Author's response to reviews

Title: Diabetes: Cost of Illness in Norway

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Author's response to reviews: see over
To Editor in chief
Nina Titmus
BMC-series Journals

Diabetes: Cost of Illness in Norway

We are grateful that we have been allowed to submit a revised version of the paper. In the following we will explain how we have responded to the comments

Editorial requests:
- Experimental research that is reported in the manuscript must have been performed with the approval of an appropriate ethics committee. Research carried out on humans must be in compliance with the Helsinki Declaration (http://www.wma.net/e/policy/b3.htm), and any experimental research on animals must follow internationally recognized guidelines. A statement to this effect must appear in the Methods section of the manuscript, including the name of the body which gave approval, with a reference number where appropriate.

Response
Regarding the survey we performed we have already stated the following in the Methods section:
“The questionnaire was approved by Regional Committees for Medical Research Ethics and Norwegian Social Science Data Services”.

The cost-of-illness study per se does not require any ethical approval.

- Please include the 'Competing interests' section between the Conclusions and Authors' contributions.
- Please include an Authors' contributions section before the Acknowledgements and Reference list.

Response
We have reorganized the paper to meet the BMC Endocrine Disorders requirements.
Referee 1
Comment
I like to thank the authors for their answers to my comments. However, I am still not convinced that your the gives a valid estimate of diabetes-attributable costs. For direct costs, it is very uncertain if all included costs are attributable to diabetes, and if there are important health care uses that are missing. The consideration of pensions as proxy of indirect costs is hard to interpret. I am sorry, but I cannot recommend the paper for publication if the approach is completely revised.

Response - General comments
We understand the Referee’s comments but think this might to some extent apply to cost of illness studies in general.

There are several challenges when estimating the costs of diabetes. One challenge is to get complete data for all different types of health care. For some types of care (example foot therapy, dietician) there are no registers, and the estimate has to be based on patient surveys. For other types of care, registry data without diagnosis exist (example: antihypertensive drugs). In such cases, it is difficult to distinguish between costs attributable to diabetes and to other diagnoses. Finally, even when the diabetes diagnosis is stated, all costs should not be attributed to the diabetes. This would be the case for example for patients with hospital admissions with diabetes as the secondary diagnosis.

It should be noted, however, that the challenges with obtaining good data in general is less in Norway (and the other Nordic countries) because Norway has a unified health care system and because several data registries have been developed in the past two decades. In other words, the limitations of our study are likely to be less than for several other published studies. Still, we have pointed to the limitations so the reader can judge the results for himself/herself.
Referee 2
GENERAL COMMENTS (MAJOR ESSENTIAL REVISIONS)
Prevalence of diabetes in Norway: The fact sheet published by the Norwegian Institute of Public Health (http://www.fhi.no) refers to 110,000 type 2 diabetes patients who require medical treatment. Interestingly, it is stated that this estimate excludes diagnosed patients requiring only diet and exercise and undiagnosed patients. If only diagnosed diabetes is the focus, I’d like to know how much the exclusion of the patients requiring diet and exercise results in an underestimate of total costs of illness. Presumably, they still incur some costs such as visits to a GP, dietician, etc.

Response
We appreciate this comment. The number of patients on insulin and/or oral antidiabetic drugs was 117,600 in 2005 according to the Norwegian Prescription Register (searchable web site: http://www.norpd.no/). 25,000 of these are assumed to be individuals with type 1 diabetes, while 92,600 have type 2 diabetes. In the HUNT study (Midthjell K. Diabetes in adults in Nord-Trøndelag. Epidemiological and public health aspects of diabetes mellitus in a large, non-selected Norwegian population. Phd-Thesis, The Norwegian University of Science and Technology (NTNU), 2001) approximately 30% of patients with type 2 diabetes were on lifestyle interventions only. This would mean that the total number of patients with type 2 diabetes is about 132,300 (92,600/0.70). We have revised the analyses accordingly and changed the text and the cost estimates. This correction, however, does only affect costs that are estimated from the number of patients in Norway (i.e. foot therapy, physiotherapy, acupuncture, nutritional advice). For the great majority of costs, we used other data, and the total impact of this correction on the diabetes costs is small.

Action
We have revised the introduction of the paper accordingly and the appropriate costs estimates. Tables 4 and 5 have been revised.

Inpatient hospital costs: more information is needed about this (p.14). A more detailed description is needed about the relationship between hospitalizations and costs.

