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

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

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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% (4 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 in endemic 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?

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

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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 can wrongly classify many uninfected people as infected.

**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*, *S. haematobium*, *S. japonicum*, *S. intercalatum*, and *S. 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 schistosomiasis.
schistosome worms (Gryseels 2012; Rollinson 2013). Mass praziquan- 
etel 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 re-
ports have described heterogeneities in egg reduction rates and 
in systematic non-clearers of infection after treatment with praz-
iquantel (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 moni-
toring 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 
chistosome antigens in serum or urine samples, and detection of 
_Schistosoma_-specific DNA in urine, stool, or blood. Indirect meth-
ods include questionnaires, biochemical tests (urine reagent strips 
for microhaematuria/proteinuria/leukocyturia), antibody tests, ul-
trasonography, computed tomography (CT) scan, magnetic reso-
nance 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 diag-
nosing 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 sensi-
tivity of microscopy decreases as the result of reduced infection in-
tensity. 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 alter-
natives to microscopy for diagnosis of schistosomiasis. Compared 
with microscopy, urine reagent strips used to detect microhaema-
uria or proteinuria as a proxy for *S. haematobium* infection are 
cheap, quick, and easy to use (Mort 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)-fea-
tures 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 dis-

eases. 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 treat-
ment (Cavalcanti 2013; Rollinson 2013). However, the sensitiv-
ity of these tests has been shown to vary with prevalence of dis-
ease 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 treat-
ment strategies in endemic areas vary with results of these tests 
(Appendix 2) and depend on financial and human resource capaci-
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 estimate 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 S. haematobium 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 leukocy turia (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 ery throcytes/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 FNPs.

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 ≥ 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 test type 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 het-
ergenecity; 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.

# of records identified through database searching
N = 17,477

# of additional records identified through other sources
N = 0

# of records after duplicates removed
N = 13,085

# of titles & abstracts screened
N = 13,085

# of abstracts excluded
N = 12,933

# of full-text articles assessed for eligibility
N = 152

*# of full-text articles excluded
N = 52

# of studies included in qualitative synthesis
N = 90

# of studies included in quantitative synthesis
N = 85
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.

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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.

Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)
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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%
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.

| Study                | TP  | FP  | FN  | TN  | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|----------------------|-----|-----|-----|-----|----------------------|----------------------|----------------------|----------------------|
| Abdel-Wahhab 1992   | 48  | 20  | 98  | 260 | 0.32 [0.25, 0.41]    | 0.93 [0.89, 0.98]    |                      |                      |
| Gunderson 1996      | 37  | 160 | 45  | 45  | 0.77 [0.50, 0.84]    | 0.25 [0.19, 0.30]    |                      |                      |
| Poggenburg 2010_settingA | 4  | 52  | 3   | 76  | 0.67 [0.16, 0.93]    | 0.65 [0.30, 0.61]    |                      |                      |
| Poggenburg 2010_settingB | 38 | 32  | 29  | 28  | 0.57 [0.44, 0.69]    | 0.48 [0.35, 0.61]    |                      |                      |
| Rasendranino 1988   | 238 | 30  | 102 | 67  | 0.57 [0.52, 0.61]    | 0.76 [0.69, 0.83]    |                      |                      |
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.

| Study      | TP  | FP  | FN  | TN  | Prevalence | Ref/Std | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|------------|-----|-----|-----|-----|------------|---------|----------------------|----------------------|----------------------|----------------------|
| Ashton 2011| 28  | 45  | 45  | 153 | Moderate   | No      | 0.37 [0.26, 0.49]    | 0.75 [0.72, 0.78]    |                      |                      |
| Meri 2009  | 80  | 23  | 78  | 78  | Moderate   | Yes     | 0.78 [0.70, 0.86]    | 0.44 [0.36, 0.53]    |                      |                      |
| Ayele 2008 | 51  | 39  | 47  | 83  | Moderate   | No      | 0.52 [0.42, 0.63]    | 0.64 [0.54, 0.73]    |                      |                      |
| Stothard 2010a | 4  | 2   | 42  | 102 | Moderate   | No      | 0.06 [0.02, 0.21]    | 0.88 [0.83, 1.01]    |                      |                      |
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.

| Study                  | TP | FP | FN | TN | Sensitivity (95% CI) | Specificity (95% CI) |
|------------------------|----|----|----|----|----------------------|----------------------|
| Adhikari 2014 Setting A| 8  | 42 | 2  | 59 | 0.75 [0.66, 0.87]     | 0.54 [0.44, 0.66]    |
| Adhikari 2014 Setting B| 49 | 62 | 6  | 72 | 0.67 [0.74, 0.59]     | 0.47 [0.38, 0.55]    |
| Adhikari 2014 Setting C| 63 | 75 | 3  | 63 | 0.59 [0.68, 0.59]     | 0.41 [0.33, 0.50]    |
| Adu 2013                | 64 | 53 | 9  | 151| 0.69 [0.76, 0.59]     | 0.74 [0.67, 0.80]    |
| Colley 2013_Uganda     | 114| 159| 11 | 178| 0.61 [0.65, 0.56]     | 0.47 [0.42, 0.52]    |
| Coulibaly 2013_Colley2013|278|42 |39 |249| 0.83 [0.84, 0.91]     | 0.96 [0.61, 0.99]    |
| Coliubaly 2013_HK      | 52 | 104| 6  | 62 | 0.93 [0.90, 0.99]     | 0.44 [0.37, 0.52]    |
| Erko 2012_Colley 2013  | 306| 103|23 |168| 0.83 [0.90, 0.99]     | 0.65 [0.59, 0.70]    |
| Legesse 2007           | 130| 50 |21 |43 | 0.86 [0.80, 0.91]     | 0.41 [0.31, 0.51]    |
| Legesse 2008           | 55 | 65 |12 |52 | 0.82 [0.71, 0.93]     | 0.44 [0.35, 0.54]    |
| Naverabaham 2012       | 149| 161|34 |255| 0.81 [0.75, 0.87]     | 0.53 [0.48, 0.56]    |
| Shane 2011_Colley 2013 | 231| 66 |39 |33 | 0.87 [0.92, 0.91]     | 0.56 [0.53, 0.56]    |
| Shane 2010             | 118| 44 |1 |10 | 0.89 [0.95, 1.00]     | 0.19 [0.09, 0.31]    |
| Stothard 2006          | 116| 26 |24 |105| 0.83 [0.76, 0.90]     | 0.31 [0.73, 0.97]    |
| Tchuente 2012_Colley2013|41 |31 |9 |57 | 0.82 [0.66, 0.91]     | 0.65 [0.54, 0.75]    |
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.

CCA 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 \( \geq 1 \), 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 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)  
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

| Test types | Number of evaluations | Summary estimates (95% CI) | In 1000 people tested |
|------------|-----------------------|----------------------------|----------------------|
|            |                       |                            | Infected cases       | Missed cases (FNs) | False-positives (FPs) | All positives (TPs + FPs) |
|            |                       |                            | *S. haematobium*     |                     |                        |                       |

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| Biochemical urine reagent strips | Sens | Spec | Number of evaluations | Number of differences in overall accuracy |
|----------------------------------|------|------|-----------------------|------------------------------------------|
| For microhaematuria              | 75%  | 87%  | 102                   | 77                                       |
|                                  | (71% to 79%) | (84% to 90%) | 384                      |                                           |
| For proteinuria                  | 61%  | 82%  | 160                   | 106                                      |
|                                  | (53% to 68%) | (77% to 88%) | 356                      |                                           |
| For leukocyturia                 | 58%  | 61%  | 172                   | 230                                      |
|                                  | (44% to 71%) | (34% to 88%) | 468                      |                                           |

| Circulating cathodic antigen test (CCA) | Sens | Spec | Number of evaluations | Number of differences in overall accuracy |
|----------------------------------------|------|------|-----------------------|------------------------------------------|
| Urine POC test                         | 39%  | 78%  | 250                   | 94                                       |
|                                        | (6% to 73%) | (55% to 100%) | 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 proteinuria are carried out and compared |
|                                |                 |                                                          | Proteinuria would be expected to miss 14% more cases than microhaematuria   |
|                                |                 |                                                          | Proteinuria would be expected to falsely identify 5% more cases than microhaematuria |
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.

