

PEER REVIEW HISTORY

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ARTICLE DETAILS

TITLE (PROVISIONAL)	Urban environment and mental health: the NAMED project, protocol for a mixed method study
AUTHORS	Lauwers, Laura; Trabelsi, Sonia; Pelgrims, Ingrid; Bastiaens, Hilde; De Clercq, Eva; Guilbert, Ariane; Guyot, Madeleine; Leone, Michael; Nawrot, Tim; Van Nieuwenhuysse, An; Remmen, Roy; Saenen, Nelly; Thomas, Isabelle; Keune, Hans

VERSION 1 – REVIEW

REVIEWER	Selena Gray University of the West of England, Bristol UK
REVIEW RETURNED	03-Sep-2019

GENERAL COMMENTS	<p>I note that you have excluded Arabic speakers from interviews; I appreciate this may be more complex to do but I think it may potentially exclude an important group in terms of exposure to diverse environmental conditions.</p> <p>Taking account of how much exposure individuals have to their home environment- for example working people - can be difficult. Some references missing eg Moore, T., Kesten, J., López-López, J., Ijaz, S., McAleenan, A., Richards, A., ...Audrey, S. (2018). The effects of changes to the built environment on the mental health and well-being of adults: Systematic review. <i>Health and Place</i>, 53, 237-257</p>
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REVIEWER	Marco Helbich Utrecht University, Netherlands
REVIEW RETURNED	06-Oct-2019

GENERAL COMMENTS	<p>Thanks for giving me the opportunity to review this manuscript addressing a timely and important topic. The authors aim to assess associations between environmental factors and mental health outcomes. I appreciate that a mixed-methods approach is used which makes the project different from others. Overall, the protocol is well-written and clear, though the authors need to add methodological details. I do have only the following comments:</p> <ul style="list-style-type: none"> - The authors question previous studies ("limited and different set of indicators"); however, from my point of view this limitation also applies to the NAMED project. For example, variables describing walkability etc. are not included. Another limitation is where exposures are assessed. This happens primarily at the residential location. Does this appropriately reflect people's exposure throughout a day? Most likely not because people spend most of the daily life outside the residential neighborhood at other locations (e.g. work place).
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	<ul style="list-style-type: none"> - I would appreciate a bit more in-depth discussion on the limitations of earlier studies. As it is, the discussion is rather brief. - Besides the study aim, please state some hypothesis which will be addressed. - Please provide a justification for selecting the Brussels region as a case study and not carrying out a nation-wide study. - More information about the interview process and the research design would be helpful (e.g. duration of interviews, is the questionnaire available and where, sampling procedure, was a power analysis conducted). - The data sources and how the environmental variables (e.g. vandalism, traffic volume) were operationalized/measured is unclear. For most variables no information was provided. For example, is traffic volume referring to weekdays, peak hours etc. How will greenery (e.g. land use data, remote sensing-based NDVI or EVI) be measured? Concerning air pollution, which kind of interpolation methods will be used? Deterministic (e.g. IDW) or stochastic approaches (e.g. kriging)? Air pollution measurements are available on a daily basis. However, it is unclear how the authors will consider them (e.g. yearly averages?). - What is the project start and end? - First introduce the abbreviations (e.g. SES). - A brief discussion section including the pros and cons could strengthen the protocol.
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REVIEWER	K Brookfield University of York UK
REVIEW RETURNED	08-Oct-2019

GENERAL COMMENTS	<p>Further details about the qualitative component of the study would be useful e.g. on the topics covered by the interview framework, on where the walking interviews will take place and their estimated length.</p> <p>Minor points: Appreciating word limits, some initial insight into how mental health is understood in the study, indicators/aspects considered, could be included in the abstract. Study strengths and limitations section – it is noted that some recommendations may not be ‘applicable in the long-term’. This sentence could perhaps be re-phrased a little to aid clarity.</p>
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REVIEWER	Eugenia South University of Pennsylvania, United States of America
REVIEW RETURNED	24-Oct-2019

