Modelling the cost-effectiveness of introducing malaria rapid diagnostic tests in the private retail sector in sub-Saharan Africa

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Introduction

There is increasing interest in the use of malaria rapid diagnostic tests (RDTs) in the private retail sector in malaria endemic countries, including pharmacies and drug stores where a high proportion of people with suspected malaria seek care.

Here we consider the introduction of RDTs in private drug stores and pharmacies in a setting with an existing (hypothetical) private sector ACT subsidy, and explore the impact of a range of factors on the cost-effectiveness of such an intervention against a baseline of no RDT availability in these outlets.

Methods

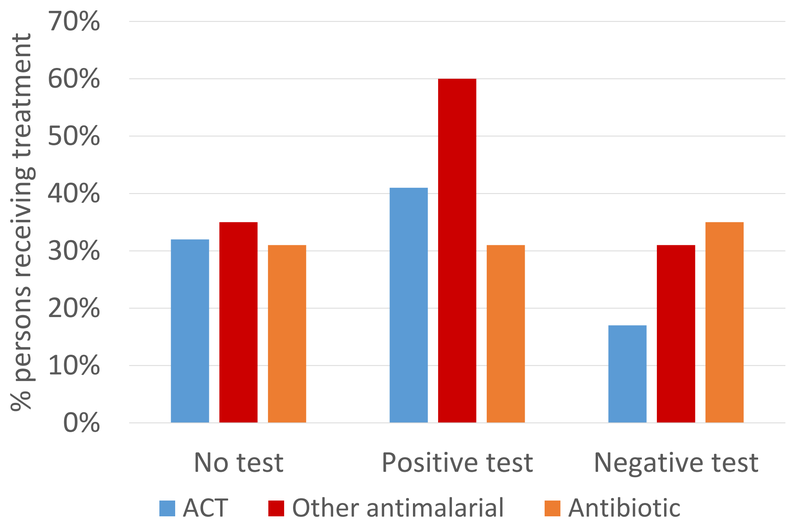
We have developed a cost-effectiveness decision tree model based on care seeking pathways for non-severe febrile illness for all age groups, from initial fever to final health outcome. Model parameterisation has drawn on recent published and unpublished data, including RDT uptake, test accuracy, and the effect of test results on treatment choice. The model generates final health outcomes in terms of disability adjusted life years (DALYs) across different levels of parasite positivity among treatment seekers.[1]

Summary of private sector intervention modelled

- Introduction of RDTs with a 50% subsidy, with ACTs subsidised at baseline.
- 3-4 day workshop training and ongoing monitoring.
- 40% uptake of RDTs [2]
- Initial treatment (i.e. treatment received with no test, positive test, or negative test), adapted from Cohen et al, 2015 (Uganda) – see Fig. 1. There are few other published private retail sector studies with usable data for parametrisation of treatment received by test type.[3]

The analysis currently assumes no change in treatment seeking across sectors.

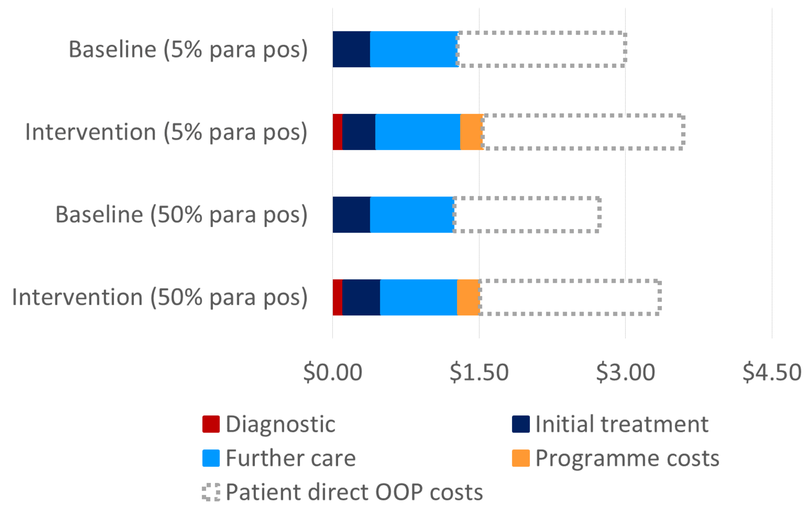
Figure 1 – Input parameters for initial treatment



Source: Cohen et al, 2015

Preliminary Findings

Figure 2 – Mean cost per febrile person at drug store / pharmacy



The high relative cost of further care is primarily due to the high cost of inpatient care for the minority of patients who seek this following the development of severe disease. High patient direct out of pocket (OOP) costs are primarily due to the proportion of patients seeking further outpatient care outside of the public sector.

