried out using a self-administered FFQ, designed and validated to measure 10-year-old children’s usual food and nutrient intake over the past year, and more specifically to estimate energy, fatty acid and antioxidant intake [19]. Due to the uncertain quality of dietary information collected from young children, the FFQ at baseline was addressed to the parents, who completed it along with their children. This was done in order to maximise accuracy by obtaining mutual impact from both the child and the parent [19]. At follow-up, the FFQ was addressed directly to the participants, who were asked to complete it themselves with support of whoever cooked at home, if needed.”

Furthermore, we have extended the section in the limitations to include further explanations for the involvement of parents at the baseline assessment and provided reference to supporting literature. (lines 507-515):

“Furthermore, the FFQ was completed by a parent alongside the participant at baseline, and by the participants themselves with support of whoever cooked at home, at follow-up. It is generally believed that children before the age of 12
have difficulties recalling intakes and understanding portion sizes, and have a more limited knowledge of foods, all of which constrains their ability to self-report without parental assistance [60]. Furthermore, studies have reported that the parental indication of children’s dietary intake appears to be moderately valid [28]. Therefore, a combined effort in the completion of the FFQ at baseline was considered appropriate to maximise response accuracy.”

Major comments:
1. Since change over time is the interest of the paper, please mention the test-retest performance of this FFQ.
RE: We appreciate the reviewer’s valuable recommendation. The FFQ was designed for measuring dietary intake in school-aged children, and was validated using 24h-dietary recalls. The test-retest performance of the questionnaire was unfortunately not assessed, which is a methodological limitation in the present study; nevertheless, at 10 years it proved applicable and comprehensible, and produced highly plausible dietary estimates, justifying its use in future epidemiological studies [6]. We have adapted the manuscript to make a stronger point of this limitation, and provide reasons why any systematic error should not majorly affect our results (lines 409-507).
“The FFQ was designed for measuring dietary intake in school-aged children, and validated using 24h-dietary recalls. The test-retest performance of the questionnaire was not assessed, which is a limitation in the present study. Nevertheless, at 10 years it proved applicable and comprehensible, and produced highly plausible dietary estimates, justifying its use in future epidemiological studies [19]. A study testing the use of an FFQ in older children and adolescents aged 9-18 years, found it to be reproducible regardless of age [58]; and a review summarizing the validity and reliability of food frequency questionnaires in children and adolescents, reported mainly strong correlations in studies reporting test-retest reliability [59]. We hence believe that our results should not be majorly affected by this limitation.”

2. I have some hesitation about the allocation of food items to food groups, more specific about the dairy group: the cocoa/milkshake, pudding and ice-cream: can they not be considered under the sugar-sweetened food group? It is possible to do this re-allocation and to test whether other results are retrieved then?
RE: We thank the reviewer for the suggestion and have re-allocated the food groups accordingly. We have re-run the analysis with the altered food groups and reported the new results in place of the old ones. We note that average intake reductions in dairy intake remained significant; but reduced sugar-sweetened-food in females was no longer significant.
Furthermore we note that all regression models have undergone further adjustments, such as altered cut-offs for categorization of “screen-time” variable (please refer to reviewer 1 comment 8) and the inclusion of a new “child education level” variable (discretionary comment 2). Therefore, new odds ratios have been calculated for all food groups and the manuscript adapted accordingly.
3. The authors have used 15 of the 17 FFQ food groups. Nevertheless, I was wondering why the group ‘water’ was not used, since this is an important target in some intervention studies to stimulate health.

RE: Tea and water were excluded due to their lack of energy content. However, comments from both reviewers (see reviewer 1, comment 5) have led us to reconsider this decision. We understand that water has an important role in stimulating health and hence both tea and water could be of interest in the present study. We have now included water and tea in our analysis, presenting their intakes in g/day. We have further adapted the manuscript results and tables 3 and 4 (previously tables 4 and 5), and Supplementary tables 1a and 1b, and 3a and 3b (previously 2a and 2b) where appropriate.

4. In addition to the comment above, I was also wondering why the EI% macronutrients and the antioxidant and fatty acid intakes were not tested. After all, the authors state that these data are available from this FFQ and this data would also be interesting for future interventions.

RE: Data on intakes of macronutrients, antioxidants and fatty acids are available; but they were not analysed as we considered this may be beyond the scope of the manuscript. We agree that this would also be of interest and have therefore carried out an extension of the analyses and have included the following macro and micronutrients: protein, fat, carbohydrates, n3 PUFAs, n6 PUFAs, retinol, Beta-carotene, vitamin C and alpha-tocopherol. We further elaborated on the results, tables and discussion sections as required.

Minor comments:

5. Textual remark: line 53 and 384: ‘that sex-specific subpopulations be considered’ -> ‘…should be considered’

RE: We have made the corresponding changes.

6. Textual remark line 195: a comma is missing before ‘pubertal onset’

RE: We have made the corresponding change.