GENERAL COMMENTS	<p>Urban environment and mental health: the NAMED project, a mixed methods approach</p> <p>Manuscript review for BMJ Open</p> <p><u>General</u></p>
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- The overall study concept to better understand the complex interplay between urban environment and mental health is a good one. The authors are using several different spatial and non-spatial data sources, which is a strength. The combination of qualitative and quantitative methods is a strength.
- However, the study protocol as laid out in this manuscript is confusing and not well explained.
- A conceptual framework diagram in the introduction might help to clarify the rationale.
- A figure in the methodology section which demonstrates pictorially how the study is organized might help clarify study protocol.

Introduction

- There are a lot of important concepts in the introduction, but its hard to follow the thought process, current evidence, and gaps in evidence as currently laid out. For example, the first sentence of the 2nd paragraph talks about demographic, socioeconomic, and cultural factors without expanding upon those concepts and what literature tells us. The next sentence goes on to talk about urban environment, then breaking into social and physical environment, also without providing much detail. 3rd paragraph talks about social capital, social segregation, and social risk factors, but gives no further information. Then goes on to physical environment again, mentions noise/air/design but again not going deeper into any of this.
- Green space is clearly a core component of this project (as per title and description), however there is only cursory look at current data linking greenspace and mental health.
- Please see following citation regarding qualitative work on perception of neighborhood environment and health, including mental health
 - Garvin E, Branas C, Keddem S, Sellman J, Cannuscio C. More than just an eyesore: Local insights and solutions on vacant land and urban health. *J Urban Heal*. 2013;90(3):412-426. doi:10.1007/s11524-012-9782-7
- Term (non-)built environment is introduced without definition.

Methodology

- Would like to see more of an explanation on how the mental health indicators the authors propose to use responds to what they say are the weakness of current literature.
- The authors comments that “these data allow to investigate the underlying mechanisms be which the urban environment associates with mental health”. However, there is no explanation in the analytic plan as to how this will occur.
- Under built and non-built environment data section, the concept of the “outdoor environment” is introduced for the

	<p>first time. Also for the first time, building structures and street network are introduced with no prior reference.</p> <ul style="list-style-type: none"> • What year will air quality data be used? Will this correspond to the year of the mental health data? Same with noise. If air and noise are key environmental metrics, need much more detail on how these are measured and planned to use in analysis. • The data analysis plan is a bit sparse. Would like to see more on this and how their analysis plans accounts for the complex relationships at play and how this will advance the science addressing the gaps discussed in introduction.
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VERSION 1 – AUTHOR RESPONSE

Reviewer(s)' Comments to Author:

Reviewer: 1

Reviewer Name: Selena Gray

Institution and Country:

University of the West of England, Bristol

UK

Please state any competing interests or state 'None declared': None

Please leave your comments for the authors below

4. I note that you have excluded Arabic speakers from interviews; I appreciate this may be more complex to do but I think it may potentially exclude an important group in terms of exposure to diverse environmental conditions.

Taking account of how much exposure individuals have to their home environment- for example working people - can be difficult. Some references missing eg

Moore, T., Kesten, J., López-López, J., Ijaz, S., McAleenan, A., Richards, A., ...Audrey, S. (2018).

The effects of changes to the built environment on the mental health and well-being of adults: Systematic review. *Health and Place*, 53, 237-257

Reply to the reviewer:

Thank you for your comments. I understand your concern. Our starting point for the interviews was reaching diversity as we are aware of the current bias in international literature. I would like to emphasize that for the qualitative reviews we do not exclude native Arabic speakers, but each participant is required to have a basic knowledge of Dutch, English or French since we do not have the financial capacity to hire a translator to conduct, transcribe and translate the interviews. In Brussels, 95,52% of citizens report to have a good or excellent knowledge of French, followed by 33,29% of Dutch, 33,25% of English and 9,99% of Arabic.¹ The majority of Arabic speakers also speak French.