Studies were insufficient to provide summary estimates for the CAA tests. When the tests were evaluated against the higher-quality reference standard (i.e., 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) |
| 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.

| Study types | 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) | 33 | | | | | |
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 ≥ 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 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 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            |              | Low                    |
| Was a case-control design avoided?                | Yes                |              |                        |
| Did the study avoid inappropriate exclusions?     | Unclear            |              |                        |

**DOMAIN 2: Index Test RS-Microhaematuria**
| Question                                                                 | Unclear |
|-------------------------------------------------------------------------|---------|
| Were the index test results interpreted without knowledge of the results of the reference standard? |         |
| If a threshold was used, was it pre-specified?                           |         |
| Was quality control done?                                                |         |
| Low                                                                      |         |

**DOMAIN 2: Index Test RS-Proteinuria**

| Question                                                                 | Unclear |
|-------------------------------------------------------------------------|---------|
| Were the index test results interpreted without knowledge of the results of the reference standard? |         |
| If a threshold was used, was it pre-specified?                           |         |
| Was quality control done?                                                |         |
| Low                                                                      |         |

**DOMAIN 2: Index Test RS-Leukocyturia**

| Question                                                                 | Unclear |
|-------------------------------------------------------------------------|---------|
| Were the index test results interpreted without knowledge of the results of the reference standard? |         |
| If a threshold was used, was it pre-specified?                           |         |
| Was quality control done?                                                |         |

**DOMAIN 3: Reference Standard**

| Question                                                                 | Unclear |
|-------------------------------------------------------------------------|---------|
| Is the reference standards likely to correctly classify the target condition? |         |
| Were the reference standard results interpreted without knowledge       |         |
Abdel-Wahab 1992  (Continued)

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|--------------------|--------------|------------------------|
| Was quality control done? | 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 | | |

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 |
| Domain: 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

| Domain: 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 |

Low

| Domain: 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 |

Low

| Domain: 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

### 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 | | |
### DOMAIN 2: Index Test CCA POC

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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  |

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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  |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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**
### Study characteristics

| Patient sampling | Cross-sectional design; random sampling |
|------------------|------------------------------------------|
| 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) |

### Methodological quality

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

| 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

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer  |
|--------------------------------------------------------------------------|---------|
| 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 |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer  |
|--------------------------------------------------------------------------|---------|
| 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 |

### 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 (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                |              | Low                    |
| Was a case-control design avoided?                                 | Yes                |              |                        |
| Did the study avoid inappropriate exclusions?                      | Yes                |              |                        |
| **DOMAIN 2: Index Test CCA POC**                                    |                    |              | Low                    |
| 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            |              |                        |
| **DOMAIN 3: Reference Standard**                                   |                    |              | Low                    |
| 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  

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

**Study characteristics**

**Patient 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                |              |                        |
| **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            |              |                        |
| **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            |              |                        |
| **DOMAIN 4: Flow and Timing**                                        |                    |              |                        |
### Adrako 2014

| 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 |

### 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 | | |
### Alsherbiny 1999  (Continued)

| Question                                                                 | Rating |
|-------------------------------------------------------------------------|--------|
| Was a case-control design avoided?                                      | Yes    |
| Did the study avoid inappropriate exclusions?                           | Unclear|
| **DOMAIN 2: Index Test CCA ELISA**                                      | Low    |
| 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|
| **DOMAIN 2: Index Test CAA ELISA**                                      | Low    |
| 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|
| **DOMAIN 3: Reference Standard**                                        | Low    |
| 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)

### DOMAIN 4: Flow and Timing

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| 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                 |              |                        |

## 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)

### Methodological quality

| Item                          | Authors' judgement | Risk of bias | Applicability concerns |
|-------------------------------|--------------------|--------------|------------------------|
| DOMAIN 1: Patient Selection   |                    |              |                        |
| Question                                                                 | 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                      |
| Domain 2: Index Test RS-Microhaematuria                                   | Low                      |
| 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                  |
| Domain 3: Reference Standard                                            | Low                      |
| 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                  |
| Domain 4: Flow and Timing                                               | Low                      |
| Was there an appropriate interval between index test and reference standard? | Yes                      |
| Did all patients receive the same reference standard?                   | Yes                      |
**Anosike 2001 (Continued)**

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Were all patients included in the analysis?                              | Yes    |

**Aryetey 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) |

### 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            |              |                        |
| **DOMAIN 2: Index Test RS-Microhaematuria**                     |                    |              | Low                    |
### Aryeetey 2000  *(Continued)*

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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**                                                                  |          |

**DOMAIN 2: Index Test RS-Proteinuria**

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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**                                                                  |          |

**DOMAIN 3: Reference Standard**

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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  |
| **Low**                                                                  |          |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| Was there an appropriate interval between index test and reference standard? | Yes      |
| Did all patients receive the same reference standard?                    | Yes      |
| **Low**                                                                  |          |
### Aryeetey 2000 (Continued)

| Were all patients included in the analysis? | Unclear |
|-------------------------------------------|---------|

### 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 | | |
| **DOMAIN 2: Index Test CCA POC** | | | Low |
### Ashton 2011 (Continued)

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |

**DOMAIN 3: Reference Standard**

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

### Ayele 2008

**Study characteristics**

| Patient sampling | Cross-sectional design; unclear sampling |
### 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 | | |
| **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 | 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 | |
| **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 | |
| **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 | |
### 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**              |                                          |
|----------------------------------|                                          |

| **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           |              | Low                    |

| **DOMAIN 2: Index Test RS-Microhaematuria** |                    |              |
| Were the index test results interpreted without knowledge of the results of the reference standard? | Yes               |              |
### Bassiouny 2014 (Continued)

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| If a threshold was used, was it pre-specified?                           | Unclear|
| Was quality control done?                                                | Unclear|

**DOMAIN 3: Reference Standard**

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| 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|

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| 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    |

**Birrie 1995 setting**

**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)

| 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 | | |
| **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 | | |
| **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 |

#### 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 |

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

### 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 | |
| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| Did the study avoid inappropriate exclusions?                          | 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?                         | No     |
| Was quality control done?                                               | 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 of the results of the index tests? | Unclear|
| Was quality control done?                                               | Unclear|
| **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|
### 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) |

### Methodological quality

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

**DOMAIN 2: Index Test RS-Microhaematuria**

| | Authors’ judgement | |
|---|---------------------|---|
| 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 | 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 |

**DOMAIN 3: Reference Standard**

| Is the reference standard 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 |

**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     |
**Bosompem 1996**

### Study characteristics

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|------------------------------------------|
| Patient character-istics 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) |

### 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 | | |
| **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 | 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 |

#### DOMAIN 3: Reference Standard

| Is the reference standard 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 |

#### 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 |
### 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 |  |  |
|  |  | **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

**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

**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

**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
### 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             |              | Low                    |
| **DOMAIN 2: Index Test CCA POC**                                     |                     |              |                         |
| Were the index test results CCA POC 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             |              | Low                    |
### DOMAIN 3: Reference Standard

| Question                                                                 | Score |
|-------------------------------------------------------------------------|-------|
| 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 |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Score |
|-------------------------------------------------------------------------|-------|
| 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 |

### 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 |
| 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            |              |                        |
|                                                                     |                    | 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                 |              |                        |
|                                                                     |                    | 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?                                            | No                 |              |                        |
**Cooppan 1987 (Continued)**

| Low |
| --- |

**DOMAIN 3: Reference Standard**

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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    |

**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)     |
|                                                                       | 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 | | |
| | **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** | | |

| **DOMAIN 3: Reference Standard** | | | |
| Is the reference standards likely to correctly classify the target condition? | Yes | | |
**Table 1. Quality Assessment Criteria**

| Criteria                                                                 | Details |
|--------------------------------------------------------------------------|---------|
| Were the reference standard results interpreted without knowledge of the results of the index test? | Unclear |
| Was quality control done?                                                | Unclear |
| **DOMAIN 4: Flow and Timing**                                            | Low     |
| 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      |

**Coulibaly 2011’ Colley2013**

**Study characteristics**

| Characteristic                                                      | Details                                                                 |
|-------------------------------------------------------------------|------------------------------------------------------------------------|
| 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, 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 | 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 | |
| **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 | |
| **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 | Low | |
### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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     |

### 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  
Was a consecutive or random sample of patients enrolled? | Yes                |              |                        |
### Was a case-control design avoided?
Yes

### Did the study avoid inappropriate exclusions?
Yes

### DOMAIN 2: Index Test CCA POC

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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    |

### DOMIAN 3: Reference Standard

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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    |

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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     |
### 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 |

**DOMAIN 2: Index Test CAA ELISA**
### De Clerq 1995 (Continued)

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |
| Low                                                                       |        |

#### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |
| Low                                                                       |        |

#### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

### 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 | | |
| | | **Low** | |

**DOMAIN 2: Index Test CAA ELISA**

| | | | |
| | | | |
| | | | |

| | | | |
| | | | |
| | | | |

| | | | |
| | | | |
### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |

**Quality:** Low

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

### El-Sayed 1995

#### Study characteristics

| Characteristic                                                                 | Details                                                                 |
|------------------------------------------------------------------------------|------------------------------------------------------------------------|
| 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) |
| 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            |              | Low                    |
| Was a case-control design avoided?                     | Yes                |              |                        |
| Did the study avoid inappropriate exclusions?          | 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            |              | Low                    |
| **DOMAIN 3: Reference Standard**                       |                    |              |                        |
| Is the reference standard 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                |              |                        |
## El-Sayed 1995  (Continued)

### DOMAIN 4: Flow and Timing

| Item                                                                 | Authors’ judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| 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 |
|--------------------------|--------------------|--------------|------------------------|
| DOMAIN 1: Patient Selection |                  |              |                        |
## Eltoum 1992  (Continued)

| Question | Answer |
|----------|--------|
| 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**

### DOMAIN 2: Index Test RS-Microhaematuria

| Question | Answer |
|----------|--------|
| 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 |

**Low**

### DOMAIN 3: Reference Standard

| Question | Answer |
|----------|--------|
| 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 |

**Low**

### DOMAIN 4: Flow and Timing

| Question | Answer |
|----------|--------|
| 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

| 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 | Low |
| **DOMAIN 2: Index Test CCA POC** |
### Erko 2013‘6KK  (Continued)

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

### 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) |
|---|

### 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 | | |
| **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 | | |

---

**Erko 2013 Colley 2013 (Continued)**
| Was quality control done? | 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 | |
| **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 | |

**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  
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** | |
| **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 | | |
| | | **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 | | |
### Etard 2004  \(\text{(Continued)}\)

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|--------------------|--------------|------------------------|
| Was quality control done? | Yes | | |
| 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 | | |

### 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 | | |

#### Methodological quality

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|--------------------|--------------|------------------------|
| | | | |
### DOMAIN 1: Patient Selection

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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**

### DOMAIN 2: Index Test RS-Microhaematuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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|

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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|

