The Impact of Introducing Malaria Rapid Diagnostic Tests on Fever Case Management: A Synthesis of Ten Studies from the ACT Consortium

Katia J. Bruxvoort,[1]* Baptiste Leurent,[1] Clare I. R. Chandler,[1] Evelyn K. Ansah,[2] Frank Baiden,[3] Anders Björkman,[4] Helen E. D. Burchett,[1] Sîan E. Clarke,[1] Bonnie Cundill,[5] Debora D. DiLiberto,[1] Kristina Elfving,[6] Catherine Goodman,[1] Kristian S. Hansen,[1,7] S. Patrick Kachur,[8] Sham Lal,[1] David G. Lalloo,[9] Toby Leslie,[1] Pascal Magnussen,[10,11] Lindsay Mangham-Jefferies,[1] Andreas Mårtensson,[12] Ismail Mayan,[13] Anthony K. Mbonye,[14,15] Mwinyi I. Msellem,[16] Obinna E. Onwujekwe,[17] Seth Owusu-Agyei,[18] Mark W. Rowland,[1] Delér Shakely,[19] Sarah G. Staedke,[1] Lasse S. Vestergaard,[20,21] Jayne Webster,[1] Christopher J. M. Whitty,[1] Virginia L. Wiseman,[1,22] Shunmay Yeung,[1] David Schellenberg,[1] and Heidi Hopkins[1]

[1]London School of Hygiene & Tropical Medicine, London, United Kingdom; [2]Ghana Health Service, Accra, Ghana; [3]Ensign College of Public Health, Kpong, Ghana; [4]Karolinska Institutet, Stockholm, Sweden; [5]Leeds Institute of Clinical Trials Research, University of Leeds, Leeds, United Kingdom; [6]University of Gothenburg, Gothenburg, Sweden; [7]University of Copenhagen, Copenhagen, Denmark; [8]US Centers for Disease Control and Prevention, Atlanta, Georgia; [9]Liverpool School of Tropical Medicine, Liverpool, United Kingdom; [10]Centre for Medical Parasitology, University of Copenhagen and Copenhagen University Hospital, Copenhagen, Denmark; [11]Department for Veterinary and Animal Sciences, University of Copenhagen, Copenhagen, Denmark; [12]Uppsala University, Uppsala, Sweden; [13]Health Protection Research Organisation, Kabul, Afghanistan; [14]Ministry of Health, Kampala, Uganda; [15]Makerere University School of Public Health, Kampala, Uganda; [16]Zanzibar Malaria Elimination Programme, Tanzania; [17]Department of Pharmacology and Therapeutics, University of Nigeria, Enugu, Nigeria; [18]Kintampo Health Research Centre, Kintampo, Ghana; [19]Centre for Malaria Research, Karolinska Institutet, Stockholm, Sweden, and Health Metrics at Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden; [20]Centre for Medical Parasitology, University of Copenhagen and Copenhagen University Hospital, Copenhagen, Denmark; [21]Department of Infectious Disease Epidemiology and Prevention, Statens Serum Institut, Copenhagen, Denmark; [22]School of Public Health and Community Medicine, University of New South Wales, Sydney, Australia

* Address correspondence to Katia J. Bruxvoort, London School of Hygiene & Tropical Medicine, 15-17 Tavistock Place, London WC1H 9SH, United Kingdom. E-mail: katia.bruxvoort@lshtm.ac.uk

Abstract.

Since 2010, the World Health Organization has been recommending that all suspected cases of malaria be confirmed with parasite-based diagnosis before treatment. These guidelines represent a paradigm shift away from presumptive antimalarial treatment of fever. Malaria rapid diagnostic tests (mRDTs) are central to implementing this policy, intended to target artemisinin-based combination therapies (ACT) to patients with confirmed malaria and to improve management of patients with nonmalarial fevers. The ACT Consortium conducted ten linked studies, eight in sub-Saharan Africa and two in Afghanistan, to evaluate the impact of mRDT introduction on case management across settings that vary in malaria endemicity and healthcare provider type. This synthesis includes 562,368 outpatient encounters (study size range 2,400–432,513). mRDTs were associated with significantly lower ACT prescription (range 8–69% versus 20–100%). Prescribing did not always adhere to malaria test results; in several settings, ACTs were prescribed to more than 30% of test-negative patients or to fewer than 80% of test-positive patients. Either an antimalarial or an antibiotic was prescribed for more than 75% of patients across most settings; lower antimalarial prescription for malaria test-negative patients was partly offset by higher antibiotic prescription. Symptomatic management with antipyretics

alone was prescribed for fewer than 25% of patients across all scenarios. In community health worker and private retailer settings, mRDTs increased referral of patients to other providers. This synthesis provides an overview of shifts in case management that may be expected with mRDT introduction and highlights areas of focus to improve design and implementation of future case management programs.

INTRODUCTION

Providing appropriate antimalarial treatment to patients who have malaria has been a long-standing challenge in fever case management and has traditionally relied on presumptive symptom-based diagnosis. Many people with malaria do not receive effective antimalarial medications, increasing their risk of severe disease or death. At the same time, many of those who receive antimalarials do not have malaria and are suffering from a nonmalaria illness which may need alternative treatment.[1] To improve rational the use of artemisinin-based combination therapies (ACTs), the World Health Organization (WHO) recommended in 2010 that all suspected cases of malaria should have parasitological confirmation before treatment.[2,3] These changes represent a paradigm shift from presumptive antimalarial treatment of fever to targeted use of ACTs only for those with a positive malaria test.

Central to implementing this policy change is malaria rapid diagnostic tests (mRDTs), relatively simple, inexpensive, and reliable point-of-care tests that can be used where high-quality microscopy services are not available.[4] mRDTs are intended to improve the management of suspected malaria cases, increasing the use of first-line antimalarials in patients with confirmed malaria and encouraging the diagnosis and appropriate treatment of patients without malaria.[1] After the WHO policy change, mRDT procurement has surged from 45 million tests globally in 2008 to 314 million in 2014.[5] Parasite-based diagnosis before treatment is now a policy in public health facilities in most malaria-endemic countries, and mRDTs are also being introduced among private retail and community health providers.[6–14]

Clinical trials and early pilot projects before the widespread adoption of mRDTs supported their use though with some heterogeneity of results.[15] Compared with presumptive treatment with antimalarials, case management based on mRDTs generally reduced antimalarial prescription, particularly in settings with relatively high provider adherence to test results and low malaria prevalence.[16–22] On the other hand, although provider adherence to negative mRDT results was high in some studies,[16,17,23,24] it was low in others.[25–27] Comparable data from good-quality studies in a variety of contexts are needed to anticipate the effects of mRDT implementation as these tests are rolled out at scale.

The ACT Consortium is a research partnership created to address key questions and inform policy on ACT delivery.[28] The Consortium conducted studies in 10 countries in Africa and Asia, including 10 studies specifically designed to address questions on improving the targeting of ACTs through the use of mRDTs. These studies looked at the impact of mRDT introduction on fever case management across a range of clinical and epidemiological contexts and among various types of healthcare providers. Studies evaluated different mRDT intervention packages, leading to heterogeneity that precludes formal meta-analysis. The current synthesis compares individual study results to identify patterns across contexts and provide an overview of what may be expected from mRDT implementation programs.

Studies included in the analysis.

ACT Consortium studies were included in this analysis if they collected data on patient consultations for suspected malaria, evaluated an intervention to implement mRDTs by healthcare providers, and included a comparison group without the mRDT intervention. The 10 studies meeting these criteria are described in Table 1, including the abbreviation for each study used throughout the text. All studies received ethical approval from their host academic institutions and national authorities; see open-access publications for further details[29–37] (Leslie, T. et al., unpublished data). Data are available at the ACT Consortium data repository (https://actc.lshtm.ac.uk/) or from the authors on request.

Eight studies took place in sub-Saharan Africa and two in Afghanistan, in a mix of rural and urban settings. mRDTs were introduced in health facilities only (Afgh1, Cam1, Ghan1, Tanz1, Tanz2, and Uga1), among community health workers (Afgh2 and Uga2), in private drug shops only (Uga3), or in a combination of public facilities, private pharmacies, and drug shops (Nige1). Seven studies were cluster-randomized trials of interventions to introduce mRDTs, two studies were individually randomized trials (Afgh1 and Ghan1), and one study was a descriptive "before and after" evaluation (Tanz1). All patients that were eligible in each study were included in the present analysis; typically, these were patients with suspected malaria, although one study included only children under age 5 years (Uga2), and two studies collected data on all patient consultations (Tanz2 and Uga1). Data were collected using provider-completed records of treatments administered (Afgh1, Afgh2, Ghan1, Uga1, and Uga2), patient exit interviews (Tanz1), both of these methods (Cam1, Nige1, and Tanz2), or provider-completed records with follow-up interviews of a subsample of patients (Uga3).

From each study, "settings" and "scenarios" were identified for this analysis. Six studies were conducted in multiple settings (indicated by suffix a, b, and c), such as distinct geographical areas and malaria transmission zones (Afgh1, Afgh2, Cam1, Tanz1, and Uga2), or where providers used different methods of routine malaria diagnosis (presumptive care or microscopy; Afgh1 and Ghan1). Trial arms or comparison groups within a setting were termed scenarios. All settings included at least one scenario without mRDT interventions, and settings in three studies (Cam1, Nige1, and Tanz2) included multiple mRDT intervention scenarios. In total, the 10 studies were conducted in 18 settings, with 18 scenarios without mRDT interventions and 24 scenarios with mRDT interventions.

Data were collected concurrently from scenarios with and without mRDT interventions in seven studies. In three studies (Nige1, Tanz1, and Tanz2), data from scenarios without mRDT interventions were collected before mRDT introduction. The scale of the interventions and their evaluations varied: for example, in Uga1 the intervention was implemented in 10 health facilities, and data were collected on 432,513 patient encounters in the study area whereas Tanz1 evaluated a nationwide intervention, and data were collected from 3,456 patients.

Microscopy was widely available in all settings in Cam1 and available at some higher-level facilities in Tanz1, particularly in the Tanz1/c scenario without mRDT interventions. The two individually randomized studies (Afgh1 and Ghan1) took place both in settings where microscopy was the standard practice and in settings where malaria diagnosis was symptom based. Microscopy services were nonexistent or very limited in the other six studies (Afgh2, Nige1, Tanz2, Uga1, Uga2, and Uga3).

Indicators of interest.

To examine the impact of mRDTs on patient care, malaria testing and prescribing indicators were reviewed. Because the objective was to compare case management in areas with and without mRDT interventions, our first indicator of interest was the proportion of patients tested by the provider with any parasite-based diagnostic test (microscopy or mRDT). Prescribing indicators were the proportions of patients prescribed one or more of the following medicines: ACTs, non-ACT antimalarials, antibiotics (antibacterials), antifungals, antihelminthics, and antipyretics. The proportion of patients referred to another healthcare provider was also reviewed.

The ACT indicator was adjusted to account for malaria epidemiology and differences in first-line antimalarial in two cases: In Afghanistan, *Plasmodium vivax* was treated with chloroquine and *Plasmodium falciparum* with ACT; in these settings, the proportion of patients prescribed any antimalarial is reported instead of ACT. In Nige1, prescription of sulfadoxine-pyrimethamine (SP) and ACTs are reported for the scenario without mRDT interventions, whereas only ACTs are reported for the scenarios with mRDT interventions. This reflects a change in treatment between the 2009 scenario without mRDT interventions (when ACTs were recommended but not yet widely used) and the 2011 scenarios with mRDT interventions (when ACTs had largely replaced SP).

Analytical approach.

Descriptive statistics on the indicators of interest were calculated from each scenario. Estimates for each indicator were made for scenarios without mRDTs and those with mRDTs. Prescribing indicators were further stratified by result of the diagnostic test performed by the healthcare provider. Odds ratios and 95% confidence intervals for indicators of interest within each setting were calculated using logistic regression with robust standard errors to account for clustering by the primary unit of sampling or randomization (see Supplemental Tables). Formal meta-analysis was deemed inappropriate because of the heterogeneity of interventions evaluated and study contexts. However, to aid comparisons between scenarios with and without mRDTs, the indicators of interest are presented as graphic point estimates by study arm. The analysis was conducted in STATA 14 (STATA Corp LP, College Station, TX). Factors which may explain variations in mRDT use are examined with additional qualitative data sources elsewhere.[38]

RESULTS

Proportion of patients tested.

