**What is the impact of the living environment on human health? A systematic map protocol**

Sophia Dollmann1,2, Aniek Messink1,Hanneke Kruize1,3, Frank den Hertog1, Judith Hin1,4, Marit de Vries1, Ana Maria de Roda Husman1,2

1 Centre for Infectious Disease Control/Centre for Sustainability, Environment and Health/Centre for Health and Society, National Institute for Public Health and the Environment (RIVM), PO Box 1, 3720 BA Bilthoven, The Netherlands

2 Institute for Risk Assessment Sciences (IRAS), Utrecht University, Yalelaan 2, 3584 CM Utrecht, The Netherlands

3 University of Applied Sciences Utrecht, Padualaan 99, 3584 CH, Utrecht, The Netherlands

4 PBL Netherlands Environmental Assessment Agency, Bezuidenhoutseweg 30, 2594 AV The Hague, The Netherlands

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**Abstract**

Background:

Natural and built features in the living environment can impact public health and well-being. There are numerous studies on the relations between the living environment and health, but it remains unclear how to design a living environment which takes into account health promoting aspects (e.g. physical activity) as well as limiting health risks (e.g. environmental stressors) in a holistic manner.

Methods:

This protocol describes how a scoping review on the impact of the physical (natural and built) living environment on health can be performed in order to collect and summarize the recent scientific knowledge on this topic. After identifying the research question, conceptual frameworks and expert consultations helped to identify key topics and set the eligibility criteria. Additionally, four scientific databases were searched to identify the relevant publications. For the study selection, title, abstract and full-text screening were performed whilst labelling key topics. By using text mining, data on for instance study design, elements in the living environment and health outcomes can be charted. The results can be summarized to present knowledge gaps in order to inform researchers about further needs of research. Moreover, this overview could help informing professionals about the characteristics and design of a living environment that promotes health and prevents diseases.

1. **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 such as 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 possible environmental risks and take into account health promoting determinants.. There are still many knowledge gaps on the influence of the living environment on health, especially regarding the interrelatedness of its key elements and pathways. 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). Knowledge is diverged across domains (19). Most published work focuses on one aspect or topic of the healthy living environment, such as noise (20) or green space (Yang, Zhao et al. 2021), without considering the interactions with other environmental health determinants.

To design a healthy living environment it is important to understand how the physical living environment influences the health and well-being of citizens, in particularly how various physical aspects interrelate to health (21). An overview of the risks and impacts of the living environment on health could help researchers in health impact assessments. Sharing of knowledge among public health advisors, researchers and urban planners can help gaining a better understanding of promoting a healthy living environment (19, 22). Since knowledge is dispersed, there is need for a holistic overview (2). By doing a systematic scoping review a broad and thorough examination of recent literature on the impact of the physical living environment on health and well-being can be achieved. The scoping review can help to inform professionals in the design of a living environment that promotes health and prevents diseases.

**Aims and objectives**

This protocol aims to describe the methods for conducting a broad scoping review on 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 scoping review can map and synthesize recent scientific knowledge on the impact of the living environment on health and well-being. The knowledge collected in this scoping review can be used to identify knowledge gaps to explore further needs of research.

1. **Definition of “health” and the “living environment”**

For the scoping review, 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” (23). 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” (24).

We define the living environment as our surrounding public outside space that encompasses both natural and built (physical) environment that can influence our health and well-being (25). Moreover, the living environment is dynamical and thus can change over time and space.

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. A living environment should facilitate interactions within neighbourhoods and increase people’s sense of belonging. In addition, a healthy living environment is of good environmental quality including sound, air, soil and external safety aspects (26). Furthermore, a healthy living environment is characterized by sufficient amounts of green, water and nature and incorporates climate change adaptation measures. Moreover, a healthy living environment considers the needs of specific population groups such as residents with lower socio-economic status, children, elderly and people with chronic diseases or disabilities. It offers attractive and diverse open spaces as well as healthy and sustainable environments. Besides, a healthy living environment includes a variety of facilities and amenities, such as schools, shops, public transport, culture, and sport facilities (27).

1. **Scope**
   1. **Concept**

The concepts of the “living environment” and “health” formed the conceptual framework (figure 1), which represent a base for the scoping review. The living environment consists of elements and/or characteristics in the natural and built environment. Furthermore, we differentiated between impacts of the living environment on intermediate health outcomes and direct health and well-being outcomes. Intermediate health outcomes are lifestyle or behavioural factors such as tobacco use, physical activity, healthy nutrition, social activities (e.g. participation and social interaction, restoration) or environmental risk factors such as exposure to environmental pollutants or infectious agents. Intermediate health outcomes also include community social capital, social safety and social cohesion, which we refer to as social neighbourhood environment. Under direct health outcomes we comprehend disease-specific or general health measures such as disease incidence or prevalence (e.g. obesity, cardiovascular disease), self-reported health and well-being, mortality or integrated health metrics such as DALYs (28).

