

PEER REVIEW HISTORY

BMJ Open publishes all reviews undertaken for accepted manuscripts. Reviewers are asked to complete a checklist review form (<http://bmjopen.bmj.com/site/about/resources/checklist.pdf>) and are provided with free text boxes to elaborate on their assessment. These free text comments are reproduced below.

ARTICLE DETAILS

TITLE (PROVISIONAL)	Reducing the carbon footprint of research: experience from the NightLife study
AUTHORS	Quann, Niamh; Burns, Steph; Hull, Katherine; Cluley, Victoria; Richardson, Carla; MacConaill, Kateryna; Conefrey, Carmel; Rooshenas, Leila; Eborall, Helen; Burton, James

VERSION 1 – REVIEW

REVIEWER	Kelleher, Deirdre Weill Cornell Medicine, Anesthesiology
REVIEW RETURNED	19-Jan-2023

GENERAL COMMENTS	<p>Thank you for the opportunity to review this manuscript highlighting how changes to a research protocol driven by pandemic restrictions led to substantial reductions in carbon emissions. The topic is important given our need to find ways in every sector to slow our trajectory towards 1.5 degrees Celsius above pre-industrial levels. The results are impressive and the process of achieving those results can be helpful in guiding future research protocols and best practices. Below are my comments as part of the peer review process:</p> <p>Abstract:</p> <p>The abstract has a lot of buzz words but is a bit vague in content and acts more like an introduction than an abstract. For example, in sentence one what type of targets have been set by the Climate Act? Environmental? Carbon and carbon equivalent emissions? “Tackling ... challenges ... is fundamental to reducing the carbon footprint” is also a vague sentence without much information for the reader. What type of recommendations do those bodies provide? What type of “research sustainability” and “support” from funding organisations is lacking?</p> <p>I suggest revising these sentences focusing on brevity and clarity of language. I also suggest including more about what was found in this particular study. “Through changes in XYZ of our study design, we were able to achieve XYZ carbon emissions reductions” or something similar.</p> <p>Manuscript:</p> <p>I find the use of acronyms in this manuscript a bit distracting. Unless these are commonplace acronyms in the UK (I am US-based) I suggest writing out to help readers who are not familiar with these groups. Alternatively, you can be less specific with your terms, eliminating the need for acronyms (e.g., “all meetings, including team management, patient experience, and XYZ, were moved to remote”). Also, if acronyms are used, please be sure to spell out at the first mention. I believe “SIV” is not written out.</p>
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	<p>Like my comments regarding the abstract, the introduction is a bit wordy and could be edited for brevity and clarity. It should rapidly transition from the regulations set forth and the changes required to what this study will be about.</p> <p>Overview of study: consider “clinical and cost effectiveness” rather than “effectiveness and cost effectiveness”</p> <p>Overview/Adjustments: You mention what things changed to, but do not mention what they were before. It ight be helpful to include a sentence like “before the pandemic, the study was conducted by doing XYZ by a staff of # people from locations all over the UK” either at the end of the “overview” or beginning of the “adjustments”</p> <p>Being more specific about the changes will help support your conclusion that you have “highlighted opportunities”</p> <p>Table 1:</p> <p>Consider adding a column to summarize the ways in which each workstream made changes. Example in Workstream X: In-person --> Virtual staff meetings; In-person --> virtual patient check-in visits</p> <p>Recommend remaining consistent in which “real-life equivalent” you pick. While it is fun to see the different things the calculators can use, I think using the most common – miles driven by a standard car (gasoline vs diesel – whichever is more common in the UK) is more helpful for the reader to understand.</p> <p>Cost savings: Can you give an estimate of cost savings?</p> <p>Carbon emissions terms: In most reports about carbon emissions, I have seen the unit be listed as “metric tons/tonnes”. The abbreviation for carbon equivalent emissions is typically “CO2e emissions”</p> <p>Discussion: Are there any limitations to your estimates of CO2e emissions?</p>
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REVIEWER	Öhman, Daniel AstraZeneca R&D Gothenburg
REVIEW RETURNED	07-Feb-2023

