Optimal cutoff selection in depression screening studies using the PHQ-9, EPDS, and HADS

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Abstract

Cutoff thresholds are chosen to identify individuals who may be at risk for disorder and determine whether further investigation is required. Cutoff selection depends on the benefits and harms of correctly identifying or missing cases and varies per clinical population. We will conduct a meta-analysis of ~300 primary depression screening studies using the Patient Health Questionnaire-9 (PHQ-9), Edinburgh Postnatal Depression Scale (EPDS), and Hospital Anxiety and Depression Scale (HADS) to examine how studies report methods of optimal cutoff selection. Preliminary results from 89 PHQ-9 studies are presented.

Background

• In mental health screening, cutoff thresholds are chosen to identify individuals who may be at risk for disorder and determine whether further investigation is required.

In theory

• Optimal cutoffs should be determined using randomized controlled trials of information on the balance between benefits and harms that would be produced using different cutoffs. However, this information is often unavailable.

In practice

• When consequences of false-positive and false-negative results are not well defined, researchers select optimal cutoffs based on population-specific criteria.

Methods

• We will include primary studies that were eligible for inclusion in databases for Individual Participant Data Meta-Analyses (IPDMAs) of the accuracy of the PHQ-9, EPDS, and HADS in detecting major depression

Search strategy and study selection

• A medical librarian searched Medline, Medline In-Process & Other Non-Indexed Citations and PsycINFO via OvidSP, and Web of Science via ISI Web of Knowledge using peer-reviewed search strategies

• Search results were uploaded into ReWorks for de-duplication, then into DistillerSR for coding

• Two investigators independently reviewed titles and abstracts, then full-texts. Disagreements were resolved by consensus or consulting a third investigator

Data extraction

• We will determine whether each study identified an optimal cutoff using ‘optimal’ or a similar term

• If an optimal cutoff was identified, we will extract information on which term was used, whether a method of optimal cutoff selection was described, and whether a rationale for the chosen method was provided

• When provided, we will determine which method was used and describe the rationale

• We will list and categorize possible methods

Data analysis

• We will evaluate the number and proportion of studies that:
  1. Identified one or more optimal cutoffs
  2. Used each term similar to ‘optimal’
  3. Reported a method used
  4. Provided a rationale for their chosen method
  5. Used each method
  6. Cited STARD guidelines 5,4

For each primary study, we will:

• Obtain the cutoff that maximizes Youden’s J index using published sensitivity and specificity estimates

• Determine the proportion of studies that generated the same optimal cutoff as would have been identified with Youden’s J, and the proportion that matched the screening tool’s standard cutoff

• Calculate 95% confidence intervals for proportions using the approximation method for interval estimation of binomial proportions by Agresti and Coull 7

Preliminary results

The Youden’s J index1,2 is a commonly used method for cutoff selection. It is defined as:

\[ J = \text{sensitivity} + \text{specificity} - 1 \]

Objectives

1. Determine the proportion of studies that identified one or more ‘optimal’ cutoffs
2. Determine whether methods for cutoff selection were described, and if so, what methods were used
3. Determine the proportion of studies that provided a rationale for choosing certain methods, and describe those rationales
4. For studies that used a method other than Youden’s J, determine the proportion that generated the same cutoff as would have been identified with Youden’s J
5. Compare optimal cutoffs to standard cutoffs and describe author recommendations for practice when there are discrepancies

References