

## PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form ([see an example](#)) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below. Some articles will have been accepted based in part or entirely on reviews undertaken for other BMJ Group journals. These will be reproduced where possible.

### ARTICLE DETAILS

<b>TITLE (PROVISIONAL)</b>	Health Impact Assessment of increased cycling to place of work or education in Copenhagen
<b>AUTHORS</b>	Holm, Astrid ; Glümer, Charlotte; Diderichsen, Finn

### VERSION 1 - REVIEW

<b>REVIEWER</b>	<p>Rainer Fehr, director, Center for Health North Rhine-Westphalia (LZG.NRW), Germany</p> <p>Competing interests: The reviewer is in paid employment at an institution engaging in HIA; he received research funding for HIA projects, espec. from the European Commission; he is deputy chairperson of EUPHA's HIA section; he received honoraria for presentations on HIA.</p>
<b>REVIEW RETURNED</b>	30-Mar-2012

<b>THE STUDY</b>	<ul style="list-style-type: none"> <li>- The sub-analysis called "impact assessment" in this paper (page 6, lines 11, 30, 35, 45..., p.7, line 40) would better be called "exposure change assessment", or simply "exposure assessment"</li> <li>- In table 1 (page 7, line 7) there is a gap between the last two classes; the value "15 km" is not covered</li> <li>- "Our basic exposure was change in travel pattern" (page 7, line 29): "exposure" should be replaced by "factor of interest"; the next sentence ("The health effect of this exposure was mediated through exposure...") should be changed into: "The health effect of this factor was mediated though exposure..."</li> <li>- page 7, line 54 "minute inhalation": is "one-minute inhalation" meant here?</li> <li>- There are reasons (although not universally agreed on) to prefer the term "crash" over "accident" because many crashes are by no means "accidental". The authors should check their preference in this respect. No problem, if the decision is made to maintain "accident".</li> </ul>
<b>RESULTS &amp; CONCLUSIONS</b>	<ul style="list-style-type: none"> <li>- In table 3, the table title (page 10, line 9) should indicate: "annual" burden of disease</li> <li>- The sensitivity analyses (page 11, line 10ff), now in the section "Discussion", would be better placed in the "Results" section</li> <li>- The systemic nature of the transport system, and its consequences for "cycling and health", should be elaborated on. There are hints in this direction, incl. page 12, lines18-20 and line 54. It should be made clear that simple dose-response functions cannot fully capture the existing complexity. Given the Public Health relevance of the</li> </ul>

	<p>topic studied here, this constitutes a profound need of further investigation</p> <p>- The paper states that positive and negative effects of cycling partly cancel out (page 13, line 47). While this is numerically correct, in my view a comprehensive HIA perspective would not stop with this insight but would proceed to underline the relevance of improving cycling safety. Given the nature of HIA as informing policy-making, this result might qualify as the most important outcome of the whole analysis.</p>
<b>GENERAL COMMENTS</b>	<p>Good overall approach to health impact quantification, dealing with an impact of high practical relevance. The paper (after minor revisions) can contribute valuable insights. - Beyond this paper, the issue deserves to be pursued in more detailed projects.</p>

<b>REVIEWER</b>	<p>J.J. de Hartog, PhD  Assistant Professor  Dept. Epidemiology, Biostatistics &amp; HTA  UMC St Radboud  PO Box 9101  6500 HB Nijmegen  the Netherlands</p>
<b>REVIEW RETURNED</b>	<p>11-Apr-2012</p>

