



How do superblock interventions influence health? A scoping review

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ARTICLE INFO

Keywords:

Superblocks
Urban health
Urban policy
Urban green spaces
Active mobility

ABSTRACT

Cities are implementing interventions to radically transform public space and urban transportation networks. While these interventions are urgently needed, many questions remain regarding their impacts on health, and how they can be effectively replicated. In the case of Superblock interventions, it is assumed they have the potential to significantly improve urban environments and health. This study aims to identify the empirical evidence on Superblocks and their effects on health outcomes in different urban settings, in addition, to understand how these interventions are defined in the literature. We conducted a scoping review and identified extremely limited empirical evidence on the health effects, despite a range of literature emphasising the potential of Superblocks to improve health through various mechanisms. Increased access to green spaces within Superblocks is estimated to have significant health benefits, including reduced premature deaths, fewer hospital admissions, and improved mental health. Also, while Superblocks may increase physical activity levels, sustained increases may not be observed among all social groups. Further evaluations are needed to understand the full health effects of Superblocks in different urban settings.

1. Introduction

Cities worldwide are grappling with a myriad of challenges that require innovative solutions to ensure that they can meet citizen needs in a sustainable manner. Notably, cities are major contributors to global greenhouse gas emissions, primary consumers of global energy, and substantial generators of solid waste (Cash-Gibson, Martínez-Herrera, et al., 2023). As urbanisation accelerates, cities face mounting pressure to address issues such as traffic congestion and environmental degradation. Current urban mobility infrastructures primarily prioritise the

needs of mass private vehicle transportation rather than addressing urban health and social needs. The increasing use of private vehicles contributes to air pollution, which is a major risk factor for several diseases and premature death (López et al., 2020). Other important determinants of urban health include traffic-related injuries, physical activity and sedentary behaviour, access to green areas, and social cohesion (WHO, 2016).

In response to these urban socio-environmental challenges, many cities are actively designing strategies and implementing interventions to bring about radical transformations in urban land use, public space,

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<https://doi.org/10.1016/j.cities.2024.105262>

Received 1 August 2023; Received in revised form 27 February 2024; Accepted 5 July 2024

Available online 15 July 2024

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and transportation networks. The primary goal is to promote active mobility, reduce reliance on driving, and enhance urban greening. New concepts such as *low-traffic neighbourhoods* and *15-Minute cities* have gained popularity as they offer potential solutions to reduce the preventable health burdens related to current urban mobility practices, such as air pollution and noise, and heat island effects (Aldred et al., 2021; Nieuwenhuijsen, 2021). For instance, the city of London has implemented the Healthy Streets Approach, an initiative aimed at improving air quality, alleviating traffic congestion, reducing sedentary lifestyles, and transforming neighbours into greener and healthier places to live and work (*Transport for London. Healthy Streets for London, 2017*) and creating low traffic neighbourhoods. Milan has implemented the *Piazze Aperte (Open squares)* program, leveraging tactical urbanism – a rapid, low-cost, and scalable approach – to swiftly transform the local urban environment, to reclaim and expand public spaces for residents (Comune Milano “*Piazze Aperte in ogni quartiere*”, 2020). A number of cities in Spain, particularly Barcelona, have introduced *Superblocks*, entailing the reorganisation of public spaces and mobility networks, to prioritise bike mobility, reduce private vehicles, and develop pedestrian-friendly, green, and recreational public spaces (Rueda Palenzuela, 2018). The overall intentions are to improve air quality, enhance biodiversity, and promote walkability, as well as enhance community participation, strengthen social cohesion, and stimulate local economic activity (Rueda Palenzuela, 2018).

While urban interventions are imperative, many questions remain unanswered regarding their actual impacts on climate abatement, sustainable mobility, urban health, and well-being. Additionally, understanding how these interventions can be effectively replicated in other urban contexts remains a crucial challenge. The term “*Superblock*” has gained prominence over the years, with several assumptions about its potential to significantly improve urban environments and health outcomes. However, some research suggests that *Superblocks* may also have negative effects in some neighbourhoods through gentrification, resulting in unaffordable housing, and the displacement of local residents, thereby adversely affecting health, well-being and equity (Anguelovski et al., 2018; Cole et al., 2019). In addition, analogous interventions may exist in cities under different names or concepts. However, to the best of our knowledge, no previous literature review has specifically examined the effects of *Superblocks* on health outcomes. Therefore, the primary purpose of this study is to identify the existing empirical evidence regarding *Superblock* interventions and their effects on urban health outcomes. In addition, we aim to understand how *Superblocks* are defined in the literature. Ultimately, this scoping review seeks to contribute to the current understanding of *Superblock* interventions, and in particular their effects on health outcomes.

