Author’s response to reviews

Title: Applying a private sector capitation model to the management of type 2 diabetes in the South African public sector: a cost-effectiveness analysis.

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Author’s response to reviews: see over
2 May 2014
Mr. Michael Leoncio

*BMC Health Services Research*
BioMed Central
236 Gray's Inn Road
London WC1X 8HB
United Kingdom

Dear Mr Leoncio,

**RE: Manuscript submission (MS: 1440263489108518)**

With reference to our earlier correspondence, below find our responses to the reviewers’ comments below. We’ve also uploaded the revised manuscript as well as figures 1 and 2.

We would like to take this opportunity to thank the reviewers for their many valuable comments, and hope that our revisions will be acceptable in terms of the manuscript’s publication.

Yours sincerely,
Karen Hofman

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Prof K Hofman
Director, PRICELESS SA
University of the Witwatersrand, School of Public Health
<table>
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<th>Reviewer</th>
<th>Comment(s</th>
<th>Response(s)</th>
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<tr>
<td>Edina Sinanovic</td>
<td>“The research question posed by the authors is clear and concise. It is original to the best of knowledge. However, more detail is needed on how the private sector chronic disease management model would be implemented in the public sector. This would help the readers better understand the intervention under analysis.”</td>
<td>The following was added in the discussion section (page 21, paragraph 3): “A pilot study could also yield information relevant to health services planning, including human resource, financial and logistical requirements. This could, in turn, inform to the final design of an implementable, adapted service model. Referral pathways from such a service to specialist levels of care, where appropriate, could also be delineated.”</td>
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<td>(1)</td>
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<tr>
<td>Edina Sinanovic</td>
<td>“The strength of the methods lies in its application. The weakness, however, is with the choice of ‘the comparator’ model – a tertiary level private sector hospital setting – which has higher costs/overheads than a primary health care public sector setting which is used as ‘the intervention’. Clearly, the hospital level costs will be higher compared to the clinic level ones. On top of that, the prices in the private sector are much higher than in the public sector in South Africa. All this might have contributed to underestimating the real cost of implementing the private model of diabetes treatment in a public sector setting. The authors should re-work the analysis using the cost estimates that are at the same level of service provision for both alternatives compared in the study.”</td>
<td>The comparator represents a recommended model of diabetes care in the public sector services. We agree the costs of delivering care via a tertiary hospital would be higher, however we also believe the health outcomes would be greater. When calculating the ICER, we would then potentially underestimate incremental costs, but also underestimate incremental health gains. On balance we feel this still provides a conservative estimate of cost-effectiveness. The following sentences were added, under “Limitations” (page 19, paragraph 2): “… while it would have been preferable to use a comparator model that was at the same level of care as that of the intervention (that is, a primary care comparator) it was difficult to obtain relevant data to do so because of the paucity of relevant studies in the South African context. Furthermore, the intention was to develop the intervention and comparator as closely as possible to the actual service models used in the respective studies. Modelling primary health centre care as a comparator</td>
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| Agnes Walker (1) | “The question posed by the authors needs to be more clearly worded, and summarised early in the paper. This could be achieved by adding a short section titled Aims (or Objectives) after the “Background” section. Also, most of the last paragraph of the “Background” section should be shifted to the new ‘Aims’ section.” | We’ve deleted the last sentence in the “Background” section and created an “Aim” section, with the following sentence added (page 7, paragraph 3):