More patients were tested in scenarios where mRDTs had been introduced (Figure 1 and Supplemental Tables 1–3). However, even with mRDTs available, the percentage of patients tested varied widely, with 50% or fewer patients tested in five settings (Nige1, Tanz1/a, Tanz1/b, Tanz2, and Uga1), and nearly 100% in others (Afgh2/a, Afgh2/b, Uga/2, Uga2/b, and Uga3). The largest increases in proportion of patients tested were seen where mRDTs were introduced outside of health facilities (Afgh2, Uga2, and Uga3). Similar proportions of children and adults were tested in most scenarios, but in Nige1, Tanz1/a, and Uga1 test uptake was slightly higher for young children than for older patients. The proportion of patients tested is not reported in Afgh1 or Ghan1, where patients were individually randomized to mRDTs or microscopy (Afgh1/a, Afg1/b, and Ghan1/a), and to mRDTs or symptom-based diagnosis (Afgh1/c and Ghan1/b).

Patients were also tested with microscopy in Cam1 and, to a lesser extent, in Tanz1. In Cam1/a and Cam1/b, microscopy was common in all scenarios, and test use was not higher in scenarios with mRDT interventions. In scenarios without mRDT interventions, 80% of patients were tested with microscopy. In the four scenarios with mRDT interventions, 27–61% of patients were tested with microscopy and 17–52% with mRDT (71–81% tested overall). Of the three Tanz1 settings, microscopy was most frequently used in the Tanz1/c scenario without mRDT interventions, where 29% of patients were tested with microscopy and 2% with mRDT; in the corresponding scenario with mRDT interventions, 8% were tested with microscopy and 63% with mRDT.

Prescription of ACTs and other antimalarial medications.

Overall, mRDTs were associated with lower ACT prescribing (Figure 2A and Supplemental Table 4). In 10/13 African settings, mRDT scenarios had statistically significantly lower ACT prescriptions than scenarios without mRDT interventions. In two African settings, there was little difference between mRDT and non-mRDT scenarios: Uga1, a high-transmission area where a high proportion of patients required ACTs even after testing and Ghan1/a, where all non-mRDT patients were randomized to testing with microscopy. In Nige1, where levels of testing were very low, presumptive diagnosis of malaria was common even where mRDTs were available. Prescription of ACT or SP in the scenario without mRDT interventions was similar to prescription of ACT in the three mRDT intervention scenarios (around 50%). In 4/5 Afghanistan settings, prescription of any antimalarial was much lower in scenarios with mRDT interventions than without; the exception was Afgh1/b, where (similar to Ghan1/a) all non-mRDT patients were randomized to testing with microscopy and where malaria transmission was low.

Recorded prescription of non-ACT antimalarials (e.g., SP, quinine, oral, and artemisinin monotherapies) was generally uncommon, except in Afghanistan. In 11/13 African settings, non-ACTs were prescribed for fewer than 10% of patients both with and without mRDT interventions (data not shown). Prescription of non-ACT antimalarials was higher in Cam1/b (20.9% in the scenario without an mRDT intervention and approximately 15% in the two scenarios with mRDT interventions) and in Nige1 (52.8% in the scenario without an mRDT intervention and approximately 30% in the three scenarios with mRDT interventions).

Overall, the finding of lower ACT prescription in scenarios with mRDT interventions was mostly due to malaria test-negative patients not receiving ACTs (Figure 2B–D and Supplemental Table 5). Fewer than 30% of test-negative patients were treated with ACTs in most mRDT intervention scenarios; exceptions were Cam1/a and Cam1/b, and Ghan1/a and Ghan1/b, where ACTs were prescribed for 39.2–49.1% of patients with negative malaria test results. There was no evident difference in this indicator by test type; in the Cam1/a and Cam1/b scenarios with mRDT interventions, ACTs were prescribed to 17.3–42.9% of microscopy test-negative patients and 15.6–45.9% of mRDT test-negative patients (data not shown). The percentages of malaria test-positive patients in scenarios with mRDT interventions who were prescribed ACTs ranged from 60.2% to 98.0% in 12/15 settings with data for this indicator. Prescription of ACTs to test-positive patients was over 90% in six of these settings, but was just 60.2–81.2% in another six settings, with 69.4–96.2% prescribed any antimalarial. In Tanz1/a, where stock-outs of ACTs in public health facilities were a major problem, ACT prescribing for test-positive patients was 18.2%. In Afgh1/a and Afgh2/a, 99.5% and 82.7% of test-positive patients were prescribed any antimalarial.

Prescription of antibiotics.

In contrast to reduced ACT prescribing, the mRDT interventions were associated with significantly more prescribing of systemic antibiotic (antibacterial) medications in seven settings (Afgh1/c, Afgh2/a, Tanz1/a, Tanz1/b, Tanz1/c, Tanz2, and Uga3) (Figure 3 and Supplemental Tables 6–7). In scenarios with mRDT interventions, antibiotic prescribing patterns varied by mRDT result. In all settings except Nige1, 40.0–79.9% of patients who tested negative for malaria were prescribed antibiotics. Antibiotic prescription was similar in patients who were not tested. Among those with a positive malaria test result, fewer than 45% were prescribed antibiotics, with higher proportions in Cam1/a and Cam1/b. Prescription of both an antimalarial and a systemic antibiotic (Figure 4A and Supplemental Table 8) was relatively uncommon in all settings (< 25% of patients, except in Cam1 and Afgh2/b) and was similar or lower in scenarios with mRDT interventions. By contrast, the prescription of either an antimalarial or an antibiotic medicine was high in all settings (more than 68%, except in Tanz1/a) and similar or lower in scenarios with mRDT interventions (Figure 4B and Supplemental Table 9). Further details of antibiotic prescribing in ACT Consortium studies are presented elsewhere.[39]

Prescription of other medicines.

Data were recorded on prescription of other anti-infectives in some study settings. Prescription of systemic antifungals (fluconazole and griseofulvin) was reported in five settings (Cam1/a, Cam1/b, Ghan1/a, Ghan1/b, and Uga1); the proportion of patients prescribed these medicines across these settings was 2.6% or less (Supplemental Table 10). Prescription of antihelminthics (albendazole and mebendazole) was recorded in 13 settings (all study settings except those in Afgh2, Tanz2, and Uga2); the proportion of patients prescribed these medicines ranged from 0.3% to 33.3%, which did not appear attributable to whether the scenarios had an mRDT intervention or not (Supplemental Table 10).

Prescription of antipyretic medicines alone, for symptomatic relief, without an antimalarial or an antibiotic, ranged from 0.3% to 23.7% across all scenarios and was similar or higher with mRDT interventions except in Nige1 (Figure 4C and Supplemental Table 11). Polypharmacy, defined as the prescription of three or more medicines, varied widely across settings (Figure 4D). However, in most settings, polypharmacy was comparable with and without mRDT interventions, but was significantly lower with mRDT interventions in four settings (Afgh1/b, Afgh2/a, Afgh2/b, and Cam2/b (Figure 4D and Supplemental Table 12).

Referral.

Figure 5 and Supplemental Table 13 show the percentage of patients referred to another care provider or facility. Referral was generally low across study settings. However, referral was significantly higher with mRDT interventions among community health workers, particularly in Uga2/a, Uga2/b, and Afgh2/b, and to a lesser extent in Uga3. Referral was uncommon (< 5%) across all scenarios in studies in public health facilities.

DISCUSSION

Providing appropriate treatment to patients who present with malaria-like symptoms remains a challenge in many endemic regions. This synthesis of data from 10 ACT Consortium studies illustrates the impact of mRDTs on case management. The data represent 24 scenarios where mRDTs were introduced, compared with 18 scenarios without mRDT interventions. This synthesis found that mRDT interventions reduced prescription of first-line antimalarials across almost all settings, except where the tests were not often used. However,

prescribing did not always reflect test results: across a range of scenarios, ACTs were prescribed for some mRDT-negative cases, and at least as concerning, ACTs were not prescribed for all mRDT-positive cases. The use of mRDTs also influenced other treatment decisions, notably resulting in an increase of antibiotic prescription especially for test-negative cases. Referral of patients to other healthcare providers was low across nearly all settings, with a few specific exceptions discussed below.

What lessons can be learned from this synthesis, to inform expectations of programs that implement mRDTs at scale? Although mRDTs generally improve malaria case management, alone, they are not a panacea to solve the major challenge of effective fever management. Simply providing mRDTs is insufficient if health workers continue prescribing antimalarials to test-negative patients[27,40] or if alternative treatments are not appropriate. The ACT Consortium studies evaluated a range of tailored and pretested elements as part of mRDT intervention strategies, such as enhanced provider training or community awareness activities.[41,42] Anecdotally, interventions designed with more intensive formative research led to greater reductions in ACT prescription for test-negative patients; but such prescribing remained inappropriately high (10–49%).

Furthermore, in five of the eight African studies included in this analysis, more than 20% of patients who tested positive for malaria at the point of care were not prescribed ACTs. Undertreatment of malaria in settings where mRDTs have been implemented has been recognized in a small proportion of cases (less than 5%), with few exceptions.[43–45] However, results of this synthesis suggest that undertreatment may be a more common problem than previously recognized. The six settings with high ACT prescription for test-positive patients varied in terms of malaria epidemiology, geography, and provider type; the same is true for the six settings with lower ACT prescription for test-positive patients. To date, research into the reasons for this phenomenon has been limited, although ACT Consortium study results presented elsewhere suggest that provider motivations, stability of ACT supplies and preexisting antimalarial preferences account for some of this underprescription.[38] Missed or ineffective treatment of malaria presents a risk to patients; a balance between reducing unnecessary antimalarial use while ensuring ACTs are provided to all malaria-positive cases needs to be integrated in future research, training, and implementation programs.

This synthesis highlights the fact that effecting change in one healthcare practice can have knock-on consequences for other practices. In many ACT Consortium studies, mRDT implementation was associated with a higher level of antibiotic prescription, particularly for malaria test-negative patients.[39] The proportion of patients prescribed either an antimalarial or an antibiotic was high, for more than 75% of cases across most settings, and this was approximately similar in settings with and without mRDT interventions. This suggests that in the absence of other diagnostic options, presumptive antimalarial treatment may be exchanged for presumptive antibiotic treatment when mRDTs are introduced. Many patients with uncomplicated febrile illness are likely to improve with symptomatic management only (e.g., antipyretic), as noted in WHO case management guidelines[46,47]; this approach was prescribed for just 0–24% of patients in ACT Consortium studies. Inappropriate use of antimicrobials is of increasing global concern because of rising resistance, which can result in longer illnesses, higher mortality, and increased treatment costs.[48,49] A more comprehensive approach to case management is needed, rather than focusing on only a single diagnosis and medication (e.g., malaria mRDTs and ACTs), if unintended consequences are to be avoided.[50]

Our data support the observation that introducing mRDTs may increase patient referral to other healthcare providers, particularly among community health workers and private

retailers.[10,51] In particular, when a malaria test is negative, alternative diagnoses must be considered; the clinical skills and diagnostic capacity to achieve this are limited among providers with less formal training, so that, referral may be necessary for adequate case management. Overall, referral remained infrequent in ACT Consortium studies. Even when referral is recommended, patients are not always inclined or able to follow the recommendation.[52–54] If current recommendations to scale up mRDTs in community and private healthcare settings are implemented, to improve referral practices in a way that is safe for individual patients, and without unduly burdening other parts of the healthcare system, the role of mRDTs will need to be better integrated into local pathways of treatment seeking and care provision.[55–57]

The observed shifts in case management practices have cost implications for health systems and for patients. When mRDTs lead to reductions in ACT use, there can be substantial savings in ACT costs. However, additional costs are incurred for mRDT implementation: the tests themselves, alternative treatments provided to mRDT-negative patients, additional referrals, and the activities required for mRDT introduction, such as training, supervision, communication campaigns, and quality control. The overall cost impact in a given context will depend on several parameters, including the relative cost of ACTs and mRDTs, the amount of subsidy for each, the proportion of patients tested, the proportion who test positive, and provider adherence to test results. Analyses of the incremental economic cost per fever case managed have been published for four studies included in this synthesis. Where mRDTs were compared with microscopy (Afgh1, Ghan1, and Cam1), mRDTs were cost saving or costs were similar in Afghanistan,[58] with an incremental provider cost per fever case managed ranging from 0.20 to 1.11 USD in in Ghana[59] and Cameroon[60] (2011 USD). Where mRDTs were compared with clinical diagnosis, the incremental provider cost per fever case managed ranged from 0.24 to 10.9 USD across different transmission levels and provider types in Afghanistan, Ghana, and Uganda (2011 USD).[58,59,61] These incremental costs may be considered good value for money if they lead to sufficient improvements in health outcomes. A full consideration of cost effectiveness would require costs from both health sector and household perspectives, extrapolation to final health outcomes such as cost per death or disability adjusted life year averted, and sensitivity analyses to explore the impact of variation in prescribing and referral practices. Ideally, a full analysis should also include the impact of malaria testing on enhancing malaria surveillance systems and resulting improvements in targeting of malaria interventions.