2. Method

To explore the existing empirical evidence on *Superblocks* and their effects on urban health outcomes, we conducted a review of the scientific literature following PRISMA extensions for scoping review (PRISMA-ScR) guidance. We also included complementary snowball techniques to identify further relevant scientific and grey literature. Our primary research question guiding this review was: *What evidence exists on Superblock interventions and their effects on urban health outcomes?* Additionally, we formulated a secondary guiding research question that aimed to enrich our understanding of *Superblock* interventions: *How are Superblocks defined in the literature?*

2.1. Search strategy

To carry out our search, we employed a targeted search strategy on PubMed and Scopus databases, using specific terms related to *Superblocks* (e.g., *superblocks*, *superillas*, *super-ille*, *superislas*, *supermanzana*) (the intervention of interest) AND *health* (e.g., *health*, *mortality*, *morbidity*) (the outcomes of interest). These search terms were applied to

the title, abstract, or keywords. Studies were eligible for inclusion if they met the following criteria: No language restrictions, and no time/date restrictions; mention of *Superblocks* (*Superillas/Supermanzanas*) in the title, abstract, or keywords; mention of the effects on health in the title, abstract or keywords. All document types were included in this search. Studies were excluded if they met the following criteria: language restrictions; time/date restrictions; restriction on document type; no mention of *Superblocks* in the title, abstract, keywords, or full text; and no mention of effects on health in the title, abstract, keywords, or full text. All searches were conducted during mid-April and mid-May 2023.

2.2. Data extraction

Articles were first screened based on keywords, title, and abstract, followed by a thorough evaluation of selected articles through full-text reading. To ensure accuracy and consistency throughout the review process, two reviewers (LCG, ABD) independently analysed the identified studies and resolved any discrepancies through discussion. The data extraction process included the retrieval of several key elements, including study type; the language in which the study was conducted; whether the study included a definition of *Superblocks* (Y/N), if so what was it; the geographical context of the study; the main issues analysed in the study; whether the study mentioned assumed effects on urban health outcomes (Y/N); whether primary research or empirical evidence on these effects were included (Y/N), and if so, what were the findings; and any additional relevant references and information that could facilitate the discovery of new evidence.

3. Results

Firstly, this review provides an overview of the extremely limited empirical evidence found on the effects of *Superblocks* on health outcomes. While we identified a number of studies that discussed the potential or assumed effects of *Superblock* interventions on health, we found very limited empirical evidence on the actual effects of *Superblocks* on health outcomes. Secondly, we discuss how *Superblocks* are defined in the literature to facilitate understanding of these interventions in different urban contexts.

3.1. How do Superblocks affect health outcomes?

Our searches yielded 25 potential articles in total. After eliminating duplicates, we were left with 17 articles based on their titles and abstracts. Upon further evaluation, four studies were excluded as they did not meet the inclusion criteria. Subsequently, we thoroughly reviewed 12 articles for potential inclusion, 8 of which referred to the assumed effects of *Superblocks* on health outcomes in the full text, but did not provide empirical evidence (Fabris et al., 2020; Heinrichs & Jarass, 2020; López et al., 2020; Mehdipanah et al., 2019; Nieuwenhuijsen, 2021; Rueda Palenzuela, 2019; Rueda Palenzuela, 2021; Staricco & Vitale Brovarone, 2022). In addition, via snowball techniques, five more articles were identified that discussed the assumed effects of *Superblocks* on health elsewhere in the full text, but lacked empirical evidence (Amati et al., 2023; Irvine et al., 2022; Rueda Palenzuela, 2021; Rodriguez-Rey et al., 2022; Rueda Palenzuela, 2018). In total, 17 articles were included in the review. Ultimately, we found only four papers that presented empirical evidence on the effects of *Superblocks* on health outcomes, three of which presented estimated effects (Li & Wilson, 2023; Mueller et al., 2020; Vidal Yañez et al., 2023), and only one study presented empirical evidence from an observational study (Puig-Ribera et al., 2022) (see Fig. 1 and Table 1).

These four studies focused on physical activity performance (Puig-Ribera et al., 2022), mental health (Vidal Yañez et al., 2023), averted premature deaths (Mueller et al., 2020), and avoidable hospital admissions (Li & Wilson, 2023). Three out of these four studies were conducted in Barcelona (Mueller et al., 2020; Puig-Ribera et al., 2022; Vidal

