Author's response to reviews

Title: The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model

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Version: 4  Date: 5 February 2014

Author's response to reviews: see over
Dear Editors,

Please find attached a copy of the manuscript “The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model” which we wish to re-submit to you.

In the following pages we set out a detailed response to the suggestions and comments of reviewers (Reviewer #1 and 2) received on 17 December 2013. We have used ‘track changes’ in the re-submitted manuscript to indicate where the text has been changed, based on reviewer/editor feedback. All page numbers listed below are in relation to the ‘track-changes’ version of the manuscript.

If you have any queries regarding the manuscript please do not hesitate to contact me.

Yours sincerely,

Michelle Cunich
Detailed response to reviewers for manuscript 4692259531083197 entitled
“The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model”
submitted to BMC Public Health

Title of Manuscript: The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model

Submitted To: BMC Public Health on 16 September 2013

Received Reviewer Comments on: 17 December 2013

Resubmitted Manuscript: 14 January 2014

We thank the Reviewers and Editor for their suggestions and comments regarding our manuscript. We provide an itemised response to the comments of Reviewer #1 and 2 as follows:

Reviewer 1

Reviewer's report (1341531595115352)

Title: The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model

Version: 2 Date: 7 December 2013

Reviewer: Anne Magnus

Reviewer's report:

This is an interesting paper that may well draw attention to the growing costs of a disease associated with ageing and many other behavioural risk factors in Australian society, but its results are quite exaggerated and the suggestion of potential prevention of the indirect costs associated with diabetes are over
optimistic. A more balanced evaluation would provide a more accurate estimation of costs now and potentially in future if investment in prevention was undertaken.

Major compulsory revisions

1. The manuscript needs to acknowledge that the expected growth in diabetes prevalence is limited to Type 2 Diabetes only and that Type 2 diabetes is the only preventable form of the disease. They also don’t sufficiently acknowledge the percentage of this increase that may be potentially preventable, given its link to unhealthy lifestyles, the expanding obesity epidemic and absence of sustainable preventive interventions to combat obesity. Is it 100%, 50% or 2% that is preventable? Some sensitivity analysis would make this manuscript more useful to promote their message of “investment in prevention seems desirable”, by identifying the realistic gains from that potential investment.

The initial data extraction from SDAC is of people who reported their main chronic illness was diabetes. The AIHW estimates that 89% of the diabetes prevalence in Australia is Type 2. ([http://www.aihw.gov.au/diabetes/prevalence/](http://www.aihw.gov.au/diabetes/prevalence/)). The estimates of income lost, welfare paid and taxes lost should be reduced in line with this at the point of identifying the potentially preventable component of these losses.

Authors’ reply:

We have addressed this concern in the following ways in our revised manuscript. In the Introduction (page 6) we firstly acknowledge that the expected growth in diabetes prevalence is restricted to Type 2 Diabetes only, and Type 2 diabetes is (currently) the only preventable form of the disease. We then specify why and how this study takes into account the percentage of this increase that is potentially preventable, given its association with unhealthy lifestyles, the increasing obesity epidemic and absence of sustainable preventive interventions to combat obesity, when estimating the economic costs of diabetes (sensitivity analysis). Following this, we state what the Type 2 diabetes prevalence rate is for people aged 40-59 years in Australia – which is consistent with the age group of workers whose labour force participation is the focus of in this paper. Finally, we state
how the sensitivity analysis assists in producing estimates that are more in line with the size of the preventable component of the disease.

This information is provided in the last paragraph of the Introduction:

“\[\text{It should be noted, however, that the expected increase in diabetes prevalence is restricted to Type 2 diabetes only, and that Type 2 diabetes is (currently) the only preventable form of the disease. For this reason, this study also takes into account the percentage of this increase that is potentially preventable, given its association with unhealthy lifestyles, the increasing obesity epidemic and absence of sustainable preventive interventions to combat obesity, when estimating the economic costs of diabetes. Diabetes Australia (2013) estimates that 89\% of people aged 40-59 years with diabetes in Australia have Type 2 diabetes}^{14} \text{ (and consistent with Australian Institute of Health and Welfare (AIHW) diabetes prevalence rates; http://www.aihw.gov.au/diabetes/prevalence). We undertook sensitivity analysis where our estimates of lost income, lost income taxation, extra government welfare payments and lost GDP were reduced in line with this prevalence rate at the point of identifying the potentially preventable component of these losses.”}\]

