Reviewer’s report

Title: Comparison of ICD code-based diagnosis of obesity with measured obesity in children and the implications for health care cost estimates

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Reviewer: Jessica Woo

Reviewer’s report:

The manuscript provides a comparison of the health care utilization and costs of obese children in Canada, with obesity determined by in-person measurements vs. an ICD-9 code diagnosis of obesity. Consistent with previous reports, the authors found that administrative data underestimates the obesity prevalence. Strengths of the study include the ability to link a prospective population-based study with administrative databases, and the analysis of both inpatient and outpatient services and costs. Despite these obvious strengths, there are several concerns that should be addressed, as follows.

Major Compulsory Revisions

1) Throughout the manuscript, the authors are vague about the timing of measurements relative to one another, and at times change the definitions. If weight is measured in 2003 at age 10/11, the sensitivity or specificity of identifying a diagnosis of obesity can only truly be interpreted very close to that measured "gold standard". If a child was not obese before that measurement, or the obesity resolved afterwards, a diagnosis of obesity would not be appropriate at these other times. This analysis is particularly troubling when the authors extend the analysis back to the participants' birth, and note that 27% of those with an obesity diagnosis were diagnosed during the first 2 years of life. While interesting in terms of potential longevity of obesity, this does not really speak to "sensitivity and specificity" of diagnosing current obesity in these children. Greater focus on timing of diagnosis vs. timing of measurement would aid in interpretation.

2) The examination of the number of physician visits in diagnosed vs. not diagnosed obese patients begs the question of whether more visits led to the diagnosis, or the converse (that with identification of obesity, physicians wanted to see the patients for more frequent evaluations). Examining the temporal relationship between visits and obesity may help disentangle which scenario is likely to be true.

3) The estimates from the logistic regression model of the impact of BMI on ICD 9 diagnosis seem too large. The authors are implying that for each unit increase of BMI, the probability of ICD-9 diagnosis increases by 26%. This raises the question of how, in fact, the probability of ICD-9 diagnosis of obesity increases with increasing BMI—a figure may help show whether this relationship is linear or exponential. Also, it is unclear from the results whether all children were included.
in this analysis, or only the measured-obese children, with respect to ICD-9 diagnosis.

Minor Essential Revisions
1) The term "diagnostic properties" of the ICD code is not defined and confusing, and should be replaced with another term throughout.
2) The authors indicate that they calculated 95% confidence intervals on the Kappa, sensitivity and specificity, but do not provide those CIs in the table, which would be helpful.
3) Methods/Statistical analysis: It is unclear what the authors mean when they indicate that "results from the models...were compared qualitatively". What qualitative comparisons were made? Why weren't models compared quantitatively?
4) In the table, for the "measured obese" children, what data formed the basis for the health care cost ratio? 2003 expenditures only, or what year(s)?
5) The section in the discussion regarding the "all ICD codes" and the ROC curve should be moved to the results. Also, it is unclear what was included in the "all ICD code" analysis.
6) The final sentence of the manuscript should be altered to something like the following to express the conclusions of the paper: "Children with measured obesity have higher health care costs than non-obese children, but not as high as would be estimated using administrative data". This would be consistent with your abstract, as well.

Discretionary Revisions
1) Page numbers are missing
2) Methods section, under "Administrative Health Data", near the bottom of the page--there seems to be a missing reference: "[13]"
3) Some additional information would be helpful about the anthropometric measurements--were these done in duplicate, were weight measurements done with full clothing, were items removed from pockets, etc.
4) Results: the abbreviation "excl." should be spelled out.

Level of interest: An article of limited interest

Quality of written English: Acceptable

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

Declaration of competing interests:
I declare that I have no competing interests