GENERAL COMMENTS	<p>The importance of reducing carbon footprint from our way of living is extremely important and I encourage this to be investigated also in the clinical trial space. The authors describe one of the hotspots in carbon footprint (travel) and that the trial community should use the learnings made with restricted travel during the pandemic to reduce the CO2 footprint in trials to come.</p> <p>The way the authors made their CO2 calculations is simple and accepted by the public but leaves many methodological and scientific questions that needs to be answered before publication.</p> <ul style="list-style-type: none"> • How have you mapped the activities in your study, i.e. in particular how many f2f meetings have been replaced by virtual meetings? • What type of travel has been replaced, mode of transportation? • For how long did the measurements take place? • Why choose these two web-based calculation tools? There are numerous out there. How are they validated?
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• Claiming to save carbon dioxide is true when you look at the replaced trips, but what significance have these had for the study in general? Is it a real reduction overall?
To make the findings in the manuscript useful to health professionals, sponsors of clinical trials or patients I think that the saved amount of CO2 needs to be put in perspective. The NightLife study also needs to be better described for the reader to understand how to apply these findings to their own situation.

Specific questions

P5L19 “, it was nevertheless a significant and positive outcome.”

This can be a true statement, it is shown later in the manuscript travel restrictions reduce CO2

However, the authors have not shown that the study progress as planned or accounted for up or downstream burden shifting. I.e. a prolonged study (lower recruitment rate) during the pandemic might lose all the CO2 savings on travel.

P6L30

The study design of NightLife is not described in number of subjects, investigators or trial sites. The length of the studied period is not described and the “normal travel” for such studies is not described. This is important to understand the magnitude of the proposed reduction in CO2 footprint

P6L50

reduction of 136 tonnes.... of a total of??

P7L28

It is not clear how or which of the calculators that has been used to calculate what, or if they are validated for this kind of assessment.

P8L40

Number of travels replaced by virtual meetings not described which makes this CO2 savings impossible to understand

P8L50

Number of participants and travel replaced by virtual meetings not described which makes this CO2 savings impossible to understand

P9L8

The magnitude of Researcher travel or mode of transportation not described which makes it impossible to put the savings in perspective.

P9L19

At least a ballpark figure is needed in this section or it does not add value and can be reduced to a sentence in the epilogue.

P10L19

What is meant by “with traditional ethnographic methods alone”

P10L26

What is meant by significant? Can you give a percentage or actual reduction, it would improve this statement.

P10L39

“positive working relationships built and maintained”

This is a very important statement and section. Do we really see maintained relations?

During pandemic there was a dramatic drop in patient recruitment across a large range of disease areas (not surprising). However, the drop is still there has not picked up to pre-pandemic numbers yet. Is this just a result of the fatigue we see with investigational sites post pandemic or is it a result of the new ways of remote working? Is the NightLife study recruiting as planned?

P12L14

The virtual design elements are applicable to more disease areas than CKD, a travel guide is applicable to the larger community.