<b>THE STUDY</b>	<p>The method section is not written in a style in which readers that are not familiar with this type of analysis would be able to understand what was done in the analysis. Moreover, important assumptions; for instance what DALY was used for injury – which is a very broad health effect- were not described. Furthermore, the paper would benefit from editorial changes which would lead to improved readability. Parts of the discussion are explanation of the approach and should be moved to the method section.</p> <p>It is therefore hard to judge whether the results are convincing and how they compare with previous papers dealing with the modal shift.</p>
<b>GENERAL COMMENTS</b>	<p><b>General comments:</b></p> <p>The use of a bicycle for commuting purposes is a hot topic and has clear policy implications. As people in the western world show increasing sedentary lifestyles, health effects such as obesity and coinciding health effects (i.e. cardiovascular health) become an increasing problem. Cycling could be a solution since it could reduce air pollution and obesity simultaneously and can be easily incorporated into everyday life.</p> <p>This paper represents a health impact assessment on the issue of a modal shift from car to bicycle. The authors have tried to bring HIA of bicycle use to a next level. As a few studies have analyzed the modal shift on mortality, the addition of morbidity in this analysis is a novel aspect. The authors conclude that the negative health effects from cycling due to increased inhalation of air pollution and higher</p>

risks from traffic accidents are outweighed by the positive health effects due to the increased physical activity, although the net effect was relatively small.

Two papers were published describing a HIA on a modal shift from car to bike. Both of these papers incorporated mortality as the health end point. This leaves an important discussion on how the analysis would look like when also morbidity would be taken into account. The authors have taken a first step in trying to bridge this gap.

However, including morbidity in the HIA has some limitations which should be dealt with.

Firstly, the health end points that are involved are broader than for mortality. Especially, in traffic accidents a wide range of health effects can be observed ranging from permanent function loss (i.e. paralysis) to minor bruises. A clear decision on which health points are taken into account and what DALY number is selected for these injuries needs to be made and described in the paper. Moreover, especially minor traffic accidents are not reported in police records nor in hospital databases and suffer therefore from major underreporting.

Secondly, also psychological health effects are expected to play a role in the modal shift. The 1990 WHO report indicated that 5 of the 10 leading causes of disability were psychiatric conditions. Psychiatric and neurologic conditions account for 28% of all years lived with disability, but only 1.4% of all deaths and 1.1% of years of life lost. As cycling can serve both as a curative and a preventive measure for depression this issue should be addressed. The state of well being is important but is hard to quantify.

I'm not convinced that the authors were able to deal with these issues adequately. This is mainly because they failed to describe their approach in detail in the method section. It is therefore hard to judge whether the results are convincing and how they compare with previous papers dealing with the modal shift. The method section is not written in a style in which readers that are not familiar with this type of analysis would be able to understand what was done in the analysis. Moreover, important assumptions; for instance what DALY was used for injury – which is a very broad health effect- were not described. Furthermore, the paper would benefit from editorial changes which would lead to improved readability. Parts of the discussion are explanation of the approach and should be moved to the method section. Nevertheless, I would be keen to read an

	improved version of this paper and therefore I suggest to revise mainly the method section and review the resubmitted
--	---

<b>REVIEWER</b>	Audrey de Nazelle, PhD Research Fellow Centre for Research in Environmental Epidemiology (CREAL) Parc de Recerca Biomèdica de Barcelona - PRBB C. Doctor Aiguader, 88, 08003 Barcelona , SPAIN  No competing interests
<b>REVIEW RETURNED</b>	30-Mar-2012