The present analysis was subject to several limitations. Data were collected concurrently from scenarios with and without mRDT interventions in seven studies, whereas in the other three (Nige1, Tanz1, and Tanz2) data were collected before and after mRDT introduction (Table 1). In Nige1, the interval between the two data collection points corresponded with a shift in antimalarial use from SP to ACT; whereas ACT prescription decreased, any antimalarial prescription remained high (≥ 75%). In addition, some indicators varied in availability and precise definition across studies (see footnotes to Figures and Supplemental Tables). For example, in Uga2, prescription of antibiotics and polypharmacy was not reported because community health workers were only permitted to dispense antimalarials and antipyretics. In Tanz1, data on medicines prescribed were not available from scenarios without mRDTs, so data on medicines dispensed were used for all Tanz1 scenarios. In designing the ACT Consortium studies and mRDT implementation packages, investigators sought to accommodate varied and transitioning contexts while still obtaining data that could be compared across studies. This synthesis therefore did not aim to provide combined estimates of the size of effect of the impact of mRDTs (meta-analysis). Instead, comparison of findings from the individual studies identified clear patterns across diverse geographical,

epidemiological, and health sector contexts, indicating both robustness and generalizability of the results.

In summary, evidence from ten ACT Consortium studies demonstrates that mRDT introduction can reduce prescription of ACTs. However, mRDTs are not an easy technological fix. Critically, challenges exist in ensuring that all patients who test positive for falciparum malaria are prescribed ACT; anything less endangers individual patients and the credibility of programs. It is also necessary to ensure that patients who test negative receive appropriate management, which may or may not include other antimicrobials. ACT Consortium studies were conducted between 2007 and 2013, and since that time, mRDT implementation programs continue to evolve. These combined results provide an overview of the generally positive shifts in case management that may be expected with mRDT introduction, and highlight issues that warrant particular attention in future work on point-of-care diagnosis and fever and malaria case management.

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Authors' addresses: Katia J. Bruxvoort, Baptiste Leurent, Clare I. R. Chandler, Helen E. D. Burchett, Sîan E. Clarke, Debora D. DiLiberto, Catherine Goodman, Kristian S. Hansen, Sham Lal, Toby Leslie, Lindsay Mangham-Jefferies, Mark W. Rowland, Sarah G. Staedke, Jayne Webster, Christopher J. M. Whitty, Virginia L. Wiseman, Shunmay Yeung, David Schellenberg, and Heidi Hopkins, London School of Hygiene & Tropical Medicine, Global Health and Development, London, United Kindom, E-mails: katia.bruxvoort@lshtm.ac.uk, baptiste.leurent@lshtm.ac.uk, clare.chandler@lshtm.ac.uk, helen.burchett@lshtm.ac.uk, sian.clarke@lshtm.ac.uk, deborah.diliberto@lshtm.ac.uk, catherine.goodman@lshtm.ac.uk, kristian.hansen@lshtm.ac.uk, sham.lal@lshtm.ac.uk, toby.leslie@lshtm.ac.uk, lindsay.mangham-jefferies@lshtm.ac.uk, mark.rowland@lshtm.ac.uk, sarah.staedke@lshtm.ac.uk, jayne.webster@lshtm.ac.uk, christopher.whitty@lshtm.ac.uk, virginia.wiseman@lshtm.ac.uk, shunmay.yeung@lshtm.ac.uk, david.schellenberg@lshtm.ac.uk, and heidi.hopkins@lshtm.ac.uk. Evelyn K. Ansah, Ghana Health Service, Research and Development, Accra, Greater Accra, Ghana, E-mail: ansahekdr@yahoo.co.uk. Frank Baiden, Ensign College of Public Health, Epidemiology, Kpong, Ghana, E-mail: baidenf@gmail.com. Anders Björkman, Karolinska Institutet, Microbiology, Tumor and Cell Biology, Stockholm, Sweden, E-mail: anders.bjorkman@ki.se. Bonnie Cundill, Leeds Institute of Clinical Trials Research, University of Leeds, Leeds, United Kingdom. Kristina Elfving, University of Gothenburg, Infectious Diseases, Gothenburg, Sweden, E-mail: kristinaelfving@hotmail.com. Kristian S. Hansen, University of Copenhagen, Health Services Research, Copenhagen, Denmark, E-mail: kristian.hansen@lshtm.ac.uk. S. Patrick Kachur, CDC, Malaria Branch, Atlanta, GA, E-mail: skachur@cdc.gov. David G. Lalloo, Liverpool School of Tropical Medicine, Clinical Sciences and International Public Health, Liverpool, United Kingdom, E-mail: david.lalloo@lstmed.ac.uk. Pascal Magnussen, University of Copenhagen and Copenhagen University Hospital, Centre for Medical Parasitology, Copenhagen, Denmark, and University of Copenhagen, Veterinary and Animal Sciences, Copenhagen, Denmark, E-mail:

pma@sund.ku.dk. Andreas Mårtensson, Uppsala Universitet, Women's and Children's Health, International Maternal and Child Health (IMCH), Uppsala, Sweden, E-mail: andreas.martensson@kbh.uu.se. Ismail Mayan, Health Protection Research Organisation, Clinical Trials, Kabul, Afghanistan, E-mail: drmayan2006@gmail.com. Anthony K. Mbonye, Makerere University School of Public Health, Community Health and Behavioral Sciences, Kampala, Uganda, E-mail: akmbonye@yahoo.com. Mwinyi I. Msellem, Zanzibar Ministry of Health, Zanzibar Malaria Elimination Programme, Zanzibar, Tanzania, E-mail: mmwinyi@hotmail.com. Obinna E. Onwujekwe, University of Nigeria Enugu Campus, Pharmacology and Therapeutics, Enugu, Nigeria, E-mail: onwujekwe@yahoo.co.uk. Seth Owusu-Agyei, Kintampo Health Research Centre, Director, Kintampo, Ghana, E-mail: seth.owusu-agyei@kintampo-hrc.org.

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FIGURE 1. Patients in scenarios without and with malaria rapid diagnostic test (mRDT) interventions that were tested with any malaria diagnostic test at the provider of (**A**) all patients, (**B**) patients under age five years, and (**C**) patients ages five years and older. Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method and are not included in this analysis. Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each), Nige1 (three intervention scenarios), and Tanz2 (three intervention scenarios). See Table 1. Scenarios with denominators fewer than 50 patients in Figure 2B are Afgh2/a without mRDT interventions and Afgh2/b both with and without mRDT interventions.

FIGURE 2. Patients prescribed an artemisinin-based combination therapy (ACT) of all patients in scenarios without and with malaria rapid diagnostic test (mRDT) interventions and by test result for all patients in scenarios with mRDT interventions. Graphs depict the percentage of patients prescribed ACT except for: Afgh1 and Afgh2, where all antimalarials are included to account for *Plasmodium vivax* treatment; and Nige1 without mRDT interventions only, where ACT or sulfadoxine-pyrimethamine (SP) are included to reflect treatment practices at the time of data collection. Scenarios with denominators fewer than 10 patients are not graphed, resulting in some points without adjoining lines: Afgh2/a and Afgh2/b in the "Not tested" column and Afgh1/b, Afgh1/c, and Afgh2/b in the "Positive test result" column. Afgh1 and Ghan1 studies individually randomized

patients to malaria diagnostic method; data are not included in “Not tested” column because all patients in mRDT intervention scenarios were tested. Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each), Nige1 (three intervention scenarios), and Tanz2 (three intervention scenarios). See Table 1. The following scenarios with denominators fewer than 50 patients are included: Uga2 in the “Not tested” column, and Cam1/a (R1), Tanz1/b, and Uga2/a in the “Positive test result” column. All other scenarios had larger denominators.

FIGURE 3. Patients prescribed an antibacterial of all patients in scenarios without and with malaria rapid diagnostic test (mRDT) interventions and by test result for all patients in scenarios with mRDT interventions. Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each), Nige1 (three intervention scenarios), and Tanz2 (three intervention scenarios). See Table 1. Community health workers in Uga2 were not permitted to prescribe antibacterials medications, so this study is not included in figure 3. Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method; data are not included in (**D**) because all patients in scenarios with mRDT interventions were tested. Scenarios with denominators fewer than 10 patients are not graphed, resulting in some points without adjoining lines: Afgh2/a and Afgh2/b in the “Not tested” column, and Afgh1/b, Afgh1/c, and Afgh2/b in the “Positive test result” column. The following scenarios with denominators fewer than 50 patients are included: Cam1/a (R1) and Tanz1/b in the “Positive test result” column. All other scenarios had larger denominators.

FIGURE 4. Patients in scenarios without and with malaria rapid diagnostic test (mRDT) interventions prescribed (**A**) an antimalarial and an antibacterial, (**B**) an antimalarial or an antibacterial, (**C**) an antipyretic without an antimalarial or an antibacterial, and (**D**) three or more medicines. Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each); Nige1 (three intervention scenarios) and Tanz2 (three intervention scenarios). See Table 1. Community health workers in Uga2 were not permitted to prescribe antibacterials medications, so this study is not included in figure 4. Tanz2 did not record data on all medications prescribed, so this study is not included in (**D**).

FIGURE 5. Patients in scenarios without and with malaria rapid diagnostic test (mRDT) interventions that were referred to another care provider or health facility. Ghan1, Tanz1, Tanz2, and Uga1 did not record data on referral. Case management was performed by community health workers in Afgh2 and Uga2, private drug store retailers in Uga3, and both public and private health facilities in Nige1. All other studies were conducted in public health facilities.

TABLE 1

Description of studies included in the analysis

Study country (reference)	Context	Healthcare provider type	Dates	Design	Setting*	Scenario description†	Number of patients	Number of clusters‡
Afgh1 Afghanistan (29)	Urban and rural	Public health facilities	September 2009–September 2010	Individually randomized trial	Afgh1/a	C	2,005	12
						R1	2,048	12, same as C
					Afgh1/b	C	517	5
						R1	527	5, same as C
					Afgh1/c	C	323	5
						R1	329	5, same as C
Afgh2 Afghanistan (Leslie T, under review)	Urban and rural	Community health workers	October 2011–May 2012	Cluster-randomized trial	Afgh2/a	C	607	6
						R1	733	6
					Afgh2/b	C	594	5
						R1	466	5
Cam1 Cameroon (30)	Urban and rural	Public and mission health facilities	October–December 2011	Cluster-randomized trial	Cam1/a	C	400	5
						R1	699	8
						R2	778	9
					Cam1/b	C	281	4
						R1	932	10
						R2	891	10
Ghan1 Ghana (31)	Rural	Public health facilities	August 2007–December 2008	Individually randomized trial	Ghan1/a	C	1,907	1
						R1	1,904	1, same as C
					Ghan1/b	C	1,727	3
						R1	1,725	3, same as C
Nige1 Nigeria (32)	Urban and rural	Public health facilities and private medicine retailers	July–December 2009 (formative), June–December 2011 (trial)	Formative study followed by cluster-randomized trial	Nige1	C	1,642	100
						R1	1,588	41
						R2	1,850	47
						R3§	1,508	41
Tanz1 Tanzania (33)	Rural/periurban	Public health facilities	May–October 2010 (baseline), April–July 2012 (follow-up)	Descriptive before and after evaluation	Tanz1/a	C	689	39
						R1	750	60
					Tanz1/b	C	559	56
						R1	388	60
					Tanz1/c	C	498	44
						R1	572	57

Tanz2 Tanzania (34)	Rural	Public health facilities	September 2010–January 2011 (baseline), February 2011–Mar. 2012 (trial)	Baseline, followed by cluster-randomized trial	Tanz2	C	16,068	36
						R1	14,217	12
						R2	15,931	12
						R3‖	13,973	12
Uga1 Uganda (35)	Rural	Public health facilities	April 2011–March 2013	Cluster-randomized trial	Uga1	C	210,758	10
						R1	221,755	1
Uga2 Uganda (36)	Rural	Community health workers	January–December 2011	Cluster-randomized trial	Uga2/a	C	2,444	32
						R1	1,207	32
					Uga2/b	C	10,625	31
						R1	7,872	30
Uga3 Uganda (37)	Rural	Private medicine retailers	January–December 2011	Cluster-randomized trial	Uga3	C	8,109	10
						R2	10,365	10

Further details of the studies are available from individual study publications.