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Was there an appropriate interval between index test and reference standard? | Yes    |
**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 |
| Domain | Question                                                                 | Answer   | Low |
|--------|---------------------------------------------------------------------------|----------|-----|
| 2      | Were the index test results interpreted without knowledge of the results of the reference standard? | Unclear  |     |
| 2      | If a threshold was used, was it pre-specified?                             | Yes      |     |
| 2      | Was quality control done?                                                 | Unclear  |     |
| 3      | Is the reference standard likely to correctly classify the target condition? | No       |     |
| 3      | Were the reference standard results interpreted without knowledge of the results of the index tests? | Unclear  |     |
| 3      | Was quality control done?                                                 | Unclear  |     |
| 4      | Was there an appropriate interval between index test and reference standard? | Unclear  |     |
| 4      | Did all patients receive the same reference standard?                      | Yes      |     |
| 4      | Were all patients included in the analysis?                                | 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 > 55 years
- **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 | Low |
  - Was a case-control design avoided? | Yes |
  - Did the study avoid inappropriate exclusions? | Yes |

**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 |
|--------------------------|---------|
| **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 |
| **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 |
| **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      |
### Study characteristics

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|------------------------------------------|
| Patient characterisics 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 |  |
|  | **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 |  |
Gigase 1988  (Continued)

| Was quality control done? | 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 |

**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 |

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**Gundersen 1996**

**Study characteristics**

| Patient sampling | Cross-sectional design; consecutive sampling |
|------------------|---------------------------------------------|
| 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 |
### Gundersen 1996 (Continued)

| 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 | |
| **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 | | |
| | | 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 |
| **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 |
| **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 |
| **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    |
### 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 |

**DOMAIN 2: Index Test RS-Microhaematuria**

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*Gundersen 1996 (Continued)*

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*Hall 1999*

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| Question                                                                 | Hall 1999 (Continued) | Hammad 1997 |
|-------------------------------------------------------------------------|-----------------------|-------------|
| Were the index test results interpreted without knowledge of the results of the reference standard? | Yes                   | Cross-sectional design; random sampling |
| If a threshold was used, was it pre-specified?                           | Yes                   |             |
| Was quality control done?                                                | Unclear               |             |
| **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               |             |
| **DOMAIN 4: Flow and Timing**                                            |                       |             |
| 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               |             |
| **Low**                                                                 |                       |             |
| 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                   |             |
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** | |
| **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 | | |
|  | | **Low** | |
### DOMAIN 2: Index Test RS-Proteinuria

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| 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 |

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| 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    |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| 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    |
### 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) |

### 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 | | |
| **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 |
|--------------------------|---------|

**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 |

**Low**

**DOMAIN 3: Reference Standard**

| Is the reference standard 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 |

**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 |
|                                                                           |         |
| 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 > 55 years                                 |
| 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                |              |                        |
| **DOMAIN 2: Index Test RS-Microhaematuria**    |                    |              | Low                    |
| 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**

(Continued)

| Was quality control done? | 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 |
| **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 |
| **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 |              |                        |
| **DOMAIN 2: Index Test RS-Microhaematuria** |                    |              | Low                    |
| 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 |              |                        |
### Houmsou 2011 (Continued)

| Domain                        | Question                                                                 | Outcome |
|-------------------------------|---------------------------------------------------------------------------|---------|
| **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 |
| **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     |
| **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     |
### Study characteristics

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|------------------------------------------|
| 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 | | |
| **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 | | |
| Domain                      | Question                                                                 | Score | Score |
|-----------------------------|---------------------------------------------------------------------------|-------|-------|
| **Was quality control done?** | 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 | 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 | 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    |       |
### 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            |              |                        |
| **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 | 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 | 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 | 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 |
### 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 | Low |
| Did the study avoid inappropriate exclusions? | Yes | |
| **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

**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

**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

**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
### 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 | | |
| **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 | | |
### King 1988'b (Continued)

| Was quality control done? | 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

**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

### Kitange 1993

**Study characteristics**

| Patient sampling | Cohort design; unclear sampling |
|------------------|---------------------------------|

| 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) |
Kitange 1993  (Continued)

| 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            |              |                        |
| **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            |              |                        |
| **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                 |              |                        |
Kitange 1993  *(Continued)*

| Was quality control done? | 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 | 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 |

Legesse 2007

**Study characteristics**

| Patient sampling | Cross sectional design; unclear sampling |
|-----------------|----------------------------------------|
| Patient characterisitics 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** | |
| **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 | | |
| | | **Low** | |
### Legesse 2007 (Continued)

| Were the reference standard results interpreted without knowledge of the results of the index tests? | Unclear |
|---|---|
| Was quality control done? | Unclear |

**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 |

### 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  
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 | | |
| **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 | | |
| **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 | | |
| **DOMAIN 4: Flow and Timing** | | | |

### Legesse 2008 (Continued)

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

### 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 |  |
| 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               |              |                        |
### Lengeler 1993  
(Continued)

| Question                                                                 | Rating |
|--------------------------------------------------------------------------|--------|
| Did the study avoid inappropriate exclusions?                           | Unclear|
| **DOMAIN 2: Index Test RS-Microhaematuria**                              | **Low**|
| 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|
| **DOMAIN 3: Reference Standard**                                         | **Low**|
| 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|
| **DOMAIN 4: Flow and Timing**                                            | **Low**|
| 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    |
### 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                |              |                        |
| **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            |              |                        |
Mafe 1997  (Continued)

| Was quality control done? | 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 | 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 |

Mafe 2000

**Study characteristics**

| Patient sampling | Cross-sectional design; consecutive sampling |
|------------------|---------------------------------------------|
| Patient characterisitcs 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) |
**Mafe 2000** (Continued)

| Target condition and reference standard(s) | $S. \text{haematobium}$ 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** | |
| **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 | | |
| | | **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 | | |
Mafe 2000  (Continued)

of the results of the index tests?  

| Was quality control done? | Unclear |  |
|---------------------------|---------|---|

**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 |  |

Magnussen 2001

**Study characteristics**

| Patient sampling | Cohort design; consecutive sampling |
|------------------|-------------------------------------|
| Patient characterisics 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) |
| Target condition and reference standard(s) | *S. haematobium* infection measured by urine microscopy (filtration method) |
| Flow and timing | Comparative |

**Methodological quality**

| Item | Authors' judgement | Risk of bias | Applicability concerns |
|------|-------------------|--------------|------------------------|

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Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)  
Copyright © 2015 The Authors. The Cochrane Database of Systematic Reviews published by John Wiley & Sons, Ltd. on behalf of The Cochrane Collaboration.
### Magnussen 2001  *(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 |

| **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 |

| **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 |

| **DOMAIN 4: Flow and Timing** |
|--------------------------------|
| Was there an appropriate interval between index test and reference standard? | Unclear |
**Magnussen 2001**  *(Continued)*

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

**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

### DOMAIN 2: Index Test CCA POC

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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      |

### DOMAIN 3: Reference Standard

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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  |

### DOMAIN 4: Flow and Timing

| Question                                                                 | Response |
|--------------------------------------------------------------------------|----------|
| 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      |
### 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 by urine microscopy (centrifugation)                                      |

### 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            |              | 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 | Low |
|---------------------------------------------|---------|-----|
| Was quality control done?                   | Unclear |     |

**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 | |

**DOMAIN 3: Reference Standard**

| Is the reference standards likely to correctly classify the target condition?                     | No  | Low |
|--------------------------------------------------------------------------------------------------|-----|-----|
| Were the reference standard results interpreted without knowledge of the results of the index tests? | Unclear | |
| Was quality control done?                                                                         | Unclear |     |

**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 |
### 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 | | |
| Did the study avoid inappropriate exclusions? | 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 | | |
| Domain | Question | Yes | No | Unclear | Rating |
|--------|----------|-----|----|---------|--------|
| **DOMAIN 2: Index Test RS-Proteinuria** | Were the index test results interpreted without knowledge of the results of the reference standard? | Yes |  |  | Low |
|  | If a threshold was used, was it pre-specified? | Yes |  |  |  |
|  | Was quality control done? | 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 |  |  | 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 |  |  |  |
### 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           |              | 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 |
|--------------------------|---------|
| **DOMAIN 2: Index Test RS-Proteinuria** | **Low** |
| 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 |
| **DOMAIN 3: Reference Standard** | **Low** |
| 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 |
| **DOMAIN 4: Flow and Timing** | **Low** |
| 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 |
### 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) |

### 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 | | |
| **DOMAIN 2: Index Test RS-Microhaematuria** | | | Low |
| 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 | | |
### Mtasiwa 1996 (Continued)

| Was quality control done? | 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 of the results of the index tests? | Unclear |
| Was quality control done? | Unclear |

#### 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 |

### 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 | | |
| **DOMAIN 2: Index Test RS-Microhaematuria** | | Low | |
| 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 | | |
| **DOMAIN 2: Index Test RS-Proteinuria** | | Low | |
| 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 | | |
### Murare 1987  
*(Continued)*

| Question                                                                 | Yes/No/Ounclear | Quality |
|--------------------------------------------------------------------------|-----------------|---------|
| Was quality control done?                                                | 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

**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

### Navaratnam 2012

**Study characteristics**

| Category                     | Details                                                                 |
|------------------------------|-------------------------------------------------------------------------|
| 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 | | |
| **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 | | |
| Was quality control done? | Unclear | | |
| **DOMAIN 3: Reference Standard** | | | |
| Is the reference standards likely to correctly classify the target condition? | Yes | | |
| Were the reference standard results interpreted without knowledge | Unclear | | |
Navaratnam 2012  (Continued)

| Item                        | Authors’ judgement | Risk of bias | Applicability concerns |
|-----------------------------|--------------------|--------------|------------------------|
| Was quality control done?   | Unclear            |              | Low                    |