(Page 6 of revised manuscript)

New reference:


We also thought it important to state that although we cannot identify the type of diabetes people have from the SDAC data, the type they are most likely to have is Type 2 diabetes (given diabetes prevalence rates):
“Whilst we cannot identify the type of diabetes people have from the SDAC data (as it is a single option in the survey), we note that the type of diabetes these people have is likely to be Type 2 diabetes based on the age group of study participants (Diabetes Australia reports that 89% of the diabetes prevalence of people aged 40-59 years in Australia is Type 2 diabetes).”

New reference:

The sensitivity analysis we undertook is outlined on pages 10-11 in Statistical Analysis section. These paragraphs are provided below for convenience:

“Sensitivity Analysis

Initial data extraction from the 2003 and 2009 SDACs was of people aged 45-64 years who reported they had left the labour force because of ill health and that their main chronic condition was diabetes.

Diabetes Australia reports that 89% of people aged 40-59 years with diabetes have Type 2 diabetes in Australia. 14 We conducted sensitivity analysis using this proportion of people with Type 2 diabetes to represent the proportion of people with the disease who could be expected to remain in the labour force if the disease were prevented. These estimates of the economic costs of diabetes represent the likely preventable component of the overall losses.”
Results from the sensitivity analysis are reported on page 13 and in Table 3. These are provided below for your convenience.

“After taking into account the Type 2 diabetes prevalence rate for people aged 40-59 years in Australia, the number of people out of the labour force with this potentially preventable form of the disease was 10 066. The national impacts were $341.7 million in lost income, $50.2 million in lost income taxation revenue, and an additional $3.1 million in government welfare payments in 2010 (Table 3). As a consequence of losing these workers prematurely because of their (Type 2) diabetes, there was a loss of $1 179 million in GDP in 2010.”

(Results, page 13)

Table 3: National impact of diabetes (adjusted for age, sex and education) for the Australian population aged 45-64 years, 2010

<table>
<thead>
<tr>
<th></th>
<th>Income (million AU$)</th>
<th>Transfer Payments (million AU$)</th>
<th>Taxation Revenue (million AU$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not in labour force due to diabetes (n = 11 310)</td>
<td>383.9</td>
<td>3.5</td>
<td>56.4</td>
</tr>
<tr>
<td>Not in labour force due to preventable form of diabetes (Type 2 diabetes; n = 10 066)</td>
<td>341.7</td>
<td>3.1</td>
<td>50.2</td>
</tr>
</tbody>
</table>

Note: Based on the differences between persons not in the labour force due to diabetes and the weighted average of persons employed full time and part time with no chronic health condition.

In the Conclusion, we also state how national estimates changed through the sensitivity analysis:

“After taking into account the type of diabetes that is potentially preventable for these workers, the national impacts were $341.7 million in lost income, $50.2 million in lost income taxation revenue, and an extra $3.1 million in government welfare payments in
2010. As a consequence of losing 10 066 workers prematurely because of Type 2 diabetes, there was a loss of $1 179 million in GDP in 2010.”

(Conclusions, page 14)

We conducted a sensitivity analysis involving the likely rate of return to work if diabetes could be prevented (i.e. Type 2 diabetes prevalence rate). We agree with the Reviewer that this sensitivity analysis makes the manuscript more in tune with promoting the message of “investment in prevention seems desirable” (stated in Conclusions section), by identifying the realistic gains from that potential investment. We made several (minor) changes to the last paragraph in the Conclusions, so as to better reflect that its Type 2 diabetics whose labour force participation (and related costs) may be reduced through intervention to prevent the disease:

“Type 2 diabetes is increasing in prevalence worldwide. It is also becoming more common amongst the working-age population, particularly those aged 45-64 years. Consequently, the impact of this form of diabetes on labour force participation and the flow-on national impacts are likely to become greater over time. To help reduce the costly outcomes of premature retirement because of diabetes, investment in prevention (Type 2 diabetes) seems desirable. This aligns with the health platform of the current Australian Government which recognises that prevention of chronic diseases can help increase labour force participation. It has been acknowledged that prevention will not only improve the health of the general population but help to maintain economic growth by sustaining human resources in production13,33, with the added advantage of helping Government to ensure that future revenues will be sufficient to fund the health care of its ageing population. 13"
Also stated information about sensitivity analysis in the Results section of the Abstract:

“Sensitivity analysis was used to assess the impact of different diabetes prevalence rates on estimates of lost income, lost income taxation, increased government welfare payments, and reduced GDP.”

