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[Diagnostic Test Accuracy Review]

Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

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ABSTRACT

Background

Point-of-care (POC) tests for diagnosing schistosomiasis include tests based on circulating antigen detection and urine reagent strip tests. If they had sufficient diagnostic accuracy they could replace conventional microscopy as they provide a quicker answer and are easier to use.

Objectives

To summarise the diagnostic accuracy of: a) urine reagent strip tests in detecting active *Schistosoma haematobium* infection, with microscopy as the reference standard; and b) circulating antigen tests for detecting active *Schistosoma* infection in geographical regions endemic for *Schistosoma mansoni* or *S. haematobium* or both, with microscopy as the reference standard.

Search methods

We searched the electronic databases MEDLINE, EMBASE, BIOSIS, MEDION, and Health Technology Assessment (HTA) without language restriction up to 30 June 2014.

Selection criteria

We included studies that used microscopy as the reference standard: for *S. haematobium*, microscopy of urine prepared by filtration, centrifugation, or sedimentation methods; and for *S. mansoni*, microscopy of stool by Kato-Katz thick smear. We included studies on participants residing in endemic areas only.

Data collection and analysis

Two review authors independently extracted data, assessed quality of the data using QUADAS-2, and performed meta-analysis where appropriate. Using the variability of test thresholds, we used the hierarchical summary receiver operating characteristic (HSROC) model for all eligible tests (except the circulating cathodic antigen (CCA) POC for *S. mansoni*, where the bivariate random-effects model was more appropriate). We investigated heterogeneity, and carried out indirect comparisons where data were sufficient. Results for sensitivity and specificity are presented as percentages with 95% confidence intervals (CI).

Main results

We included 90 studies; 88 from field settings in Africa. The median *S. haematobium* infection prevalence was 41% (range 1% to 89%) and 36% for *S. mansoni* (range 8% to 95%). Study design and conduct were poorly reported against current standards.

Tests for *S. haematobium*

Urine reagent test strips versus microscopy

Compared to microscopy, the detection of microhaematuria on test strips had the highest sensitivity and specificity (sensitivity 75%, 95% CI 71% to 79%; specificity 87%, 95% CI 84% to 90%; 74 studies, 102,447 participants). For proteinuria, sensitivity was 61% and specificity was 82% (82,113 participants); and for leukocyturia, sensitivity was 58% and specificity 61% (1532 participants). However, the difference in overall test accuracy between the urine reagent strips for microhaematuria and proteinuria was not found to be different when we compared separate populations (P = 0.25), or when direct comparisons within the same individuals were performed (paired studies; P = 0.21).

When tests were evaluated against the higher quality reference standard (when multiple samples were analysed), sensitivity was marginally lower for microhaematuria (71% vs 75%) and for proteinuria (49% vs 61%). The specificity of these tests was comparable.

Antigen assay

Compared to microscopy, the CCA test showed considerable heterogeneity; meta-analytic sensitivity estimate was 39%, 95% CI 6% to 73%; specificity 78%, 95% CI 55% to 100% (four studies, 901 participants).

Tests for *S. mansoni*

Compared to microscopy, the CCA test meta-analytic estimates for detecting *S. mansoni* at a single threshold of trace positive were: sensitivity 89% (95% CI 86% to 92%); and specificity 55% (95% CI 46% to 65%; 15 studies, 6091 participants) Against a higher quality reference standard, the sensitivity results were comparable (89% vs 88%) but specificity was higher (66% vs 55%). For the CAA test, sensitivity ranged from 47% to 94%, and specificity from 8% to 100% (four studies, 1583 participants).

Authors' conclusions

Among the evaluated tests for *S. haematobium* infection, microhaematuria correctly detected the largest proportions of infections and non-infections identified by microscopy.

The CCA POC test for *S. mansoni* detects a very large proportion of infections identified by microscopy, but it misclassifies a large proportion of microscopy negatives as positives in endemic areas with a moderate to high prevalence of infection, possibly because the test is potentially more sensitive than microscopy.

PLAIN LANGUAGE SUMMARY

How well do point-of-care tests detect *Schistosoma* infections in people living inendemic areas?

Schistosomiasis, also known as bilharzia, is a parasitic disease common in the tropical and subtropics. Point-of-care tests and urine reagent strip tests are quicker and easier to use than microscopy. We estimate how well these point-of-care tests are able to detect schistosomiasis infections compared with microscopy.

We searched for studies published in any language up to 30 June 2014, and we considered the study's risk of providing biased results.

What do the results say?

We included 90 studies involving almost 200,000 people, with 88 of these studies carried out in Africa in field settings. Study design and conduct were poorly reported against current expectations. Based on our statistical model, we found:

• Among the urine strips for detecting urinary schistosomiasis, the strips for detecting blood were better than those detecting protein or white cells (sensitivity and specificity for blood 75% and 87%; for protein 61% and 82%; and for white cells 58% and 61%, respectively).

• For urinary schistosomiasis, the parasite antigen test performance was worse (sensitivity, 39% and specificity, 78%) than urine strips for detecting blood.

• For intestinal schistosomiasis, the parasite antigen urine test, detected many infections identified by microscopy but wrongly labelled many uninfected people as sick (sensitivity, 89% and specificity, 55%).

What are the consequences of using these tests?

If we take 1000 people, of which 410 have urinary schistosomiasis on microscopy testing, then using the strip detecting blood in the urine would misclassify 77 uninfected people as infected, and thus may receive unnecessary treatment; and it would wrongly classify 102 infected people as uninfected, who thus may not receive treatment.

If we take 1000 people, of which 360 have intestinal schistosomiasis on microscopy testing, then the antigen test would misclassify 288 uninfected people as infected. These people may be given unnecessary treatment. This test also would wrongly classify 40 infected people as uninfected who thus may not receive treatment.

Conclusion of review

For urinary schistosomiasis, the urine strip for detecting blood leads to some infected people being missed and some non-infected people being diagnosed with the condition, but is better than the protein or white cell tests. The parasite antigen test is not accurate.

For intestinal schistosomiasis, the parasite antigen urine test classifies many microscopy negative people as being infected. This finding may be explained by the low sensitivity of microscopy.

BACKGROUND

Target condition being diagnosed

Schistosomiasis, also known as bilharzia, is the second major parasitic disease affecting tropical and subtropical regions after malaria. It is caused by trematode worms of the genus *Schistosoma* (Gryseels 2012). The latest estimates show that schistosomiasis is endemic in 76 countries, with 779 million people at risk of infection and approximately 207 million people currently infected. Sub-Saharan Africa accounts for more than 90% of current cases of schistosomiasis (Engels 2002; WHO 2010; Gryseels 2012). The global burden of disease in 2004 was estimated at 13 to 15 million disability-adjusted life-years (DALYs) lost as the result of schistosomiasis (King 2010a). These estimates could be an underestimate resulting from the low sensitivity of routinely used diagnostic tests (King 2010a; King 2010b).

Five main schistosome species are known to infect man (*Schistosoma mansoni*, *Schistosoma haematobium*,*Schistosoma japonicum*, *Schistosoma intercalatum*, and *Schistosoma mekongi)*, of which *S. mansoni*, *S. haematobium,* and *S. japonicum* have the greatest impact on morbidity (Gryseels 2006). The focus of this review will be on diagnosing infection caused by *S. mansoni* and *S. haematobium,* as they are more widespread globally and account for most infections and associated morbidity worldwide. These species cause intestinal schistosomiasis and urogenital schistosomiasis, respectively. As outlined in Appendix 1, urogenital schistosomiasis presents with blood in urine (haematuria), proteins in urine (proteinuria), or white blood cells in urine (leukocyturia). In its chronic form, it presents with major bladder, kidney, and genital pathologies including chronic renal failure. Intestinal schistosomiasis presents with abdominal pain and in its chronic and severe forms can present with enlarged liver (hepatomegaly), abdomen distended with fluid (ascites), and liver failure.

Currently, no vaccine is available to protect against schistosomal infection (Rollinson 2009; Bethony 2011). If left untreated, schistosomal infection may result in chronic disease. The current drug of choice is praziquantel, which is cheap (costing less than USD

0.15 per treatment) and safe and causes few side effects. Praziquantel however is ineffective against the eggs and larval forms of schistosome worms (Gryseels 2012; Rollinson 2013). Mass praziquantel treatment of populations at risk of infection is now routine in many endemic areas (WHO 2010; Rollinson 2013). Reinfections rapidly occur as the result of recurrent direct contact with water bodies infected with schistosomal parasites (WHO/TDR 2006; Rollinson 2009; Rollinson 2013). No strong evidence of clinically relevant drug resistance is available (Geerts 2001; Doenhoff 2002; Fenwick 2003; Doenhoff 2009; Greenberg 2013). However reports have described heterogeneities in egg reduction rates and in systematic non-clearers of infection after treatment with praziquantel (Black 2009; Melman 2009; Ahmed 2012). In the long run, mass treatment has limitations related to cost-effectiveness (French 2010), poor sustainability (Utzinger 2009), poor drug compliance by individuals (Guo 2005; Croce 2010), and increased drug selection pressure (Greenberg 2013).

Accurate and affordable diagnostic tools are essential for providing targeted treatment and for maximizing the success of control of schistosomiasis in endemic areas; they are required for monitoring drug efficacy as well. Diagnosis of schistosomiasis can be performed directly or indirectly. Direct methods include detection of schistosome eggs in urine or stool by microscopy, detection of schistosome antigens in serum or urine samples, and detection of *Schistosoma*-specific DNA in urine, stool, or blood. Indirect methods include questionnaires, biochemical tests (urine reagent strips for microhaematuria/proteinuria/leukocyturia), antibody tests, ultrasonography, computed tomography (CT) scan, magnetic resonance imaging (MRI) scan, endoscopy, and cystoscopy (Feldmeier 1993; Rabello 1997; Doenhoff 2004; Bichler 2006; Gryseels 2012; Cavalcanti 2013).

Currently no gold standard is recommended for the detection of schistosomiasis. Microscopy is the most widely used test for diagnosing schistosomiasis and, although imperfect, it is commonly used as the reference standard in practice. Its sensitivity has been shown to vary with intensity of infection, prevalence of infection, sample preparation techniques, stool consistency, and circadian and day-to-day variation of egg counts in stool and/or urine (Doehring 1983; Doehring 1985a; Rabello 1992; Feldmeier 1993; Rabello 1997; van Lieshout 2000; Knopp 2008). This becomes particularly pertinent as control programmes progress and sensitivity of microscopy decreases as the result of reduced infection intensity. Repeated measurements over multiple days from multiple samples and/or multiple smears/slides taken from each sample has been shown to increase sensitivity (Knopp 2008; da Frota 2011; Siqueira 2011; Deelder 2012); however this task increases the time taken to perform the survey and therefore becomes logistically expensive (van Lieshout 2000; Legesse 2007).

Index test(s)

Urine reagent strips and circulating antigen tests are used as alternatives to microscopy for diagnosis of schistosomiasis. Compared with microscopy, urine reagent strips used to detect microhaematuria or proteinuria as a proxy for *S. haematobium* infection are cheap, quick, and easy to use (Mott 1985; Brooker 2009); have no technical requirements; and are less influenced by the circadian production of schistosome eggs (Murare 1987; Lengeler 1991b). Furthermore, some studies have shown that the sensitivity of these strips is higher than that of urine filtration (French 2007; Robinson 2009), and that a single test with microhaematuria strips is more sensitive than a single test with urine filtration (Taylor 1990)-features that make these strips suitable for screening of urogenital schistosomiasis in the field. However, results should be interpreted against the background of risk for schistosomiasis, as well as any other signs and symptoms that could be indicative of other diseases. Microhaematuria and proteinuria are non-specific signs that could also result from other ailments such as urogenital infection, malignancy, immune system disorders, metabolic disorders, and trauma.

Circulating antigen tests (circulating anodic antigen (CAA) and circulating cathodic antigen (CCA)) have also been evaluated as replacements for microscopy in the diagnosis of infection due to *S. haematobium* or *S. mansoni*. These tests can differentiate between active and past infections, as the circulating antigens are probably present only when there is active infection (Doenhoff 2004). As circulating antigens are released from living worms, antigen levels may correlate directly with parasite load, whilst microscopy does not. This may make the CCA POC test useful in monitoring the dynamics of worm burdens and clearance of worms after treatment (Cavalcanti 2013; Rollinson 2013). However, the sensitivity of these tests has been shown to vary with prevalence of disease and intensity of infection (De Jonge 1988; De Jonge 1989; van Lieshout 1992; De Clerq 1997; Stothard 2006; Ayele 2008; Obeng 2008; Midzi 2009; Colley 2013).

This review evaluates the urine CCA POC test, urine CCA and CAA enzyme-linked immunosorbent assay (ELISA), and serum CCA and CAA ELISA. The urine CCA POC test is a lateral flow assay that uses a nitrocellulose strip with a monoclonal antibody-coated test line to detect the presence of *Schistosoma*-specific CCA antigen in urine. When urine from an infected individual flows through the strip, the antigen will bind to the test line, which becomes visible with the binding of added labelled monoclonal antibodies (van Dam 2004). Of note, the urine CCA POC test was developed based on the performance of the ELISA format (Brooker 2009). The urine CCA ELISA was found to have the best diagnostic performance, followed by the serum CAA assay for *S. mansoni* (Polman 1995; van Lieshout 1995; van Lieshout 2000). Therefore, although they are not rapid tests, the accuracy measures of ELISA tests will be systematically assessed, as the summary measures obtained may guide the ongoing development of improved POC tests.

So far, a range of accuracy measures have been reported for urine

reagent tests and for circulating antigen tests. Diagnostic and treatment strategies in endemic areas vary with results of these tests (Appendix 2) and depend on financial and human resource capacity.

Clinical pathway

Patients suspected of having active *S. haematobium* or *S. mansoni* infection in endemic settings.

Prior test(s)

As outlined in Appendix 2, current practice in endemic settings is to use urine reagent strips as a replacement for microscopy or as a triage test (before microscopy), or circulating antigen tests as a replacement for microscopy. In line with practice in disease control programmes, we focus on the role of these tests as alternatives to microscopy. We will not consider prior testing with other tests, as this is rarely done in public health programmes.

Role of index test(s)

We are interested in the following purposes for testing.

- Reagent strips to detect microhaematuria, proteinuria, or leukocyturia as a replacement test for microscopy for *S. haematobium* infection.
- CCA point-of-care test as a replacement test for microscopy for *S. haematobium* or *S. mansoni* infection.

Alternative test(s)

Apart from the two test types mentioned above, a range of other tests can be used to screen for schistosomiasis. However, all are used in different situations and in different circumstances than the tests mentioned above.

Questionnaires have been used for the initial rapid screening for urinary schistosomiasis in high-risk communities in endemic areas (Lengeler 1991a; Feldmeier 1993; Chitsulo 1995). These questionnaires rely on self-reporting of blood in urine. Studies have shown that questionnaires demonstrate moderate to high sensitivities and specificities when used to screen individuals for urogenital schistosomiasis in high-prevalence areas but low sensitivity and specificity in low-prevalence areas (Lengeler 1991a; Lengeler 1991b; Brooker 2009). Questionnaires for intestinal schistosomiasis have been shown to be less sensitive and specific than those for urogenital schistosomiasis (WHO/TDR 2006; Brooker 2009). Symptoms of intestinal schistosomiasis are associated with many other diseases, which often overlap in range. As co-infection is the norm rather than a rare occurrence, the questionnaires are less specific. The accuracy of questionnaires has been shown to be influenced by age and gender. When questionnaires are used repeatedly in the same area, respondents are prone to give biased answers, as they know the consequences of the answers they give. Thus, recall bias may interfere with the accuracy of the test. Consequently, relying on questionnaires may become ineffective, making this screening method unsuitable even for follow-up of patients after treatment (Ansell 1997; Guyatt 1999; Lengeler 2002). As questionnaires are recommended mainly for initial rapid screening and not for routine screening for schistosomiasis, they will not be evaluated in this review.

Serology tests are alternative tests for the diagnosis of schistosomiasis. These tests detect antibodies against worm antigens, egg antigens (soluble egg antigens (SEAs)), or eosinophil cationic proteins (ECPs) (Reimert 1991; Feldmeier 1993; ITM 2007). Available methods include ELISA, indirect immunofluorescence assay (IFA), and indirect haemagglutination assay (IHA). Antibody tests demonstrate high sensitivity even in areas with light infection and therefore can be used in areas with low endemicity. However these tests fall short in distinguishing current active infection from past infection, have low specificity in endemic areas because of cross-reactivity with antigens of other helminths, and often show antibody levels that remain elevated after treatment; therefore they yield many false-positive results (Doenhoff 2004; Cavalcanti 2013). Antibody tests may have a role in checking for maintained exposure to schistosomiasis in areas that are moving towards elimination (Rollinson 2013).

The ECP test is an indirect marker of *S. haematobium* infection and related morbidity (Reimert 2000; Vennervald 2004). Other test examples include rectal biopsy (ITM 2007), cystoscopy and endoscopy, radiological methods (Bichler 2006), FLOTAC (a novel faecal egg count technique) (Knopp 2009; Glinz 2010), and molecular tests using polymerase chain reaction (PCR) (Ten Hove 2008; Oliveira 2010; Knopp 2011). However these tests may be expensive or may require trained laboratory personnel and an elaborate laboratory infrastructure.

Rationale

For improved mapping to ensure effective selective (or targeted) treatment and for accurate data on treatment success with praziquantel, appropriate diagnostic tests are urgently required. When a test for diagnosing schistosomiasis is considered, a test with high sensitivity is paramount, especially when infection is being monitored within a disease control programme. False-negative results lead to missed treatment and subsequently to more advanced disease or, if occurring after praziquantel treatment, may lead to overestimated cure rates and potentially undetected cases of praziquantel resistance and the spread of the disease. High specificity is also required, as unnecessary treatment due to false-positive results could reduce cost-effectiveness in current control programme strategies through potentially inaccurate classification of prevalence levels or in future targeted treatment control programmes (WHO/TDR 2006). On the other hand, a test for mapping of disease (to get an estimation of disease prevalence in an endemic

area) may not need sensitivity and specificity as high as those required for monitoring of disease.

There is currently no recommended gold standard for the detection of active schistosomiasis. However, because microscopy is the most commonly used test in practice and is often used as the reference test in studies, we selected it for use as the reference standard within this review to detect *S. haematobium* and *S. mansoni*. The primary concern with microscopy is the possibility of missing infected cases (because of its low and varied sensitivity), especially in areas with low intensity of infection. This means that truly infected cases may be missed and misclassified as non-infected by microscopy. Therefore when comparing an index test against microscopy, the number of false-positives (potentially true cases classified as positive by the index test and classified as negative by the reference test) may be high, and the index test may present with low specificity. Increasing the sensitivity of microscopy by taking multiple measurements may reduce the number of true cases wrongly classified as non-infected by microscopy. An index test compared against a more sensitive reference test (microscopy with multiple measurements) may have higher specificity because the number of false-positives will be low. Our review will therefore also investigate the effect of the quality of the reference standard on the sensitivity and specificity of the index tests being evaluated. In this case, a test considered as a replacement for microscopy should have comparable sensitivity or should be less costly, portable, faster, and easier to use or interpret, and it should be less demanding logistically. Point-of-care tests based on circulating antigen detection and biochemical urine reagent strips in particular are being included (or developed) in disease control strategies, as they are easy to use and interpret, require minimal laboratory infrastructure, are cost-effective, reduce patient waiting time and potentially therefore reduce loss to follow-up, and may have comparable or higher sensitivity to microscopy (Loubiere 2010). The results of this review may guide policy makers on appropriate diagnostic tests to use and may help identify research gaps in diagnostic testing for schistosomiasis in endemic areas.

OBJECTIVES

With the goals of making recommendations and informing policy makers on which tests to use and identifying research gaps, these were our primary objectives:

- To obtain summary estimates of the diagnostic accuracy of urine reagent strip tests for microhaematuria, proteinuria, and leukocyturia in detecting active *S. haematobium* infection, with microscopy of urine as the reference standard.
- To obtain summary estimates of the diagnostic accuracy of circulating antigen tests-a urine POC circulating cathodic antigen (CCA) test, a urine and serum CCA enzyme-linked immunosorbent assay (ELISA) test, and a urine and serum circulating anodic antigen (CAA) test-for detection of active *Schistosoma* infection in geographical regions endemic for *S. mansoni* or *S. haematobium* or both, with microscopy as the reference standard.
- To compare the accuracy of the above index tests.
- To investigate potential sources of heterogeneity in the diagnostic accuracy of the tests listed above.

Secondary objectives

To investigate whether age and gender of participants, positivity thresholds, prevalence of infection, intensity of infection, quality of the reference standard, effects of praziquantel treatment, infection stage, mixed infections, and the methodological quality of included studies can explain observed heterogeneity in estimates of test accuracy.

METHODS

Criteria for considering studies for this review

Types of studies

We included primary observational studies that compared the results of one or more of the index tests versus the reference standard. These studies could be cross-sectional in design, cohort studies, or diagnostic case-control studies with cases and controls sampled from the same patient population.

We included studies that provide participant data. Only studies in which true-positives (TPs), true-negatives (TNs), false-positives (FPs), and false-negatives (FNs) were reported or could be extracted from the data were included.

We excluded case-control studies with healthy controls, controls from non-endemic areas, or controls with alternative diagnoses (patients with diseases similar to schistosomiasis), as specificity may be overestimated (Rutjes 2005). False-positive test results may occur when an alternative disease produces the same pathophysiological changes as the target condition. We also excluded studies that enrolled only participants with proven schistosomiasis, as sensitivity may be overestimated.

Participants

Participants had to be individuals residing in regions where *S. haematobium* and *S. mansoni* infections were endemic. We excluded articles that studied travelers originating from non-endemic

countries, as they were typically screened with other tests such as antibody tests.

Index tests

We included studies that evaluated the following tests.

Urine reagent strip tests

A urine reagent strip test is a biochemical semiquantitative test. It is regarded as an indirect indicator of *S. haematobium* infection or morbidity, as it detects microhaematuria, proteinuria, or leukocyturia (white blood cells in urine) that can develop as a consequence of schistosomal infection (Doehring 1985b;Doehring 1988). This test is cheap and easy to use for rapid screening of urinary schistosomiasis (Feldmeier 1993; Gryseels 2006; Gryseels 2012).
The results of urine reagent tests used to measure haematuria are scored as 0 (negative), trace-positive (tr), 1+ (5 to 10 erythrocytes/μL), 2++ (10 to 50 erythrocytes/μL), or 3+++ (50 to 250 erythrocytes/μL). For proteinuria, results are scored as 0 (negative), trace-positive (tr), 1+ (30 mg protein/dL), 2++ (100 mg protein/dL), or 3+++ (500 mg protein/dL) (Murare 1987).

Antigen tests

Antigen tests are based on detection of schistosome antigens in the serum and urine of individuals (Gryseels 2006; WHO/TDR 2006; Gryseels 2012). The main circulating antigens are adult worm gut-associated circulating antigens, and CAA and CCA are the main focus of research.
The CCA dipstick is scored according to test band reaction intensity as negative (-), trace-positive (tr), single-positive (+), double-positive (++), and triple-positive (+++) (Stothard 2006). ELISA results are continuous, and positivity thresholds may vary. To estimate the accuracy of ELISA tests, ELISA must have been evaluated against the reference standard only.

Target conditions

Active infection with *S. haematobium.*
Active infection with *S. mansoni.*

Reference standards

S. haematobium

For diagnosis of *S. haematobium* infection, the reference standard is microscopy of urine for examination of schistosome eggs. To increase sensitivity, urine samples can be concentrated by sedimentation, filtration, or centrifugation techniques (Gryseels 2006), or more samples can be examined (Feldmeier 1993). We therefore included studies that use all of these concentration techniques, and to estimate the effect of the quality of the reference standard, we accepted studies using microscopy on a single urine sample (lower-quality reference standard) and studies performing microscopy on multiple urine samples (higher-quality reference standard).

S. mansoni

For diagnosis of *S. mansoni* infection, microscopic examination of schistosome eggs in stool is the reference standard. Sensitivity is increased by preparing a faecal thick smear using the Kato-Katz (KK) method (Gryseels 2006) or by examining multiple stool samples (Feldmeier 1993). To estimate the effect of the quality of the reference standard, we accepted studies using microscopy on a single stool sample (lower-quality reference standard) and studies performing microscopy on multiple stool samples (higher-quality reference standard).
It is important to note that some regions experience mixed infections of *S. haematobium* and *S. mansoni*. In such situations, microscopy of both stool and urine samples must be carried out to confirm infection.

Search methods for identification of studies

Electronic searches

We searched the electronic databases MEDLINE, EMBASE, BIOSIS, MEDION, and HTA (Health Technology Assessment). The MEDLINE search strategy is outlined in Appendix 3. We further translated the MEDLINE search to EMBASE and BIOSIS databases to identify additional records. To avoid missing studies, we did not use a diagnostic search filter. We performed the searches on 12 January 2012 and repeated them on 16 November 2012, 29 August 2013, and 30 June 2014.

Searching other resources

We looked through reference lists of relevant reviews and studies and websites of the World Health Organization (WHO), the Schistosomiasis Control Initiative (SCI), and the Schistosomiasis Consortium for Operational Research and Evaluation (SCORE). When possible, we contacted study authors to request extra information.

Data collection and analysis

Selection of studies

Two independent review authors first looked through titles and abstracts to identify potentially eligible studies. Full-text articles of

these studies were obtained and assessed for study eligibility by two independent review authors using the predefined inclusion and exclusion criteria. Disagreements were resolved through discussion and by consultation with a third review author when necessary.

Data extraction and management

Two independent review authors extracted data onto a data extraction form.

The following data were extracted.

- Study authors, publication year, and journal.
- Study design.
- Study participants-age, sex.
- Prevalence of schistosomiasis.
- Treatment status of participants with praziquantel-treatment status before study or post treatment.
- Reference standard (microscopy), including number of samples per individual and exact volume of stool/urine examined.
- Index tests-urine and serum circulating antigen tests (CCA and CAA) and urine reagent strips.
- Urine reagent strips-signs measured (microhaematuria, proteinuria, leukocyturia).
- Sample preparation techniques-time of day urine/stool sample was taken, intensity of infection-egg counts in urine and stool by microscopy.
- Presence of missing or unavailable test results.
- Numbers of TPs, FNs, FPs, and FNs.

Assessment of methodological quality

We used the Quality Assessment of Diagnostic Accuracy Studies (QUADAS-2) tool to assess risk of bias and concerns for applicability of the included studies (Whiting 2011) (Appendix 4). Disagreements were resolved through consensus or by consultation with a third review author. We extracted data using signalling questions and scored for risk of bias and concerns for applicability under the four main domains: participant selection, index test, reference standard, and participant flow.

Statistical analysis and data synthesis

Comparisons of index test versus the reference standard

We analyzed data for the two target conditions (*S. haematobium* and*S. mansoni*) separately. Only one included study (Ashton 2011) evaluated the ability of a test to detect *S. haematobium* and/or*S. mansoni* in an area of mixed infection.

Among studies reporting sufficient data for calculating sensitivity and specificity, we plotted their sensitivity and specificity in both forest plots and receiver operating characteristic (ROC) space using the software Review Manager 5.2. We performed a meta-analysis using the statistical software SAS version 9.2 for test types that had sufficient data points (four or more data points) to be pooled by the statistical models and those that did not demonstrate substantial heterogeneity in ROC space (Macaskill 2010). These tests included the reagent strip for microhaematuria, the reagent strip for proteinuria, the reagent strip for leukocyturia, the CCA POC test for *S. haematobium,* and the CCA POC test for *S. mansoni*.

The statistical model selected to perform the overall meta-analysis depended on the variability of the positivity thresholds, as discussed below. Data for urine reagent strips and urine CCA POC tests were ordinal. These tests are typically scored as 0, trace, 1+, 2+, and 3+, or as 0, 1+, 2+, and 3+.

When data from a test had multiple thresholds, we used the hierarchical summary receiver operating characteristic model (HSROC) to perform the overall meta-analysis. This model estimates the underlying ROC curve, which describes how sensitivity and specificity of the included studies trade off with each other as thresholds vary. It allows for variation in the parameters of accuracy, thresholds between studies, and the shape of the underlying ROC curve (Rutter 2001; Macaskill 2010). Because this method models sensitivity and specificity indirectly, we calculated average sensitivities and average specificities from the output of the model.

When data from a test had one or a common threshold, we used the bivariate random-effects model to perform the overall meta-analysis. This method models sensitivity and specificity directly at a common threshold (Reitsma 2005; Macaskill 2010).

We included all studies in the overall meta-analysis, whether or not a positivity threshold was included. We assumed that different thresholds were used for the studies that did not report their thresholds, and we used the HSROC model to perform the overall meta-analysis. For urine reagent strips for microhaematuria and proteinuria, many studies did not report a positivity threshold (n = 41 for microhaematuria and n = 25 for proteinuria). Some studies (n = 2) provided data points at both thresholds of trace and +1. When data points were provided at both thresholds, we selected the data point at threshold trace for the overall analysis; we selected the first stipulated positivity threshold. Leukocyturia had five overall data points, with four data points at threshold trace and one at +1. The CCA POC for *S. haematobium* had four overall data points, with two at threshold trace and two at +1.

All studies evaluating CCA POC for *S. mansoni* reported positivity thresholds; five provided data points at both thresholds trace and +1. When data points were provided at both thresholds, we selected the data point at threshold trace for the overall analysis; we selected the first stipulated positivity threshold. The overall analysis therefore contained 15 data points with threshold $\geq$ trace, for which we used the bivariate model for meta-analysis.

Comparisons of index tests

We compared the accuracy of the reagent strips for microhaematuria in detecting *S. haematobium* versus the accuracy of the reagent strips for proteinuria. These were the only tests with sufficient data

to enable comparisons between different types of tests. Tests were compared by adding the co-variate test type to the HSROC model and allowing this to have an effect on the accuracy, threshold, and shape parameters. We performed indirect comparisons and direct comparisons; in the latter, we included only studies that applied both index tests in the same individuals.

Investigations of heterogeneity

We investigated heterogeneity by examining the forest plots and statistically by including co-variates in the HSROC or bivariate model, by conducting subgroup analysis, and by performing sensitivity analysis. In the HSROC model, we investigated whether these co-variates affect the parameters of this model-accuracy, threshold, and shape-whereas in the bivariate model, we investigated whether these co-variates affect sensitivity and specificity.

We did not investigate the effects of infection stage and mixed infection caused by poor reporting and insufficient data for these items.

We investigated the following sources of heterogeneity: quality of the reference standard, positivity threshold, age, gender (proportion of female participation), intensity of infection, prevalence of infection, effect of praziquantel treatment, and QUADAS-2 risk of bias domains. Of these, the co-variates gender (proportion of female participation) and prevalence of infection were analyzed as a continuous co-variate. The rest were analyzed as categorical co-variates.

We classified studies that used single-measurement microscopy (one stool and/or one slide or smear) and those that did not report how the reference standard was conducted as using lower-quality reference standards because single measurements are more likely to miss diseased individuals. We assumed that studies that used multiple measurements of microscopy were likely to report this, given the relevance of this additional effort. Reference standards that used multiple urine or stool samples or multiple slides or smears were classified as higher-quality reference standards.

For the age co-variate, many mixed adult/children studies did not state the proportions of adults or children. Some did not state the age of participants. As accuracy data were not provided for age subgroups in most studies, we dichotomized the age co-variate into the groups 'all ages' and 'children only'. We assumed that studies that did not state the age had included participants of all ages.

Because the proportions of female and male participants were poorly reported at the test level and at the level of the 2 × 2 tables, we analyzed the co-variate of gender as a continuous variable at the study level. For this co-variate, gender indicated the proportion of female participation. We focused on females because gender may influence accuracy estimates through factors associated with females, such as menstruation and genitourinary tract infection (Hall 1999; French 2007; Brooker 2009).

The World Health Organization (WHO) recommendations (WHO 2002) categorize intensity of infection for *S. haematobium* as follows: < 50 eggs/10 mL (light) and ≥ 50 eggs/10 mL (heavy) and intensity of *S. mansoni* as follows: 1 to 99 eggs per gram (epg) (light), 100 to 399 epg (moderate), and ≥ 400 epg (heavy). In our review, the intensity of infection was reported in different ways (arithmetic mean or range of infection, or geometric mean or range of infection, or proportions of participants with light/moderate/heavy infection) and for most included studies was not reported at all (63% and 65% for microhaematuria and proteinuria, respectively). We used the reported estimates of mean (arithmetic/geometric) or median intensity of infection to classify our studies according to WHO recommendations. We classified as unclear studies that reported only proportions of participants with light/moderate/heavy infections or did not report estimates of intensity of infection.

We examined the effects of treatment with praziquantel on the sensitivity and specificity of the testtype microhaematuria because it was the only test with sufficient data to investigate this. Nine studies provided data on praziquantel treatment; seven were follow-up studies with praziquantel given at variable intervals (King 1988_a (one year), NGoran 1989 (one month), Kitange 1993 (one year), Lengeler 1993 (one month), Shaw 1998 (six weeks), Magnussen 2001 (one year), French 2007 (one year)), and two indicated that praziquantel had been given before the baseline study was performed (Abdel-Wahab 1992 (two years), Bogoch 2012 (two years)). When multiple follow-up studies were performed, we selected data for the first follow-up evaluation (Shaw 1998; French 2007). However, pooling of results of all studies with varying time intervals would likely introduce a lot of heterogeneity, bias our summary estimates, and lead to overestimates of sensitivity, because studies with long time intervals were likely to have a greater number of participants reinfected compared with studies done at shorter time intervals. We opted to present estimates of sensitivity and specificity of individual studies evaluating the performance of microhaematuria post treatment in the ROC space.

We added the following co-variates one by one to the HSROC model for microhaematuria and proteinuria and to the bivariate model for CCA POC for *S. mansoni*: quality of the reference standard, age, gender, and prevalence of infection. We then performed a subgroup analysis for the co-variates-quality of the reference standard, age, positivity threshold, and intensity of infection-for all three index tests.

Sensitivity analyses

We performed a sensitivity analysis to check the robustness of results when filtration was used as a concentration for urine microscopy for *S. haematobium*, and to estimate sensitivity and specificity for studies with low risk of bias according to the QUADAS domains, along with participant selection, participant flow, and the reference standard.

