Author's response to reviews

Title: The development of a public optometry system in Mozambique: a Cost Benefit Analysis

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Author's response to reviews: see over
Dear editor

RE: MS: 4361275571168208 - The development of a public optometry system in Mozambique: a Cost Benefit Analysis

Thank you for the opportunity to revise the manuscript. The comments have been received and carefully considered. Please see below for our response to each point. In our Revised Manuscript we have addressed the comments made by both Reviewers and have made changes where appropriate (using track changes). We have also highlighted any changes made to our Revised Manuscript in this response. We hope that our reply is satisfactory, and that we have responded to, and dealt with, all Reviewer comments adequately. Our responses here are made in bold text, while changes to the manuscript are highlighted in bold italic text.

Comments from Roger Chung
The Introduction section would benefit a lot with a paragraph on the epidemiology of the URE in Mozambique and probably in Africa, and how that compares to the rest of the world.

It is interesting that this was highlighted by the Reviewer, as there is a paucity of epidemiological data on URE for Mozambique. However, a Rapid Assessment of Refractive Error study is currently in the process of being published and the results from it can be compared to a similar study in Eritrea to give a comparison.

Revision – Page 3, line 60

“In Mozambique, the burden of URE is thought to be high, having a severe impact on the livelihoods and wellbeing of disadvantaged communities [5]. A Rapid Assessment of Refractive Error study in Mozambique found the prevalence of vision impairment was 3.5% (95% CI 4.7% - 4.2%), with 65.8% of those visually impaired being 35 years of age and older. URE prevalence was 2.6% (95% CI 2.1%-3.2%), and was the primary cause of vision impairment among 64.5% of cases. The spectacle coverage for URE was 0%. Presbyopia prevalence was higher, at 25.8% (95% CI 12.0% - 30.5%), with only 2.2% spectacle coverage. A RARE study completed in Eritrea found URE prevalence was 6.4% (95% CI 5.6%-7.2%) and spectacle coverage of 22.2%, while for presbyopia prevalence was 32.9% (95% CI 30.3%-35.7%) with spectacle coverage of 9.9%. This comparison indicates how poorly developed and inaccessible refractive error services are in Mozambique compared to Eritrea.”

VERY IMPORTANT: You need to have sensitivity analyses of all your projected values to show how your results respond to parameter changes. State very clearly what your assumptions are. Alternatively, you may conduct a risk analysis
using Monte Carlo simulations. It is not acceptable that your projected cost values have no range.

This is a useful observation by the Reviewer. While there was a degree of sensitivity analysis in the original manuscript, perhaps this was not clear enough. We take on board the need to strengthen this part of the study and have done so accordingly.

Revision – Page 9, line 221

“Sensitivity analysis

Methodological sensitivity to the discount rate was tested, and the results indicated that the outcome of the study did not change until a 72% discount rate was applied, at which point the net present value of societal benefits for new DWs became negative. Without any including any discounting at all, by 2049, a total of $2.5 billion in societal benefits are recorded.

Further investigation into the sensitivity of the methodology was implemented by comparing four scenarios based on different assumptions. Scenario 1 was the most conservative compared to the other three. For this scenario, it was assumed that spectacles were only effective for two years instead of four years, the new disability weights were used and the salary of optometrists was doubled. Scenario 2 employed new disability with the longevity of spectacles being reduced to two years instead of the original four years. Scenario 3 represented the assumptions used in the main analysis and were included to allow comparison. Scenario 4 employed the same assumptions as scenario 3, but used the original DW as opposed to the new DWs. This was the least conservative scenario.
Scenario 1 found that by 2049, a net present value of $649 million in societal benefits would be realised. Scenario 2 found that by 2049, $695 million in societal benefits would be realised. As described above, scenario 3 resulted in a net societal benefit of $1.1 billion by 1949. For the first 3 scenarios the annual net societal benefit is negative until 2013 and positive from 2014 until the end of the time period analysed. Scenario 4 found that the annual net societal benefit is negative until 2012. From 2013 until the end of the time period analysed, it is positive. By 2049, a net present value of $9.6 billion of societal benefits will have been realised. Table 5 indicates the results of the sensitivity analysis, showing the NPV of societal benefits at 3% discount rate for the four scenarios analysed.