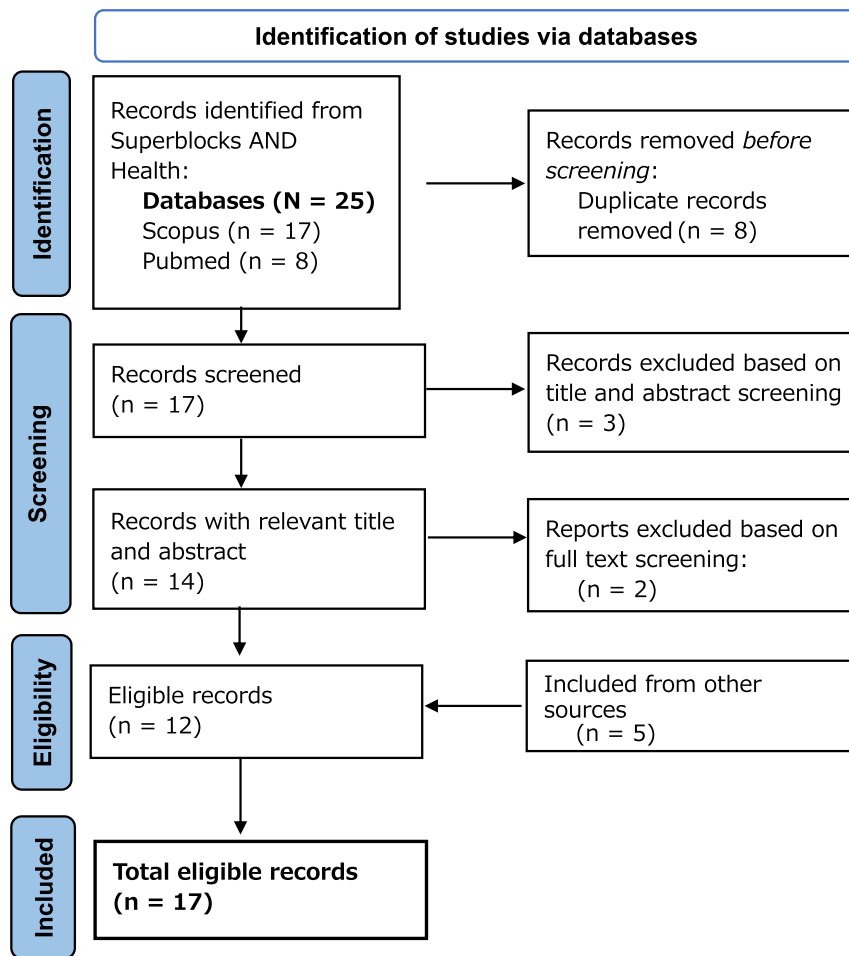


Fig. 1. PRISMA flow diagram for the scoping review.

Yañez et al., 2023). The fourth study was based in Los Angeles (US) (Li & Wilson, 2023).

From the three studies conducted in Barcelona, one study used a Health Impact Assessment (HIA) technique and estimated that the implementation of the originally planned 503 Superblocks in Barcelona could potentially prevent 667 premature deaths annually and increase the average gains in life expectancy by nearly 200 days (Mueller et al., 2020). More specifically, the preventable deaths were attributed to several factors, including reductions in air pollution (NO₂) (291, 95 % PI: 0–838), reductions in noise (163, 95 % CI: 83–246), a decrease in heat-related health effects (117, 95 % CI: 101–137), increased access to green space (60, 95 % CI: 0–119), and increased transport-related physical activity resulting from approximately 65,000 persons shifting from car/motorcycle trips to public and active transportation (36, 95 % CI: 26–50). The reduction of 667 premature deaths resulted in an estimated economic impact of 1.7 billion EUR annually (95 % CI: 0.6–2.8).

A second study conducted a 1-year observational comparative study to assess citizens' use of the Sant Antoni Superblock in Barcelona for physical activity and sedentary behaviour by gender, age group, and time of the day, during the first year of its implementation (2018–2019) (Puig-Ribera et al., 2022). Five weekly observations were made at the Superblock using the SOPARC protocol: during the opening week, then three, five, eight, and twelve months later. At a designated comparison site, one weekly observation was made at 12 months. These observations were carried out 4 days/week and for 4 h each day during different moments of the day. The authors found that at baseline, an average of 2340 citizens/h were observed using the Superblock, 92.9 % of citizens walked (2170 citizens/h), and 3.1 % engaged in physical activity (73

citizens/h). After 12 months, there was a decrease in citizens' use of the Superblocks by 17.6 %, walking decreased by 18.2 %, and physical activities decreased by 11 %. Also, citizens' usage for walking and physical activity was similar in the Superblock and the comparison site after 12 months. Overall, the findings suggest a decrease in citizen activity in terms of overall visits and participation in walking and physical activities within the Superblock over the course of the one-year observational period, particularly among elderly individuals and teenagers.

A third study conducted a HIA to estimate the potential impacts of the implementation of the Barcelona *Eixos Verds Plan* on mental health, specifically on self-perceived poor mental health, tranquilliser/sedative use, antidepressant use, and visits to mental health specialists (psychologist and/or psychiatrist) for adult residents (Vidal Yañez et al., 2023). The *Eixos Verds Plan* is an extension of the Barcelona City Council Superblock programme which aims to increase urban green spaces and streets by transforming one out of every three streets into “green corridors” (Ajuntament de Barcelona, n.d.). The authors projected that the full implementation of the *Eixos Verds Plan* could result in increased exposure to green spaces across the city and that 14 % of self-perceived poor mental health, antidepressant use, and visits to mental health specialists could be prevented, as well as an 8 % decrease in tranquilliser/sedative use. The largest mental health benefits were expected in neighbourhoods with the highest population and traffic densities, and the least access to green spaces. In addition, the authors estimated significant cost savings associated with depressive disorders in the city (45 M € annually). The authors added that if additional mental health outcomes, such as tranquilliser/sedative use and self-perceived mental health, were monetized, and other intangible costs (e.g., pain, suffering,

Table 1
Summary of papers included in the scoping review.

