

## Systematic Map Protocol

### Title

What evidence exists on the impacts of the natural and built environment on human health - a systematic map protocol

### Citation:

Sophia Dollmann, Aniek Messink, Hanneke Kruize, Frank den Hertog, Judith Hin, Marit de Vries, Ana Maria de Roda Husman. What evidence exists on the impacts of the natural and built environment on human health - a systematic map protocol: a Systematic Map Protocol.

PROCEED-23-00077 Available from:

<https://proceedevidence.info/protocol/view-result?id=77>

<https://doi.org/10.57808/proceed.2023.4>

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### Keywords

Built environment, natural environment, health and well-being, health determinants, environmental planning

### Background

Numerous studies indicate that the living environment impacts health and well-being in various ways (1-7). Natural and built environmental features such as green and blue infrastructure have been linked to promote healthy behaviour as it may stimulate physical activity and social cohesion (5, 8-12). Conversely, environmental stressors (i.e. air pollution, crowding and noise) can adversely affect the health of residents (13-15). A living environment that promotes healthy behaviour is of great importance for public health as the major health impacts, such as mental health, obesity and cardiovascular diseases are related to an unhealthy lifestyle (16, 17). When designing a living environment, it should protect health as much as possible by reducing environmental risks and take into account health promoting determinants. There are still many knowledge gaps on the influence of the living environment on health. Research on the living environment and health is often limited to cross-sectional studies, which do not provide sufficient information to derive causal relationships. In addition, there is a lack of studies that investigate the (long-term)effectiveness of interventions that contribute to a healthy living environment (2, 18). Most published work focuses on one aspect or topic of the healthy living environment, such as noise (19, 20) or green space (21), without considering the interactions with other environmental health determinants. To design a healthy living environment it is important to understand how the living environment influences the health and well-being of citizens (22). Sharing this knowledge among public health advisors, researchers and urban planners can help promoting a healthy living environment (19, 23). Since knowledge is dispersed, there is need for a holistic overview (2). By means of a broad and thorough examination of the recent literature this systematic map can help informing professionals in the design of a living environment that promotes health and prevents diseases.

### Theory of change or causal model

see uploaded file "WING Conceptual framework"

### Stakeholder engagement

Expert consultations will be conducted in the first stage of the review process to sharpen the search

strategy by determining relevant concepts, frameworks and topics, keywords, and eligibility criteria. The eleven consulted experts have research experience on specific fields of the relationship between the living environment and health. Their expertise entails noise, green space, blue space, biodiversity, climate (change), physical activity, healthy mobility, social environment, food environment, air quality and health-promoting aspects of the living environment. Along the mapping review process, four experts with different backgrounds will be involved to assist in the interpretation of the research findings and comment on the report.

### **Objectives and review question**

This protocol aims to describe the methods for conducting a mapping review on broad research fields (e.g. healthy living environment or climate change) that entail a large variety of topics. These methods include the literature search, data extraction and data synthesis. This protocol explains how this systematic map can present and synthesize recent scientific knowledge on the impact of the living environment on health and well-being. The knowledge collected in this systematic map can be used to identify knowledge gaps to explore further needs of research.

### **Definitions of the question components**

We aim to map the existing knowledge on the relations between the living environment and health for all people living in and using the outdoor environment. We define the living environment as our surrounding public outside space that encompasses both natural and built environment. A healthy living environment is clean and safe, it facilitates social interaction, recreation, playing and exercising, as well as healthy mobility, such as walking, biking and the use of public transportation (27). A living environment should facilitate interactions within neighborhoods and increase people's sense of belonging. We define health and well-being as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" (24). Additionally, we extend the definition of health and well-being with "the individual's ability to cope with physical, emotional or social challenges as well as an individual's perceived quality of life and well-being" (25).

### **Search strategy**

See attached file "Search strategy"

### **Bibliographic databases**

The scientific databases selected for the scoping review are Embase, Pubmed, Scopus and PsychInfo, which could be accessed through our institutional license. By combining these four databases we intend to incorporate a variety of studies from the fields of medicine, biomedical, behavioral and social science. These databases are expected to cover the majority of relevant scientific literature on the association between the design of the living environment and health. No additional grey literature searches will be conducted as we intend to only include peer-reviewed publications.

### **Web-based search engines**

N/A

### **Organisational websites**

N/A

### **Comprehensiveness of the search**

From experts on the different research fields we retrieved a selection of benchmark articles. Keywords from these benchmark articles were included in the search strategy, which yielded increased the comprehensiveness of the search. Some benchmark articles were not included in the search as they fell out of the time range of the searched literature.

## **Search update**

N/A

## **Screening strategy**

The reviewing process will be conducted by two independent researchers. The systematic review management program Covidence will be used to facilitate the blinded screening of articles throughout title/abstract and full text. Reasons for exclusion have to be selected in the program. A PRISMA flowchart will be updated throughout the process to give a transparent overview of the screening process.