Assessment of reporting bias

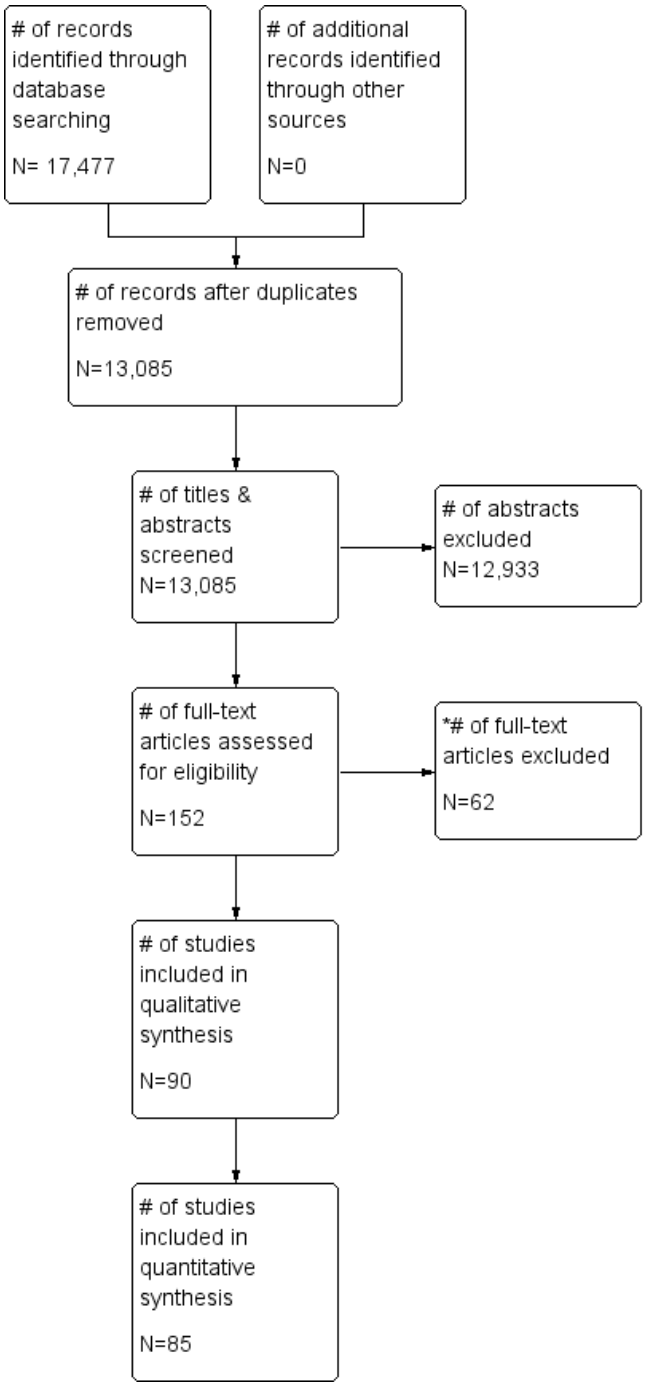
We did not assess reporting bias. Methods of assessing reporting bias for diagnostic accuracy studies are still being refined. For instance, the Deeks test, a test that has been proposed for use in diagnostic accuracy studies, has low power to detect funnel plot asymmetry, especially when a lot of heterogeneity is present (Macaskill 2010). The studies included in our review showed a lot of heterogeneity; therefore assessments for reporting bias may not yield conclusive results.

RESULTS

Results of the search

Our search yielded 17,477 hits. After the titles and abstracts were screened, 152 full texts were retrieved, and after full texts were assessed, 90 articles were deemed suitable for inclusion; 62 were excluded. One study author whom we contacted responded to our request for information, but the data submitted did not meet our eligibility criteria. No additional eligible studies were found through additional searches. This review contains results derived from 90 articles. The search results can be seen in Figure 1.

Figure 1. Study flow diagram.* Reasons for exclusion can be found in the table of Characteristics of excluded studies.



Included studies

Details of included studies can be found in the Characteristics of included studies table. We included 90 studies containing 197,411 participants. Of these included studies, 88 were carried out in Africa, one in South America (Surinam), and one in Asia (Yemen). Only one study was conducted in a hospital setting (antenatal clinic, outpatient setting). The other tests were performed in a field setting (village/school/military camp). *S. haematobium* was evaluated in most studies (n = 74); 16 evaluated *S. mansoni*. One study evaluated both species. Eighty studies reported the age of study participants; most of these were conducted in children (n = 50; 62.5%). Median prevalence of *S. haematobium* infection was 41% (range 1% to 89%), and that of *S. mansoni* infection was 36% (range 8% to 95%). Median female participation was 50% (Q1 46; Q3 53) for studies that reported gender (n = 46; 51%). Most of the included studies (n = 73; 81%) did not report on the status of praziquantel treatment in the study setting before the baseline study was performed. Eighty-one studies used a cross-sectional design; six were cohort studies (longitudinal studies with follow-up), and three were case-control studies with controls from the same population (nested case-control studies). We included 84 English studies and six French studies. One study (Colley 2013), which was retrieved through an updated search, provided recent data for studies retrieved previously (Coulibaly 2011; Shane 2011; Tchuente 2012). In this case, we gathered data for the 2 × 2 tables from the most recent publication (Colley 2013).

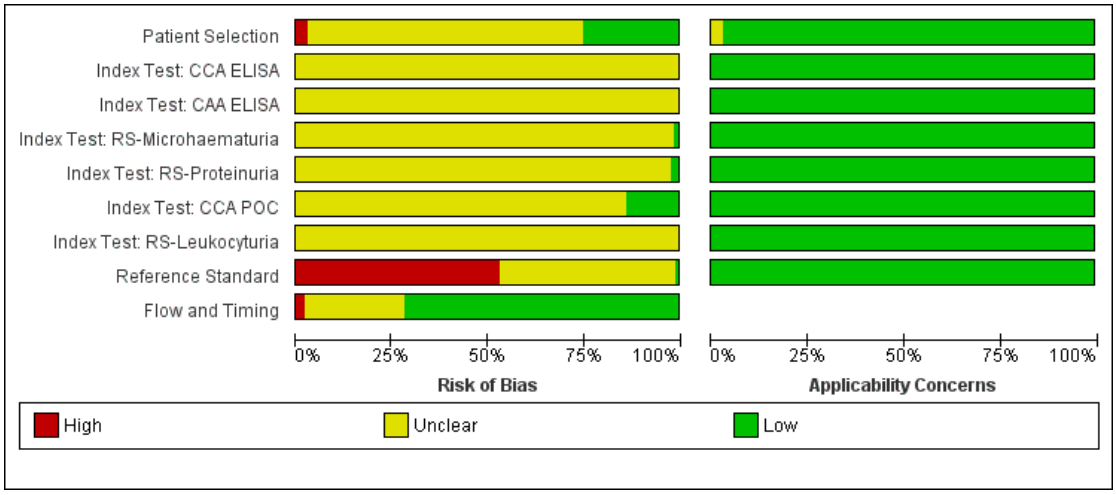
Excluded studies

Full details of excluded studies can be found in the Characteristics of excluded studies table. We excluded 62 articles after reading the full texts. We excluded 17 case-control studies with healthy controls or with controls from non-endemic areas of schistosomiasis. We could not extract data from 2 × 2 tables for 16 studies. Twelve studies were not test accuracy studies, and four studies enrolled only patients proven to have schistosomiasis. Six studies used reference standards other than microscopy, four studies used other index tests to diagnose schistosomiasis that did not fulfil our inclusion criteria, and three studies performed similar tests on the same population as those reported by other already included studies.

Methodological quality of included studies

Figure 2 and Appendix 5 show results of the quality appraisal of the 60 included studies. Using the QUADAS-2 tool, we evaluated these studies for risk of bias in the following domains: participant selection, index test, reference standard, and participant flow. In general, poor reporting of quality items hindered our evaluation of quality. We therefore rated the risk of bias for these domains largely as unclear. In the participant selection domain, about 75% of studies were rated as having unclear risk of bias. For index tests, unclear risk of bias ranged from 80% to about 98% (about 98% for reagent strips for microhaematuria, about 95% for reagent strips for proteinuria, and about 80% for CCA POC testing). None of the studies had high risk of bias in the index test domain. For the reference standard, about 50% of the studies had high risk of bias, whereas the other half had unclear risk of bias. For the participant flow domain, about 75% of the studies had low risk of bias, and the remaining studies had unclear risk. Concerns for applicability for all four domains were predominantly low.

Figure 2. Risk of bias and applicability concerns graph: review authors' judgements about each domain presented as percentages across included studies.



Findings

A summary of the main findings can be found in Summary of findings 1 and Summary of findings 2. Below we present in detail the overall findings for each index test.

Urine reagent strips

For microhaematuria

A total of 74 evaluations of the reagent strip for microhaematuria were performed with a total of 102,447 individuals. All evaluations were conducted in Africa. Median prevalence of *S. haematobium* was 42% (range 1% to 87%), and median female participation was 49% (Q1 49; Q3 53). Most of these evaluations were conducted with a lower-quality reference standard of only one slide/person (n = 63; 85%), and most evaluations were carried out in mixed populations of adults and children (n = 40; 54%). These evaluations were described in articles published between the years 1979 and 2014; a large proportion (n = 43; 58%) were published between 1979 and 1999. Over these four decades, no clear pattern was evident for effects of year of study on sensitivity and specificity of microhaematuria (see forest plot in Appendix 6). However, the forest plot shows greater heterogeneity for sensitivity compared with specificity.

A large range of test brands were used to estimate the sensitivity and specificity of microhaematuria, as shown in Appendix 7. Most evaluations (n = 25; 34%) were performed with the brand from the manufacturer Ames.

The forest plot (Figure 3) and the HSROC curve (Figure 4) for the reagent strip for microhaematuria reveal heterogeneity for estimates of both sensitivity and specificity.

Figure 3. Forest plot of sensitivity and specificity of the urine reagent strip for microhaematuria.Squares represent sensitivity and specificity of one study, the black line its confidence interval.

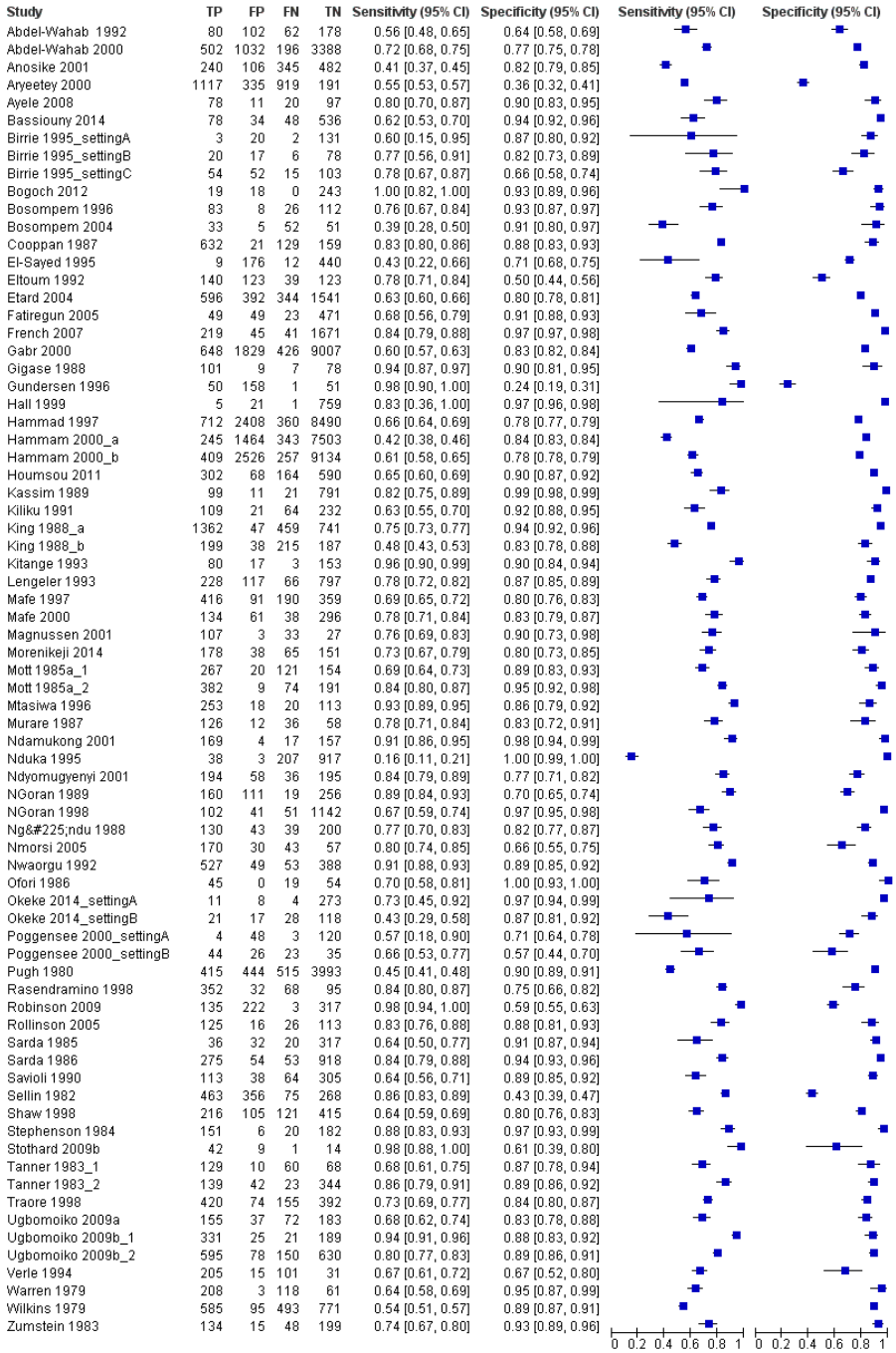
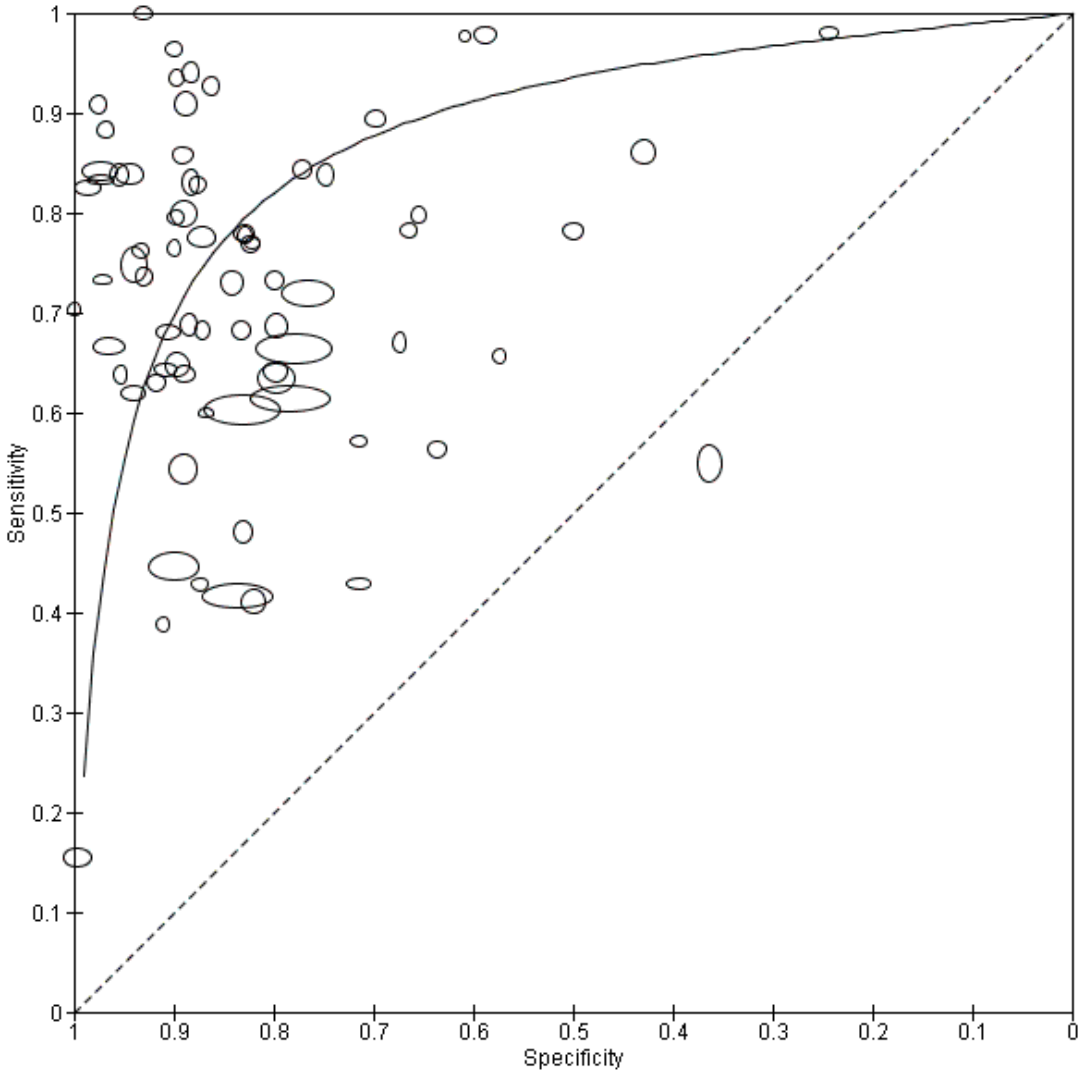


Figure 4. Summary ROC plot of sensitivity versus specificity of the urine reagent strip for microhaematuria.The size of the points is proportional to the study sample size. The solid line shows the summary ROC curve.



Meta-analytical sensitivity and specificity (95% confidence interval (CI)) of data at mixed thresholds were 75% (71% to 79%) and 87% (84% to 90%).

For proteinuria

A total of 46 evaluations of the reagent strip for proteinuria were performed with a total of 82,113 individuals. All evaluations were conducted in Africa. Median prevalence of *S. haematobium* was

51% (range 4% to 89%), and median female participation was 50% (Q1 46; Q3 53). Most of these evaluations were conducted with a lower-quality reference standard (n = 36; 78%), and most were carried out in mixed populations of adults and children (n = 28; 61%). These evaluations were described in articles published between the years 1979 and 2014; the largest proportion (n = 27; 59%) were published before the year 2000. Over these four decades, no clear pattern was evident for effects of year of study on sensitivity and specificity of proteinuria (see forest plot in Appendix 8).

A large range of test brands were used to estimate the sensitivity and specificity of proteinuria, as shown in Appendix 9. Most evaluations (n = 17; 37%) were performed using the brand from the manufacturer Ames.

The forest plot (Figure 5) and the HSROC plot (Figure 6) for the reagent strip for proteinuria reveal greater heterogeneity for estimates of sensitivity than specificity. Meta-analytical sensitivity and specificity (95% CI) of data at mixed thresholds were 61% (53% to 68%) and 82% (77% to 88%).

Figure 5. Forest plot of sensitivity and specificity of the urine reagent strip for proteinuria.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

Study	TP	FP	FN	TN	Sensitivity (95% CI)	Specificity (95% CI)
Abdel-Wahab 1992	32	31	110	249	0.23 [0.16, 0.30]	0.89 [0.85, 0.92]
Abdel-Wahab 2000	97	81	602	4338	0.14 [0.11, 0.17]	0.98 [0.98, 0.99]
Aryeetey 2000	610	842	1003	107	0.38 [0.35, 0.40]	0.11 [0.09, 0.13]
Bogoch 2012	8	53	11	208	0.42 [0.20, 0.67]	0.80 [0.74, 0.84]
Bosompem 1996	44	10	65	110	0.40 [0.31, 0.50]	0.92 [0.85, 0.96]
Bosompem 2004	26	17	59	39	0.31 [0.21, 0.42]	0.70 [0.56, 0.81]
Cooppan 1987	616	112	145	68	0.81 [0.78, 0.84]	0.38 [0.31, 0.45]
Gabr 2000	185	293	889	10540	0.17 [0.15, 0.20]	0.97 [0.97, 0.98]
Gundersen 1996	43	163	8	46	0.84 [0.71, 0.93]	0.22 [0.17, 0.28]
Hammad 1997	662	3081	410	7817	0.62 [0.59, 0.65]	0.72 [0.71, 0.73]
Hammam 2000_a	155	605	433	8362	0.26 [0.23, 0.30]	0.93 [0.93, 0.94]
Hammam 2000_b	297	1174	369	10487	0.45 [0.41, 0.48]	0.90 [0.89, 0.90]
Houmsou 2011	446	216	20	442	0.96 [0.93, 0.97]	0.67 [0.63, 0.71]
Kassim 1989	96	98	24	704	0.80 [0.72, 0.87]	0.88 [0.85, 0.90]
Kiliku 1991	206	63	58	99	0.78 [0.73, 0.83]	0.61 [0.53, 0.69]
King 1988_a	1343	118	478	670	0.74 [0.72, 0.76]	0.85 [0.82, 0.87]
Kitange 1993	27	4	56	166	0.33 [0.23, 0.44]	0.98 [0.94, 0.99]
Morenikeji 2014	195	88	48	101	0.80 [0.75, 0.85]	0.53 [0.46, 0.61]
Mott 1985a_1	334	99	38	47	0.90 [0.86, 0.93]	0.32 [0.25, 0.40]
Mott 1985a_2	428	25	75	123	0.85 [0.82, 0.88]	0.83 [0.76, 0.89]
Murare 1987	140	25	22	45	0.86 [0.80, 0.91]	0.64 [0.52, 0.75]
Ndamukong 2001	155	17	31	144	0.83 [0.77, 0.88]	0.89 [0.84, 0.94]
Ngándu 1988	90	58	79	185	0.53 [0.45, 0.61]	0.76 [0.70, 0.81]
Nmorsi 2005	115	25	90	70	0.56 [0.49, 0.63]	0.74 [0.64, 0.82]
Nwaorgu 1992	537	85	43	352	0.93 [0.90, 0.95]	0.81 [0.77, 0.84]
Ofori 1986	42	13	22	41	0.66 [0.53, 0.77]	0.76 [0.62, 0.87]
Okeke 2014_settingA	8	64	7	217	0.53 [0.27, 0.79]	0.77 [0.72, 0.82]
Okeke 2014_settingB	15	18	34	117	0.31 [0.18, 0.45]	0.87 [0.80, 0.92]
Onayade 1996	53	1	41	10	0.56 [0.46, 0.67]	0.91 [0.59, 1.00]
Poggensee 2000_settingA	1	14	6	154	0.14 [0.00, 0.58]	0.92 [0.86, 0.95]
Poggensee 2000_settingB	8	6	59	55	0.12 [0.05, 0.22]	0.90 [0.80, 0.96]
Pugh 1980	508	887	422	3550	0.55 [0.51, 0.58]	0.80 [0.79, 0.81]
Rasendramino 1998	316	20	104	107	0.75 [0.71, 0.79]	0.84 [0.77, 0.90]
Sarda 1985	35	73	21	276	0.63 [0.49, 0.75]	0.79 [0.74, 0.83]
Sarda 1986	234	173	94	799	0.71 [0.66, 0.76]	0.82 [0.80, 0.85]
Sellin 1982	376	227	162	397	0.70 [0.66, 0.74]	0.64 [0.60, 0.67]
Stephenson 1984	113	11	58	177	0.66 [0.58, 0.73]	0.94 [0.90, 0.97]
Tanner 1983_1	108	10	81	68	0.57 [0.50, 0.64]	0.87 [0.78, 0.94]
Tanner 1983_2	136	68	26	318	0.84 [0.77, 0.89]	0.82 [0.78, 0.86]
Traore 1998	340	84	235	382	0.59 [0.55, 0.63]	0.82 [0.78, 0.85]
Ugbomoiko 2009a	121	45	106	175	0.53 [0.47, 0.60]	0.80 [0.74, 0.85]
Ugbomoiko 2009b_1	206	12	146	202	0.59 [0.53, 0.64]	0.94 [0.90, 0.97]
Ugbomoiko 2009b_2	602	9	147	699	0.80 [0.77, 0.83]	0.99 [0.98, 0.99]
Verle 1994	168	21	138	25	0.55 [0.49, 0.61]	0.54 [0.39, 0.69]
Warren 1979	123	1	203	63	0.38 [0.32, 0.43]	0.98 [0.92, 1.00]
Wilkins 1979	701	251	377	615	0.65 [0.62, 0.68]	0.71 [0.68, 0.74]

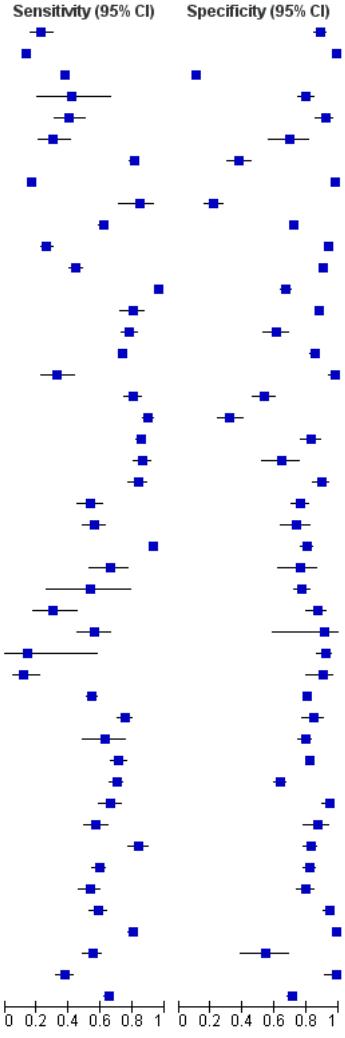
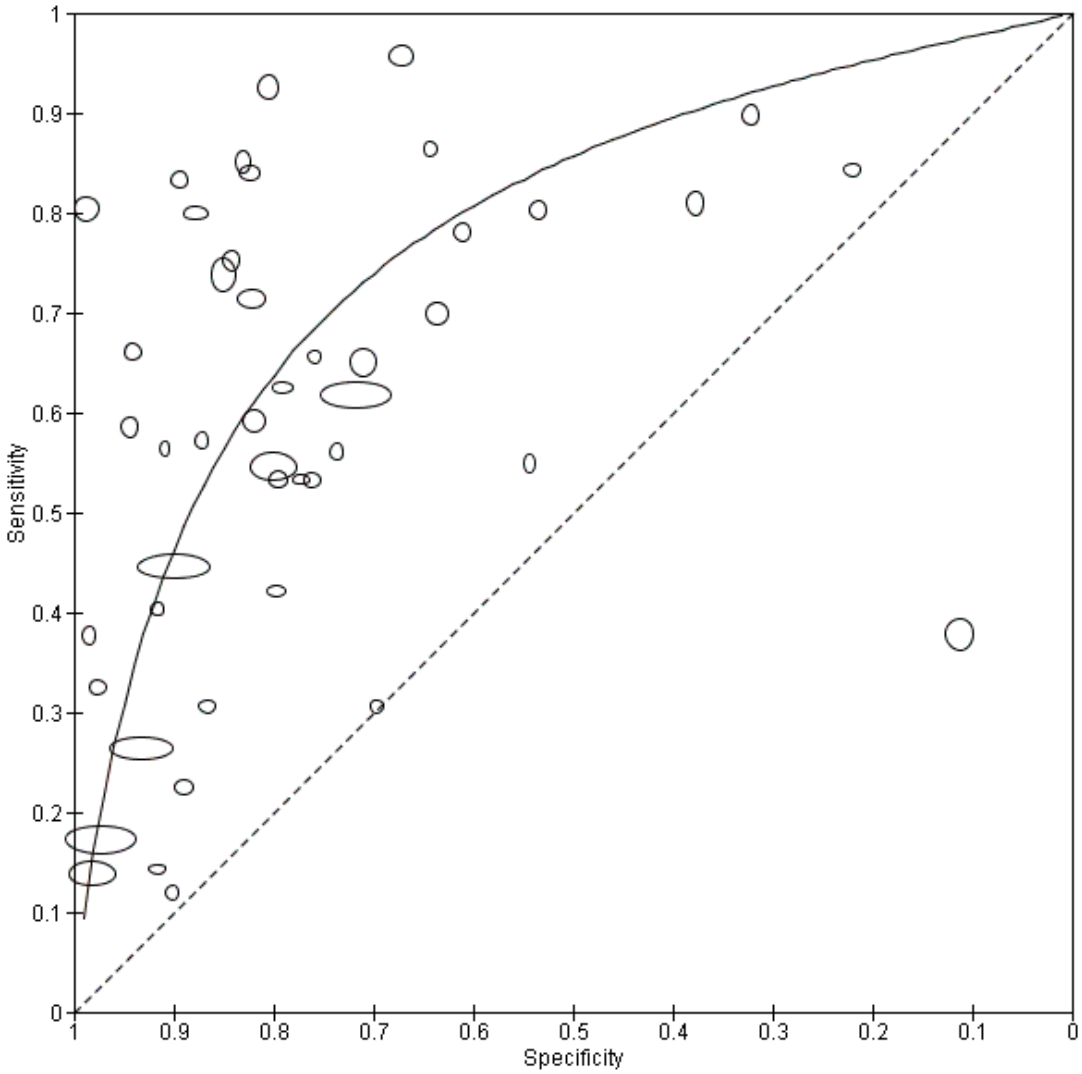


Figure 6. Summary ROC plot of sensitivity versus specificity of the urine reagent strip for proteinuria.The size of the points is proportional to the study sample size. The solid line shows the summary ROC curve.



For leukocyturia

A total of five evaluations of the reagent strip for leukocyturia were performed with data from four publications and a total of 1532 individuals. Of these evaluations, two were carried out with a higher-quality reference standard (40%). Median prevalence of *S. haematobium* was 34% (range 4% to 77%), and median female participation was 100% (Q1 68; Q3 100). All evaluations except one were conducted in Africa in mixed populations of adults and children. These evaluations were described in articles published between the years 1992 and 2000; most (n = 3) were published before the year 2000. Two different test brands were evaluated. Most evaluations (n = 3; 60%) were done using the Nephur-test from Boehringer Mannheim.

The forest plot (Figure 7) and the HSROC plot (Figure 8) for the reagent strip for leukocyturia reveal greater heterogeneity for estimates of specificity than sensitivity. The ROC plot also reveals poor accuracy of the test, as most study points lie close to the diagonal line. Meta-analytical sensitivity and specificity (95% CI) of data at mixed thresholds were 58% (44% to 71%) and 61%

(34% to 88%).

Figure 7. Forest plot of sensitivity and specificity of the urine reagent strip for leukocyturia.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

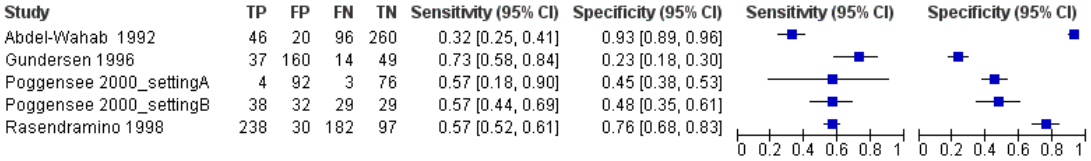
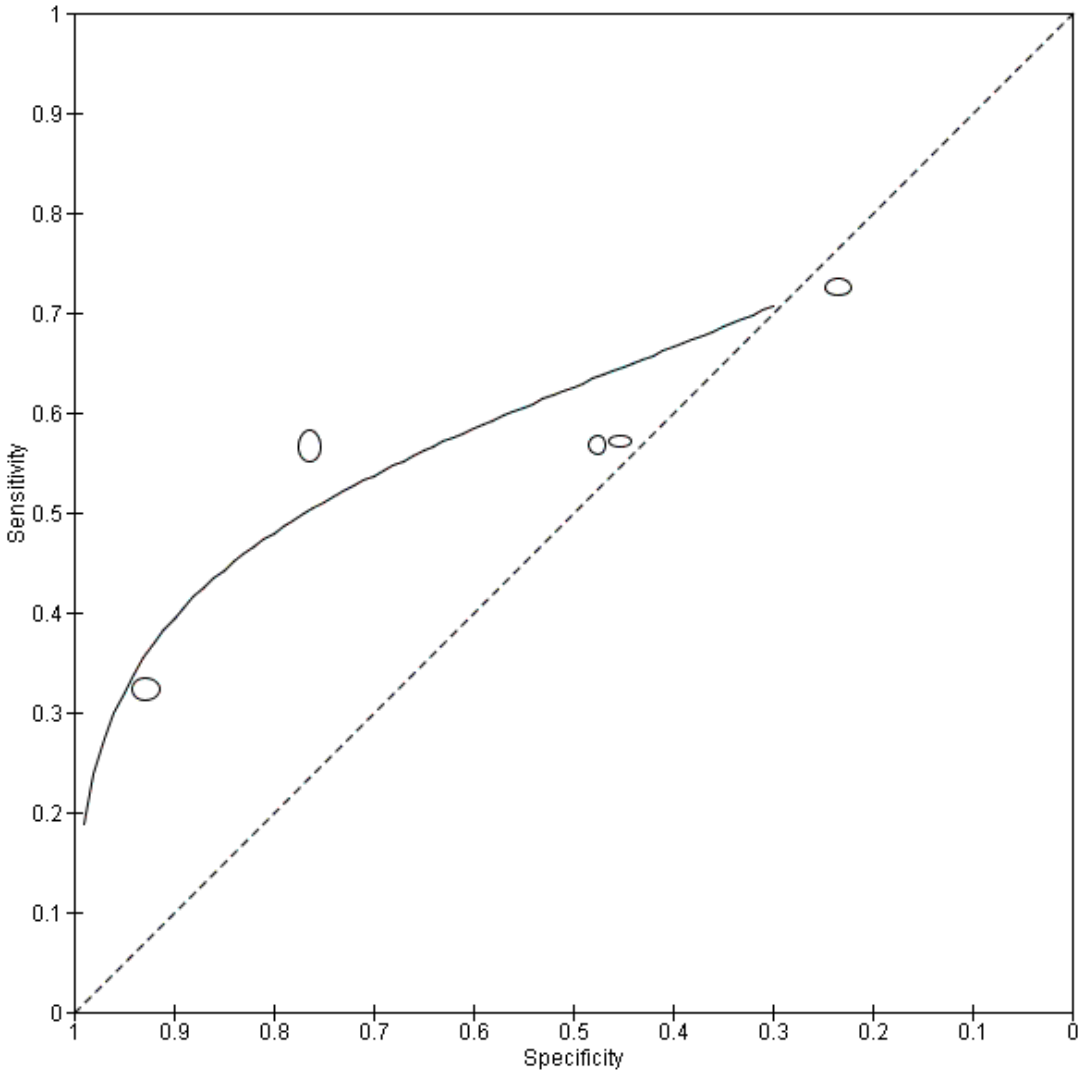


Figure 8. Summary ROC plot of sensitivity versus specificity of the urine reagent strip for leukocyturia.The size of the points is proportional to the study sample size. The solid line shows the summary ROC curve.



Urine CCA POC test

For *S. haematobium*

A total of four evaluations of the CCA POC test for *S. haematobium* were performed on data derived from four publications with a total population of 901 individuals. Median prevalence of *S. haematobium* was 40% (range 31% to 48%), and median female participation was 47% (Q1 40; Q3 51). Most of these evaluations were conducted with a lower-quality reference standard (n = 3; 75%). All evaluations were conducted in Africa. All evaluations included data from children only. These evaluations were described in articles published between the years 2008 and 2011. Four different test brands were evaluated.

Forest plots (Figure 9) and ROC plots (Figure 10) for this test reveal a high degree of heterogeneity for estimates of both sensitivity and specificity. The ROC plot also reveals poor accuracy of the test, as the study points lie close to the diagonal line. Meta-analytical

sensitivity and specificity (95% CI) of data at mixed thresholds were 39% (6% to 73%) and 78% (55% to 100%).