Year	Author(s)	Title	Type of document	Publication	Type of study	Geographical context	Definition of superblock included (yes/no)	Relationship/tendency mentioned	Empirical evidence on health (yes/no)
2023	Amati, M. Stevens, Q. Rueda, S.	Taking Play Seriously in Urban Design: The Evolution of Barcelona's Superblocks	Research article	Space and Culture	Case study	Barcelona, Spain	Yes	Play potential in public spaces and wellbeing, supporting physical and mental health	No
2023	Li, K. Wilson, J.P.	Modelling the Health Benefits of Superblocks across the City of Los Angeles	Research article	Applied Sciences	Modelling (BenMap-CE) and i-Tree tools	Los Angeles, US	Yes	General health	Yes
2023	Vidal, D. Pereira, E. Cirach, M. Daher, C. Nieuwenhuijsen, M. Mueller, N.	An urban green space intervention with benefits for mental health: A health impact assessment of the Barcelona "Eixos Verds" Plan	Research article	Environment International	Quantitative health impact assessment/ Case study	Barcelona, Spain	Yes	Impact of green space on mental health	Yes
2022	Irvine, K.N. Suwanarit, A. Likitswat, F. Srilertchaipanij, H. Ingegno, M. Kaewlai, P. Boonkam, P. Tontisirin, N. Sahavacharin, A. Wongwatcharapai boon, J. Janpathompong, S.	Smart City Thailand: Visioning and Design to Enhance Sustainability, Resiliency, and Community Wellbeing	Research article	Urban Science	Case study (Mixed-method approach: surveys, interviews, observation, photo-documentation)	Thailand	Yes	Community wellbeing	No
2022	Puig-Ribera, A. Arumí-Prat, I. Cirera, E. Solà, M. Codina-Nadal, A. Palència, L. Biaani, B. Pérez, K.	Use of the Superblock model for promoting physical activity in Barcelona: a one-year observational comparative study	Research article	Archives of Public Health	Observational comparative study	Barcelona, Spain	Yes	Sedentary and physical activity behaviour	Yes
2022	Rodriguez-Rey, D. Guevara, M. Linares, M.P. Casanovas, J. Armengol, J. M. Benavides, J. Soret, A. Jorba, O. Tena, C., García-Pando, C.P.	To what extent the traffic restriction policies applied in Barcelona city can improve its air quality?	Research article	Science of The Total Environment	Quantitative Case study. Multi-scale modelling chain	Barcelona, Spain	Yes	Air pollution (NOx emissions and NO2 concentration levels)	No
2022	Staricco, L. Vitale Brovarone, E.	Livable neighbourhoods for sustainable cities: Insights from Barcelona	Conference paper	Transportation Research Procedia	Case study (in-depth and on field interviews)	Barcelona, Spain	Yes	Accessibility, equity, health and liveability	No
2021	Nieuwenhuijsen, M.	New urban models for more sustainable, liveable and healthier cities post covid19; reducing air pollution, noise and heat island effects and	Research article	Environment International	Narrative meta-review	Barcelona, (superblocks) (and London, Paris, France, Freiburg and Hamburg Germany: other types)	Yes	More sustainable, liveable and healthier cities post covid19; reducing air pollution, noise and heat island effects and increasing green space and physical activity	No

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Table 1 (continued)

Year	Author(s)	Title	Type of document	Publication	Type of study	Geographical context	Definition of superblock included (yes/no)	Relationship/tendency mentioned	Empirical evidence on health (yes/no)
2021	Rueda Palenzuela, S.	increasing green space and physical activity Vitoria-Gasteiz: la implantación del modelo de supermanzanas	Research article	Revista de Obras Públicas	Case study	Vitoria-Gasteiz, Spain	Yes	Descriptive impacts	No
2021	Rueda Palenzuela, S.	Superblocks Base of a New Model of Mobility and Public Space. Barcelona as an Example	Book chapter	International Encyclopedia of Transportation	–	Barcelona, Spain	Yes	Quality and liveability of public space to guarantee a more accessible, comfortable, safe, and multifunctional public space	No
2020	Fabris, L.M.F. Camerin, F. Sempredon, G. Balzarotti, R.M.	New Healthy Settlements Responding to Pandemic Outbreaks: Approaches from (and for) the Global City	Research article	The Plan Journal	Essay (including 3 case studies)	Barcelona, Spain; Milan, Italy; Beijing, China	Yes	BCN: air quality, prevention of deaths, decrease of private motorised transport, less urban noise, increase green space side effect of rising real estate value; BEIJING: assist with housing demand; MILAN: lack of space for the pedestrian and social interactions. Two to create space for sociality and neighbourhood activities.	No
2020	Heinrichs, D. Jarass, J.	Designing healthy mobility in cities: how urban planning can promote walking and cycling	Research article	Bundesgesundheitsblatt	Essay	Barcelona, Spain (Superblocks); Bogota, Colombia (bike lanes); Germany (not really discussed)	Yes	Healthy mobility: walking or biking	No
2020	López, I., Ortega, J., Pardo, M.	Mobility Infrastructures in Cities and Climate Change: An Analysis Through the Superblocks in Barcelona	Research article	Atmosphere	Case study (grey, scientific literature, newspapers).	Barcelona, Spain	Yes	Reducing automobile traffic, and accordingly GHG emissions, while increasing green space in the city and improving the health and quality of life, Superblocks are infrastructures useful for mitigating climate change	No
2020	Mueller, N. Rojas-Rueda, D. Khreis, H. Cirach, M. Andrés, D. Ballester, J. Bartoll, X. Daher, C. Deluca, A. Echave, C. Milà, C. Márquez, S. Palou, J. Pérez, K. Tonne, C. Stevenson, M. Rueda, S. Nieuwenhuijsen, M.	Changing the urban design of cities for health: The superblock model	Research article	Environment International	Quantitative health impact assessment	Barcelona, Spain	Yes	Reduce premature mortality burden and increase life expectancy through reductions in air pollution, noise and heat and increased access to green space and transport-related physical activity performance	Yes

