Discover Cities

Review

Investigating the role of the built environment in healthy living: lessons for urban managers from the literature

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Abstract
The increasing interest in research on healthy cities, reflected in the growing number of research outputs, coupled with the increasing need for building cities that promote the health and wellbeing of residents has evoked a need to conduct a review of this growing amount of research. In this connection, this study, through a systematic review of the literature, seeks answers to the following questions: How can the built environment be designed to promote healthy living? What insights can city authorities glean from existing literature? And what research gaps exist that could inform future studies in this area? Through this review, key lessons for city authorities to promote healthy living in urban areas are identified, alongside the identification of research gaps that can guide future investigations and contribute to the advancement of knowledge in urban planning.

Keywords Healthy city · Healthy living · Urban health · Built environment (BE) · Systematic review

1 Introduction

The connection between urban planning within the context of the built environment (BE) and health is well rooted in the literature [1, 2]. Several studies conducted over the years have investigated the various aspects of this connection see, for example, [3–6], since the 1986 Ottawa Charter for Health Promotion [1]. In fact, health has long been a crucial consideration in urban planning and management since the birth of the academic field of urban planning[1] when there was an outbreak of contagion in the nineteenth century Victorian era [7]. This led to professionals such as health workers, architects and social workers to take leading roles in urban planning with the shared goal of promoting healthy living [8]. During this period, architects saw the city as a built environment and as such were largely concerned with urban design and aesthetics [8]. Health officials on the other hand focused on infrastructure such as water and waste distribution lines since, according to them, outbreaks of diseases were closely related to how these infrastructures were distributed across

[1] For the origin of the field of urban planning see, www.citylab.com/life/2012/08/brief-history-birth-urban-planning/2365/ and Fainstein [8].

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cities [1, 8]. This view of the city has recently been found to resonate with the reality of urban life especially during the COVID-19 pandemic when a reawaken interest in an almost extinct area of urban research is noted see, [9–12].

The development of the field of urban planning in the last century has thus shifted the responsibility of towns and cities to the realm of urban planners who, among other things, are expected to design and maintain a built environment that is capable of enhancing healthy living environments. The need for planning for healthy cities has more than ever been made even more urgent by the involvement of the United Nations (UN) through the World Health Organisation (WHO) when it declared and promoted the concept of a "Healthy City" [13, 14]. Accordingly, the WHO defines a healthy city "by a process" and "not [as] an outcome". It maintains that a healthy city "leads by example" in adapting to change. A change that promotes the better life and well-being of its residents. Within this context, a healthy city is therefore defined as a city that promotes the continuous improvement of its physical environment in ways that enhance the optimal health and wellbeing of its residents [13, 14]. In this connection, healthy living can be defined as lifestyle choices, behaviours, and environmental factors that contribute to the optimal health and wellbeing of individuals. This work therefore seeks to identify the roles the built environment plays in enhancing the health and wellbeing of urban residents.

As previously stated, since the 1990s e.g., [3], there has been a rise in interest in research in the area of healthy living environments not only from medical scholars who are traditionally known to pursue research in this field [5] but also from urban planners. As will be seen later in this work, approximately 90% of studies carried out in this area of research performed in the last 10 years alone are a testament to this fact. With this large volume of research conducted in this area in the last few decades, a systematic review of these studies is therefore necessary to summarise the findings obtained thus far. In addition, lessons can be drawn from these findings, which are expected to support the work of urban managers as they strive to create a city that promotes the health and wellbeing of residents. It is also acknowledged that several of the studies on the subject also involve reviews of different types, ranging from scoping reviews [15–17] to umbrella reviews [18], through systematic reviews and meta-analyses [4, 5, 19–21]. However, these aforementioned reviews focused only on specific aspects of the subject. For instance, some of these studies reviewed the various urban health indicator tools and/or models that have been proposed by previous research for example, [4, 16, 17]. Others also reviewed the existing research paradigms used by scholars from different fields and how that resulted in conflicting claims among them [5]. Again, others also reviewed studies that investigated the associations between the various aspects of the built environment and different health issues, such as the one by Bonaccorsi et al. [18], which reviewed studies that examined the impact of the built environment on mental health alone. Similar review studies, such as Lai et al. [19], also reviewed works that investigated the connection between the built environment and cardiovascular risks and mortality.

