Author's response to reviews

Title: The cost of uncomplicated childhood fevers to Kenyan households: implications for reaching international access

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We would truly like to thank the reviewer for his diligence and patience with us during the review process for our manuscript (MS: 1062452707105894, "The cost of uncomplicated childhood fevers to Kenyan households: implications for reaching international access").

It is now clear that we did not fully understand the reviewer's comments, but the latest note to us was very clear. In the following, we explain how we revised our analysis and discussion to incorporate the Reviewer's comments.

Revisions for "Reason 1":

In our data, for children taken to a health care facility, our baseline analysis suggests that fevers managed in Branch 1 involved a total of 1.96 days of caretaker time (0.78 at home, 0.5 transport, and 0.68 at the HCF and at home).

For Scenario 1, we considered what would happened if these same children were delivered to a HCF earlier, so that the time in Stage 1 fell to 0.44 of caretaker time), so that the overall amount of time would be 1.62 days (0.44 at home, 0.5 transport, and 0.68 at the HCF and at home).

As the reviewer correctly pointed out, if a child is taken to a HCF sooner, but does not have malaria, there is no reason to believe that their illness time should be shorter. For example, if 40% of the children actually taken to a HCF in Branch 2 have malaria, caretaker time for these children would be estimated to fall from a total of 1.96 days to 1.62 days. But, for the 60% of fevers that would not be malaria, their resolution time would be expected to remain unchanged (still using 1.96 of the caretaker time).

We have revised our presentation of Scenario 1 to reflect this logical change as follows:

(continuation of revised text section, starting on page 12 of revision)

While children in Branch 2 are delivered to a HCF on average 1.35 days earlier for Scenario 1 than current practice as reported in Table 2, with a saving of 0.34 days of caretaker time in Stage 1, earlier delivery to a HCF would only be expected to reduce the overall illness time if the child has malaria. For children delivered earlier in Branch 2 who do not have malaria, receiving AL should have no impact on the length of their fever. For these children, we would continue to expect on average that caretakers devote 1.96 days of time to managing their child's fever (as in Table 1 for Branch 2). In this case, earlier delivery to a HCF that saves 0.34 days of caretaker time in Stage 1 would simply imply a longer fever resolution time (and 0.34 days of caretaker time) in Stage 3 at home after a HCF visit.

Given the initial estimate of 0.68 days of caretaker time at a HCF and at home after the visit for Branch 2 in Table 1, we would now expect 0.68 + 0.34 = 1.02 days would be the appropriate amount of caretaker time in Stage 3 for children delivered to a HCF earlier without malaria. For children taken earlier to a HCF earlier who have malaria, earlier treatment should imply earlier resolution of the fever. For these children, the estimate of 0.68 days of caretaker time at a HCF and at home following remains the correct figure. Assuming that only 40% of children with fever in Branch 2 actually have malaria, on average 0.40*0.68 + 0.60*1.02 = 0.88 days of caretaker time is the appropriate figure to include for caretaker time in Stage 3 for
Scenario 1.

As reported in Table 2 for Scenario 1, shortening the time before delivery to a HCF from 3.1 days to 1.75 days at home (Stage 1) for fevers already managed in Branch 2 reduces caretaker time on average per fever across all three branches from 1.47 days for the base case to 1.42 days for Scenario 1 (and from 1.96 days to 1.82 days for fevers in Branch 2). Given constant cash costs, the average cost of a fever in Scenario 1 falls slightly to $1.86.

(...of text section for Scenario 1).

Thus, for Scenario 1, we have now revised our analysis to incorporate the Reviewer’s comments in “Reason 1”. We note, however, that the empirical results are largely unchanged for Scenario 1 because the change from 0.68 to 0.88 days of caretaker time in Stage 3 has minor impacts on the final results for Scenario 1. The important point that we try to emphasize is that Scenario 1 is only focused on fevers that are being managed through seeking care at a HCF. For these fevers, 38% of all fevers, earlier delivery involves no extra cash costs and is not expected to increase caretaker time.

For Scenario 2, incorporating the revision into the analysis is somewhat more interesting. To explain our revision, we provide the key section from the revised paper below:

(...of text section from page 12, Scenario 2)

If we raised the numbers of children effectively managed with AL within 48 hours from 33% of all fevers, as in Scenario 1, to 50% (Scenario 2), treatment seeking behavior would also need to change so that a larger percentage of all fevers were taken to a HCF and prescribed AL. If the percentage of fevers treated at home fell from 30% to 10.5%, for example, and instead these 19.5% of fevers were delivered to a HCF within 48 hours, 57.5% of all fevers would be managed in Branch 2 and 50% of all fevers would be treated with AL at a HCF (assuming as in Table 1 that 87% of fevers at a HCF are prescribed AL).

The first implication of Scenario 2 is that cash expenses would increase by $0.30 for the 19.5% of all fevers switched from Branch 1 to Branch 2. In Table 1, cash expenses are $0.48 for fevers managed in Branch 1 because households purchased medicines used to manage these fevers, while cash expenses are $0.78 for fevers managed in Branch 2 because of transportation costs and fees at a HCF. The difference between the two branches of $0.30 is essentially equal to cash expenses for transportation in Branch 2.