7. Methods: The BMI has been used as a dichotomous variable. Nevertheless, the authors did not mention what the cut-off was to create 2 groups

RE: We apologise for the confusion and clarify that BMI was used as a continuous variable. We believe that the cause for this confusion may have been our reference to higher and lower BMI when reporting results, as was done with categorical variables. We have adapted the text where possible to avoid any misunderstanding, and clarified in the methods that the variable is continuous (lines 167):

“BMI [kg/m2] at baseline was used as a continuous variable, calculated from parental-reported weight and height measurements obtained from the 10-year follow-up questionnaire.”

8. Line 225 to 236: the authors mention a lot of numbers in the text that are
already shown in the table. I would suggest to remove the numbers from the text, to decrease redundancy.

RE: We have adapted the text according to the suggestion (lines 294-308).

9. Table 2: It seems there is an error in the energy intake: >8000kcal/day
RE: We thank the reviewer for noticing this detail and have made the correction in the corresponding table (Table 3, previously Table 2).

10. Table 3: I would suggest to include the p-values (males vs females) in this table
RE: We agree that p-values could add relevant information, and have added them to table 2 (previously Table 3), along with a short description in the methods (lines 221-223) and further elaboration of significant differences in the results (lines 284-292).

“The basic characteristics of the study population were described by means (standard deviation) and percentages, separately for females and males. Female and male characteristics were compared using Pearson’s Chi-squared Test or Student’s t-test for categorical and continuous variables respectively.”

11. Table 4: No units were mentioned for the food group intakes
RE: We thank the reviewer for noting this. Units (%EI) have been added to the table 3 (previously table 4) caption.

12. Figure 1: Is there any explanation why 5991 children were included in the large study, but only 3317 children completed the main questionnaire?
RE: 5991 children were recruited in the large study; however, our analyses are based on the data (main questionnaire and FFQ) administered at the 10- and 15y follow-ups. Due to loss-to-follow-up, 3317 of the initially recruited 5991 children completed the main questionnaire at the 10-year-follow-up (referred to as “baseline”) and 3199 at the 15-year follow-up (referred to as “follow-up”). Referring to the 10- and 15-year follow-ups as “baseline” and “follow-up” in the figure may have caused some misunderstanding, although this was done to facilitate reporting of results within the manuscript (lines 120-122). To clarify while remaining consistent with the text, we have adapted the figure labels to “Baseline (10 years)” and “Follow-up (15 years)”. We hope this will suffice to avoid confusion.

Discretionary comments:
1. Since the title states ‘during puberty’, it might be helpful to see the pubertal status at follow-up
RE: We thank the reviewer for the constructive comment. The pubertal onset (yes/no) variable available at baseline, asked the parents if their child presented any signs of pubertal onset. This variable was not included in the questionnaires at follow-up, as most children at age 15 would have reached onset of puberty. A 5-category variable on puberty developmental stage (“pre-”, “early-”, “mid-”),
“late-” and “post-” pubertal), was available from the 15-y follow-up, where 0/553 girls and 6/490 boys were pre-pubertal. We believe that the 10-year pubertal onset variable is important for the analysis given the focus of the manuscript on determinants at baseline on dietary changes. Nevertheless, we agree that pubertal information at follow-up is relevant given the context of the study, and have included the 15-y variable in the appropriate tables, Supplementary Table 2 (previously table 2) and table 2 (previously table 3) and to the text (lines 200-204); however, it must be kept in mind that it is not comparable to the 10-y variable.

“Data on pubertal stage at follow-up was obtained from a self-rating pubertal development scale [30], and children were categorised into “pre-”, “early-”, “mid-”, “late-” and “post-” pubertal. As the study focus is on changes during puberty, pubertal stage at follow-up was presented for reference, but it must be kept in mind that it is not analogous to the 10-year variable, and hence not comparable.”

2. If the study collected information about nutritional knowledge or child’s education performance or level (e.g. school type like vocational vs technical vs general/academic-oriented), it would be very interesting to test it as determinant of dietary change.

RE: We again thank the reviewer for the good suggestion. We also believe this could be of interest and we have made use of available data on school type at the 15y follow-up to define a “child education level” variable. We point out that given the focus of the manuscript on baseline determinants, our interest is on education level at baseline. However, as many children are still completing primary education at this age they could not be categorized by levels. In the German education system, children are allowed into one of 3 secondary schooling programmes, depending on their primary school performance. The 15 year data stated which programme the children had been assigned to and we were hence able to create a variable analogous to the “parental education level” variable (low: # 10 years, and high: >10 years). Although the data for this variable was collected at 15y, it is dependent on the child’s performance up to 10 years of age, and hence also reflects child education level at baseline. We have added the variable definition under the subheading “Individual characteristics and behaviours” (lines 204-209):

“Child education level was defined by the highest level achievable in the secondary school type they attended according to the German education system. Children were grouped analogous to the definition used for parental education, as “low” (schooling programme finalized in 10 years or less) or “high” (schooling programme finalized in more than 10 years). Children who could not be grouped by school type were not included in the analyses.”

We have included the variable in all our models and adapted the manuscript text and tables where appropriate.

References