2. I would also like the authors to provide supportive argument for the assumption that workers have left the workforce "because of diabetes" if they report diabetes as their main health problem. Some discussion of the scope and distribution of multiple health problems in this population would be appropriate and add to the strength of the manuscript.

Authors’ reply:

The SDACs 2003 and 2009 contain information on the individual’s labour force participation. For those who stated they were ‘not in the labour force’, the main reason for them not being in the labour force can also be identified. These options are:

- Own ill health or disability
- Retired
- Too old
- Someone’s ill health or disability
- Child care
- Pregnancy
- Other family considerations
- Lacks relevant schooling, training
- Study or returning to study
- Don’t know
- Does not need or want to work
- Other
In this study, people who were out of the labour force and stated the main reason for leaving the labour force was their ‘own ill health or disability’ were considered to be ‘out of the labour force due to ill health’. From this, we can also see that these individuals experienced poor health first and then left the labour force. The next step in defining the subgroup that has left the labour force "because of diabetes" required the main chronic condition data. Those who reported being ‘out of the labour force’ because of their ‘own ill health or disability’ and selected ‘diabetes’ as their main chronic condition formed the subgroup of interest.

Diabetes reported as ‘main chronic condition’ which, given ABS descriptive information about SDAC surveys (see references 15 and 16), is interpreted as the individual’s most disabling condition. We note this in Research Design and Methods section:

“Like we did here, previous studies \(^\text{10,17,18}\) have extracted data from national household survey data on people who have left the labour force because of their ill health or disability and used “main chronic condition” data to identify the disease having the largest (disabling) impact on individuals.”

(page 7)

The distribution of multiple chronic conditions in this subgroup (46 individuals we identified as out of the labour force due to diabetes) is shown below:
We have added the following description about the scope and distribution of multiple chronic conditions in this population (46 individuals we identified as out of the labour force due to diabetes) to the Results section to strengthen the manuscript, as suggested by the Reviewer:

“Of the people who reported they left the labour force due to diabetes, 13% reported having diabetes only (i.e. 1 chronic condition), 11% reported 2 chronic conditions, 26% reported 3 chronic conditions, and 50% reported 4 or more chronic conditions. Common chronic conditions for people out of the labour force due to diabetes were hypertension, heart disease, stroke and high cholesterol, which are associated with Type 2 diabetes.
We also note in this report that, in a previous study (Schofield et al. 2013) we estimated, for the number of people with different health conditions (diabetes was one such condition) who were out of the labour force in the SDAC 2009, the proportion with different numbers of co-morbidities (1 only up to 4-plus). We found that 20% of people who were out of the labour force and had diabetes had only diabetes (1 chronic condition), another 20% had 2 conditions (diabetes and one other), 40% had 3 conditions and 20% had 4-plus.

Reference:

http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3815132/

And note the findings from Smith et al (2013), as these demonstrate that chronic conditions are associated with labour market participation limitations:

Using three representative samples from the Canadian Community Health Survey 2000, 2003 and 2005, Smith et al (2013) examined the relationship between seven chronic conditions (arthritis, hypertension, back problems, migraine, diabetes, heart disease, and thyroid) and labour force participation of older workers in Canada between 2000 and 2005. They found that all conditions were associated with an increased probability of not being able to work due to health reasons. After adjusting their labour force participation models for age, sex and education, diabetes was associated with the third greatest probability of not working due to health reasons. They also found that, by combining heart disease and diabetes, these conditions were associated with a greater risk than the separate effects of each condition independently.
Reference:


DOI: http://dx.doi.org/10.1017/S0144686X13000457

We have referenced the Smith et al (2013) paper on page 7 of our revised manuscript where we provide references to previous studies that have used these variables from household survey data in a similar way in terms of defining a sample of workers who have left the labour force because of diabetes:

“Like we did here, previous studies\textsuperscript{10, 17, 18} have extracted data from national household survey data on people who have left the labour force because of their ill health or disability and used “main chronic condition” data to identify the disease having the largest (disabling) impact on individuals.”