Thank you for the reference of Moore et al 2018, we included this reference in the 'introduction' section and included the limitation that we only focus on residential environment in the 'strengths and limitations' section.

1. Rudi Janssens, « Language use in Brussels and the position of Dutch », *Brussels Studies* [En ligne], Collection générale, n° 13, mis en ligne le 07 janvier 2008, consulté le 29 octobre 2019. URL : <http://journals.openedition.org/brussels/520> ; DOI : 10.4000/brussels.520

Reviewer: 2

Reviewer Name: Marco Helbich

Institution and Country: Utrecht University, Netherlands

Please state any competing interests or state 'None declared': None declared.

Please leave your comments for the authors below

Thanks for giving me the opportunity to review this manuscript addressing a timely and important topic. The authors aim to assess associations between environmental factors and mental health outcomes. I appreciate that a mixed-methods approach is used which makes the project different from others. Overall, the protocol is well-written and clear, though the authors need to add methodological details. I do have only the following comments:

5A. The authors question previous studies ("limited and different set of indicators"); however, from my point of view this limitation also applies to the NAMED project. For example, variables describing walkability etc. are not included.

5B. Another limitation is where exposures are assessed. This happens primarily at the residential location. Does this appropriately reflect people's exposure throughout a day? Most likely not because people spend most of the daily life outside the residential neighborhood at other locations (e.g. work place).

6. I would appreciate a bit more in-depth discussion on the limitations of earlier studies. As it is, the discussion is rather brief.

7. Besides the study aim, please state some hypothesis which will be addressed.

8. Please provide a justification for selecting the Brussels region as a case study and not carrying out a nation-wide study.

9. More information about the interview process and the research design would be helpful (e.g. duration of interviews, is the questionnaire available and where, sampling procedure, was a power analysis conducted).

10a. The data sources and how the environmental variables (e.g. vandalism, traffic volume) were operationalized/measured is unclear. For most variables no information was provided. For example, is traffic volume referring to weekdays, peak hours etc. How will greenery (e.g. land use data, remote sensing-based NDVI or EVI) be measured? Concerning air pollution, which kind of interpolation methods will be used? Deterministic (e.g. IDW) or stochastic approaches (e.g. kriging)? Air pollution measurements are available on a daily basis. However, it is unclear how the authors will consider them (e.g. yearly averages?).

10b. What is the project start and end?

10c. First introduce the abbreviations (e.g. SES).

10d. A brief discussion section including the pros and cons could strengthen the protocol.

Reply to the reviewer:

Thank you for your comments. We included more detailed information on limitations of previous research, how the current study addresses those limitations and the limitations of the current study in the 'introduction', 'methodology' and 'strengths and limitations' section. No extra discussion section was included as this does not fit within the format of a study protocol in the BMJ Open journal.

According to your comment on the lack of walkability measures more detailed information is now added to the 'indicators for urban environment' section in the quantitative research part. The indicator

development for the urban environment does approach the concept of walkability by taking into account the presence of sidewalk, urban street trees, design of the street (canyon and street corridor effect), visible street vegetation coverage, etc.

The major strengths of the NAMED project are the mixed method approach, the application of a variety of indicators for mental health and the urban environment, the combination of both subjective and objective environmental indicators, and the coupling of urban environment indicators and mental health indicators at individual level. A limitation among our indicators is the lack of indicators for the social residential environment (such as neighborhood cohesion, neighborhood criminality). By using the HIS data, we have information on the residential environment of more than 5.000 people. We are aware that schools and office building are part of the living environment, but we found it not possible within the set-up of the project to enrich the existing dataset with information on the school, work and leisure environment.

Because of the exploratory nature of this project we choose not to include hypotheses, but restrict to research questions.