As has been clearly demonstrated, this work differs in substance from the studies reviewed above in that its focus is on the current state of the literature on the subject. Again, it is also focused on extracting findings from related research whose lessons can be adopted by planners around the world in their quest to build urban areas that promote healthy living. Like other review works, this work is also expected to present to scholars interested in this area of research, the state-of-the-art of research in this area. In this regard, this study seeks to reach three main objectives that have been structured in the following research questions which are expected to be answered by the end of the study: How can the built environment be designed to promote healthy living? What insights can city authorities glean from existing literature? And what research gaps exist that could inform future studies in this area?

The remainder of this paper proceeds as follows: the second section describes the methodology adopted in this review. Information regarding the sources and nature as well as the method of analysis of the records used in the review is provided in the second section. The third section presents the findings this work has extracted from the literature reviewed. In the third section, aspects such as the type of studies (reviews and empirical, etc.), the years and trend of research in the area, the various built environment interventions put in place, and the countries of research among other categories are grouped, and relevant tables and charts are created to reflect these different categories. The fourth section, which is the final section, concludes this study by summarising the key lessons for urban managers. Finally, some research gaps that are worthy of future investigations have also been outlined in the conclusion to ensure further enrichment of this area and, by extension, the field of urban planning, as this will lead to the deepening and widening of the knowledge base of the field.

2 Methods

Review studies typically take one of the following forms: scoping reviews, systematic reviews, meta-analyses or umbrella reviews. Scoping review often entails the use of systematic and iterative approaches in the search for records for synthesis and analysis [22]. Like in other reviews, scoping reviews also enable researchers to identify the state of the art of

the literature on a topic. In a systematic review, the records used for the review are systematically searched with a given approach such that other researchers would most likely reach the same records for similar works given that they adopt the stated approach. The principle of repeatability is therefore ensured in systematic reviews. In more recent years, researchers in different fields have adopted what is known as the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), which was introduced by Liberati et al. [23], in their systematic reviews as it is generally regarded as more robust [24]. This approach is discussed in more detail later in this work.

Unlike systematic reviews which focus on the qualitative analysis of literature in a systematic way, meta-analyses are concerned with the quantitative analysis of existing studies [24, 25]. The other method of review normally adopted by researchers in review studies is an umbrella review, which can essentially be explained as a review of existing review studies only see, for example, [18]. Although systematic reviews and meta-analyses represent the highest level of evidence [25], sometimes when both approaches are used on the same topic, the results are inconclusive, especially in medical research, which makes it difficult for decision makers to reach a final conclusion; hence, there is a need for umbrella reviews [26]. Although these review methods (i.e., systematic reviews, meta-analyses and umbrella reviews) were originally rooted in medical research, they have gained popularity in other social science fields such as urban planning in recent years. Therefore, in this research, this work adopts the systematic review method in the analyses of the literature using the PRISMA approach, which is explained below.

2.1 The PRISMA approach

As previously mentioned, this work drew from the body of knowledge already available by reviewing pertinent works in accordance with the PRISMA guidelines as proposed by Page et al. [25], an update of what was initially introduced by Liberati et al. [23]. This approach to review studies originated from the field of medical sciences with the aim of improving the clarity, transparency [23] and robustness of reporting. However, as with other aspects of the scientific process, the approach has since gain widespread acceptance and adoption within the social sciences and thus viewed as more robust than the conventional review methodology. The main advantages of the PRISMA approach lie in its clarity and transparency as it affords researchers the opportunity to track all records that were used for the review. Also, this approach prevents bias in the selection of records within specific database/s due to its systematic approach. All these enhance its repeatability as a methodology in a scientific enquiry. The PRISMA technique requires that the major subject of the research questions is used to identify the search terms. Further inclusion and exclusion criteria must be met using a 27-item checklist that is summarised in a flow chart such as the one in Fig. 1.

Figure 1 above depicts the processes involved in the search and retrieval of records for systematic reviews based on the PRISMA approach. The records retrieval process comprises three stages: identification, screening, and inclusion. Initially, search terms are determined based on research objectives, and appropriate databases and/or registries are identified. Duplicates are then identified and removed. Ineligible records are excluded by the search engine's automation system, and any other ineligible records are removed before progressing to the screening stage, where exclusion criteria are applied to remove non-relevant records. During the screening stage, only records meeting the study objectives are retained, while ineligible ones are removed. Access limitations may prevent the retrieval of eligible records, resulting in their exclusion. A thorough examination of the remaining records, including reading abstracts and the main contents, is conducted to remove non-relevant studies. Some studies initially deemed eligible may be found ineligible during this examination stage. Finally, the reasons for excluding records are stated, and a final list is compiled for the review to commence (Fig. 2).

