Reviewer's report

Title: Median ages at stages of sexual maturity and excess weight in boys and girls

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Reviewer: Elise Murowchick

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The question Luciano et al., seems to be posing is: Does excess weight related to differences in median ages with respect to the different components of pubertal development as measured my Tanner staging. There are a couple questions threading this review, which once addressed and revised may make many of the auxiliary comments clearer and greatly strengthen the article.

The use of the median age may need clarification. This is a major clarification and occurs in several places in the article, (Major compulsory revision #1 that infiltrates much of the paper). Once the clarification as to why median age is employed has been established this can be integrated into the revised statement of the research question.

In addition, clarify why this particular area (with better health indices than the rest of the country as a whole) was selected. The authors need to make this point clearer, especially as it relates to the research question (Major compulsory revision #2).

While there are a number of potential variables described in the measures section little in the analysis indicates if and how these were used. For example, description of the birth weight, the birth weight categories, maternal weight, etc., are put forth in the methods section but not mentioned again in the analysis or results except briefly in Table 1. Each of the variables described may be linked with pubertal status and /or BMI. Are these variables controls or alternative hypotheses? This needs clarification. (Major compulsory revision #3).

It is often the case one includes a bivariate correlation table to see these associations and if some of the variables are not normal and/or interval a Spearman’s correlation table might be appropriate (Major compulsory revision #4).

It is not clear why in multiple instances continuous variables are then categorized. This seems to limit the power of the analysis and may produce spurious findings as has been noted (cf. MacCallum, Zhang, Preacher, & Rucker, 2002) (variation of major compulsory revision #1).

From what I can understand the BMI were normalized by age and gender with a z-score. Did this not render this variable normally distributed? How are decisions about normality being made? Be explicit to allow others to replicate the findings. Also if the BMI’s are age normed will that throw out variation due to age in
addressing the research question of puberty, weight, and timing? To allow others to replicate give specifics about what anthropometric data were not normal and how this was determined. Does this include age? Would trimmed means (see Rand Wilcox) allow one to retain more variability in the data? (Major compulsory revision #5)

p.8. The authors report a higher median pubertal score for boys than girls. There is a large literature that finds girls are usually earlier than boys. If the boys being earlier is not an artifact of the medians then this should be explained. Is there a difference in who gets to go to school, the boys were heavier according the Table 1 and had higher z-score BMI’s. Is this typical of this country? (Major compulsory revision #6).

Furthermore, it seems the boys' have higher weight, higher BMI, and earlier puberty overall although the girls who are categorized as higher BMI were more often in the earlier puberty group compared with the normal weight peers. How does this fit the research question and outside research presented on leptin etc. (Major Revisions #7)

There may be a typo with the on this page (p. 8 )too after the reference 16, The should not be capitalized. Check this paragraph for this type of error. (Minor compulsory revision #1)

In describing the pattern for boys in Table 2 seems to indicate that 3 of the 10 tests presented are statistically significant at p < .05. This might not qualify as a trend. Were any correction like Bonferonni’s, done for running multiple tests? (Minor compulsory revision #2)

Authors posit a unidirectional hypothesis when it is possible that a lack of body weight could delay puberty as has been seen throughout history with delays in puberty due to famines, excessive exercise, restricted eating due to anorexia (see R. Frisch or J. Brooks-Gunn for examples). (Minor compulsory revision #3)

In addition to major revisions suggested above regarding medians and distributions the data reported in tables for the p-values could be reported just to two decimal places. .(Minor compulsory revision #4)

On p. 4 If one is looking at sexual precocity why not collect from 7 year olds? (Minor compulsory revision #5)

Explain what ASSIS is and provide a reference if needed.( Minor compulsory revision #6)

In the abstract two minor modifications are suggested, these are optional. First, the word transversal is unique to some disciplines and adding the cognate cross-sectional would be good. Some explanation as to why medians are used here, are the data not normal? Also the tone of the abstract “excess weight is an important variable in the determination of median age” sounds more causal than a transversal /cross-sectional non-experimental study could conclude. (Discretionary revision #1).
Somewhere in the introduction a brief acknowledgement of puberty can be delayed as well as accelerated by environmental and other types of variables. For example, there can be delayed puberty due to under nutrition or other medical problems. It seems only half of the ways BMI and puberty is considered and this merits an acknowledgement if not a direct test. The lack of pubertal developmental as well as its occurrence can be used to monitor growth. (Discretionary revision #2).

The sampling design is a careful one, selecting schools in different areas. The weighting based on this seems appropriate. Since income level is a contributor to BMI in many studies, perhaps an indication of income from the schools (or parents) might be useful. Also are there differences in income level for the schools or for Tanner stages or gender? (Discretionary revision #3).

The discussion of leptin and genetics is interesting but the data presented here do not really address this cellular and hormonal level of analysis. If this line of think seems relevant perhaps work on the genetic component of puberty might also be relevant. However since the authors did not report data on leptin or genetic markers this seems to be speculative. More germane might be the data collected on maternal weight but understanding this role could be subsumed in an epigenetic model (e.g. shared genes, stress, contexts, or economics). Is there a gender difference in under nutrition in this area? (Discretionary revisions #4)

This study was cross-sectional so the discussion points going beyond associative relationships might be speculative. (Discretionary revisions #5)

**Level of interest:** An article whose findings are important to those with closely related research interests

**Quality of written English:** Acceptable

**Statistical review:** Yes, and I have assessed the statistics in my report.

**Declaration of competing interests:**

- Have you in the past five years received reimbursements, fees, funding, or salary from an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? No.
- Do you hold any stocks or shares in an organisation that may in any way gain or lose financially from the publication of this manuscript, either now or in the future? No.
- Do you hold or are you currently applying for any patents relating to the content of the manuscript? Have you received reimbursements, fees, funding, or salary from an organization that holds or has applied for patents relating to the content of the manuscript? No.
- Do you have any other financial competing interests? No.
- Do you have any non-financial competing interests in relation to this paper? No.

I declare that I have no competing interests' below. If your reply is yes to any, please give details below.