* Some studies had multiple "settings," defined as distinct geographical areas, malaria transmission zones, or different standard practices of malaria diagnosis. Where the study had only one setting, the study and setting abbreviations are the same.

† C = Without malaria rapid diagnostic test (mRDT) interventions; R1 = mRDT intervention with basic provider training; R2 = mRDT intervention with enhanced provider training; R3 = mRDT intervention with enhanced provider training and other activities.

‡ Clusters were health facilities in all studies, except Nige1 (health facilities and private medicine retailers), Uga2 (villages) and Uga3 (drug shops within a single administrative area, and drug shops in a neighboring administrative area if the distance between drug shops was < 1 km).

§ The R3 intervention in Nige1 also included school-based activities.

|| The R3 intervention in Tanz2 also included patient sensitization.

SUPPLEMENTAL TABLE 1

Patients tested by any malaria diagnostic test

Study (by setting)	Without mRDT interventions percentage numerator/denominator	With mRDT interventions percentage numerator/denominator	Odds ratio (95% CI)
Afgh1/a*	NA	NA	NA
Afgh1/b*	NA	NA	NA
Afgh1/c*	NA	NA	NA
Afgh2/a	0	98.8	∞†
	0/607	724/733	
Afgh2/b	0	100	∞†
	0/594	466/466	
Cam1/a‡	78.3	(1): 70.7	(1): 0.67
	313/400	494/699	(0.17, 2.66)
	–	(2): 79.5	(2): 1.08
	–	617/776	(0.28, 4.1)
Cam1/b[3]	80.4	(1): 81.0	(1): 1.04
	226/281	757/933	(0.23, 4.7)
	–	(2): 77.8	(2): 0.85
	–	692/889	(0.15, 4.7)
Ghan1/a*	NA	NA	NA
Ghan1/b*	NA	NA	NA
Nige1§	1.7	(1): 29.9	(1): 25.5
	27/1,634	472/1,576	(7.5, 86)
		(2): 23.2	(2): 18.0
		428/1,844	(5.0, 64)
		(3): 15.8	(3): 11.2
		237/1,502	(3.08, 40)
Tanz1/a	7.3	48.4	12.0
	50/689	363.750	(4.2, 34.6)
Tanz1/b	12.7	43.1	5.2
	71/559	167/387	(2.26, 12.0)
Tanz1/c	31.3	71.5	5.5
	156/498	409/572	(2.30, 13.2)
Tanz2‖	0	(1): 39.1	∞†
	0/16,068	5,556/14,216	
		(2): 39.7	
		6,332/15,931	
		(3): 40.6	
		5,673/13,972	
Uga1	7.3	52.9	14.4
	15,285/210,758	117,350/221,755	(6.1, 33.9)
Uga2/a	0	96.0	∞†
	0/10,625	1,150/1,198	
Uga2/b	0	98.7	∞†
	0/2,444	7,736/7,840	
Uga3	0	97.3	∞†
	0/8,109	10,078/10,357	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method and are not included in this analysis.

† Odds ratio undefined; approaches infinity.

‡ Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

§ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

|| Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

SUPPLEMENTAL TABLE 2

Patients under age 5 years tested by any malaria diagnostic test

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a*	NA	NA	NA
Afgh1/b*	NA	NA	NA
Afgh1/c*	NA	NA	NA
Afgh2/a	0.0	100.0	∞†
	0/47	76/76	
Afgh2/b	0.0	100.0	∞†
	0/20	15/15	
Cam1/a‡	85.2	(1): 64.4	(1): 0.32
	109/128	116/680	(0.04, 2.42)
		(2): 81.2	(2): 0.75
		190/234	(0.12, 4.7)
Cam1/b‡	85.2	(1): 84.0	(1): 0.91
	92/108	352/419	(0.18, 4.7)
		(2): 77.4	(2): 0.60
		291/376	(0.09, 3.85)
Ghan1/a*	NA	NA	NA
Ghan1/b*	NA	NA	NA
Nige1§	2.0	(1): 32.8	(1): 23.8
	6/299	38/116	(5.46, 103)
		(2): 30.9	(2): 21.9
		43/139	(4.96, 96.5)
		(3): 27.7	(3): 18.7
		38/137	(3.27, 107)
Tanz1/a	3.5	50.4	28.4
	14/405	259/514	(7.9, 102)
Tanz1/b	10.7	40.5	5.7
	33/308	100/247	(2.41, 13.3)
Tanz1/c	32.2	72.2	5.48
	103/320	268/371	(2.16, 13.9)
Tanz2||	0.0	(1): 37.7	∞†
	0/6,559	1,981/5,270	–
	–	(2): 38.5	–
	–	2,346/6,101	–
	–	(3): 39.1	–
	–	1,820/4,649	–
Uga1	8.9	61.0	16.0
	5,774/64,825	40,978/67,159	(6.1, 42)
Uga2/a	0.0	96.0	∞†
	0/2,444	1,150/1,198	
Uga2/b	0.0	98.7	∞†
	0/10,625	7,736/1,198	
Uga3	0.0	98.3	∞†
	0/2,761	3,829/3,895	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method and are not included in this analysis.

† Odds ratio undefined; approaches infinity.

‡ Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

§ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

|| Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

SUPPLEMENTAL TABLE 3

Patients ages 5 years and older tested by any malaria diagnostic test

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a*	NA	NA	NA
Afgh1/b*	NA	NA	NA
Afgh1/c*	NA	NA	NA
Afgh2/a	0.0	98.6	∞†
	0/558	633/642	
Afgh2/b	0.0	100.0	∞†
	0/573	449/449	
Cam1/a‡	75.0	(1): 72.8	(1): 0.89
	204/272	378/519	(0.28, 2.90)
	–	(2): 78.8	(2): 1.24
	–	427/542	(0.37, 4.1)
Cam1/b[3]	77.5	(1): 78.6	(1): 1.07
	134/173	403/513	(0.24, 4.7)
	–	(2): 78.2	(2): 1.04
	–	401/513	(0.20, 5.5)
Ghan1/a*	NA	NA	NA
Ghan1/b*	NA	NA	NA
Nige1§	1.5	(1): 29.5	(1): 26.9
	20/1,306	424/1,438	(7.3, 99)
	–	(2): 22.3	(2): 18.5
	–	375/1,679	(4.8, 71)
	–	(3): 14.3	(3): 10.7
	–	191/1,336	(2.85, 40)
Tanz1/a	12.7	44.1	5.4
	36/284	104/236	(1.77, 16.6)
Tanz1/b	15.1	47.9	5.1
	38/251	67/140	(1.92, 13.8)
Tanz1/c	29.8	70.1	5.5
	53/178	141/201	(2.21, 13.9)
Tanz2||	0.0	(1): 40.0	∞†
	0/9,429	3,572/8,926	–
	–	(2): 40.6	–
	–	3,975/9,787	–
	–	(3): 41.4	–
	–	3,849/9,301	–
Uga1	6.5	49.9	14.4
	9,298/143,834	74,313/148,980	(6.23, 33.3)
Uga2/a	NA	NA	NA
Uga2/b	NA	NA	NA

Uga3	0.0	96.7	∞†
	0/5,625	6,156/6,369	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method and are not included in this analysis.

† Odds ratio undefined; approaches infinity.

‡ Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

§ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

|| Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

SUPPLEMENTAL TABLE 4

Patients prescribed ACT

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a	42.0	36.1	0.78
	843/2,005	740/2,048	(0.68, 0.90)
Afgh1/b	24.4	20.1	0.78
	126/517	106/527	(0.54, 1.13)
Afgh1/c	87.6	34.7	0.07
	283/323	114/329	(0.02, 0.25)
Afgh2/a	77.9	26.6	0.10
	471/605	188/708	(0.04, 0.25)
Afgh2/b	95.9	0.6	0.00
	567/591	3/463	(0.00, 0.00)
Cam1/a*	79.5	(1): 43.5	(1): 0.20
	314/395	294/676	(0.06, 0.61)
	–	(2): 37.9	(2): 0.16
	–	286/754	(0.05, 0.52)
Cam1/b[2]	69.8	(1): 55.1	(1): 0.53
	194/278	496/900	(0.28, 1.02)
	–	(2): 46.5	(2): 0.38
	–	408/877	(0.17, 0.84)
Ghan1/a	63.7	62.3	0.94
	1,210/1,900	1,180/1,893	(0.83, 1.08)
Ghan1/b	91.6	69.0	0.20
	1,577/1,722	1,188/1,721	(0.07, 0.62)
Nige1*	56.9	(1): 49.3	(1): 0.74
	934/1,642	717/1,453	(0.40, 1.35)
	–	(2): 45.4	(2): 0.63
	–	828/1,823	(0.38, 1.03)
	–	(3): 54.2	(3): 0.90
	–	808/1,409	(0.51, 1.57)
Tanz1/a†	20.1	8.5	0.37
	138/688	64/750	(0.17, 0.79)
Tanz1/b†	49.2	25.5	0.35
	275/559	99/388	(0.20, 0.61)
Tanz1/c†	57.0	35.1	0.41
	284/498	201/572	(0.24, 0.68)
Tanz2‡	43.6	(1): 15.8	(1): 0.24

	7,008/16,068	2,246/14,217	(0.15, 0.40)
	–	(2): 11.6	(2): 0.17
	–	1,846/15,931	(0.10, 0.28)
	–	(3): 9.5	(3): 0.14
	–	1,329/13,973	(0.08, 0.22)
Uga1	53.8	50.8	0.89
	113,411/210,758	112,673/221,755	(0.67, 1.19)
Uga2/a	95.1	8.2	0.00
	2,310/2,428	94/1,149	(0.00, 0.01)
Uga2/b	99.2	45.7	0.01
	10,500/10,589	3,512/7,677	(0.00, 0.01)
Uga3	99.1	60.0	0.01
	7,981/8,055	5,933/9,987	(0.01, 0.04)

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable. Table presents the percentage of patients prescribed artemisinin-based combination therapy (ACT) except for: Afgh1 and Afgh2, where the percentage prescribed all antimalarials is presented to account for *Plasmodium vivax* treatment; and Nige1 without mRDT interventions only, where ACT or sulfadoxine-pyrimethamine (SP) is presented to reflect treatment practices at the time of data collection.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.
† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ ACTs obtained by patient at the consultation (ACTs prescribed not available).