Figure 9. Forest plot of the sensitivity and specificity of the urine CCA POC test for S. haematobium.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

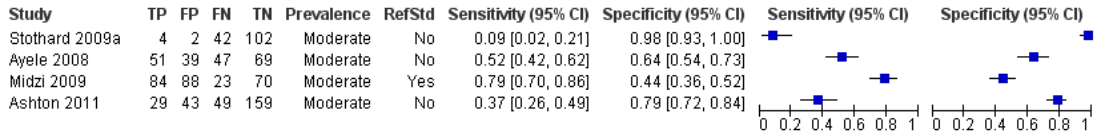
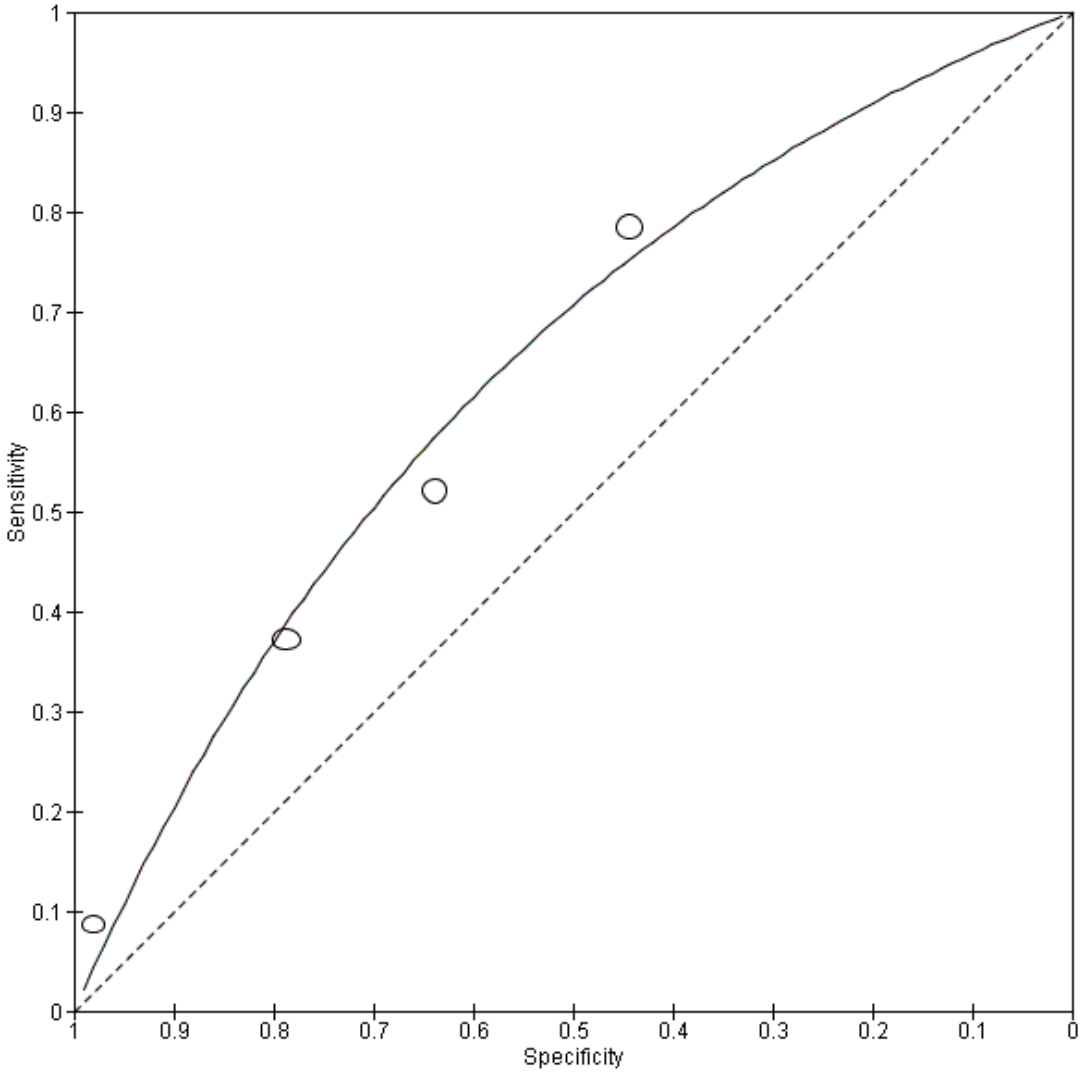


Figure 10. Summary ROC plot of sensitivity versus specificity of the urine CCA POC test for S. haematobium. The size of the points is proportional to the study sample size. The solid line shows the summary ROC curve.



For *S. mansoni*

A total of 15 evaluations of the CCA POC test for *S. mansoni* were performed on data derived from 13 publications with a total population of 6091 individuals. Median prevalence of *S. mansoni* was 36% (range 8% to 68%), and median female participation was 49% (Q1 48; Q3 51). Most of these evaluations were conducted with a lower-quality reference standard (n = 10; 67%). All evaluations were conducted in Africa, and all except one included data from children only. These 15 evaluations were described in articles published between the years 2007 and 2014. Two different test brands were evaluated: Rapid Diagnostic Tests from Pretoria South Africa and Schistosomiasis One Step Test from EVL Holland, as shown in Appendix 10. Most evaluations (n = 9) were performed using the Rapid Diagnostic Tests from South Africa. The forest plot for this test reveals greater heterogeneity for estimates of specificity versus estimates of sensitivity (Figure 11). Meta-analytical sensitivity and specificity (95% CI) of data at a threshold ≥ trace positive were 89% (86% to 92%) and 55% (46% to 65%) (Figure 12).

Figure 11. Forest plot of sensitivity and specificity of the urine CCA POC test for S. mansoni.Squares represent the sensitivity and specificity of one study, the black line its confidence interval. Colley 2013 was a study that included data for 5 studies (done in different countries). Some of the studies had been published earlier (Coulibaly 2011, Erko 2013, Shane 2011, Tchuente 2012). In this case, we used data from Colley 2013, which provided the most recent and updated data.

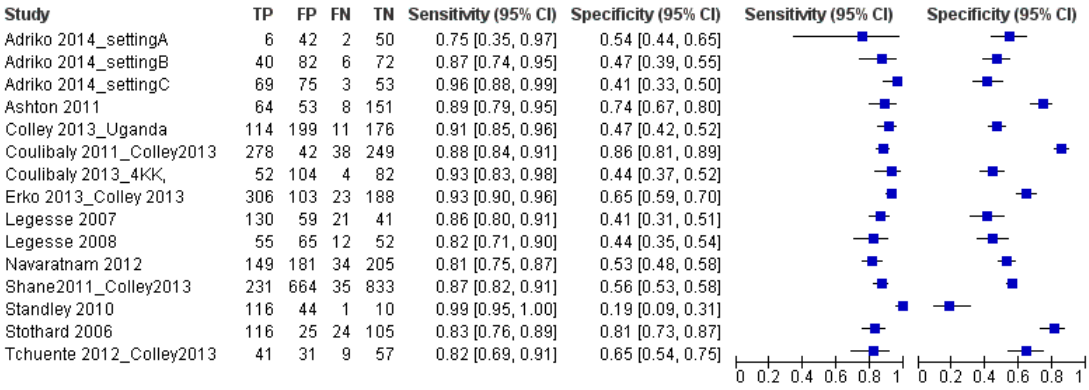
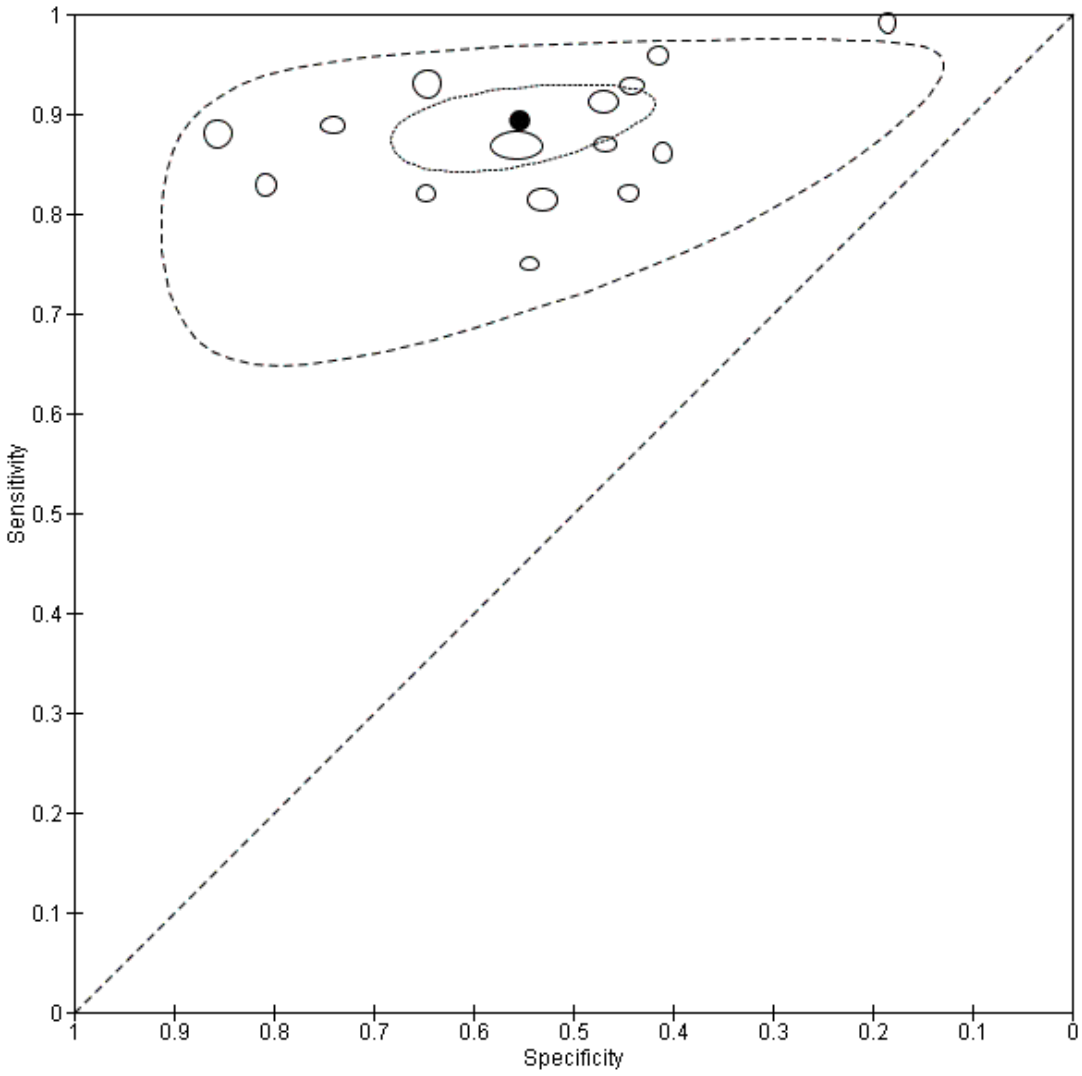


Figure 12. Summary ROC plot of sensitivity versus specificity of the urine CCA POC test for S. mansoni. The size of the points is proportional to the study sample size. The thick black point shows the average value for sensitivity and specificity. The inner ellipse around the black spot represents the 95% confidence regions around the summary estimates. The outer ellipse represents the prediction region.



For mixed infection

One study assessed the capability of the POC test to detect schistosomiasis in an area of mixed *S. haematobium* and *S. mansoni* infection. This evaluation was conducted in Africa (Southern Sudan) in children only and was published in 2011. The brand used was Rapid Diagnostic Tests from Pretoria, South Africa. The sensitivity of the test was 66%, and the specificity was 79%. No meta-analysis was performed for this test because of insufficient data.

CAA ELISA test

Serum

A total of five evaluations of the serum CAA test for *S. mansoni* were performed on data derived from four publications (total population 1583, years of publication 1995 to 1998). Median prevalence of *S. mansoni* was 93% (range 28% to 96%), and median female participation was 49% (Q1 49; Q3 51). All of these evaluations were conducted using relatively higher-quality reference standards (n = 5; 100%). All were in-house assays, and one study involved only children. Sensitivity of the serum CAA ELISA for *S. mansoni* ranged from 47% to 94%, and specificity ranged from 8% to 100% (Appendix 11). The ROC plot (Appendix 12) reveals a lot of scatter of the estimates of sensitivity and specificity provided by the included studies.

A total of three evaluations of the serum CAA test for*S. haematobium* were performed on data derived from three publications (total population 990, years of publication 1995 to 1999). Median prevalence of *S. haematobium* was 38% (range 18% to 57%). Only one study provided data on gender proportions (female participation was 54%). Two of the three evaluations were conducted using a higher-quality reference standard (67%). All were in-house assays, and all were carried out in mixed populations of adults and children. Sensitivity of the serum CAA test for *S. haematobium* ranged from 55% to 97%, and specificity ranged from 24% to 57% (Appendix 13; Appendix 14).

Urine

Only one evaluation of the urine CAA test for *S. mansoni* was performed on data derived from one publication (total population 204, year of publication 1995).. This was an in-house assay and was done on data obtained from a mixed population of adults and children. Sensitivity of this test was 10%, and specificity was 99%.

Only one evaluation of the urine CAA test for *S. haematobium* was performed on data derived from one publication (total population 370, year of publication 1999). This in-house assay was performed on data obtained from a mixed population of adults and children. Sensitivity of this test was 16%, and specificity was 94%.

CCA ELISA test

Serum

Two evaluations of the urine CCA test for *S. mansoni* were performed on data derived from two publications (total population 569, year of publication 1995). Both were in-house assays performed on data obtained from a mixed population of adults and children. Sensitivity of this test ranged from 36% to 85%, and specificity was 50% to 93% (Appendix 15).

Only one evaluation of the urine CCA test for *S. haematobium* was performed on data derived from one publication (total population 370, year of publication 1999). This in-house assay was performed on data obtained from a mixed population of adults and children. Sensitivity of this test was 3%, and specificity was 90%.

Urine

Two evaluations of the urine CCA test for *S. mansoni* were performed on data derived from two publications (total population 560, year of publication 1995). Both were in-house assays, and neither involved children only. Sensitivity of this test ranged from 62% to 97%, and specificity from 27% to 84% (Appendix 16).

Only one evaluation of the urine CCA test for *S. haematobium* was performed on data derived from one publication (total population 370, year of publication 1999). This in-house assay did not involve children only. Sensitivity of this test was 78%, and specificity was 70%.

Comparisons of accuracy between reagent strips for microhaematuria and proteinuria

Results of comparisons between microhaematuria and proteinuria are outlined in the Summary of findings 1. We first compared accuracy in all studies (indirect comparisons); we then limited the comparison to paired studies (direct comparisons). No statistically significant difference between the accuracy of microhaematuria and that of proteinuria was observed when the tests were compared in different populations using all studies (P = 0.25) (Figure 13). This can be demonstrated in the ROC curve showing the curves of tests as close together and crossing. The difference in accuracy also was not statistically significant when the tests were directly compared in the same individuals (P = 0.21) (Figure 14). A statistically significant difference in the threshold parameter was noted when the tests were compared in different populations using all

studies (P < 0.0001), and when the tests were directly compared in the same individuals (P = 0.0009). This could imply that one test has a different operating threshold when compared with the other, and although overall accuracy is not statistically significantly different, sensitivity and specificity may be different under field circumstances.

Figure 13. Summary ROC plot of sensitivity versus specificity showing the indirect comparison between microhaematuria and proteinuria (all studies). The solid lines show the summary ROC curves.

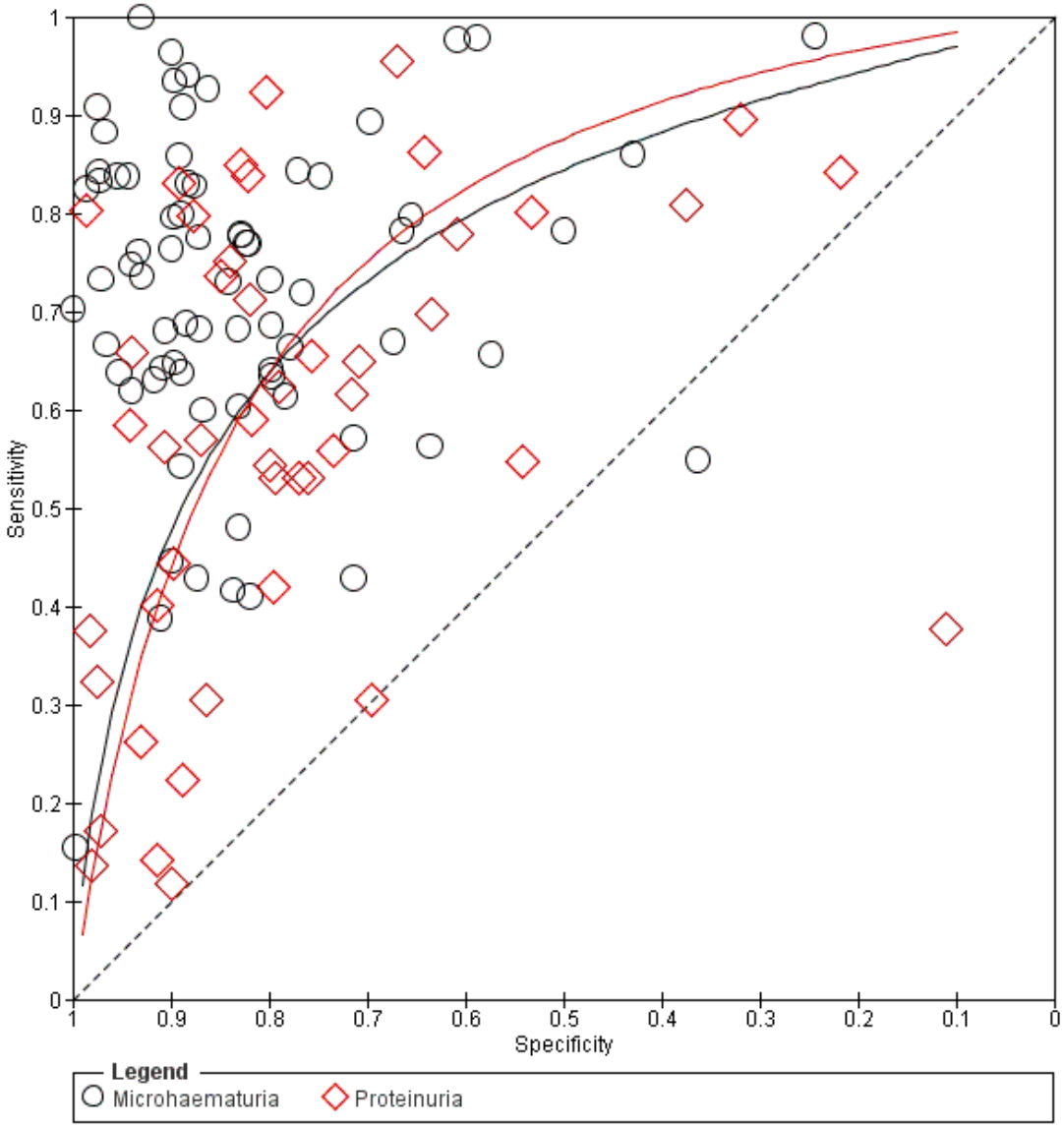
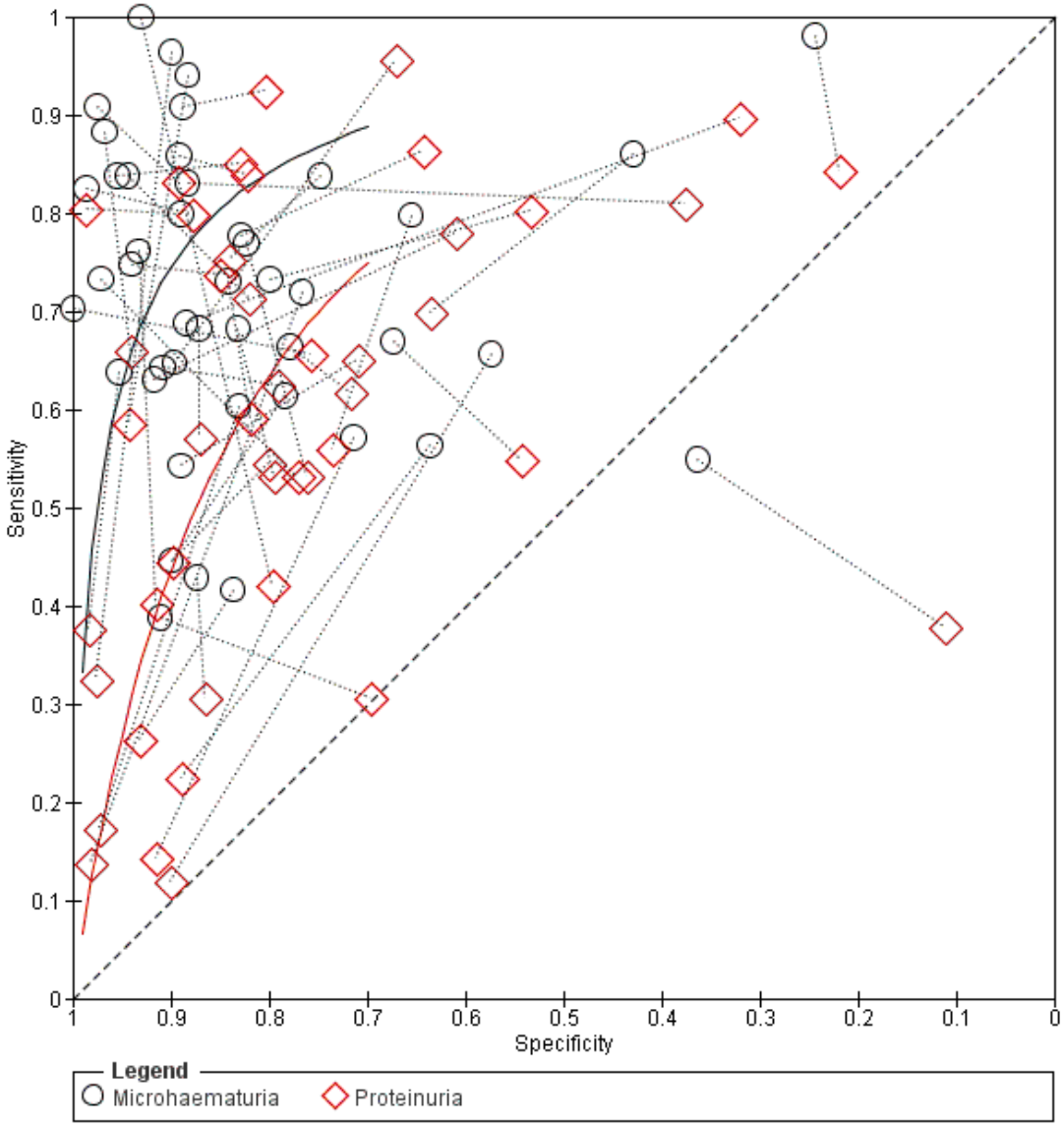


Figure 14. Summary ROC plot of sensitivity and specificity showing the direct comparison between microhaematuria and proteinuria (paired studies). Study points of microhaematuria and proteinuria from the same study are joined by a dotted line. The solid lines show the summary ROC curves.



Investigations of heterogeneity

Co-variates in the models

The co-variates quality of reference standard, age, gender (% female participation), prevalence of infection, and intensity of infection were added to the HSROC model. We investigated whether these co-variates affect the parameters of the HSROC model, that is, accuracy, threshold, and shape.

For the reagent strip for microhaematuria, the co-variates age (P = 0.002) and gender (% female participation) (P = 0.02) had statistically significant effects only on the threshold parameter of the HSROC model.

For the reagent strip for proteinuria, the co-variates quality of reference standard (P = 0.01) and prevalence of infection (P value 0.007) had statistically significant effects on the accuracy parameter. Accuracy was higher with the higher-quality reference standard and in settings with higher prevalence. Other co-variates did not have a statistically significant effect on any of the other parameters of the HSROC model.

For CCA POC used to detect *S. mansoni*, no co-variate had a statistically significant effect on sensitivity or on specificity.

Subgroup analysis

Table 1, Table 2, and Table 3 outline the results of subgroup analyses on the tests microhaematuria, proteinuria, and CCA POC for *S. mansoni*. When these tests were evaluated against the higher-quality reference standard (ie when multiple samples were analyzed), sensitivity was lower for microhaematuria (71% vs 76%) and proteinuria (49% vs 68%) than with a lower-quality reference standard. Specificity of these tests was lower for microhaematuria (85% vs 87%) but higher for proteinuria (83% vs 78%). In contrast, sensitivity was similar (88%) and specificity was higher for the CCA POC test for *S. mansoni* (66% vs 55%) when measured against a higher-quality reference standard in comparison with a lower-quality reference standard.

Microhaematuria and proteinuria had higher sensitivity (77% vs 73% and 67% vs 56%) in children than in mixed populations of adults and children. Specificity was higher for microhaematuria (91% vs 82%) but was comparable for proteinuria (81% vs 82%) in children compared with mixed populations of adults and children. All except one study of CCA POC for *S. mansoni* were carried out with children. At a positivity threshold ≥ 1, sensitivity of CCA POC for *S. mansoni* was lower (72% vs 89%) and specificity higher (85% vs 55%) than at a positivity threshold of trace positive. In the light-intensity subgroup, sensitivity was slightly lower for microhaematuria (73% vs 75%) and specificity was slightly higher (88% vs 87%) compared with results of the overall analysis. In contrast, sensitivity (60% vs 61%) and specificity (83% vs 82%) for proteinuria were comparable. Data were insufficient to permit estimation of the sensitivity and specificity of CCA POC for *S. mansoni* in light-intensity settings.

The forest plot (Figure 15) and the ROC plot (Figure 16) demonstrating sensitivity and specificity for microhaematuria after praziquantel treatment show a lot of variation in the estimates (predominantly for sensitivity) of the individual studies.

Figure 15. Forest plot of sensitivity and specificity of the urine reagent strip for microhaematuria for studies done after treatment with praziquantel.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

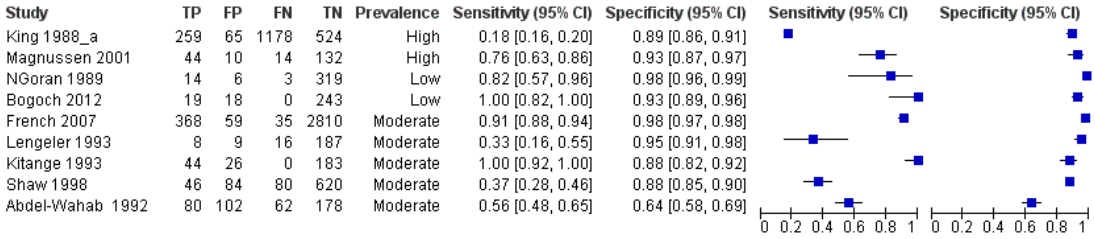
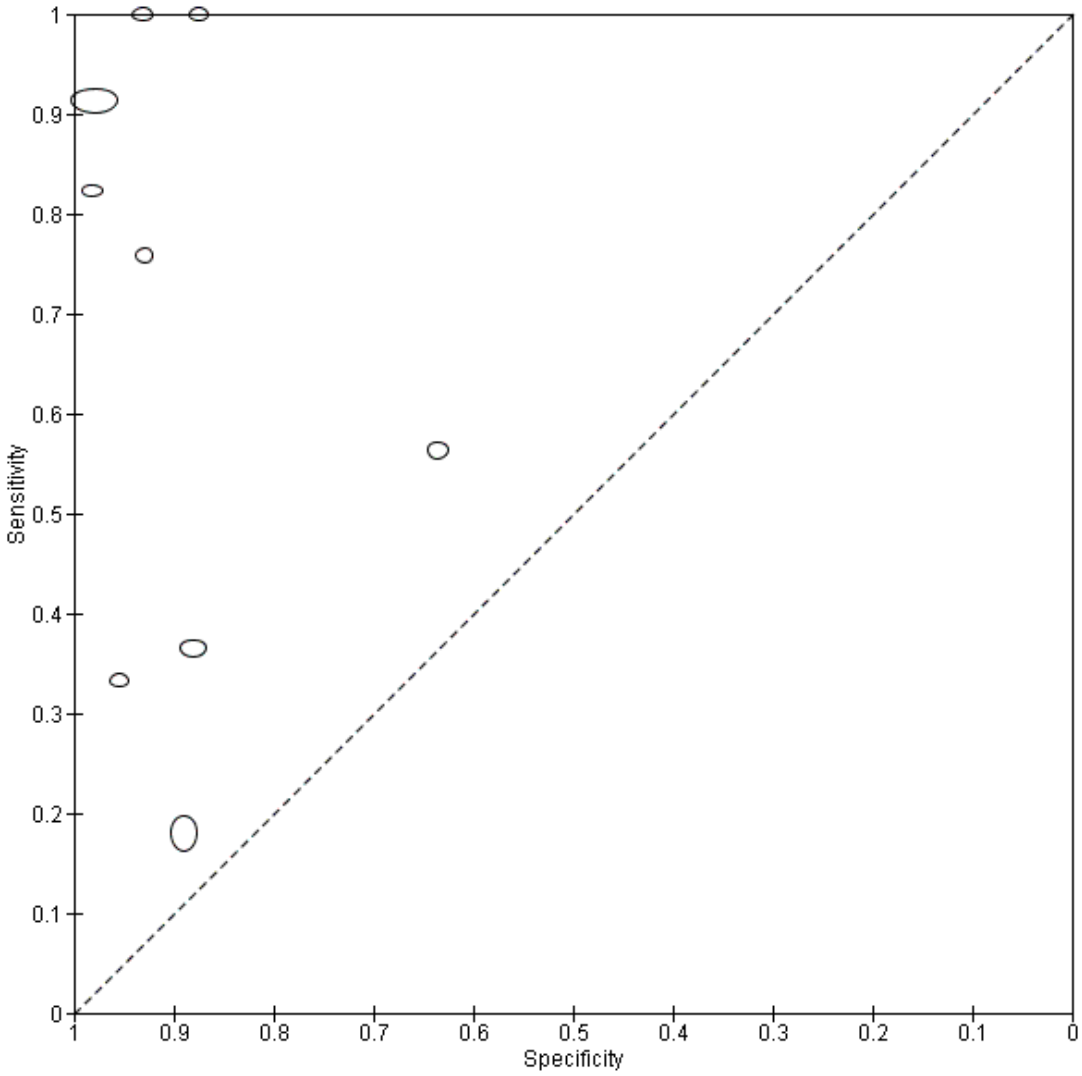


Figure 16. Summary ROC plot of sensitivity and specificity of the urine reagent strip for microhaematuria for studies done after treatment with praziquantel.The size of the points is proportional to the study sample size



Sensitivity analysis

For microhaematuria, when the analysis was limited to studies that used filtration only as the concentration method for urine microscopy, sensitivity (73% (69% to 78%) vs 76% (72% to 80%)) was lower and specificity was comparable (86% (82% to 89%) vs 86% (82% to 89%)) with those produced by the overall analysis. For proteinuria, when the analysis was limited to studies that used filtration only as the concentration method for urine microscopy, sensitivity was comparable (62% (52% to 71%) vs 61% (53% to 69%) and specificity was lower (80% (73% to 86%) than those produced by the overall analysis (83% (77% to 88%)) (Table 1; Table 2; Table 3).

Sensitivities and specificities of microhaematuria were comparable when analysis was limited to studies with low risk of bias for the participant flow domain. Sensitivity of proteinuria was higher when limited to studies with low risk of bias for the participant selection domain (64%) and the participant flow domain (67%). Specificity on the other hand was comparable for these two domains. Sensitivity and specificity of CCA POC for *S. mansoni* were comparable when limited to studies with low risk of bias for the participant flow domain (Table 1; Table 2; Table 3). Data were insufficient to allow estimation of sensitivity and specificity for studies with low risk of bias in the other domains-reference standard and participant selection-for the CCA POC test for *S. mansoni*.

As part of post hoc analyses, we noted that three evaluations showed substantial heterogeneity for the tests microhaematuria (Aryeetey 2000; sensitivity 55%, specificity 36%), proteinuria (Aryeetey 2000; sensitivity 38%, specificity 11%), and CCA POC for *S.mansoni* (Standley 2010; sensitivity 99%, specificity 19%). We excluded these evaluations in sensitivity analyses for the respective tests and found the following results. Results for microhaematuria (sensitivity 75%, specificity 87%) and proteinuria (sensitivity 61%, specificity 82%) were similar to those of the overall analysis. For CCA POC for *S. mansoni*, sensitivity was comparable (88% vs 89%) and specificity was slightly higher (58% vs 55%) compared with those of the overall analysis.

Summary of findings

What is the diagnostic accuracy of circulating antigen tests and biochemical urine reagent strips in detecting *S. haematobium* infection?						
Patients/Population	People residing in areas endemic for *S. haematobium* infection (74 out of 90 studies)					
Prior treatment with praziquantel before baseline study	Yes (6 studies), No (11 studies), Unclear (57 studies)					
Prior testing	None					
Settings	Field settings (villages and schools) and 1 outpatient clinic in Africa					
Index tests	Circulating cathodic antigen test (CCA) Circulating anodic antigen test (CAA)[a] Urine reagent strips to detect microhaematuria, proteinuria, and leukocyturia					
Reference standard	Urine microscopy					
Importance	These tests are being used as replacements for conventional microscopy in disease control programmes for schistosomiasis, as they are rapid, are easier to use and interpret, and may have comparable sensitivity to microscopy. As control programmes gain impetus and infection intensities decrease, higher sensitivities become a prerequisite for future diagnostics					
Studies	Cross-sectional (n = 62), cohort (n = 6), and case-control studies with controls from same population (n = 3)					
Quality concerns	Poor reporting of participant characteristics, index test and reference standard methods, and intensity of infection were common concerns. The risk of bias assessment for most included studies was largely unclear for the QUADAS domains Patient Selection, Index Tests, and Reference Tests					
Test types	**Number of evaluations**	**Summary estimates (95% CI)**	**In 1000 people tested**			
			Infected cases S. haematobium	**Missed cases (FNs)**	**False-positives (FPs)**	**All positives (TPs + FPs)**

Biochemical urine reagent strips						
For microhaematuria	74	Sens = 75% (71% to 79%) Spec = 87% (84% to 90%)	410	102	77	384
For proteinuria	46	Sens = 61% (53% to 68%) Spec = 82% (77% to 88%)	410	160	106	356
For leukocyturia	5	Sens = 58% (44% to 71%) Spec = 61% (34% to 88%)	410	172	230	468
Circulating cathodic antigen test (CCA)						
Urine POC test	4	Sens = 39% (6% to 73%) Spec = 78% (55% to 100%)	410	250	94	254

Comparisons

Comparison	Comparison type	Number of evaluations and differences in overall accuracy	Explanation		
Microhaematuria vs proteinuria	All studies	74 microhaematuria vs proteinuria, difference in accuracy (P = 0.25)	We found no evidence of a statistically significant difference in overall accuracy when microhaematuria and pro-	Proteinuria would be expected to miss 14% more cases than microhaematuria	Proteinuria would be expected to falsely identify 5% more cases than microhaematuria

			teinuria are carried out and compared in different individuals		
	Paired studies (tests done in the same individuals)	44 microhaematuria vs proteinuria, differences in accuracy (P = 0.21)	We found no evidence of a statistically significant difference in overall accuracy when microhaematuria and proteinuria are carried out and compared in the same individuals		

[a] Studies were insufficient to provide summary estimates for the CAA tests.

