Author's response to reviews

Title: Externalizing behavior in early childhood and body mass index from age 2 to 12 years: longitudinal analyses of a prospective cohort study

Authors:

Sarah E Anderson (sanderson@cph.osu.edu)
Xin He (xinhe@umd.edu)
Sarah Schoppe-Sullivan (schoppe-sullivan.1@osu.edu)
Aviva Must (aviva.must@tufts.edu)

Version: 2 Date: 15 May 2010

Author's response to reviews: see over
Externalizing behavior in early childhood and body mass index from age 2 to 12 years: longitudinal analyses of a prospective cohort study

We appreciate the comments of the reviewers and have revised our manuscript to clarify the analytic approach. We believe that the manuscript has benefited. Description of the specific changes we have made to the manuscript and our responses to the reviewers’ comments are below. We have used **bold** type for our response and to indicate changes in the revised manuscript.

**Reviewer 1:** Simon Rueckinger

*This paper addresses the association of externalizing behaviours with BMI in children. The paper is well written but the analyses do not seem that much meaningful to me.*

*It seems the authors make no real beneficial use of the prospective design of the study. This is an important limitation, since being overweight may also contribute to externalizing behaviour (reverse causation). The results presented in Table 2 are cross-sectional. The results presented in Table 3 and the Figure refer to linear mixed effects models. This approach basically models the dependency between age and BMI. This dependency could however be addressed more straightforward and conventional by the use of BMI z-scores using age- and sex-specific reference values as e.g. provided by the WHO. The impact of externalizing behaviours could then simply be addressed by modeling BMI z-score at any time point after two years of age, dependent on externalizing behaviours and baseline BMI z-score at two years of age. This would allow conclusions about the direction of the association.*

*We appreciate the opportunity to clarify our analytic approach. In the revised manuscript we have expanded our description of the linear mixed effects models and how we have used them to address our research questions.*

*In the analytic approach section of the methods (pages 7-8) we expanded our description of the terms in the model.*

We tested whether externalizing behaviors at 24 months were related to average BMI and to linear change in BMI with age; **we operationalized this by including externalizing behaviors at 24 months and the interaction of externalizing behaviors at 24 months and age in the linear mixed effects model. Evidence for an interaction between externalizing behaviors at 24 months and age would suggest that children’s level of externalizing behavior at 24 months was related to BMI in a manner that depended upon age (for example, if there were no association between externalizing behavior and BMI at 24 months, but externalizing behavior at 24 months was associated with BMI at age 12 years).**

*In the results (page 10) we added to our explanation of Table 3.*
Externalizing behavior at 24 months was associated with average BMI trajectory ($\beta=0.21$, $p=0.02$), but there was little evidence overall that this association differed by age ($\beta=0.002$, $p=0.38$)(Table 3).

Our objectives were to understand the extent to which early childhood behavior problems were related concurrently and prospectively to children’s BMI. We agree that it is possible that a child’s early weight status could contribute to development of subsequent behavior problems, but investigation of that research question is beyond the scope of this manuscript. As we discussed, other researchers (see reference 9) have used different analytic approaches in attempt to gain traction on the issue of directionality. However, it is a difficult issue to address given that the association was already evident at 24 months of age. We believe that our analytic approach is consistent with our objectives and have taken the opportunity to clarify the analytic approach in the manuscript (see above). We revised the discussion to state more clearly what we meant and we replaced, with the 2 sentences below, the original sentence, ‘Our analyses were not designed to address questions of directionality.’

Discussion, page 14:

We found that externalizing behavior and BMI were associated in two-year-old children. Our analysis does not allow us to identify whether the higher BMI came before, after, or developed concurrently with the higher levels of externalizing behavior.

We chose to model children’s BMI trajectories adjusting for their age and sex, but have clarified that we also ran these models using CDC BMI z-scores and conclusions are unchanged. To our knowledge, the WHO BMI-for-age growth charts do not go beyond age 5, and thus would not be appropriate in this context.

Results, page 10:

We also repeated analyses using sex-specific BMI z-scores based on the CDC BMI-for-age growth reference and observed consistent results (not shown).

Reviewer 2: Julie Lumeng

Major Compulsory Revisions: None
Minor Essential Revisions: None
Discretionary Revisions: None

I rarely have no specific suggestions for improvement of a manuscript, but this is such a case. This manuscript addresses an important and timely topic, is extremely clear and well written, takes an appropriate statistical approach, does not overstate its findings, and places the findings solidly in context. An excellent paper which makes a clear contribution.

Thank you for the positive feedback.