(page 7)

Minor essential revisions

3. Page 1

"2010 reports that there were 1.3 million deaths were due to diabetes worldwide in 2010" needs to be rewritten as "2010 reports that 1.3 million deaths were due to diabetes worldwide in 2010"

Authors’ reply:

We thank the reviewer for this comment and have made this change to the text. The sentence has been changed from:
“The Global Burden of Disease Study 2010 reports that there were 1.3 million deaths were
due to diabetes worldwide in 2010 which is twice as many in 1990.³v

To:

“The Global Burden of Disease Study 2010 reports 1.3 million deaths due to diabetes
worldwide in 2010, which is twice as many as in 1990.³v

(paragraph 1, sentence 4, page 4)

4. Page 8

"reported they did not a chronic health condition" needs to be rewritten as "reported they did not
have a chronic health condition"

Authors’ reply:

We thank the reviewer for this comment and have added “have” to this sentence (in bold below).
This line now reads as:

“A multiple regression model of the log of annual income was used to assess the differences
between annual incomes of people in employment (full time) who reported they did not
have a chronic health condition and people not in the labour force who reported they had
left because of their illness and nominated diabetes as their main chronic condition.”

(page 9)

Discretionary Revisions

5. It would be a stronger paper if the components of welfare payments were explained. Is it
comprehensive and incorporate health care payments, rent assistance, child support payments
and allowances?

Authors’ reply:
Welfare payment in APPSIM (our data source for financial measures) includes:

- Aged pension – This pension provides income support and access to a range of concessions for eligible older Australians (64-65 years and older) ([http://www.humanservices.gov.au/customer/services/centrelink/age-pension](http://www.humanservices.gov.au/customer/services/centrelink/age-pension)).

- Disability support pension – This is financial support for people who have a physical, intellectual, or psychiatric condition that prevents them from working or who are permanently blind ([http://www.humanservices.gov.au/customer/services/centrelink/disability-support-pension](http://www.humanservices.gov.au/customer/services/centrelink/disability-support-pension)).

- Newstart allowance – This is financial help if people are looking for work. It supports people while they undertake activities that may increase their likelihood of finding a job ([http://www.humanservices.gov.au/customer/services/centrelink/newstart-allowance](http://www.humanservices.gov.au/customer/services/centrelink/newstart-allowance)).

- Youth allowance – This is financial help for people aged 16-24 years who are studying full time, undertaking a full time Australian Apprenticeship, training or looking for work ([http://www.humanservices.gov.au/customer/services/centrelink/youth-allowance](http://www.humanservices.gov.au/customer/services/centrelink/youth-allowance)).

- Carer payment – This is an income support payment for people who personally provide constant care in the home of someone with a severe disability, illness, or who is frail aged ([http://www.humanservices.gov.au/customer/services/centrelink/carer-payment](http://www.humanservices.gov.au/customer/services/centrelink/carer-payment)).

- Family tax benefits - This is a two part payment that assists with the cost of raising children (A and B) ([http://www.humanservices.gov.au/customer/services/centrelink/family-tax-benefit-part-a-part-b](http://www.humanservices.gov.au/customer/services/centrelink/family-tax-benefit-part-a-part-b)).

Overall link to these payments is: [http://www.humanservices.gov.au/customer/services/](http://www.humanservices.gov.au/customer/services/)

We have listed and explained these components of welfare payments in the revised manuscript (see note 2 under Table 1).
6. The paper would benefit from providing some justification for making the following assumption on Page 10, and/or performing a sensitivity analysis on varying that assumption if need be, to reflect actual labour force participation data reported in the most recent Australian National Health Survey. “assuming that otherwise those with diabetes would have the same labour force participation rate and full time and part time work rates as people without a chronic health condition.”