In Scenario 2, the majority of children (38% of all fevers out of the total 57.5% of all fevers in branch 2) are the same children analyzed as part of Scenario 1 and, therefore, the numbers for their analysis do not change as part of Scenario 2. Fevers for these children are estimated to require 1.82 days of caretaker time on average (0.44 days in Stage 1, 0.50 days in Stage 2, and 0.88 days in Stage 3).

The 19.5% out of 57.5% of all fevers now in Branch 2 for Scenario 2 are children who were managed in Branch 1 (treated at home). As reported in Table 2, these fevers resolved on average in 4.8 days, with an estimate of 1.20 days of caretaker time. Thus, fevers managed in Branch 1 resolved more quickly and required less caretaker time (1.2 days of caretaker time) than fevers managed in Branch 2 (1.82 days on average in Scenario 1). Delivery to a HCF should not increase the overall time for these children's fevers to resolve (fevers switched from Branch 1 to Branch 2). Assuming that 0.44 days of caretaker time are used in Stage 1 and 0.50 days for Stage 2, we would estimate that 1.20 - 0.44 - 0.50 = 0.26 days is the maximum average amount of caretaker time used in Stage 3 for the fevers switched from Branch 1 to Branch 2. The 0.26 days figure is a maximum because some of the fevers treated earlier would be malaria, as discussed in Scenario 1, so that their fever resolution time could fall with earlier AL treatment. Thus, for all of the fevers managed in Branch 2 for Scenario 2, on average (0.195/0.575)0.26 + (0.38/0.575)0.88 = 0.67 days of caretaker time would be used as the overall average amount of caretaker time in Stage 3 of Branch 2 for Scenario 2.

As shown in Table 2, the average cost of a fever across all three branches is $1.92 for Scenario 2. Changing treatment seeking behavior as considered in this scenario would involve a $0.06 increase in direct cash expenses per fever, and a slight decrease in days of caretaker time (0.05 days for the base case and the lower range). As discussed above, however, all of the average cash cost increase comes from a cash cost increase of $0.30 for the 19.5% of fevers switched from Branch 1 to Branch 2.

(...of text section for Scenario 2 revisions)
In sum, based on the above revisions to our presentation of Scenario 1 and 2, we think we have not correctly incorporated the comments in "Reason 1".

Revisions and Responses for "Reason 2":

As we think is now clear from the above discussion, the revisions of our Scenario 1 and Scenario 2 did not change substantially our key results.

As we now emphasis in the Discussion section, achieving Scenario 1 (33% of all fevers treated at a HCF within 48 hours) can be achieved at no cost (no cash costs and minor savings in caretaker time). With the RBM goal of 80% by 2010, Kenyan can achieve substantial progress towards this target as shown for Scenario 1 by focusing on earlier delivery of children already being taken to a HCF. In other words, the first 41% (33% out of 80%) of the RBM target can be achieved without imposing any costs on households.

As now emphasized more directly in our discussion of Scenario 2 and in the Discussion section, achieving the next 17% increase in the overall number of fevers treated at a HCF (our Scenario 2) does little to the average cost across all fevers, but achieving this increase would involved additional costs of about $0.30 for the 19.5% of fevers 'switched' from Branch 1 (home treatment) to Branch 2 (treatment at a HCF).

The implication of both Scenario 1 and 2 is that 63% of the RBM target (50% out of 80%) can be achieved in Kenya under current practices with an estimated $0.30 increase in cash expenses for 19.5% of all fevers. We have now tried to be more explicit on this point in our presentation. Given the increase in cash costs, future research is clearly needed to evaluate the best options for achieving such an increase.

As a practical matter, we think that achieving 63% of the RBM target represents significantly progress and, in our opinion, is sufficiently ambitious to focus attention directly on what needs to be done now.

Based on the discussion above and revisions in the paper, we hope that we have responded corrected to the Reviewer's basic comment in "Reason 1". We also hope that we have tighten up our analysis and conclusions based on Scenario 1 and 2.

For this paper, we have not however included a scenario in which "subsidized ACTs are available outside of the formal health sector" for four reasons:

1. there is no indication that subsidized AL will go over-the-counter within the next several years in Kenya;
2. there is no idea what a subsidized price would be; and
3. much more research is needed to evaluate the implications of providing subsidized ACTs over-the-counter, and at the moment not everyone believes these new medicines should be available cheaply over-the-counter.

At minimum, any policy that attempts to deliver ACTs at highly subsidized prices OTC for children under 5 would need to acknowledge the related Kenyan policy of reducing significantly the number of adults with fever who are treated with antimalarials who do not have malaria. Providing highly subsidized ACTS OTC, even in doses designed for under 5s, would clearly provide incentives for adults to buy more ACTs OTC.

We note, however, that we provide all the necessary information in Table 1 and Equation 1 for any interested reader to explore any other scenarios of interested.