VERSION 1 – AUTHOR RESPONSE

Reviewer 1 comments	
Comment	Response
<p>Abstract:</p> <p>The abstract has a lot of buzz words but is a bit vague in content and acts more like an introduction than an abstract. For example, in sentence one what type of targets have been set by the Climate Act? Environmental? Carbon and carbon equivalent emissions? “Tackling ... challenges ... is fundamental to reducing the carbon footprint” is also a vague sentence without much information for the reader. What type of recommendations do those bodies provide? What type of “research sustainability” and “support” from funding organisations is lacking?</p> <p>I suggest revising these sentences focusing on brevity and clarity of language. I also suggest including more about what was found in this particular study. “Through changes in XYZ of our study design, we were able to achieve XYZ carbon emissions reductions” or something similar.</p>	<p>Thank you for your feedback. The abstract has been reworded to incorporate these suggestions.</p> <p>Thank you, this has been completed.</p>
<p>Manuscript:</p> <p>I find the use of acronyms in this manuscript a bit distracting. Unless these are commonplace acronyms in the UK (I am US-based) I suggest writing out to help readers who are not familiar with these groups. Alternatively, you can be less specific with your terms, eliminating the need for acronyms (e.g., “all meetings, including team management, patient experience, and XYZ, were moved to remote”). Also, if acronyms are used, please be sure to spell out at the first mention. I believe “SIV” is not written out.</p> <p>Like my comments regarding the abstract, the introduction is a bit wordy and could be edited for brevity and clarity. It should rapidly transition from the regulations set forth and the changes required to what this study will be about.</p> <p>Overview of study: consider “clinical and cost effectiveness” rather than “effectiveness and cost effectiveness”</p> <p>Overview/Adjustments: You mention what things changed to, but do not mention what they were before. It might be helpful to include a sentence like “before the pandemic, the study was conducted by doing XYZ by a staff of # people from locations all over the UK” either at the end of the “overview” or beginning of the “adjustments”</p> <p>Being more specific about the changes will help support your conclusion that you have “highlighted opportunities”</p>	<p>Thank you for highlighting this. Reference to meetings has been made less specific so to reduce the number of acronyms. We agree this makes the manuscript easier to read for our international colleagues.</p> <p>Thank you, this has been completed.</p> <p>Thank you, this has been updated on line 49</p> <p>Thank you for this suggestion, an additional sentence has been included on lines 55 - 57.</p>
<p>Table 1:</p>	

<p>Consider adding a column to summarize the ways in which each workstream made changes. Example in Workstream X: In-person --> Virtual staff meetings; In-person --> virtual patient check-in visits</p> <p>Recommend remaining consistent in which “real-life equivalent” you pick. While it is fun to see the different things the calculators can use, I think using the most common – miles driven by a standard car (gasoline vs diesel – whichever is more common in the UK) is more helpful for the reader to understand.</p>	<p>Thank you for this suggestion. Two columns have been added to table 1: ‘original method’ and ‘adaptations implemented’. We hope you agree this makes it much clearer.</p> <p>Thank you for your comment, we agree the number of kilometres driven a car would be more relatable to the reader. This has been updated in table 1.</p>
<p>Cost savings: Can you give an estimate of cost savings?</p>	<p>Thank you, this has been clarified on lines 115 - 117.</p>
<p>Carbon emissions terms: In most reports about carbon emissions, I have seen the unit be listed as “metric tons/tonnes”. The abbreviation for carbon equivalent emissions is typically “CO₂e emissions”</p>	<p>Thank you for highlighting this, it has been updated throughout the manuscript.</p>
<p>Discussion: Are there any limitations to your estimates of CO₂e emissions?</p>	<p>Thank you for this question. We used a validated carbon footprint calculator and the calculations took into account the type of vehicle. However, the results are based on estimates and this has been clarified on lines 79, 81 and 87).</p>