Diagram

Description automatically generated

Figure 1 Conceptual framework of the scope of this review

To thematically assess the knowledge on the living environment and health, key topics on the healthy living environment were identified based on conceptual frameworks and expert consultations (figure 1), see the appendix for a description list of the key topics (29-35).

**4.2. Context**

Regarding the living environment within the scoping review, we intended to focus on public spaces, meaning public outdoor environments and access to public services and facilities. This could entail parks or urban infrastructure, but not working environments (i.e. occupational risks) or indoor housing quality. The scope of the living environment was set on the Dutch context. We did not limit the search to studies performed in the Netherlands, but instead included studies done in countries where aspects of the living environment are comparable to the Dutch context. Subsequently, we aimed to provide a broader knowledge base than only Dutch studies can provide.

**4.3. Study population**

We aimed to map the existing knowledge on the relations between the living environment and health for all people living in and using the outdoor environment. Vulnerable groups may be disadvantaged because they often have more limited access to health promoting opportunities in the living environment or are more susceptible to suffer from disease (36, 37). They might also be more exposed to risk factors such as environmental pollution, crime, neighbourhood disadvantage or deprivation (38, 39). Homeless people were regarded out of the scope as they face other exposure or health problems that are not comparable with the general population using the living environment. We took vulnerable groups into special consideration by labelling studies which look at e.g. elderly, children, vulnerable socio-economic groups, people with disabilities, immunocompromised or minority groups.

1. **Systematic approach**

To guide this scoping review, the steps of the Arksey & O’Malley framework were 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 (figure 2). Expert consultations were 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.

Timeline

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Figure 2 Steps of the scoping review

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 scoping review process, four experts from the project group with different backgrounds were involved to assist in the interpretation of the research findings and comment on the report. The reviewing process was conducted by two independent researchers. The scoping review was documented following the Preferred Reporting Items for Systematic reviews and Meta-analyses extension for Scoping Reviews (PRISMA-ScR) checklist from Tricco, Lillie (40) was used. According to Lockwood, dos Santos (41) this approach helps maintaining the best practice standard.

1. **Search strategy**

The focus of this systematic scoping review lies on sensitivity rather than specificity, meaning that it maintains a broad scope. The search was based on the main concepts “health” and “physical living environment”, as also shown in the conceptual framework (figure1). We were also interested in studies in which the interconnection between the physical and social neighbourhood environment (i.e. community social capital, social safety and social cohesion) on health was examined, in which the social environment is classified as an intermediate outcome. We aimed to retrieve articles of the combination of “health” and “physical environment” (figure 3, B) or all the three concepts of “health”, “physical environment” and “social environment” (figure 3, A). The combination of “health” and “social environment” was considered out of the scope of this review (figure 3, C) as it did not intend to investigate how the design of the social living environment can influence health (figure 3, C).

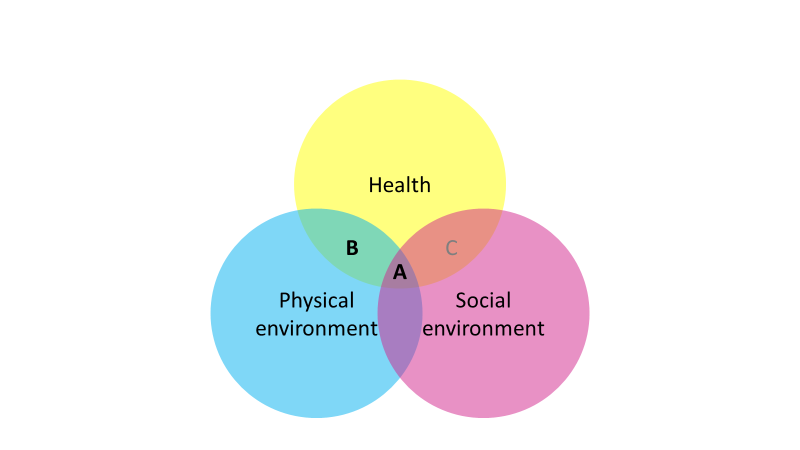


Figure 3 Diagram of the search strategy including the three concepts “health”, “physical environment” and “social environment”

Concepts terms health and physical environment were applied to maintain a sensitive search, whilst entailing the major topics for the “health” concept (table 1). Additional terms which were found relevant by the consulted experts but did not exist as a concept term in the databases, were searched as “text word”. The full search queries can be found in the appendix. The search was critically appraised by two reviewers, by checking whether key articles (proposed by experts) were retrieved in the search. Keywords of these key articles were additionally considered. The search strategy was discussed with a librarian to optimize the search.

1. **Information sources**

The scientific databases searched were Embase, Pubmed, Scopus and PsychInfo. By combining these four databases we intended to incorporate a variety of studies from the fields of medicine, biomedical, behavioural and social science. These databases were 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 were conducted.

