Standardization of Assays from Multiple Labs for a Given Analyte

Assume one lab/method ('lab 0') has a special status, by virtue of presumed assay quality or frequency of use in WHI samples or some other criterion, and consider the standardization of measures from other labs/methods so that they 'align' with lab 0 measures:

For a specific analyte (e.g. CRP; vitamin D) let Y(i,j) denote the log-transformed assessment for the jth individual from lab/method i; i=0,1,2,…

Apply a simple statistical model

$Y(i,j)= a0 + ai* X(i) +b* Z(i,j) +si*e(i,j)$,

Where X(i)=1 for lab i>0, and =0 otherwise,

Z(i,j) is a vector of study subject characteristics that may associate with the Y, for the jth participant and the ith lab/method (e.g. case versus control status in contributing project, risk factors for elevated values of analyte in question),

si is a scale parameter for the ith lab, and

e(i,j) is a noise term.

After **model fitting** the standardized values would be:

Y(i,j) for lab 0,

Y(i,j) + aihat , for lab i measurements, where 'hat' denotes estimate, in the absence of evidence against s(i)=s(0), and either

(Y(i,j)+aihat)/ (sihat/s0hat) for lab/method i measurements if there is evidence against s(i)=s(0), or decide to keep lab/method i data separate (no standardized value developed).

Label standardized data a 'standardized to lab 0 assessments'.

Some additional useful analyses can be entertained if multiple labs/methods were used on the same specimens. For example, differences between Y(i,j) values from the same specimen (ratios on the original scale) are free of dependence on Z(i,j) values under the above model, and if sufficiently numerous, can support simple estimates of ai and si values.

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