When the tests were evaluated against the higher-quality reference standard (ie when multiple samples were analyzed), sensitivity was lower for microhaematuria (71% vs 76%) and proteinuria (49% vs 61%) in comparison with a lower-quality reference standard. The specificity of these tests was comparable.

In light-intensity settings, sensitivity was slightly lower for microhaematuria (73% vs 76%) and specificity was slightly higher (88% vs 86%) compared with results of the overall analysis. In contrast, sensitivity (60% vs 61%) and specificity (83% vs 83%) for proteinuria were comparable.

Microhaematuria and proteinuria had higher sensitivity (77% vs 73% and 67% vs 56%) in children than in mixed populations of adults and children. Specificity was higher for microhaematuria (91% vs 82%) but specificity was comparable for proteinuria (81% vs 82%) in children compared with mixed populations of adults and children.

For the effects of risk of bias, sensitivities and specificities of microhaematuria were comparable when limited to studies with low risk of bias for the participant flow domain. Sensitivity of proteinuria was higher when limited to studies with low risk of bias for the participant selection domain (64%) and the participant flow domain (67%). Specificity on the other hand was comparable for these 2 domains.

Abbreviations: TPs (true-positives), FPs (false-positives), FNs (false-negatives).

What is the diagnostic accuracy of circulating antigen tests for *S. mansoni* infection?						
Patients/Population	People residing in areas endemic for *S. mansoni* infection (16 out of 90 studies)					
Prior treatment with praziquantel before baseline study	Yes (1 study), No (5 studies), Unclear (10 studies)					
Prior testing	None					
Settings	Field settings (villages, schools, and military camp) in Africa and South America					
Index tests	Circulating cathodic antigen test (CCA) Circulating anodic antigen test (CAA)[a]					
Reference standard	Stool microscopy					
Importance	These tests are being used as replacements for conventional microscopy in disease control programmes for schistosomiasis, as they are rapid, are easier to use and interpret, and may have comparable sensitivity to microscopy. As control programmes gain impetus and infection intensities decrease, higher sensitivities become a prerequisite for future diagnostics					
Studies	Cross-sectional studies					
Quality concerns	Poor reporting of participant characteristics, index test and reference standard methods, and intensity of infection were common concerns. The risk of bias assessment for most included studies was largely unclear for the QUADAS domains Patient Selection, Index Tests, and Reference Tests					
Test types	**Number of evaluations**	**Summary estimates (95% CI)**	**In 1000 people tested**			
			Infected cases S. mansoni	**Missed cases (FNs)**	**False-positives (FPs)**	**All positives (TPs + FPs)**
Circulating cathodic antigen test (CCA)						

Urine POC test	15	Sens = 89% (86% to 92%); Spec = 55% (46% to 65%)	360	40	288	608

[a] Studies were insufficient to provide summary estimates for CAA tests.

When measured against a higher-quality reference standard, sensitivity of CCA POC for *S. mansoni* was comparable (88% vs 88%) but specificity was higher (66% vs 55%) than when measured against a lower-quality reference standard.

At a positivity threshold $\geq$ 1, sensitivity of CCA POC for *S. mansoni* was lower (72% vs 87%) and specificity higher (85% vs 61%) than at a positivity threshold of trace-positive.

Data were insufficient to estimate the sensitivity of CCA POC for *S. mansoni* in light-intensity settings.

For the effects of risk of bias, sensitivity and specificity of CCA POC for *S. mansoni* were comparable when limited to studies with low risk of bias for the participant flow domain.

Abbreviations: TPs (true-positives), FPs (false-positives), FNs (false-negatives).

DISCUSSION

Summary of main results

This review focused on analyzing the accuracy of urine reagent strips for the diagnosis of *S. haematobium* and of circulating antigen tests for the detection of *S. haematobium* and *S. mansoni* infections. Microscopy was used as the reference standard, and 90 studies were found to fit our inclusion criteria; data from these studies were used in this review. The main results, including average sensitivities and specificities for tests included in the meta-analyses, are reported in Summary of findings 1 and Summary of findings 2.

Most of the studies included in our overall meta-analyses used a 'lower-quality reference test': microhaematuria 81%, proteinuria 73%, leukocyturia 60%, circulating cathodic antigen point-of-care (CCA POC) for *S. haematobium* 75%, and CCA POC for *S. mansoni* 81%. This implies that infections missed by single-sample microscopy may have increased the number of false-positives identified by the index tests, consequently leading to lower estimates of specificity.

Our overall analyses suggest that among the tests used to detect *S. haematobium*, the urine reagent strip for microhaematuria detects the largest proportion of schistosome infections identified by microscopy (sensitivity 75%); it also detects the largest proportion of non-infections identified by microscopy (specificity 87%). Proteinuria follows suit, with sensitivity of 61% and specificity of 82%.

The superior performance of microhaematuria over proteinuria was not statistically significant when the comparison was performed both indirectly (using all studies) and directly (using paired studies) within the HSROC model. When measured against a higher-quality reference standard (multiple measurements), microhaematuria had both lower sensitivity (71% vs 75%) and lower specificity (85% vs 87%) than were seen with a lower-quality reference standard. Proteinuria on the other hand, when measured against a higher-quality reference standard, had lower sensitivity (49% vs 61%) and higher specificity (82% vs 78%) versus a lower-quality reference standard. Increasing the sensitivity of microscopy by taking multiple measurements may reduce the number of true cases wrongly classified as non-infected by microscopy. An index test compared against a more sensitive reference test (higher quality) may have higher specificity because the number of false-positives will be low. The lower specificity for microhaematuria may be due in part to poor reporting of how the reference standard was conducted in some studies.

Our results suggest that the urine reagent strip when used to detect leukocyturia is limited by low sensitivity (58%) and specificity (61%) and is not useful in practice. The low sensitivity for leukocyturia could be explained by the variations in morbidity caused by *S. haematobium*. Not all infected people have leukocyturia; therefore the proportion of false-negatives is higher. The CCA POC test has very low sensitivity (39%) to detect *S. haematobium* and specificity of 78% and may not be suitable for mapping or estimation of infection, because it misses very many infections identified by microscopy.

The CCA POC test for *S. mansoni* detected a large proportion of infections identified by microscopy (sensitivity 89%). However, it also detected a lower proportion of the non-infected cases identified by microscopy (specificity 55%). The low specificity can be explained by the fact that most studies in the overall analyses were measured against a lower-quality reference standard. When compared with a higher-quality reference standard, the CCA POC test had comparable sensitivity (88%) but higher specificity (66%). Arguably, if the reference standard had been even better, this specificity might have increased further.

As studies were insufficient, we were unable to generate summary estimates for the circulating antigen enzyme-linked immunosorbent assay (ELISA) tests (CCA and circulating anodic antigen (CAA)). Estimates of sensitivity and specificity from the included studies evaluating these tests ranged widely.

Results of our assessment of risk of bias of the included studies were largely unclear because of poor reporting of items in these studies.

Application of the meta-analysis to a hypothetical cohort

Summary of findings 1 and Summary of findings 2 apply the results of the meta-analyses to a hypothetical cohort of 1000 individuals suspected of having active *S. haematobium* and/or active *S. mansoni* infection in a field setting. We illustrate the impact of using microhaematuria, proteinuria, leukocyturia, and CCA POC for *S. haematobium* in a setting with a prevalence of *S. haematobium* infection of 41%, and the impact of using CCA POC for *S. mansoni* in a setting with a prevalence of *S. mansoni* infection of 36%. These are the estimates of median prevalence of infection obtained from all studies included in this review.

Delivery of population-based control programmes such as treatment with praziquantel requires knowledge of prevalence estimates of schistosomal infections (Colley 2014). This helps the clinician in determining whether mass drug treatment should be administered in settings of very high prevalence, or targeted treatment in settings of low prevalence. We have included descriptions of the performance of these tests in estimating the prevalence (index test positives (TP + FP)) of *S. haematobium* and *S. mansoni* infections.

S. haematobium infection

If the point estimates of the tests for *S. haematobium* are applied to a hypothetical cohort of 1000 individuals suspected of having active *S. haematobium* infection, among whom 410 actually have the infection, the strip for microhaematuria would be expected to

miss (102) and falsely identify (77) the least number of cases. This test would identify 384 positive cases in total.

For the other tests (in increasing order of missed cases): The strip for proteinuria would be expected to miss 160 cases and to falsely identify 106 cases; proteinuria would be expected to miss 14% more cases than microhaematuria and to falsely identify 5% more cases than microhaematuria; leukocyturia would be expected to miss 172 cases and to falsely identify 230 cases; and the CCA POC test would be expected to miss 250 cases and to falsely identify 130 cases. In total, the strips for proteinuria, leukocyturia, and the CCA POC test would identify 356, 468, and 254 positive cases, respectively.

Overall, when infection is mapped, the prevalence of microhaematuria would seem to be 38%-close to the true prevalence of 41%. The prevalence of proteinuria would seem to be 36%, that of leukocyturia 47%, and that of CCA POC 25%. In cases of mass treatment, the ultimate consequences of these numbers would depend on the minimal prevalence needed to start mass treatment.

S. mansoni infection

If the point estimates for the CCA POC test are applied to the same hypothetical cohort of 1000 individuals suspected of having active *S. mansoni* infection, among whom 360 actually have the infection, the CCA POC test would be expected to miss 40 cases and to falsely identify 288 cases. In total, the test would identify 608 positive cases (for an observed prevalence of 61%).

Comparison with other reports

The absence of a suitable gold standard for active schistosomiasis is reflected in the existing literature, where different reference standards are used with subsequent variation in accuracy (especially with specificity) of the index test (Koukounari 2009; Coulibaly 2011; Tchuente 2012; Colley 2013; Erko 2013; King 2013;Lodh 2013; Sousa-Figueiredo 2013).

A meta-analysis was recently published that assessed the accuracy of urine reagent strips for microhaematuria against conventional microscopy as a reference standard (King 2013). Unlike King's review, our review also estimated the accuracy of other urine reagent strips for proteinuria and leukocyturia. To guide decision making, it is important to show which of these tests fares better. Our analyses suggest that microhaematuria has higher sensitivity than proteinuria and leukocyturia.

Compared with results from King's meta-analysis (King 2013), our estimate of sensitivity for microhaematuria was lower (75% vs 81%) but specificity was comparable (87% vs 89%). This difference may be attributed to the method of meta-analysis used. King used the HSROC regression following a Bayesian Monte Carlo Markov chain approach (Dendukuri 2012), and we used the HSROC model recommended in the *Cochrane Handbook for Systematic Reviews of Interventions* (Macaskill 2010). With regard to sources of heterogeneity, some of our results are also comparable with those of King 2013. For instance, King found through multi-variable regression modelling that the urine heme dipstick performed better in children than in mixed populations of adults and children (Relative diagnostic odds ratio = 3.16). In our review, we found that sensitivity and specificity were higher in studies on children compared with studies on mixed populations of adults and children. We strongly confirm that this test is therefore highly suitable for mass mapping of school-aged children in endemic areas. Again our analyses show that sensitivity of the urine heme dipstick was slightly lower in settings of low intensity (73%) compared with that of the overall estimate (75%). This finding was similar to the findings of King, which showed that sensitivity of the urine heme dipstick was lower in settings of lower infection intensity (65%) in the subgroup analysis than in the overall analysis (81%). However it should be noted that our definition of light intensity differed from that used by King. We selected the more commonly used World Health Organization (WHO) recommended cutoff of < 50 eggs per 10 mL, whereas King defined low intensity as ≤ 100 eggs/10 mL. This could explain in part why our sensitivity estimates were higher than those of King in settings of light intensity.

A key difference between our review and that of King 2013 concerned the effects of treatment on the estimate of sensitivity of the heme dipstick. In a subgroup of eight studies with mixed post-treatment evaluations of one year (n = 6), six months (n = 1), and one month (n = 1), King's review produced a lower summary estimate of sensitivity (72%) in the subgroup of treated populations as compared with the overall analysis (81%). King considered treatment evaluations with praziquantel and metrifonate, whereas we focused on studies that evaluated the effects of praziquantel treatment, as this is the current drug of choice. Because studies reported varied time intervals between treatment and retesting, we opted not to pool the estimates of studies, as this would likely produce biased overestimates of sensitivity and specificity. Studies with long time intervals were likely to include greater numbers of participants reinfected compared with studies carried out at shorter time intervals, and their results may be confounded by repeated treatments provided by national programmes.

A recently published multi-centre evaluation of CCA POC tests done in five African countries (Colley 2013) recommended that the CCA POC test for *S. mansoni* (evaluated with a positivity threshold ≥ trace positive) was a sufficiently sensitive and specific tool for mapping intestinal schistosomiasis in moderate- to high-prevalence areas, and therefore it was a viable alternative to microscopy (Colley 2013). After acknowledging the absence of a gold standard, this multi-centre study used latent class analysis (modelling results from CCA POC, Kato-Katz, and PCR) to generate an overall estimate of 86% sensitivity and 72% specificity of the CCA POC based on data from 4405 school-age children. Using microscopy only (KK) as the reference standard, our review, which incorporated all include study results along with findings of

additional studies, produced a comparable summary estimate of 89% sensitivity but a lower summary estimate of 55% specificity at a threshold of trace positive. Differences in specificity could be explained by the reference standard and indicate that some of the false-positives identified by CCA POC are indeed likely to be true infections that are not detected by standard microscopy.

Few studies have fully evaluated the accuracy of the circulating antigen ELISA tests (CCA and CAA). The serum CAA ELISA test is currently being converted to a point-of-care format for *S. mansoni* (Corstjens 2008) and*S. haematobium* (van Dam 2013) with promising results of analytical sensitivity and specificity. In our review, sensitivity of the included studies evaluating the serum CAA ELISA test for *S. mansoni* ranged widely from 47% to 94%, and specificity ranged widely from 8% to 100%. Sensitivity of the included studies evaluating the serum CAA ELISA test for *S. haematobium* ranged from 55% to 97%, and specificity was low, ranging from 24% to 57%. However, the studies included in our review were carried out before the year 2000 with in-house tests. The tests currently being developed are most likely improved versions; therefore additional studies analyzing the clinical sensitivity and specificity of the serum ELISA tests are needed for conclusive determination of whether they are suitable for the diagnosis of active schistosomiasis.

Strengths and weaknesses of the review

Strengths

We have evaluated the accuracy of POC tests currently in use and tests that have recently been transformed into POC tests for detection of active schistosomiasis in endemic areas. This makes our review relevant to current practice. To avoid missing studies, we did not use a search filter, and we did not limit our search by publication year or language; also to limit bias, data extraction was performed by two people independently.

Weaknesses

Choice of the reference standard

In light of the absence of a suitable gold standard for active schistosomiasis and the presence of other proposed alternative reference standards, evaluation of index tests with only microscopy as the reference standard may be considered a shortcoming of our review. However because microscopy remains the most commonly used test and therefore reference test, we wanted our review to be applicable to current practice. Our review provides better insight into the proportion of cases detected and the proportion of cases misclassified by urine reagent strips and CCA POC tests when microscopy is used as the reference standard. A more reliable way of evaluating whether an index test can replace microscopy would be to compare the accuracy of microscopy, urine reagent strips, and circulating antigen tests against other proposed reference standards in the same set of participants (direct comparison studies). A few studies have compared the accuracy of one or more KK smears and CCA POC against a reference standard comprising six or more KK smears (Coulibaly 2011; Tchuente 2012; Erko 2013) or against PCR as the reference test (Lodh 2013) (see comparisons in Appendix 17). All of these studies have shown the CCA POC test to be more sensitive but less specific than single or double KK. More direct comparative studies and reviews are needed to reliably confirm this finding and to identify sources of variation in results.

Quality of included studies

Poor and inconsistent reporting of participant characteristics such as clinical status of participants, intensity of infection, administration of praziquantel treatment, and conduct of the study limited our investigations of sources of heterogeneity and risk of bias assessment.

In our review, the reporting of intensity of infection was unclear (reported in different ways (arithmetic mean or range of infection or geometric mean or range of infection or proportions with light/moderate/heavy infections) or not reported at all) for a large proportion of the included studies (microhaematuria 44%, proteinuria 42%, and CCA POC 45%). It was therefore difficult to effectively investigate its influence on the accuracy of the evaluated tests. It was also a challenge to fully investigate the effects of praziquantel treatment on the accuracy of the evaluated tests because 82% of the studies did not report the treatment status of participants before the start of the study. The effects of intensity of infection and the effects of praziquantel treatment on the accuracy of diagnostic tests for schistosomiasis are currently an important concern for national control programmes, particularly as praziquantel treatments progress, with subsequent decreases in infection intensities. Indeed, in areas where the force of infection and associated morbidity have been greatly reduced, some programmes are beginning to focus on elimination. It is therefore of vital importance that highly sensitive tests are used for monitoring, and that highly sensitive and specific tests are used in efficacy studies before and after treatment.

Applicability of findings to the review question

Our concern about the applicability of the included studies to our review question was low, as assessed by QUADAS-2. As all but one study were carried out in Africa, and all but one study were conducted in field settings, our results are highly applicable for use in endemic communities for which disease control programmes are often targeted. However, one area that may limit the applicability of our findings to the review question is our investigation into sources of heterogeneity such as effects of praziquantel treatment and risk of bias assessment on the accuracy estimates of evaluated

tests. As discussed earlier, poor and inconsistent reporting limited this investigation. In light of the ongoing disease control programmes, fully showing any variation in test accuracy associated with effects of praziquantel treatment would be useful for policy makers. Knowing the risk of bias of included studies would also help in objective assessments of the strength of the evidence. Study authors therefore are encouraged to use the Standards for Reporting of Diagnostic Accuracy Studies (STARD) guidelines (Bossuyt 2003) in reporting the design and conduct of their studies.

AUTHORS' CONCLUSIONS

Implications for practice

Among the tests evaluated for *S. haematobium* infection, microhaematuria has detected the largest proportion of infections and non-infections identified by microscopy. This test could continue to serve as a replacement test for microscopy for initial mapping or estimation of *S. haematobium* infection, particularly in endemic areas with moderate to high prevalence of infection.

The CCA POC test for *S. mansoni* detects a very large proportion of infections identified by microscopy but misclassifies many microscopy-negatives as -positives in endemic areas with moderate to high prevalence of infection. This may occur because the test is potentially more sensitive than microscopy. Nevertheless, healthcare workers should interpret the results with care when using this test for initial mapping or estimation of *S. mansoni* infection, as some of the positives may still be false-positives, in particular when trace-positive is used as the threshold.

Besides assessment of the accuracy of a test, the choice of a suitable diagnostic test should be made in light of cost and logistical considerations. Costs for microscopy (USD per examination, 0.3 for a single thick KK smear) (Cavalcanti 2013) and for reagent strips for microhaematuria (USD 0.32) (Legesse 2008) are comparable, but the strips are easier to use and interpret and therefore are not logistically challenging in field settings. The CCA POC tests are more costly (USD 2.6 per examination) (Cavalcanti 2013) but are rapid and easy to use and interpret, are highly portable, and require fewer technical personnel than microscopy; they are also suitable for field screening and diagnosis.

Implications for research

As control programmes progress with expected subsequent decreases in prevalence and intensity of infection, we highlight the importance of additional primary research conducted to identify a suitable clinical reference standard for active schistosomiasis.

Additional studies comparing the accuracy of microscopy, circulating antigen tests, and urine reagent strips versus other proposed reference standards are needed if a suitable replacement for microscopy in practice is to be reliably recommended.

Further studies to identify other sensitive tests to detect active *S. haematobium* and *S. mansoni* infections and further evaluations of the CAA test as a future POC test for serum or urine are also needed.

For suitable tests to be reliably recommended for monitoring effects of praziquantel treatment in disease control programmes, additional follow-up studies are required to evaluate the effects of praziquantel treatment on intensity of infection and accuracy of urine reagent strips and circulating antigen tests.

Further research on cost-effectiveness of diagnostic tests in areas of different endemicity is also needed, as cost is a key deciding factor in resource-limited settings.

Finally, authors of primary test accuracy studies should be encouraged to use the STARD guidelines when reporting the design and conduct of their studies. This will enable systematic reviewers to better synthesize the data and to draw conclusions on risk of bias in studies of test accuracy.

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* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Abdel-Wahab 1992

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 422 Age range: 12 to 16 years Participants: school children whose parents gave consent Setting: field study Praziquantel status before study: About half of the included children gave a history of receiving PZQ in past 2 years		
Index tests	RS-Microhaematuria, RS-Proteinuria, RS-Leukocyturia (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Leukocyturia			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge	Unclear		

Abdel-Wahab 1992 (*Continued*)

of the results of the index tests?			
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Abdel-Wahab 2000

Study characteristics			
Patient sampling	Cross-sectional design; multi-stage stratified random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 5214 Age range: 5 to 25 years Participants: residents from villages in Fayoum Governorate Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**

Abdel-Wahab 2000 (*Continued*)

DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		

Abdel-Wahab 2000 (*Continued*)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Adriko 2014˙6KK

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 469 Age range: 7 to 13 years Participants: children from 5 schools categorized into 3 settings Setting: field study Praziquantel status before study: Annual mass treatment had been administered 5 years before study began		
Index tests	CCA POC test		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (6 Kato-Katz smears)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		

		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Adriko 2014 : settingA

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 100 Age range: 7 to 13 years Participants: children from 1 school from low endemic setting (setting A) Setting: field study Praziquantel status before study: Annual mass treatment had been administered 5 years before study began		
Index tests	CCA POC test		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (2 Kato-Katz smears from 1 stool sample)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Adriko 2014˙settingA (*Continued*)

If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Adriko 2014˙settingB

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 200 Age range: 7 to 13 years Participants: children from 2 schools from moderate endemic setting (setting B) Setting: field study

Adriko 2014˙settingB (*Continued*)

	Praziquantel status before study: Annual mass treatment had been administered 5 years before study began		
Index tests	CCA POC test		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (2 Kato-Katz smears from 1 stool sample)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		

Adriko 2014˙settingB (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Adriko 2014˙settingC

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 200 Age range: 7 to 13 years Participants: children from 2 schools from high endemic setting (setting C) Setting: field study Praziquantel status before study: Annual mass treatment had been administered 5 years before study began
Index tests	CCA POC test
Target condition and reference standard(s)	*S. mansoni* measured by stool microscopy (2 Kato-Katz smears from 1 stool sample)
Flow and timing	
Comparative	

Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Adriko 2014˙settingC (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Alsherbiny 1999

Study characteristics			
Patient sampling	Cross-sectional design; consecutive enrolment		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 370 Age range: 5 to 75 years Participants: Occupants > 5 years of age living in Behbeet Village willing to provide a stool, urine, and blood sample Setting: field study Praziquantel status before study: not reported		
Index tests	CAA ELISA-Serum and Urine; CCA ELISA-Serum and Urine (in-house assays)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Low	**Low**
DOMAIN 2: Index Test CCA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		

Alsherbiny 1999 (*Continued*)

		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Anosike 2001

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 1173 Age range: not reported Participants: all participating households in 7 communities Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Medi-Test Combi-9, Macherey Nagel, Düren, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			

Anosike 2001 (*Continued*)

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	Yes		
		Low	

Aryeetey 2000

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 370 Age range: > 5 years Participants: All participants aged 5 years and above from the 3 study areas Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Hema-Combi-Stix, Bayer Diagnostics, Sudbury, UK)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Aryeetey 2000 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Low	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Low	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	Unclear		
		Low	

Ashton 2011

Study characteristics			
Patient sampling	Nested case-control design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* and *S. mansoni* Country: Ivory Coast Sample size: 370 Age range: 5 to 16 years Participants: enrolled children within a study, rapid mapping for soil-transmitted helminthiasis Setting: field study Praziquantel status before study: not reported		
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method) and *S. mansoni* infection by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	No		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ayele 2008

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling

Ayele 2008 (*Continued*)

Patient characteristics and setting	Species: *S. haematobium* Country: Ethiopia Sample size: 206 Age range: 4 to 21 years Participants: school children from 1 school, born and grown up in the area, and not moved since birth Setting: field Praziquantel status before study: not reported		
Index tests	RS-Microhamaturia (Combur 10 test, Roche GmbH, Mannheim, Germany); CCA POC test (European Veterinary Laboratory (EVL), Woerden, Holland)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Bassiouny 2014

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Yemen Sample size: 696 Age range: 10 to 16 years Participants: primary school children from fifth and sixth grades and first and second grades of preparatory education Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Urocolor 9, Standard Diagnostics Inc., Suwon City, Kyonggi Province, Korea)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		

If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Birrie 1995˙settingA

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Ethiopia Sample size: 156 Age range: 0 to > 40 years Participants: all residents invited for checkup (low endemic area) Setting: field study

Birrie 1995˙settingA (*Continued*)

	Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Multistix Reagent Strips, Ames-Miles, Elkhart, IN, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		

Birrie 1995˙settingA (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Birrie 1995˙settingB

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Ethiopia Sample size: 121 Age range: 0 to > 40 years Participants: all residents invited for checkup (moderate endemic area) Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Multistix Reagent Strips, Ames-Miles, Elkhart, IN, USA)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Birrie 1995˙settingB (*Continued*)

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Birrie 1995˙settingB (*Continued*)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Birrie 1995˙settingC

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ethiopia Sample size: 224 Age range: 0 to > 40 years Participants: all residents invited for checkup (high endemic area) Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Multistix Reagent Strips, Ames-Miles, Elkhart, IN, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		

Birrie 1995˙settingC (*Continued*)

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Bogoch 2012

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 280 Age range: 1 to 77 years Participants: all willing to participate in voluntary screening and treatment Setting: field study Praziquantel status before study: 2 years before study		
Index tests	RS-Microhaematuria (Combur 10 Test, Roche GmbH, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Bosompem 1996

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 229 Age range: 1 to 86 years Participants: volunteers Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Ames-Miles, Tokyo, Japan)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Bosompem 1996 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Unclear		
		Unclear	

Bosompem 2004

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 141 Age range: not reported Participants: Urine samples were collected from 90 individuals with symptoms and 51 asymptomatic individuals Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Haemacombrix Strips, Millipore Corp., Billerica, MA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Bosompem 2004 (*Continued*)

If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		

Bosompem 2004 (*Continued*)

		Unclear	

Colley 2013˙Uganda

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting			
Index tests	CCA POC cassette test (Rapid Medical Diagnostics; Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* as measured by stool microscopy (1 KK smear)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Colley 2013˙Uganda (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Unclear		
		Unclear	

Cooppan 1987

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: South Africa Sample size: 941 Age range: 4 to 20 years Participants: school children belonging to most infected age group were examined at selected localities Setting: field study Praziquantel status before study: not reported

Cooppan 1987 (*Continued*)

Index tests	RS-Microhaematuria, RS-Proteinuria (Labstix, Ames, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	No		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Cooppan 1987 (*Continued*)

If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	No		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Coulibaly 2011˙9KK

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Ivory Coast Sample size: 146 Age range: 8 to 12 years Participants: children from grades 3 to 5 attending the schools selected for participation in the study Setting: field study (low endemic area)

Coulibaly 2011˙9KK (*Continued*)

	Praziquantel status before study: not reported		
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes	In Coulibaly 2011_9KK, the index test was measured against a higher-quality reference standard (9 Kato-Katz smears)		
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Low	**Low**
DOMAIN 3: Reference Standard			

Coulibaly 2011˙9KK (*Continued*)

Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Coulibaly 2011˙Colley2013

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Ivory Coast Sample size: 146 Age range: 8 to 12 years Participants: children from grades 3 to 5 attending the schools selected for participation in the study Setting: field study (low endemic area) Praziquantel status before study: not reported
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)
Flow and timing	

Comparative			
Notes	This article describes part of a multi-centre study (Colley 2013). This was similar to Coulibaly 2011_9KK, but this article presented 2-by-2 tables of the CCA POC measured against the first daily stool specimen (triplicate KK smears on 1 stool sample)		
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Low	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		

Coulibaly 2011˙Colley2013 (*Continued*)

		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		High	

Coulibaly 2013˙4KK,

Study characteristics			
Patient sampling	Cohort design; consecutive sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Cote D'ivoire Sample size: 367 Age range: < 6 years Participants: all preschool children from 2 villages Setting: field study Praziquantel status before study: reported that there had been no treatment in the area		
Index tests	CCAPOC cassette test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* as measured by stool microscopy (4 Kato-Katz smears)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			

Coulibaly 2013˙4KK, (*Continued*)

Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Coulibaly 2013˙4KK, (*Continued*)

Were all patients included in the analysis?	No		
		Unclear	

De Clerq 1995

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Mali Sample size: 441 Age range: not reported Participants: Blood and urine samples were collected from 182 and 271 people in the villages of Kassa and Boro Setting: field study Praziquantel status before study: no prior drugs		
Index tests	CAA ELISA Serum (in-house assay)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			

Methodological quality

Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**

De Clerq 1995 (*Continued*)

DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

El-Morshedy 1996

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Egypt Sample size: 257 Age range: 20 to 25 years Participants: Cohort consisted of 257 men, treated, infected cases in a military camp Setting: military camp Praziquantel status before study: no prior drugs		
Index tests	CAA ELISA Serum (in-house assay)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		High	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

El-Morshedy 1996 (*Continued*)

Was quality control done?	No		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

El-Sayed 1995

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 280 Age range: 4 to 36 years Participants: permanent settlers who agreed to participate in study Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Chemistrip, Boehringer, Indianapolis, IN, USA)

El-Sayed 1995 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge	Unclear		

El-Sayed 1995 (*Continued*)

of the results of the index tests?			
Was quality control done?	Yes		
		Unclear	**Low**

DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?			
Were all patients included in the analysis?			

Eltoum 1992

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Sudan Sample size: 425 Age range: 3 to 39 years Participants: asymptomatic and symptomatic participants randomly selected from population Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Ames-Miles, Elkhart, IN, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**

Eltoum 1992 (*Continued*)

DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		

Eltoum 1992 (*Continued*)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Erko 2013˙6KK

Study characteristics			
Patient sampling	Cross sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Ethiopia Sample size: 620 Age range: 8 to 12 years Participants: children from a village in Western Kenya Setting: field study Praziquantel status before study: reported that there had been no treatment in the area		
Index tests	CCA POC cassette test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* as measured by stool microscopy (3 Kato-Katz smears on 3 stool samples (6KK))		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		

		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Erko 2013˙Colley 2013

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Ethiopia Sample size: 620 Age range: 8 to 12 years Participants: children from a village in Western Kenya Setting: field study Praziquantel status before study: reported that there had been no treatment in the area		
Index tests	CCA POC cassette test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* as measured by stool microscopy (3 Kato-Katz smears on 1 stool sample)		
Flow and timing			
Comparative			
Notes	This article describes part of a multi-centre study (Colley 2013). This was similar to Erko 2013_6KK, but in this article 2 × 2 tables of the CCA POC measured against the first daily stool specimen (triplicate KK smears on 1 stool sample) were presented		
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Etard 2004

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Mali Sample size: 2873 Age range: 10 to 22 years Participants: families from 14 villages Setting: field study

Etard 2004 (*Continued*)

	Praziquantel status before study: Half of the villages had received mass treatment		
Index tests	RS-Microhaematuria (Ecur test, Boehringer- Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured with urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		

Etard 2004 (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Fatiregun 2005

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 592 Age range: 11 to 20 years Participants: all students of junior classes Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Combi-9 Multi-Strip, Macherey Nagel, Düren, Germany)
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Fatiregun 2005 (*Continued*)

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Fatiregun 2005 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

French 2007

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 1976 Age range: 6 to 19 years Participants: school children from 24 sentinel schools Setting: field study Praziquantel status before study: Participants were already receiving praziquantel as part of a World Health Organization (WHO) programme, but no time interval was provided		
Index tests	RS-Microhaematuria (Haemastix, Bayer, Glasgow, UK)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		

		Unclear	

Gabr 2000

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 12,134 Age range: 0 to > 55years Participants: Randomization took place at village and household levels Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Gabr 2000 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	No		
		Unclear	

Gigase 1988

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Chad Sample size: 195 Age range: 7 to 19 years Participants: children from a village Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Hema-Combi-Stix) (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Gigase 1988 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Gundersen 1996

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling

Gundersen 1996 (*Continued*)

Patient characteristics and setting	Species: *S. haematobium* Country: Malawi Sample size: 260 Age range: 6 to 19 years Participants: all women of childbearing age (range 15 to 47 years) willing to provide samples, irrespective of complaints Setting: outpatient department, hospital Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Combur Test 9, Boehringer, Mannheim, Germany)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Methodological quality

Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		

		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Leukocyturia			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Gundersen 1996 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Hall 1999

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 786 Age range: 6 to 16 years Participants: school-age children from 10 communities Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Hemastix, Bayer, Glasgow, UK)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		

Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	No		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Yes		
		Unclear	

Hammad 1997

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 11,970 Age range: not reported Participants: participants interviewed and willing to participate in study Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Chemstrip-4 OB, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Hammad 1997 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Hammam 2000˙a

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 9555 Age range: 0 > 55 years Participants: residents from villages and households in Assiut Governorate Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Hammam 2000˚a (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Unclear		
		Unclear	

Hammam 2000˙b

Study characteristics			
Patient sampling	Cross-sectional design; multi-stage stratified cluster sample		
Patient characteristics and setting	Species: *S. haematobium* Country: Egypt Sample size: 12,327 Age range: 0 to > 55years Participants: residents from villages and households in Qena Governorate Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Hammam 2000˙b (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Houmsou 2011

Study characteristics			
Patient sampling	Cross-sectional; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 1124 Age range: 3 to 27 years Participants: those interviewed and willing to participate in study Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Medi-Test Combi 9, Macherey-Nagel, Düren, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Kassim 1989

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 922 Age range: 5 to 14 years Participants: school children from Epe and surrounding communities in SW Nigeria Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Labstix, Ames, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Kassim 1989 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Kiliku 1991

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species:*S. haematobium* Country: Kenya Sample size: 426 Age range: not reported Participants: sample of all participants in Kwale District Setting: field study Praziquantel status before study: no prior drug given		
Index tests	RS-Microhaematuria, RS-Proteinuria (Uro-Labstix III, Miles-Sanko Co., Ltd., Osaka, Japan)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		

Kiliku 1991 (*Continued*)

Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	No		
Were all patients included in the analysis?	Yes		
		Low	

King 1988˙a

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Kenya Sample size: 2628 Age range: 4 to 21 years Participants: students registered at 5 local primary and secondary schools Setting: field study Praziquantel status before study: before and after study; follow-up evaluation 1 year after PZQ and metrifonate given		
Index tests	RS-Microhaematuria, RS-Proteinuria (Chemstrip 5 Indicator Dipsticks, Roche Diagnostics, Montreal, Quebec Canada)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

King 1988˙a (*Continued*)

If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		

		Low	

King 1988˙b

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Kenya Sample size: 639 Age range: 0 to 60+ years Participants: residents of a village who submitted urine samples Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

King 1988˙b (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Kitange 1993

Study characteristics	
Patient sampling	Cohort design; unclear sampling

Kitange 1993 (*Continued*)

Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 253 Age range: not reported Participants: children in classes 1 to 7 in Melela primary school Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (BM Test 5L, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**

