Peer Review Report

Review Report on Predicting Low Cognitive Ability at Age 5 – Feature Selection Using Machine Learning Methods and Birth Cohort Data

Original Article, Int J Public Health

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EVALUATION

Q 1 **Please summarize the main findings of the study.**

The manuscript “Predicting Low Cognitive Ability at Age 5v – Feature Selection Using Machine Learning Methods and Birth Cohort Data” is an interesting paper reporting mainly the results of a study who applied machine learning methods to an existing birth cohort data (the Irish Cork BASELINE Birth Cohort Study) to predict cognitive ability at age 5 using perinatal information readily available at a population level. The Authors examined the most important predictive features identiyfing among them: total years of maternal schooling, infant Apgar score at 1 minute, socioeconomic index, maternal BMI, and alcohol consumption in the first trimester. Then, the Authors described how the random forest model based on 11 features showed excellent predictive ability on internal validation, with a sensitivity of 0.89 and a specificity of 0.98. In conclusion, they claim that their results provide a foundation suitable for external validation in an unseen cohort.

Q 2 **Please highlight the limitations and strengths.**

The Authors described the limitations of their study in a long and well-structured paragraph in the discussion section. They recognize the potential bias of Machine Learning models in data collection, model development and evaluation. Their bias acknowledgment include also potential sampling bias of the original study (BASELINE cohort). The Authors stated clearly that their results can have some issues in generalizability and that their model need future studies in order to achieve external validation maybe using an unseen cohort more representative of the population.
Despite these limitations, the study can be considered very useful in exploring the machine learning methods applications to larger cohort registries.

Q 3 **Please provide your detailed review report to the authors. The editors prefer to receive your review structured in major and minor comments. Please consider in your review the methods (statistical methods valid and correctly applied (e.g. sample size, choice of test), is the study replicable based on the method description?), results, data interpretation and references. If there are any objective errors, or if the conclusions are not supported, you should detail your concerns.**

Major revisions
The manuscript “Predicting Low Cognitive Ability at Age 5v – Feature Selection Using Machine Learning Methods and Birth Cohort Data” is an interesting and well-written paper that deserves consideration. In my opinion, however, some major revisions are needed in order to make this paper suitable for publication.
1) Although there is a reference to the Irish Cork BASELINE Birth Cohort Study, in order to clarify the text, an in-depth paragraph is needed on the methodology of the original study. For example, in the flow-chart in figure 1 are mentioned 3 questionnaires of follow-up (respectively at 6,12 and 24 months) never cited in the methods section. A short explanation about these questionnaires and the follow-up expected in the main study would help the readers in the results contextualization.
2) The flow-chart in figure 1 could be clarified better. Among the patients recruited to BASELINE birth cohort study and those who completed the questionnaire at 6 months there are two boxes related to consent withdrawn and lost to follow-up… why? What does the second refer to? To the 600 children recruited in the post-natal period? It is not really clear. Always in the flow chart, between the questionnaire at 24 months and

those who have completed the Kaufman IQ Test at 5 years, there are 7 children excluded with the entry "Unknown": what does this mean?
3) The authors declared that their work aimed to “determine the most important of these features for predicting low cognitive ability at age 5; to examine the important interactions between these features; to train a RF classification model using these features; and to examine the accuracy of this model within our cohort”. Although the results respond to these 4 specific objectives, the discussion section focuses heavily on the last two, giving little space to reflections on the variables identified and the use of their findings from a public health point of view. There are 13 important features identified by the model used: well, how can we use them in the preventive field? Since the journal aims to add valute to research and knowlegde in the public health field, I suggest to expand the discussion with some reflections about these identified features meaning according to a prevention perspective.
4) The topic is ethically complex. Identifying a potential predisposition towards an outcome such as cognitive impairment at 5 years of age must make us reflect on the feasibility and opportunity of using this information. Again, I suggest to add a reflection on the ethical implications in the discussion section.

Minor revisions
1) I would suggest, in the Methods section, to provide further information about the Kaufman Brief Intelligence Test Second Edition and specifically what they mean / how are measured respectively the verbal and non-verbal intelligence.
2) In the legend or in the title of table 1, I would clarify that the data reported, except when otherwise indicated, are to be referred to as n (%).

PLEASE COMMENT

Q 4 **Is the title appropriate, concise, attractive?**

The title is appropriate, concise and attractive.

Q 5 **Are the keywords appropriate?**

Yes, the keywords are appropriate.

Q 6 **Is the English language of sufficient quality?**

Yes, the English languade is of good quality.

Q 7 **Is the quality of the figures and tables satisfactory?**

Yes.

Q 8 **Does the reference list cover the relevant literature adequately and in an unbiased manner?)**

Yes, the reference list cover the relevant literature adequatelu and in an unbiased manner.

QUALITY ASSESSMENT

Q 9 **Originality**

Q 10 **Rigor**

Q 11 **Significance to the field**

Q 12 **Interest to a general audience**

Q 13 Quality of the writing

Q 14 Overall scientific quality of the study

REVISION LEVEL

Q 15 Please make a recommendation based on your comments:

Major revisions.