Figure 3 – One-way deterministic sensitivity analysis – 5% parasite positivity[4]

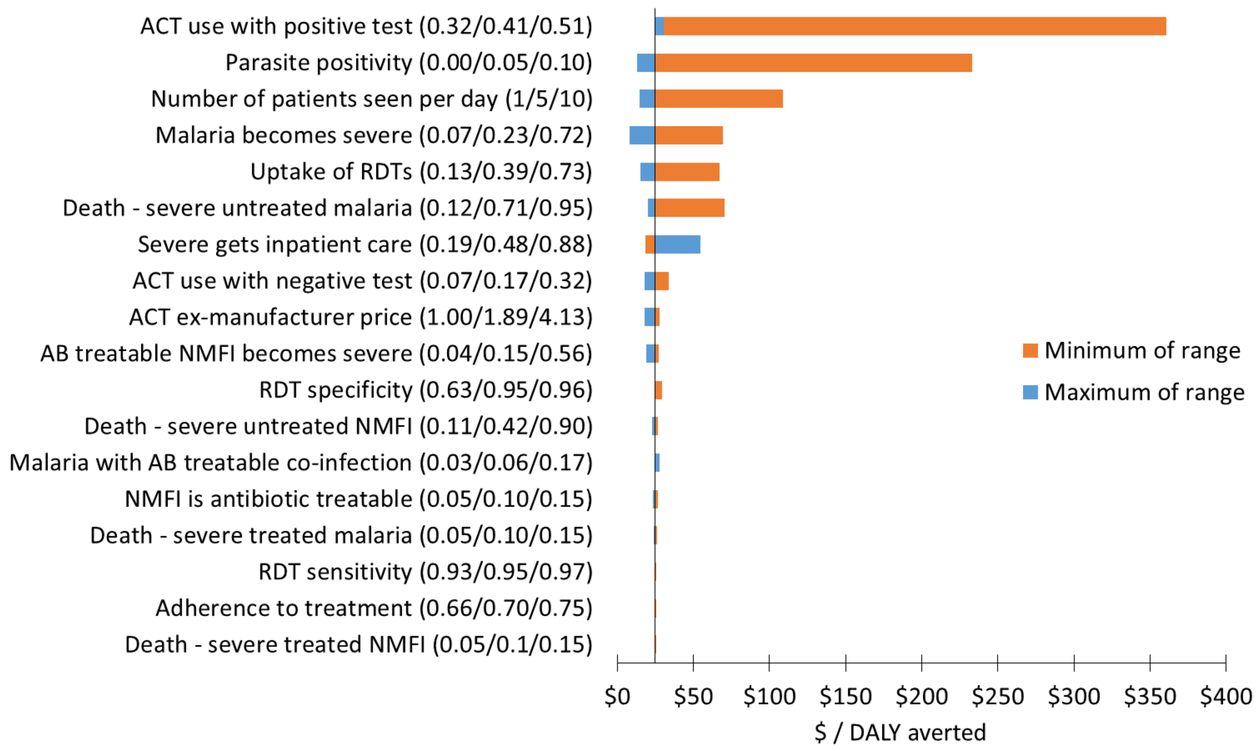
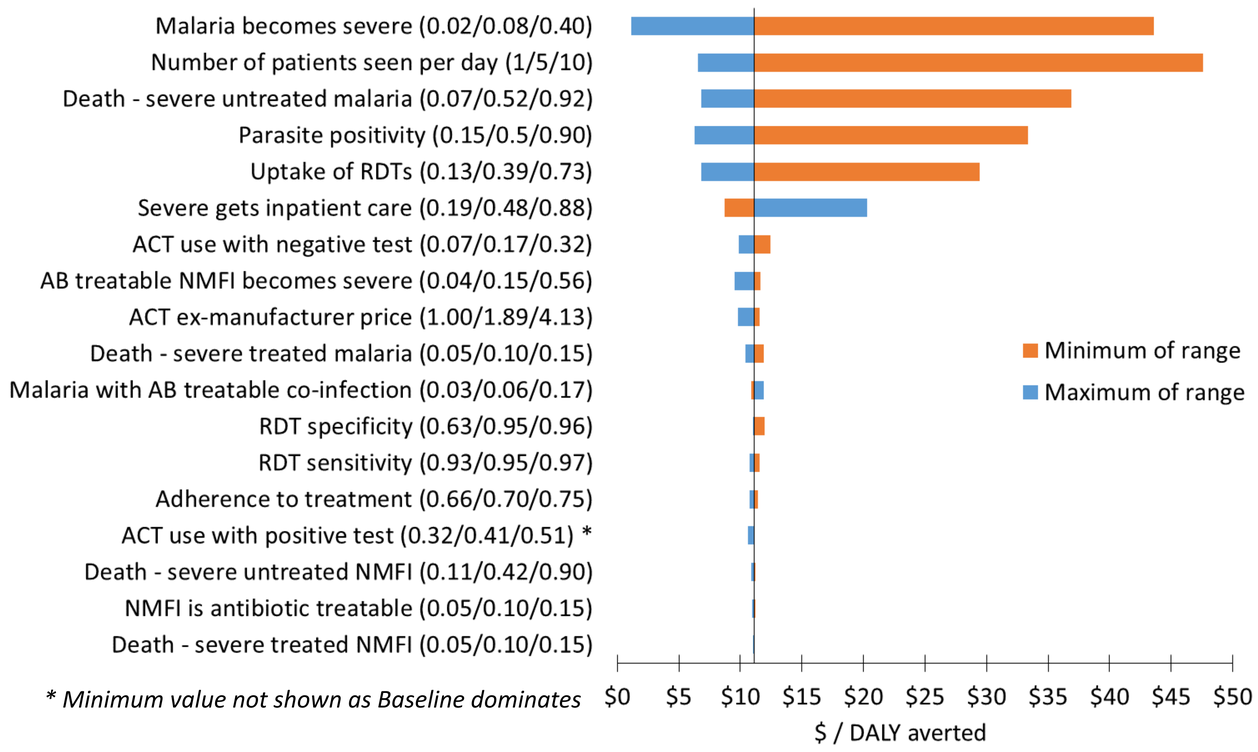