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Table 1 (continued)

Year	Author(s)	Title	Type of document	Publication	Type of study	Geographical context	Definition of superblock included (yes/no)	Relationship/tendency mentioned	Empirical evidence on health (yes/no)
2020	Palència, L. León-Gómez, B. B. Bartoll, X. Carrere, J. Díez, E. Font-Ribera, L. Gómez, A. López, M. J. Mari-Dell'Olmo, M. Mehdipanah, R. Olabarría, M. Pérez, G. Puig-Ribera, A. Rico, M. Rojas-Rueda, D. Vásquez-Vera, H. Pérez, K.	Study Protocol for the Evaluation of the Health Effects of Superblocks in Barcelona: The "Salut Als Carrers" (Health in the Streets) Project	Research article	International Journal of Environmental Research and Public Health	Study protocol evaluation (quantitative and qualitative mixed-methods)	Barcelona, Spain	Yes	Project to evaluate the potential environmental and health effects of the superblock model with an equity perspective	No
2019	Mehdipanah, R. Novoa, A. M. León-Gómez, B. B. López, M. J. Palència, L. Vásquez, H. Díez, È. Borrell, C. Pérez, K.	Effects of Superblocks on health and health inequities: a proposed evaluation framework	Research article	Journal of Epidemiology and Community Health	Essay and conceptual framework	Not specified	Yes	Framework that will serve as a guide in the evaluation of the different effects of the Superblocks, including: the interventions implemented in the Superblock strategy, the changes that occur at neighbourhood and individual level and the population turnover as intermediate factors and the health outcomes	No
2018	Rueda Palenzuela, S.	Superblocks for the design of new cities and renovation of existing ones: Barcelona's case	Book chapter	Integrating Human Health into Urban and Transport Planning	Case study	Barcelona, Spain	Yes	Environmental impacts that influence health	No

well-being losses associated with poor mental health) or other health-related benefits were included, the estimated total avoidable costs would be even greater.

The fourth study, based in Los Angeles (US), built a Superblocks Model for the city. Researchers quantitatively assessed the health and economic benefits of five different scenarios that involved transforming between 5 and 50 % of the residential areas into Superblocks (Li & Wilson, 2023). The authors selected increasing urban green space/tree canopy as the specific intervention, and used air pollution reduction (NO₂, SO₂, PM_{2.5}, and O₃) as the intermediate effect to model the health and economic benefits (indicated by avoidable hospital admissions). Based on the local population and the anticipated changes in pollutant concentrations, the study estimated that around 600 Superblocks could be developed in the city and that the creation of Superblocks could result in significant reductions in hospital admissions and economic savings. After examining the health and economic benefits of the five different scenarios, the strongest benefits were found when 5–10 % of residential areas were transformed into Superblocks. While the benefits increased as the 30 % threshold was reached, the rate of increase slowed down with further transformation. These findings could help to determine the optimal balance between the size of residential areas and the scale of Superblock interventions for maximising improved health outcomes.

3.2. How are Superblocks defined?

All of the articles included in the review included a definition of Superblocks. A notable observation emerged - there is no standard definition of what a Superblock is. Authors varied in their approaches, with some defining Superblocks in terms of their physical or technical dimensions, while others approach them from more conceptual perspectives. Despite the absence of a universally agreed-upon definition, several common key features and objectives can be distinguished. We therefore summarise the findings accordingly.

Superblocks are defined by various authors as large-scale urban planning units that aim to create pedestrian-friendly environments by reimagining traditional city blocks (Amati et al., 2023; Fabris et al., 2020; Mueller et al., 2020; Nieuwenhuijsen, 2021; Puig-Ribera et al., 2022; Rodriguez-Rey et al., 2022; Rueda Palenzuela, 2018; Staricco & Vitale Brovarone, 2022). They typically consist of a cluster of nine (3 × 3) interconnected street blocks, enclosed by major routes that connect different parts of the city (Mehdipanah et al., 2019). Their physical dimensions are commonly described as being around 400 m × 400 m and the interior streets within the Superblock are transformed into pedestrian and bicycle-friendly spaces, with strict speed limits of 10–20 km/h. The Superblock is often designed around the idea of a pedestrian being able to circle a block within the Superblock of 100 × 100 m taking the same time required for a car to travel around the 400 × 400 m Superblock (Amati et al., 2023). However, in practice Superblocks can vary in size, sometimes being larger or smaller than the three-by-three block prototype (Li & Wilson, 2023).

