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Application and interpretation of multiple statistical tests to evaluate validity of dietary intake assessment methods

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Background: Several statistical tests are currently applied to evaluate validity of dietary intake assessment methods. Each of these tests provides information on specific facets of validity. However, there is no consensus on types and combinations of tests that is need to reflect acceptable or good validity for the foods and or nutrient intakes being investigated. We aimed to conduct an in-depth literature review to identify the range of statistical tests and interpretation criteria used in studies where a dietary assessment method was validated against a reference method and illustrate the value of and challenges that may arise in the interpretation of the outcomes of multiple statistical tests in the assessment of the relative validity of a quantified food frequency questionnaire (QFFQ) using a test data set.

Methods: Four databases (EBSCO host, Pubmed/Medline, Google Scholar and Science Direct) were accessed to search for the statistical methods and interpretation criteria used in papers that focused on assessment of the relative validity of a test method. Identified statistical tests and interpretation criteria were applied to a test data set obtained using a QFFQ and four repeated 24-hour recalls from 47 adults (18-65 years) residing in rural Eastern Cape, South Africa.

Results: 102 studies were screened and 60 included. Six different statistical tests were identified; five with one set of interpretation criteria and one with two sets of criteria resulting in seven possible validity interpretation outcomes. Twenty-one different combinations of the six statistical tests were identified with the majority including three or less tests. Correlation coefficients were the most common, either as a single test or in combination with one or more tests. Clinical significance of the width of LOA was not considered in any of the studies. Results of our application and interpretation of multiple statistical tests to assess validity of energy, protein, fat, carbohydrate, folate, vitamin A and iron estimates derived from the test QFFQ illustrate that for most of the nutrients considered, some outcomes support validity while others do not.

Conclusions: Validation studies that involve QFFQs use different combinations of statistical tests. The one to three statistical tests that are typically included in combinations may not be sufficient to provide comprehensive insights into the various facets of validity. Results of our application and interpretation of multiple statistical tests in dietary assessment method validation using a test data set support the value of such an approach in gaining comprehensive insights in different facets of validity. These insights should be considered in the formulation of conclusions regarding the validity of the method to answer a particular dietary intake related research question.

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Page 87