Figure 4 – One-way deterministic sensitivity analysis – 50% parasite positivity[4]



** Minimum value not shown as Baseline dominates*

Summary

- These results draw on a single study for the parameterisation of the impact of RDT use in drug shops and pharmacies on the type of treatment received. Figures 3 and 4 demonstrate the sensitivity of cost-effectiveness to changes in ACT use with a positive test.
- The model contains many other sources of uncertainty that impact upon cost-effectiveness, including the number of febrile patients seen per outlet in a day, parasite positivity, RDT uptake, and the probability that malaria becomes severe upon treatment failure or no treatment.
- These preliminary results should therefore be interpreted with caution and will be strengthened as other studies report on similar variables in the private retail sector.

Next steps:

- Enhanced modelling of uncertainty, including interrelationships between parameters, via probabilistic sensitivity analysis.
- Adoption of a cross-sectoral approach, to explore the impact of variations in treatment seeking behaviour on the cost effectiveness of this intervention and other possible interventions in different sectors.

[1] Parasite positivity refers to the presence of *Plasmodium* parasites in blood or tissues. [2] Based on the median uptake of a literature review by Visser, T et al, 2015 (submitted) of RDT interventions in the private retail sector. [3] Intervention was compared against baseline of no RDTs in drug stores and pharmacies, with treatment consistent with 'No test' (Fig. 1). [4] Provider perspective. Sensitivities presented as: (Minimum / Best estimate / Maximum).

Key References: *Initial treatment:* Cohen, J et al. Bull World Health Organ 2015. *RDT sensitivity/specificity*: Abba, K et al. Cochrane Database of Systematic Reviews, 2011; Mbonye, A et al. PLoS ONE, 2015. *Adherence to test results:* Bruxvoort, K et al. Malar J, 2015. *Health outcomes:* Lubell Y et al. PLoS ONE, 2011; Shillcutt S, et al. Bull World Health Organ, 2008. *Program costs:* Mbonye, A et al. PLoS ONE, 2015; Hansen, K et al. (submitted), 2015.