Findings suggest that Superblocks represent a multifaceted approach to urban transformation and sustainability, drawing inspiration from a variety of sources. These urban transformations aim to reconfigure urban spaces to create traffic-pacified interior areas and promote sustainable mobility (and non-motorised modes of transportation such as cycling), promote active lifestyles, and increase urban greening, as well as foster a sense of community, ultimately enhancing the overall urban living experience (Amati et al., 2023; Li & Wilson, 2023; Mueller et al., 2020; Rodriguez-Rey et al., 2022). The redirection of through traffic facilitates the reclamation of public space for leisure activities, where social and economic interactions can be fostered. This not only enhances the comfort of neighbours but also contributes to an improved quality of life for both residents and visitors (Palència et al., 2020). This approach is also expected to contribute to climate change mitigation efforts. Further, the implementation of Superblocks can be carried out gradually

and incrementally, offering a potentially flexible and adaptable approach to urban planning. This approach could enable the adjustment of strategies and interventions based on evolving needs and priorities, allowing for continuous refinement and improvement as the urban landscape evolves (Li & Wilson, 2023).

The Barcelona Superblock model is often referred to in the included literature, as it represents an ambitious large-scale urban and transport planning strategy pioneered by architect and urban planner Salvador Rueda in 1987. Rooted in the visionary principles of 19th-century architect Ildefons Cerdà, the model places paramount importance on human well-being. Cerdà's emphasis on factors such as natural light, ventilation, open spaces, greenery, and a comprehensive transport network that catered to the needs of road users, serves as a foundational influence (Amati et al., 2023; Mehdipanah et al., 2019; Palència et al., 2020). By integrating these principles, the Barcelona Superblock model apparently strives to address multiple challenges by reducing motorised transportation, reclaiming public open spaces for people, promoting sustainable mobility, and active lifestyles, fostering urban greening, and mitigating the adverse effects of climate change. The overall aim is said to create vibrant, healthy, and environmentally friendly neighbourhoods that prioritise the health, well-being, and quality of life of its residents (López et al., 2020; Nieuwenhuijsen, 2021; Staricco & Vitale Brovarone, 2022; Vidal Yañez et al., 2023).

Interestingly, the definition of Superblock varies by geographical location. For example, in Thailand, (Irvine et al., 2022) define them as expansive land areas located in the peri-urban Bangkok Metropolitan Region. These areas are encompassed by a network of major roads and consist of diverse elements, including lanes, canals, idle land held for speculation, as well as rural and agricultural land. In China, Superblocks are characterised by their boundaries, often formed by expansive arterial roads, enclosing sizable blocks ranging from 300 to 500 m in length and width. These blocks are demarcated by a combination of walls, fences, plantings, gates, and guard houses, which determine the level of public access. Within these tracts, spanning 12 to 20 ha, one can find clusters of single- or multi-family housing, accompanied by small-scale retail services and community facilities, catering to the needs of residents (Fabris et al., 2020). Fabris et al. (2020) state how Chinese Superblocks are characterised by their significant size, surpassing those found in cities like Barcelona, and that these are usually enclosed by fences along their borders, isolating them from the surrounding roads and urban fabric. Despite their limited accessibility to the general public, it seems these Superblocks also aim to foster the development of social relations among the community living inside the block and act as confined microcosms where everyday life unfolds.

4. Discussion

The primary purpose of this scoping review was to identify the available empirical evidence on Superblock interventions and their effects on health outcomes. In addition, to expand understanding of Superblock interventions, we also sought to understand how Superblocks are defined in the scientific literature.

Overall, our review reveals a surprising lack of empirical-observation-based evidence on the effects of Superblocks on health outcomes. We found only four papers that presented empirical evidence on the effects of Superblocks on health outcomes, three of which presented estimated effects in two urban settings (Barcelona and LA), and only one presented empirical evidence from an observational study based in Barcelona. We found several more articles (n = 13) that mentioned somewhere in the paper the assumed effects of Superblocks on health outcomes, and mostly cited the three studies that presented estimated effects only. Surprisingly, in the included literature, the health effects of Superblock implementation have only been discussed in the context of a few urban settings (e.g. Barcelona and Victoria in Spain, Bangkok Metropolitan Region in Thailand, and LA in the US). Nevertheless, based on the limited evidence available, it seems plausible that

Superblocks could potentially enhance health and well-being by reducing risk factors such as noise and pollution, creating more spaces for bicycles and walking, fostering closer proximity and social contacts etc. However, these benefits may only materialize when more specific actions are implemented, and these urban transformations are scaled up. These findings emphasise that it is imperative to conduct further empirical research and evaluations in order to gain a more comprehensive understanding of the numerous effects of Superblocks in different contexts.