<b>THE STUDY</b>	<p>While it not now a new question, more evidence is still needed on health risks and benefits trade-offs when cycling in urban areas, so the paper raises an interesting question and has an appropriate general design to answer the question.</p> <p>However, more details should be provided for the reader to understand specifically the methods, including data sources, assumptions and calculation steps. For example:</p> <ul style="list-style-type: none"> <li>- What is the data source for km travelled by various modes in Copenhagen?</li> <li>- What were the criteria for selection of exposures (physical inactivity, air pollution, and traffic accidents)?</li> <li>- What were the criteria for selection of outcomes (IHD, stroke, diabetes, etc) and selection of exposure-response functions?</li> <li>- How is the population that shifts from car to bike modes chosen according to baseline physical activity (proportional to baseline PA distribution?)</li> <li>- How is the air pollution exposure pre- and post- intervention calculated specifically: inputs are mentioned (speed, distance, etc), but it would be good to see what the actual equations and data look like. For example what is the inhalation rate for each mode (and how is it calculated, what is the speed assumed per mode etc) and how are traffic and non-traffic measurements used (to estimate exposure in different tavel modes? How?)? What is the resulting relative risk function for air pollution between cars and bikes (only RR from the Pope et al. study reported, but these are transformed when accounting for differences in air pollution exposure and inhalation rates – so what is the final RR?)</li> <li>- How is the RR for traffic injuries calculated specifically (RR=7.01), and why are cyclists compared to all other modes in the RR calculation, but in the intervention from what I can tell there is only a mode shift from cars to bikes? So how is the RR function then applied?</li> </ul> <p>Importantly, I find the burden of disease calculation potentially problematic. First of all I believe there is an error in the reporting: all the outcomes chosen from each exposure appear to be morbidity, but it seems that the RR chosen for the air pollution outcome are not incidence of cardiopulmonary disease and lung cancer, but rather mortality from cardiopulmonary disease and lung cancer. Then, although it is not completely clear in the methods description, it seems that perhaps these RR functions are used to estimate the PIF, which is just then directly applied to DALYS reported by the WHO for each outcome (ie (1-PIF)xDALYS) – but it seems like the correct method should be to separate out outcomes in terms of Years of Life Lost (YLL) and years of life with disability (YLD) (using the appropriate RR function for each), which you should then sum to</p>
------------------	--

	<p>obtain DALYs. These steps should be explained more thoroughly to be able to verify how appropriate is the approach, or simplifications should be justified if that is the case</p> <p>The discussion should include the most up-to-date literature in this area (there are not many papers on this issue, so they should all be mentioned)- a few missing: - Lindsay G, Macmillan A, Woodward A. Moving urban trips from cars to bicycles: impact on health and emissions. Aust N Z J Public Health 35:54-60 (2011) ; - Rabl A, de Nazelle A. Benefits of shift from car to active transport. Transport Policy 19:121-131 (2012); - Grabow ML, Spak SN, Holloway T, Stone JB, Mednick AC, Patz JA. Air Quality and Exercise-Related Health Benefits from Reduced Car Travel in the Midwestern United States. Environ Health Perspect (2011).</p> <p>Implications of assumptions should be discussed more – for example all road traffic accidents are treated equally, however are bike traffic accidents more severe than car accidents? And what are implications of not reporting minor injuries? Other assumptions mentioned above should be discussed more.</p> <p>The English should be improved a bit – mostly it's ok but there are a few mistakes here and there (e.g. page 5 line 28 should be “focuses”), some sentences are not entirely clear (e.g. page 5 line 17, what “approach” are you referring too), and there are some poor choices of words (e.g. page 7 should be “virgorous” not “hard” activity).</p>
<b>RESULTS &amp; CONCLUSIONS</b>	<p>ThIt is difficult to judge the conclusion currently because the methods are not sufficiently clear and specific. The reflection that net effects is rather small should be put more in context: small compared to what? Benefits are still much greater than risks, and overall mode shift is itself relatively small. In addition many potential outcomes are not included in the analysis, and this needs to be put in perspective in the conclusion as well.</p> <p>The conclusion could reflect a bit more specifically what I think the main message of the paper is – to propose better policies that reduce risks from air pollution and traffic injuries – this could be slightly more developed and clarified.</p> <p>e conclusion</p>

### VERSION 1 – AUTHOR RESPONSE

We found the comments very relevant and have revised the manuscript accordingly. Below we have broadly described the main revisions, and all changes are highlighted by red colour in the new version of the manuscript.

- We have made changes to the methods section, including further details on selection criteria, data sources and values used in the calculations.
- We have revised the calculation of burden of disease from accidents, so the relative risk used is now for bicycle compared to car (excluding other modes of transport).
- We have moved the main description of sensitivity analyses from the discussion to the result section.
- Made changes to figure 1 (clarifying the message of the figure), table 1 (highlighting the relevant modes of transport and travel distances), table 2 (added specific RR-estimates for air pollution) and updated results in tables 2 and 3.