“The aim of the study was to assess whether a DMP capitation model, adapted for the South African public sector setting, was potentially cost-effective.” |
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<td>Agnes Walker (2)</td>
<td>“Data source descriptions should be under a new heading, ‘Data’, followed by the existing text on the sources of the data used and their pre-analysis characteristics. Most of the related text could be extracted from the current “Methods” section. Description of how such data were used in your study should of course remain in the “Methods” section.”</td>
<td>We appreciate this suggestion, but felt that our methodological approach was best described with reference to data sources (especially in terms of model development and costing). We, therefore, have kept the data source descriptions within the relevant areas of the “Methods” section.</td>
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<td>Agnes Walker (3)</td>
<td>“Methods section should start with a brief overview, so that readers can better comprehend the rest of the text (which is long and technical). Starting with Figure 1, and a brief description of its major elements should achieve that, but some extensions to the text may be needed. Next, the rest of the “Methods” section should be re-organised under sub-headings that line up with the element descriptions in Figure 1. For example the sub-headings could indicate the ‘intervention’ to ‘comparator”</td>
<td>The “Methods” section was re-arranged in line with some of the suggestions made in this comment. More specifically, sub-headings were added to the section to reflect the elements of Figure 1 (the figure itself was altered slightly to accommodate these changes). Furthermore, a “Limitations” sub-heading was added to the “Results” section and a point was included on the scarcity of relevant data.</td>
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differences found, for example: Cost estimates, Risk reductions, Life Years Gained, etc. Lining up with the Figure 1 elements here would greatly help readers to understand the big picture while they are reading about the technical details of your study.

Apart from the ‘value for money’ of the ‘intervention’ option and the robustness of the study results, policy makers will also be interested in the limitations of the models and analyses before deciding on implementation. So there should also be a main heading labelled “Limitations” into which the existing text on limitations should be shifted. Also, more limitations could be added (for example the ones due to scarce data - see comment (c) below).

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<th>Agnes Walker (4)</th>
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<td>“I found brief mention of the use of “probabilistic modelling” first in the “Abstract”, and then in the “Background” section. Next, a little more is said about such modelling in the “Results” section under the “ICER” sub-heading. Here, in a final mention of that type of modelling, the authors state that “Probabilistic modelling was used for ICER analysis.”. Such a brief general sentences are clearly not sufficient even for readers familiar with probabilistic modelling. The authors should clarify why probabilistic modelling was chosen, and explain how that type of modelling was implemented in the ICER analyses. Reference 3 below includes a description of a probabilistic model, the UKPDS, which was also used by the authors in this</td>
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| The following sentence was added to the “Methods” section (page 14, paragraph 2) : |
| “A probabilistic approach was adopted because of the level of uncertainty in the modelling. Indeed, probabilistic sensitivity analysis has been described as a more robust way of dealing with parameter uncertainty as compared to standard sensitivity analytical approaches.” |
| Agnes Walker (5) | “Similarly, brief descriptions of the key parts of the ‘intervention’ and ‘comparator’ models should be added. These should include the key equations embedded in the authors’ EXCEL software. Examples of using equations when describing model detail can be found in References 1, 3 and 4 below. In this manuscript the only equation I found is:

\[
\text{ICER} = \frac{\text{Cost (intervention)} - \text{Cost (comparator)}}{\text{Effect (intervention)} - \text{Effect (comparator)}}
\]

This is a very general formula, and thus does not specifically describe the economic analyses reported in this manuscript. The formula states that ICER is the ratio of the ‘difference in cost’ to the ‘difference in health outcomes’ between the ‘intervention’ and the ‘comparator’. As an aside, note that I added square brackets in red ‘[]’. Without these the manuscript’s ICER equation is incorrect (ie it is not the ‘Cost (comparator)’ that needs to be divided by the ‘Effect (intervention)’, but the differences in these). What the specific key equations – such as those describing the Risk Factor and Life Year estimation processes – will do is to clarify for the reader the study-specific details. Currently these are only implied by the above general ICER equation. |
| Under the “Methods” section, the ICER formula was corrected (that is, the brackets were added) and a greater level of detail was added to its components. With regards to the point on additional formulae, several equations were added in the life table section and the following reference was made to the UKDPS (page 10, paragraph 3):

“ A description, and explanatory details, of the UKPDS prediction equations can be found in an article written by Stevens et al. [23]” |

| Agnes | “It is not clear in the manuscript whether – due to data |
| While improvements in glycaemic control will result in |
| Walker (6) | limitations – only the ‘intervention’ to ‘comparator’ changes that involved hospitalisation were accounted for, and whether the health effects could only be measured by changes in CVD mortality rates among those with diabetes. If this is the case, then the health benefits of the ‘intervention’ are considerably underestimated. This is because the lowering of the HbA1c risk factor for diabetes is expected to result in a lowering morbidity – as well as mortality - rates and in lesser need for outside-hospital diabetes management services.