**DOMAIN 4: Flow and Timing**

| Item                        | Authors’ judgement | Risk of bias | Applicability concerns |
|-----------------------------|--------------------|--------------|------------------------|
| Was there an appropriate interval between index test and reference standard? | Unclear            |              | Low                    |
| Did all patients receive the same reference standard? | Yes                |              |                        |
| Were all patients included in the analysis? | Yes                |              |                        |

**Ndamukong 2001**

**Study characteristics**

| Item                        | Authors’ judgement | Risk of bias | Applicability concerns |
|-----------------------------|--------------------|--------------|------------------------|
| 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) |              |                        |
| Target condition and reference standard(s) | S. haematobium measured by urine microscopy |              |                        |
| Flow and timing             | Comparative        |              |                        |
| Notes                       |                    |              |                        |
## DOMAIN 1: Patient Selection

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Was a consecutive or random sample of patients enrolled?                 | Unclear|
| Was a case-control design avoided?                                       | Yes    |
| Did the study avoid inappropriate exclusions?                            | Unclear|

**Low**

## DOMAIN 2: Index Test RS-Microhaematuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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|

**Low**

## DOMAIN 2: Index Test RS-Proteinuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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|

**Low**

## DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Is the reference standard likely to correctly classify the target condition? | No     |
| Were the reference standard results                                      | Unclear|
### Ndamukong 2001 (Continued)

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| Interpreted without knowledge of the results of the index tests?        |        |
| Was quality control done?                                               | Unclear|
| **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    |

### Ndlovu 1996

**Study characteristics**

| Patient sampling          | Nested case-control design; unclear sampling |
|---------------------------|---------------------------------------------|
| Patient characteristics and setting | Species: *S. haematobium*  |
|                           | Country: Zimbabwe                           |
|                           | 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**

Low
| 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            |              |                        |
| **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            |              |                        |
| **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            |              |                        |
| **DOMAIN 4: Flow and Timing**                                        |                    |              |                        |
| Was there an appropriate interval between index test and reference standard? | Unclear            |              |                        |
Ndlovu 1996  (Continued)

| Did all patients receive the same reference standard? | Unclear |
|------------------------------------------------------|---------|
| Were all patients included in the analysis?          | 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, D ü ren, 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 | | |
| Domain | Question                                                                 | Answer |
|--------|--------------------------------------------------------------------------|--------|
| Low    | Nduka 1995 (Continued) |        |
| Low    | **DOMAIN 2: Index Test RS-Microhaematuria**                              |        |
|        | Were the index test results interpreted without knowledge of             | Unclear|
|        | the results of the reference standard?                                   |        |
|        | If a threshold was used, was it pre-specified?                           | Yes    |
|        | Was quality control done?                                                | Unclear|
| Low    | **DOMAIN 3: Reference Standard**                                         |        |
|        | Is the reference standards likely to correctly classify the target       | No     |
|        | condition?                                                               |        |
|        | Were the reference standard results interpreted without knowledge of    | Unclear|
|        | the results of the index tests?                                          |        |
|        | Was quality control done?                                                | Unclear|
| Low    | **DOMAIN 4: Flow and Timing**                                            |        |
|        | Was there an appropriate interval between index test and reference       | Yes    |
|        | standard?                                                                |        |
|        | Did all patients receive the same reference standard?                    | Yes    |
|        | Were all patients included in the analysis?                              | Yes    |
### 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 | | |
| | | | 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

**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

**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

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

**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

---

### NGoran 1998

**Study characteristics**

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|-----------------------------------------|

| 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 | 

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Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)  
Copyright © 2015 The Authors. The Cochrane Database of Systematic Reviews published by John Wiley & Sons, Ltd. on behalf of The Cochrane Collaboration.
| 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                    |
| **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             |              | 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             |              | 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

Ngându 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)

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**

**DOMAIN 2: Index Test RS-Microhaematuria**

| Question | Answer |
|---|---|
| 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 |

**Low**

**DOMAIN 2: Index Test RS-Proteinuria**

| Question | Answer |
|---|---|
| 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 |

**Low**

**DOMAIN 3: Reference Standard**

| Question | Answer |
|---|---|
| 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 |

**Low**

**DOMAIN 4: Flow and Timing**
Ngándu 1988  *(Continued)*

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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     |

Nmorsi 2005

**Study characteristics**

| Section                              | Information                                                                 |
|--------------------------------------|-----------------------------------------------------------------------------|
| 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            |               |                        |
| Domain                        | Question                                                                 | Answer |
|-------------------------------|---------------------------------------------------------------------------|--------|
| **DOMAIN 1: Study Selection** | **Was a case-control design avoided?**                                   | Yes    |
|                               | **Did the study avoid inappropriate exclusions?**                        | No     |
|                               | **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 |
|                               | **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 |
|                               | **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 |

**Notes:**
- Unclear
- Low
### Nmorsi 2005 (Continued)

| 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 |

### 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) |
| 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 | | | |
### Nwaorgu 1992  (Continued)

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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**                                                                |        |
| **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|
| **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|
| **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|

Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)  
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Nwaorgu 1992  (Continued)

| Was quality control done? | Unclear |
|---------------------------|---------|

**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 |

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) |

| 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**
| Question                                                                 | Rating   |
|-------------------------------------------------------------------------|----------|
| Was a consecutive or random sample of patients enrolled?                | Unclear  |
| Was a case-control design avoided?                                      | Yes      |
| Did the study avoid inappropriate exclusions?                           | 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  |
| **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  |
| **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  |
### Ofori 1986 (Continued)

| Was quality control done? | Unclear |  |
|----------------------------|---------|---|

**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     |  |

### Okeke 2014: setting A

**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, Dü ren, Germany) |
|-------------|--------------------------------------------------------------------------------------|

| Target condition and reference standard(s) | *S. haematobium* infection measured by urine microscopy (sedimentation method) |
|--------------------------------------------|--------------------------------------------------------------------------------|

### 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

| **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 |

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 |

Low

| **DOMAIN 3: Reference Standard** |  |
|---------------------------------|---|
| Is the reference standards likely to correctly classify the target condition? | No |
| Were the reference standard results | Unclear |
interpreted without knowledge of the results of the index tests?

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Was quality control done?                                               | Unclear|

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

**Okeke 2014 setting B**

### Study characteristics

| Category                          | Details                                                                 |
|-----------------------------------|------------------------------------------------------------------------|
| **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 Niger cem, 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) |
| **Target condition and reference standard(s)** | *S. haematobium* measured by urine microscopy (sedimentation method) |

### Methodological quality

| Quality |
|---------|
| Low     |
###DOMAIN 1: Patient Selection

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

###DOMAIN 2: Index Test RS-Microhaematuria

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| Were the index test results interpreted without knowledge of the results of the reference standard? | Yes                | Low          |                        |
| If a threshold was used, was it pre-specified?                       | Unclear            | Low          |                        |
| Was quality control done?                                            | Unclear            | Low          |                        |

###DOMAIN 2: Index Test RS-Proteinuria

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| Were the index test results interpreted without knowledge of the results of the reference standard? | Yes                | Low          |                        |
| If a threshold was used, was it pre-specified?                       | Unclear            | Low          |                        |
| Was quality control done?                                            | Unclear            | Low          |                        |

###DOMAIN 3: Reference Standard

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| Is the reference standards likely to correctly classify the target condition? | No                 | Low          |                        |
Were the reference standard results interpreted without knowledge of the results of the index tests? | Unclear
---|---
Was quality control done? | Unclear

**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

**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) |
| Target condition and reference standard(s) | *S. haematobium* infection measured by urine microscopy (sedimentation method) |

Flow and timing

Comparative

Notes
| Item                                                                 | Authors’ judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| **DOMAIN 1: Patient Selection**                                       |                    |              |                        |
| Was a consecutive or random sample of patients enrolled?             | Yes                |              | Low                    |
| Was a case-control design avoided?                                   | Yes                |              |                        |
| Did the study avoid inappropriate exclusions?                        | Yes                |              |                        |
| **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            |              | 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            |              | Low                    |
| **DOMAIN 4: Flow and Timing**                                         |                    |              |                        |
### Onayade 1996 (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 |

### 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

| 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 |
| **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 |
| **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 |
| **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 |
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

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

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: 128
Age range: 15 to 60 years
Participants: women of childbearing age
Setting: field study (high 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

| 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

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|---------------------|--------------|------------------------|

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

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|---------------------|--------------|------------------------|

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

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|---------------------|--------------|------------------------|
| 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 |
| **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 |
| **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 |
### 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 | | |
| | | **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 | 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 | |
| **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 | |
| **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 | |
### Study characteristics

| Category                          | Details                                                                                                                                 |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|
| 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             |              |                         |
| **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

**DOMIAN 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

**DOMIAN 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

**DOMIAN 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
### 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 | | |
| Did the study avoid inappropriate exclusions? | Unclear | | |
| | | Low | |
| **DOMAIN 2: Index Test RS-Microhaematuria** | | | |
| Were the index test results interpreted without knowledge of the results of the reference standard? | Unclear | | |
|                        | Rasendramino 1998  
|------------------------|---------------------|
| **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 |
|                         | 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 |
|                         | 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 |
|                         | Low |
### Rasendramino 1998

(Continued)

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Authors’ judgement |
|-------------------------------------------------------------------------|---------------------|
| 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                 |

### 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            |              |                        |
Robinson 2009 (Continued)