2.2 The search strategy and composition of records for this study

The search process begins by determining the specific search terms, which typically aligns with the study objectives. For this research, we chose the terms "built environment" and "healthy city". These terms were used to scour the database for records containing both expressions in their titles, abstracts, keywords, or main body. However, to ensure inclusivity and capture studies using 'healthy cities', we used the term "healthy cit*" instead (refer to Fig. 3). This broadened the search to include studies featuring variations like 'healthy city' or 'healthy cities.' To refine the search and prevent non-relevant results, we encased these terms in quotation marks. This ensured the database's algorithm searched for the exact phrases rather than individual words. Without this precision, the search might have returned countless non-relevant records, potentially causing relevant studies to be overlooked. Additionally, we utilised the 'Booleans' feature within the database.

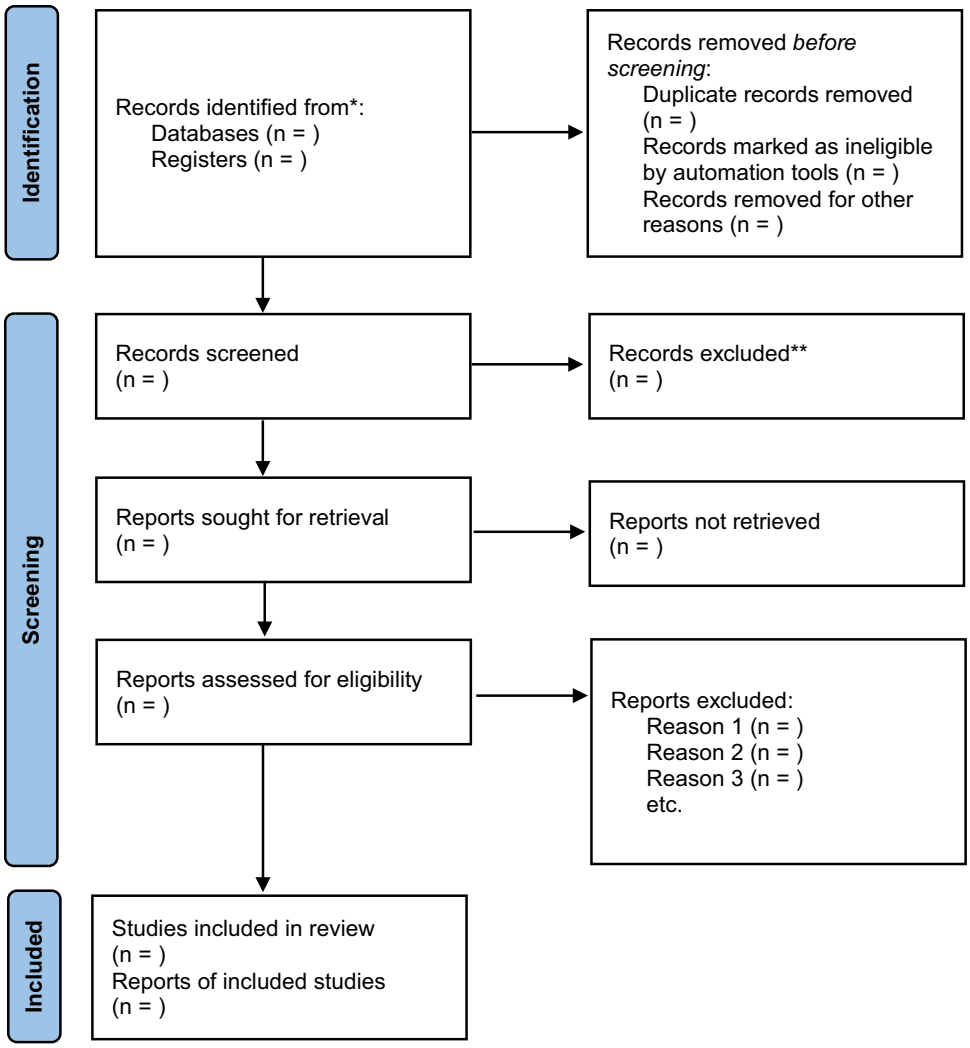

Fig. 1 Identification of studies via databases and registries. Source: Page et al. [25]

Specifically, we employed the 'AND' operator to connect the terms 'built environment' and 'healthy cit*.' This instructed the search engine to retrieve only records containing both terms within the specified sections (i.e., titles, abstracts, keywords, and main body), without the requirement for them to appear consecutively.