The sensitivity analysis found that regardless of parameter changes to assumptions made about the costs, benefits or disability weighting, a positive net societal benefit is realised very soon after the optometrists graduate and commence work. Even when assumptions were extremely conservative, $649 million in societal benefits could be realised by 2049.”

- Figure 1: Please show results from the sensitivity analyses of your projection, besides this base case scenario.

Figure 1 removed as it was felt it did not add any value to the study. However, a new table (table 5) has been included to provide easy comparison between scenarios.

New table – Page 24, line 559
• The paper would also benefit with an additional table listing out all the assumptions of each base case and sensitivity scenarios.

The assumptions made have been included under the costs and benefits section of the manuscript. In the revised version, the assumptions have been clarified where necessary.

• Table 4 is 5% discounting? You need to justify why 5% not 3% here. Moreover, you may use other % of discounting for sensitivity analyses.

This has been amended.

Revision – Page 22, line 556

“Table 4 – Costs and benefits of the optometry programme with 3% discounting”

• The Discussion and Conclusion sections are awfully long, but lack a clear structure, and makes it very difficult to grasp the key points. It is almost impossible to follow. Please revise them to give a clearer flow and structure (may need to seek advise for technical writing expert). Also, the Conclusion should at most have 2 paragraphs, and preferably 1 paragraph. Please revise.

We appreciate the structural guidance from the Reviewer. The suggestions have been acted upon and the revised manuscript now reflects the Reviewers preference for structure.

• I would suggest not to use numerical subheadings under the "Costs" section.

Please use italic instead.

Done

Format revision – Page 6, line 146

• In Conclusion section, 1st paragraph: "it is an attractive and justifiable..."
“*Investment in optometry is shown to be attractive and justifiable in economic terms, regardless of which DWs are selected.*”

Comments from Kevin Frick

- Not really a single human capital technique. So, I would not refer to it as “the human capital technique.” I would refer to using a human capital approach to valuing sight.

This is an important clarification. The manuscript has been amended accordingly.

Revision – Page 2, line 33

“*Benefits were calculated using a human capital approach to valuing sight.*”

Revision – Page 4, line 104

“*Benefits were calculated using a human capital approach to valuing sight, measuring the potential economic productivity foregone by not addressing URE.*”

- Talking about the productivity as if it will emerge with certainty is a bit strong.

The authors accept that it is not a certainty that productivity will occur with the implementation of the intervention. This has been clarified in the manuscript.

Revision – Page 5, line 112

“A Labour Force Participation Rate (LFPR) of 82.75% and an Employment Rate (ER) of 79% were included to reflect the labour market and that the emergence of productivity once URE has been addressed is not a certainty.”
• For individuals whose refractive error is corrected to become economically productive there needs to be an economic ecosystem with economic opportunity or entrepreneurial opportunity for all so that we can assume that the person will get a new job and will not simply be taking an employment opportunity away from someone else.

Similar to the point above, the Reviewer makes an important observation. A statement has been inserted to reflect this point and the relevant sections of the manuscript have been revised.

Revision – Page 11, line 285

“Addressing URE does not guarantee the emergence of economic productivity. The conditions and environment will need to be conducive to economic opportunity or entrepreneurial opportunity for productivity to flourish after URE is addressed.”

• There are a variety of opinions in the literature about the use of PPP adjustments. At this point, if the PPP adjustment is used then the authors should refer to international dollars rather than US dollars. However, I would recommend leaving the PPP adjustment alone and just using US dollars. A recent news report suggesting that the Chinese economy is “bigger” than the US economy when adjusting for PPP makes the difficulty of interpreting PPP very clear. Given the international purchases for equipment, this would be another reason to stick with non-PPP adjusted US dollars.

This is a really interesting comment and something the authors discussed at length. As the majority of costs were calculated based on US dollars, we have decided to stick our original data. We recognise that while PPP estimates can
provide a starting point for comparisons of economic strength and well-being between countries, they are not always very accurate for developing countries are often rough approximations. In particular, for countries like Mozambique with weak currencies, the exchange rate estimate of GDP in dollars can be a fraction of the PPP estimate. The GDP data were sourced from https://www.cia.gov/library/publications/the-world-factbook/geos/mz.html which uses PPP, displayed in US $. As such, while recognising there is ongoing discussion in the literature on the use of PPP adjustments, we retain our original approach.

