Reviewer's report

Title: Empirical Comparison of Linear, Logistic, and CART Models for Binary Classification of Dyslipidemia from Anthropometric Measurements

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Reviewer: Tommy Visscher

Reviewers report:

General
The first objective of Costanza and Paccaud was to study whether there are better strategies to predict levels of cholesterol in a general population than previous statistical strategies, with specific focus on waist-hip ratio (WHR) and body mass index (BMI). The second objective was to compare the performance of four statistical modeling approaches with regard to a binary distribution of cholesterol. Please note that this reviewer is an epidemiologist rather than a statistician. I apologize at forehand, if I make wrong interpretations.

The authors state that predicting levels of cholesterol is important because impaired cholesterol levels determine cardiovascular risk. Of course there is no doubt that impaired cholesterol levels are important in predicting cardiovascular risk. However, this reviewer feels that it is not useful to predict cholesterol levels from BMI and WHR. In practice, cardiovascular risk is estimated from levels of body weight and cholesterol, next to smoking and blood pressure levels. Predicting ‘cholesterol levels’ is , to my opinion, not relevant when cardiovascular risk is already predicted from the same measures that are available. ‘Predicted’ cholesterol levels will then not add to a better predicted cardiovascular risk.

Further, if a clinician would be interested in cholesterol levels per se in specific situations, for instance when cholesterol levels are especially impaired without the other cardiovascular risk factors being impaired, it seems to be important enough to measure cholesterol levels, rather than predicting them from WHR or BMI.

This reviewer is sorry to report that for this reason the paper does not seem relevant for general readers or readers with interest for cardiovascular diseases.

This reviewer has doubts on whether the second research aim has been met to study four modeling approaches regard binary levels of cholesterol. If I understand the methods section well, the authors assessed four models of which only two on a binary distribution of cholesterol (< 5.0 vs ≥5.0) and two on continuous levels. If the latter is true, the title is wrong. ‘ for binary classification of dyslipidaemia’. Page 5, strategy 2 (‘for the same Xi predictors in strategy 1, but with binary Y) are compatible with my idea that not all models were on a binary distribution of cholesterol.

If all models were indeed on binary distributions of cholesterol, the research focus would be even less interesting. A physician should be interested in the absolute level of cholesterol, not only in whether cholesterol levels are impaired or not.

The conclusion in the he last sentence that ‘even an odd standby such as…….would have sufficed’ is disappointing. This reviewer appreciates that the outcome of a study should not influence the decision on publication. However, the question rises why the authors hypothesized that the studied models would be better. This is not clear. ‘Other’ statistical strategies are only mentioned in the very last sentence of this paper.
Discretionary Revisions (which the author can choose to ignore)

Minor Essential Revisions (such as missing labels on figures, or the wrong use of a term, which the author can be trusted to correct)

Page 4: Smoking (smoke): readers are not interested how the authors named their variables.
As an epidemiologist, I would prefer the use of ‘independent variables’, or related terminology to ‘Xi predictors’.

Major Compulsory Revisions (that the author must respond to before a decision on publication can be reached)

I have some other remarks:

Page 3: ‘central obesity is studied by use of the WHR.’ It should be realized that central obesity is assessed by levels of waist circumference alone. Fat distribution is assessed by WHR. Indeed, WHR levels may indicate cardiovascular risk better than waist circumference alone. This issue may deserve attention in the discussion, as both large waist circumferences and low hip circumference seem to affect disease risk.

Page 4: Two MONICA samples are used, one with age-range 25-74, one with age-range 35-64. For comparability reasons analyses were restricted to age-range 35-64. If the two samples are comparable then, why are the analyses performed for the samples separately?

Page 4: We applied five modeling approaches minimal benchmarks strategy:
This is unclear for non-statisticians without reading the explanations. I would advice changing the text into: five models were tested followed by the text starting from Strategy 0;.....

Page 4: ‘No model’. Non-statisticians could be mislead by this terminology.

Page 5: HBP: Why is blood pressure taken as binary variable, rather than as a continuous?

Page 5: estimated at Y <5.0
1) Does this mean ‘estimated’ from the model? Than readers would be interested in ?-coefficients rather than b0-k. I have the impression that ‘measured’ is meant here. Consider avoiding use of estimated’ then.
2) Why it is important to mention here that Y <5.0 is considered as dyslipidaemia. If I get it right, continuous levels are used here.

P <0.50 was classified as dyslipidaemic: This is unclear to this reviewer. I assume that authors KNOW cholesterol levels. I start doubting whether the authors have MEASURED cholesterol levels. Indeed, it is not described how (and whether) cholesterol levels are measured. If cholesterol levels are indeed not measured but solely based on prediction formulas, more clarity is definitely needed
on producing cholesterol levels. Table 1 presents cholesterol levels. How are these values produced?

This model assumes the relationship…..is linear: Why stating that the model is linear here and not making a statement on linearity regarding strategy 2. Consider consistency. Either make the statement on both or no strategies.

Page 6, first paragraph.

This paragraph is unclear without looking at the trees.

This reviewer feels it is important to mention how cut-off points in the tree structures have been defined.

Page 7: Switzerland has…..:
As I know the MONICA study, samples are not necessarily representative of the countries. Are the studied samples representative for Switzerland?

Page 7: bivariate relationship patterns ALSO were similar.

It is unclear where ‘also’ refers to.

The first sentence of the conclusion paragraph is disappointingly weak: We wonder less now……more effective.

What next?: Reject because scientifically unsound

Level of interest: Too insignificant to warrant publication in any journal

Quality of written English: Acceptable

Statistical review: Yes

Declaration of competing interests:

none