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

SUPPLEMENTAL TABLE 5

Patients in scenarios with mRDT interventions prescribed ACT, by malaria test result and not tested

	Percentage patients prescribed an ACT (95% CI) numerator/denominator		
Study (by setting)	Positive test result	Negative test result	Not tested
Afgh1/a*†‡	99.5 (97.9, 99.9)	12.6 (5.1, 27.7)	NA
	552/555	188/1,493	
Afgh1/b*†‡	–	19.2 (1.7, 76.0)	NA
		100/521	
Afgh1/c*†‡	–	34.5 (8.4, 75.1)	NA
		113/328	
Afgh2/a*‡	82.7 (63.3, 93.0)	4.0 (1.7, 9.2)	–
	163/197	20/503	
Afgh2/b*‡	–	0.4 (0.1, 1.3)	–
		2/459	
Cam1/a§	(1): 70.2 (37.3, 90.3)	(1): 39.2 (13.4, 72.8)	(1): 45.2 (28.7, 62.7)
	33/47	167/426	89/197
	(2): 79.6 (62.1, 90.3)	(2): 24.6 (7.4, 57.2)	(2): 35.3 (6.1, 82.0)
	117/147	110/447	54/153
Cam1/b§	(1): 72.4 (58.2, 83.1)	(1): 42.5 (29.3, 56.9)	(1): 48.5 (40.5, 56.6)
	254/351	157/369	81/167
	(2): 70.1 (54.6, 82.0)	(2): 18.3 (8.8, 34.2)	(2): 51.6 (28.6, 73.9)
	246/351	57/312	99/192
Ghan1/a†	98.2 (96.7, 99.0)	45.9 (43.2, 48.6)	(1): 45.0 (29.1, 61.9)
	584/595	596/1,298	453/1,007
	–	–	(2): 48.2 (38.3, 58.2)
	–	–	674/1,399
	–	–	(3): 56.9 (46.1, 67.1)
	–	–	710/1,248

Ghan1/b†	97.5 (88.0, 99.5)	49.1 (1.0, 98.9)	NA
	692/710	496/1,011	
Nige1‖	(1): 74.4 (68.3, 79.6)	(1): 21.4 (10.3, 39.3)	NA
	238/320	24/112	
	(2): 66.9 (48.4, 81.3)	(2): 21.6 (10.8, 38.5)	
	95/142	59/273	
	(3): 60.2 (40.3, 77.2)	(3): 26.5 (11.3, 50.4)	
	59/98	36/136	
Tanz1/a¶	18.2 (7.0, 39.7)	4.9 (2.5, 9.6)	9.3 (4.9, 17.1)
	14/77	14/283	36/387
Tanz1/b¶	94.4 (56.6, 99.5)	13.4 (8.1, 21.4)	28.2 (18.3, 40.8)
	17/18	20/149	62/220
Tanz1/c¶	68.2 (53.4, 80.1)	5.1 (1.9, 12.9)	36.2 (17.3, 60.7)
	131/192	11/217	59/163
Tanz2#	(1): 78.8 (64.6, 88.3)	(1): 17.0 (10.7, 26.0)	(1): 4.6 (2.2, 9.6)
	1,146/1,455	685/4,024	401/8,660
	(2): 80.2 (65.2, 89.8)	(2): 4.2 (1.8, 9.7)	(2): 3.0 (1.2, 7.0)
	1,361/1,696	191/4,541	286/9,599
	(3): 75.6 (50.3, 90.4)	(3): 3.6 (1.6, 8.2)	(3): 2.6 (1.2, 5.7)
	944/1,249	157/4,332	218/8,299
Uga1	93.2 (89.7, 95.5)	2.7 (2.1, 3.5)	34.2 (23.1, 47.3)
	75,808/81,359	977/35,711	35,717/104,405
Uga2/a	66.7 (41.7, 84.8)	3.1 (1.4, 6.4)	69.6 (48.7, 84.6)
	24/36	32/1,041	32/46
Uga2/b	98.0 (96.9, 98.7)	1.1 (0.6, 1.8)	93.1 (80.4, 97.8)
	3,318/3,385	43/4,067	95/102
Uga3	97.9 (96.5, 98.7)	1.2 (0.8, 1.9)	96.4 (91.4, 98.5)
	5,551/5,670	47/3,868	269/279

ACT = artemisinin-based combination therapy; CI = confidence interval; mRDT = malaria rapid diagnostic tests; NA = not applicable.

* Table presents the percentage of patients in scenarios with mRDT interventions prescribed ACT except for Afgh1 and Afgh2, where the percentage prescribed all antimalarials is presented to account for *Plasmodium vivax* treatment.

† Patients in the Afgh1 and Ghan1 studies were individually randomized to malaria diagnostic method; data are not included in this analysis because all patients in scenarios with mRDT interventions were tested.

‡ Data not included in the analysis when denominators were less than 10.

§ Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

‖ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

¶ ACTs obtained by patient at the consultation; data on ACTs prescribed not available in Tanz1.

Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

SUPPLEMENTAL TABLE 6

Patients prescribed a systemic antibacterial

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a	38.1	40.8	1.12
	763/2,005	836/2,048	(0.97, 1.03)
Afgh1/b	73.3	78.9	1.36
	379/517	416/527	(0.76, 2.43)
Afgh1/c	14.2	57.1	8.0
	46/323	188/329	(2.70, 23.9)
Afgh2/a	18.2	54.1	5.3
	110/605	383/708	(2.28, 12.4)
Afgh2/b	48.4	68.5	2.32
	286/591	317/463	(0.85, 6.3)
Cam1/a*	72.8	(1): 78.5	(1): 1.36
	287/394	534/680	(0.68, 2.84)
	–	(2): 78.5	(2): 1.36
	–	595/757	(0.76, 2.43)
Cam1/b1	50.4	(1): 56.9	(1): 1.30
	140/278	510/897	(0.48, 3.53)
	–	(2): 47.3	(2): 0.89
	–	415/877	(0.35, 2.27)
Ghan1/a	30.8	32.1	1.06
	586/1,900	608/1,896	(0.92, 1.21)
Ghan1/b	28.0	32.6	1.24
	483/1,723	560/1,719	(0.90, 1.72)
Nige1†	23.2	(1): 13.6	(1): 0.52
	382/1,642	199/1,467	(0.29, 0.93)
	–	(2): 18.2	(2): 0.73
	–	330/1,817	(0.46, 1.17)
	–	(3): 15.1	(3): 0.59
	–	223/1,474	(0.34, 1.03)
Tanz1/a‡	29.7	44.7	1.92
	204/688	335/749	(1.20, 3.08)
Tanz1/b‡	35.2	56.4	2.38
	197/688	219/388	(1.54, 3.68)
Tanz1/c‡	33.1	49.0	1.94
	165/498	280/572	(1.32, 3.83)
Tanz24§	61.5	(1): 73.2	(1): 1.71
	9,875/16,068	10,407/14,217	(1.25, 2.35)
	–	(2): 75.4	(2): 1.92
	–	12,014/15,931	(1.42, 2.61)
	–	(3): 70.5	(3): 1.50
	–	9,853/13,973	(1.19, 1.89)
Uga1	53.7	57.9	1.18
	113,102/210,758	128,406/221,755	(0.79, 1.77)
Uga2/a‖	NA	NA	NA
Uga2/b‖	NA	NA	NA
Uga3	19.4	34.9	2.24
	48/248	87/249	(1.41, 3.54)

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ Any antibacterials obtained by patients at the consultation; data on systemic antibacterials prescribed not available in Tanz1.

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

|| Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

SUPPLEMENTAL TABLE 7

Patients in scenarios with mRDT interventions prescribed a systemic antibacterial, by malaria test result and not tested

Study (by setting)	Percentage prescribed an antibacterial (95% CI) numerator/denominator		
	Positive test result	Negative test result	Not tested
Aghg1/a*	3.6 (1.8, 7.1)	54.7 (37.9, 70.4)	NA
	20/555	816/1,493	
Afgh1/b*†	–	70.7 (60.0, 91.1)	NA
		415/521	
Afgh1/c*†	–	57.3 (23.0, 85.8)	NA
		188/328	
Afgh2/a†	8.1 (4.8, 13.5)	72.8 (49.9, 87.8)	–
	16/197	366/503	
Afgh2/b†	–	68.8 (41.9, 87.1)	–
		316/459	
Cam1/a‡	(1): 66.0 (48.2, 80.1)	(1): 79.9 (65.9, 89.1)	(1): 80.0 (57.5, 92.2)
	31/47	341/427	160/200
	(2): 74.7 (65.3, 82.2)	(2): 83.1 (75.4, 88.9)	(2): 69.3 (64.6, 73.6)
	109/146	375/451	106/153
Cam1/b‡	(1): 58.0 (42.4, 72.2)	(1): 63.5 (46.9, 77.4)	(1): 42.5 (25.2, 61.9)
	203/350	(2): 52.6 (45.1, 60.0)	71/167
	(2): 43.7 (31.7, 56.5)	164/312	(2): 47.9 (28.2, 68.3)
	153/350	–	92/192
Ghan1/a*	14.6 (12.0, 17.7)	40.0 (37.4, 42.7)	NA
	87/595	521/1,301	
Ghan1/b*	18.0 (11.1, 27.9)	42.8 (12.4, 79.9)	NA
	128/710	432/1,009	
Nige1§	(1): 17.5 (13.3, 22.7)	(1): 26.1 (12.2, 47.4)	(1): 11.1 (5.6, 20.9)
	55/314	29/111	114/1,026
	(2): 14.9 (8.5, 24.7)	(2): 13.3 (6.7, 24.6)	(2): 19.5 (14.9, 25.2)
	21/141	37/279	271/1,388
	(3): 20.2 (8.5, 41.0)	(3): 21.6 (13.9, 32.2)	(3): 13.9 (8.9, 21.3)
	20/99	29/134	172/1,233
Tanz1/a||	31.6 (17.3, 50.5)	53.0 (42.2, 63.6)	41.3 (30.4, 52.2)
	24/76	150/283	160/387
Tanz1/b||	44.4 (11.4, 83.3)	58.4 (47.2, 68.8)	56.4 (44.7, 67.4)
	8/18	87/149	124/220
Tanz1/c||	30.7 (20.8, 42.9)	61.8 (50.4, 71.9)	53.4 (39.4, 66.8)
	59/192	134/217	87/163
Tanz2¶	(1): 26.5 (13.4, 45.8)	(1): 74.2 (67.1, 80.2)	(1): 80.6 (75.5, 84.8)
	386/1,455	2,985/4,024	6,979/6,880
	(2): 36.1 (25.4, 48.3)	(2): 77.7 (69.9, 83.9)	(2): 81.3 (75.1, 86.2)
	612/1,696	3,527/4,541	7,800/9,599
	(3): 26.3 (18.0, 36.6)	(3): 74.7 (69.2, 79.6)	(3): 74.9 (68.6, 80.3)
	328/1,249	3,238/4,332	6,214/8,299
Uga1	40.5 (30.6, 51.2)	69.3 (65.3, 73,0)	66.3 (60.5, 71.7)
	32,935/81,359	24,737/35,711	69,178/104,405

Uga2/a#	NA	NA	NA
Uga2/b#	NA	NA	NA
Uga3†	23.6 (16.3, 33.0)	46.0 (37.7, 54.6)	–
	30/127	52/113	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Patients in the Afgh1 and Ghan1 studies were individually randomized to malaria diagnostic method; data are not included in this analysis because all patients in scenarios with mRDT interventions were tested.

† Data not included in the analysis when denominators were less than 10.

‡ Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

§ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

|| Any antibacterials obtained by patients at the consultation; data on systemic antibacterials prescribed not available in Tanz1.

¶ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

SUPPLEMENTAL TABLE 8

Patients prescribed an antimalarial and an antibacterial

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a	1.2	1.5	1.18 (0.66, 2.11)
	25/2,005	30/2,048	
Afgh1/b	10.6	8.7	0.80 (0.54, 1.19)
	55/517	46/527	
Afgh1/c	4.6	4.3	0.91 (0.50, 1.68)
	15/323	14/329	
Afgh2/a	47.4	0.2	0.00 (0.00, 0.02)
	280/51	1/463	
Afgh2/b	16.7	3.1	0.16 (0.06, 0.40)
	101/605	22/708	
Cam1/a*	66.1	(1): 37.7	(1): 0.31 (0.15, 0.65)
	259/392	253/672	
	–	(2): 32.8	(2): 0.25 (0.10, 0.61)
	–	247/753	
Cam2/b*	43.9	(1): 40.1	(1): 0.85 (0.33, 2.24)
	122/278	359/896	
	–	(2): 28.1	(2): 0.50 (0.19, 1.31)
	–	247/875	
Ghan1/a	12.3	12.4	1.01 (0.83, 1.22)
	234/1,899	235/1,893	
Ghan1/b	23.8	15.3	0.58 (0.32, 1.04)
	410/1,722	263/1,719	
Nige1†	14.7	(1): 12.3	(1): 0.81 (0.48, 1.39)
	241/1,642	174/1,459	
	–	(2): 14.0	(2): 0.95 (0.58, 1.55)
	–	253/1,805	
	–	(3): 11.9	(3): 0.78 (0.51, 1.21)
	–	175/1,472	

Tanz1/a‡	6.8	4.1	0.59 (0.27, 1.28)
	47/688	31/749	
Tanz1/b‡	18.2	12.9	0.66 (0.36, 1.22)
	102/559	50/388	
Tanz1/c‡	15.5	14.7	0.94 (0.49, 1.82)
	77/498	84/572	
Tanz2§	24.2	(1): 6.9	(1): 0.23 (0.14, 0.37)
	3,891/16,068	974/14,217	
	–	(2): 5.7	(2): 0.19 (0.12, 0.31)
	–	908/15,931	
	–	(3): 3.6	(3): 0.12 (0.07, 0.19)
	–	500/13,973	
Uga1	23.8	23.5	0.99 (0.59, 1.65)
	50,098/210,758	52,212/221,755	
Uga2/a‖	NA	NA	NA
Uga2/b‖	NA	NA	NA
Uga3	19.4	14.2	0.69 (0.45, 1.06)
	48/248	33/233	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ Antimalarials and any antibacterials obtained by patients at the consultation; data on medicines prescribed not available in Tanz1.