Response
We are slightly uncertain about this the meaning of this comment, but we agree that our arguments could be more explicit. With respect to the costs we use in the study, we will inform about the following: In Norway, all patients receive a main diagnosis and possibly one or more secondary diagnoses at discharge from hospital. ICD10 has been used since 1999. On the basis of the diagnoses, age, sex and possibly procedures, patients are allocated to a diagnosis related group (DRG). The Directorate of Health performs annual cost studies of a representative sample of hospitals in order to estimate the mean hospital costs of patients in each DRG. Even though the cost estimate may be incorrect for the individual patient, on average they represent reasonable costs for the different types of patients. The Norwegian Hospital Register covers all hospitals, and there is no reason to believe that any number of patients with a diabetes diagnosis is discharged.
without this diagnosis. The DRG reimbursement is based on – inter alia – the secondary diagnosis, so hospitals have a clear self interest in having all diagnoses stated at discharge.

**Action**
We have revised the paragraph with comments to the hospital costs in order to make the arguments more clear.

**Assumptions:** More justification is needed for the assumptions made. For example, why assume that one year of treatment with antihypertensive drugs costs €154? Table 3 suggests that survey data were used for this.

**Response**
We agree that some assumptions could be explained more explicitly.

**Action**
We added two references and changed the Background section to: “The number of patients with type 1 diabetes has been estimated at 25,000 [8]. In 2005, 117,600 persons in Norway were treated with insulin or oral antidiabetics [9]. We then assume that 92,600 of them have type 2 diabetes. In the Norwegian HUNT study [10] the proportion of patients with type 2 diabetes that was not on antidiabetic pharmaceuticals was 30%. This would imply that the total number of patients with type 2 diabetes is 132,300 (92,600/0.7). [8-11].”

And changed the Methods section, subheading Drugs to: “Based on data from the NPR we estimated average costs for one year of treatment with antihypertensive drugs (€154) and cholesterol lowering drugs (€357). This was based on market share of the different drugs available, average dose and prices”.

**Limits to generalisability:** The second last paragraph on page 7 refers to problems regarding the extent to which the survey population is representative of the Norwegian diabetes population, especially for type 2 diabetes. Since the results of this survey were used in calculating certain cost components, what implications does this have for the cost estimates from this COI study?

**Response**
We agree that selection bias in the survey limits the generalisability of the data, but it should be noted that any bias here will have little impact on the total diabetes costs because we used survey data only for a small proportion of the total costs.

**Action**
We have added the following sentence in the discussion: “Some cost estimates (GP home visits for hypoglycaemia, foot therapy, nutritional guidance, physiotherapy, acupuncture,
costs of cholesterol lowering- and antihypertensive drugs) may consequently be biased, but the impact on any bias here will be small because the relevant costs were small.

Comparisons with other COI studies: A general and more complete comparison with the COI results from Sweden would be beneficial. Since the Swedish COI study described the situation in 1994, care needs to be taken to distinguish between differences between countries and differences between time periods.

Response
One should be careful when comparing different COI studies. The Swedish study and our study were performed with different methods and the methodology may have a major impact on the results (see below).

Action
We have revised the discussion of the Swedish study.

Future research: The authors seem to have an enlightened opinion about COI studies and their limitations. I’d like to know what kinds of studies the authors think should be performed next.

Response
The results from the review of COI analyses that we mention in the discussion shows that the proportion of indirect costs in the studies reviewed varies from 25% to 64%. Our point is merely that our COI analysis could be used as a toolbox for analysts and if later studies are performed in the same way it may provide useful insight in how costs develop over time.

Action
None

SPECIFIC COMMENTS (MINOR ESSENTIAL REVISIONS)
1) A few errors (e.g., typos) need correction (e.g., p. 7, sent. 2, “productions losses”)

Response
We agree with the reviewer

Action
We have changed the typo mentioned by the reviewer to: “productivity losses”, and searched the manuscript for other typos.

2) Abstract (Results, final sentence): The total costs of €485 million given in this sentence contradict the value given in the first sentence (€274 million). More clarification is needed.
Response
We agree with the reviewer

Action
We have rearranged the first sentence in the results section of the abstract to:
“When hospital stays with diabetes as a secondary diagnosis were excluded, total costs were €293 million, which represents about 1.4% of the total health care expenditure”.

Furthermore we have changed the final sentence in the results in the abstract to:
“If all diabetes related hospital stays are included (primary-, secondary- and more diagnosis) total costs amounts to €535 million, about 2.6% of the total health care expenditure in Norway”.

3) The information in the tables can be presented in a more efficient and clearer manner. For example, e-tables 3 and 4 are not really needed and can be included in the text.

Response
We understand the reviewers comment. However, the results of this study may be used as input in economic evaluations/analysis performed by others. We therefore think it is a potential demand for detailed cost presentation.

Action
None

4) Table 3: It’s not clear what the total in the final line (A10) means compared to the other A10 values shown higher up in the table. More information is needed in the text.

Response
We agree with the reviewer.

Action
We have removed the A10 from the final line in table 3, which now reads “Total”. 