According to the PRISMA guidelines, a search based on the above was performed on 07/10/2023. This resulted in 120 records that included articles, conference proceedings, books and book chapters, among other records. Exclusion criteria were used to limit the outcome to records only from the Web of Science (WoS) Core Collection and studies that were conducted in the English language only. This reduced the total to 112 records (Fig. 3). No restrictions were placed on the years of publication or the research field within which the studies were conducted. Additionally, no restrictions were placed on the type of research. So studies such as articles, review articles/books, and (conference) abstracts from the search results were included in this work. At this point, all the pertinent information, including the abstracts, was pulled from the WoS as a list in an MS Excel file format. The screening stage (112 documents) came next, and it was used to weed out research works that were not relevant to the subject being investigated. These studies were eliminated by going through the Excel file to remove titles that were found to be unrelated to the topic, yielding 90 studies for eligibility assessment. A final screening was performed by reading the abstracts to identify and delete studies whose main focus was not on either built environment or health-related issue. Studies that focused on only one of these topics were removed. This resulted in 64 studies eligible for analysis in this study (see Supplementary File).

Although searching from a single trustworthy database is also permissible, systematic reviews that adhere to the PRISMA principles typically tend to extract studies from more than one databases. However, because the WoS has an established reputation for hosting high-quality research, we found it sufficient as the sole source for extracting records