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| Was a case-control design avoided?                                      | No     |
| Did the study avoid inappropriate exclusions?                           | Unclear|
| **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|
| **DOMAIN 3: Reference Standard**                                         |        |
| Is the reference standard 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     |
| **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    |
### 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          |                        |

**DOMAIN 2: Index Test RS-Microhaematuria**
### Rollinson 2005 (Continued)

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**DOMAIN 3: Reference Standard**

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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     |

### 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 |                   | Low                    |
| Was a case-control design avoided? | Yes |                   |                        |
| Did the study avoid inappropriate exclusions? | 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 |                   |                        |
### DOMAIN 2: Index Test RS-Proteinuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Is the reference standard 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 |

**Low**

### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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     |
### 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 | | |
| **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 | 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 |

**DOMAIN 3: Reference Standard**

| Is the reference standard 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 |

**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 |
### 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 | | |
| **DOMAIN 2: Index Test RS-Microhaematuria** | | | Low |
| 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 | | |
### Savioli 1990 (Continued)

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

### Sellin 1982

**Study characteristics**

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|----------------------------------------|
| 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 |
Sellin 1982  (Continued)

| 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 | | |
| | | 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 | | |
| | | 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 |

**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 |

**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 |

**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            |              | 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                    |
| **DOMAIN 3: Reference Standard**                                      |                    |              |                        |
| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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    |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|------------------------------------------------------------------------|--------|
| 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    |

**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  
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            |              |                        |
| **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            |              |                        |
| **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            |              |                        |
### Domain 4: Flow and Timing

| Question                                           | Answer |
|----------------------------------------------------|--------|
| 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    |

### 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 |
|-------|

**Methodological quality**

| Item                                           | Authors' judgement | Risk of bias | Applicability concerns |
|------------------------------------------------|--------------------|--------------|------------------------|
| **DOMAIN 1: Patient Selection**                |                    |              |                        |
| Was a consecutive or random sample of patients enrolled? | Unclear            |              |                        |
| Standley 2010  (Continued) |
|--------------------------------------------------|
| **Was a case-control design avoided?** | Yes |
| **Did the study avoid inappropriate exclusions?** | Unclear |
| **DOMAIN 2: Index Test CCA POC** | Low |
| **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 |
| **DOMAIN 3: Reference Standard** | Low |
| **Is the reference standard 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 |
| **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 |
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 |  |  |
| Did the study avoid inappropriate exclusions? | Yes |  |  |
|  |  | Low |  |
| **DOMAIN 2: Index Test RS-Microhaematuria** |  |  |  |
| Stepenson 1984  | (Continued) |
|----------------|-------------|
| **W**ere 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 |
| **W**as quality control done? | Unclear |
| **DOMAIN 2: Index Test RS-Proteinuria** |
| **W**ere 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 |
| **W**as quality control done? | Unclear |
| **DOMAIN 3: Reference Standard** |
| **Is the reference standards likely to correctly classify the target condition?** | Unclear |
| **W**ere the reference standard results interpreted without knowledge of the results of the index tests? | Unclear |
| **W**as quality control done? | Unclear |
| **DOMAIN 4: Flow and Timing** |
| **W**as there an appropriate interval between index test and reference standard? | Yes |
| **D**id all patients receive the same reference standard? | Yes |
| **Low** | **Low** |
Stephenson 1984  (Continued)

| Were all patients included in the analysis? | Yes |

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) |

**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 | | |
| **DOMAIN 2: Index Test CCA POC** | | | Low |
**Stothard 2006**

(Continued)

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |
|                      |        | **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 |
|                      |        | **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    |

**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

### 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                |              | Low                    |
| Did the study avoid inappropriate exclusions?  | Yes                |              |                        |
| **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            |              | Low                    |
### Stothard 2009a (Continued)

#### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**Low**

#### DOMAIN 4: Flow and Timing

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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    |

### Stothard 2009b

#### Study characteristics

| Category                        | Details                                                                                                                                                                                                 |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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 |
| Index tests                     | RS-Microhaematuria (Hemastix, Bayer, Sudbury, UK)                                                                                                                                                         |
| Target condition and reference standard(s) | *S. haematobium* infection measured by urine microscopy (filtration method)                                                                                                                                  |
### Methodological quality

| Item                                                                 | Authors’ judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| **DOMAIN 1: Patient Selection**                                      |                    |              |                        |
| Was a consecutive or random sample of patients enrolled?            | Unclear            |              | Low                    |
| Was a case-control design avoided?                                  | Yes                |              |                        |
| Did the study avoid inappropriate exclusions?                       | 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?                      | Yes                |              |                        |
| Was quality control done?                                           | Unclear            |              | Low                    |
| **DOMAIN 3: Reference Standard**                                    |                    |              |                        |
| Is the reference standard 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            |              |                        |
**DOMAIN 4: Flow and Timing**

| Question                                                                 | Yes |
|-------------------------------------------------------------------------|-----|
| 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 |

**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 | |

**Methodological quality**

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|---------------------|--------------|------------------------|
| DOMAIN 1: Patient Selection | | | |
Tanner 1983' 1  (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                                                    |     |
| **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 |
|                                                       |     |
| 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 |
|                                                       |     |
| 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 |
### Tanner 1983'1 (Continued)

| Item                          | Authors' judgement | Risk of bias | Applicability concerns |
|-------------------------------|--------------------|--------------|------------------------|
| Tanner 1983'1                |                    | Low          |                        |
| **Was quality control done?** | Unclear            |              |                        |

### DOMAIN 4: Flow and Timing

| Item                                      | Authors' judgement | Risk of bias | Applicability concerns |
|-------------------------------------------|--------------------|--------------|------------------------|
| **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                |              |                        |

### Tanner 1983’2

**Study characteristics**

| Item                                      | Authors' judgement | Risk of bias | Applicability concerns |
|-------------------------------------------|--------------------|--------------|------------------------|
| 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**                       | Comparative        |              |                        |
| **Notes**                                 |                    |              |                        |

**Methodological quality**

| Item                                      | Authors' judgement | Risk of bias | Applicability concerns |
|-------------------------------------------|--------------------|--------------|------------------------|
### DOMAIN 1: Patient Selection

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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**

### DOMAIN 2: Index Test RS-Microhaematuria

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**Low**

### DOMAIN 2: Index Test RS-Proteinuria

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**Low**

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| Is the reference standards likely to correctly classify the target condition? | Unclear |
| Were the reference standard results                                      | Unclear |
Tanner 1983 (Continued)

| Interpreted without knowledge of the results of the index tests? | Yes |
|---------------------------------------------------------------|-----|
| Was quality control done?                                     | Unclear |

**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 |

**Tchuente 2012 9KK**

**Study characteristics**

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|------------------------------------------|
| Patient characterstics 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) |

**Methodological quality**

| Methodological quality | Low |
|------------------------|-----|
## Item | Authors' judgement | Risk of bias | Applicability concerns
--- | --- | --- | ---
### DOMAIN 1: Patient Selection

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|---|---|---|---|
| Was a consecutive or random sample of patients enrolled? | Unclear | | |
| Was a case-control design avoided? | Yes | | |
| Did the study avoid inappropriate exclusions? | Unclear | | Low |

### DOMAIN 2: Index Test CCA POC

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|---|---|---|---|
| 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 | | Low |

### DOMAIN 3: Reference Standard

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|---|---|---|---|
| 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 | | Low |

### DOMAIN 4: Flow and Timing

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|---|---|---|---|
| Was there an appropriate interval between index test and reference standard? | Yes | | |
### Study characteristics

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|------------------------------------------|
| 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                |              |                        |
| Question                                                                 | Evidence Level |
|-------------------------------------------------------------------------|----------------|
| Did the study avoid inappropriate exclusions?                          | Unclear        |
| **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            |
| **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        |
| **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             |
### 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** | | | |
| **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**

### DOMAIN 2: Index Test RS-Proteinuria

| Was 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 |

### 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 |

### 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  |
### Study characteristics

| Study characteristics                  | Value                                                                 |
|----------------------------------------|----------------------------------------------------------------------|
| **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) |

### 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            |              | 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 |
| **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**                                                                                           |     |

**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 |
| **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 |
### 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** | | | |
| 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** | |
| **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 | 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 |
|-----|

### DOMAIN 3: Reference Standard

| Is the reference standard 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 |

| 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 |
|-----|
### 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 |
|------|--------------------|--------------|------------------------|
| **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 | | |
| **DOMAIN 2: Index Test RS-Microhaematuria** | | | |
| Were the index test results interpreted without knowledge of the results of the reference standard? | Unclear | | Low |
| If a threshold was used, was it pre-specified? | Yes | | |
| Was quality control done? | 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 | 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 | 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 | |
### 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

| 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 | | |
| **DOMAIN 2: Index Test CCA ELISA** | | | Low |
| 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 |
|--------------------------|--------|

**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 |

**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 |

**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 |

*Van Lieshout 1995 (Continued)*
**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) |

### 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 |
| | | 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 |
### Van Lieshout 1998'1 (Continued)

| Was quality control done? | 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 | 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 |

### Van Lieshout 1998’2

**Study characteristics**

| Patient sampling | Cross-sectional design; unclear sampling |
|------------------|-----------------------------------------|
| Patient characterisics 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

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|-------------------|--------------|------------------------|
| Was a consecutive or random sample of patients enrolled? | Unclear | | Low |
| Was a case-control design avoided? | Yes | | |
| Did the study avoid inappropriate exclusions? | Unclear | | |

#### DOMAIN 2: Index Test CAA ELISA

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|-------------------|--------------|------------------------|
| 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 | | Low |