Table 1 Overview of the index terms of the concepts specific for EMBASE, PUBMED, Scopus and PsychInfo

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Concepts* | EMBASE | PUBMED | SCOPUS | PSYCH INFO |
| HEALTH | Public health | Environmental medicine  Public health surveillance  Social determinants of health |  | Public health |
|  | Mental health |  | Mental health |
|  | Minority health | Minority health |  | Health disparities |
|  | Urban health | Population health | Population health | Urban health |
|  | Rural health |  | Rural health |
|  | Population health |  | Population health |
|  | Well-being | Well-being |  | Well-being |
|  | Health equity | Health equity |  | Health disparities |
|  | Health status | Vital statistics | Health status | Health status |
|  | Mortality |  | Epidemiology  Health outcomes |
|  | Morbidity |  |
|  | Incidence |  |
|  | Prevalence |  |
|  | Epidemiological surveillance | Epidemiological monitoring  Causality |  |
|  | Disease burden | Global burden of disease |  |
|  | Motor activity | Motor activity |  |  |
|  | Healthy lifestyle | Healthy lifestyle |  | Lifestyle  Health behaviour |
|  | Health behaviour | Health risk behaviours |  |
|  | Pathogen transmission | Disease transmission, infectious  Zoonoses |  | Infectious disorders  Disease transmission |
|  | Zoonotic transmission |  |
|  | Infection risk |  |
| SOCIAL NEIGHBOURHOOD ENVIRONMENT | Neighbourhood | Residence characteristics | Neighbourhood | Neighbourhoods  Facilities |
|  | Social cohesion |  |  |  |
|  | Social capital | Social capital |  | Social capital |
| PHYSICAL ENVIRONMENT | Physical environment |  | Built environment  Blue space | Built environment  Blue space |
|  |  |  |  | Environmental attitudes |
|  | Environmental planning | Social planning  Environment design | Environment design | Environmental planning |
|  | Environmental quality |  |  |  |
|  | Environmental management | Environmental policy |  | Environmental policy |
|  | City planning |  |  | Urban planning  Urban environments |
|  | Pollution AND pollution related phenomena | Environmental pollution |  |  |
|  | Environmental exposure |  |  | Environmental effects  Exposure |
|  | Recreational park | Parks, recreational |  | Recreation areas |
|  | Vegetation |  | Green space | Nature (environment) |
|  | Land use |  |  |  |
|  | Dens\* NEAR/2 urban |  | Urban densification | Crowding  Overpopulation |
|  | Urbanization | Urbanization |  | Urbanization |

1. **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.

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:

* No specific link to (a feature of) the living environment
* No specific link to a health outcome
* Not translatable to Dutch context (e.g. excluding slums, non-endemic infectious diseases)
* Indoor housing environment/quality
* Animal studies
* Studies which only cover the individual social environment (e.g., social support or peer-pressure)
* Studies on the social environment without a specific link to the physical living environment (e.g. social networks)
* No access to full-text of the article
* Study types i.e. protocols, methodological evaluations, commentary, editorial, reviews
* Settings i.e. work environment, situation for homeless people, socio-economic environment

**9. Data management and selection**

The review management program Covidence was used for the article screening. Title-abstract and full-text screening were conducted independently by two researchers. Articles which did not conform to the eligibility criteria were excluded during the title-abstract screening. The remaining articles were screened for full-text and again reviewed based on the eligibility criteria. Articles categorized as “maybe”, were discussed by the two researchers in order to come to an agreement.

Moreover, the option in Covidence to label articles with self-defined key topics was used during screening. The list of key topics (figure 1) has been created by the two researchers based on previous research and conceptual frameworks about the relations between the living environment and health.

Subsequently, text-mining in the programming language R (version 4.2.0) was used to retrieve data from 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 was exported from Covidence. The file consisted of columns that describe the title of the article, the publication year, the abstract and the labelled key topics. We manually created lists with terms of health outcomes and elements of the living environment named in the abstracts. These lists enabled a simple form of text mining from the abstracts. In general, text mining detects specific search terms from a set of data. Since we aimed to perform a broad scoping review without a specifically defined outcome, we needed to manually identify all health outcomes and elements of the living environment mentioned in the abstracts. By using text mining, the terms of these lists are recognized and summarized in a separate column per article.

For extensive and more detailed data extraction, a data charting form was created in Covidence (table 2). The data charting form was independently evaluated by the two reviewers. This form was used to extract data from a number of studies on each topic to check whether the extracted data aligns to the purpose of the scoping review (42). The predefined data form included:

Table 2 Structure and information extracted from the data charting form

|  |  |
| --- | --- |
| General information | Environmental labels, health labels, title, year of publication, country, geographical region, aim of study |
| Methodology | Qualitative/quantitative/mixed methods, study design, description of the study design, study population, description/details of the study population, sample size, natural and built element(s) in the living environment / intervention(s), characteristics / details / dimensions or detailed information of physical element or intervention, indirect health outcome (behaviour/exposure), direct health outcome, data collection, description of data collection, analytical method(s), description of analytical method, statistical analysis, description of statistical analysis |
| Results | Independent variable, Dependent variable, Effect modifier, Effect mediator, Confounder, Positive/negative effect, Behaviour/exposure, Health outcome, Outcome value, Outcome measure (e.g. hazard ratio, odds ratio), Confounder/effect modifier, Positive / negative / non-significant association |
| Discussion and conclusion | Key findings and conclusion, policy recommendation(s), positive/negative quality notes |

