Review

Testing for Allergic Disease: Parameters Considered and Test Value
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Research article

This manuscript addresses the decision of family physicians to order specific IgE blood tests as a diagnostic tool for patient suspected of having allergic rhinitis. Using a set of clinical vignettes and a randomly selected sample of physicians, the authors set out to measure the relative strengths of association between four patient history attributes and the subsequent decision to order IgE tests.

Allergic rhinitis is very common in many western-type populations, and is responsible for moderate levels of disability among its victims. Correct diagnosis is always important for appropriate treatment, but these authors do not make a strong case in either direction for the costs – in morbidity, quality of life, or the resources used for testing – of errors in diagnosis. It is difficult, therefore, without considerable pre-existing background knowledge, to assess the importance of this research question.

The authors focus entirely on the clinical factors associated with physicians' decision to order IgE tests. There is no attempt at a decision-theoretic analysis of the responses, no attempt to quantify prior or posterior probabilities and no attempt to account for the likelihood ratio characteristics of the IgE test itself. As a statistician, I see this as a lost opportunity for this manuscript.

A panel of n=50 physicians was assembled – with a disappointing response rate of only 33%, which raises questions of representativeness – and each was presented with nine clinical scenarios, and a binary response was elicited to indicate an intention to order IgE tests. A factorial experimental design was used to balance clinical factors within and between respondents. This is an appropriate design.

The statistical analysis methods used are not well described. The principal analysis, so-called 'conjoint analysis' appears to be a straight-forward multiple regression approach (although the cited reference [14] addresses mainly a reliability question, rather than the parameter estimation attempted in this paper).
Although the binary outcome (yes/no to ordering tests) would usually call for logistic modelling, there is some confusion in this manuscript, with the terms used:

“some form of regression” (p 7);
“a linear or logistic regression” (p 7);
“a random effects linear model” (p 9);
“the random effects logit model” (p 9);
“random effects logistic regression model” (p 22).

The confusion is not resolved by the authors’ interpretation of the reported regression coefficients. On p 10, the coefficient for ‘symptoms > 20 yrs’ is reported as “coefficient = 2.494”, with the interpretation of “a 2.49% increase in likelihood to consider specific IgE blood testing for every ‘one unit’ increase in symptom severity”. But if the model is logistic, then these coefficients are log(odds ratio); they cannot be interpreted as proportional increases in risk of the outcome. Indeed, why have not odds ratios been reported in Table 2, if the model is indeed logistic? And why have the authors chosen orthogonal parameterisation for the categorical predictors reported in Table 2, which is contrary to Stata’s default indicator parameterisation? These certainly cannot be interpreted as proportional increases in risk of outcome. Finally, how (and why?) was the coefficient of 2.49 converted to a percentage of 2.49%?

The authors also seem to believe that the Wald chi-square test (pp 9-10) is a test of the contrast that four estimated coefficients are equal. This is not true. The Wald statistic tests the hypothesis that all estimated coefficients are simultaneously zero, not that they are equal to each other.

I am forced to the conclusion that the statistical methods reported in this manuscript are not well described and are difficult to interpret. I am unable to recommend publication in its present form.

**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.