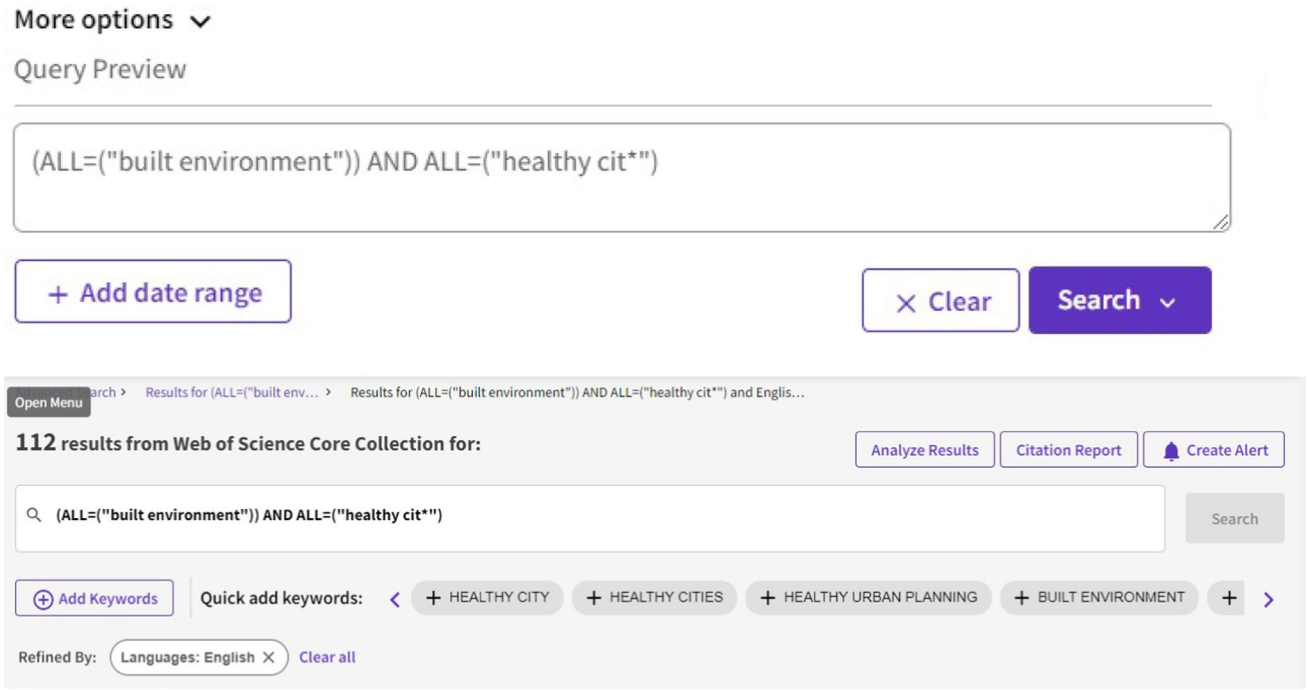

Fig. 2 Screenshots of the WoS search process

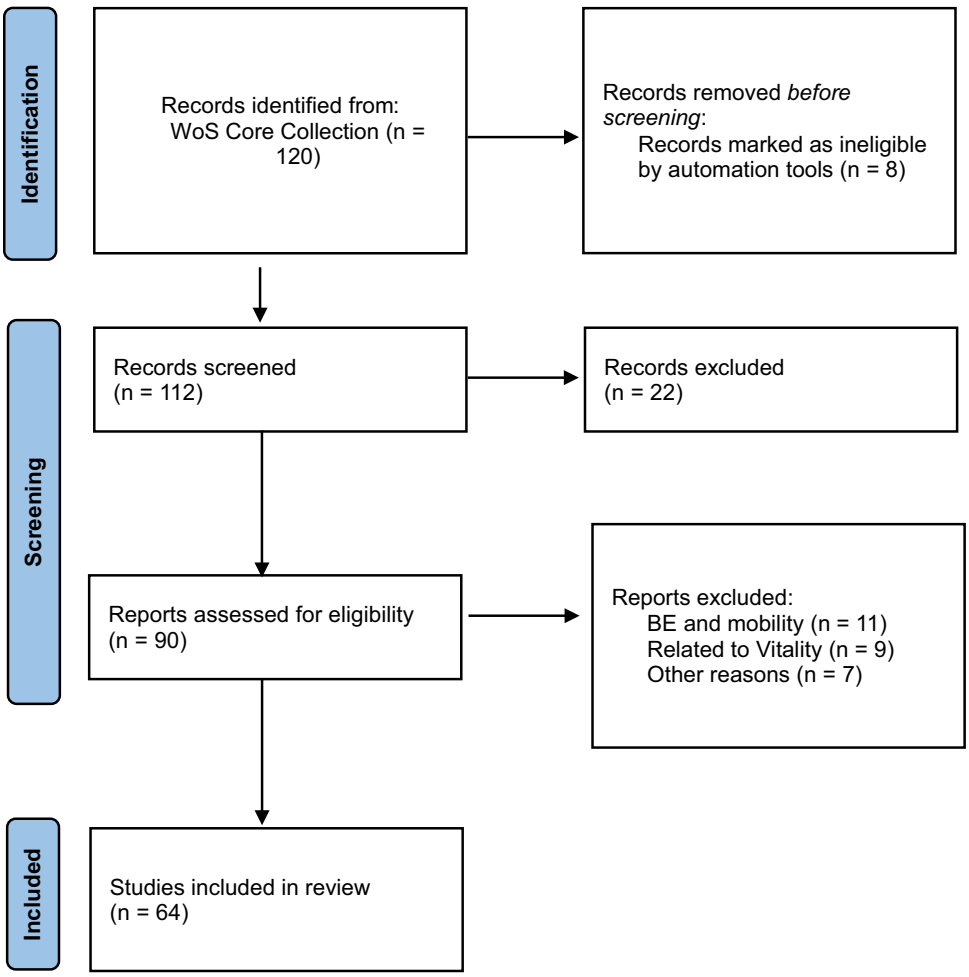

Fig. 3 Flowchart of the records selection process

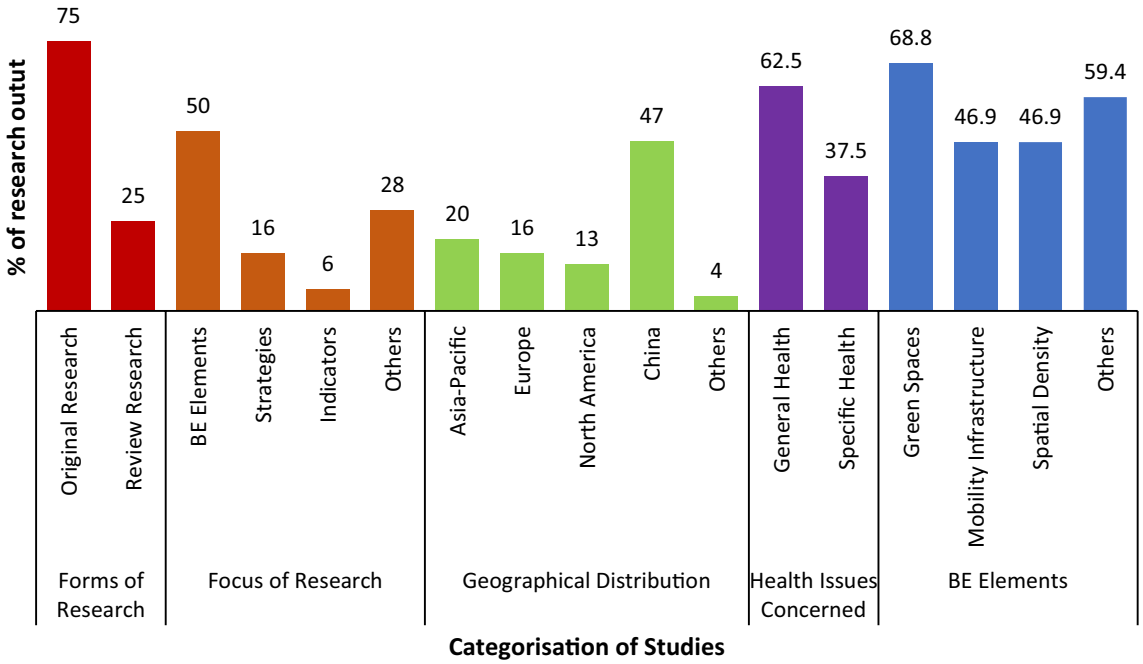

Fig. 4 Distribution of studies

for this review study. The 64 studies extracted from this database were the ones that met our search criteria given the objectives of the study.

3 Results

In this section, we provide answers to the research questions posed in the introduction using evidence from the studies reviewed in this work. Before presenting these answers, we report the distribution of the nature and attributes of the studies reviewed in this study. Accordingly, we present the geographical distribution of the studies, the forms the studies take in terms of original (empirical) or review studies, the forms of health issues that BE elements tend to prevent and the BE elements often discussed in studies related to building healthy cities. These insights are expected to lead to answers to the research questions posed.

3.1 Distribution of studies

As previously mentioned, a total of 64 studies were reviewed. Of these studies, an overwhelming majority (75%) were original (empirical) research, as can be expected, with only a few (15%) being review studies taking different forms and with *focuses* different from the present study, as previously explained. To avoid doubt, original research, as construed in this work, refers to empirical research conducted using unpublished primary data of different forms rather than review studies that rely on the findings of previously published works for further analyses. The original research studies were found to take two (2) main forms, namely, those that focus on BE elements and those whose focus is on elements other than the BE elements, which have been grouped in this work as 'Others' (see Fig. 4). Those that focused on the BE elements addressed the specific elements of the BE that affect different forms of health conditions. From these, the answer to the first research question was obtained. The studies categorised as 'Others' primarily delved into research philosophies, also known as research paradigms in this field, as well as the relationship between spatio-economic status and its impact on people's health perceptions. The review studies, on the other hand, usually adopted at least one of the four main methods of review studies as discussed in the previous section. In general, half of the studies reviewed in this study focused on specific BE elements that enhance the health and wellbeing of urban residents (50%), while a few others focused on strategies (16%) for building healthy cities by way