**10. Data synthesis and presentation**

Data synthesis was performed in the programming software R (version 4.2.0) based on the data extraction output. The proportion and intersection of studied key topics to investigate their interrelation were plotted. Moreover, (i.e. the number and characteristics of) the investigated associations between the living environment and health were mapped to identify knowledge gaps and give directions for future research. Especially articles that covered the combination of several living environment labels were of interest. Moreover, the type of study designs (e.g. cross-sectional, longitudinal, natural experiment) and study populations (e.g. elderly, children, migrants) were inspected. By means of evidence gap maps, upset plots and other descriptive illustrations the study findings were presented.

**Appendix**

**Description of the labelled key topics**

|  |  |  |  |
| --- | --- | --- | --- |
| **Key topic** | **Living environment label** | **Description** | **References** |
| **Environmental stressor** | **Air quality** | Environmental stressors are natural or anthropogenic factors that can induce health impacts. Examples of environmental stressors are air pollution, noise pollution, light pollution, temperature, allergens, and infectious agents. | (43, 44) |
| **Allergy** |
| **Climate** |
| **Environmental quality** |
| **Hazard exposure** |
| **Infectious diseases** |
| **Light** |
| **Noise** |
| **Access to facilities / amenities** | **Access to facilities / amenities** | Accessibility encompasses the number, variety and types of facilities and amenities. Facilities and amenities entail (basic) public services, by means of, for example, good infrastructure or high density of facilities. | (45) |
| **Healthcare** |
| **Alcohol / tobacco / drugs** | **Alcohol / tobacco / drugs** | The density of tobacco or alcohol outlet shops, smoking bans or built environmental features such as ash trays can influence the use of alcohol/tobacco/drugs. | (46) |
| **Biodiversity** | **Biodiversity** | Biodiversity is shaped by the landscape that surrounds or is embedded in the living environment. Biodiversity has been described by the WHO as “the variability of – and among – living organisms from all sources, including terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. It includes diversity within species, between species and of ecosystems.” | (47-49) |
| **Blue spaces** | **Blue spaces** | Outdoor blue spaces combine surface waterbodies, such as rivers, lakes and fountains, and coastal regions, such as beaches, the sea and promenades. | (9, 10, 50) |
| **Environmental perception** | **Environmental perception** | Awareness of or feelings about, the objective characteristics of the environment, and apprehending the environment by the senses, including personal and contextual aspects. | (25, 51) |
| **Food environment** | **Food environment** | The food environment (food stores and restaurants) can be described by four dimensions: food availability, affordability, accessibility and acceptability. | (52-54) |
| **Green space** | **Green space** | Vegetated land that is public or semi-private.  In urban areas green spaces are for examples parks, sports fields, cemeteries, vegetated areas of street and road corridors, natural and built corridors adjacent to waterways and [wetlands](https://www.sciencedirect.com/topics/agricultural-and-biological-sciences/wetlands), and external green areas to public buildings (e.g. libraries, galleries, community centres). |  |
| **Healthy mobility** | **Healthy mobility** | Environmentally friendly and healthy modes of transport, such as cycling or walking (active transport). Active travel also entails access to public transport, and mobility infrastructure promoting healthy mobility. | (12, 55) |
| **Neighbourhood condition** | **Housing infrastructure /**  **gentrification** | A measure of environmental quality of the neighbourhood. This can include disadvantages  or deprivation (resources, crime), regeneration, housing renewal and infrastructure and gentrification. | (56-58) |
| **Housing renewal** |
| **Neighbourhood deprivation** |
| **Neighbourhood intervention** |
| **Regeneration** |
| **Land use mix** | **Land use mix** | The combination or integration of different natural and built elements in the living environment. These offer more than one function and can for instance include different walking destinations in a neighbourhood, as it is associated with access to different facilities, amenities and public open spaces. | (59, 60) |
| **Social environment** | **Social environment** | Social environmental aspects at neighbourhood level include social cohesion, (community), social capital as well as social safety. This entails social contact between community members, social integration and ties that can benefit individual’s health. | (61-64) |
| **Social cohesion** |
| **(Community) Social capital** |
| **(Social) Safety** |
| **Sport and Play** | **Sport and Play** | Features or aspects in the living environment that promote or facilitate intended physical activity; physical activity as part of recreation and leisure (i.e. play, games, sports or planned exercise). | (65, 66) |
| **Urban densification** | **Urban densification** | The process of growing density or state of a compact and high density city. Urban environment with high population and dwelling density, closer proximity to facilities and amenities (i.e. urbanicity, urban form). | (67, 68) |

