**Reviewer 2:** Open Review

Investigation of the Associations between Diet quality and Health-Related Quality of Life in a Sample of Swedish Adolescents

Overall comments: supportive of the paper but have concerns about it for the following 5 reasons.

1. The level of reporting of the core assessment instruments and their items, dimensions and subdomains needs to be enhanced.

**Thank you for your comments about the instruments and the associated domains. We have updated these and aimed to explain them in more detail and with more clarity, sections 2.5, 2.6 and 2.7 lines 193-196, 215-225, 236-244.**

1. There is a need to revising the reporting of the results and information in the tables along with the statistical methodology used with interval data and group comparison research.

**These issues have been addressed. The tables and figures are more clear and more detailed. We have provided are reasoning for the choices of statistical methods.**

1. The focus on only the global mean score for the wellness KQ-10 measure rather than the 5 dimensions. Diet is only expected to influence 2 of these 5 dimensions.

**Thank you for this concern. We have aimed to explain that the KS-10 takes items from the longer KS versions but does not measure for each dimension as it is a general score. However, you have made a great point that some associations may be lost on the specific dimensions, we have tried to explain this reasoning such the burden of participation is lower to complete the KS-10 version lines 493-494 . We wanted to use the general score so that results can be compared with other studies and in other countries, which is one of the advantages of KS-10. Thank you for the insight, this has made us reflect on the KS-10 from the longer versions more.**

1. The lack of recognition that income and cost of living rather than education of parents is also a likely reason for the findings.

**We have now recognised the impact and importance of income to a greater depth and are thankful for your comments on this matter. It is a shame that we cannot say anything about income in this article as this was not measured, only parental education, however this has been suggested for future studies lines 535-537 .**

1. The lack of recommendations associated with the Swedish free lunch program to assist the diets of students in low SES families to have more fruit and vegetables

**We have now made a recommendation to investigate this in more depth and to compare diet quality between school time and home time. It is important to assess if the lunches are the same across students of different SES, some insight on this is given in lines 522 and 534 and that an issue could be the diet quality provided at home as school lunches may even-out diet-related inequalities. Thank you for the recommendation as this is an important aspect of adolescents’ diet.**

* The first sentence assumes that poor diet is always associated with adolescents, this is incorrect
* Better to say: Adolescents often do not consume a high-quality diet, concurrently their self- 13 reported mental health problems are increasing.

**Thank you for your comments on this matter, we have edited this and hope it makes more sense now and that it does not make that assumption any longer, see lines 48-50.**

* Line 90 need to put in the full name Health Related Quality of Life (HRQoL). You have so many abbreviations confusing to follow in places. The authors may know what these are, but many reader will not. To assist the reader’s comprehension, explain the instruments more as you develop the paper.

**We understand your concern, there are a lot of abbreviations, the abbreviations have been re-written in each section to help follow the flow, and we have now added an abbreviation and key word table before the introduction to provide additional help for readers, thank you for this comment lines 37-45.**

* The important issue is in the method section the reader needs understand the dimensions and sub-dimension that make up within each survey. Unless these are included the reader can not fully understand the study.

**Thank you for your great comment, we want the dimensions to be clear for the readers and this is an important observation. We have now edited how the SHEIA and RADDS variables are explained as well as the KS-10, sections 2.5 and 2.6 and we hope they are clearer to understand lines 193-196, 215-225, 236-244.**

* The term is usually SES social economic status so it should be SES- F if it is social economic status – factors. Given you are using education of parents as the status measure of SES the term status is important in this paper and should not be dropped.

**Thank you for your comments, it is important to mention status and the term SES-F has now been incorporated. We have also now used the term parental education and in section 2.7 we have mentioned that this was used as a proxy for SES, lines 257-258. This is to make it clearer that we only had access to parental education and no other SES-Fs and we hope that this is clearer now, we have used parental education instead of SES in lines 21, 111-114 and 149-150. We have also emphasised the importance of parental income, lines 419-428, 503-506, 533-537 and 550-555.**

* It is more that education it is also income re line 106-107 “It is proposed that parents with more educational experience are more likely to make healthier food choices for their family” . Miss the point

**Thank you, we agree that income as well as education plays a role in healthy food choices. However, the results in the article we are referring to looked at parental education, not income. As we did not have access to data in parental income, we were not able to include that variable in our paper**

* It also assumes that parents with more educational experience are more likely to have higher incomes and so are more likely to make and avoid healthier food choices for their family.