Reviewer 2 comments	
Comment	Response
<p>How have you mapped the activities in your study, i.e. in particular how many f2f meetings have been replaced by virtual meetings?</p>	<p>Thank you for this question. The original grant application outlined the total number of planned face-to-face meetings for the duration of the study, as well as related costings. This was used to map which study activities were reconfigured to virtual methods. This has been clarified on lines 75, 76 and 77.</p>
<p>What type of travel has been replaced, mode of transportation?</p>	<p>The calculations were performed according to planned transport modality: rail, car, bicycle and air travel. This has been clarified on line 84.</p>
<p>For how long did the measurements take place?</p>	<p>The time period is the first 18 months of the study following grant activation on 1st January 2020. This has been clarified in the abstract.</p>
<p>Why choose these two web-based calculation tools? There are numerous out there. How are they validated?</p>	<p>Thank you for this question. The carbonfootprint.com calculator is widely used by other research institutions in the UK and Republic of Ireland. This particular calculator was highlighted at the International Clinical Trials Methodology Conference ‘Reducing Trial Waste’ session (Harrogate, October 2022).</p> <p>Based on Reviewer 1’s comments, ‘trees planted’ has been removed from table 1. Therefore reference to the second web-based calculator has been removed from the text and the references.</p>
<p>Claiming to save carbon dioxide is true when you look at the replaced trips, but what significance have these had for the study in general? Is it a real reduction overall?</p>	<p>Thank you for this question. Changing to a hybrid model has not affected study integrity or governance. In fact, the frequency of oversight committee meetings increased with no change to costs</p>

	or carbon footprint. This is highlighted on lines 149 - 152.
<p>To make the findings in the manuscript useful to health professionals, sponsors of clinical trials or patients I think that the saved amount of CO2 needs to be put in perspective.</p> <p>The NightLife study also needs to be better described for the reader to understand how to apply these findings to their own situation.</p>	<p>Thank you for this suggestion. As per Reviewer 1's comments, table 1 has been updated to include a more relatable real-life equivalent (kilometres driven in a car).</p> <p>Thank you for highlighting this. This information was previously outlined in an earlier draft, however the manuscript type changed to a communication article which has a limited word count. We have provided additional links to the trial registry record (ISRCTN) and study website in the text (see line 50) and references which provide further information about study design.</p>
<p>P5L19 " , it was nevertheless a significant and positive outcome."</p> <p>This can be a true statement, it is shown later in the manuscript travel restrictions reduce CO2. However, the authors have not shown that the study progress as planned or accounted for up or downstream burden shifting. I.e. a prolonged study (lower recruitment rate) during the pandemic might lose all the CO2 savings on travel.</p>	<p>Thank you. We are approaching study governance as a whole in a hybrid manner. However, recruitment to the main study is still face-to-face as the patient population is adults receiving thrice weekly in-centre haemodialysis. This has not changed.</p>
<p>P6L30</p> <p>The study design of NightLife is not described in number of subjects, investigators or trial sites. The length of the studied period is not described and the "normal travel" for such studies is not described. This is important to understand the magnitude of the proposed reduction in CO2 footprint</p>	<p>Thank you. This information was previously outlined in an earlier draft, however the manuscript type changed to a communication article which has a limited word count. We have provided additional links to the trial registry record (ISRCTN) and study website in the text and references which provide further information about study design.</p> <p>"Normal travel" for this study type is described in lines 165 – 172.</p>
<p>P6L50</p> <p>reduction of 136 tonnes.... of a total of??</p>	<p>We acknowledge the use of the word 'reduction' is ambiguous; we have therefore changed the text to read "a saving of 136 tonnes of CO2e".</p> <p>See lines 34,45, 88, 91, 95, 100, 107, 129, 199 and Table 1.</p>
<p>P7L28</p> <p>It is not clear how or which of the calculators that has been used to calculate what, or if they are validated for this kind of assessment.</p>	<p>Please refer to the previous comment regarding web-based calculation tools.</p>
<p>P8L40</p> <p>Number of travels replaced by virtual meetings not described which makes this CO2 savings impossible to understand.</p>	<p>Thank you for highlighting this. This is now included in table 1 which has been updated as per Reviewer 1's comments.</p>
<p>P8L50</p> <p>Number of participants and travel replaced by virtual meetings not described which makes this CO2 savings impossible to understand</p>	<p>Face-to-face contact with participants was reduced. Participant travel was not reduced as patients were already attending the haemodialysis unit thrice weekly as part of their standard care.</p>
<p>P9L8</p> <p>The magnitude of Researcher travel or mode of transportation not described which makes it impossible to put the savings in perspective.</p>	<p>Please refer to Reviewer 1's comment regarding the limitations to our estimates of CO2e.</p>
<p>P9L19</p>	<p>Thank you for this suggestion. Reduced expenditure has been clarified on lines 115 -117.</p>