Authors’ reply:

We conducted sensitivity analysis using the Type 2 diabetes prevalence rate to determine the proportion of workers who have left the labour force because of the preventable form of diabetes. The number of workers affected was 10,066. All national impacts (income, government welfare payments, taxation, GDP) were estimated with this smaller sample as the analysis sample. See authors’ reply to Query 1 above.

7. The discussion of the ability of older workers who retire early due to diabetes in Australia and their ability to pay for future health costs, does not appear to acknowledge universal health coverage in Australia, by referring to the studies in the US. Rather than reduced ability to pay from reduced savings, the greater impact on quality of life is likely to be longer waiting times for appropriate care in the public system.

Authors’ reply

We have made this adjustment in paragraph 3, page 16 of Conclusions:

“Reduced income amongst those who retire early due to diabetes may also lead to inadequate (personal) finance for future health care needs.” One study in the United States found a high correlation between chronic illness and financial stress, with one quarter of
bankruptcies attributable to chronic illness. This may reflect families being ill-prepared to deal with the financial implications of caring for a family member with a long-term health condition. In Australia, older workers who retire early due to diabetes have a value of total wealth that is 89.6% lower (includes savings, superannuation, and property) than that of older full time workers with no health condition, leaving them with minimal savings to cover their health care costs. However, universal health coverage in Australia implies reduced ability to pay from reduced savings is somewhat moderated (although 30% of health care costs in Australia are private coming from individuals, private health insurance and other non-government sources). Nonetheless, patients without savings for private care often face long waiting times for appropriate care in the public system.”

Conclusions page 16

Level of interest: An article whose findings are important to those with closely related research interests

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests

Reviewer 2

Reviewer's report (2012268384115792)

Title: The economic impact of diabetes through lost labour force participation on individuals and government: evidence from a microsimulation model

Version: 2 Date: 11 December 2013

Reviewer: Nick Hex
Reviewer's report:

The article is well written and makes some interesting points about the indirect costs of diabetes. The quantification of the loss of income at the macroeconomic level is a helpful addition to the literature in this area. The description of methods is clear and the methods themselves appear to be robust. The results are presented clearly and the conclusions flow logically from the results.

I have a number of comments:

1) Major compulsory revision: The article would benefit from a statement of the limitations of the analysis. There are three key areas where I think a clear outline of limitations would be helpful.

Firstly, the analysis is limited to people who have reported that they are no longer in work as a result of having diabetes. It does not include other forms of absenteeism (e.g. time off work for sickness), presenteeism, GDP lost through early mortality, the economic impact of carers having to give up work etc. I appreciate that the study did not set out to cover these areas, which is fine, but as the title refers to the economic impact of diabetes through lost labour force participation, I think a reference to these other forms of indirect economic impact would be warranted, somewhere in the text.

Secondly, the age range is limited to 45-64 years. The report alludes to this being the age range which experiences the largest economic impact but some clarity about why the data for people below 45 years was not analysed would help.

Thirdly, the calculations of lost income taxation revenue and GDP do not appear to take into account levels of unemployment and potential 'friction periods', time in which a replacement worker might be found. The WHO guide to identifying the economic consequences of disease and injury refers to this on p 26. This may not be a factor in Australia at present but it should be acknowledged and explained.

If these points are addressed I would be happy to recommend acceptance of the article.
Authors’ reply:

We thank the reviewer for these suggestions and have incorporated a “limitations of the study” section into the Conclusions:

“There are several limitations of the analysis. Firstly, the analysis is limited to people aged 45-64 years who reported that they are no longer in work as a result of having diabetes. It does not include other forms of limited labour force participation such as absenteeism (taking time off work while sick) and presenteeism (attending work while sick resulting in reduced productivity at work), nor does it estimate the value of lost GDP through early mortality, or the economic impact of carers having to give up work. Although the study did not set out to cover these areas, an estimate of the wider economic impact of diabetes through lost labour force participation would most likely result in even higher indirect economic impacts.