**Full search queries**

1. Embase

('public health'/exp/mj OR 'mental health'/exp/mj OR 'minority health'/exp/mj OR 'urban health'/exp/mj OR 'rural health'/exp/mj OR 'population health'/exp/mj OR 'wellbeing'/exp/mj OR 'health equity'/exp/mj OR 'health status'/exp/mj OR 'mortality'/exp/mj OR 'morbidity'/exp/mj OR 'incidence'/exp/mj OR 'prevalence'/exp/mj OR 'epidemiological surveillance'/exp/mj OR 'disease burden'/exp/mj OR 'motor activity'/exp/mj OR 'healthy lifestyle'/exp/mj OR 'health behavior'/exp/mj OR 'pathogen transmission'/exp/mj OR 'zoonotic transmission'/exp/mj OR 'infection risk'/exp/mj) AND ('neighborhood'/exp/mj OR 'social cohesion'/exp/mj OR 'social capital'/exp/mj OR 'neighbo\*rhood effects':ti OR 'physical environment' OR 'landscape environment':ti OR 'perceived environment':ti OR 'outdoor environment':ti OR 'built environment':ti OR 'natural environment':ti OR 'greenspace':ti OR 'greenery':ti OR 'greenness':ti OR 'blue space':ti OR 'environmental planning'/exp/mj OR 'environmental quality' OR 'environmental management'/exp/mj OR 'city planning'/exp/mj OR ('pollution'/exp/mj AND 'pollution related phenomena') OR 'environmental exposure'/exp/mj OR 'recreational park'/exp/mj OR 'vegetation'/exp/mj OR 'land use'/exp/mj OR ('dens\*' NEAR/2 'urban') OR 'urbanicity':ti OR 'urbanization'/exp/mj) AND [2016-2021]/py AND (english:la OR german:la OR dutch:la) AND ('article'/it OR 'article in press'/it OR 'review'/it)

1. Pubmed

("environmental medicine"[MeSH Major Topic] OR "public health surveillance"[MeSH Major Topic] OR "social determinants of health"[MeSH Major Topic] OR "population health"[MeSH Major Topic] OR "wellbeing"[Title] OR "minority health"[MeSH Major Topic] OR "health equity"[MeSH Major Topic] OR "vital statistics"[MeSH Major Topic] OR "epidemiological monitoring"[MeSH Major Topic] OR "causality"[MeSH Major Topic] OR "global burden of disease"[MeSH Major Topic] OR "motor activity"[MeSH Major Topic] OR "healthy lifestyle"[MeSH Major Topic] OR "health risk behaviors"[MeSH Major Topic] OR "zoonoses"[MeSH Major Topic] OR "disease transmission, infectious"[MeSH Major Topic]) AND ("neighborhood"[Title] OR "residence characteristics"[MeSH Major Topic] OR "social capital"[MeSH Major Topic] OR "social cohesion"[Title] OR "physical environment"[Title] OR "perceived environment"[Title] OR "outdoor environment"[Title] OR "built environment"[Title] OR "natural environment"[Title] OR "greenery"[Title] OR "green space"[Title] OR "blue spaces"[Title] OR "greenspace"[Title] OR "greenness"[Title] OR "blue space"[Title] OR "social planning"[MeSH Major Topic] OR "environmental quality"[Title] OR "environment design"[MeSH Major Topic] OR "environmental policy"[MeSH Major Topic] OR "environmental pollution"[MeSH Major Topic] OR "parks, recreational"[MeSH Major Topic] OR "vegetation"[Title] OR "land use"[Title] OR "urban density"[Title] OR "urban stressors"[Title] OR "urbanization"[MeSH Major Topic]) AND 2016/01/01:3000/12/31[Date - Publication] AND ("english"[Language] OR "dutch"[Language] OR "german"[Language])

1. Scopus

( TITLE-ABS-KEY ( ( "population health" OR "health status" ) ) AND TITLE-ABS-KEY ( ( "neighborhood" OR "built environment" OR "green space" OR "blue space" OR "environment design" OR "urban densification" ) ) AND LANGUAGE ( ( "English" OR "Dutch" OR "German" ) ) ) AND PUBYEAR > 2015 AND PUBYEAR < 2022 AND ( LIMIT-TO ( DOCTYPE , "ar" ) OR LIMIT-TO ( DOCTYPE , "re" ) )

1. PsychInfo

(exp Public Health/ OR exp Mental Health/ OR exp Urban Health/ OR exp Rural Health/ OR exp Population Health/ OR well being/ OR exp Health Status/ OR exp Health Disparities/ OR exp Epidemiology/ OR exp Health Outcomes/ OR exp Lifestyle/ OR exp Health Behavior/ OR exp Disease Transmission/) AND (exp Neighborhoods/ OR exp Social Capital/ OR exp Facilities/ OR exp Environmental Attitudes/ OR exp Built Environment/ OR "nature (environment)"/ OR green space.m\_titl. OR blue space.m\_titl. OR exp Urban Planning/ OR exp Environmental Planning/ OR urban environments/ OR environmental effects/ OR pollution/ OR exp Recreation Areas/ OR population density.mp. OR crowding/ OR exp Overpopulation/ OR urbanization/ OR exp Social Density/)  
AND (limit to (full text and yr="2016 - 2021"))

**References**

1. Schulz M, Romppel M, Grande G. Built environment and health: a systematic review of studies in Germany. Journal of Public Health. 2016.