At least a ballpark figure is needed in this section or it does not add value and can be reduced to a sentence in the epilogue.	
P10L19 What is meant by “with traditional ethnographic methods alone”	Thank you, this has been clarified on line 66 -67 (in-person observations and real-time field notes).
P10L26 What is meant by significant? Can you give a percentage or actual reduction, it would improve this statement.	This is now clarified on line 115 with the added details regarding estimated money saved from reduced travel.
P10L39 “positive working relationships built and maintained” This is a very important statement and section. Do we really see maintained relations? During pandemic there was a dramatic drop in patient recruitment across a large range of disease areas (not surprising). However, the drop is still there has not picked up to pre- pandemic numbers yet. Is this just a result of the fatigue we see with investigational sites post pandemic or is it a result of the new ways of remote working? Is the NightLife study recruiting as planned?	Thank you for these comments, however the impact of COVID-19 on recruitment to trials is beyond the scope of this brief communication article. “Positive working relationships built and maintained” has been removed from the text.
P12L14 The virtual design elements are applicable to more disease areas than CKD, a travel guide is applicable to the larger community.	Thank you for this important comment, we agree the virtual design elements don’t have to be limited to kidney disease. We have therefore updated the wording.

VERSION 2 – REVIEW

REVIEWER	Kelleher, Deirdre Weill Cornell Medicine, Anesthesiology
REVIEW RETURNED	22-Feb-2023

GENERAL COMMENTS	<p>Thank you for the opportunity to review this revised manuscript. The authors have answered my initial concerns as well as the concerns of the second reviewer. The current manuscript flows well and is much easier to understand without the frequent abbreviations. I have two minor comments:</p> <p>Please write out the first mention of CO₂e (carbon dioxide equivalents).</p> <p>Table 1 – If you change the last column heading to “Equivalent Kilometres Driven in a Car” you can reduce the redundancy of the words in each subsequent box. You may also want to put a clarification at the bottom of the table indicating that the calculation is for a standard (?) gasoline (?) car.</p>
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REVIEWER	Öhman, Daniel AstraZeneca R&D Gothenburg
REVIEW RETURNED	21-Feb-2023

GENERAL COMMENTS	Thank you for the new version of your manuscript. This version is much clearer and does your study more justice.
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	<p>The authors have shown that through the Covid restrictions for face-to-face meetings, carbon dioxide was saved on travel.</p> <p>My only objection is that the manuscript would be more balanced if the authors reasoned a little more about the risks, cofounding factors and other limitations that a virtual way of working might have.</p>
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VERSION 2 – AUTHOR RESPONSE

Reviewer 1 comments	
Comment	Response
Please write out the first mention of CO2e (carbon dioxide equivalents).	Thank you, this has been moved from the abstract to the main text on line 44.
Table 1 – If you change the last column heading to “Equivalent Kilometres Driven in a Car” you can reduce the redundancy of the words in each subsequent box.	Thank you for this suggestion. The header of table 1 has been updated to reduce the redundancy of words.
You may also want to put a clarification at the bottom of the table indicating that the calculation is for a standard (?) gasoline (?) car.	Thank you, we have clarified that the calculation is for a standard (non-electric) car.

Reviewer 2 comments	
Comment	Response
My only objection is that the manuscript would be more balanced if the authors reasoned a little more about the risks, cofounding factors and other limitations that a virtual way of working might have.	Thank you for highlighting this, we agree with this comment. We feel that a full assessment is beyond the scope of this work and we have acknowledged and clarified this on lines 152 – 156. We have also changed the wording on line 147 to state “teleconferencing, video-conferencing and web-based training were <u>found</u> to be effective” rather than “... <u>proven</u> to be effective”.