#### DOMAIN 3: Reference Standard

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|-------------------|--------------|------------------------|
| Is the reference standards likely to correctly classify the target condition? | Yes | | |
| Were the reference standard results interpreted without knowledge | Unclear | | |
**Van Lieshout 1998**

*Continued*

| Item | Authors’ judgement | Risk of bias | Applicability concerns |
|------|---------------------|--------------|------------------------|
| of the results of the index tests? | | | |
| Was quality control done? | 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 | | |

**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

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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    |

### DOMAIN 2: Index Test RS-Microhaematuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |
|                                                                           |        |
|                                                                           |        |
|                                                                           | Low    |

### DOMAIN 2: Index Test RS-Proteinuria

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| 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 |
|                                                                           |        |
|                                                                           |        |
|                                                                           | Low    |

### DOMAIN 3: Reference Standard

| Question                                                                 | Answer |
|--------------------------------------------------------------------------|--------|
| Is the reference standards likely to correctly classify the target condition? | Yes    |
| Were the reference standard results                                       | Unclear |

| |
### Verle 1994  (Continued)

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| Was quality control done?                                               | Yes    |
| 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    |

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

**DOMAIN 2: Index Test RS-Microhaematuria**

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|---------------------------------------------------------------------|--------------------|--------------|------------------------|
| 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                |              |                        |

**DOMAIN 2: Index Test RS-Proteinuria**

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|---------------------------------------------------------------------|--------------------|--------------|------------------------|
| 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                |              |                        |

**DOMAIN 3: Reference Standard**

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|---------------------------------------------------------------------|--------------------|--------------|------------------------|
| Is the reference standards likely to correctly classify the target condition? | No                 |              |                        |
### Warren 1979 (Continued)

| Question                                                                 | Response |
|-------------------------------------------------------------------------|----------|
| Were the reference standard results interpreted without knowledge of the results of the index tests? | Unclear  |
| Was quality control done?                                               | Unclear  |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Response |
|-------------------------------------------------------------------------|----------|
| 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      |

### 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: ≥ 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            |              | 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            |              | 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            |              | Low                    |
| **DOMAIN 3: Reference Standard**                                    |                    |              |                        |
Wilkins 1979  

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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 |

**DOMAIN 4: Flow and Timing**

| Question                                                                 | Answer |
|-------------------------------------------------------------------------|--------|
| 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    |

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 from 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  |                                      |
### Methodological quality

| Item                                                                 | Authors' judgement | Risk of bias | Applicability concerns |
|----------------------------------------------------------------------|--------------------|--------------|------------------------|
| **DOMAIN 1: Patient Selection**                                        |                    |              |                        |
| Was a consecutive or random sample of patients enrolled?             | Unclear            | Low          |                        |
| Was a case-control design avoided?                                   | Unclear            | Low          |                        |
| Did the study avoid inappropriate exclusions?                        | 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            |              | 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            |              | Low                    |
### DOMAIN 4: Flow and Timing

| Question                                           | Answer |
|---------------------------------------------------|--------|
| 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     |

### 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 |
| Mott 1985   | Accuracy study carried out with similar tests and populations as another included paper |
| Doehring 1985| Not a test accuracy study                                                           |
| Feldmeier 1986| Case series with healthy individuals from "same endemic area"             |
| de Jonge 1988| Case-control study with healthy controls                                           |
| Madwar 1988 | Not a test accuracy study                                                            |
| Deelder 1989| Not a test accuracy study                                                            |
| de Jonge 1989,a| Only proven cases included in study                                                  |
| Savioli 1989| Not a test accuracy study                                                            |
| de Jonge 1989,b| Only proven cases included in study                                                  |
| Study                | Study Characteristics                                      |
|---------------------|-----------------------------------------------------------|
| de Jonge 1990       | Cannot extract 2-by-2 tables                              |
| Taylor 1990         | Cannot extract 2-by-2 tables                              |
| de Jonge 1990       | Case-control study with controls from non-endemic areas    |
| Lengeler 1991       | Cannot extract 2-by-2 tables                              |
| Hassan 1992         | Ineligible index test                                     |
| Gundersen 1992      | Case-control study with healthy controls                  |
| van Lieshout 1992   | Case-control study with controls from non-endemic areas    |
| Eltoum 1992         | Accuracy study carried out with similar tests and populations as another included paper |
| Kaiser 1992         | Ineligible reference standard                             |
| Krijger 1994        | Case-control study with healthy controls                  |
| Jemaneh 1994        | Cannot extract 2-by-2 tables                              |
| van Etten 1994      | Case-control study with healthy controls                  |
| Fillie 1994         | Case-control study with healthy controls                  |
| Kremsner 1994       | Cannot extract 2-by-2 tables                              |
| Hassan 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    |
| Disch 1997          | Only proven cases included in study                       |
| van Etten 1997      | Ineligible reference standard                             |
| Tiemersma 1997      | Cannot extract 2-by-2 tables                              |
| Lwambo 1997         | Cannot extract 2-by-2 tables                              |
| de Clerq 1997       | Cannot extract 2-by-2 tables                              |
| Nibbeling 1998      | Ineligible index test                                     |
| Study            | Description                                                      |
|------------------|------------------------------------------------------------------|
| Poggensee 1998   | Cannot extract 2-by-2 tables                                     |
| Polman 1998      | Not a test accuracy study                                        |
| Kahama 1998      | Cannot extract 2-by-2 tables                                     |
| Pereira 1999     | Case-control study with controls from non-endemic areas          |
| Hassan 1999      | Only proven cases included in study                              |
| Kahama 1999      | Not a test accuracy study                                        |
| Polman 2000      | Case-control study with healthy controls                         |
| van Dam 2004     | Case-control study with controls from non-endemic areas          |
| Takougang 2004   | Cannot extract 2-by-2 tables                                     |
| Brouwer 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                                   |
| Stoithard 2011   | Ineligible reference standard                                   |
| Kosinski 2011    | Cannot extract 2-by-2 tables                                     |
| Verani 2011      | Cannot extract 2-by-2 tables                                     |
| Adesola 2012     | Cannot extract 2-by-2 tables                                     |
| Coulibaly 2012   | Not a test accuracy study                                        |
| Eyo 2012         | Not a test accuracy study                                        |
| Lodh 2013        | Ineligible reference standard                                   |
| Grenfell 2013    | Not a test accuracy study                                        |
| Coulibaly 2013,2 | Not a test accuracy study                                        |
| Coulibaly 2013,3 | Ineligible index test                                            |
| Reference          | Reason                  |
|-------------------|-------------------------|
| Sousa-Figueiredo 2013 | Ineligible reference standard |
| Melchers 2014     | Ineligible index test   |
| Degarege 2014     | Not a test accuracy study |
**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 | 10247 |
| 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

| 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          | 117 | 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] |
| Bassiouney 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 | 1541| 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] |
| Hammam 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] |
| Kilku 1991             | 109 | 21  | 64  | 232 | 0.63 [0.55, 0.70] | 0.92 [0.88, 0.95] |

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

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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] |
| Masiwa 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] |
| Ndumugenyi 2001  | 194   | 58    | 36    | 195   | 0.84 [0.79, 0.89] | 0.77 [0.71, 0.82] |
| NGoran 1989      | 160   | 11    | 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] |
| Nmosi 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] |
| Poggenpoe 2000 settingA | 4   | 48   | 3    | 120   | 0.57 [0.18, 0.90] | 0.71 [0.64, 0.78] |
| Poggenpoe 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] |
| Savali 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] |
| Study               | TP  | FP  | FN  | TN  | Sensitivity | Specificity |
|---------------------|-----|-----|-----|-----|-------------|-------------|
| Shaw 1998           | 216 | 105 | 121 | 415 | 0.64        | 0.80        |
| Stephenson 1984     | 151 | 6   | 20  | 182 | 0.88        | 0.97        |
| Stothard 2009b      | 42  | 9   | 1   | 14  | 0.98        | 0.61        |
| Tanner 1983 1       | 129 | 10  | 60  | 68  | 0.68        | 0.87        |
| Tanner 1983 2       | 139 | 42  | 23  | 344 | 0.86        | 0.89        |
| Traore 1998         | 420 | 74  | 155 | 392 | 0.73        | 0.84        |
| Ugbomoika 2009a     | 155 | 37  | 72  | 183 | 0.68        | 0.83        |
| Ugbomoika 2009b 1   | 331 | 25  | 21  | 189 | 0.94        | 0.88        |
| Ugbomoika 2009b 2   | 595 | 78  | 150 | 630 | 0.80        | 0.89        |
| Verle 1994          | 205 | 15  | 101 | 31  | 0.67        | 0.67        |
| Warren 1979         | 208 | 3   | 118 | 61  | 0.64        | 0.95        |
| Wilkins 1979        | 585 | 95  | 493 | 771 | 0.54        | 0.89        |
| Zumstein 1983       | 134 | 15  | 48  | 199 | 0.74        | 0.93        |

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

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**Test 2. Microhaematuria after treatment.**

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

| 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

| 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 4K, | 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] |