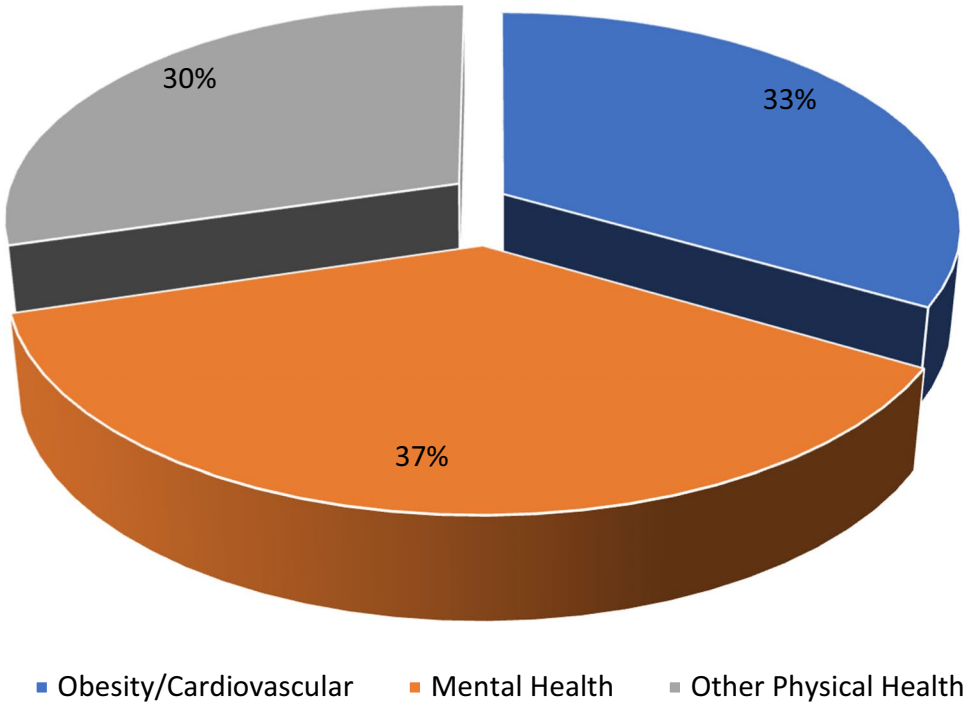

Fig. 5 Distribution of stated health conditions

of BE interventions. Again, a small percentage (6%) also either investigated or proposed some indicators used in assessing healthy cities. More than a quarter of the studies (28%) also focused on different areas that could not be put into any of the previously mentioned categories and so were categorised as 'Others'. These include studies that focused on research philosophies, the roles of municipalities, health inequalities, health impacts, current research trends and the success stories of cities that implemented healthy city strategies.

The geographical distribution of the studies captured in this work is uneven across the globe (Fig. 4). There appears to be more interest in this research area in China (47%) than in any other geographical area. In fact, even though some studies were from other countries, such as the UK, the US and Sweden, these studies were combined as part of their larger geo-political areas, namely, the Asia–Pacific region, Europe, North America and 'others', which includes studies from Africa and Singapore. The absence of South/Latin American representation, along with scant representation from other places such as Africa, Europe and North America, means that there is still more room for research in the area of urban health across the world.

The health issues noted in these studies were grouped into two groups, namely, general health and specific health issues (Fig. 4). The studies analysed in this work focused on health in general, which is explained in this work to include both physical and mental health issues (Fig. 5). The physical health issues mainly included noncommunicable diseases such as cardiovascular disease and physical health issues such as diabetes, cancer, and chronic respiratory diseases. Generally, of the studies that mentioned the health issues being investigated, those that specified mental health were the majority (37%), followed by obesity and related ailments such as cardiovascular diseases (33%) and others considered in this work to be 'other physical health issues' (Fig. 5).

3.2 The BE elements necessary for healthy cities

Various components of the built environment that were found to be essential for building healthy cities were observed in the studies reviewed in this work. As presented in Fig. 4, the main BE elements found to be essential for promoting healthy living in cities include green spaces, mobility infrastructure, spatial density and others, such as recreational areas, a reduced presence of unhealthy eateries, the presence of urban furniture such as benches at regular intervals and legal regulations regarding the use of tobacco in public open spaces, among others. These elements are closely related to each other and can therefore be said to be complementary in nature. For instance, because green spaces, as found in the reviewed studies, encompass amenities such as parks, street greenery and other open spaces with green infrastructure,

these spaces often serve mobility needs such as walking and cycling [27]. However, because these mobility infrastructures require special engineering, they are often constructed with mobility purpose in mind and were therefore put into a separate category in this work. In terms of spatial density, cities designed to be compact in nature also facilitate the use of non-motorised mobility modes such as walking and cycling. They therefore enhance the provision of the needed mobility infrastructure along with green spaces.

These elements were found to be relevant in the prevention of both physical and mental health issues [16, 28–30] such as schizophrenia [31], obesity [32], kidney failure [33] and cardiovascular-related diseases [20, 34], such as hypertension [13, 35]. For instance, in the study of Shen [33] in Taiwan, he observed that the built environment has an impact on atmospheric threats emanating from air pollution, which, along with high temperatures and a greater proportion of elderly persons, also impacts kidney diseases. He therefore concluded that appropriate urban policies that lead to healthy city development have the potential to lower the risk of kidney failure. In a similar vein, the importance of urban greenness, as emphasised by the frequency of its mention (see Fig. 4) in urban health research, cannot be overemphasised enough. For instance, its efficacy in promoting mental health is abundantly recognised by several studies, as observed in this work see, for example, [31, 36–38]. Spatial density has also been found to be associated with the incidence of suicidal tendencies [38], obesity and cardiovascular risk factors [19, 39–41].