Kitange 1993 (*Continued*)

DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Unclear		
		Unclear	

Legesse 2007

Study characteristics			
Patient sampling	Cross sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Ethiopia Sample size: 251 Age range: 5 to 75 years Participants: those > 5 years recruited through house-to-house visits Setting: field study Praziquantel status before study: not reported		
Index tests	CCA POC test (Schistosomiasis One Step Test, BV European, Veterinary Laboratory, Woerden, The Netherlands)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Unclear**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Legesse 2007 (*Continued*)

If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Legesse 2008

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Ethiopia Sample size: 184 Age range: 5 to 22 years Participants: primary school children Setting: field study

Legesse 2008 (*Continued*)

	Praziquantel status before study: not reported		
Index tests	CCA POC test (Schistosomiasis One Step Test, BV European, Veterinary Laboratory, Woerden, The Netherlands)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target	No		

Legesse 2008 (*Continued*)

condition?			
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Lengeler 1993

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 1208 Age range: 11 to 15 years Participants: school children who were willing to participate and provided a urine sample Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Combur 9 Multistix, Boehringer, Mannheim, Germany)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	

Lengeler 1993 (*Continued*)

Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Lengeler 1993 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Mafe 1997

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 1056 Age range: 5 to > 60 years Participants: individuals residing in 4 lakeside villages Setting: field study Praziquantel status before study: no prior drugs given		
Index tests	RS-Microhaematuria (Ames Chemical Reagent Strip, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Mafe 2000

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 529 Age range: mean 11 years Participants: school children in Borgo local government area Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Sangur Sticks, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Mafe 2000 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Magnussen 2001

Study characteristics	
Patient sampling	Cohort design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 170 Age range: 11 to 17 years Participants: All children in class 5 in each school in the district were selected Setting: field study Praziquantel status before study: given prior, but time interval not stated
Index tests	RS-Microhaematuria (Haemastix, Ames Labs, Ames, IA, USA; Bayer Diagnostics, Sudbury, UK)

Magnussen 2001 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge	Unclear		

Magnussen 2001 (*Continued*)

of the results of the index tests?			
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Midzi 2009

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Zimbabwe Sample size: 265 Age range: 2 to 19 years Participants: preschool and primary school children Setting: field study Praziquantel status before study: not reported		
Index tests	CCA POC test (Van Dam version)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**

Midzi 2009 (*Continued*)

DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		

Midzi 2009 (*Continued*)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Morenikeji 2014

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Uganda Sample size: 432 Age range: 7 to 13 years Participants: primary school children Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Medi-Test Combi 10, Standard Diagnostics Inc., Suwon City, Kyonggi Province, Korea)		
Target condition and reference standard(s)	*S. haematobium* infection measured bu urine microscopy (centrifugation)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		

		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Morenikeji 2014 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Mott 1985a˙1

Study characteristics			
Patient sampling	Cohort design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 562 Age range: 5 to 64 years Participants: those from 5 settlements interviewed and samples collected Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Neostix-3, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		

Mott 1985a˙1 (*Continued*)

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Mott 1985a˙1 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Mott 1985a˙2

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Zambia Sample size: 656 Age range: 0 to 64 years Participants: those in Mutenda Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Neostix-3, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Mott 1985a˙2 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Mtasiwa 1996

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 404 Age range: 7 to 15 years Participants: Urine samples were drawn from 404 pupils, including those with frank haematuria Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Sangur Reagent Sticks, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)			
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Murare 1987

Study characteristics			
Patient sampling	Cohort design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Zimbabwe Sample size: 232 Age range: 9 to 14 years Participants: school children from a school chosen on basis of previous studies Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Medi-Test Combi-7, Macherey-Nagel, Düren, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Navaratnam 2012

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 569 Age range: 1 to 5 years Participants: preschool children living in 4 villages in Buliisa District Setting: field study Praziquantel status before study: not reported		
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Navaratnam 2012 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ndamukong 2001

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Cameroon Sample size: 347 Age range: 5 to 16 years Participants: primary school children attending 6 primary schools Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (Haemastix and Albustix, Bayer, Pittsburgh, PA, USA)

Ndamukong 2001 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Ndamukong 2001 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ndlovu 1996

Study characteristics	
Patient sampling	Nested case-control design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Zimbabawe Sample size: 179 Age range: > 5 years Participants: egg-positives and egg-negatives, resulting in 96 cases and 83 controls from same population Setting: field study Praziquantel status before study: not reported

Index tests	CAA ELISA Serum (in-house assay)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	No		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Unclear**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		

Ndlovu 1996 (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Unclear		
		Unclear	

Nduka 1995

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 1165 Age range: 6 to 21 years Participants: school children from a rural town Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Medi-Test Combi-9, Macherey Nagel, Düren, Germany)
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			

Nduka 1995 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ndyomugyenyi 2001

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 483 Age range: 5 to 19 years Participants: children from 3 primary schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Multistix, Ames Labs, Ames, IA, USA; Bayer Diagnostics, Tarrytown, NY, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		

		Low	

NGoran 1989

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Ivory Coast Sample size: 1059 Age range: not reported Participants: inhabitants of village of Nguessan Pokoukro, present on the day of examination Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Hemastix) (Combur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

NGoran 1989 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Yes		
		Low	

NGoran 1998

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling

NGoran 1998 (*Continued*)

Patient characteristics and setting	Species: *S. haematobium* Country: Ivory Coast Sample size: 1336 Age range: 12.2 +/- 1.6 years Participants: school children from 14 schools in town of Toumoudi Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Sangur-Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**

NGoran 1998 (*Continued*)

DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ngándu 1988

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Zambia Sample size: 412 Age range: 6 to 19 years Participants: school children from 9 primary schools Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (Bili-Labstix, Miles, Bridgend, UK)
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)

Ngándu 1988 (*Continued*)

Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		

Ngándu 1988 (*Continued*)

		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Nmorsi 2005

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 300 Age range: 5 to 60 years Participants: volunteers; excluded were patients with allergy and skin infections Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Haemastix, Ames Laboratories, Ames, IA, USA), RS-Proteinuria (Albustix, Ames Laboratories)

Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (centrifugation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	No		
		Unclear	**Unclear**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Nwaorgu 1992

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 437 Age range: 0 to 35+ years Participants: permanent settlers who agreed to participate in study Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (L-Combur, Boehringer, Mannheim, Germany)

Nwaorgu 1992 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		

Nwaorgu 1992 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ofori 1986

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Ghana Sample size: 118 Age range: not reported Participants: urine specimens collected from 118 pupils Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (N-Multistix SG, Ames, Glasgow, England)

Ofori 1986 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Ofori 1986 (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Okeke 2014˙settingA

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 296 Age range: 5 to 13 years Participants: primary school children from Niger Lake, a low endemic setting (setting A) Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (Medi-Test Combi-9, Macherey-Nagel, Düren, Germany)

Okeke 2014˙settingA (*Continued*)

Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		

Okeke 2014˙settingA (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Okeke 2014˙settingB

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 184 Age range: 5 to 13 years Participants: primary school children from Nigercem, a moderate endemic setting (setting B) Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (Medi-Test Combi-9, Macherey-Nagel, Düren, Germany)

Okeke 2014˙settingB (*Continued*)

Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Unclear		

Okeke 2014˙settingB (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Onayade 1996

Study characteristics	
Patient sampling	Cross-sectional design; consecutive sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 105 Age range: 8 to 16 years Participants: all grade 4 to 6 pupils with minimum age of 4 Setting: field study Praziquantel status before study: not reported
Index tests	RS-Proteinuria (N-Multistix, Ames Labs, Ames, IA, USA)

Onayade 1996 (*Continued*)

Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge	Unclear		

Onayade 1996 (*Continued*)

of the results of the index tests?			
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Poggensee 2000˙settingA

Study characteristics	
Patient sampling	Cross-sectional design; non-probability-based sampling procedure
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 175 Age range: 15 to 60 years Participants: women of childbearing age Setting: field study (low endemic setting) Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria, RS-Leukocyturia (Nephur-Test + Leuco, Boehringer, Mannheim, Germany)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	
Methodological quality	

Poggensee 2000˙settingA (*Continued*)

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		High	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Leukocyturia			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		

Poggensee 2000˙settingA (*Continued*)

If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Poggensee 2000˙settingB

Study characteristics	
Patient sampling	Cross-sectional design; non-probability-based sampling procedure
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 128 Age range: 15 to 60 years Participants: women of childbearing age Setting: field study (high endemic setting)

Poggensee 2000˙settingB (*Continued*)

	Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria, RS-Leukocyturia (Nephur-Test + Leuco, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	No		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		High	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			

Poggensee 2000˙settingB (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Leukocyturia			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	Yes		
		Low	

Polman 1995

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Senegal Sample size: 422 Age range: 0 to 77 years Participants: 10% of the households (all members) from an updated census list Setting: field study Praziquantel status before study: not reported		
Index tests	CAA ELISA Serum; CCA ELISA Serum and Urine (in-house)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA ELISA			

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	Unclear		
		Low	

Pugh 1980

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 5367 Age range: 5 to > 36 years Participants: males 5 to 25 years of age from 3 villages and all participants over 4 years from 2 study areas Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria; RS-Proteinuria (Labstix, Ames Labs, Berlin, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**

Pugh 1980 (*Continued*)

DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		

Pugh 1980 (*Continued*)

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Rasendramino 1998

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Madagascar Sample size: 574 Age range: > 5 years Participants: all inhabitants of a village > 5 years Setting: field study Praziquantel status before study: Study reports that no praziquantel was administered before the study		
Index tests	RS-Microhaematuria, RS-Proteinuria, RS-Leukocyturia (Nephur 7 test, Roche Diagnostics, Montreal, Quebec, Canada)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		

Rasendramino 1998 (*Continued*)

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Leukocyturia			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			

Rasendramino 1998 (*Continued*)

Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Robinson 2009

Study characteristics	
Patient sampling	Nested case-control design; quasi-random 2-stage cluster sampling method
Patient characteristics and setting	Species: *S. haematobium* Country: Sudan Sample size: 677 Age range: 5 to 16 years Participants: In each selected household, children were asked to provide a urine sample Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Hemastix Bayer Diagnostics, Bridgend, UK)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	

Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	No		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	No		
		High	**Low**

Robinson 2009 (*Continued*)

DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Rollinson 2005

Study characteristics			
Patient sampling	Cross-sectional design; random sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 280 Age range: 10 to 22 years Participants: children from 2 schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Hemastix, Bayer, Pittsburgh, PA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		

		Unclear	

Sarda 1985

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 2418 Age range: 7 to 19 years Participants: children from 12 schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (N-Multistix, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy(filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Sarda 1985 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		

Sarda 1985 (*Continued*)

Were all patients included in the analysis?	No		
		Unclear	

Sarda 1986

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Kenya Sample size: 1300 Age range: 6 to 19 years Participants: school children from various schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (N-Multistix Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Sarda 1986 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Yes		
		Low	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		

Were all patients included in the analysis?	Yes		
		Low	

Savioli 1990

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 879 Age range: 5 to 19 years Participants: children in a village Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Hemastix, Ames-Miles Laboratories, Elkhart, IN, USA)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			

Savioli 1990 (*Continued*)

Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Sellin 1982

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling

Sellin 1982 (*Continued*)

Patient characteristics and setting	Species: *S. haematobium* Country: Burkina Faso Sample size: 1162 Age range: not reported Participants: people from a high endemic village in Upper Volta Setting: field study Praziquantel status before study: treatment given after baseline study and follow-up accuracy study done 1 year later
Index tests	RS-Microhaematuria, RS-Proteinuria (Laboratoires Ames, Paris, France)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Methodological quality

Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		

		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Shane2011˙Colley2013

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Kenya Sample size: 1845 (updated from Colley 2013) Age range: 1 to 15 years Participants: children from a village in Western Kenya Setting: field study Praziquantel status before study: reported that there had been no treatment in the area		
Index tests	CCA POC cassette (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz smears)		
Flow and timing			
Comparative			
Notes	This article was part of a multi-centre study (Colley 2013). In this article, 2-by-2 tables of the CCA POC measured against the first daily stool specimen (duplicate KK smears on 1 stool sample) were presented		
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		

If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Low	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Yes		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Shaw 1998

Study characteristics	
Patient sampling	Cohort design; random sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Senegal Sample size: 857 Age range: 4 to > 40 Participants: individuals in households invited to participate Setting: field study

Shaw 1998 (*Continued*)

	Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Ames Labs, Ames, IA, USA; Bayer Diagnostics, Gent, Belgium)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		

Shaw 1998 (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Standley 2010

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Eastern Lake Victoria (Tanzania and Kenya) Sample size: 171 Age range: 6 to 17 years Participants: school children selected in 11 schools by headmaster Setting: field study Praziquantel status before study: not reported
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)
Flow and timing	
Comparative	
Notes	

Standley 2010 (*Continued*)

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	No		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Standley 2010 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Unclear		
		Unclear	

Stephenson 1984

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Kenya Sample size: 359 Age range: 6 to 16 years Participants: Children from 2 primary schools not previously tested were examined Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Ames N-Multistix, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Stephenson 1984 (*Continued*)

Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Stephenson 1984 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Stothard 2006

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Uganda Sample size: 270 Age range: 11 years Participants: children from 9 sentinel schools of matched sexes Setting: field study Praziquantel status before study: not reported		
Index tests	CCA POC test (Schistosomiasis One Step Test, EVL, Woerden, Holland)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Stothard 2006 (*Continued*)

Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Stothard 2009a

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 150 Age range: 8 to 14 years Participants: children from 5 schools Setting: field study Praziquantel status before study: annual MDA 11 months before the study		
Index tests	CCA POC test (Leiden University Medical Centre, Leiden, The Netherlands)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Stothard 2009a (*Continued*)

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Stothard 2009b

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 66 Age range: 9 to 15 years Participants: school children Setting: field study Praziquantel status before study: Likely, children enrolled were already part of a 'kick out schistosomiasis' campaign

Stothard 2009b (*Continued*)

Index tests	RS-Microhaematuria (Hemastix, Bayer, Sudbury, UK)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		

Stothard 2009b (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Tanner 1983˙1

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Liberia Sample size: 267 Age range: 0 to 15 years Participants: school children from 3 villages Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria, RS-Proteinuria (Labstix, Ames, Glasgow, England)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	
Comparative	
Notes	

Tanner 1983˙1 (*Continued*)

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			

Tanner 1983˙1 (*Continued*)

Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Tanner 1983˙2

Study characteristics	
Patient sampling	Cross-sectional design; random sampling
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 548 Age range: 0 to 15 years Participants: children from 1 village and river plain Setting: field study Praziquantel status before study: not reported
Index tests	RS-Microhaematuria (Blood Sangur Test, Boehringer, Mannheim FRG), RS-Proteinuria (Protein Albym Test, Boehringer, Mannheim, Germany)
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)
Flow and timing	

Tanner 1983˙2 (*Continued*)

Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**

Tanner 1983˙2 (*Continued*)

DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Unclear		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Tchuente 2012˙9KK

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Cameroon Sample size: 138 Age range: 7 to 15 years Participants: children who provided all 3 samples Setting: field study (low endemicity) Praziquantel status before study: not reported
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)
Target condition and reference standard(s)	

Tchuente 2012˙9KK (*Continued*)

Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		

Tchuente 2012˙9KK (*Continued*)

		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Unclear		
Were all patients included in the analysis?	Unclear		
		Unclear	

Tchuente 2012˙Colley2013

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Cameroon Sample size: 138 Age range: 7 to 15 years Participants: children who provided all 3 samples Setting: field study (low endemicity) Praziquantel status before study: not reported		
Index tests	CCA POC test (Rapid Medical Diagnostics, Pretoria, South Africa)		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes	This article describes part of a multi-centre study (Colley 2013), which was similar to Tchuente 2012_9KK, but in this article, 2-by-2 tables of the CCA POC measured against the first daily stool specimen (triplicate KK smears on 1 stool sample) were presented		
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**

DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA POC			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		

Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Low	

Traore 1998

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Mali Sample size: 1041 Age range: 2 to 25+ years Participants: all inhabitants in a village older than 2 years Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Combur-9, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured with urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		

		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Traore 1998 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Ugbomoiko 2009a

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 447 Age range: 3 to 17 years Participants: all school children except girls who had menstruated within 5 days of sample collection Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Medi-Test Combi-9, Analyticon Biotechnologies, Rosbach vor der Höhe, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		

Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		

Ugbomoiko 2009a (*Continued*)

		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ugbomoiko 2009b˚1

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 566 Age range: > 1 year Participants: consenting individuals at household level in 5 communities Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (5L test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			

Ugbomoiko 2009b˙1 (*Continued*)

Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Yes		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		

Ugbomoiko 2009b˙1 (*Continued*)

Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Ugbomoiko 2009b˙2

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Nigeria Sample size: 1457 Age range: > 1 year Participants: consenting participants at central locations in 5 communities Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Combur-9 test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (sedimentation method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**

Ugbomoiko 2009b˙2 (*Continued*)

DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results	Unclear		

Ugbomoiko 2009b˙2 (*Continued*)

interpreted without knowledge of the results of the index tests?			
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Van Lieshout 1995

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Surinam Sample size: 389 Age range: 1 to 85 years Participants: all inhabitants of a village except those younger than 1 year of age Setting: field study Praziquantel status before study: not reported
Index tests	CAA and CCA ELISA_Serum (in-house assays)
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)
Flow and timing	
Comparative	
Notes	
Methodological quality	

Van Lieshout 1995 (*Continued*)

Item	Authors' judgement	Risk of bias	Applicability concerns
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CCA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		

Van Lieshout 1995 (*Continued*)

Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Van Lieshout 1998˙1

Study characteristics	
Patient sampling	Cross-sectional design; unclear sampling
Patient characteristics and setting	Species: *S. mansoni* Country: Zaire Sample size: 508 Age range: 1 to 66 years Participants: data set populations living in Maniema-area with intense transmission Setting: field study Praziquantel status before study: not reported
Index tests	CAA ELISA Serum test
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)
Flow and timing	
Comparative	
Notes	

Van Lieshout 1998˙1 (*Continued*)

Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			

Van Lieshout 1998˙1 (*Continued*)

Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Van Lieshout 1998˙2

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. mansoni* Country: Senegal Sample size: 246 Age range: 1 to 77 years Participants: data set of populations living in Ndombo-area with intense transmission Setting: field study Praziquantel status before study: not reported		
Index tests	CAA ELISA Serum test		
Target condition and reference standard(s)	*S. mansoni* infection measured by stool microscopy (Kato-Katz)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		

Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test CAA ELISA			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Verle 1994

Study characteristics			
Patient sampling	Cross-sectional design; consecutive sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Senegal Sample size: 352 Age range: 0 to > 50 years Participants: registered village inhabitants invited to participate Setting: field study Praziquantel status before study: not given previously		
Index tests	RS-Microhaematuria, RS-Proteinuria (Multistix, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* infection measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Yes		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Low	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Yes		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	Yes		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Warren 1979

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Kenya Sample size: 390 Age range: 5 to 18 years Participants: school children from 2 schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria, RS-Proteinuria (Bili-Lab-Stix, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Yes		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Wilkins 1979

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Gambia Sample size: 1944 Age range: $\geq$ 2 years Participants: study based on specimens collected from earlier study Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Lab-Stix, Ames Labs, Ames, IA, USA)		
Target condition and reference standard(s)	*S. haematobium* measured by urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Yes		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Proteinuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		
Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Unclear		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	Yes		
		Low	

Zumstein 1983

Study characteristics			
Patient sampling	Cross-sectional design; unclear sampling		
Patient characteristics and setting	Species: *S. haematobium* Country: Tanzania Sample size: 3478 Age range: 6 to 19 years Participants: school children form 15 schools Setting: field study Praziquantel status before study: not reported		
Index tests	RS-Microhaematuria (Sangur Test, Boehringer, Mannheim, Germany)		
Target condition and reference standard(s)	*S. haematobium* measured with urine microscopy (filtration method)		
Flow and timing			
Comparative			
Notes			
Methodological quality			
Item	**Authors' judgement**	**Risk of bias**	**Applicability concerns**
DOMAIN 1: Patient Selection			
Was a consecutive or random sample of patients enrolled?	Unclear		
Was a case-control design avoided?	Unclear		
Did the study avoid inappropriate exclusions?	Unclear		
		Unclear	**Low**
DOMAIN 2: Index Test RS-Microhaematuria			
Were the index test results interpreted without knowledge of the results of the reference standard?	Unclear		
If a threshold was used, was it pre-specified?	Unclear		

Was quality control done?	Unclear		
		Unclear	**Low**
DOMAIN 3: Reference Standard			
Is the reference standards likely to correctly classify the target condition?	No		
Were the reference standard results interpreted without knowledge of the results of the index tests?	Unclear		
Was quality control done?	Unclear		
		High	**Low**
DOMAIN 4: Flow and Timing			
Was there an appropriate interval between index test and reference standard?	Yes		
Did all patients receive the same reference standard?	Yes		
Were all patients included in the analysis?	No		
		Unclear	

Characteristics of excluded studies *[ordered by year of study]*

Study	Reason for exclusion
Deelder 1981	Not a test accuracy study
Feldmeier 1982	Case-control study with healthy controls
Kassim 1983	Case-control study with healthy controls
Mott 1983	Accuracy study carried out with similar tests and populations as another included paper

(*Continued*)

Doehring 1985	Not a test accuracy study
Mott 1985	Accuracy study carried out with similar tests and populations as another included paper
Feldmeier 1986	Case series with healthy individuals from "same endemic area"
Madwar 1988	Not a test accuracy study
de Jonge 1988	Case-control study with healthy controls
de Jonge 1989˙a	Only proven cases included in study
Deelder 1989	Not a test accuracy study
Savioli 1989	Not a test accuracy study
de Jonge 1989˙b	Only proven cases included in study
de Jonge 1990˙1	Case-control study with controls from non-endemic areas
de Jonge 1990˙2	Cannot extract 2-by-2 tables
Taylor 1990	Cannot extract 2-by-2 tables
Lengeler 1991	Cannot extract 2-by-2 tables
Eltoum 1992˙b	Accuracy study carried out with similar tests and populations as another included paper
van Lieshout 1992	Case-control study with controls from non-endemic areas
Hassan 1992	Ineligible index test
Kaiser 1992	Ineligible reference standard
Gundersen 1992	Case-control study with healthy controls
Krijger 1994	Case-control study with healthy controls
Kremsner 1994	Cannot extract 2-by-2 tables
van Etten 1994	Case-control study with healthy controls
Hassan 1994	Cannot extract 2-by-2 tables
Fillie 1994	Case-control study with healthy controls

(*Continued*)

Jemaneh 1994	Cannot extract 2-by-2 tables
van Lieshout 1995	Case-control study with controls from non-endemic areas
Hakangard 1996	Case-control study with controls from non-endemic areas
van Etten 1997	Ineligible reference standard
Lwambo 1997	Cannot extract 2-by-2 tables
de Clerq 1997	Cannot extract 2-by-2 tables
Tiemersma 1997	Cannot extract 2-by-2 tables
Disch 1997	Only proven cases included in study
Polman 1998	Not a test accuracy study
Kahama 1998	Cannot extract 2-by-2 tables
Nibbeling 1998	Ineligible index test
Poggensee 1998	Cannot extract 2-by-2 tables
Pereira 1999	Case-control study with controls from non-endemic areas
Kahama 1999	Not a test accuracy study
Hassan 1999	Only proven cases included in study
Polman 2000	Case-control study with healthy controls
van Dam 2004	Case-control study with controls from non-endemic areas
Brouwer 2004	Cannot extract 2-by-2 tables
Takougang 2004	Cannot extract 2-by-2 tables
Obeng 2008	Case-control study with controls from non-endemic areas
Leutscher 2008	Case-control study with healthy controls
Koukounari 2009	Ineligible reference standard
Stothard 2011	Ineligible reference standard

(*Continued*)

Verani 2011	Cannot extract 2-by-2 tables
Kosinski 2011	Cannot extract 2-by-2 tables
Coulibaly 2012	Not a test accuracy study
Adesola 2012	Cannot extract 2-by-2 tables
Eyo 2012	Not a test accuracy study
Coulibaly 2013˙2	Not a test accuracy study
Lodh 2013	Ineligible reference standard
Grenfell 2013	Not a test accuracy study
Coulibaly 2013˙3	Ineligible index test
Sousa-Figueiredo 2013	Ineligible reference standard
Degarege 2014	Not a test accuracy study
Melchers 2014	Ineligible index test

DATA

Presented below are all the data for all of the tests entered into the review.

Tests. Data tables by test

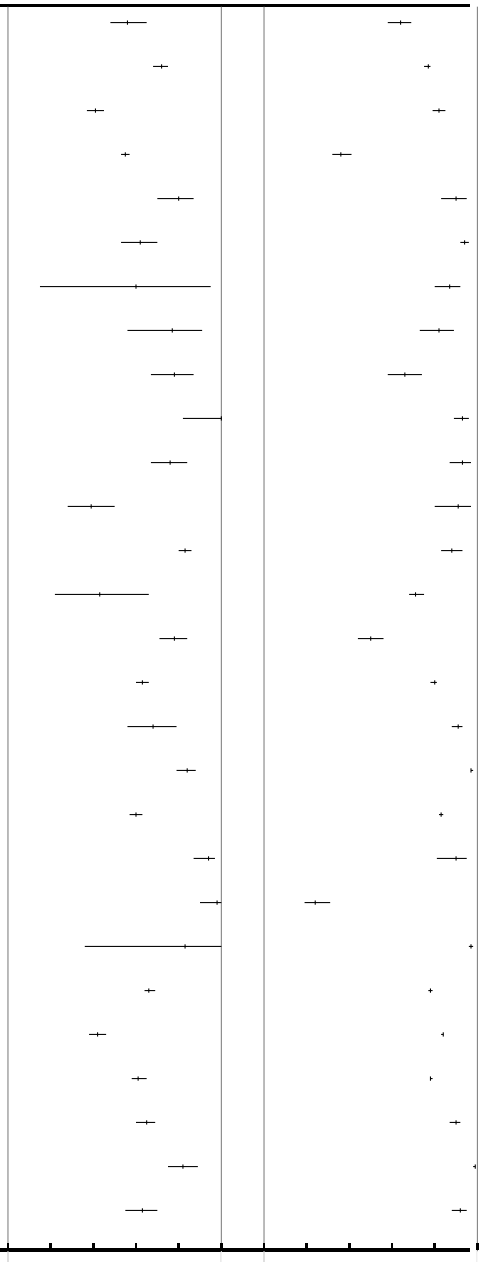
Test	No. of studies	No. of participants
1 Microhaematuria	74	102447
2 Microhaematuria after treatment	9	7845
3 CCA POC *mansoni* trace threshold	15	6091
4 Proteinuria	46	82113
5 Leukocyturia	5	1532
6 CCA POC *mansoni* +1 threshold	5	1404
7 CCA POC *mansoni* with good reference standard	5	2399
8 CCA POC *haematobium*	4	901
10 CCA POC mixed species	1	373
11 Serum CAA ELISA *mansoni*	5	1583
12 Serum CAA ELISA *haematobium*	3	990
13 Urine CAA ELISA *mansoni*	1	204
14 Urine CAA ELISA *haematobium*	1	370
15 Serum CCA ELISA *mansoni*	2	569
16 Serum CCA ELISA *haematobium*	1	370
17 Urine CCA ELISA *mansoni*	2	560
19 Urine CCA ELISA *haematobium*	1	370

Test 1. Microhaematuria.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 1 Microhaematuria

Study	TP	FP	FN	TN	Sensitivity	Specificity
Abdel-Wahab 1992	80	102	62	178	0.56 [0.48, 0.65]	0.64 [0.58, 0.69]
Abdel-Wahab 2000	502	1032	196	3388	0.72 [0.68, 0.75]	0.77 [0.75, 0.78]
Anosike 2001	240	106	345	482	0.41 [0.37, 0.45]	0.82 [0.79, 0.85]
Aryeetey 2000	1117	335	919	191	0.55 [0.53, 0.57]	0.36 [0.32, 0.41]
Ayele 2008	78	11	20	97	0.80 [0.70, 0.87]	0.90 [0.83, 0.95]
Bassiouny 2014	78	34	48	536	0.62 [0.53, 0.70]	0.94 [0.92, 0.96]
Birrie 1995˙settingA	3	20	2	131	0.60 [0.15, 0.95]	0.87 [0.80, 0.92]
Birrie 1995˙settingB	20	17	6	78	0.77 [0.56, 0.91]	0.82 [0.73, 0.89]
Birrie 1995˙settingC	54	52	15	103	0.78 [0.67, 0.87]	0.66 [0.58, 0.74]
Bogoch 2012	19	18	0	243	1.00 [0.82, 1.00]	0.93 [0.89, 0.96]
Bosompem 1996	83	8	26	112	0.76 [0.67, 0.84]	0.93 [0.87, 0.97]
Bosompem 2004	33	5	52	51	0.39 [0.28, 0.50]	0.91 [0.80, 0.97]
Cooppan 1987	632	21	129	159	0.83 [0.80, 0.86]	0.88 [0.83, 0.93]
El-Sayed 1995	9	176	12	440	0.43 [0.22, 0.66]	0.71 [0.68, 0.75]
Eltoum 1992	140	123	39	123	0.78 [0.71, 0.84]	0.50 [0.44, 0.56]
Etard 2004	596	392	344	1541	0.63 [0.60, 0.66]	0.80 [0.78, 0.81]
Fatiregun 2005	49	49	23	471	0.68 [0.56, 0.79]	0.91 [0.88, 0.93]
French 2007	219	45	41	1671	0.84 [0.79, 0.88]	0.97 [0.97, 0.98]
Gabr 2000	648	1829	426	9007	0.60 [0.57, 0.63]	0.83 [0.82, 0.84]
Gigase 1988	101	9	7	78	0.94 [0.87, 0.97]	0.90 [0.81, 0.95]
Gundersen 1996	50	158	1	51	0.98 [0.90, 1.00]	0.24 [0.19, 0.31]
Hall 1999	5	21	1	759	0.83 [0.36, 1.00]	0.97 [0.96, 0.98]
Hammad 1997	712	2408	360	8490	0.66 [0.64, 0.69]	0.78 [0.77, 0.79]
Hammam 2000˙a	245	1464	343	7503	0.42 [0.38, 0.46]	0.84 [0.83, 0.84]
Hammam 2000˙b	409	2526	257	9134	0.61 [0.58, 0.65]	0.78 [0.78, 0.79]
Houmsou 2011	302	68	164	590	0.65 [0.60, 0.69]	0.90 [0.87, 0.92]
Kassim 1989	99	11	21	791	0.83 [0.75, 0.89]	0.99 [0.98, 0.99]
Kiliku 1991	109	21	64	232	0.63 [0.55, 0.70]	0.92 [0.88, 0.95]



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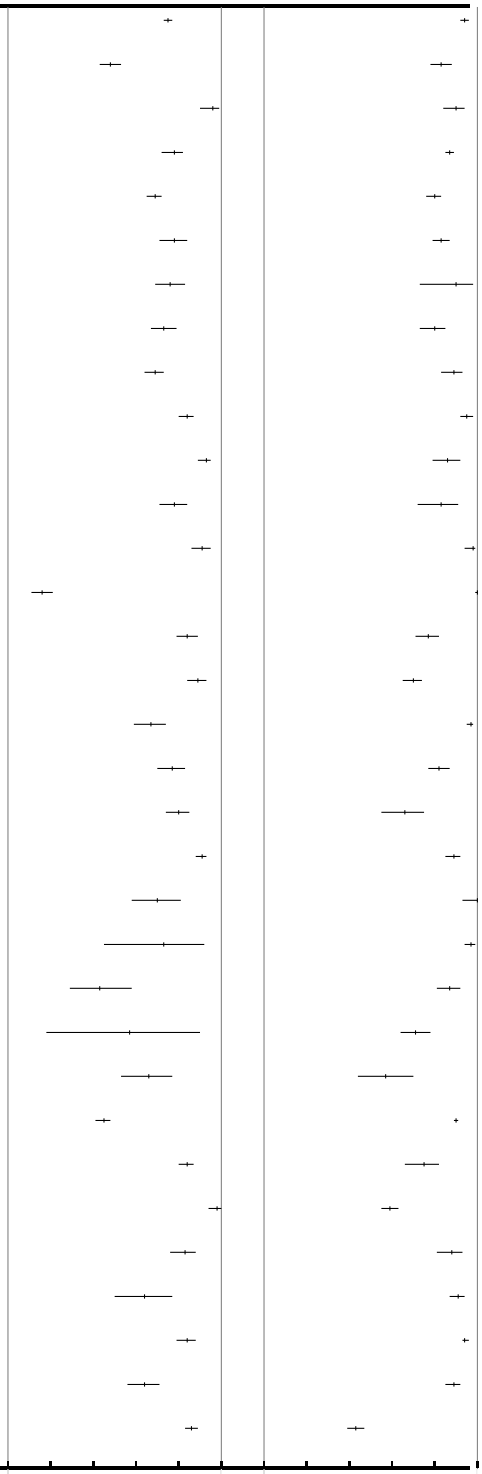
Study	TP	FP	FN	TN	Sensitivity	Specificity
King 1988˙a	1362	47	459	741	0.75 [0.73, 0.77]	0.94 [0.92, 0.96]
King 1988˙b	199	38	215	187	0.48 [0.43, 0.53]	0.83 [0.78, 0.88]
Kitange 1993	80	17	3	153	0.96 [0.90, 0.99]	0.90 [0.84, 0.94]
Lengeler 1993	228	117	66	797	0.78 [0.72, 0.82]	0.87 [0.85, 0.89]
Mafe 1997	416	91	190	359	0.69 [0.65, 0.72]	0.80 [0.76, 0.83]
Mafe 2000	134	61	38	296	0.78 [0.71, 0.84]	0.83 [0.79, 0.87]
Magnussen 2001	107	3	33	27	0.76 [0.69, 0.83]	0.90 [0.73, 0.98]
Morenikeji 2014	178	38	65	151	0.73 [0.67, 0.79]	0.80 [0.73, 0.85]
Mott 1985a˙1	267	20	121	154	0.69 [0.64, 0.73]	0.89 [0.83, 0.93]
Mott 1985a˙2	382	9	74	191	0.84 [0.80, 0.87]	0.96 [0.92, 0.98]
Mtasiwa 1996	253	18	20	113	0.93 [0.89, 0.95]	0.86 [0.79, 0.92]
Murare 1987	126	12	36	58	0.78 [0.71, 0.84]	0.83 [0.72, 0.91]
Ndamukong 2001	169	4	17	157	0.91 [0.86, 0.95]	0.98 [0.94, 0.99]
Nduka 1995	38	3	207	917	0.16 [0.11, 0.21]	1.00 [0.99, 1.00]
Ndyomugyenyi 2001	194	58	36	195	0.84 [0.79, 0.89]	0.77 [0.71, 0.82]
NGoran 1989	160	111	19	256	0.89 [0.84, 0.93]	0.70 [0.65, 0.74]
NGoran 1998	102	41	51	1142	0.67 [0.59, 0.74]	0.97 [0.95, 0.98]
Ng ndu 1988	130	43	39	200	0.77 [0.70, 0.83]	0.82 [0.77, 0.87]
Nmorsi 2005	170	30	43	57	0.80 [0.74, 0.85]	0.66 [0.55, 0.75]
Nwaorgu 1992	527	49	53	388	0.91 [0.88, 0.93]	0.89 [0.85, 0.92]
Ofori 1986	45	0	19	54	0.70 [0.58, 0.81]	1.00 [0.93, 1.00]
Okeke 2014˙settingA	11	8	4	273	0.73 [0.45, 0.92]	0.97 [0.94, 0.99]
Okeke 2014˙settingB	21	17	28	118	0.43 [0.29, 0.58]	0.87 [0.81, 0.92]
Poggensee 2000˙settingA	4	48	3	120	0.57 [0.18, 0.90]	0.71 [0.64, 0.78]
Poggensee 2000˙settingB	44	26	23	35	0.66 [0.53, 0.77]	0.57 [0.44, 0.70]
Pugh 1980	415	444	515	3993	0.45 [0.41, 0.48]	0.90 [0.89, 0.91]
Rasendramino 1998	352	32	68	95	0.84 [0.80, 0.87]	0.75 [0.66, 0.82]
Robinson 2009	135	222	3	317	0.98 [0.94, 1.00]	0.59 [0.55, 0.63]
Rollinson 2005	125	16	26	113	0.83 [0.76, 0.88]	0.88 [0.81, 0.93]
Sarda 1985	36	32	20	317	0.64 [0.50, 0.77]	0.91 [0.87, 0.94]
Sarda 1986	275	54	53	918	0.84 [0.79, 0.88]	0.94 [0.93, 0.96]
Savioli 1990	113	38	64	305	0.64 [0.56, 0.71]	0.89 [0.85, 0.92]
Sellin 1982	463	356	75	268	0.86 [0.83, 0.89]	0.43 [0.39, 0.47]