(Continued...)
| 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]    |
| Hammam 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]    |
| 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] |
| Kizange 1993        | 27  | 4   | 56  | 166 | 0.33 [0.23, 0.44] | 0.98 [0.94, 0.99] |
| Morenikej 2014      | 195 | 88  | 48  | 101 | 0.80 [0.75, 0.85] | 0.53 [0.46, 0.61] |
| Mott 1985’a 1       | 334 | 99  | 38  | 47  | 0.90 [0.86, 0.93] | 0.32 [0.25, 0.40] |
| Mott 1985’a 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] |
| Nnorsu 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] |
| Onuyade 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] |
| Rasendrarno 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] |
| Selin 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] |
| Ugboro & 2009a      | 121 | 45  | 106 | 175 | 0.53 [0.47, 0.60] | 0.80 [0.74, 0.85] |
| Ugboro & 2009b 1    | 206 | 12  | 146 | 202 | 0.59 [0.53, 0.64] | 0.94 [0.90, 0.97] |
| Ugboro & 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] |
## 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        | 0.93        |
|                      |     |     |     |     | [0.25, 0.41] | [0.89, 0.96] |
| Gundersen 1996      | 37  | 160 | 14  | 49  | 0.73        | 0.23        |
|                      |     |     |     |     | [0.58, 0.84] | [0.18, 0.30] |
| Poggensee 2000 settingA | 4  | 92  | 3   | 76  | 0.57        | 0.45        |
|                      |     |     |     |     | [0.18, 0.90] | [0.38, 0.53] |
| Poggensee 2000 settingB | 38 | 32  | 29  | 29  | 0.57        | 0.48        |
|                      |     |     |     |     | [0.44, 0.69] | [0.35, 0.61] |
| Rasendramino 1998   | 238 | 30  | 182 | 97  | 0.57        | 0.76        |
|                      |     |     |     |     | [0.52, 0.61] | [0.68, 0.83] |
### 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] |
| Coulbaly 2011 Colley 2013 | 27  | 6   | 21  | 92  | 0.56 [0.41, 0.71] | 0.94 [0.87, 0.98] |
| Coulbaly 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.

| 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] |
| Coulbaly 2011 9KK | 213 | 13  | 58  | 159 | 0.79 [0.73, 0.83] | 0.92 [0.87, 0.96] |
| Coulbaly 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.

#### Study TP FP FN TN Sensitivity Specificity

| 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.

#### Study TP FP FN TN Sensitivity Specificity

| 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 | 449 | 8   | 34  | 17  | 0.93 [0.90, 0.95] | 0.68 [0.46, 0.85] |
| Van Lieshout 1998 | 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

#### Study: 19 Urine CCA ELISA *haematobium*

| Study               | TP | FP | FN | TN | Sensitivity | Specificity | 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 biasa               | 1          | -                    | -                    |
| QUADAS Flow and Timing |         | Low risk of bias                | 43         | 0.77 (0.72-0.82)     | 0.87 (0.83-0.90)     |

*aInsufficient 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 infec- | 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 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<sup>a</sup> | 1          | -                    |                      |
|                      | QUADAS Flow and Timing | Low risk of bias              | 36         | 0.67 (0.59-0.76)     | 0.82 (0.73-0.88)     |

<sup>a</sup>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<sup>a</sup>** |                               |            |                      |                      |
|                      | 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<sup>b</sup> | > +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<sup>c</sup> | 3 | - | - |

Sensitivity analysis

| QUADAS Patient Selection         | Low risk of bias<sup>c</sup> | 3 | - | - |
| QUADAS Reference Standard       | Low risk of bias<sup>c</sup> | 0 | - | - |
| QUADAS Flow and Timing          | Low risk of bias              | 11 | 0.87 (0.84-0.90) | 0.57 (0.49-0.65) |

<sup>a</sup>Three studies had data points for evaluations with both a lower- and a higher-quality reference standard.

<sup>b</sup>Five studies had data points at both thresholds: trace and +1.

<sup>c</sup>Insufficient data for synthesis.

### APPENDICES

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

| Species             | Geographical distribution<sup>a</sup> | Number infected (millions) | Morbidity (millions) |
|---------------------|--------------------------------------|---------------------------|----------------------|
| *S. haematobium*    | Africa, Middle East                   | In SSA (112)<sup>b</sup>  | Urethral schistosomiasis<sup>a</sup> |
|                     | |                           | Signs and symptoms:        | Haematuria (71)       |
|                     | |                           |                          | Dysuria (32)          |
|                     | |                           |                          | Minor bladder pathology(76) |
|                     | |                           |                          | Major bladder pathology(24) |
|                     | |                           |                          | Major hydrenephrosis (9.6) |

<sup>a</sup>Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)

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vaginal bleeding, pain during sexual intercourse, nodules in the vulva, infertility, pathology in prostate 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.

**Urine reagent strips to detect haematuria/proteinuria/leukocyturia**

- Urine reagent strips (U) → Microscopy (M)
  - U+ → Rx
  - U- → No Rx
- Urine reagent strips
  - M+ → +ve Rx
  - M- → -ve Rx
- Urine reagent strips
  - +ve → Rx
  - -ve → No Rx

**Antigen tests**

- Urine/Serum CAA test
  - +ve → Treatment
  - -ve → No treatment
- Urine/Serum CCA test
  - +ve → Treatment
  - -ve → 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/                                                   |
|   |   |
|---|---|
| 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. haematobium 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.

