Reviewer's report

Title: Centile Charts for Birthweight for Gestational Age for Scottish Singleton Births

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Reviewer: Tim J Cole

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The authors develop new centiles of birthweight for gestation using the LMS method. I have some comments on the description, analysis and presentation of the results.

1. The Abstract is somewhat repetitive, e.g. Scotland appears twice in the Methods. Data were … (not was…). The second sentence of the Conclusions adds nothing and can be omitted.

2. Overall I am disappointed that the authors show little curiosity about the LMS values they have generated (see Tables 2-5). The M values are the median (not mean) birthweight by gestation, and these are discussed relative to the current ISD centiles. But the S values (the coefficient of variation) and the L values (the Box-Cox power) are not discussed at all.

   It is striking that the S values consistently show a pattern of decreasing variability with increasing gestation, from 0.25 down to 0.11 (i.e. 25% down to 11%), and this is surely worth discussing. Similarly the L values generally fall with increasing gestation, but within the narrow range 1.4 down to 0.8 (though the range for para 0 girls is wider). An L value of 1 corresponds to a normal distribution, whereas 0.5 is a square root transformation which adjusts for mild right skewness, and 1.4 is a similar adjustment for left skewness. In practice these values probably have little effect on the distribution, and may only emerge as significant due to the very large sample sizes available. This also deserves some comment.

3. Tukey’s methodology is used to detect outliers (page 4/5), but this assumes a symmetric distribution which is not strictly relevant due to the skewness adjustment. However as discussed above the degree of skewness present is only slight, so it probably does not make too much difference in practice. This possible weakness should be acknowledged though.

4. The rising trend in mean birthweight from 1980 to 2003 is used to justify restricting the dataset to 2002/03. But this highlights a philosophical problem with the charts. If there is a rising trend then the charts are already out of date, being 4-5 years old.

   In fact the time trend in birthweight is not linear, as Figure 1 shows. The rising trend stops in 1994 or so, so there is no need to exclude data after this date. The advantage of using data from 1994/2003 is that the flat birthweight pattern can be
used to extrapolate the results to the present, and this certainly cannot be done with the centiles as presented.

5. Why does the third paragraph on page 5 start with ‘Second’? And please note that the M value is the median not the mean, and that the S value is the coefficient of variation of the data, not the transformed data (this is why the S values can be interpreted in the way they are above). The formula at the top of page 6 needs a statement that the values of L(t), M(t) and S(t) correspond to the child’s age and sex.

6. From Figure 2 onwards the figure numbers are out of step by one.

7. On page 8, four lines up, I think the word ‘restriction’ needs adding.

8. The statement on page 9 that ethnic minorities make up 2% of the population ought to take into account the differing ethnic minority age distribution, possibly with more of child-bearing age.

9. The format of the references does not match the journal’s requirements.

10. Figure legends. Please replace the phrase ‘observed centiles’ with ‘ISD centiles’.

11. It’s not clear in Table 1 if the means and SDs include or exclude the outliers. The mean and SD should be given as integers. This also applies to the M values in later tables, where M is given with 6 significant figures whereas S has only 3. Integers for M are fine.

12. The solid lines in Figure 7 look rougher to me than I would expect for the given d.f.

Of the comments here, I view 2 and 4 as important, whereas the others are relatively minor.

What next?: Accept after minor essential revisions

Level of interest: An article of importance in its field

Quality of written English: Acceptable

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

Declaration of competing interests:

A possible non-financial competing interest is that I developed the LMS method, which this paper uses to develop the birthweight centiles.