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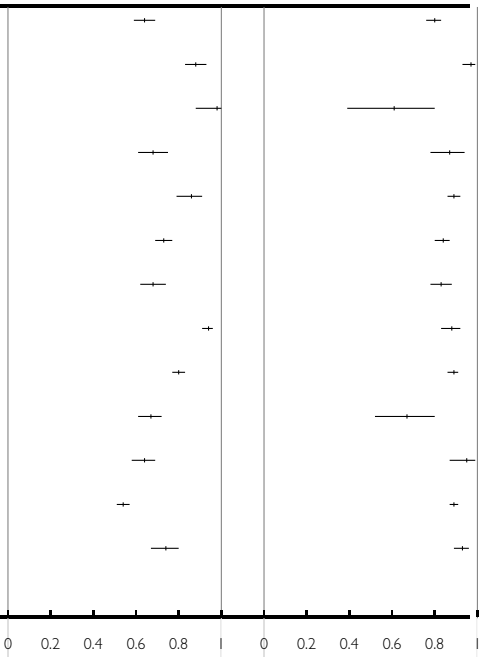
Study	TP	FP	FN	TN	Sensitivity	Specificity
Shaw 1998	216	105	121	415	0.64 [0.59, 0.69]	0.80 [0.76, 0.83]
Stephenson 1984	151	6	20	182	0.88 [0.83, 0.93]	0.97 [0.93, 0.99]
Stothard 2009b	42	9	1	14	0.98 [0.88, 1.00]	0.61 [0.39, 0.80]
Tanner 1983˙1	129	10	60	68	0.68 [0.61, 0.75]	0.87 [0.78, 0.94]
Tanner 1983˙2	139	42	23	344	0.86 [0.79, 0.91]	0.89 [0.86, 0.92]
Traore 1998	420	74	155	392	0.73 [0.69, 0.77]	0.84 [0.80, 0.87]
Ugbomoiko 2009a	155	37	72	183	0.68 [0.62, 0.74]	0.83 [0.78, 0.88]
Ugbomoiko 2009b˙1	331	25	21	189	0.94 [0.91, 0.96]	0.88 [0.83, 0.92]
Ugbomoiko 2009b˙2	595	78	150	630	0.80 [0.77, 0.83]	0.89 [0.86, 0.91]
Verle 1994	205	15	101	31	0.67 [0.61, 0.72]	0.67 [0.52, 0.80]
Warren 1979	208	3	118	61	0.64 [0.58, 0.69]	0.95 [0.87, 0.99]
Wilkins 1979	585	95	493	771	0.54 [0.51, 0.57]	0.89 [0.87, 0.91]
Zumstein 1983	134	15	48	199	0.74 [0.67, 0.80]	0.93 [0.89, 0.96]

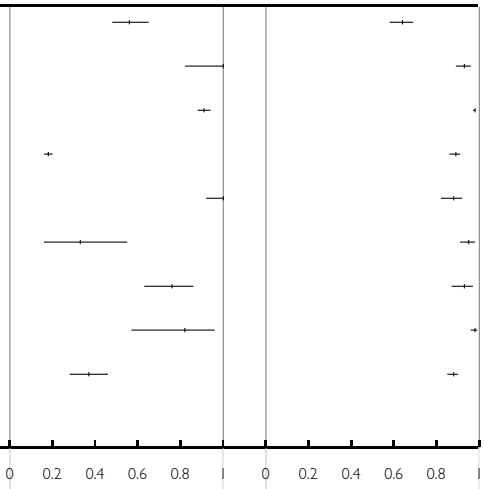


Test 2. Microhaematuria after treatment.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 2 Microhaematuria after treatment

Study	TP	FP	FN	TN	Sensitivity	Specificity
Abdel-Wahab 1992	80	102	62	178	0.56 [0.48, 0.65]	0.64 [0.58, 0.69]
Bogoch 2012	19	18	0	243	1.00 [0.82, 1.00]	0.93 [0.89, 0.96]
French 2007	368	59	35	2810	0.91 [0.88, 0.94]	0.98 [0.97, 0.98]
King 1988˙a	259	65	1178	524	0.18 [0.16, 0.20]	0.89 [0.86, 0.91]
Kitange 1993	44	26	0	183	1.00 [0.92, 1.00]	0.88 [0.82, 0.92]
Lengeler 1993	8	9	16	187	0.33 [0.16, 0.55]	0.95 [0.91, 0.98]
Magnussen 2001	44	10	14	132	0.76 [0.63, 0.86]	0.93 [0.87, 0.97]
NGoran 1989	14	6	3	319	0.82 [0.57, 0.96]	0.98 [0.96, 0.99]
Shaw 1998	46	84	80	620	0.37 [0.28, 0.46]	0.88 [0.85, 0.90]

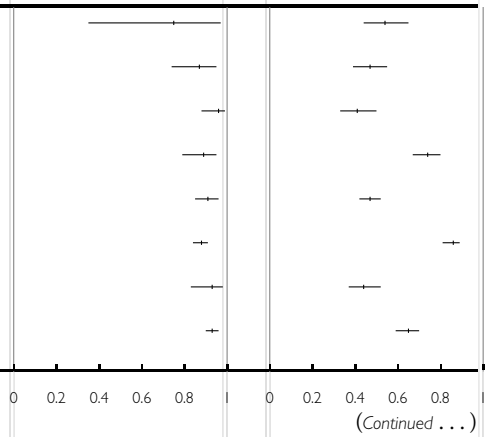


Test 3. CCA POC mansoni trace threshold.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 3 CCA POC *mansoni* trace threshold

Study	TP	FP	FN	TN	Sensitivity	Specificity
Adriko 2014˙settingA	6	42	2	50	0.75 [0.35, 0.97]	0.54 [0.44, 0.65]
Adriko 2014˙settingB	40	82	6	72	0.87 [0.74, 0.95]	0.47 [0.39, 0.55]
Adriko 2014˙settingC	69	75	3	53	0.96 [0.88, 0.99]	0.41 [0.33, 0.50]
Ashton 2011	64	53	8	151	0.89 [0.79, 0.95]	0.74 [0.67, 0.80]
Colley 2013˙Uganda	114	199	11	176	0.91 [0.85, 0.96]	0.47 [0.42, 0.52]
Coulibaly 2011˙Colley2013	278	42	38	249	0.88 [0.84, 0.91]	0.86 [0.81, 0.89]
Coulibaly 2013˙4KK,	52	104	4	82	0.93 [0.83, 0.98]	0.44 [0.37, 0.52]
Erko 2013˙Colley 2013	306	103	23	188	0.93 [0.90, 0.96]	0.65 [0.59, 0.70]



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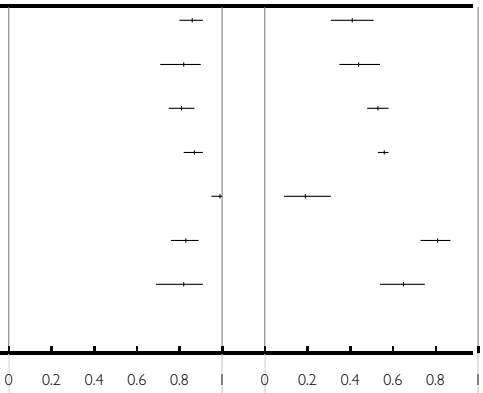
Study	TP	FP	FN	TN	Sensitivity	Specificity
Legesse 2007	130	59	21	41	0.86 [0.80, 0.91]	0.41 [0.31, 0.51]
Legesse 2008	55	65	12	52	0.82 [0.71, 0.90]	0.44 [0.35, 0.54]
Navaratnam 2012	149	181	34	205	0.81 [0.75, 0.87]	0.53 [0.48, 0.58]
Shane2011˙Colley2013	231	664	35	833	0.87 [0.82, 0.91]	0.56 [0.53, 0.58]
Standley 2010	116	44	1	10	0.99 [0.95, 1.00]	0.19 [0.09, 0.31]
Stothard 2006	116	25	24	105	0.83 [0.76, 0.89]	0.81 [0.73, 0.87]
Tchuente 2012˙Colley2013	41	31	9	57	0.82 [0.69, 0.91]	0.65 [0.54, 0.75]

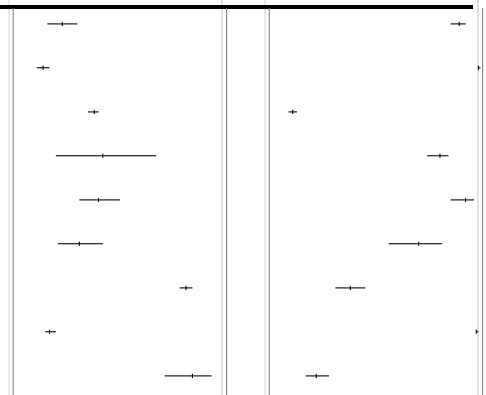


Test 4. Proteinuria.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 4 Proteinuria

Study	TP	FP	FN	TN	Sensitivity	Specificity
Abdel-Wahab 1992	32	31	110	249	0.23 [0.16, 0.30]	0.89 [0.85, 0.92]
Abdel-Wahab 2000	97	81	602	4338	0.14 [0.11, 0.17]	0.98 [0.98, 0.99]
Aryeetey 2000	610	842	1003	107	0.38 [0.35, 0.40]	0.11 [0.09, 0.13]
Bogoch 2012	8	53	11	208	0.42 [0.20, 0.67]	0.80 [0.74, 0.84]
Bosompem 1996	44	10	65	110	0.40 [0.31, 0.50]	0.92 [0.85, 0.96]
Bosompem 2004	26	17	59	39	0.31 [0.21, 0.42]	0.70 [0.56, 0.81]
Cooppan 1987	616	112	145	68	0.81 [0.78, 0.84]	0.38 [0.31, 0.45]
Gabr 2000	185	293	889	10540	0.17 [0.15, 0.20]	0.97 [0.97, 0.98]
Gundersen 1996	43	163	8	46	0.84 [0.71, 0.93]	0.22 [0.17, 0.28]
Hammad 1997	662	3081	410	7817	0.62 [0.59, 0.65]	0.72 [0.71, 0.73]
Hammam 2000˙a	155	605	433	8362	0.26 [0.23, 0.30]	0.93 [0.93, 0.94]
Hammam 2000˙b	297	1174	369	10487	0.45 [0.41, 0.48]	0.90 [0.89, 0.90]
Houmsou 2011	446	216	20	442	0.96 [0.93, 0.97]	0.67 [0.63, 0.71]



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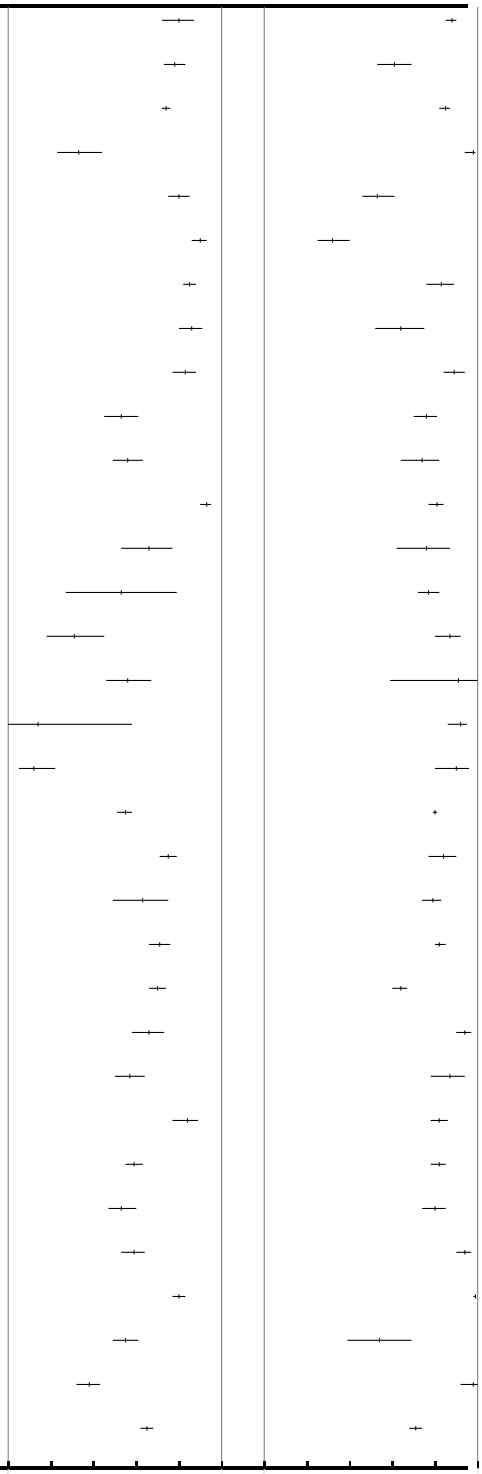
Study	TP	FP	FN	TN	Sensitivity	Specificity
Kassim 1989	96	98	24	704	0.80 [0.72, 0.87]	0.88 [0.85, 0.90]
Kiliku 1991	206	63	58	99	0.78 [0.73, 0.83]	0.61 [0.53, 0.69]
King 1988˙a	1343	118	478	670	0.74 [0.72, 0.76]	0.85 [0.82, 0.87]
Kitange 1993	27	4	56	166	0.33 [0.23, 0.44]	0.98 [0.94, 0.99]
Morenikeji 2014	195	88	48	101	0.80 [0.75, 0.85]	0.53 [0.46, 0.61]
Mott 1985a˙1	334	99	38	47	0.90 [0.86, 0.93]	0.32 [0.25, 0.40]
Mott 1985a˙2	428	25	75	123	0.85 [0.82, 0.88]	0.83 [0.76, 0.89]
Murare 1987	140	25	22	45	0.86 [0.80, 0.91]	0.64 [0.52, 0.75]
Ndamukong 2001	155	17	31	144	0.83 [0.77, 0.88]	0.89 [0.84, 0.94]
Ng ndu 1988	90	58	79	185	0.53 [0.45, 0.61]	0.76 [0.70, 0.81]
Nmorsi 2005	115	25	90	70	0.56 [0.49, 0.63]	0.74 [0.64, 0.82]
Nwaorgu 1992	537	85	43	352	0.93 [0.90, 0.95]	0.81 [0.77, 0.84]
Ofori 1986	42	13	22	41	0.66 [0.53, 0.77]	0.76 [0.62, 0.87]
Okeke 2014˙settingA	8	64	7	217	0.53 [0.27, 0.79]	0.77 [0.72, 0.82]
Okeke 2014˙settingB	15	18	34	117	0.31 [0.18, 0.45]	0.87 [0.80, 0.92]
Onayade 1996	53	1	41	10	0.56 [0.46, 0.67]	0.91 [0.59, 1.00]
Poggensee 2000˙settingA	1	14	6	154	0.14 [0.00, 0.58]	0.92 [0.86, 0.95]
Poggensee 2000˙settingB	8	6	59	55	0.12 [0.05, 0.22]	0.90 [0.80, 0.96]
Pugh 1980	508	887	422	3550	0.55 [0.51, 0.58]	0.80 [0.79, 0.81]
Rasendramino 1998	316	20	104	107	0.75 [0.71, 0.79]	0.84 [0.77, 0.90]
Sarda 1985	35	73	21	276	0.63 [0.49, 0.75]	0.79 [0.74, 0.83]
Sarda 1986	234	173	94	799	0.71 [0.66, 0.76]	0.82 [0.80, 0.85]
Sellin 1982	376	227	162	397	0.70 [0.66, 0.74]	0.64 [0.60, 0.67]
Stephenson 1984	113	11	58	177	0.66 [0.58, 0.73]	0.94 [0.90, 0.97]
Tanner 1983˙1	108	10	81	68	0.57 [0.50, 0.64]	0.87 [0.78, 0.94]
Tanner 1983˙2	136	68	26	318	0.84 [0.77, 0.89]	0.82 [0.78, 0.86]
Traore 1998	340	84	235	382	0.59 [0.55, 0.63]	0.82 [0.78, 0.85]
Ugbomoiko 2009a	121	45	106	175	0.53 [0.47, 0.60]	0.80 [0.74, 0.85]
Ugbomoiko 2009b˙1	206	12	146	202	0.59 [0.53, 0.64]	0.94 [0.90, 0.97]
Ugbomoiko 2009b˙2	602	9	147	699	0.80 [0.77, 0.83]	0.99 [0.98, 0.99]
Verle 1994	168	21	138	25	0.55 [0.49, 0.61]	0.54 [0.39, 0.69]
Warren 1979	123	1	203	63	0.38 [0.32, 0.43]	0.98 [0.92, 1.00]
Wilkins 1979	701	251	377	615	0.65 [0.62, 0.68]	0.71 [0.68, 0.74]



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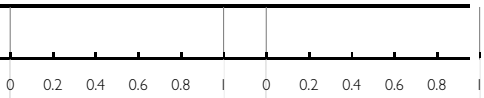
Study	TP	FP	FN	TN	Sensitivity	Specificity

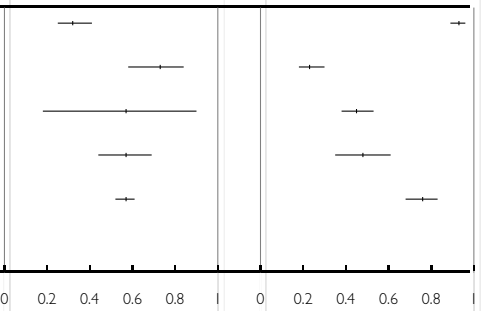


Test 5. Leukocyturia.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 5 Leukocyturia

Study	TP	FP	FN	TN	Sensitivity	Specificity
Abdel-Wahab 1992	46	20	96	260	0.32 [0.25, 0.41]	0.93 [0.89, 0.96]
Gundersen 1996	37	160	14	49	0.73 [0.58, 0.84]	0.23 [0.18, 0.30]
Poggensee 2000˙settingA	4	92	3	76	0.57 [0.18, 0.90]	0.45 [0.38, 0.53]
Poggensee 2000˙settingB	38	32	29	29	0.57 [0.44, 0.69]	0.48 [0.35, 0.61]
Rasendramino 1998	238	30	182	97	0.57 [0.52, 0.61]	0.76 [0.68, 0.83]

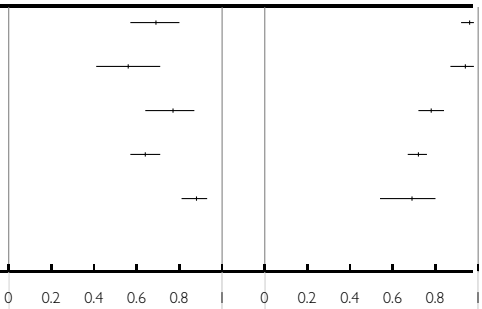


Test 6. CCA POC mansoni +1 threshold.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 6 CCA POC *mansoni* +1 threshold

Study	TP	FP	FN	TN	Sensitivity	Specificity
Ashton 2011	50	9	22	195	0.69 [0.57, 0.80]	0.96 [0.92, 0.98]
Coulibaly 2011˙Colley2013	27	6	21	92	0.56 [0.41, 0.71]	0.94 [0.87, 0.98]
Coulibaly 2013˙4KK,	43	40	13	146	0.77 [0.64, 0.87]	0.78 [0.72, 0.84]
Navaratnam 2012	118	109	65	277	0.64 [0.57, 0.71]	0.72 [0.67, 0.76]
Standley 2010	103	17	14	37	0.88 [0.81, 0.93]	0.69 [0.54, 0.80]

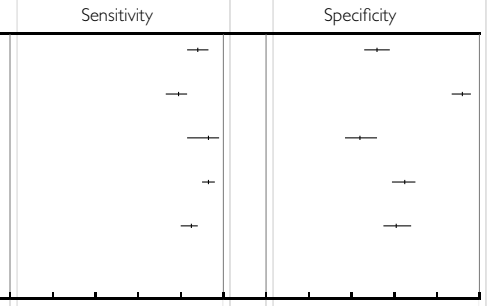


Test 7. CCA POC mansoni with good reference standard.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 7 CCA POC *mansoni* with good reference standard

Study	TP	FP	FN	TN	Sensitivity	Specificity
Adriko 2014˙6KK	157	139	21	152	0.88 [0.83, 0.93]	0.52 [0.46, 0.58]
Coulibaly 2011˙9KK	213	13	58	159	0.79 [0.73, 0.83]	0.92 [0.87, 0.96]
Coulibaly 2013˙4KK,	52	104	4	82	0.93 [0.83, 0.98]	0.44 [0.37, 0.52]
Erko 2013˙6KK	306	103	23	188	0.93 [0.90, 0.96]	0.65 [0.59, 0.70]
Tchuente 2012˙9KK	322	94	59	150	0.85 [0.80, 0.88]	0.61 [0.55, 0.68]

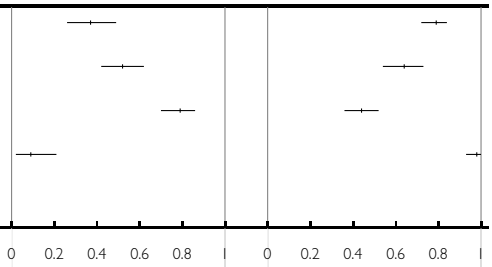


Test 8. CCA POC haematobium.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 8 CCA POC *haematobium*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Ashton 2011	29	43	49	159	0.37 [0.26, 0.49]	0.79 [0.72, 0.84]
Ayele 2008	51	39	47	69	0.52 [0.42, 0.62]	0.64 [0.54, 0.73]
Midzi 2009	84	88	23	70	0.79 [0.70, 0.86]	0.44 [0.36, 0.52]
Stothard 2009a	4	2	42	102	0.09 [0.02, 0.21]	0.98 [0.93, 1.00]

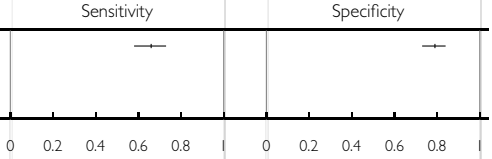


Test 10. CCA POC mixed species.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 10 CCA POC mixed species

Study	TP	FP	FN	TN	Sensitivity	Specificity
Ashton 2011	111	43	58	161	0.66 [0.58, 0.73]	0.79 [0.73, 0.84]

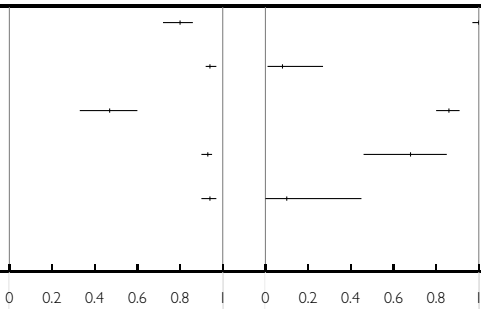


Test 11. Serum CAA ELISA mansoni.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 11 Serum CAA ELISA *mansoni*

Study	TP	FP	FN	TN	Sensitivity	Specificity
El-Morshedy 1996	117	0	30	110	0.80 [0.72, 0.86]	1.00 [0.97, 1.00]
Polman 1995	325	22	19	2	0.94 [0.92, 0.97]	0.08 [0.01, 0.27]
Van Lieshout 1995	27	20	31	126	0.47 [0.33, 0.60]	0.86 [0.80, 0.91]
Van Lieshout 1998`1	449	8	34	17	0.93 [0.90, 0.95]	0.68 [0.46, 0.85]
Van Lieshout 1998`2	222	9	14	1	0.94 [0.90, 0.97]	0.10 [0.00, 0.45]

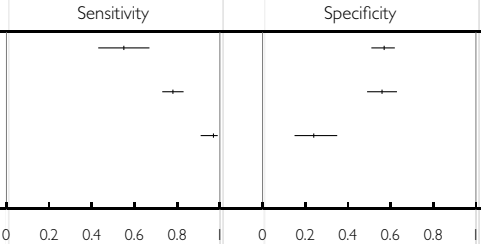


Test 12. Serum CAA ELISA haematobium.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 12 Serum CAA ELISA *haematobium*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Alsherbiny 1999	37	131	30	172	0.55 [0.43, 0.67]	0.57 [0.51, 0.62]
De Clerq 1995	199	82	55	105	0.78 [0.73, 0.83]	0.56 [0.49, 0.63]
Ndlovu 1996	93	63	3	20	0.97 [0.91, 0.99]	0.24 [0.15, 0.35]

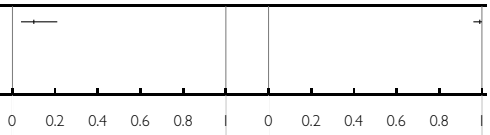


Test 13. Urine CAA ELISA mansoni.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 13 Urine CAA ELISA *mansoni*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Van Lieshout 1995	6	1	52	145	0.10 [0.04, 0.21]	0.99 [0.96, 1.00]

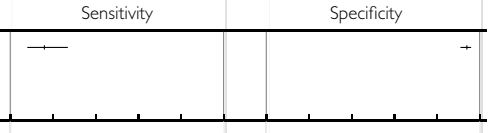


Test 14. Urine CAA ELISA haematobium.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 14 Urine CAA ELISA *haematobium*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Alsherbiny 1999	11	18	56	285	0.16 [0.08, 0.27]	0.94 [0.91, 0.96]

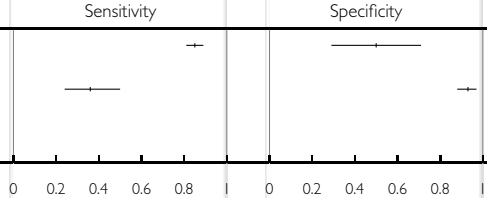


Test 15. Serum CCA ELISA mansoni.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 15 Serum CCA ELISA *mansoni*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Polman 1995	290	12	51	12	0.85 [0.81, 0.89]	0.50 [0.29, 0.71]
Van Lieshout 1995	21	10	37	136	0.36 [0.24, 0.50]	0.93 [0.88, 0.97]

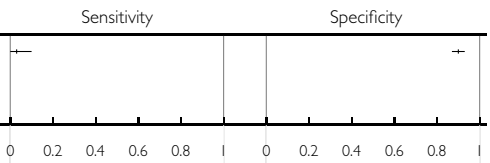


Test 16. Serum CCA ELISA haematobium.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 16 Serum CCA ELISA *haematobium*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Alsherbiny 1999	2	29	65	274	0.03 [0.00, 0.10]	0.90 [0.87, 0.93]

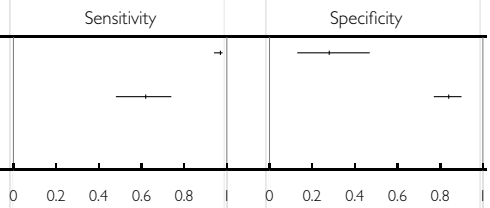


Test 17. Urine CCA ELISA mansoni.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 17 Urine CCA ELISA *mansoni*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Polman 1995	316	21	11	8	0.97 [0.94, 0.98]	0.28 [0.13, 0.47]
Van Lieshout 1995	36	23	22	123	0.62 [0.48, 0.74]	0.84 [0.77, 0.90]

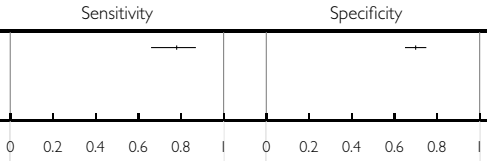


Test 19. Urine CCA ELISA haematobium.

Review: Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas

Test: 19 Urine CCA ELISA *haematobium*

Study	TP	FP	FN	TN	Sensitivity	Specificity
Alsherbiny 1999	52	90	15	213	0.78 [0.66, 0.87]	0.70 [0.65, 0.75]



ADDITIONAL TABLES

Table 1. Sources of heterogeneity for urine reagent strip for microhaematuria

Group	Co-variate	Subgroup	n (N = 74)	Sensitivity (95% CI)	Specificity (95% CI)
Overall				**0.75 (0.71-0.79)**	**0.87 (0.84-0.90)**
Subgroup analysis	Reference standard	Higher quality (> 1 sample)	10	0.71 (0.62-0.80)	0.85 (0.78-0.93)
		Lower quality (1 sample)	64	0.76 (0.71-0.80)	0.87 (0.84-0.90)
	Threshold	≥ +1	23	0.80 (0.73-0.85)	0.85 (0.78-0.92)
	Age	Children	34	0.77 (0.71-0.82)	0.91 (0.87-0.93)
	Intensity of infection	Light	28	0.73 (0.66-0.79)	0.88 (0.84-0.92)
Sensitivity analysis	Concentration	Filtration only	62	0.73 (0.69-0.78)	0.86 (0.82-0.89)
	QUADAS Patient Selection	Low risk of bias	16	0.77 (0.70-0.86)	0.86 (0.79-0.92)
	QUADAS Reference Standard	Low risk of bias[a]	1	-	-
	QUADAS Flow and Timing	Low risk of bias	43	0.77 (0.72-0.82)	0.87 (0.83-0.90)

[a] Insufficient data for synthesis.

Table 2. Sources of heterogeneity for urine reagent strip for proteinuria

Group	Co-variate	Subgroup	n (N = 46)	Sensitivity (95% CI)	Specificity (95% CI)
Overall				**0.61 (0.53-0.68)**	**0.82 (0.77-0.88)**
Subgroup analysis	Reference standard	Higher quality (> 1 sample)	9	0.49 (0.28-0.70)	0.83 (0.76-0.90)
		Lower quality (1 sample)	37	0.68 (0.60-0.76)	0.78 (0.69-0.87)
	Threshold	≥ +1	13	0.69 (0.56-0.81)	0.72 (0.54-0.90)
	Age	Children	18	0.67 (0.56-0.76)	0.81 (0.74-0.87)
	Intensity of infection	Light	15	0.60 (0.43-0.77)	0.83 (0.73-0.93)
Sensitivity analysis	Concentration	Filtration only	35	0.62 (0.52-0.71)	0.80 (0.73-0.86)
	QUADAS Patient Selection	Low risk of bias	11	0.64 (0.50-0.79)	0.81 (0.70-0.93)
	QUADAS Reference Standard	Low risk of bias[a]	1	-	
	QUADAS Flow and Timing	Low risk of bias	36	0.67 (0.59-0.76)	0.82 (0.73-0.88)

[a] Insufficient data for synthesis.

Table 3. Sources of heterogeneity for CCA POC test for *S. mansoni*

Group	Co-variate	Subgroup	n (N = 15)	Sensitivity (95% CI)	Specificity (95% CI)
Overall				**0.89 (0.86-0.92)**	**0.55 (0.46-0.65)**
Subgroup analysis	Reference standard[a]				
		Higher quality (> 1 sample)	5	0.88 (0.82-0.92)	0.66 (0.46-0.82)
		Lower quality (1 sample)	13	0.88 (0.85-0.91)	0.55 (0.45-0.66)

Table 3. Sources of heterogeneity for CCA POC test for *S. mansoni* (*Continued*)

	Positivity threshold [b]	> +1	5	0.72 (0.60-0.82)	0.85 (0.71-0.93)
	Age	Children	14	0.90 (0.86-0.92)	0.56 (0.46-0.66)
	Intensity of infection	Light[c]	3	-	-
Sensitivity analysis	QUADAS Patient Selection	Low risk of bias[c]	3	-	-
	QUADAS Reference Standard	Low risk of bias[c]	0	-	-
	QUADAS Flow and Timing	Low risk of bias	11	0.87 (0.84-0.90)	0.57 (0.49-0.65)

[a] Three studies had data points for evaluations with both a lower- and a higher-quality reference standard.
[b] Five studies had data points at both thresholds: trace and +1.
[c] Insufficient data for synthesis.