| Year | Sensitivity (95% CI) | Specificity (95% CI) |
|------|---------------------|----------------------|
| 1970 | 0.54 (0.51, 0.57)   | 0.93 (0.92, 0.94)    |
| 1971 | 0.56 (0.53, 0.58)   | 0.94 (0.93, 0.95)    |
| 1972 | 0.58 (0.55, 0.60)   | 0.94 (0.93, 0.95)    |
| 1973 | 0.59 (0.56, 0.61)   | 0.94 (0.93, 0.95)    |
| 1974 | 0.60 (0.57, 0.62)   | 0.94 (0.93, 0.95)    |
| 1975 | 0.61 (0.58, 0.63)   | 0.94 (0.93, 0.95)    |
| 1976 | 0.62 (0.59, 0.64)   | 0.94 (0.93, 0.95)    |
| 1977 | 0.63 (0.60, 0.65)   | 0.94 (0.93, 0.95)    |
| 1978 | 0.64 (0.61, 0.66)   | 0.94 (0.93, 0.95)    |
| 1979 | 0.65 (0.62, 0.67)   | 0.94 (0.93, 0.95)    |
| 1980 | 0.66 (0.63, 0.68)   | 0.94 (0.93, 0.95)    |
| 1981 | 0.67 (0.64, 0.69)   | 0.94 (0.93, 0.95)    |
| 1982 | 0.68 (0.65, 0.70)   | 0.94 (0.93, 0.95)    |
| 1983 | 0.69 (0.66, 0.71)   | 0.94 (0.93, 0.95)    |
| 1984 | 0.70 (0.67, 0.72)   | 0.94 (0.93, 0.95)    |
| 1985 | 0.71 (0.68, 0.73)   | 0.94 (0.93, 0.95)    |
| 1986 | 0.72 (0.69, 0.74)   | 0.94 (0.93, 0.95)    |
| 1987 | 0.73 (0.70, 0.75)   | 0.94 (0.93, 0.95)    |
| 1988 | 0.74 (0.71, 0.76)   | 0.94 (0.93, 0.95)    |
| 1989 | 0.75 (0.72, 0.77)   | 0.94 (0.93, 0.95)    |
| 1990 | 0.76 (0.73, 0.78)   | 0.94 (0.93, 0.95)    |
| 1991 | 0.77 (0.74, 0.79)   | 0.94 (0.93, 0.95)    |
| 1992 | 0.78 (0.75, 0.80)   | 0.94 (0.93, 0.95)    |
| 1993 | 0.79 (0.76, 0.81)   | 0.94 (0.93, 0.95)    |
| 1994 | 0.80 (0.77, 0.82)   | 0.94 (0.93, 0.95)    |
| 1995 | 0.81 (0.78, 0.83)   | 0.94 (0.93, 0.95)    |
| 1996 | 0.82 (0.79, 0.84)   | 0.94 (0.93, 0.95)    |
| 1997 | 0.83 (0.80, 0.85)   | 0.94 (0.93, 0.95)    |
| 1998 | 0.84 (0.81, 0.86)   | 0.94 (0.93, 0.95)    |
| 1999 | 0.85 (0.82, 0.87)   | 0.94 (0.93, 0.95)    |
| 2000 | 0.86 (0.83, 0.88)   | 0.94 (0.93, 0.95)    |
| 2001 | 0.87 (0.84, 0.89)   | 0.94 (0.93, 0.95)    |
| 2002 | 0.88 (0.85, 0.90)   | 0.94 (0.93, 0.95)    |
| 2003 | 0.89 (0.86, 0.91)   | 0.94 (0.93, 0.95)    |
| 2004 | 0.90 (0.87, 0.92)   | 0.94 (0.93, 0.95)    |
| 2005 | 0.91 (0.88, 0.93)   | 0.94 (0.93, 0.95)    |
| 2006 | 0.92 (0.89, 0.94)   | 0.94 (0.93, 0.95)    |
| 2007 | 0.93 (0.90, 0.95)   | 0.94 (0.93, 0.95)    |
| 2008 | 0.94 (0.91, 0.96)   | 0.94 (0.93, 0.95)    |
| 2009 | 0.95 (0.92, 0.97)   | 0.94 (0.93, 0.95)    |
| 2010 | 0.96 (0.93, 0.98)   | 0.94 (0.93, 0.95)    |
| 2011 | 0.97 (0.94, 0.99)   | 0.94 (0.93, 0.95)    |
| 2012 | 0.98 (0.95, 1.00)   | 0.94 (0.93, 0.95)    |
| 2013 | 0.99 (0.96, 1.02)   | 0.94 (0.93, 0.95)    |
| 2014 | 1.00 (0.97, 1.03)   | 0.94 (0.93, 0.95)    |
| 2015 | 1.01 (0.98, 1.04)   | 0.94 (0.93, 0.95)    |
| 2016 | 1.02 (0.99, 1.05)   | 0.94 (0.93, 0.95)    |
| 2017 | 1.03 (1.00, 1.06)   | 0.94 (0.93, 0.95)    |
| 2018 | 1.04 (1.01, 1.07)   | 0.94 (0.93, 0.95)    |
| 2019 | 1.05 (1.02, 1.08)   | 0.94 (0.93, 0.95)    |
| 2020 | 1.06 (1.03, 1.10)   | 0.94 (0.93, 0.95)    |
| 2021 | 1.07 (1.04, 1.11)   | 0.94 (0.93, 0.95)    |
| 2022 | 1.08 (1.05, 1.13)   | 0.94 (0.93, 0.95)    |
| 2023 | 1.09 (1.06, 1.14)   | 0.94 (0.93, 0.95)    |
| 2024 | 1.10 (1.07, 1.16)   | 0.94 (0.93, 0.95)    |
| 2025 | 1.11 (1.08, 1.18)   | 0.94 (0.93, 0.95)    |
| 2026 | 1.12 (1.09, 1.20)   | 0.94 (0.93, 0.95)    |
| 2027 | 1.13 (1.10, 1.22)   | 0.94 (0.93, 0.95)    |
| 2028 | 1.14 (1.11, 1.24)   | 0.94 (0.93, 0.95)    |
| 2029 | 1.15 (1.12, 1.26)   | 0.94 (0.93, 0.95)    |
| 2030 | 1.16 (1.13, 1.28)   | 0.94 (0.93, 0.95)    |
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 | TM | Year | Sensitivity (95% CI) | Specificity (95% CI) |
|-------|----|----|----|----|------|----------------------|----------------------|
| Willems 1979 | 120 | 1 | 203 | 63 | 1979 | 6.38 [0.22, 0.43] | 9.59 [0.92, 1.00] |
| Ylikoski 1978 | 701 | 251 | 327 | 615 | 1978 | 6.35 [0.55, 0.68] | 9.71 [0.69, 0.74] |
| Rumi 1980 | 569 | 197 | 422 | 2650 | 1980 | 6.55 [0.51, 0.58] | 8.39 [0.74, 0.91] |
| Itelim 1982 | 376 | 172 | 163 | 397 | 1982 | 6.70 [0.74, 0.78] | 8.64 [0.50, 0.67] |
| Tamir 1982 | 126 | 66 | 26 | 319 | 1982 | 6.64 [0.77, 0.99] | 9.02 [0.70, 0.86] |
| Tamir 1982 | 126 | 66 | 26 | 319 | 1982 | 6.64 [0.77, 0.99] | 9.02 [0.70, 0.86] |
| Steinhof 1984 | 113 | 11 | 50 | 177 | 1984 | 6.69 [0.56, 0.73] | 9.04 [0.70, 0.91] |
| Mod 1985a | 334 | 98 | 38 | 47 | 1985 | 6.60 [0.56, 0.71] | 9.32 [0.25, 0.40] |
| Mod 1985a | 334 | 98 | 38 | 47 | 1985 | 6.60 [0.56, 0.71] | 9.32 [0.25, 0.40] |
| Bera 1985 | 35 | 73 | 21 | 276 | 1985 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1986 | 42 | 13 | 22 | 41 | 1986 | 6.63 [0.53, 0.77] | 9.78 [0.62, 0.79] |
| Oche 1986 | 42 | 13 | 22 | 41 | 1986 | 6.63 [0.53, 0.77] | 9.78 [0.62, 0.79] |
| Bera 1986 | 34 | 17 | 21 | 276 | 1986 | 6.63 [0.46, 0.74] | 9.79 [0.74, 0.82] |
| Oche 1987 | 42 | 13 | 22 | 41 | 1987 | 6.60 [0.53, 0.77] | 9.78 [0.62, 0.79] |
| Oche 1987 | 42 | 13 | 22 | 41 | 1987 | 6.60 [0.53, 0.77] | 9.78 [0.62, 0.79] |
| Bera 1986 | 25 | 27 | 75 | 122 | 1986 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Bera 1986 | 25 | 27 | 75 | 122 | 1986 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1988 | 35 | 73 | 21 | 276 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1988 | 35 | 73 | 21 | 276 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1989 | 42 | 13 | 22 | 41 | 1989 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1989 | 42 | 13 | 22 | 41 | 1989 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Bera 1988 | 25 | 27 | 75 | 122 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Bera 1988 | 25 | 27 | 75 | 122 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1987 | 35 | 73 | 21 | 276 | 1987 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1987 | 35 | 73 | 21 | 276 | 1987 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1988 | 35 | 73 | 21 | 276 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |
| Oche 1988 | 35 | 73 | 21 | 276 | 1988 | 6.63 [0.46, 0.73] | 9.79 [0.74, 0.82] |

Circulating antigen tests and urine reagent strips for diagnosis of active schistosomiasis in endemic areas (Review)
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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 *S. mansoni.*

Legend
- ○ Brand: Rapid Medical Diagnostics Pretoria South Africa
- □ Brand: Schistosomiasis on step test EVL Holland
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 shows its confidence interval.

| Study               | TP  | FP  | FN  | TN  | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|---------------------|-----|-----|-----|-----|----------------------|----------------------|----------------------|----------------------|
| El-Borsahey 1996   | 117 | 30  | 110 | 110 | 0.80 (0.72, 0.88)    | 1.00 (0.97, 1.00)    |                      |                      |
| Polman 1995        | 325 | 22  | 76  | 110 | 0.94 (0.92, 0.97)    | 0.88 (0.81, 0.97)    |                      |                      |
| Van Loo 1995       | 27  | 10  | 10  | 126 | 0.47 (0.33, 0.60)    | 0.88 (0.80, 0.91)    |                      |                      |
| Van Loo 1999_1     | 449 | 9   | 34  | 17  | 0.92 (0.90, 0.95)    | 0.99 (0.48, 0.86)    |                      |                      |
| Van Loo 1999_2     | 232 | 6   | 14  | 17  | 0.94 (0.90, 0.97)    | 0.10 (0.00, 0.45)    |                      |                      |

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

**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.

| Study          | TP  | FP  | FN  | TN  | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|----------------|-----|-----|-----|-----|----------------------|----------------------|----------------------|----------------------|
| Alhewairi 1999 | 37  | 121 | 30  | 172 | 0.55 [0.42, 0.67]    | 0.67 [0.51, 0.63]    |                      |                      |
| De Clerq 1995  | 198 | 82  | 55  | 105 | 0.72 [0.73, 0.83]    | 0.68 [0.43, 0.63]    |                      |                      |
| Ndlovu 1998   | 83  | 63  | 3   | 20  | 0.37 [0.21, 0.99]    | 0.24 [0.15, 0.33]    |                      |                      |

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.
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.

| Study                | TP | FP | FN | TN  | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|----------------------|----|----|----|-----|----------------------|----------------------|----------------------|----------------------|
| Polman 1995          | 20 | 12 | 51 | 12  | 0.95 (0.81, 0.99)    | 0.90 (0.72, 0.97)    |                      |                      |
| Van Lieshout 1995    | 21 | 10 | 37 | 12  | 0.39 (0.24, 0.50)    | 0.93 (0.89, 0.97)    |                      |                      |

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.

| Study                | TP | FP | FN | TN | Sensitivity (95% CI) | Specificity (95% CI) | Sensitivity (95% CI) | Specificity (95% CI) |
|----------------------|----|----|----|----|----------------------|----------------------|----------------------|----------------------|
| Polman 1995          | 31 | 21 | 11 | 8  | 0.97 (0.94, 0.98)    | 0.75 (0.63, 0.87)    |                      |                      |
| Van Lieshout 1995    | 36 | 23 | 22 | 133| 0.62 (0.45, 0.74)    | 0.84 (0.77, 0.90)    |                      |                      |

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      | 9 KK    | 1 KK       | 83 (76-88) | 100 (77-100) | 90 (83-94) | 85 (55-99) |
| Setting C           |         | 2 KK       | 86 (80-91) | 100 (77-100) |
|                     |         | 3 KK       | 94 (89-97) | 100 (77-100) |


CONTINUATION

|                | Tchuente 2012 | Erko 2013 | Lodh 2013 |
|----------------|---------------|-----------|-----------|
|                | 9KK           | 6KK       | PCR       |
| Writing of first draft of review: | Eleanor Ochodo. | | |
| Methodological advice: | Mariska Leeflang, Johannes Reitsma, Patrick Bossuyt. | | |
| Content advice: | Lisette Van Lieshout, Katja Polman, Poppy Lambert. | | |
| Data collection: | Eleanor Ochodo, Gowri Gopalakrishna, Bea Spek, Mariska Leeflang, Lisette Van Lieshout, Katja Polman, Poppy Lambert. | | |
| Data analysis: | Eleanor Ochodo, Mariska Leeflang, Johannes Reitsma. | | |
| Contributions to manuscript drafts: | Eleanor Ochodo, Mariska Leeflang, Johannes Reitsma, Patrick Bossuyt, Lisette Van Lieshout, Katja Polman, Poppy Lambert, Gowri Gopalakrishna, Bea Spek. | | |
| Agreement with final draft of review: | Eleanor Ochodo, Gowri Gopalakrishna, Bea Spek, Poppy Lambert, Lisette Van Lieshout, Katja Polman, Johannes Reitsma, Patrick Bossuyt, Mariska Leeflang. | | |

DECLARATIONS OF INTEREST

The review authors have reported no conflicts of interest.
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  Technical support

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 ≥ +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.