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

‖ Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

SUPPLEMENTAL TABLE 9

Patients prescribed an antimalarial or an antibacterial

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a	78.9	75.5	0.83 (0.74, 0.93)
	1,581/2,005	1,546/2,048	
Afgh1/b	87.0	90.3	1.39 (0.73, 2.66)
	450/517	476/527	
Afgh1/c	97.2	87.5	0.20
	314/323	288/329	0.08, 0.48)
Afgh2/a	97.0	68.9	0.07 (0.03, 0.19)
	573/591	319/463	
Afgh2/b	79.3	77.5	0.90 (0.32, 2.56)
	480/605	549/708	
Cam1/a*	94.2	(1): 92.5	(1): 0.73 (0.19, 2.76)
	372/394	629/680	
	–	(2): 90.9	(2): 0.59 (0.16, 2.14)
	–	687/757	
Cam1/b*	97.1	(1): 88.1	(1): 0.22 (0.10, 0.49)
	270/278	790/897	
	–	(2): 79.8	(2): 0.12 (0.05, 0.27)
	–	700/877	

Ghan1/a	82.9	82.2	0.95 (0.80, 1.12)
	1,575/1,899	1,557/1,894	
Ghan1/b	97.0	85.7	0.21 (0.10, 0.48)
	1,670/1,722	1,501/1,719	
Nige1†	84.5	(1): 81.7	(1): 0.82 (0.37, 1.79)
	1,369/1,642	1158/1,460	
	–	(2): 80.4	(2): 0.75 (0.41, 1.37)
	–	1,451/1,805	
	–	(3): 86.8	(3): 1.20 (0.49, 2.93)
	–	1,278/1,473	
Tanz1/a‡	46.2	52.7	1.30 (0.81, 2.09)
	318/688	395/749	
Tanz1/b‡	68.7	70.4	1.08 (0.61, 1.93)
	384/559	273/388	
Tanz1/c‡	79.1	72.2	0.69 (0.40, 1.16)
	394/498	413/572	
Tanz2§	87.9	(1): 85.4	(1): 0.81 (0.61, 1.08)
	14,125/16,068	12,146/14,217	
	–	(2): 84.4	(2): 0.74 (0.55, 1.01)
	–	13,446/15,931	
	–	(3): 79.0	(3): 0.52 (0.40, 0.66)
	–	11,032/13,973	
Uga1	85.5	87.0	1.13 (0.67, 1.91)
	180,106/210,758	192,831/221,755	
Uga2/a‖	NA	NA	NA
Uga2/b‖	NA	NA	NA
Uga3	100.0	78.7	0.00¶
	248/248	188/239	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ Antimalarials and any antibacterials obtained by patients at the consultation; data on medicines prescribed not available in Tanz1.

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

‖ Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

¶ Odds ratio undefined; approaches zero.

SUPPLEMENTAL TABLE 10

Patients prescribed a systemic antihelminthic, and patients prescribed a systemic antifungal

Study (by setting)	Antihelminthics		Antifungals	
	Without mRDT interventions	With mRDT interventions	Without mRDT interventions	With mRDT interventions
	Percentage numerator/denominator	Percentage numerator/denominator	Percentage numerator/denominator	Percentage numerator/denominator
Afgh1/a	0.5 (10/2,005)	0.3 (7/2,048)	0 (0/2,005)	0 (0/2,048)
Afgh1/b	0.8 (4/517)	0.8 (4/527)	0 (0/517)	0 (0/527)
Afgh1/c	0.0 (0/323)	0.3 (1/329)	0 (0/323)	0 (0/329)
Afgh2/a*	NA	NA	NA	NA
Afgh2/b*	NA	NA	NA	NA
Cam1/a†	11.4 (45/394)	(1): 4.3 (29/680)	0.8 (3/394)	(1): 1.2 (8/680)
	–	(2): 8.5 (76/897)	–	(2): 1.9 (17/897)
	–		–	
Cam1/b†	8.3 (23/278)	(1): 7.1 (54/757)	1.4(4/278)	(1): 0.4 (3/757)
		(2): 10.4 (91/877)		(2): 2.6 (23/877)
Ghan1/a	31.6 (600/1,900)	33.3 (631/1,896)	0.6 (11/1,900)	0.7 (13/1,896)
Ghan1/b	8.6 (149/1,723)	11.3 (195/1,719)	0.1 (1/1,723)	0.3 (6/1,719)
Nige1‡	2.0 (33/1,642)	(1): 0.3 (4/1,588)	0.1 (1/1642)	(1): 0 (0/1,588)
		(2): 0.3 (5/1,850)		(2): 0 (0/1,850)
		(3): 1.3 (19/1,508)		(3): 0 (0/1,508)
Tanz1/a§	1.7 (12/688)	4.5 (34/749)	0 (0/688)	0 (0/749)
Tanz1/b§	3.2 (18/559)	7.2 (28/388)	0 (0/559)	0 (0/388)
Tanz1/c§	2.2 (11/498)	3.1 (18/572)	0 (0/498)	0 (0/572)
Tanz2*	NA	(1) NA	NA	(1) NA
		(2) NA		(3) NA
		(4) NA		(2) NA
Uga1	14.6 (30,865/210,758)	16.1 (35,683/221,755)	0.1 (195/210,758)	0.1 (318/221,755)
Uga2/a*	NA	NA	NA	NA
Uga2/b*	NA	NA	NA	NA
Uga3	4.0 (10/248)	5.2 (13/249)	0 (0/248)	0 (0/249)

mRDT = malaria rapid diagnostic test; NA = not applicable.

* Data on systemic antihelminthics and antifungals prescribed were not collected from Afgh2, Tanz2, and Uga2.

† Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

‡ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

§ Systemic antihelminthics and antifungals obtained by patients at the consultation; data on medicines prescribed not available in Tanz1.

SUPPLEMENTAL TABLE 11

Patients prescribed an antipyretic without an antimalarial or an antibiotic

Study (by setting)	Without mRDT interventions	With mRDT interventions	Odds ratio (95% CI)
	Percentage numerator/denominator	Percentage numerator/denominator	
Afgh1/a	19.7	22.7	1.19 (1.07, 1.34)
	395/2,005	464/2,048	
Afgh1/b	10.8	8.2	0.73 (0.35, 1.53)
	56/517	43/527	
Afgh1/c	2.8	12.2	4.8 (2.16, 10.8)
	9/323	40/329	
Afgh2/a	1.2	17.3	17.4 (3.41, 89)
	7/591	80/463	
Afgh2/b	0.3	11.6	39.5 (12.9, 121)
	2/605	82/708	
Cam1/a*	0.5	(1): 4.2	(1): 8.5 (1.34, 54)
	2/392	28/671	
	–	(2): 7.1	(2): 14.9 (2.44, 90)
	–	53/749	
Cam1/b*	1.8	(1): 3.7	(1): 2.09 (0.66. 6.7)
	5/278	33/895	
	–	(2): 5.8	(2): 3.38 (1.01, 11.4)
	–	51/874	
Ghan1/a	12.6	14.3	1.16 (0.96, 1.40)
	239/1,899	271/1,893	
Ghan1/b	2.4	10.2	4.6 (1.98, 10.5)
	42/1,722	176/1,719	
Nige1†	7.6	(1): 3.1	(1): 0.39 (0.17, 0.89)
	138/1,642	44/1,459	
	–	(2): 8.9	(2): 1.19 (0.66, 2.13)
	–	161/1,825	
	–	(3): 3.9	(3): 0.50 (0.18, 1.39)
	–	58/1,489	
Tanz1/a‡	23.7	18.8	0.75 (0.46, 1.23)
	163/688	141/749	
Tanz1/b‡	12.7	12.1	0.95 (0.49, 1.83)
	71/559	47/388	
Tanz1/c‡	9.4	18.2	2.13 (1.25, 3.64)
	47/498	104/572	
Tanz2§	6.4	(1): 10.9	(1): 1.78 (1.32, 2.41)
	(1,020/15,953)	1,545/14,217	
	–	(2): 11.4	(2): 1.89 (1.34, 2.65)
	–	1,818/15,931	
	–	(3): 14.1	(3): 2.39 (1.89, 3.04)
	–	1,964/13,973	
Uga1	10.1	8.4	0.79 (0.43, 1.45)
	21,803/210,758	18,630/221,755	
Uga2/a‖	NA	NA	NA
Uga2/b‖	NA	NA	NA
Uga3	0.0	14.6	∞¶
	0/248	34/233	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ Antipyretics obtained by patients at the consultation; data on medicines prescribed not available in Tanz1.

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

|| Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

¶ Odds ratio undefined; approaches infinity.

SUPPLEMENTAL TABLE 12

Patients prescribed three or more medicines

Study (by setting)	Without mRDT interventions Percentage numerator/denominator	With mRDT interventions Percentage numerator/denominator	Odds ratio (95% CI)
Afgh1/a	16.1 322/2,005	15.1 309/2,048	0.93 (0.80, 1.08)
Afgh1/b	36.0 186/517	34.7 183/527	0.95 (0.85, 1.06)
Afgh1/c	60.1 194/323	38.3 126/329	0.41 (0.19, 0.92)
Afgh2/a	62.3 368/591	3.2 15/463	0.02 (0.01, 0.05)
Afgh2/b	28.1 170/605	10.2 72/708	0.29 (0.10, 0.88)
Cam1/a*	87.5 350/400	(1): 82.3 575/699	(1): 0.66 (0.28, 1.58)
	– –	(2): 79.8 621/778	(2): 0.57 (0.26, 1.22)
Cam1/b*	78.6 221/281	(1): 71.5 667/933	(1): 0.68 (0.33, 1.41)
	– –	(2): 61.3 546/891	(2): 0.43 (0.19, 0.98)
Ghan1/a	91.8 (1,751/1,907)	91.4 (1,740/1,904)	0.95 (0.75, 1.19)
Ghan1/b	90.3 (1,559/1,727)	88.2 (1,521/1,725)	0.80 (0.61, 1.07)
Nige1†	60.8 965/1,587	(1): 56.4 896/1,588	(1): 0.83 (0.45, 1.54)
	– –	(2): 53.2 985/1,850	(2): 0.73 (0.39, 1.38)
	– –	(3): 57.1 861/1,508	(3): 0.86 (0.51, 1.44)
Tanz1/a‡	13.8 95/688	18.6 139/748	1.42 (0.80, 2.53)
Tanz1/b‡	24.2 143/498	30.7 119/388	1.39 (0.90, 2.14)
Tanz1/c‡	28.7 143/498	26.6 152/571	0.90 (0.52, 1.57)
Tanz2§	NA	(1): NA	(1): NA
		(2): NA	(2): NA
		(3): NA	(3): NA
Uga1	50.9 107,348/210,758	52.2 115,850/221,755	1.05 (0.66, 1.68)

Uga2/a‖	NA	NA	NA
Uga2/b‖	NA	NA	NA
Uga3	54.0	60.2	1.29 (0.80, 2.07)
	134/248	150/249	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

‡ Medicines obtained by patients at the consultation; data on medicines prescribed not available in Tanz1.

§ Tanz2 did not record data on all medications prescribed, so this study is not included in Figure 4D.

‖ Community health workers in Uga2 were not permitted to prescribe antibacterials medicines, so this study is not included in this analysis.