- The assumption of optometrists providing 15 corrections per day should probably state that it is 15 corrections of individuals who are potentially economically productive rather than 15 who are economically productive. Two things to consider. First, the age group is not defined? Second, while the authors are careful to adjust their figures to account or less than 100% labor force participation and more than 0% unemployment, there is still no guarantee that someone whose URE is corrected would instantly become economically productive.

The Reviewer is correct – this has been updated throughout the manuscript.

- Four years is a long time to assume that spectacles will remain effective. Is there any data to support this spectacle useful lifetime? Does this account for loss and breakage? What about damaged but not broken? Diminishing effectiveness is assumed but what if the trajectory is incorrect?

The original time period of four years for the longevity of the spectacles was based on estimates from existing literature:


This is clarified in the revised manuscript. However, the authors accept the Reviewers concern as to the reality of this longevity. As such, a new section in the sensitivity analysis considers the impact on the outcome of the model if longevity is reduced to two years of 100% effectiveness.

Revision – Page 5, line 129

“Spectacles were assumed to provide an effective solution to URE for up to four years once dispensed, based on studies in Africa, Asia, America and Europe. [17, 18]. Further research is needed to establish whether this assumption is suitable specifically in the Mozambican context. To take into account prescription instability and spectacle frame/lens durability, effectiveness was assumed to diminish by 100% in years one and two, 75% in year three and 50% in year four.”

• Are we going to assume that people who are new to spectacles will wear them every day? This is implied? Are there data to support?

It is interesting that the Reviewer should identify the issue of compliance as there is not much data to guide any assumptions made. Further research is needed. Complete compliance is assumed in the study. However, a revision
has been made to reflect that the compliance ratio will directly impact on the benefit realised.

Revision – Page 11, line 282

“The compliance ratio has a direct relationship with the benefits realised. The study assumes 100% spectacle wear compliance for patients with refractive error, which may not be the case. If half of the patients rejected the spectacles or took them but never wore them, then the benefits would also be reduced by half. Addressing URE does not guarantee the emergence of economic productivity. The conditions and environment will need to be conducive to economic opportunity or entrepreneurial opportunity for productivity to flourish after URE is addressed.”

• If we don’t have good data on the useful spectacle lifetime or the proportion of days used, perhaps the authors could do a sensitivity (what if?) analysis to check on combinations of useful spectacle lifetime and proportion of days of use to yield a positive net benefit.

This has been addressed as part of the revised sensitivity analysis.

Revision – Page 9, line 221

• Why do management costs drop to 1/3 of the per annum rate after the first six years? And how does the phrase “to generously reflect on-going support from the partners” fit in?

This comment has been carefully considered. The costing for the initial implementation period was based on actual programme budgeting reports. The future costs were based on estimates of what it would cost to support the
programme on an ongoing basis. The future costs were kept conservative to reflect the fact that they are dependent on securing new funding streams.

Revision – Page 6, line 161

“MEP Management costs included advocacy, project and financial management, procurement, research and human resource development. Costs were $1.7 million over the first six years, to reflect the assigned Programme for Strategic Cooperation funding from Irish Aid and the project partners. A rate of $100,000 per annum was applied thereafter, to reflect on-going support from the partners, which will depend on securing new funding once the original funding phase has ended.”

• The Vision Centre costs include setup, human resources, and overhead. What about upkeep?

Some costs for upkeep were included, however significant repair was not included. This position has been clarified in the revised manuscript.

Revision – Page 8, line 194

“For use of electricity, water, and basic upkeep of the building, $672 per optometrist per annum was included. Significant building repair have not been included in this analysis.”

• It would be useful to see the undiscounted benefits at some point just to have a point of reference for assessing whether the impact of the 3% discount rate is as expected.

We agree it is important to include this and the manuscript has been revised accordingly.
“Without any including any discounting at all, by 2049, a total of $2.5 billion in societal benefits are recorded.”

- The net benefit amount is more useful than the benefit cost ratio. The other interesting calculation would be an internal rate of return.

The net benefit amount is arguably the most important output of this study and it has been included accordingly.

- Perhaps I missed it but it would also be useful if the authors could report the number of years to reach a positive overall net benefit.

This is included under Page 8, line 210

Please contact us if there are any further suggestions.

Yours sincerely

Stephen Thompson

(On behalf of the authors)