**Thank you for your comment. Although a higher education might lead to a higher income we unfortunately do not have the data to look at that but as previously mentioned we have now stressed the importance of parental income, lines 419-428, 503-506, 533-537 and 550-555, thank you for pointing this out.**

* If income is not important than the paper should be the on home education level and home diet not home SES and home diet.

**Thank you for your comment, income is most certainly important and we have now emphasised its importance in lines 419-428, 503-506, 533-537 and 550-555. We also have mentioned that parental education is being used as a proxy for SES lines 257-258 but we cannot infer anything about income as this was not measured, only parental education, not overall SES.**

* See Murayama, N. (2015). Effects of socioeconomic status on nutrition in Asia and future nutrition policy studies. Journal of nutritional science and vitaminology, 61(Supplement), S66-S68. Darmon, N., & Drewnowski, A. (2008). Does social class predict diet quality?. The American journal of clinical nutrition, 87(5), 1107-1117.
* The issues raised in the well quoted Darmon and Drewnowski paper need to be considered more.

**Thank you for suggesting that we reference these two papers, Darmon and Drewnoski was very insightful and most certainly useful for this article, and we now make it clearer that education is a factor of SES and a proxy for income. Lines 419-428 offer an insight into income and affluence, however we have elaborated more on income in future perspectives 533-537 and in the conclusion, lines 550-555 as it may, as you say, play a significant role in these associations.**

* The Swedish Healthy Eating Index for Adolescents 2015 (SHEIA15) is not well explained in this paper. The following paper did a better job of reporting it Moraeus L, Lindroos AK, Warensjö Lemming E, Mattisson I. Diet diversity score and healthy eating index in relation to diet quality and socio-demographic factors: results from a cross-sectional national dietary survey of Swedish adolescents. Public Health Nutr. 2020 Jul;23(10):1754-1765. doi: See their Table 5.

**Thank you for your comment, we want to make the definition of this index as clear as possible and we have edited this in section 2.5.1 and included the sub-components, lines 193-196. We have also cited that reference in both sections 2.5.1 and 2.5.2 so that readers can find a more detailed description. We have also edited section 2.5.2, lines 215-225 so that the RADDS index is also easier to understand and have mentioned some of the sub-components.**

* The KIDSCREEN-10 is not well described. The basic information is not there in the paper: “KIDSCREEN-10 (KS-10) is derived from the KIDSCREEN-27, and provides a single index of global QoL using ten items related to physical well-being, psychological well-being, autonomy and parent relation, social support and peers, and school environment”
* See how these researchers have described the KIDSCREEN-10 . Bouwmans, C., van der Kolk, A., Oppe, M., Schawo, S., Stolk, E., van Agthoven, M., ... & van Roijen, L. (2014). Validity and responsiveness of the EQ-5D and the KIDSCREEN-10 in children with ADHD. The European Journal of Health Economics, 15(9), 967-977.

**Thanks for your observation, we have now tried to describe the KS-10 with more details, and to make it clearer, section 2.6, 236-244.**

In terms of results the flowchart was interesting.

**We are very pleased that you found this interesting!**

* I am a not European reviewer and so found the RADDS a rather restricted list without some meat.

**Thank you for this comment, the figure may have been minimised and red meat and poultry are now visible which may not have been before, apologies for this, also we have mentioned some of the sub-components in lines 215-225. Also the figures and tables became distorted when the manuscript was uploaded, we have fixed this.**

* Why was the Pearson's chi-squared test used (table 1) for analysis of variance? For while gender and in this study education are categorical (group) the data being evaluated is continuous and interval data and so an ANOVA or MANOVA by group is the method of analysis of variance. (Tabachnick, B.G., Fidell, L. S., & Ullman, J.B. (2007). Using multivariate statistics (5th ed.). Pearson.)