SUPPLEMENTAL TABLE 13

Patients referred to another care provider or health facility

Study (by setting)	Without mRDT interventions Percentage numerator/denominator	With mRDT interventions Percentage numerator/denominator	Odds ratio (95% CI)
Afgh1/a	0.1	0.0	0.33 (0.03, 3.47)
	3/2,005	1/2,048	
Afgh1/b	0.0	0.0	–
	0/323	0/329	
Afgh1/c	0.2	0.4	1.97 (0.13, 29.1)
	1/517	2/527	
Afgh2/a	29.0	64.2	4.4 (2.28, 8.5)
	172/594	299/466	
Afgh2/b	23.9	15.7	0.59 (0.19, 1.81)
	145/607	115/732	
Cam1*	0.8	(1): 0.9	(1): 1.15 (0.28, 4.7)
	3/399	6/695	
	–	(2): 1.4	(2): 1.92 (0.47, 7.8)
	–	11/769	
Cam2*	0.4	(1): 1.3	(1): 3.76 (0.70, 20.1)
	1/280	12/903	
	–	(2): 3.5	(2): 10.0 (1.38, 73)
	–	30/864	
Ghan1/a†	NA	NA	NA
Ghan1/b†	NA	NA	NA
Nige1‡	1.0	(1): 1.9	(1): 1.88 (0.59, 5.9)
	17/1,630	30/1,548	
	–	(2): 1.7	(2): 1.63 (0.61, 4.4)
	–	31/1,833	
	–	(3): 3.8	(3): 3.77 (0.89, 15.93)
	–	57/1,491	
Tanz1/a†	NA	NA	NA
Tanz1/b†	NA	NA	NA
Tanz1/c†	NA	NA	NA
Tanz2†§	NA	(1): NA	(1): NA
		(2): NA	(2): NA
		(3): NA	(3): NA

Uga1†	NA	NA	NA
Uga2/b	1.0	35.1	52 (34.8, 77)
	109/10,599	821/1,168	
Uga2/a	13.1	70.3	15.8 (9.3, 27)
	314/2,404	2,706/77,16	
Uga3	3.5	12.1	3.82 (0.82, 17.8)
	279/8,039	1,234/10,226	

CI = confidence interval; mRDT = malaria rapid diagnostic test; NA = not applicable.

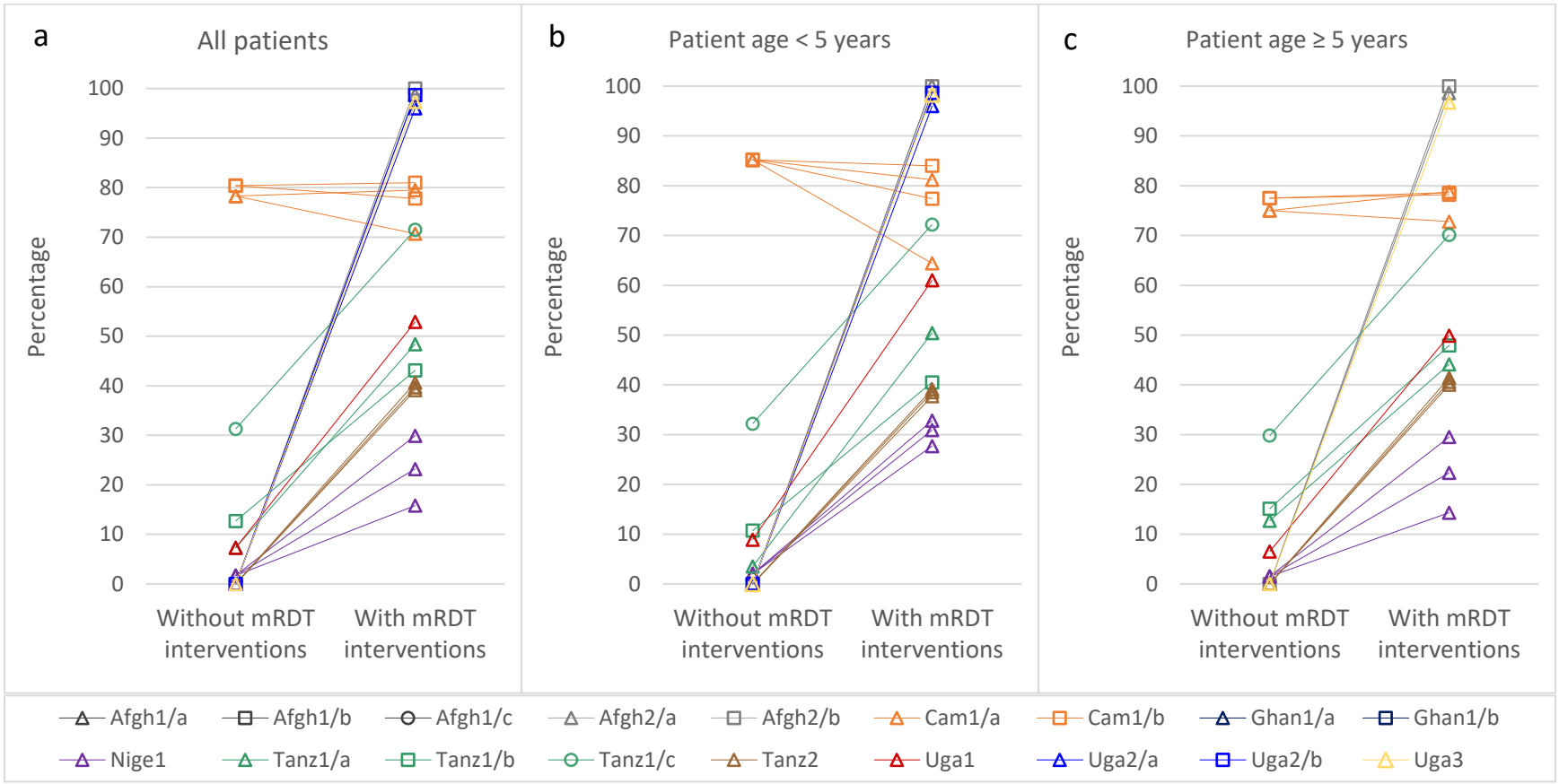
* Cam1/a and Cam1/b each had two interventions: (R1) mRDTs supplied with basic training, and (R2) mRDTs supplied with enhanced training.

† Ghan1, Tanz1, Tanz2, and Uga1 did not record data on referral.

‡ Nige1 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus school-based activities.

§ Tanz2 had three interventions: (R1) mRDTs supplied with basic training, (R2) mRDTs supplied with enhanced training, and (R3) mRDTs supplied with enhanced training plus patient sensitization.

FIGURE 1: Patients in scenarios without and with mRDT interventions that were tested with any malaria diagnostic test at the provider of (a) all patients, (b) patients under age five years, and (c) patients ages five years and older.[1,2,3]

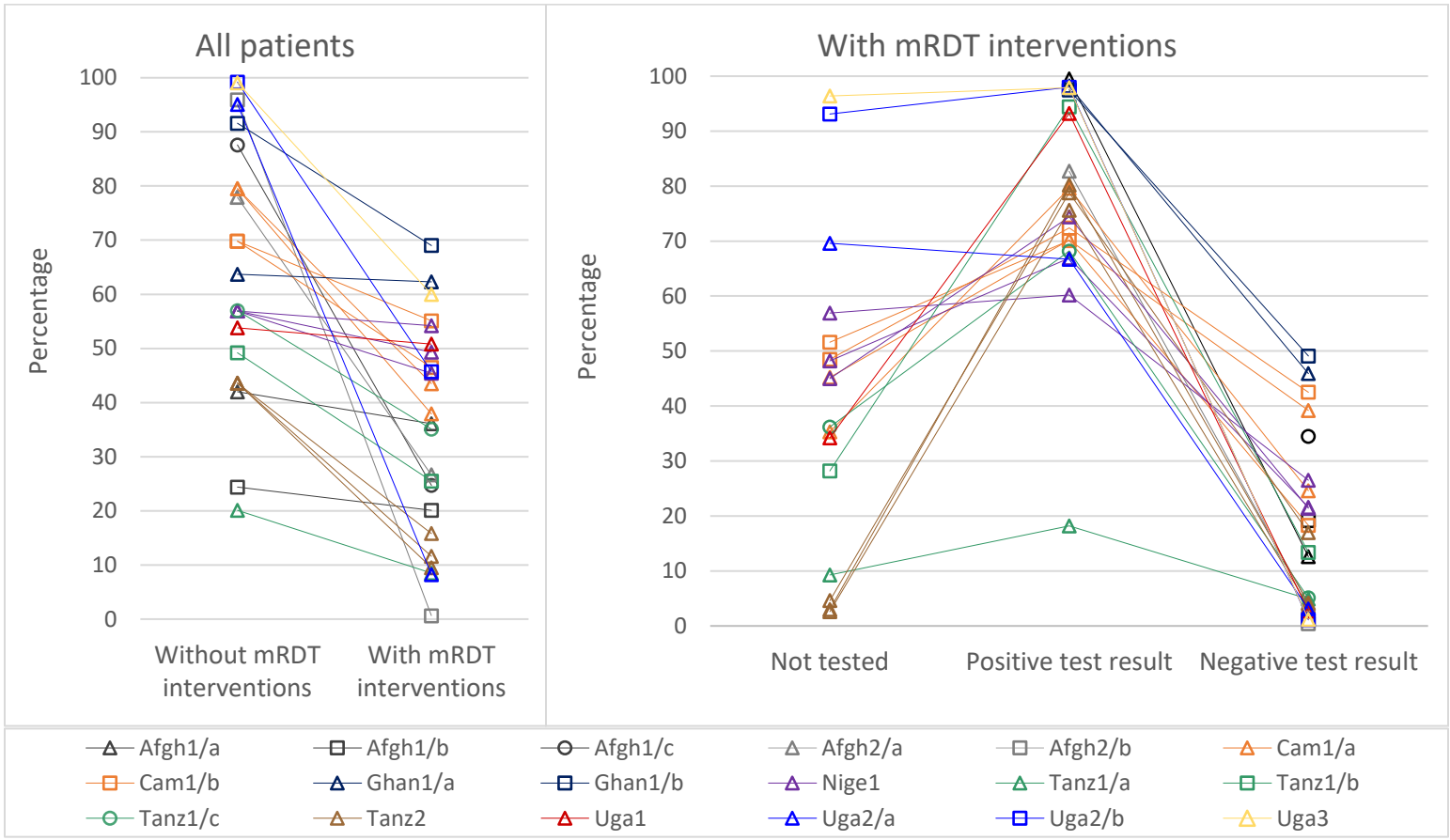


[1]Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method and are not included in this analysis.

[2]Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each); Nige1 (three intervention scenarios); and Tanz2 (three intervention scenarios). See Table 1.

[3]Scenarios with denominators fewer than fifty patients in Figure 2b are Afgh2/a without mRDT interventions and Afgh2/b both with and without mRDT interventions.

FIGURE 2: Patients prescribed an ACT of all patients in scenarios without and with mRDT interventions, and by test result for all patients in scenarios with mRDT interventions. [1,2,3,4,5]



[1] Graphs depict the percentage of patients prescribed ACT except for: Afgh1 and Afgh2, where all antimalarials are included to account for *P. vivax* treatment; and Nige1 without mRDT interventions only, where ACT or sulfadoxine-pyrimethamine (SP) are included to reflect treatment practices at the time of data collection.

