Project Details	
Project Code	MRC22PHSBr Jones
Title	Building an evidence base on diagnostic test accuracy research: a meta-epidemiological study
Research Theme	Population Health Sciences
Summary	With an ever-increasing number of diagnostic tools available, evidence on test accuracy is critical. Results from multiple studies are summarised in systematic reviews. These are resource intensive and many of the studies found may be small and of low quality. You will fit Bayesian hierarchical models to explore associations between study features and test accuracy. Ultimately we aim to produce guidance on how reviews might be conducted more efficiently.
Description	Although many factors contribute to decisions about whether a diagnostic test should be used, a critical factor is test accuracy, measured by sensitivity and specificity - how often the test is correct among people who have and do not have the disease, respectively. These are estimated in diagnostic test accuracy (DTA) studies, often small in size. Systematic reviews and meta-analyses are used to summarise evidence across studies, producing pooled estimates of accuracy. Meta-analyses of DTA tend to display particularly high levels of heterogeneity, i.e. differences across studies in estimates of accuracy, beyond what can be explained by chance. While some of these differences are "real", some will be due to bias, which may result from methodological limitations in some studies (1). The "risk of bias" in each DTA study is now routinely assessed using the QUADAS-2 tool (2). Conducting a full DTA systematic review is resource intensive, often taking months or years to complete. Unlike trials of intervention effectiveness, DTA studies are poorly indexed on major databases. This means that, to find all relevant studies, literature search strategies need to be very broad. These searches often retrieve several thousand references, which need to be screened in duplicate. "Restricted searches", involving searching only a limited number of databases using a diagnostic filter, can limit the number of references identified but at the expense of missing some relevant studies. But does it matter? It has been suggested, but not yet empirically investigated, that "harder to find" studies (those not found by restricted searches) may tend to be smaller and at higher risk of bias, such that the additional effort taken to find these may not be worthwhile. Another potential way to reduce reviewing time would be to only include studies of at least a particular size. This might be reasonable if smaller studies tend to be at higher risk of bias. "Meta-epidemiological" research provides a framework that allows researchers to examine the association between study characteristics and statistical measures (e.g. estimates of sensitivity and specificity). Although a few meta-epidemiological studies of DTA data have been conducted (e.g. 1), this type of research has mostly been conducted on intervention effectiveness data. Both the evidence base itself and the statistical methodology for analysis of meta-epidemiological DTA data sets is much less developed. This project will involve collection and analysis of meta-epidemiological data from DTA studies. The student will fit Bayesian hierarchical models, using software such as WinBUGS/JAGS, to investigate associations between test

	accuracy and novel study characteristics (including sample size and whether studies were detected by restricted searches) in addition to QUADAS-2 risk of bias assessments. Depending on the student's interests, they may: 1. Assemble / contribute to development of a database of studies from DTA reviews, suitable for meta-epidemiological analysis 2. Contribute to the development of Bayesian hierarchical models for analysis of meta-epidemiological DTA data, building on a modelling approach developed for intervention effectiveness data 3. Fit Bayesian hierarchical models to the data to address questions such as: - Do studies that are "harder to find" and/or smaller studies tend to be at higher risk of bias? - Is use of restricted searches associated with differences in pooled estimates of accuracy, compared with comprehensive searches? - To what extent are QUADAS-2 risk of bias assessments associated with test accuracy estimates? - How much heterogeneity is typically observed in meta-analyses of DTA? 4. Produce recommendations for how systematic reviews of DTA can be conducted more efficiently, based on the findings. 1. Lijmer JG et al, 1999. JAMA, 282(11), pp.1061-1066 2. Whiting PF et al, 2011. Annals of Internal Medicine, 155(8), pp.529-536
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