## **Eligibility criteria**

First, articles were included based on the following eligibility criteria: • In-press or published in English, Dutch or German which are the professional languages of the reviewers. • Published after 2015 in a peer-reviewed journal to obtain state of the art articles. • Primary research only. • No protocols, methodological evaluations, commentary, editorial, reviews • Access to full-text of the article Second, articles with an explicit reference to the physical and/or natural living environment as well as human health and/or well-being were screened based on the following exclusion criteria: Population: • No animal studies Exposure: • No specific link to (a feature of) the living environment • Not translatable to Dutch context (e.g. excluding slums, non-endemic infectious diseases) • No indoor housing environment/quality • No studies which only cover the individual social environment (e.g., social support or peer-pressure) • No studies on the social environment without a specific link to the physical living environment (e.g. social networks) • No settings i.e. work environment, situation for homeless people, socio-economic environment Outcome: • No specific link to a health outcome

## **Consistency checking**

To guide this mapping review, the steps of the Arksey & O'Malley framework will be used (Arksey & O'Malley, 2005, Levac, D., Colquhoun, H. & O'Brien, K.K. (2010). These steps include (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, (5) collating, summarizing and report results, and (6) consultation. The review management program Covidence will be used for the article screening. Title-abstract and full-text screening will be conducted independently by two researchers. Articles which do not conform to the eligibility criteria will be excluded during the title-abstract screening. The remaining articles will be screened for full-text and again reviewed based on the eligibility criteria. Articles categorized as "maybe", will be discussed by the two researchers in order to come to an agreement.

## **Reporting screening outcomes**

The outcomes of the screening will be reported in a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) flowchart including the number of studies imported for screening, removed duplicates, included studies for screening, irrelevant studies, studies assessed for eligibility, excluded studies and reasons for exclusion, and final number of included studies.

## **Study validity assessment**

N/A

## **Consistency checking**

N/A

## **Data coding strategy**

During the screening process key topics (environmental labels) based on conceptual frameworks and literature will be assigned to the included studies. Text-mining in the programming language R

(version 4.2.0) will be used to retrieve data on elements/characteristic of the living environment, health outcomes, as well as study design and population. A file that lists all the included studies after full-text screening will be exported from Covidence. The file will consist of columns describing the title of the article, the publication year, the abstract and the labelled key topics.

### **Meta-data to be coded**

The environmental labels "access to facilities / amenities", "alcohol/tobacco/drugs", "biodiversity", "blue spaces", "environmental perception", "environmental stressors", "food environment", "green spaces", "healthy mobility", "neighborhood condition", "land use mix", "social environment", "sport & play" and "urban densification" have been assigned to the papers. In the attached file "description of labels" a description / definition of the labels and associated key topics are mentioned. By means of text mining further meta-data on the elements of the living environment (e.g. parks, community gardens), health outcomes (e.g. mental health, cortisol levels, infectious diseases), study design (e.g. cross-sectional, longitudinal), study population (e.g. elderly, patients, vulnerable socio-economic populations) or countries could be extracted from abstracts as input for the systematic map.

### **Consistency checking**

Since we will be using text mining from abstracts for the extraction of data, we will validate whether the extracted data match with the information in the abstract. The input lists which form a base for the text mining will also be developed and cross-checked by the independent researchers.

### **Type of mapping**

The extracted meta-data will be made available in form of a table. The systematic map will provide information about the relation between the living environment and health. Furthermore, data on study design, elements in the living environment and health outcomes will be charted. The proportion and intersection of studied environmental labels to investigate their interrelation will be plotted. Moreover, (i.e. the number and characteristics of) the investigated associations between the living environment and health will be mapped to identify knowledge gaps and give directions for future research. Especially articles that covered the combination of several environmental labels will be of interest. Moreover, the type of study designs (e.g. cross-sectional, longitudinal, natural experiment) and study populations (e.g. elderly, children, migrants) will be inspected. By means of evidence gap maps, upset plots and other descriptive illustrations the study findings will be presented.

### **Narrative synthesis methods**

The systematic map will mainly include the recent findings in form of descriptive statistics by reporting the quantity and characteristics of scientific knowledge on the living environment and health outcome measures. These can illustrate which environmental labels have been studied in conjunction to show which topics on the living environment are interrelated. Moreover, health outcome measures in relation to the living environment can be mapped. Consequently, this will also reveal knowledge gaps, which could feed future research as well as policy recommendations.

### **Knowledge gap identification strategy**

By means of evidence gap maps, heatmaps or upset plots, the interactions and combinations of different topics (elements of the living environment or health outcomes) can be illustrated. This can give insights into knowledge gaps for future research.

### **Demonstrating procedural independence**

Two independent junior researchers will carry out the review. Both junior researchers did not yet publish articles within this scope. Other team members who have published in this research field do not have access to the program.

## Competing interests

The authors declare that they have no competing interests.

## Funding information

This study is funded through the Strategic Program 2021-2023 of the Dutch National Institute of Public Health and the Environment, project number S/020013/01.

## Author's contributions

SD and AMdRH conceptualized the study and acquired research funding. SD was responsible for project management. SD and AM designed the review protocol. SD and AM collected literature and reviewed titles and abstracts. SD and AM reviewed full texts and mined data. SD and AM curated the data. SD and AM made data visualizations, analyzed and interpreted the data. All authors (SD, AM, AMdRH, HK, FH, JV, JH) contributed to writing, editing, and revision of the manuscript. All authors read and approved the final manuscript.

## Acknowledgements

We would like to thank Brigit Staatsen and Annemarie Ruijsbroek for critically reviewing the manuscript.

## References

see references in attachment "Protocol WING"

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Submitted: Jan 30, 2023 | Published: Feb 23, 2023

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