The reasons behind our choice to focus on the Brussels-Capital Region are now added to the 'method' section. The restriction to the Brussels-Capital Region is motivated by the high prevalence of the mental health problems, but also by the distribution of the HIS-participants 2008 and 2013. The large cities in Flanders and Wallonia have much less HIS-participants than Brussels. Since we include qualitative interviews, it is not realistic to propose an investigation in the large cities of every region in Belgium. As such, we have chosen to focus on the Brussels-Capital Region. The focus on Brussels-Capital Region (BCR) was also motivated by the available geographic data. Very detailed spatial information, for instance on tree position, pavement width etc, has been collected, digitized and made available to the general public for BCR, which is not the case for the other regions of Belgium, Flanders and Wallonia. The existence of a rich dataset, both in HIS participation and geographic detail, was a strong argument for choosing BCR as our study region.

More information regarding the interview process is now included in the 'qualitative research part' of the manuscript. No power analysis was conducted in the qualitative research part. Based on sample size recommendations to reach theoretical saturation when using a semi-structured interview approach and considering the exploratory nature of the research, the sample size should consist of 30 participants.² This sample size should permit to reach the desired diversity of respondent profiles and to uncover the complexity of the issue

The topics of the interview script are now included in the protocol, the script itself will be published as part of the results papers.

The project period has been mentioned in the 'introduction' section: 2017 – 2021.

A methodological figure is added in the 'methodology' section to declare how each part contributes to the main objective of the project. According to your comments, we clarify now more in detail the air pollution models in the 'methodology' section.

2. Morse JM. Determining sample size. Qual Health Res. 2000;10(1):3–5. doi: 10.1177/104973200129118183.

Reviewer: 3

Reviewer Name: Katherine Brookfield

Institution and Country:

University of York

UK

Please state any competing interests or state 'None declared': None declared

Please leave your comments for the authors below

11. Further details about the qualitative component of the study would be useful e.g. on the topics covered by the interview framework, on where the walking interviews will take place and their estimated length.

Minor points:

12. Appreciating word limits, some initial insight into how mental health is understood in the study, indicators/aspects considered, could be included in the abstract.

13. Study strengths and limitations section – it is noted that some recommendations may not be ‘applicable in the long-term’. This sentence could perhaps be re-phrased a little to aid clarity.

Reply to the reviewer:

Thank you for your comments. More information regarding the interview process is now included in the ‘quantitative research part’. How the quantitative and qualitative research part approach concepts of mental health and the urban environment is now described in more detail in the ‘methodology’ section (under ‘mixed method approach’), due to word limits we could not add this information in the abstract. We rephrased the strengths and limitations of the current study in the dedicated section. -----

Reviewer: 4

Reviewer Name: Eugenia South

Institution and Country: University of Pennsylvania, United States of America

Please state any competing interests or state ‘None declared’: None

Please leave your comments for the authors below

However, the study protocol as laid out in this manuscript is confusing and not well explained.

15. A conceptual framework diagram in the introduction might help to clarify the rationale.

16. A figure in the methodology section which demonstrates pictorially how the study is organized might help clarify study protocol.

Introduction

17. There are a lot of important concepts in the introduction, but its hard to follow the thought process, current evidence, and gaps in evidence as currently laid out. For example, the first sentence of the 2nd paragraph talks about demographic, socioeconomic, and cultural factors without expanding upon those concepts and what literature tells us. The next sentence goes on to talk about urban environment, then breaking into social and physical environment, also without providing much detail. 3rd paragraph talks about social capital, social segregation, and social risk factors, but gives no further information. Then goes on to physical environment again, mentions noise/air/design but again not going deeper into any of this.

18. Green space is clearly a core component of this project (as per title and description), however there is only cursory look at current data linking green space and mental health.

19. Please see following citation regarding qualitative work on perception of neighborhood environment and health, including mental health o Garvin E,

Branas C, Keddem S, Sellman J, Cannuscio C. More than just an eyesore: Local insights and solutions on vacant land and urban health. *J Urban Heal.* 2013;90(3):412-426. doi:10.1007/s11524-012-9782-7

20. Term (non-)built environment is introduced without definition.

Methodology

21. Would like to see more of an explanation on how the mental health indicators the authors propose to use responds to what they say are the weakness of current literature.