APPENDICES

Appendix 1. Geographical distribution, infection, and morbidity of *S. haematobium* and *S. mansoni*

Species	Geographical distribution[a]	Number infected (millions)	Morbidity (millions)	
S. haematobium	Africa, Middle East	In SSA (112)[b]	Urogenital schistosomiasis [a] **Signs and symptoms:** Haematuria (blood in urine), proteinuria (proteins in urine), leukocyturia (white blood cells in urine), urinary obstruction, hydronephrosis, chronic renal failure, bladder cancer, genital lesions,	In SSA[b]: Haematuria (71) Dysuria (32) Minor bladder pathology (76) Major bladder pathology (24) Major hydronephrosis (9.6)

(*Continued*)

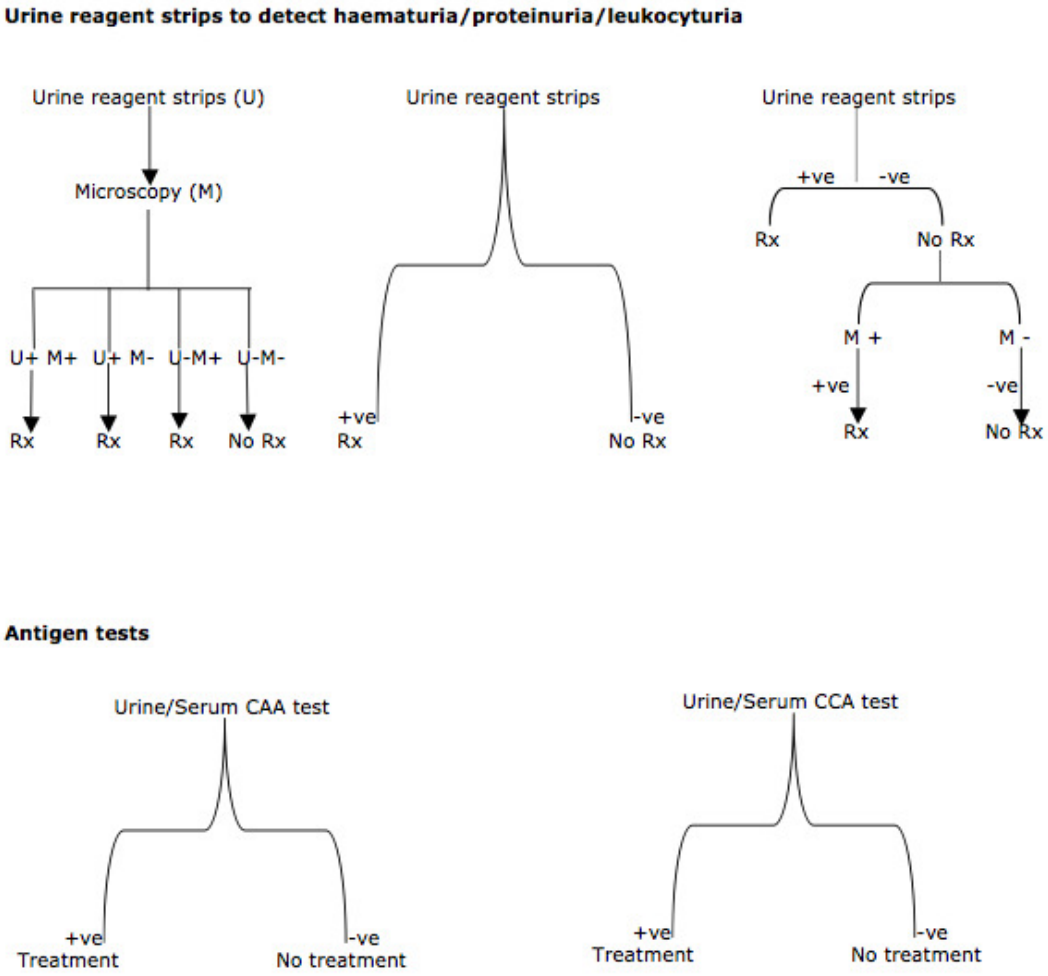
			vaginal bleeding, pain during sexual intercourse, nodules in the vulva, infertility, pathology in prostrate and seminal vesicles	
S. mansoni	Africa, Middle East, the Caribbean, South America	In SSA (54)[b]	Intestinal schistosomiasis[a] **Signs and symptoms:** Abdominal pain, blood in stool, portal hypertension, ascites	In SSA[b]: Diarrhoea (0.78) Blood in stool (4.4) Hepatomegaly (8.5)

Abbreviations: SSA = sub-Saharan Africa.
[a] WHO 2010.
[b] van der Werf 2003.
[c] WHO/TDR 2006.

Appendix 2. Diagnostic and treatment strategies

Figure 17

Figure 17. Diagnostic and treatment strategies. Abbreviations: +ve = positive; -ve = negative; CAA = circulating anodic antigen; CCA = circulating cathodic antigen; M+ = microscopy positive; M- = microscopy negative; U+ = urine reagent strips positive; U- = urine reagent strips negative; Rx = treatment; No Rx = no treatment.



Abbreviations: +ve = positive; -ve = negative; CAA = circulating anodic antigen; CCA = circulating cathodic antigen; M+ = microscopy positive; M- = microscopy negative; U+ = urine reagent strips positive; U- = urine reagent strips negative; Rx = treatment; No Rx = no treatment.

Appendix 3. MEDLINE search strategy via Ovid SP platform

Limits: limited to human studies

Line #	Term
1	(anodic adj3 antigen*).ti,ab.
2	(cathodic adj3 antigen*).ti,ab.
3	exp Enzyme-Linked Immunosorbent Assay/
4	exp Immunoenzyme Techniques/
5	hematuria/ or exp proteinuria/
6	leukocyturia.ti,ab.
7	leucocyturia.ti,ab.
8	h?ematuria.ti,ab.
9	proteinuria.ti,ab.
10	albuminuria.ti,ab.
11	CCA.ti,ab.
12	CAA.ti,ab.
13	urinalysis.ti,ab.
14	elisa.ti,ab.
15	eia.ti,ab.
16	exp Reagent Strips/ or dipstick.mp.
17	(reagent adj3 strip*).ti,ab.
18	(test adj3 strip*).ti,ab.
19	haemastix.ti,ab.
20	"schistosoma mansoni".ti,ab. or "schistosoma haematobium".ti,ab
21	exp Glycoproteins/

(*Continued*)

22	exp Antigens, Helminth/
23	exp Helminth Proteins/
24	exp Schistosoma haematobium/
25	exp Antibodies, Monoclonal/
26	exp Schistosoma mansoni/
27	or/1-26
28	schistosomiasis/ or schistosomiasis haematobia/ or schistosomiasis mansoni/
29	schistosomiasis.ti,ab.
30	bilharzia*.ti,ab.
31	or/28-30
32	animals/ not humans/
33	exp Letter/
34	exp Case Reports/
35	or/32-34
36	27 and 31
37	36 not 35

With use of the Ovid platform, this MEDLINE search was translated automatically to suit the EMBASE and BIOSIS databases to identify additional records. In the search interface, under 'resource selected,' with the link 'change,' one can select the desired database.

Appendix 4. QUADAS tool

We used the QUADAS-2 tool. The signalling questions under the four recommended domains are outlined in questions 7 to 10 on the data extraction form.
The scoring guidance for these questions was as follows.

Flow diagram

For questions 7 and 8, drawing a flow diagram of the study may be helpful (this is not mandatory). Flow charts of patients display how many patients were eligible for the study, how many were actually recruited, how many received the index test, how many received the reference standard, etc. In addition, the numbers of true- and false-positives and true- and false-negatives are displayed. If necessary, please draw a flow diagram for the primary study in the space provided on page 8 of the extraction form.

7. Patient selection (patient selection domain)

These questions will help assess risks of bias in the study design.

a. Please cite here the selection criteria

Please list in the space provided the selection criteria used to recruit patients into the study. You can also cite the page number in the article on which the selection criterion was written.
If no criteria were reported, indicate "Not reported/NR" in the space provided. If the criterion was unclear, please indicate "Unclear," and explain your answer.

b. Stage of disease

Participants recruited into the study may be without symptoms or with symptoms. Please indicate the disease stage for participants. If the study clearly reports that both asymptomatic and symptomatic cases were evaluated, please tick the appropriate box provided (both A and S). If the study does not clearly report the clinical status of the participants, please tick the box 'Unclear.' A box N/A has been provided. If *S. m* for example was not evaluated in the study, please tick this box. The same applies to *S. h.* A comment box is provided for any comments that you may have.

c. What was the study design?

Please indicate the design of the study by ticking one of the choices provided.
We will not include case-control studies that incorporate healthy controls, alternative diagnosis controls, or controls from non-endemic areas. Research has shown that this type of study overestimates accuracy measures. Healthy controls are those who have been confirmed as disease-free. Alternative diagnosis controls are controls who have symptoms similar to those of the disease under study.
If the design is not stated or is unclear, please tick the appropriate boxes. If necessary, insert comment into the box provided.

d. Was a consecutive or random sample of patients enrolled?

- Yes: when the authors report random patient sampling or consecutive enrolment.
- No: when patients were selected, for example, based on previous (reference or index) test results.
- Unclear: there seems to be no problem, but the study authors do not explicitly state that patients were enrolled consecutively.

e. Did the study avoid inappropriate exclusions?

- Yes: No patients were excluded after inclusion.
- No: For example, when patients with mild disease were excluded, because they are more difficult to detect.
- Unclear: not reported or insufficient information given to permit a decision.

f. Could the selection of patients have introduced bias?

- High: if one or more of the questions above (7 d-e) was answered with 'no.'
- Low: if all questions were answered with 'yes' (7 d-e), or if at most one question was answered with 'unclear.'
- Unclear: for any other combination of answers (eg if two or more questions were unclear and the other(s) was/were answered with 'yes.'

g. Is there a concern that the included patients do not match the review question?

- High concern: when participants are those who do not reside in endemic areas, such as tourists, healthy controls, or controls with alternative diagnoses.
- Low concern: when participants in the study are those who reside in schistosomiasis endemic areas. This group will include those at risk of infection, those who are infected but asymptomatic, or those who are infected with symptoms.
- Unclear: scored when information is insufficient to permit a decision.

8. Patient flow and timing (Flow and Timing domain)

a. Was there an appropriate interval between index test(s) and reference standard?

- Yes: if urine/stool samples are examined by both the reference standard and the index standard at the same time, or if the time period is less than one week.
- No: if time period between index and reference standards is longer than one week.
- Unclear: if no or insufficient information on time period is provided.

b. Did all patients receive a reference standard? (focus on those included in 2 × 2 table)

- Yes: scored when the whole sample or a random selection of the sample or a selection of the sample with consecutive series receive verification using the reference standard.
- No: scored when a part of the sample that is non-randomly or non-consecutively selected receives verification with the reference standard.
- Unclear: scored when no or insufficient information is provided to ascertain whether the whole sample or a random selection of the sample received verification with a reference standard.

c. Did patients receive the same reference standard?

- Yes: scored when study participants are tested with the same reference standard, urine/stool microscopy, regardless of index test result.
- No: scored when microscopy is used with different urine concentration techniques depending on index test results for *S. haematobium.*
- Unclear: scored when no or insufficient information is provided on the different reference standards used.

d. Were all patients included in the analysis?

- Yes: scored when the patients who were included in the study were also included in the analysis.
- No: scored when some patients/results are missing.
- Unclear: scored when no or insufficient information is provided to permit a judgement.

e. Could the conduct or interpretation of the flow and timing have introduced bias?

- High: if two or more questions above (8 a-d) were answered with 'no.'
- Low: if all questions were answered with 'yes'; or at least three and the other one with unclear.
- Unclear: for any other combination of answers (eg all questions were unclear; three were unclear and the last one was 'yes').

Please state the tests under evaluation in the study.

Indicate the tests that have been evaluated for *S. mansoni* and/or *S. haematobium* in the study by ticking the appropriate boxes for the respective species. If a species was not evaluated, please tick the box 'not applicable.'

9. Index tests (Index test domain)

a. Was quality control done?

To ensure reliability or good quality of results, a sample of slides may be cross-checked by a second person, by an expert, or by a reference laboratory. Please indicate whether this was done in the study. If information given is unclear, please tick the box 'unclear.' If not reported, tick the box 'not stated.' If necessary, provide comment in the box provided.

b. Were the index test results interpreted without knowledge of the results of the reference standard?

- Yes: when results of the index tests are interpreted without knowledge of reference test results, or when index tests are done before the reference standard.
- No: when results of the index tests are interpreted with knowledge of reference test results in cases when reference tests were used before the index tests.
- Unclear: when information on when the index and reference tests were interpreted is insufficient.
- Not stated: when no information was reported on this item.

c. If a threshold was used, was it prespecified?

- Yes: when the study authors report the use of one prespecified cutoff value. A prespecified threshold also includes statements such as, "the test was scored according to manufacturer's instructions."
- No: when multiple cutoff values were tested and the best one chosen afterwards.
- Unclear: when only one cutoff value was used, but this was not explicitly stated in the Methods section.
- Not stated: when no information was reported on this item.
- Could the conduct or interpretation of the index test have introduced bias?
    - High: if two or more questions above (9 a-c) were answered with 'no.'
    - Low: if questions (9 a-c) were answered with 'yes.'
    - Unclear: for any other combination of answers (eg both questions were unclear; one was unclear and one was 'yes').

10. Reference test (Reference Test domain)

The reference test for *S.h* that this review will evaluate is urine microscopy.

The following questions (10 A (h-k)) are part of the QUADAS tool and will be used to assess for risk of bias in how the reference test is carried out.

A. S. haematobium

h. Was quality control done?

To ensure reliability or good quality of results, a sample of slides may be cross-checked by a second person, by an expert, or by a reference laboratory. Please indicate whether this was done in the study. If information given is unclear, please tick the box 'unclear.' If not reported, tick the box 'not stated.' If necessary, insert comment into the box provided.

i. Is the reference standard likely to correctly classify the target condition?

- Yes: if measures to increase sensitivity are used (eg concentration techniques, multiple slides examined, stool sampled over a number of days. The recommended reference std for microscopy is one carried out on 3 stools or 3 urine samples (grading as follows: 1 sample; poor; 2 samples; moderate; 3 samples; good).
- No: for example, if only ill children are sampled for the reference standard, or if stool samples with blood are thrown away to avoid contaminating technicians
- Unclear: scored when information on the reference standard used or sample preparation technique used was insufficient.

j. Were the reference standard results interpreted without knowledge of results of the index test?

- Yes: when results of the reference tests are interpreted without knowledge of index test results in cases when reference tests are used before the index standard.
- No: when results of the reference tests are interpreted with knowledge of the index test results in cases in which index tests are used before reference tests.
- Unclear: when information on when the index and reference tests were interpreted is insufficient.
- Not stated: when no information on this item was reported.

k. Could the conduct or interpretation of the reference standard have introduced bias?

- High: if one or both questions above (a-b) were answered with 'no.'
- Low: if both questions were answered with 'yes.'
- Unclear: if both questions were unclear; or one was unclear and one was 'yes.'

B. S. mansoni

Tick the appropriate box for the index tests used to detect *S. m* in the article.
These questions for *S.m* should be tackled in a similar fashion to those for *S. haematobium.*

a. Reference standard

The reference test for *S.m* that this review will evaluate is microscopy of stool that is prepared by the Kato-Katz method.

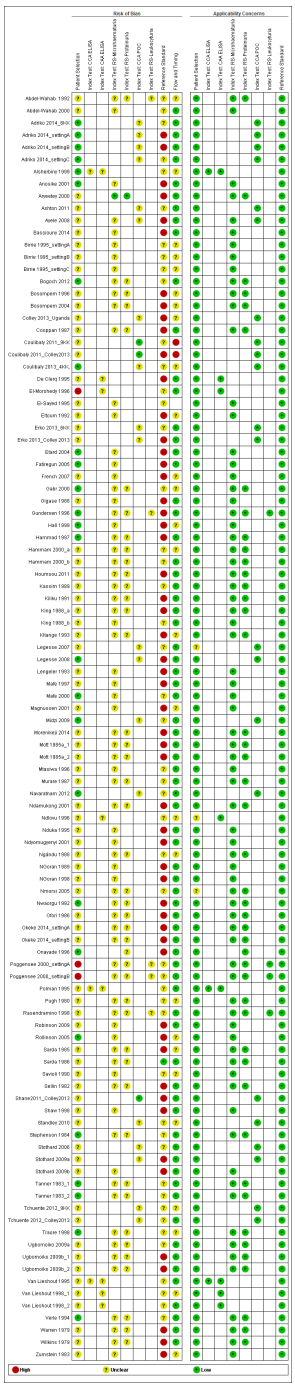
b. Was quality control done?

To ensure reliability or good quality of results, a sample of slides may be cross-checked by a second person, by an expert, or by a reference laboratory. Please indicate whether this was done in the study. If information given is unclear, please tick the box 'unclear.' If not reported, tick the box 'not stated.' If necessary, insert comment into the box provided.
The questions 10 B (i-l) are part of the QUADAS tool and will be used to assess for risk of bias in how the reference test is carried out. Instructions for these questions are similar to those for *S. haematobium* given above.

Appendix 5. Risk of bias and applicability concerns summary: review authors' judgements about each domain for each included study

Figure 18

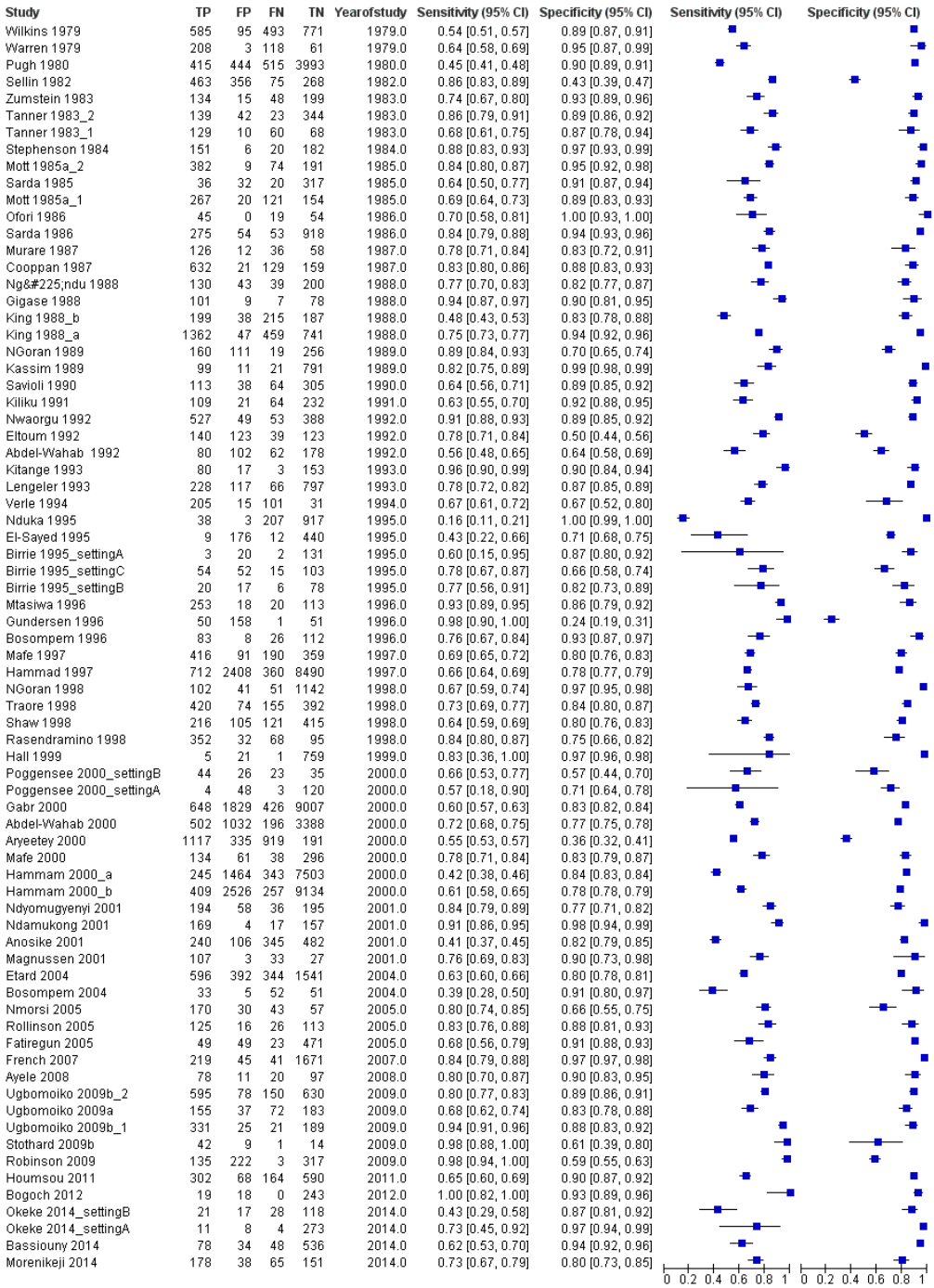
Figure 18. Risk of bias and applicability concerns summary: review authors' judgements about each domain for each included study. The blank cells refer to information that is not applicable to the stated study.



Appendix 6. Effect of year of study on the accuracy of microhaematuria

Figure 19

Figure 19. Forest plot showing effect of year of study on sensitivity and specificity of microhaematuria.

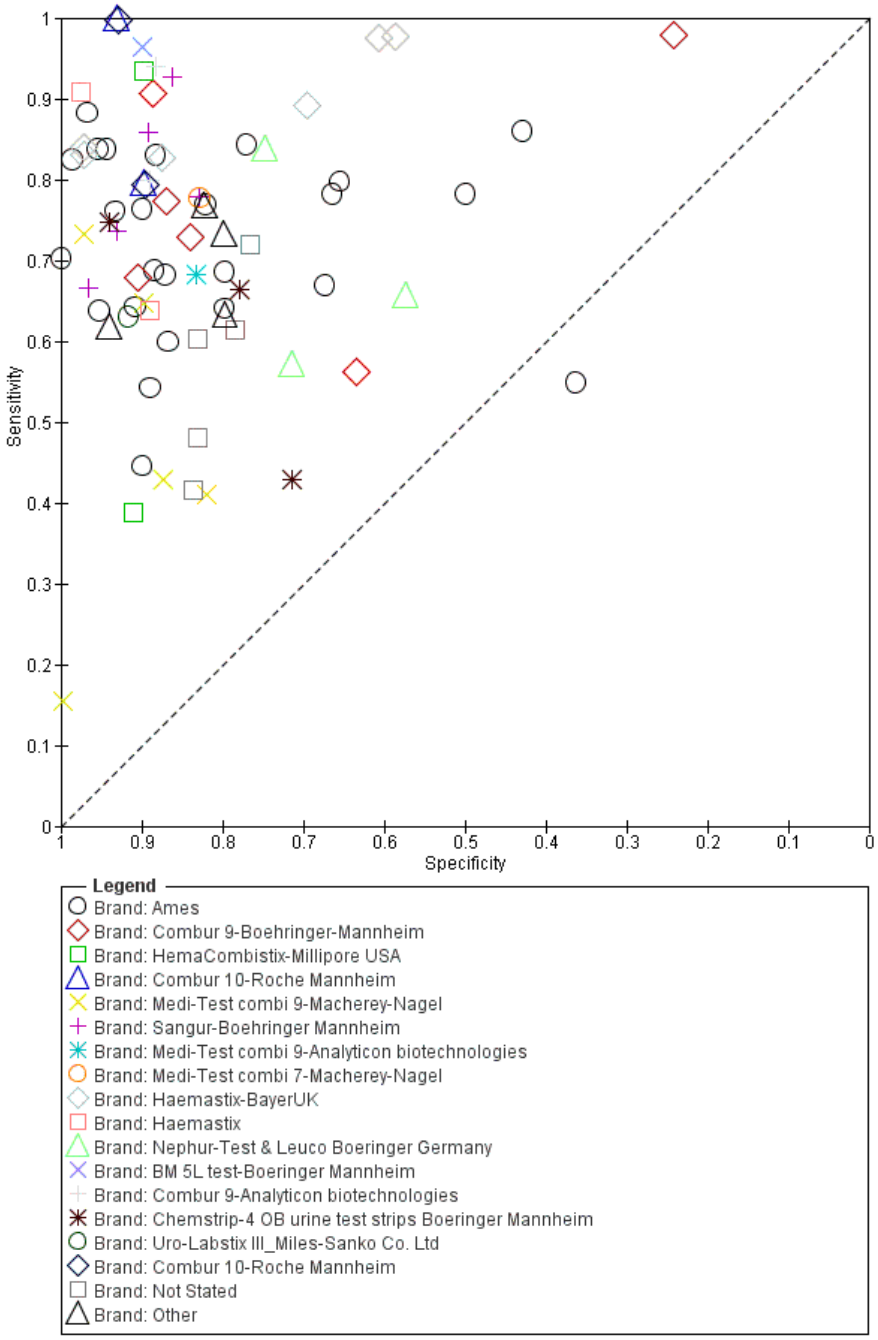


Study	TP	FP	FN	TN	Yearofstudy	Sensitivity (95% CI)	Specificity (95% CI)
Wilkins 1979	585	95	493	771	1979.0	0.54 [0.51, 0.57]	0.89 [0.87, 0.91]
Warren 1979	208	3	118	61	1979.0	0.64 [0.58, 0.69]	0.95 [0.87, 0.99]
Pugh 1980	415	444	515	3993	1980.0	0.45 [0.41, 0.48]	0.90 [0.89, 0.91]
Sellin 1982	463	356	75	268	1982.0	0.86 [0.83, 0.89]	0.43 [0.39, 0.47]
Zumstein 1983	134	15	48	199	1983.0	0.74 [0.67, 0.80]	0.93 [0.89, 0.96]
Tanner 1983_2	139	42	23	344	1983.0	0.86 [0.79, 0.91]	0.89 [0.86, 0.92]
Tanner 1983_1	129	10	60	68	1983.0	0.68 [0.61, 0.75]	0.87 [0.78, 0.94]
Stephenson 1984	151	6	20	182	1984.0	0.88 [0.83, 0.93]	0.97 [0.93, 0.99]
Mott 1985a_2	382	9	74	191	1985.0	0.84 [0.80, 0.87]	0.95 [0.92, 0.98]
Sarda 1985	36	32	20	317	1985.0	0.64 [0.50, 0.77]	0.91 [0.87, 0.94]
Mott 1985a_1	267	20	121	154	1985.0	0.69 [0.64, 0.73]	0.89 [0.83, 0.93]
Ofori 1986	45	0	19	54	1986.0	0.70 [0.58, 0.81]	1.00 [0.93, 1.00]
Sarda 1986	275	54	53	918	1986.0	0.84 [0.79, 0.88]	0.94 [0.93, 0.96]
Murare 1987	126	12	36	58	1987.0	0.78 [0.71, 0.84]	0.83 [0.72, 0.91]
Cooppan 1987	632	21	129	159	1987.0	0.83 [0.80, 0.86]	0.88 [0.83, 0.93]
Ngándu 1988	130	43	39	200	1988.0	0.77 [0.70, 0.83]	0.82 [0.77, 0.87]
Gigase 1988	101	9	7	78	1988.0	0.94 [0.87, 0.97]	0.90 [0.81, 0.95]
King 1988_b	199	38	215	187	1988.0	0.48 [0.43, 0.53]	0.83 [0.78, 0.88]
King 1988_a	1362	47	459	741	1988.0	0.75 [0.73, 0.77]	0.94 [0.92, 0.96]
NGoran 1989	160	111	19	256	1989.0	0.89 [0.84, 0.93]	0.70 [0.65, 0.74]
Kassim 1989	99	11	21	791	1989.0	0.82 [0.75, 0.89]	0.99 [0.98, 0.99]
Savioli 1990	113	38	64	305	1990.0	0.64 [0.56, 0.71]	0.89 [0.85, 0.92]
Kiliku 1991	109	21	64	232	1991.0	0.63 [0.55, 0.70]	0.92 [0.88, 0.95]
Nwaorgu 1992	527	49	53	388	1992.0	0.91 [0.88, 0.93]	0.89 [0.85, 0.92]
Eltoum 1992	140	123	39	123	1992.0	0.78 [0.71, 0.84]	0.50 [0.44, 0.56]
Abdel-Wahab 1992	80	102	62	178	1992.0	0.56 [0.48, 0.65]	0.64 [0.58, 0.69]
Kitange 1993	80	17	3	153	1993.0	0.96 [0.90, 0.99]	0.90 [0.84, 0.94]
Lengeler 1993	228	117	66	797	1993.0	0.78 [0.72, 0.82]	0.87 [0.85, 0.89]
Verle 1994	205	15	101	31	1994.0	0.67 [0.61, 0.72]	0.67 [0.52, 0.80]
Nduka 1995	38	3	207	917	1995.0	0.16 [0.11, 0.21]	1.00 [0.99, 1.00]
El-Sayed 1995	9	176	12	440	1995.0	0.43 [0.22, 0.66]	0.71 [0.68, 0.75]
Birrie 1995_settingA	3	20	2	131	1995.0	0.60 [0.15, 0.95]	0.87 [0.80, 0.92]
Birrie 1995_settingC	54	52	15	103	1995.0	0.78 [0.67, 0.87]	0.66 [0.58, 0.74]
Birrie 1995_settingB	20	17	6	78	1995.0	0.77 [0.56, 0.91]	0.82 [0.73, 0.89]
Mtasiwa 1996	253	18	20	113	1996.0	0.93 [0.89, 0.95]	0.86 [0.79, 0.92]
Gundersen 1996	50	158	1	51	1996.0	0.98 [0.90, 1.00]	0.24 [0.19, 0.31]
Bosompem 1996	83	8	26	112	1996.0	0.76 [0.67, 0.84]	0.93 [0.87, 0.97]
Mafe 1997	416	91	190	359	1997.0	0.69 [0.65, 0.72]	0.80 [0.76, 0.83]
Hammad 1997	712	2408	360	8490	1997.0	0.66 [0.64, 0.69]	0.78 [0.77, 0.79]
NGoran 1998	102	41	51	1142	1998.0	0.67 [0.59, 0.74]	0.97 [0.95, 0.98]
Traore 1998	420	74	155	392	1998.0	0.73 [0.69, 0.77]	0.84 [0.80, 0.87]
Shaw 1998	216	105	121	415	1998.0	0.64 [0.59, 0.69]	0.80 [0.76, 0.83]
Rasendramino 1998	352	32	68	95	1998.0	0.84 [0.80, 0.87]	0.75 [0.66, 0.82]
Hall 1999	5	21	1	759	1999.0	0.83 [0.36, 1.00]	0.97 [0.96, 0.98]
Poggensee 2000_settingB	44	26	23	35	2000.0	0.66 [0.53, 0.77]	0.57 [0.44, 0.70]
Poggensee 2000_settingA	4	48	3	120	2000.0	0.57 [0.18, 0.90]	0.71 [0.64, 0.78]
Gabr 2000	648	1829	426	9007	2000.0	0.60 [0.57, 0.63]	0.83 [0.82, 0.84]
Abdel-Wahab 2000	502	1032	196	3388	2000.0	0.72 [0.68, 0.75]	0.77 [0.75, 0.78]
Aryeetey 2000	1117	335	919	191	2000.0	0.55 [0.53, 0.57]	0.36 [0.32, 0.41]
Mafe 2000	134	61	38	296	2000.0	0.78 [0.71, 0.84]	0.83 [0.79, 0.87]
Hammam 2000_a	245	1464	343	7503	2000.0	0.42 [0.38, 0.46]	0.84 [0.83, 0.84]
Hammam 2000_b	409	2526	257	9134	2000.0	0.61 [0.58, 0.65]	0.78 [0.78, 0.79]
Ndyomugyenyi 2001	194	58	36	195	2001.0	0.84 [0.79, 0.89]	0.77 [0.71, 0.82]
Ndamukong 2001	169	4	17	157	2001.0	0.91 [0.86, 0.95]	0.98 [0.94, 0.99]
Anosike 2001	240	106	345	482	2001.0	0.41 [0.37, 0.45]	0.82 [0.79, 0.85]
Magnussen 2001	107	3	33	27	2001.0	0.76 [0.69, 0.83]	0.90 [0.73, 0.98]
Etard 2004	596	392	344	1541	2004.0	0.63 [0.60, 0.66]	0.80 [0.78, 0.81]
Bosompem 2004	33	5	52	51	2004.0	0.39 [0.28, 0.50]	0.91 [0.80, 0.97]
Nmorsi 2005	170	30	43	57	2005.0	0.80 [0.74, 0.85]	0.66 [0.55, 0.75]
Rollinson 2005	125	16	26	113	2005.0	0.83 [0.76, 0.88]	0.88 [0.81, 0.93]
Fatiregun 2005	49	49	23	471	2005.0	0.68 [0.56, 0.79]	0.91 [0.88, 0.93]
French 2007	219	45	41	1671	2007.0	0.84 [0.79, 0.88]	0.97 [0.97, 0.98]
Ayele 2008	78	11	20	97	2008.0	0.80 [0.70, 0.87]	0.90 [0.83, 0.95]
Ugbomoiko 2009b_2	595	78	150	630	2009.0	0.80 [0.77, 0.83]	0.89 [0.86, 0.91]
Ugbomoiko 2009a	155	37	72	183	2009.0	0.68 [0.62, 0.74]	0.83 [0.78, 0.88]
Ugbomoiko 2009b_1	331	25	21	189	2009.0	0.94 [0.91, 0.96]	0.88 [0.83, 0.92]
Stothard 2009b	42	9	1	14	2009.0	0.98 [0.88, 1.00]	0.61 [0.39, 0.80]
Robinson 2009	135	222	3	317	2009.0	0.98 [0.94, 1.00]	0.59 [0.55, 0.63]
Houmsou 2011	302	68	164	590	2011.0	0.65 [0.60, 0.69]	0.90 [0.87, 0.92]
Bogoch 2012	19	18	0	243	2012.0	1.00 [0.82, 1.00]	0.93 [0.89, 0.96]
Okeke 2014_settingB	21	17	28	118	2014.0	0.43 [0.29, 0.58]	0.87 [0.81, 0.92]
Okeke 2014_settingA	11	8	4	273	2014.0	0.73 [0.45, 0.92]	0.97 [0.94, 0.99]
Bassiouny 2014	78	34	48	536	2014.0	0.62 [0.53, 0.70]	0.94 [0.92, 0.96]
Morenikeji 2014	178	38	65	151	2014.0	0.73 [0.67, 0.79]	0.80 [0.73, 0.85]

Appendix 7. Effect of test brand on accuracy of microhaematuria

Figure 20

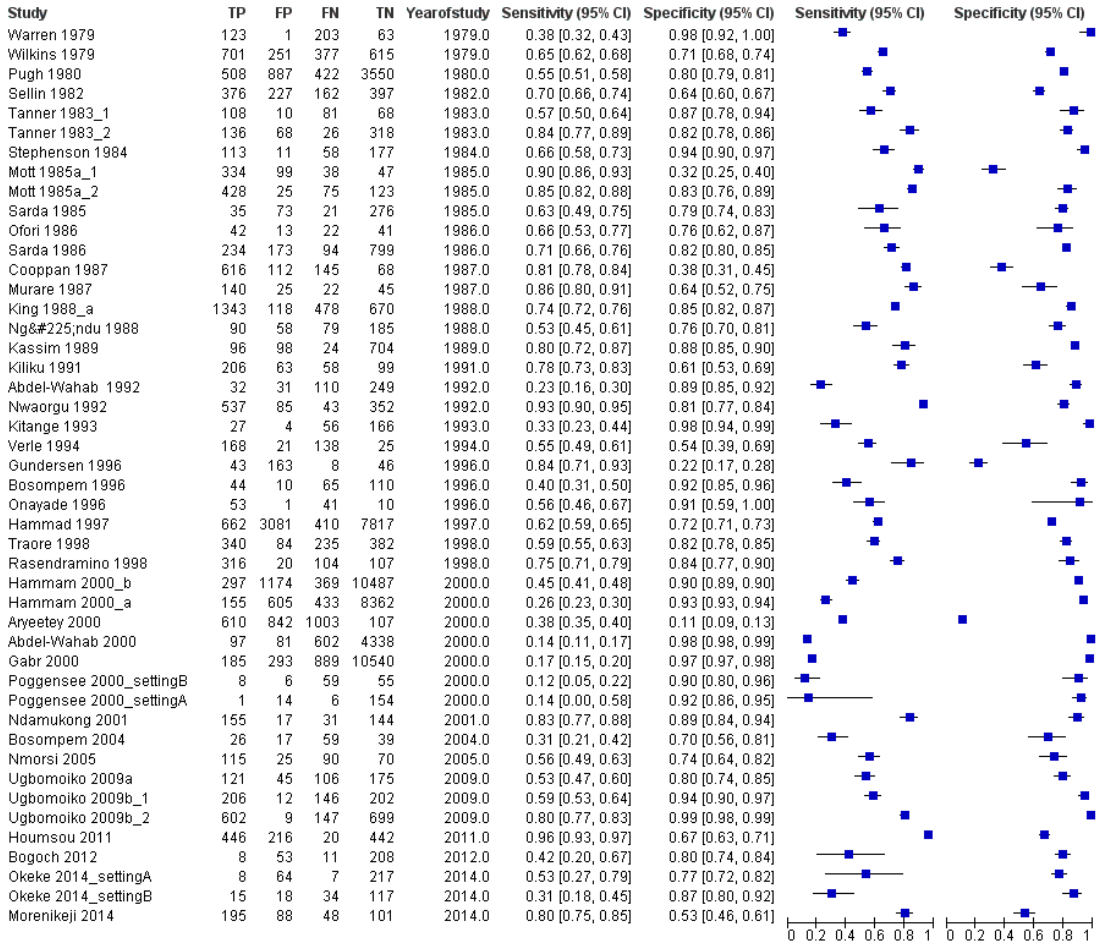
Figure 20. Summary ROC plot showing effect of test brand on sensitivity and specificity of microhaematuria.