In terms of how Superblock interventions are defined in the scientific literature, we found that there is no standard definition or universally agreed-upon characteristics. However, the various definitions presented by different authors highlight both the physical/technical aspects and the conceptual perspectives associated with this novel urban intervention. In physical terms, Superblocks are typically described as large-scale units consisting of interconnected street blocks, often encompassing a 3 × 3 cluster of blocks and spanning around 400 m × 400 m (Mehdipanah et al., 2019; Amati et al., 2023; Palència et al., 2020; Puig-Ribera et al., 2022; Li & Wilson, 2023). From a conceptual perspective, Superblocks are considered an urban transformation aimed at enhancing public space, encouraging social and economic interactions, minimising reliance on motorised transportation, and integrating urban greening and biodiversity (Vidal Yañez et al., 2023; López, Ortega and Pardo, 2020; Rodriguez-Rey et al., 2022; Rueda Palenzuela, 2021). These multiple conceptual perspectives assume the potential that Superblocks have to address various urban challenges while offering a flexible and adaptable approach to urban planning, allowing for continuous refinement and adjustment based on evolving needs. They are also said to prioritise public space, sustainable mobility, and community well-being, while promoting health and physical activity, and contributing to mitigating climate change (Anguelovski et al., 2022; Zografos et al., 2020). Therefore, although there may be variations and adaptations in different contexts, the core principles of using interventions in the built environment and street layout to enhance liveability, promote sustainability, and address urban challenges remain central to the Superblock concept.

Moreover, as mentioned, we identified very limited empirical evidence on the effects of Superblocks on health. Nevertheless, we found some evidence of the estimated benefits of increasing access to urban green space (a significant aspect of Superblock interventions) in terms of preventable deaths, reductions in hospital admissions, and improvements in mental health (Li & Wilson, 2023; Mueller et al., 2020; Vidal Yañez et al., 2023). Several other studies (Jungman et al., 2021; Khomeiko et al., 2020; Mitsakou et al., 2019; Mueller et al., 2017, 2018) have estimated that many European cities have insufficient access to green spaces, therefore these findings suggest that increasing access to urban green spaces in European cities could potentially yield notable long-term health, environmental and cost benefits.

We also found mixed evidence regarding the estimated and actual effects of Superblocks on physical activity. (Mueller et al., 2020) estimated that the 503 planned Superblocks in Barcelona could potentially reduce the premature mortality burden and increase life expectancy through reductions in air pollution, noise, and heat, as well as increased physical activity. However, Puig-Ribera et al. (2022)'s observational study found that the implementation of the Barcelona Sant Antoni Superblock did not result in a sustained increase in physical activity among all residents after one year of observation and that the promotion of car-free transportation did not necessarily increase transport-related physical activity during this period, given the increased use of electric scooters. Although, the authors also note that this Superblock was not specifically designed to promote physical activity. These findings, therefore, emphasise the importance of considering theories of change in the design of Superblock interventions, and urban policies in general, particularly when evaluating their effects or impacts (Cash-Gibson, Martínez-Herrera, et al., 2023; Cash-Gibson, Muntané Isart, et al., 2023). In order to increase health-enhancing physical activity within Superblocks, (Puig-Ribera et al., 2022) suggest that appropriate spaces

need to be incorporated into the design. In addition, to maximise citizens' active use of the space, policies should be adopted to promote Superblock active mobility, particularly walking or cycling, as well as to improve connections between different Superblocks through car-free routes. Furthermore, they suggest developing alliances with neighbourhood physical activity organisations to organise outdoor physical activities tailored to the resident's demographic features and patterns of use.

Additionally, we identified a number of papers that discuss the potential intermediate neighbour-level effects of Superblocks, such as reduced air and noise pollution, increased biodiversity, enhanced transport-related physical activity levels, and improved aesthetics. Several of these papers cite one of the abovementioned studies as a key reference for explaining the health benefits of the Superblock interventions (Mueller et al., 2020). Yet the authors estimated the effects of multiple Superblocks together, and the findings are based on an HIA. HIA techniques use standard coefficients to estimate health benefits, which have limitations in accuracy, and are typically used in scenario analysis and general forecasting.

Interestingly, among the papers that mentioned the assumed effects of Superblocks on health outcomes, one paper includes a conceptual framework aiming to guide evaluations of how Superblocks can potentially influence various health (and non-health related) outcomes, both in general and among different social groups, as well as the potential mechanisms and relationships involved (Mehdipanah et al., 2019). The conceptual framework presents potential pathways between Superblocks to health outcomes, highlighting potential intermediate effects (neighbour vs individual level) that connect the intervention outcomes to health and health inequities. The neighbourhood-level effects mentioned include air pollution, noise pollution, traffic, walk-ability, recreational spaces, commercial availability, housing, a sense of community, a sense of security, and social networks. The authors also state that a number of these neighbourhood-level effects can also influence individual-level factors, such as active transportation use and physical activity. This conceptual framework may be useful for future evaluations of Superblocks in different settings.