Secondly, the age range of study participants is limited to 45-64 years, as this is the age range which experiences the largest economic impact because of Type 2 diabetes prevalence and plans for retirement. Latest data shows that Type 2 diabetes affects 7% of people with diabetes aged 0-20 years, 54% of people with diabetes aged 21-39 years, 89% of people with diabetes aged 40-59 years, and 94% of people with diabetes aged 60 years or older. Data for people under 45 years was not analysed because the paper sought to evaluate the costs associated with the age group with the highest proportion of the preventable form of diabetes who, in turn, would incur the largest costs of the disease through premature exit from the labour force.

Lastly, the study takes the human capital approach to valuing productivity costs (i.e. the patient’s perspective) and thus counts any hour not worked as an hour lost and values these hours. It does not consider potential ‘friction periods’ – the time in which a replacement employee may be found. Valuing this period is the focus of the friction cost method for
valuing productivity costs; this method takes an employer’s perspective and only counts as lost those hours not worked until another employee takes over the work of the person who is ill.\textsuperscript{24-26} However, Australia’s economy is currently quite robust with a low unemployment rate and relatively strong economic growth with significant labour shortages in numerous industries making it difficult to replace lost labour and long recruitment periods.”

(pages 14-15)

New references


2) Minor essential revision: p4 line 6 - there is an 'as' missing from the sentence ending "...which is twice as many\_ in 1990."

Authors’ reply:

We thank the reviewer for this comment and have made this change to the text. The sentence has been changed from:

“The Global Burden of Disease Study 2010 reports that there were 1.3 million deaths were due to diabetes worldwide in 2010 which is twice as many in 1990.\textsuperscript{3v}

To:

“The Global Burden of Disease Study 2010 reports that 1.3 million deaths were due to diabetes worldwide in 2010 which is twice as many as in 1990.\textsuperscript{3v}

(paragraph 1, sentence 4, page 4)

3) Minor essential revision: p8 line 14 - there is a word missing in the sentence, "...who reported they did not \_a chronic health condition..."


Authors’ reply:

We thank the reviewer for this comment and have added “have” to this sentence (in bold below).

This line now reads as:

“A multiple regression model of the log of annual income was used to assess the differences between annual incomes of people in employment (full time) who reported they did not have a chronic health condition and people not in the labour force who reported they had left because of their illness and nominated diabetes as their main chronic condition.”

4) Discretionary revision: The variables described at the top of page 8 could be shown in a diagram for greater clarity.

Author’s reply

We have stated the categories in each variable in this paragraph as follows:

“Ten variables that were common to both datasets and strongly related to income were chosen as matching variables for synthetic matching: labour force status (4 groups: employed full time, employed part time, unemployed, not in the labour force), income unit type (4 groups: married couple with dependents, married couple only, one parent with dependents, one person), income quintile (5 groups: income quintiles 1st-5th), receiving age pension (2 groups: yes or no), receiving disability support pension (2 groups: yes or no), sex (2 groups: male or female), age group (4 groups: 45-49 years, 50-54 years, 55-59 years, 60-64 years), hours worked per week (5 groups: 1-15 hours, 26-24 hours, 25-34 hours, 35-40 hours, 41-plus hours), highest educational qualification (2 groups: university or non-university) and home ownership (2 groups: yes or no).”

(page 9)
We didn’t think that a new table was needed – fits into a single paragraph.

5) Minor discretionary revision: Would there be any value in showing the data for the group "Not in labour force, no chronic health condition", in Table 1 and text? This could provide a comparator for those people not in work as a result of diabetes.

Authors’ reply

We thank the Reviewer for their comment regarding possible comparators. This issue was discussed at length by co-authors, and a number of comparators were examined. We chose “Employed full time, no chronic condition” as the comparator of this study because our interest was in the impact of diabetes on employment rather than anything to do with unemployment or longevity in this state. “Not in the labour force, no chronic condition” may be a good comparator for future studies where we investigate the relative impact of different diseases on exit rates.

We note though that the group “not in the labour force, no chronic health condition” is a rather special group because it includes people who are wealthy enough to retire early, or whose overall household income (spouse) is high – makes comparisons a little hard to interpret.

Level of interest: An article of importance in its field

Quality of written English: Acceptable

Statistical review: No, the manuscript does not need to be seen by a statistician.

Declaration of competing interests:

I declare that I have no competing interests.