2. Bird EL, Ige JO, Pilkington P, Pinto A, Petrokofsky C, Burgess-Allen J. Built and natural environment planning principles for promoting health: an umbrella review. BMC Public Health. 2018;18(1):930.

3. McCormack GR, Cabaj J, Orpana H, Lukic R, Blackstaffe A, Goopy S, et al. A scoping review on the relations between urban form and health: a focus on Canadian quantitative evidence. Health Promot Chronic Dis Prev Can. 2019;39(5):187-200.

4. Moore THM, Kesten JM, López-López JA, Ijaz S, McAleenan A, Richards A, et al. The effects of changes to the built environment on the mental health and well-being of adults: Systematic review. Health & Place. 2018;53:237-57.

5. Kruize H, van der Vliet N, Staatsen B, Bell R, Chiabai A, Muinos G, et al. Urban Green Space: Creating a Triple Win for Environmental Sustainability, Health, and Health Equity through Behavior Change. Int J Environ Res Public Health. 2019;16(22).

6. Rojas-Rueda D, Nieuwenhuijsen MJ, Gascon M, Perez-Leon D, Mudu P. Green spaces and mortality: a systematic review and meta-analysis of cohort studies. The Lancet Planetary Health. 2019;3(11):e469-e77.

7. Khreis H, Kelly C, Tate J, Parslow R, Lucas K, Nieuwenhuijsen M. Exposure to traffic-related air pollution and risk of development of childhood asthma: A systematic review and meta-analysis. Environ Int. 2017;100:1-31.

8. WHO. Urban green spaces and health. Copenhagen: World Health Organization. Regional Office for Europe; 2016 2016. Contract No.: WHO/EURO:2016-3352-43111-60341.

9. Gascon M, Zijlema W, Vert C, White MP, Nieuwenhuijsen MJ. Outdoor blue spaces, human health and well-being: A systematic review of quantitative studies. International Journal of Hygiene and Environmental Health. 2017;220(8):1207-21.

10. White MP, Elliott LR, Gascon M, Roberts B, Fleming LE. Blue space, health and well-being: A narrative overview and synthesis of potential benefits. Environmental Research. 2020;191:110169.

11. De la Fuente F, Saldías MA, Cubillos C, Mery G, Carvajal D, Bowen M, et al. Green Space Exposure Association with Type 2 Diabetes Mellitus, Physical Activity, and Obesity: A Systematic Review. Int J Environ Res Public Health. 2020;18(1).

12. Staatsen B, van der Vliet N, Kruize H, Hall L, Morris G, Bell R, et al. INHERIT. Exploring triple-win solutions for living, moving and consuming that encourage behavioural change, protect the environment, promote health and health equity. 2020.

13. Rojas-Rueda D, Morales-Zamora E, Alsufyani WA, Herbst CH, AlBalawi SM, Alsukait R, et al. Environmental Risk Factors and Health: An Umbrella Review of Meta-Analyses. Int J Environ Res Public Health. 2021;18(2).

14. Tainio M, Jovanovic Andersen Z, Nieuwenhuijsen MJ, Hu L, de Nazelle A, An R, et al. Air pollution, physical activity and health: A mapping review of the evidence. Environ Int. 2021;147:105954.

15. Nieuwenhuijsen MJ, Agier L, Basagaña X, Urquiza J, Tamayo-Uria I, Giorgis-Allemand L, et al. Influence of the Urban Exposome on Birth Weight. Environ Health Perspect. 2019;127(4):47007.

16. Hilderink H. Dutch DALYs: estimates of current and future Burden of Disease in the Netherlands. European Journal of Public Health. 2018;28.

17. Zaman R, Hankir A, Jemni M. Lifestyle Factors and Mental Health. Psychiatr Danub. 2019;31(Suppl 3):217-20.

18. Schulz M, Romppel M, Grande G. Is the built environment associated with morbidity and mortality? A systematic review of evidence from Germany. Int J Environ Health Res. 2018;28(6):697-706.

19. Staatsen BAM, van Alphen TH, Houweling DA, van den Broek I, Kruize H. Gezonde leefomgeving, gezonde mensen. Healthy living environment, healthy people: Rijksinstituut voor Volksgezondheid en Milieu RIVM; 2017.

20. Peris E. Environmental noise in Europe - 2020. European Environment Agency; 2020. Report No.: EEA Report No 22/2019.

21. Pilkington P, Powell J, Davis A. Evidence-Based Decision Making When Designing Environments for Physical Activity: The Role of Public Health. Sports Med. 2016;46(7):997-1002.