So clarification in the manuscript of what changes could be estimated is essential. Once this is done, then it will be possible to explain to readers the key reasons for the estimated differences reported in the “Results” section in total costs and in health benefits (see item 4 below).” | reductions of both microvascular and macrovascular complication, we have chosen to focus on CVD outcomes (other health benefits have not been estimated due to data limitation). Furthermore, the UKPDS engine requires very specific input data. In this case, these data were drawn from the source articles and, therefore, related to specific study conditions. Furthermore, the models assume outpatient treatment (a point which we added in “Methods” section in light of your comment), and therefore do not include the costs of hospitalizations.

While other health effects could have been explored, the CVD mortality data were selected because this allowed us to use the APCSC data in the life table modelling.

Furthermore, as we were using secondary data, we were limited by what the study authors had reported, thus changes in immediate diabetes outcomes were what we had to work with. In order to translate this into a more meaningful outcome, we modelled through to a conservative estimate of mortality changes. |
| --- | --- | --- |
| Agnes Walker (7) | ““Results” section needs to start with a brief explanation of how the findings will be presented. For example, ‘Below we present and compare the results for simulations over a 10 year period of the ‘intervention’ and ‘comparator’ options.’

Next, all text under the section’s sub-headings should adopt the same - just described - format. Once this format is followed throughout the “Results” section, the | The follow sentence was added at the beginning of the “Results” section (page 8, paragraph 1):

“The results as described below in terms of: the costs of the intervention and comparator; the cost consequences related to CVD risk reduction (given as intermediate results); the life table modelling and, finally, the ICER and WTP results.”

Signs have now been added to give the direction of |
sub-headings could be more specific and more informative to users. For example, instead of “Costs of Models”, the 1st sub-heading could be ‘Higher costs under the intervention’; and the 2nd sub-heading could be: ‘Lower Cardiovascular Risk’, etc. Under the manuscript’s 1st sub-heading, “Costs of Models”, the 1st sentence is already in this the format, i.e: “The annual per capita cost of intervention model was ZAR 5950 (USD 725) while that of the comparator was ZAR 4946 (USD 602), representing a cost difference of 20.3%.”

So this is a good start. However, because readers are likely to be very interested in the sign (+ or -) of that difference, the last part of the above sentence could be reworded as: ‘indicating that the costs under the intervention option would be 20.3% higher than the cost under the comparator (or ‘no intervention’) option.

Readers would also like to know the reasons for the 20.3% higher costs. For example, this could be because of a 40% (?) reduction over 5 years in the hospital admission rates of those with diabetes, and a considerable (?) % lowering in the risk of acquiring diabetes. Thus policy developers/deciders would not only be interested in the extent of the extra costs, but also in the reasons for these costs and for the subsequent increases in health benefits. The 4 authors should add text explaining why they think the simulated cost and benefit changes are believable, and what factors have – or are likely to have - contributed to the study’s findings.”

changes (in Table 2) and “cost difference” was changed to “cost increase” in the sentence that is quoted in the comment.

Other than the differences in the models themselves, it was very difficult for us to comment on the reasons for the simulated cost and benefit changes. Moreover, we felt it safer to just rely (and report) on the actual UKPDS outputs. The intervention requires a more intensive intervention protocol than current practice represents, leading to this increase in costs. However, we were not able to discern the potential downstream cost savings resulting from tighter glucose control and less hospitalizations from the data available in this study. This would be an important consideration during any pilot study.

