Peak Expiratory Flow Rate (PEFR) in Elderly Malaysians

Dear Sir - I read with concern the recent paper "Peak Expiratory Flow Rate (PEFR) in Elderly Malaysians"[1]. I am afraid the research appears flawed.

The author's assertion that "the sample studied is broadly representative of elderly population in the area" is false. Firstly, there is no adequate sample description at all nor a comparison with local census data and other known relevant information like for example proportion of smokers among elderly. Secondly, the sample ethnic distribution was 76% Malay, 16% Chinese, 13% Indian and 1% Other, and we were indirectly informed in the introduction that the area has 50% Malay, 27% Chinese, 18% Indian and 4% Other. Finally, a sampling design based on enrolling volunteers attending free health screening service set up for the survey purpose by definition cannot be representative. For example, 65% of the men in the sample were ex-or current smokers; one must suspect that smokers were more motivated to attend such health screening related to airway disease. For the authors to further assert that "it is unlikely a more representative sample would have been obtained by expending extra resources...inviting a randomly selected individuals to attend" (that is employing probability sampling design) is unacceptable. Non-representative sample is not necessary "fatal", survey statistician are used to coping with such sample in real survey where non-response and slightly out-dated sampling frame are facts of life. The point is it allows one to "correct" for the selection bias due to non-response and non-coverage. The survey on elderly PEFR has selection bias built into the design and I hope the investigators had the foresight to make allowance for that. I cannot comment without seeing the protocol and the data; but I doubt the survey had the benefits of professional advice from survey statistician. The uncorrected selection bias in itself is sufficient to invalidate the research.

Even ignoring the selection bias, the analyses of the data is wrong. One of the objectives of the survey is to obtain reference values for elderly PEFR. This is obviously of some importance for diagnosis and monitoring treatment of airway disease, and published values are not applicable given known ethnic differences in PEFR norms. For the purpose, linear regression model was fitted to the data and prediction equations for obtaining expected PEFR values were derived.

Unfortunately, the conduct of the analyses is lacking.

a. PEFR measurements are almost certainly right skewed, like all other biological measurements (the rare exception is body height).
b. The authors decided against log transformation on ground that "our equation appears simpler that those using log transformations". Since when does mathematical simplicity has overriding consideration in science, Occam's razor not withstanding?. "Goodness of fit" to the data is what that counts. The fact is both the log transformed and non-transformed equations cannot be right. If log Y is linearly related to X (linearity is a required assumption for linear regression), then Y cannot be linearly related to X.
c. And, a priori, the log transformed equation has a better case as others in the field have already published equations based log transformed PEFR and of course the almost certainly right skewed data and heterocedasticity would demand log transformation.
d. Finally, no prediction equation should be published without adequate validation internally and preferably also externally. The medical literature is replete with "prediction equations" that don't predict in clinical practice.

e.   Anyway, prediction equation derived from global liner regression is not the best answer for the research question. Centile charts is better for obtaining reference values, notice that paediatricians don't use prediction equation, they use reference centile charts for height, weight, growth etc.

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References

1.   Srinivas P, Chia YC, Poi PJH, Ebrahim S. Peak Expiratory Flow Rate in Elderly Malaysian. Med J Malaysia 1999; 54: 11-21.