22. Mourits K, van der Velden K, Molleman G. The perceptions and priorities of professionals in health and social welfare and city planning for creating a healthy living environment: a concept mapping study. BMC Public Health. 2021;21(1):1085.

23. World Health Organization. Constitution of the World Health Organization. 2006.

24. Huber M, Knottnerus JA, Green L, Horst Hvd, Jadad AR, Kromhout D, et al. How should we define health? BMJ. 2011.

25. van Kamp I, Leidelmeijer K, Marsman G, de Hollander A. Urban environmental quality and human well-being: Towards a conceptual framework and demarcation of concepts; a literature study. Landscape and Urban Planning. 2003;65(1-2):5-18.

26. RIVM. Healthy living environment Bilthoven: National Institute for Public Health and the Environment 2021 [Available from: <https://www.rivm.nl/en/healthy-living-environment#:~:text=The%20environment%20in%20which%20we,an%20impact%20on%20our%20health.&text=A%20healthy%20living%20environment%20is,is%20pleasant%20to%20live%20in>.

27. de Jongh D, den Hertog F, Kruize H, Arrahmani F, Tholen A, van Overveld A, et al. LEGO. Bouwstenen voor Leefomgeving en Gezondheid.: Rijksinstituut voor Volksgezondheid en Milieu,; 2021. p. 22.

28. Hilderink HBM, Plasmans MHD, Poos MJJC, Eysink PED, Gijsen R. Dutch DALYs, current and future burden of disease in the Netherlands. Archives of Public Health. 2020;78(1):85.

29. Staatsen B, van der Vliet N, Kruize H, Hall L, Morris G, Bell R, et al. INHERIT. Exploring triple-win solutions for living, moving and consuming that encourage behavioural change, protect the environment, promote health and health equity. 2017.

30. Staatsen B, van Alphen T, Houweling DA, van der Ree J, Kruize H. Gezonde leefomgeving, gezonde mensen. Bilthoven: Rijksinstituut voor Volksgezondheid en Milieu; 2017. p. 42.

31. Van Kamp I. Social Aspects of the Living Environment in Relation to Environmental Health. The Hague: Health Council of the Netherlands 2012.

32. Rijksinstituut voor Volksgezondheid en Milieu. Volksgezondheid Toekomst Verkenning 2018. Een gezond vooruitzicht. Synthese. Bilthoven: Rijksinstituut voor Volksgezondheid en Milieu,; 2018.

33. Van Kamp I, Van Loon J, Droomers M, De Hollander A. Residential Environment and Health: A Review of Methodological and Conceptual Issues. Reviews on Environmental Health. 2004;19(3-4):21.

34. Leidelmeijer K, van Kamp I. Kwaliteit van de Leefomgeving en Leefbaarheid. Naar een begrippenkader en conceptuele inkadering. Bilthoven: Rijksinstituut voor Volksgezondheid en Milieu; 2003. p. 104.

35. van Kamp I, Leidelmeijer K, Marsman G, de Hollander A. Urban environmental quality and human well-being: Towards a conceptual framework and demarcation of concepts; a literature study. Landscape and Urban Planning. 2003;65(1):5-18.

36. Narsakka N, Suhonen R, Kielo-Viljamaa E, Stolt M. Physical, social, and symbolic environment related to physical activity of older individuals in long-term care: A mixed-method systematic review. International Journal of Nursing Studies. 2022;135:104350.

37. Fortune N, Singh A, Badland H, Stancliffe RJ, Llewellyn G. Area-Level Associations between Built Environment Characteristics and Disability Prevalence in Australia: An Ecological Analysis. Int J Environ Res Public Health. 2020;17(21).

38. Visser K, Bolt G, Finkenauer C, Jonker M, Weinberg D, Stevens GWJM. Neighbourhood deprivation effects on young people's mental health and well-being: A systematic review of the literature. Social Science & Medicine. 2021;270:113542.

39. Awuor L, Melles S. The influence of environmental and health indicators on premature mortality: An empirical analysis of the City of Toronto's 140 neighborhoods. Health Place. 2019;58:102155.

40. Tricco AC, Lillie E, Zarin W, O'Brien KK, Colquhoun H, Levac D, et al. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation 2018 [467-73]. Available from: <https://www.acpjournals.org/doi/abs/10.7326/M18-0850>.

41. Lockwood C, dos Santos KB, Pap R. Practical Guidance for Knowledge Synthesis: Scoping Review Methods. Asian Nursing Research. 2019;13(5):287-94.

42. Levac D, Colquhoun H, O'Brien KK. Scoping studies: advancing the methodology. Implementation Science. 2010;5(1):69.

43. Park G, Evans GW. Environmental stressors, urban design and planning: implications for human behaviour and health. Journal of Urban Design. 2016;21(4):453-70.

44. Evans GW. Crowding and Other Environmental Stressors. In: Smelser NJ, Baltes PB, editors. International Encyclopedia of the Social & Behavioral Sciences. Oxford: Pergamon; 2001. p. 3018-22.