**Thank you for your comment. However, we think chi-squared is the appropriate statistical test as we are only comparing the proportions of distribution between categorical variables, we are not comparing the means between more than two groups which is what ANOVA is used for. We have not used chi square to assess analysis of variance, we have now made it clearer that frequency distribution is being assessed in the statistical methods section**

* In terms of gender and education: the mean, standard deviation, df and sig t or F test need to be reported in the tables.

**Thanks for this comment, we have incorporated t and df scores, see tables 1 and 4.**

* Similarly, a correlation matrix is typically reported as it the foundation of regression analyses and so it needs to be reported to understanding the interaction between three main tests variables being investigated in this study.

**This has been put in the appendix, table A1, page 18, thanks for the suggestion**

* The regression analyses “p” value is reported, but the beta values and significance must also be reported. The regressing table needs reworked, as it is the influence of diet the independent variable on wellbeing KO-10, the dependent variable. If the focus is on gender typically both a boy and a girl regression model is reported.

**Great that you mentioned the beta values, the coefficients in the tables are in fact unstandardised beta coefficient values, this has been made clearer in the tables. The tables have diet (ind variable) on the left and the dependent variable KS-10 is on the top to indicate that interaction, then this is stratified by gender. I hope this makes more sense now.**

* Table 5 is interesting but the setting out is poor and so the columns do not align with headings, particularly the wellness KQ -10 information. Again, an ANOVA “ t” value and df as well as the p value have to be reported. In table 5 only one p value is reported, but what it is measuring is unclear, as there are a number of interactions occurring. Should be reporting total, then girls, and then boys as there look to be interaction effects.

**We had a problem with uploading the figures and they became distorted, thank you for your comments, we have fixed this and incorporated t and df values.**

* Because the KQ-10 is a composite tests there is the likelihood to be some interaction with the sub-domains. Focusing only on the global KQ-10 scores is hiding the subdomain differences to diet. Diet is not expected to have any influence of parent relations, social relations or peers but your study may find an influence on psychological well-being and even school environment. This is the core of your study: does diet have an influence on psychological wellbeing? Remember the KQ-10 is made up of five subdomains (psychological well-being, autonomy and parent relation, social support and peers, and school environment) The fact is diet is no expected to change 3 of these KQ-3 subdomains and only one or two KQ-10 dimensions. Use all five of the KO-10 dimensions as your outcome measure not the Mean average global KQ-10 score. You may have a more important study if you do that, with a different finding to what you have just using the composite total.

**We appreciate your concern regarding the KS-10 item domains. The reason we chose to use the general item value is that it is less burdensome than the longer versions and it is best practice to use the general score and not to directly try to analyse for each dimension. We are not sure that it is a fact that diet can not influence parent relations or social relations, if diet can help to improve quality of life then this may improve how an adolescent feels and their emotions which ultimately may have an influence on relations to others. However, we realise that we may miss out other findings and have mentioned this as a limitation, lines 496-497 and we appreciate your views on this matter. We have also incorporated more information about KS-10 reliability in measuring HRQoL, 236-244This is also a cross sectional study and so only associations can be established not causations.**

* The conclusion is sound given the findings but the lack of reference to income is an issue as educational status of parents is often a “de-facto” measure for income. It maybe, it is the cost of living associated with fresh fruit and vegetables that is the real issue. Given the findings the researchers could be arguing that a review may be needed with the Swedish school lunch program and increase the level of fruit and vegetables in the students' diet, particularly for students in lower SES locations. Schools may be making the lunches to a budget rather than to a healthy diet criteria which is more expensive. Different sub-populations even in the same school may need different mix of foods. A public education program could also be encouraged about health eating.

**Great comments, we have elaborated more on income, lines 419-428, 503-506, 533-537 and 550-555. We have also included a detailed section about the significance of school lunches and education in Sweden across different SES groups lines 528-532. In Sweden the school lunch is of rather high diet quality, reaching many of the national dietary recommendations and is provided free of charge regardless of income or SES. However, it would be insightful to a complete a deeper analysis investigating the differences of school quality across differing socio-demographic areas. Nonetheless, the problem related to diet quality may lie in the food provided at home as financial constraints are most likely to be of more significance, lines 528-534.**

There is much about this paper that is of value, but it does need relooking at, particularly in the results reporting to do the research and the data justice. It needs minor revision in places but the results need more attention. Have given it minor but it is needs more in the tables