22. The authors comments that “these data allow to investigate the underlying mechanisms be which the urban environment associates with mental health”. However, there is no explanation in the analytic plan as to how this will occur.

23. Under built and non-built environment data section, the concept of the “outdoor environment” is introduced for the first time. Also for the first time, building structures and street network are introduced with no prior reference.

24. What year will air quality data be used? Will this correspond to the year of the mental health data? Same with noise. If air and noise are key environmental metrics, need much more detail on how these are measured and planned to use in analysis.

25. The data analysis plan is a bit sparse. Would like to see more on this and how their analysis plans accounts for the complex relationships at play and how this will advance the science addressing the gaps discussed in introduction.

Reply to the reviewer:

Thank you for your comments.

We were not able to provide a conceptual framework diagram, but included now a figure in the ‘methodology’ section to demonstrate the organization of the project process.

The ‘introduction’ section has been edited according to your comments. We included more detail on current literature linking green space and mental health. However, we would like to underline that the project does not only focus on green space but on urban environment in general.

Thank you for the reference of the qualitative study. We chose not to include the reference in the current paper as our project does not take into account vacant lands, but it is interesting to observe growing attention for marginal land. We will consider the reference for the qualitative results paper.

We chose not to use the term (non-)built environment anymore as it may cause confusion among the readers. Instead we restrict to ‘urban environment’ and describe in the ‘methodology’ section how we approach ‘urban environment’ in both research parts.

More declaration on the choice of our mental health indicators is now included in the ‘abstract’ and ‘methodology’ section.

We provided more clarification on how the underlying mechanisms are investigated in the ‘introduction’ section, this information is further clarified in the ‘methodology’ section. The mixed method approach supports a better understanding of those underlying mechanisms. In the quantitative research part, we assess the potential mediating role of physical activity, social life, and noise and air pollution in the associations between mental health and urban environment in a mediation analysis. The qualitative research part allows to explore impacts of individuals’ perceptions and experiences on associations between mental health and urban environment.

We included more clarification on the air and noise pollution data in the ‘methodology’ section. We depend on noise data collected in 2006 and 2011 since no data are available for the years of the HIS data (2008, 2013). Since the evolution in noise pollution between 2006 and 2011 was very weak, we can assume that average noise levels in 2008 and 2013 will not differentiate significantly on a two-years difference from the collected noise data.³ Furthermore, associations between mental health and noise pollution are expected to occur as a result of long-term exposure.⁴

We extended details on the data analysis in the ‘methodology’ section.

3. Styns 2016. Evaluatie van de gezondheids- en economische gevolgen van het globale verkeersgeluid in het Brussels Hoofdstedelijk Gewest. BIM, collectie factsheets, thema geluid. Leefmilieu Brussel, 2016.
4. World Health Organization. Environmental Noise Guidelines for the European Region; WHO Regional Office for Europe: Copenhagen, Denmark, 2018.

VERSION 2 – REVIEW

REVIEWER	Helbich, Marco Universiteit Utrecht, Human Geography and Spatial Planning
REVIEW RETURNED	15-Jan-2020

GENERAL COMMENTS	Thank you for your efforts. The authors have addressed my questions appropriately. Good luck with the study!
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REVIEWER	Katherine Brookfield University of York, UK
REVIEW RETURNED	15-Jan-2020

GENERAL COMMENTS	The authors have appropriately addressed the issues previously raised. Some relatively minor grammatical errors in places e.g. in some of the discussion of the qualitative element of the study.
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REVIEWER	Eugenia South University of Pennsylvania, USA
REVIEW RETURNED	29-Jan-2020

GENERAL COMMENTS	The authors adequately addressed all reviewer comments
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