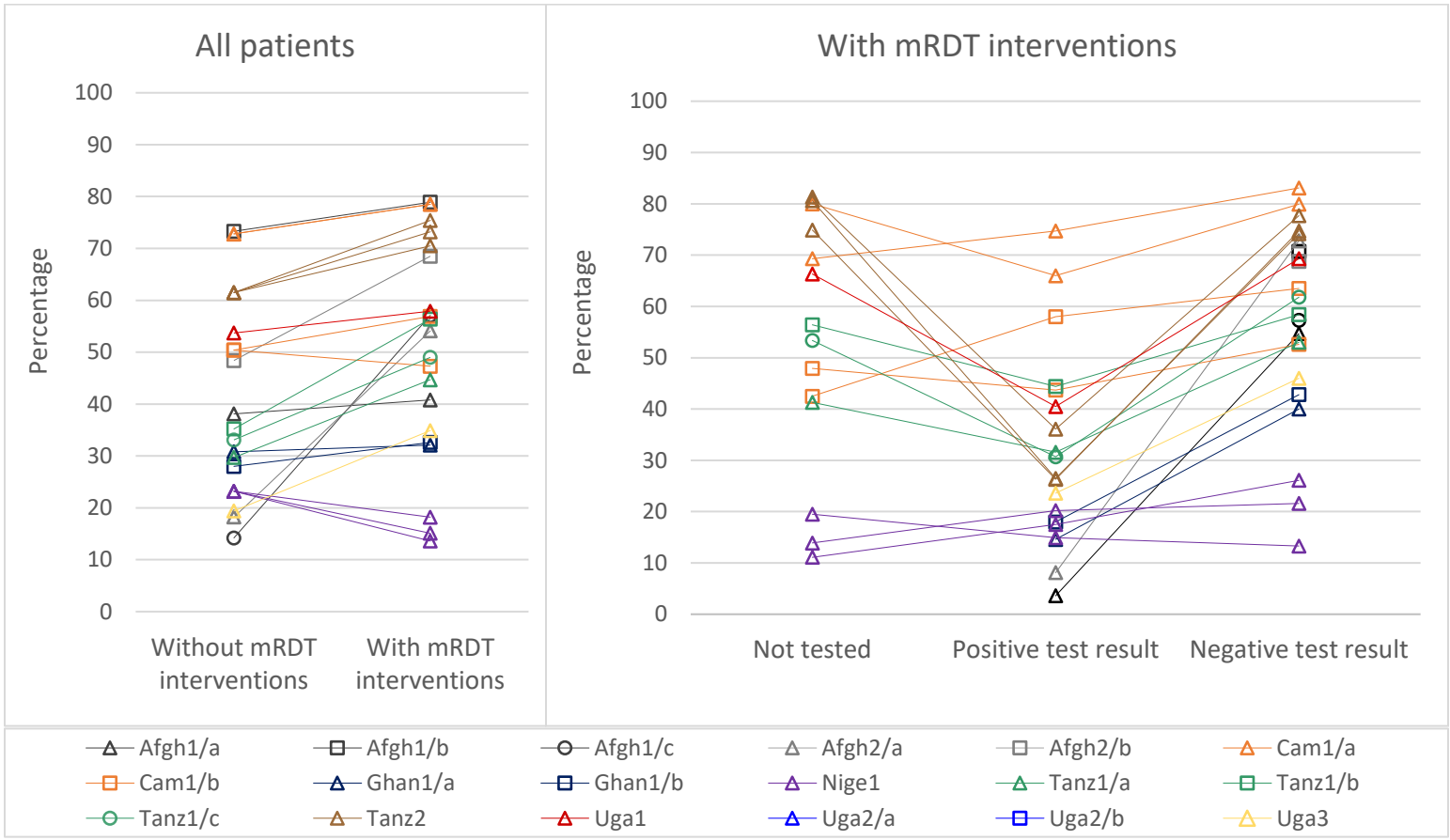
[2] Scenarios with denominators fewer than ten patients are not graphed, resulting in some points without adjoining lines: Afgh2/a and Afgh2/b in the "Not tested" column and Afgh1/b, Afgh1/c, and Afgh2/b in the "Positive test result" column.

[3] Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method; data are not included in "Not tested" column since all patients in mRDT intervention scenarios were tested.

[4] Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each); Nige1 (three intervention scenarios); and Tanz2 (three intervention scenarios). See Table 1.

[5] The following scenarios with denominators fewer than fifty patients are included: Uga2 in the "Not tested" column; and Cam1/a (R1), Tanz1/b, and Uga2/a in the "Positive test result" column. All other scenarios had larger denominators.

FIGURE 3: Patients prescribed an antibacterial of all patients in scenarios without and with mRDT interventions, and by test result for all patients in scenarios with mRDT interventions.[1,2,3,4,5]



[1] Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each); Nige1 (three intervention scenarios); and Tanz2 (three intervention scenarios). See Table 1.

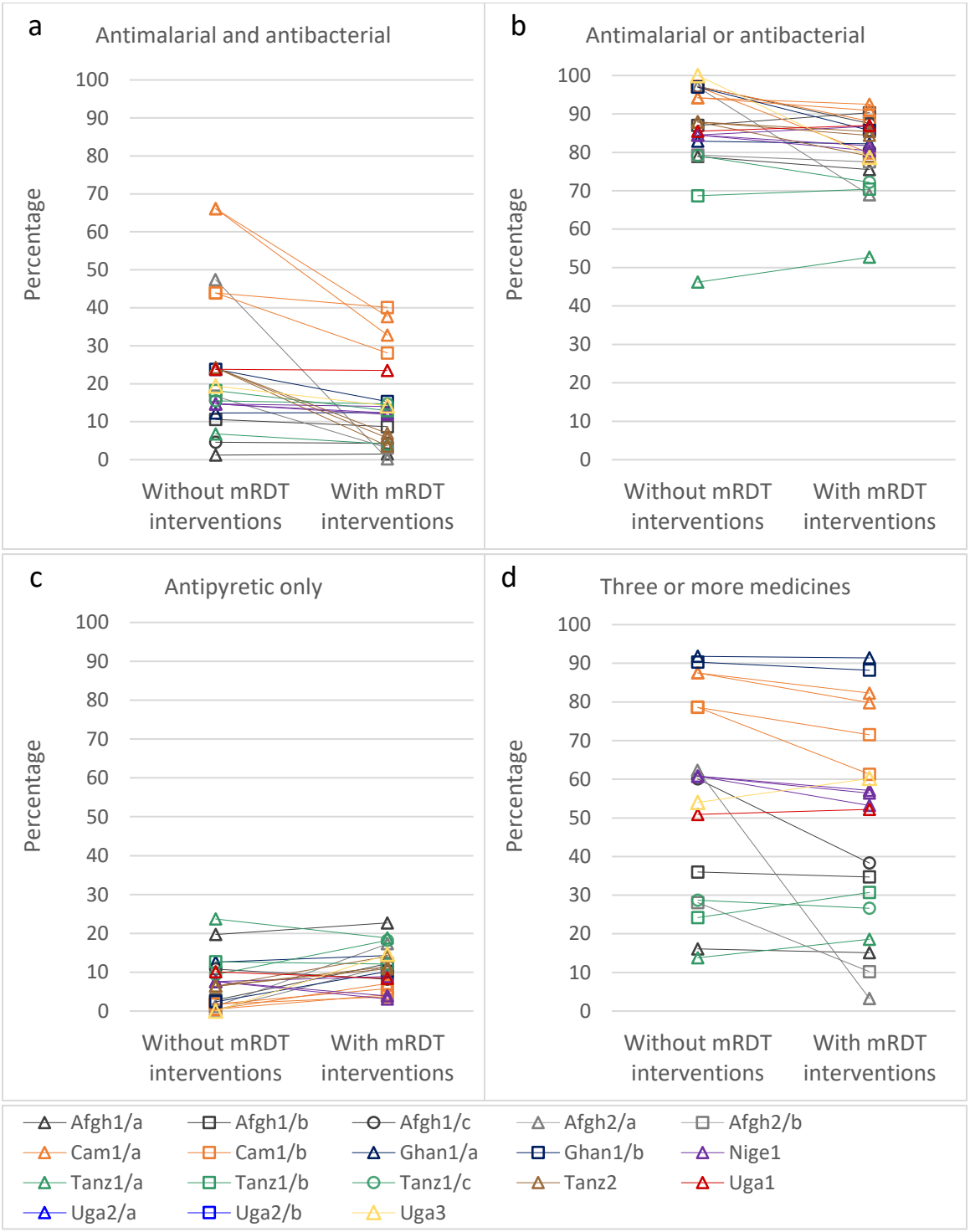
[2]Community health workers in Uga2 were not permitted to prescribe antibacterials medications, so this study is not included in Figure 3.

[3]Afgh1 and Ghan1 studies individually randomized patients to malaria diagnostic method; data are not included in Figure 3d since all patients in scenarios with mRDT interventions were tested.

[4]Scenarios with denominators fewer than ten patients are not graphed, resulting in some points without adjoining lines: Afgh2/a and Afgh2/b in the "Not tested" column; and Afgh1/b, Afgh1/c, and Afgh2/b in the "Positive test result" column.

[5]The following scenarios with denominators fewer than fifty patients are included: Cam1/a (R1) and Tanz1/b in the "Positive test result" column. All other scenarios had larger denominators.

FIGURE 4: Patients in scenarios without and with mRDT interventions prescribed (a) an antimalarial and an antibacterial, (b) an antimalarial or an antibacterial (c) an antipyretic without an antimalarial or an antibacterial, and (d) three or more medicines.[1,2,3]

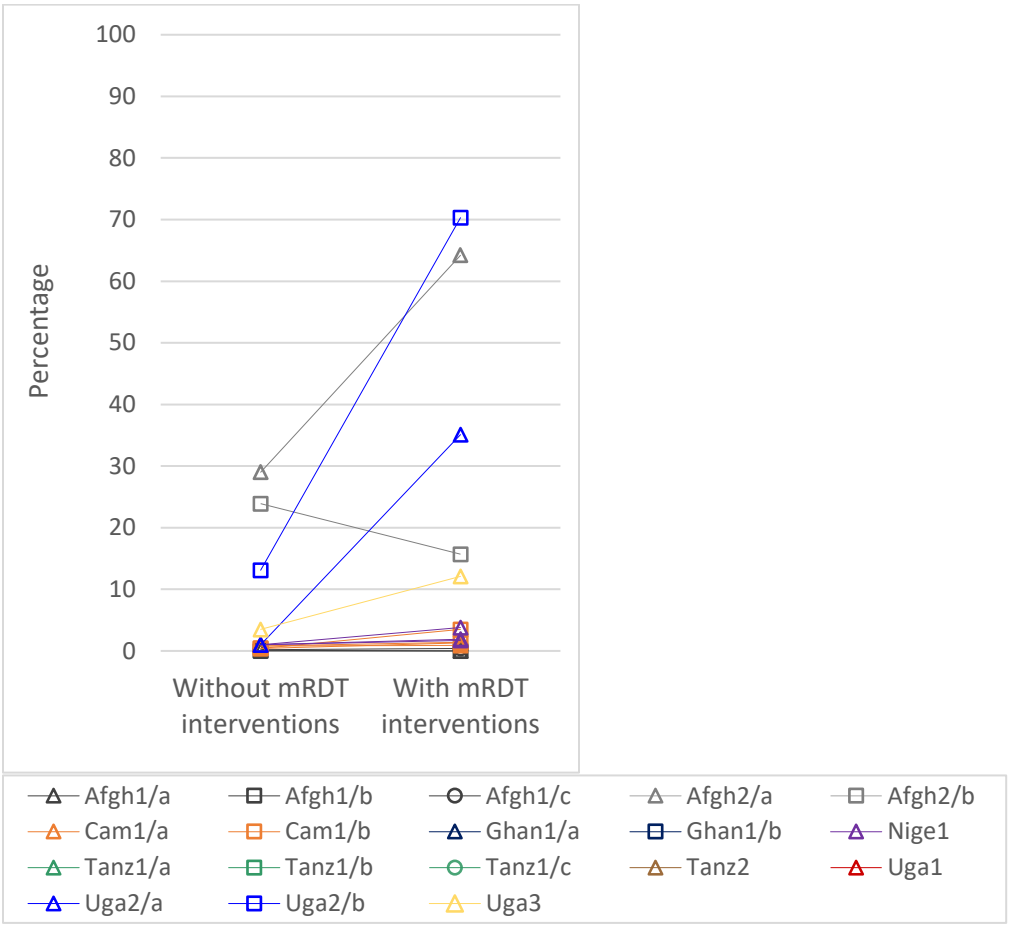


[1]Some settings had more than one mRDT intervention scenario, which are graphed separately using the color and symbol for the setting. These include Cam1/a and Cam1/b (two intervention scenarios each); Nige1 (three intervention scenarios); and Tanz2 (three intervention scenarios). See Table 1.

[2]Community health workers in Uga2 were not permitted to prescribe antibacterials medications, so this study is not included in Figure 4.

[3]Tanz2 did not record data on all medications prescribed, so this study is not included in Figure 4d.

FIGURE 5: Patients in scenarios without and with mRDT interventions that were referred to another care provider or health facility.[1,2]



[1]Ghan1, Tanz1, Tanz2, and Uga1 did not record data on referral.
[2]Case management was performed by community health workers in Afgh2 and Uga2, private drug store retailers in Uga3, and both public and private health facilities in Nige1. All other studies were conducted in public health facilities.