Given the immediate outcomes seen in diabetes related risk predictors, such as lower HbA1C and SBP, which lead to reduced CVD mortality, the health outcomes modelled seem entirely plausible. The estimated differential in years of life represents a + 1.75% change in healthy life years lived in men and a + 2.25% change in women. Given the other potential health outcomes, such as reductions in hospitalizations, amputations, vision impairment and disability resulting from non-fatal CVD events, we believe this is an intervention which could save lives and improve productivity.
| Agnes Walker (8- Minor Essential Revisions) | 1 In ABSTRACT:  
(a) please add a heading: ‘Aims’ or ‘Objectives’ after “Background”  
(b) shift last sentence of the “Backgound”para under the new ‘Aims/Objectives’ heading  
(c) under “Results” clarify “Modelling found” to – for example - ‘Model estimates over a 10 (?) year period were’  
(d) under “Conclusion” replace “Initial probabilistic” with ‘Probabilistic’; and  
“Piloting” with ‘As a first step, piloting’. Also, repeating the ICER result four lines below where it is first mentioned is not necessary. You might like to replace it with a clarification of what is meant by “service within the public sector” (eg ‘the proposed adoption of the private sector’s diabetes management program within the South Africa’s public sector).  
2 Throughout text:  
(a) shorten long, hard to read sentences. Often simply creating two sentences by replacing a ‘;’ or ‘,’ with a full stop (ie ‘.’) will make the text much easier to comprehend.  
(b) I got confused about the use of the term ‘model’ in several contexts other than the ICER analyses themselves. The text would be considerably clearer if | 1(a & b) – We added an ‘Aim’ section, with a succinct description, after the ‘Background’ section.  
1(d) – “Initial” was removed from the first sentence under “Conclusions” and “as an initial step” was added to the second.  
2 (b) ‘Model’ was replaced with the appropriate word(s) at a number of points in the document. |
you only used ‘model’ when referring to the model-based impact-estimates of implementing the ‘intervention’ option or ‘no intervention’, or the ‘comparator’ option). For expressiona such as: (1) “cost-effective models of care”; (2) “life-table model”; (3) “model the mortality experience” ; (4) “in Thailand the use of a contract capitation model” – you could use terms such as, ‘systems of’ or ‘approaches to’ for (1); ‘method’ or ‘approach’ for (2); ‘quantification’ or ‘measure’ for (3); and ‘capitation program’ for (4).3 In Background section: line 1: delete “observable”

Elizaveta Sopina (1)

“The study states that ‘cost-effectiveness’ modelling was performed, however, does not explain what type of model was used. This needs to be described in more detail and the choice of model needs to be justified. However, it is perhaps advisable to reconsider the type of model used. It appears that the costs were only considered for a year, and all patients were considered to have the same needs. Given that diabetes is an incurable long-term condition, this approach taken by this study seems unsuitable – as both the effects and costs of a significant intervention like the one investigated are likely to have a lasting impact and need to be considered over a longer time frame.”

We’ve provided some detail on the probabilistic modelling that was used in the study as well as why we thought this was an appropriate approach (under the “ICER and WTP analysis” sub-heading). We’ve also included a table on uncertainty parameters (Table 1).

While the point on using multiple years is a valid one, we felt that, except for the effect of inflation, the costs of the model would remain the same per year and yield similar effects (at least during a pilot period).

Furthermore, developing a long-term model would require extensive analysis based, ideally, on primary data – this could perhaps be done in a follow-up study.

Elizaveta

“The perspective of the study also needs to be explicitly...”

The following sentence was added in the “Methods”
<table>
<thead>
<tr>
<th>Elizaveta Sopina (2)</th>
<th>The analysis was undertaken for a government perspective, with particular relevance to the review of health service delivery and funding in the public sector.</th>
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<td>Elizaveta Sopina (3)</td>
<td>I would recommend reconsidering the approach to costing the comparator arm of the model. It is stated that the comparator model was ‘set at the tertiary level of care because the studies references were undertaken in tertiary hospital settings’. From this description it is unclear whether or not the reality of Diabetes management in South Africa is in fact reflected. A more robust approach to estimating costs for the base case is to simulate the real-world scenario as closely as possible in the model by identifying the patient pathways and then populating these pathways with costs – either from primary or published data.</td>
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| Elizaveta Sopina (4)| The following sentence was added in the “Methods” section (page 9, paragraph 4):

Costing of medication was undertaken for diabetes medicines only; medication costs associated with the treatment of co-morbidities were not included. |
<p>| Elizaveta Sopina (5 – discretionary) | • The word “observable” was removed from the identified sentence. |</p>
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<td>• “The authors refer to ‘SEDMSA’ guidelines. This should be corrected to SEMDSA – Society for Endocrinology, Metabolism and Diabetes of South Africa.”</td>
<td>• The SEMDSA abbreviation was corrected.</td>
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