- We have elaborated on the discussion section, especially with a focus on limitations in the calculation of burden of disease from accidents and regarding outcomes which we were not able to include in the analysis.

- Finally, in the conclusion, we have highlighted the policy recommendations from the study.

We look forward to hearing from you and hope that our revised manuscript is suitable for publication in BMJOpen.

Best regards,  
Astrid Ledgaard Holm

#### VERSION 2 – REVIEW

<b>REVIEWER</b>	J.J. de Hartog, PhD Assistant Professor University Medical Centre St Radboud Dept. Epidemiology, Biostatistics & HTA Nijmegen, the Netherlands
<b>REVIEW RETURNED</b>	12-Jun-2012

<b>GENERAL COMMENTS</b>	<p><b>General comments:</b></p> <p>In my opinion the paper improved from the revisions as suggested by the reviewers.</p> <p>Mainly the method section is more comprehensible although I'm not entirely sure whether readers less known to this field of science will be able to understand the paper fully. It took me quite some time to understand all aspects of this paper and I would suggest the editor to make editorial changes to solve this issue.</p> <p>In my opinion parts from the discussion should be moved to the method and result section (e.g. parts of p10 line 25-32, p10 line34-42 and p11 line 4-44).</p>
-------------------------	--

	<p><b>Major comments</b></p> <p>Table2, line 41; “* Insignificant (not included in the analysis”</p> <p>→I fail to see why this number was not included in the analysis. I hope it is not just because of the significance. Maybe the net-effect is not large but that is no reason to exclude it.</p> <p>P8, line 50; “Assuming the same relative severity”</p> <p>→Most readers will expect a larger severity for cyclist as they are less protected than car drivers in case of an accident. This assumption should at least be discussed or quantified in a sensitivity analysis.</p> <p><b>Minor comments</b></p> <p>P4, line 31; “Figure 1 show”</p> <p>→ Shows</p> <p>P5, line 53 ; “sights”</p> <p>→sites.</p> <p>P6, line 8 ; “ventilation for was”</p> <p>→ ventilation was.</p> <p>P5, line 34; “Levels of exposure to”</p> <p>→Exposure levels of.</p>
--	--

	<p>P8, line 14; "shows the annual pre- and post-intervention burden of disease"</p> <p>→ shows the pre- and post-intervention annual burden of disease.</p>
--	---

<b>REVIEWER</b>	<p>Rainer Fehr, director, Center for Health North Rhine-Westphalia (LZG.NRW), Germany</p> <p>Competing interests: The reviewer is in paid employment at an institution engaging in HIA; he received research funding for HIA projects, espec. from the European Commission; he is deputy chairperson of EUPHA's HIA section; he received honoraria for presentations on HIA.</p>
<b>REVIEW RETURNED</b>	22-May-2012

<b>GENERAL COMMENTS</b>	<p>text needs final clerical checking, e.g. p.6, line 7-8: "One-minute ventilation for was calculated as an average...".</p> <p>otherwise, the manuscript seems fine to me - nice job.</p>
-------------------------	--

#### VERSION 2 – AUTHOR RESPONSE

We thank you for the additional review comments received regarding our Manuscript ID bmjopen-2012-001135 entitled "Health Impact Assessment of increased cycling to place of work or education in Copenhagen".

Based on the review comments, we have made the following revisions to the manuscript:

- Parts of the discussion has been moved to the methods and result sections (changes are highlighted by red colour in the new version of the manuscript)
- The manuscript has been proof-read, and clerical changes have been made (these minor changes are not highlighted in the text)
- The association between moderate physical activity and stroke has been included in the analysis (this only resulted in minor changes in the results, which are not highlighted in the text)
- The assumption of same relative severity for bicycle and car accidents is tested in the sensitivity analyses and discussed (parts of this section has been moved to the results section, which is highlighted by red colour in the new version of the manuscript)

Best regards,  
Astrid Ledgaard Holm