Appendix 8. Effect of year of study on the accuracy of proteinuria

Figure 21

Figure 21. Forest plot showing effect of year of study on sensitivity and specificity of proteinuria.

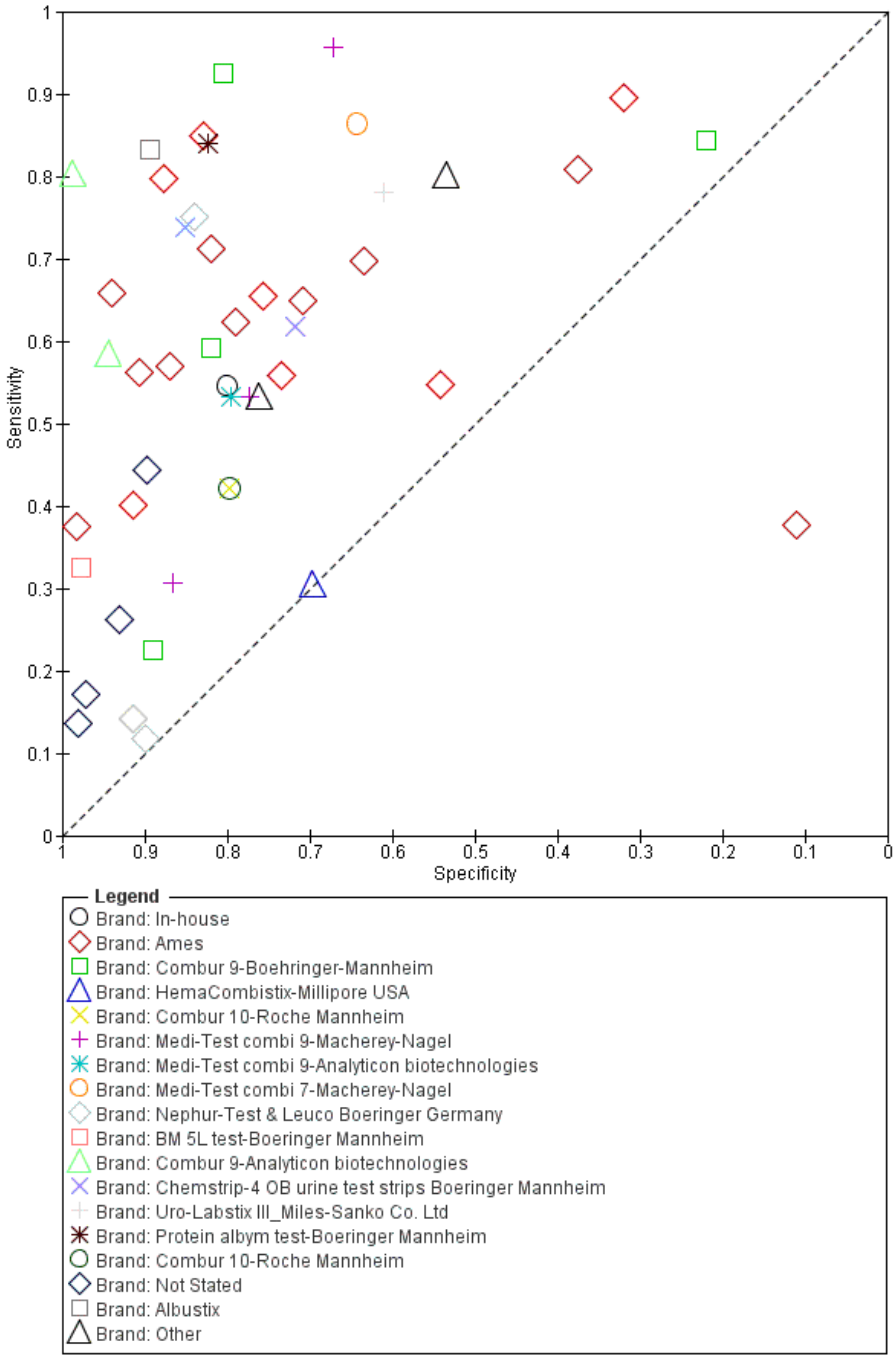


Study	TP	FP	FN	TN	Yearofstudy	Sensitivity (95% CI)	Specificity (95% CI)
Warren 1979	123	1	203	63	1979.0	0.38 [0.32, 0.43]	0.98 [0.92, 1.00]
Wilkins 1979	701	251	377	615	1979.0	0.65 [0.62, 0.68]	0.71 [0.68, 0.74]
Pugh 1980	508	887	422	3550	1980.0	0.55 [0.51, 0.58]	0.80 [0.79, 0.81]
Sellin 1982	376	227	162	397	1982.0	0.70 [0.66, 0.74]	0.64 [0.60, 0.67]
Tanner 1983_1	108	10	81	68	1983.0	0.57 [0.50, 0.64]	0.87 [0.78, 0.94]
Tanner 1983_2	136	68	26	318	1983.0	0.84 [0.77, 0.89]	0.82 [0.78, 0.86]
Stephenson 1984	113	11	58	177	1984.0	0.66 [0.58, 0.73]	0.94 [0.90, 0.97]
Mott 1985a_1	334	99	38	47	1985.0	0.90 [0.86, 0.93]	0.32 [0.25, 0.40]
Mott 1985a_2	428	25	75	123	1985.0	0.85 [0.82, 0.88]	0.83 [0.76, 0.89]
Sarda 1985	35	73	21	276	1985.0	0.63 [0.49, 0.75]	0.79 [0.74, 0.83]
Ofori 1986	42	13	22	41	1986.0	0.66 [0.53, 0.77]	0.76 [0.62, 0.87]
Sarda 1986	234	173	94	799	1986.0	0.71 [0.66, 0.76]	0.82 [0.80, 0.85]
Cooppan 1987	616	112	145	68	1987.0	0.81 [0.78, 0.84]	0.38 [0.31, 0.45]
Murare 1987	140	25	22	45	1987.0	0.86 [0.80, 0.91]	0.64 [0.52, 0.75]
King 1988_a	1343	118	478	670	1988.0	0.74 [0.72, 0.76]	0.85 [0.82, 0.87]
Ngándu 1988	90	58	79	185	1988.0	0.53 [0.45, 0.61]	0.76 [0.70, 0.81]
Kassim 1989	96	98	24	704	1989.0	0.80 [0.72, 0.87]	0.88 [0.85, 0.90]
Kiliku 1991	206	63	58	99	1991.0	0.78 [0.73, 0.83]	0.61 [0.53, 0.69]
Abdel-Wahab 1992	32	31	110	249	1992.0	0.23 [0.16, 0.30]	0.89 [0.85, 0.92]
Nwaorgu 1992	537	85	43	352	1992.0	0.93 [0.90, 0.95]	0.81 [0.77, 0.84]
Kitange 1993	27	4	56	166	1993.0	0.33 [0.23, 0.44]	0.98 [0.94, 0.99]
Verle 1994	168	21	138	25	1994.0	0.55 [0.49, 0.61]	0.54 [0.39, 0.69]
Gundersen 1996	43	163	8	46	1996.0	0.84 [0.71, 0.93]	0.22 [0.17, 0.28]
Bosompem 1996	44	10	65	110	1996.0	0.40 [0.31, 0.50]	0.92 [0.85, 0.96]
Onayade 1996	53	1	41	10	1996.0	0.56 [0.46, 0.67]	0.91 [0.59, 1.00]
Hammad 1997	662	3081	410	7817	1997.0	0.62 [0.59, 0.65]	0.72 [0.71, 0.73]
Traore 1998	340	84	235	382	1998.0	0.59 [0.55, 0.63]	0.82 [0.78, 0.85]
Rasendramino 1998	316	20	104	107	1998.0	0.75 [0.71, 0.79]	0.84 [0.77, 0.90]
Hammam 2000_b	297	1174	369	10487	2000.0	0.45 [0.41, 0.48]	0.90 [0.89, 0.90]
Hammam 2000_a	155	605	433	8362	2000.0	0.26 [0.23, 0.30]	0.93 [0.93, 0.94]
Aryeetey 2000	610	842	1003	107	2000.0	0.38 [0.35, 0.40]	0.11 [0.09, 0.13]
Abdel-Wahab 2000	97	81	602	4338	2000.0	0.14 [0.11, 0.17]	0.98 [0.98, 0.99]
Gabr 2000	185	293	889	10540	2000.0	0.17 [0.15, 0.20]	0.97 [0.97, 0.98]
Poggensee 2000_settingB	8	6	59	55	2000.0	0.12 [0.05, 0.22]	0.90 [0.80, 0.96]
Poggensee 2000_settingA	1	14	6	154	2000.0	0.14 [0.00, 0.58]	0.92 [0.86, 0.95]
Ndamukong 2001	155	17	31	144	2001.0	0.83 [0.77, 0.88]	0.89 [0.84, 0.94]
Bosompem 2004	26	17	59	39	2004.0	0.31 [0.21, 0.42]	0.70 [0.56, 0.81]
Nmorsi 2005	115	25	90	70	2005.0	0.56 [0.49, 0.63]	0.74 [0.64, 0.82]
Ugbomoiko 2009a	121	45	106	175	2009.0	0.53 [0.47, 0.60]	0.80 [0.74, 0.85]
Ugbomoiko 2009b_1	206	12	146	202	2009.0	0.59 [0.53, 0.64]	0.94 [0.90, 0.97]
Ugbomoiko 2009b_2	602	9	147	699	2009.0	0.80 [0.77, 0.83]	0.99 [0.98, 0.99]
Houmsou 2011	446	216	20	442	2011.0	0.96 [0.93, 0.97]	0.67 [0.63, 0.71]
Bogoch 2012	8	53	11	208	2012.0	0.42 [0.20, 0.67]	0.80 [0.74, 0.84]
Okeke 2014_settingA	8	64	7	217	2014.0	0.53 [0.27, 0.79]	0.77 [0.72, 0.82]
Okeke 2014_settingB	15	18	34	117	2014.0	0.31 [0.18, 0.45]	0.87 [0.80, 0.92]
Morenikeji 2014	195	88	48	101	2014.0	0.80 [0.75, 0.85]	0.53 [0.46, 0.61]

Appendix 9. Effect of test brand on accuracy of proteinuria

Figure 22

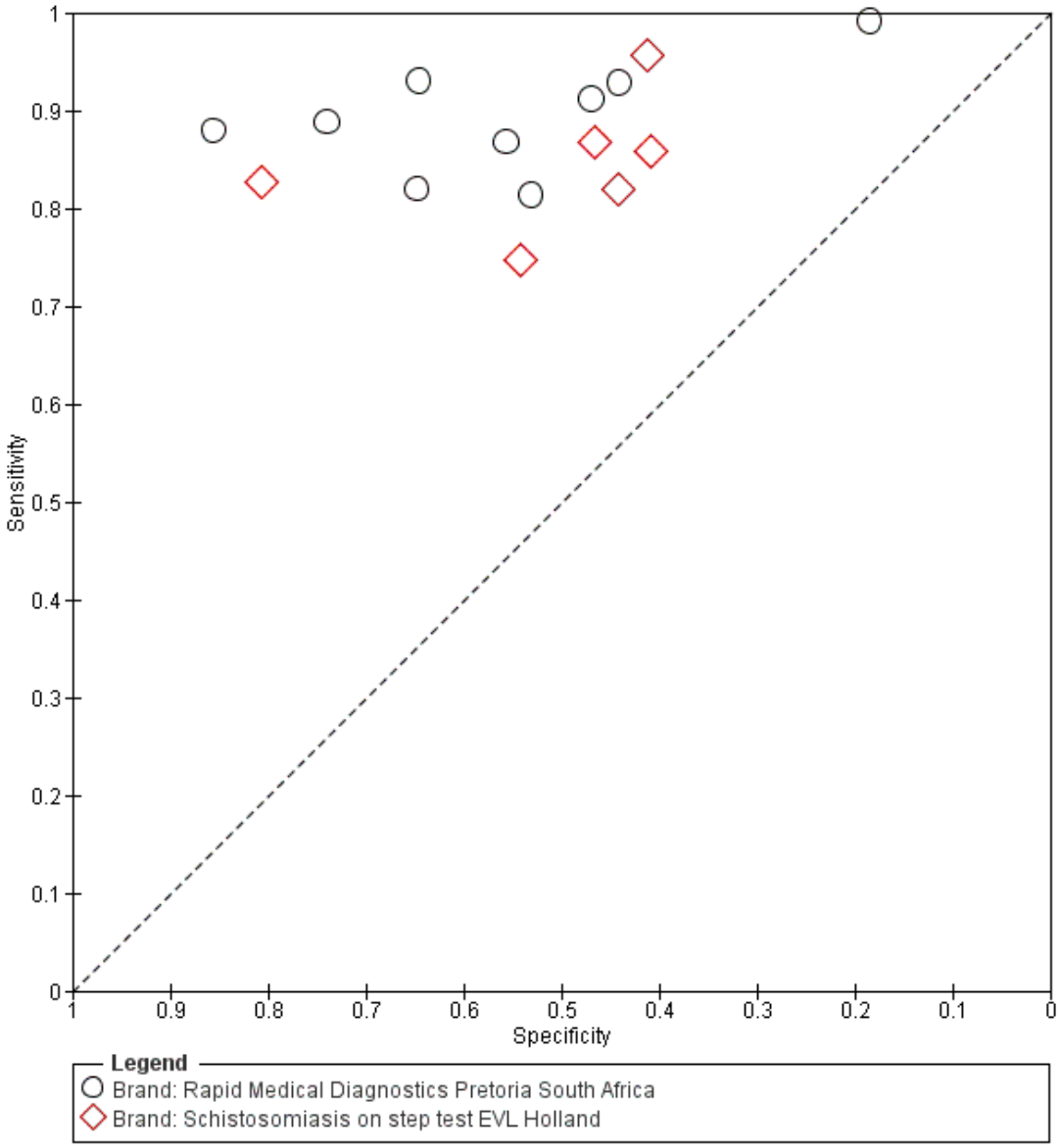
Figure 22. Summary ROC plot showing effect of test brand on sensitivity and specificity of proteinuria.



Appendix 10. Effect of test brand on accuracy of CCA POC *S. mansoni*

Figure 23

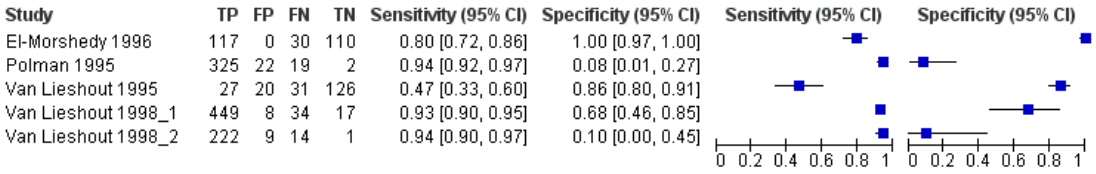
Figure 23. Summary ROC plot showing effect of test brand on sensitivity and specificity of CCA POC mansoni.



Appendix 11. Forest plot of sensitivity and specificity of serum CAA ELISA for *S. mansoni*

Figure 24

Figure 24. Forest plot of sensitivity and specificity of serum CAA ELISA for S. mansoni.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

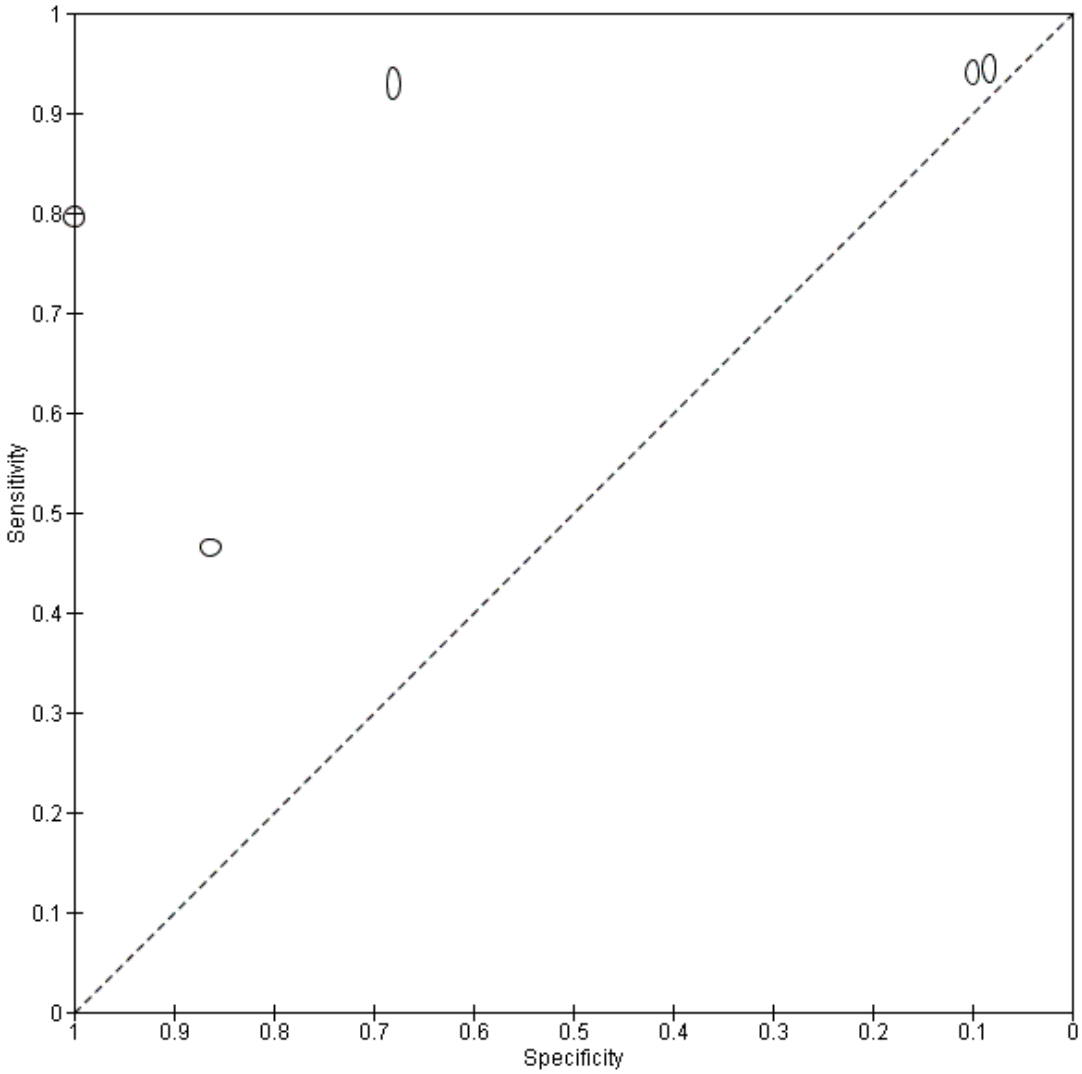


Squares represent the sensitivity and specificity of one study. The black line shows its confidence interval.

Appendix 12. Summary ROC plot of sensitivity versus specificity of serum CAA ELISA for *S. mansoni*

Figure 25

Figure 25. Summary ROC plot of sensitivity versus specificity of serum CAA ELISA for S. mansoni. The size of the points is proportional to the study sample size.

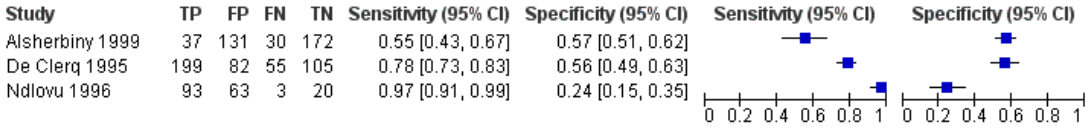


The size of the points is proportional to the study sample size.

Appendix 13. Forest plot of sensitivity and specificity of serum CAA ELISA for *S. haematobium*

Figure 26

Figure 26. Forest plot of sensitivity and specificity of serum CAA ELISA for S. haematobium.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

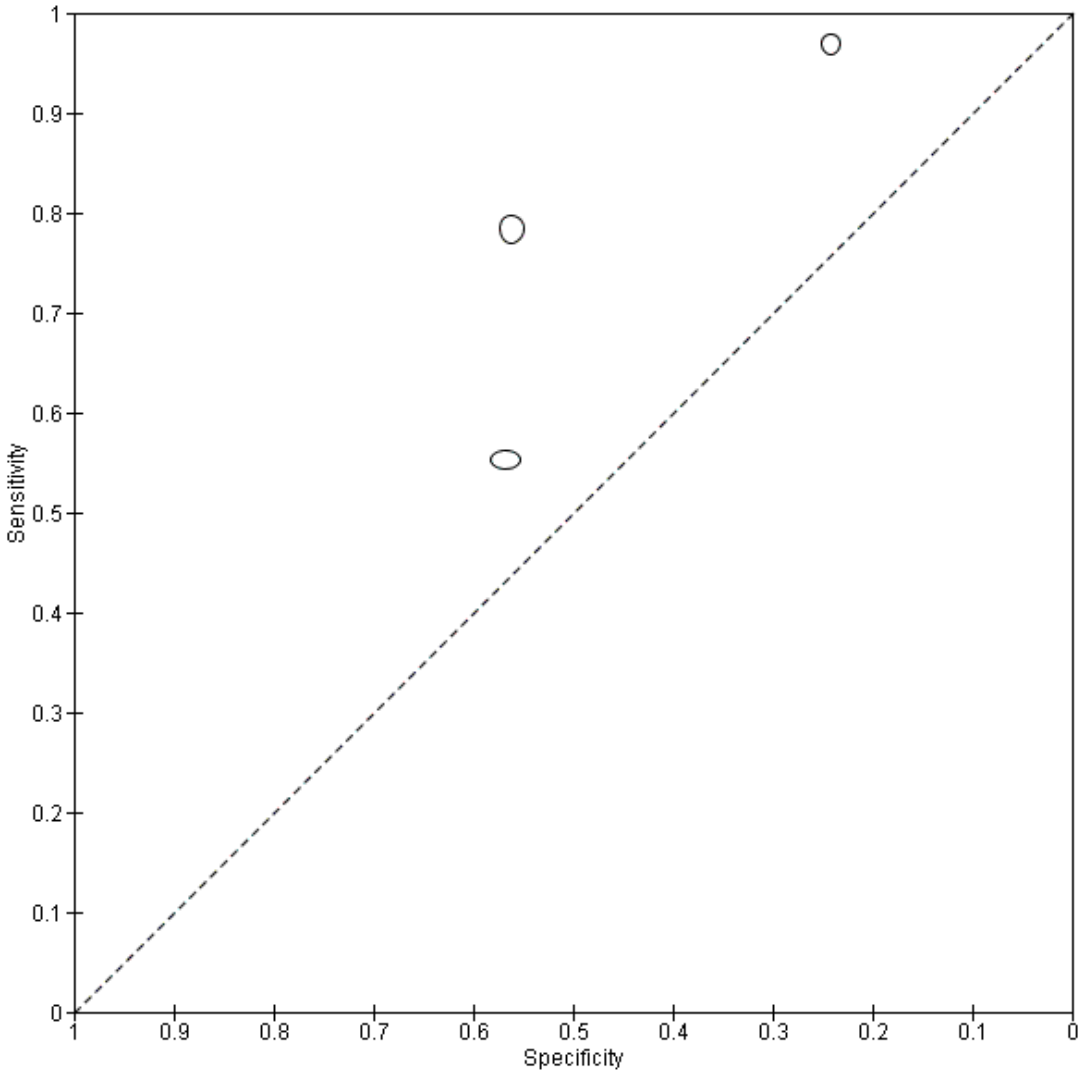


Squares represent sensitivity and specificity of one study. The black line shows its confidence interval.

Appendix 14. Summary ROC plot of sensitivity versus specificity of serum CAA ELISA for *S. haematobium*

Figure 27

Figure 27. Summary ROC plot of sensitivity versus specificity of serum CAA ELISA for S. haematobium. The size of the points is proportional to the study sample size

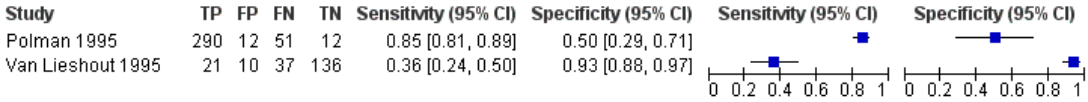


The size of the points is proportional to the study sample size.

Appendix 15. Forest plot of sensitivity and specificity of serum CCA ELISA for *S. mansoni*

Figure 28

Figure 28. Forest plot of sensitivity and specificity of serum CCA ELISA for S. mansoni.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.

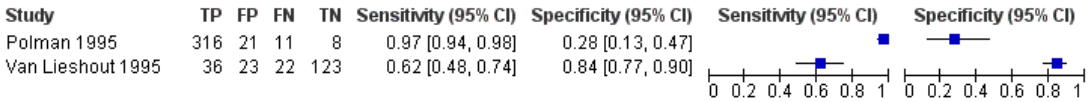


Squares represent sensitivity and specificity of one study. The black line shows its confidence interval.

Appendix 16. Forest plot of sensitivity and specificity of urine CCA ELISA for *S. mansoni*

Figure 29

Figure 29. Forest plot of sensitivity and specificity of urine CCA ELISA for S. mansoni.Squares represent the sensitivity and specificity of one study, the black line its confidence interval.



Squares represent sensitivity and specificity of one study. The black line shows its confidence interval.

Appendix 17. Comparison of KK smears and CCA POC against other reference standards (as reported by study authors)

Study	Ref std	Index test				
		KK			1 CCA	
			Sensitivity	Specificity	Sensitivity	Specificity
Coulibaly 2011_ Setting C	9KK	1 KK	83 (76-88)	100 (77-100)	90 (83-94)	85 (55-99)
		2 KK	86 (80-91)	100 (77-100)		
		3 KK	94 (89-97)	100 (77-100)		

(*Continued*)

Tchuente 2012	9KK	1 KK	54 (49-59)	100	84 (81-88)	61 (55-68)
		3 KK	68 (64-74)	100		
Erko 2013	6KK	1 KK	70 (65-75)	100	93 (90-96)	65 (59-70)
		2 KK	81 (77-85)	100		
Lodh 2013	PCR	1 KK	57 (47-68)	100 (69-100)	67 (56-77)	60 (26-88)

F E E D B A C K

Feedback from Dr Charles King, 17 March 2015

Summary

Point 1:

I feel that the current review's results and conclusions are misleading. The inappropriate analysis used in the HSROC estimation results in incorrect conclusions about the diagnostic performance of both antigen tests and dipsticks. The main objection I have is to the use of microscopic detection of eggs as the reference standard for the diagnosis of Schistosoma infection. Microscopy to detect *S. mansoni* or *S. japonicum* eggs in stool or *S. haematobium* eggs in filtered urine has long been known to be poorly sensitive for moderate and low intensity infections. When subjects are repeatedly tested for 7-15 days in a row, single day egg visualization has a sensitivity of 40-60%. The poor performance of microscopy for *S. mansoni* has been well documented by de Vlas and colleagues [1, 2] for *S. japonicum* by Carabin, et al.[3] and Hubbard, et al. [4] and for *S. haematobium* by Savioli et al.[5] and Warren, et al [6], among others.

Point 2:

Given the lack of a true 'gold standard' and a sensitivity by microscopy of ~50%, a more appropriate approach for the review would have been Latent Class Analysis (LCA), in which results from two or more imperfect tests are used together to estimate an unmeasured 'true' infection status. In stating that the antigen test 'misclassify' (i.e., have poor specificity), the review claims that a person with a positive POC CCA and negative stool examination is not infected. In fact, several lines of evidence appear to indicate that many if not most of those who have negative stool examinations but positive POC CCA results are, in fact, infected. [7, 8, 9, 10, 11]

Point 3:

I would also encourage the authors to include results from populations or areas without significant Schistosoma risk. Measuring results among persons with very low pre-test probability of infection can contribute greatly to assessing the specificity of new tests.

Point 4:

Could the authors revisit the data using the LCA approach of Dendukuri, et al., 2012 [12] for situations in which there is no gold standard? Their SAS code is available online, and the reanalysis could be done in a matter of a day. A revised review, reflecting the LCA approach, would do much to remove the confusion about these tests in policy circles.
I agree with the conflict of interest statement below:
I certify that I have no affiliations with or involvement in any organization or entity with a financial interest in the subject matter of my feedback.

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Reply

Point 1:

We would like to thank Professor King for his comment, although we do believe that the analysis used was appropriate. The limitations of microscopy as a reference standard have been acknowledged several times in our review. In the main text, we interpret the sensitivity of all tests as percentage of microscopy positives retrieved by the index test; and the specificity as microscopy negatives found negative by the index test. We therefore believe that our review gives better insight in the proportion of cases detected and missed by microscopy, which is still a commonly used tool in practice. Our discussion and conclusion within the main text and abstract reflect this. However we agree that the final line of the Plain Language Summary may be misleading, and we have therefore corrected this, incorporating the likely low sensitivity of egg counts (see below).

Moreover, attempts have been made by researchers to improve the quality of the microscopy (by increasing the number of samples or slides used) as the reference standard. A higher quality reference standard may be expected to detect more of the lower intensity infections. We showed how this affects the index test's estimates. For *S. mansoni*, in studies with a higher quality reference standard the specificity of the POC-CCA increased. This strongly supports our, and your, conclusion that the apparent low specificity of POC-CCA is due to low sensitivity of the microscopy reference standard. POC-CCA may be more sensitive than Kato-Katz, particularly in low endemicity areas. Conversely, for *S.haematobium* the sensitivity of microhaematuria was lower in studies using a higher quality reference standard. The extra infections found by the higher quality reference standard were not picked up by microhaematuria dipsticks.

Point 2:

The proposed latent class analysis (LCA) approach for meta-analysis of diagnostic accuracy data takes into account the imperfect nature of the reference standard to come to a 'true' sensitivity and specificity. However, in latent class models, the target condition is a statistical entity and is not defined in a clinical way. The interpretation and use of accuracy results based on latent class models may therefore be challenging in practice, as clinicians are unclear about the target condition or what the results stand for. This target condition may reflect infection status, but there may also be another, unknown underlying latent patient status that does not necessarily correlate with infection. At least in our meta-analyses, we know what the limitations are and we know how to interpret the results.

We agree that 'misclassify' may not be the appropriate term and we will replace it in the abstract of the review with the first update. We have corrected the Plain Language Summary, incorporating the likely low sensitivity of egg counts. The end of the plain language summary now states

"For intestinal schistosomiasis, the parasite antigen urine test classifies many microscopy negative people as being infected. This finding may be explained by the low sensitivity of microscopy."

Point 3:

We understand the value of assessing the accuracy of these tests in non-endemic areas. However, we wanted to focus our review to endemic populations where disease control programs are mostly based and where diagnostic methods and control interventions are mostly applied. Yet, in the discussion we have included comments on the high specificity of POC-CCA tests in non-endemic areas. This was to strengthen our argument that the low specificity calculated from our meta analyses is likely due to low sensitivity of the commonly used reference standard (i.e. microscopy).

Point 4:

As explained above, the interpretation of LCA results may not be as straightforward as indicated. Moreover, the validity of results produced by LCA models depends on the specifications of the statistical model and the assumptions made when modelling the data. Especially determining the appropriate levels of dependence between tests complicates interpretation and the actual conduct of the models.

In summary, we whole heartedly agree on the potential benefits of LCA, but would like to see more research done on the validity, variability and interpretation of the models before using it at a regular basis and accepting it as the true gold standard approach for these meta-analyses in infectious diseases.

Contributors

All authors contributed to drafting this response.

WHAT'S NEW

Date	Event	Description
8 July 2015	Feedback has been incorporated	Feedback from Dr Charles King and responses from authors incorporated into the review
8 July 2015	Amended	Review amended to incorporate small change in Plain Language Summary and feedback from contributor

CONTRIBUTIONS OF AUTHORS

Writing of first draft of review: Eleanor Ochodo.

Methodological advice: Mariska Leeflang, Johannes Reitsma, Patrick Bossuyt.

Content advice: Lisette Van Lieshout, Katja Polman, Poppy Lamberton.

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DECLARATIONS OF INTEREST

The review authors have reported no conflicts of interest.

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External sources

- No sources of support supplied

DIFFERENCES BETWEEN PROTOCOL AND REVIEW

Title of the review: To make the title of the review more specific to the tests that we evaluated, we have changed the title from "Rapid diagnostic tests for human schistosomiasis in endemic areas" to "Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas."

We used QUADAS-2 to assess the methodological quality of studies included in the review. In the protocol, we stated that we would use the original QUADAS tool to assess quality and planned to perform a sensitivity analysis of the individual quality (QUADAS) items 4, 7, 8, 10, and 11, to explore whether the results that we found are robust for methodological challenges. Items 10 and 11 are not included in QUADAS-2. We instead assessed whether reference tests could classify the target condition as a co-variate.

In the protocol, we stated that we would analyze the intensity of infection as numerical co-variates. Because of poor reporting, we converted the data into categorical co-variates, including intensity of infection (light, moderate, heavy, unclear).

In the protocol, we also stated that we would estimate the sensitivity of urine reagent strips and urine CCA POC at positivity thresholds of +1 and $\geq$ +1. Instead we estimated the accuracy at thresholds > trace and > +1, as these data were most commonly provided.

As part of the post hoc analyses, we noted that three evaluations had substantial heterogeneity for the tests microhaematuria (Aryeetey 2000; sensitivity 55%, specificity 36%), proteinuria (Aryeetey 2000; sensitivity 38%, specificity 11%), and CCA POC for *S. mansoni* (Standley 2010; sensitivity 99%, specificity 19%). We excluded these evaluations in sensitivity analyses for the respective tests, as shown in the Results section.

INDEX TERMS

Medical Subject Headings (MeSH)

*Reagent Strips; *Schistosoma haematobium [immunology]; *Schistosoma mansoni [immunology]; Antigens, Helminth [blood]; Cross-Sectional Studies; Hematuria [diagnosis]; Microscopy; Prevalence; Proteinuria [diagnosis]; Reference Standards; Schistosomiasis haematobia [blood; *diagnosis; immunology; urine]; Schistosomiasis mansoni [blood; *diagnosis; immunology; urine]; Sensitivity and Specificity

MeSH check words

Adult; Animals; Child; Female; Humans; Male