45. Machon M, Vrotsou K, Larranaga I, Vergara I. Proximity to Facilities and Its Association with the Health-Related Habits of Functionally Independent Older Adults. Int J Environ Res Public Health. 2020;17(22).

46. Marsh L, Vaneckova P, Robertson L, Johnson TO, Doscher C, Raskind IG, et al. Association between density and proximity of tobacco retail outlets with smoking: A systematic review of youth studies. Health & Place. 2021;67:102275.

47. Spotswood EN, Beller EE, Grossinger R, Grenier JL, Heller NE, Aronson MFJ. The Biological Deserts Fallacy: Cities in Their Landscapes Contribute More than We Think to Regional Biodiversity. BioScience. 2021;71(2):148-60.

48. WHO. Nature, biodiversity and health: an overview of interconnections. Copenhagen: World Health Organization. Regional Office for Europe; 2021 2021.

49. Cianfagna M, Bolon I, Babo Martins S, Mumford E, Romanelli C, Deem SL, et al. Biodiversity and Human Health Interlinkages in Higher Education Offerings: A First Global Overview. Frontiers in Public Health. 2021;9.

50. White MP, Elliott LR, Grellier J, Economou T, Bell S, Bratman GN, et al. Associations between green/blue spaces and mental health across 18 countries. Scientific Reports. 2021;11(1):8903.

51. Zube EH. Environmental perception. Environmental Geology. Dordrecht: Springer Netherlands; 1999. p. 214-6.

52. Sawyer ADM, van Lenthe F, Kamphuis CBM, Terragni L, Roos G, Poelman MP, et al. Dynamics of the complex food environment underlying dietary intake in low-income groups: a systems map of associations extracted from a systematic umbrella literature review. International Journal of Behavioral Nutrition and Physical Activity. 2021;18(1):96.

53. Lam TM, Vaartjes I, Grobbee DE, Karssenberg D, Lakerveld J. Associations between the built environment and obesity: an umbrella review. International Journal of Health Geographics. 2021;20(1):7.

54. Story M, Kaphingst KM, Robinson-O'Brien R, Glanz K. Creating healthy food and eating environments: policy and environmental approaches. Annu Rev Public Health. 2008;29:253-72.

55. Winters M, Buehler R, Götschi T. Policies to Promote Active Travel: Evidence from Reviews of the Literature. Curr Environ Health Rep. 2017;4(3):278-85.

56. Glassman B. The Multidimensional Deprivation Index Using Different Neighborhood Quality Definitions. In: Poverty Statistics Branch S, Economic, and Housing Statistics Division, editor.: U.S. Census Bureau; 2020.

57. Mui Y, Headrick G, Chien J, Pollack C, Saleem HT. Revisiting revitalization: exploring how structural determinants moderate pathways between neighborhood change and health. Int J Equity Health. 2022;21(1):165.

58. Ross CE, Mirowsky J. Neighborhood disadvantage, disorder, and health. J Health Soc Behav. 2001;42(3):258-76.

59. Jia P, Pan X, Liu F, He P, Zhang W, Liu L, et al. Land use mix in the neighbourhood and childhood obesity. Obes Rev. 2021;22 Suppl 1(Suppl 1):e13098.

60. Gehrke SR, Clifton KJ. An activity-related land use mix construct and its connection to pedestrian travel. Environment and Planning B: Urban Analytics and City Science. 2017;46(1):9-26.

61. Yamaguchi A. Effects of social capital on general health status. Glob J Health Sci. 2014;6(3):45-54.

62. Ruijsbroek A, Droomers M, Hardyns W, Groenewegen PP, Stronks K. The interplay between neighbourhood characteristics: The health impact of changes in social cohesion, disorder and unsafety feelings. Health Place. 2016;39:1-8.

63. Broeder JM, South J, Rothoff A, Bagnall A-M, Azarhoosh F, Linden G, et al. Community engagement in deprived neighbourhoods during the COVID-19 crisis: perspectives for more resilient and healthier communities. Health Promotion International. 2021;37.

64. Ruijsbroek A, Mohnen SM, Droomers M, Kruize H, Gidlow C, Gražulevičiene R, et al. Neighbourhood green space, social environment and mental health: an examination in four European cities. International Journal of Public Health. 2017;62(6):657-67.

65. WHO. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020.

66. Piggin J. What Is Physical Activity? A Holistic Definition for Teachers, Researchers and Policy Makers. Frontiers in Sports and Active Living. 2020;2.

67. Beenackers MA, Oude Groeniger J, Kamphuis CBM, Van Lenthe FJ. Urban population density and mortality in a compact Dutch city: 23-year follow-up of the Dutch GLOBE study. Health Place. 2018;53:79-85.

68. Chandrabose M, Owen N, Giles-Corti B, Turrell G, Carver A, Sugiyama T. Urban Densification and 12-Year Changes in Cardiovascular Risk Markers. J Am Heart Assoc. 2019;8(15):e013199.