The nature in which BE elements are associated with human health varies. For instance, Yin and Sun [39] observed a U-shaped relationship between population density (a factor of residential density) and obesity using data from the China Health and Nutrition Survey (CHNS) between 2004 and 2011. In that study, the risk of obesity was found to be greater in places with lower population density, where the risk continuously decreased until reaching a certain threshold of 25,000 persons per square km in that particular case in China. The reasons for this are that higher population density (compact development) reduces travel distances, which encourages non-motorised mobility, such as walking and cycling. However, extremely higher densities (above 25000 per square km in the case of China) tend to reduce the per capita public and green spaces available for physical activities. Still on urban green spaces, good mental health is also found to be positively associated with urban greenness, and this relationship is said to be stronger in medium-sized high-density cities [36]. Zumelzu and Herrmann-Lunecke [37] also identified six thematic areas of the BE, namely, walkability, density, spatial design, environmental noise, green areas, and social interaction, that positively impact both physical and mental health.

The above discussions, as guided by the literature reviewed in this study, point to the importance of the built environment in promoting healthy living. City authorities can therefore pick a thing or two from this study when designing a healthy city. From designing and guiding development towards the building of compact cities to the provision of public and/or green spaces with non-motorised mobility infrastructure such as walking and cycling lanes at both the neighbourhood and city levels, there are a host of possible initiatives that city authorities can implement in their areas of influence. For instance, the improvement of infrastructure —particularly mobility— backed by strong political commitments as well as engagement with the private sector and experts from academia and industry to offer their expertise in healthy city programmes is noted [42] to constitute a possible approach towards implementing successful healthy city strategies.

4 Conclusion

As has been demonstrated, this work sets out to evaluate the literature relating to the topic at hand by presenting some cues to city managers on how to design a city that promotes healthy living by focusing on the built environment component of the physical environment. It is worth noting that this work acknowledges that health is not just the absence of disease; thus, for the comprehensive development of healthy cities, other non-built environment elements, such as social cohesion, participatory governance, community capacity and social capital, are essential [42]. However, while not ignoring these factors, this work seeks to highlight the elements of the BE that also need the attention of policy makers, as presented in the previous sections.

In terms of the research gaps identified in this review, some prospects for future research in the area of healthy urban living or healthy cities can be pursued. This area of research is concentrated in China and the Asia–Pacific region of the world, with little interest in other parts of the world. It is therefore suggested that further investigations on the topic be pursued in other places of the world, such as Africa and South America, given the gross underrepresentation of these territories in the literature thus far. Another area that could be of interest to the advancement of research in this aspect of urban studies is a possible comparative analysis of healthy city initiatives that will evaluate the outcomes of specific strategies in this regard within and across countries. Also, longitudinal outcomes of urban health trends portend for an intriguing enquiry in the future. Here, changes in health outcomes of urban residents vis-à-vis the changes in the

built environment over time could be studied to afford for long-term examination of the impact of urban planning and development on the health of urban residents. While our study relied on data from a single database, it is important to acknowledge the potential limitations this may introduce to the findings presented. One notable limitation is the possibility of geographical imbalances in the dataset. Other databases might include studies from different regions that could have mitigated the imbalances observed here. To address this, we encourage future review studies to consider utilising multiple repositories, ideally three or more, to ensure more comprehensive representation across different geographic areas.

From the outlined health issues and their associated BE elements that were found to prevent or reduce the risks of such health issues, it is therefore expected that this work will serve to evoke the interest of city authorities as well as guide any urban policy they may have formulated towards investing in healthy city development. Additionally, with the future of humanity being urban [43], this work is also expected to present to planning scholars and practitioners, the main areas of the built environment that need further investment and attention. From the different health issues and their corresponding preventive-built environment measures, scholars and practitioners can determine the exact BE components to invest in to prevent and/or mitigate any identified health risks in a given urban area. Given that the evidence presented in this work was picked from several works, this work serves to strengthen the grounds for which any healthy city policy may be implemented by city authorities in any part of the world. The same can also be said of the urban studies literature in this area of research, which can be said to adequately contribute to the knowledgebase in this area.

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Author contributions A.S.A. was responsible for idea conceptualisation, records search, records review, data analysis and write up of initial and final draft. F.S.N.A. was responsible for records search and review. T.S.A. was responsible for records search and review. A.T. reviewed the final draft.

Data availability No datasets were generated or analysed during the current study.

Declarations

Competing interests The authors declare no competing interests.

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