Another article presents a study protocol for evaluating the effects of the Barcelona Superblocks on health and health equity (Palència et al., 2020). In 2021, an evaluation of the Barcelona Superblocks was conducted by the Barcelona Public Health Agency. However, limited health results were reported in the available literature. Only the evaluation of the Poblenou Superblock mentioned that some study participants stated that air pollution might have increased in the neighbouring streets around the Superblock, which could have led to potential negative effects for the people who live in these streets (WHO, 2016). Therefore, it seems that plans to conduct evaluations of the Barcelona Superblocks have been made. Nevertheless, our study findings reveal a lack of empirical-observation-based evidence on the effects of Superblocks on urban health outcomes in different urban contexts worldwide, and findings underscore the need for more design, implementation, and impact evaluations in different global contexts.

In general, our review found that the Barcelona Superblocks have been studied the most, and can serve as an example of how the implementation of these urban interventions can potentially improve pedestrian safety, create more public open spaces, and positively impact the quality of physical and social experiences within the city. These may in turn have positive effects on social cohesion, well-being, and mental health. These findings may or may not be applicable to other urban settings. Other studies point out that the suitability of implementing the Superblock design varies across cities, with some having a small percentage of their street network suitable for implementation (e.g. Atlanta, London, Hong Kong). However, even if only a few Superblocks can be implemented, there is still notable potential for transforming streets (Eggimann, 2022; Li & Wilson, 2023). However, the desirability of Superblock locations can contribute to rising housing prices, the displacement of long-time residents, and changes in the socioeconomic

composition of neighbourhoods which may create gentrification (Mehdipanah et al., 2019; Roberts, 2019). It is therefore also essential to be mindful of the local political and power dynamics, and risk of gentrification of Superblock locations, and the subsequent effects on urban health, well-being, and equity (Anguelovski et al., 2022; Anguelovski et al., 2023; Cole et al., 2019; Frago & Graziano, 2021; Mehdipanah et al., 2019; Zografos et al., 2020). To mitigate these effects, and ensure that the benefits of Superblocks are accessible to a diverse range of residents, the implementation of social housing and measures such as subsidised rents and rent control have been suggested as effective strategies (Roberts, 2019). Future research should further explore these important issues in detail across various urban settings.

Finally, it is important to mention that scoping reviews play a valuable role in conducting preliminary assessments of the available literature and evidence on a specific topic of interest. To the best of our knowledge, no previous literature review has specifically examined the effects of Superblocks on health outcomes. However, it is important to note that while the term “Superblock” has gained prominence, similar interventions may exist in cities under different names or concepts. There may be other reviews that have explored similar urban interventions and their effects on health outcomes, without explicitly using the term “Superblock”, or other reviews that have only explored part of the potential pathways that connect Superblocks interventions to health outcomes, and other non-health related outcomes. Future research should delve further into these related interventions, the intertwined social-political-environmental determinants and risk factors associated with their implementation, and their impact on health (and non-health related) outcomes to provide a comprehensive understanding of the field and more conclusive insights. Moreover, more evaluations on the design, implementation, and impact of current Superblock interventions are needed. This new knowledge could be used to guide the design and implementation of new Superblocks and/or similar interventions in different urban settings which aim to improve the urban environment, population health, and well-being.

5. Conclusions

In response to pressing socio-environmental challenges, many cities are actively designing strategies and implementing interventions to radically transform urban land use, public space, and transportation networks and promote active mobility, social connectivity and enhance health and wellbeing. The term ‘Superblock’ has gained prominence, and a number of assumptions have been made about their potential to significantly improve urban environments and health outcomes. This study reviewed the existing literature on Superblocks and found extremely limited empirical evidence on their effects on health outcomes. Nevertheless, it seems that these types of urban interventions have the potential to positively impact health and well-being through various mechanisms. Increased access to urban green spaces within Superblocks is estimated to yield significant health benefits, including reduced premature deaths, fewer hospital admissions, and improved mental health. Therefore, incorporating urban greening strategies into Superblock interventions is important to potentially enhance public health and well-being. While some studies suggest that Superblocks can increase physical activity levels by reducing reliance on motorised transportation and improving walkability, sustained increases in physical activity may not be observed immediately. Design considerations and a thoughtful approach to promoting physical activity are necessary to maximise the health benefits of Superblocks. It is imperative to conduct further empirical research and evaluations in order to gain a more comprehensive understanding of the numerous effects of Superblocks in different contexts.

CRedit authorship contribution statement

Lucinda Cash-Gibson: Writing – review & editing, Writing –

original draft, Visualization, Validation, Project administration, Methodology, Investigation, Data curation, Conceptualization. **Alexandra Bretones Diaz:** Writing – review & editing, Writing – original draft, Visualization, Validation, Investigation, Data curation, Conceptualization. **Oriol Marquet Sardà:** Writing – review & editing. **Joan Benach:** Conceptualization, Methodology, Writing – review & editing.

Declaration of competing interest

Authors declare no competing interests.

Data availability

Data will be made available on request.

Acknowledgements

JB is a recipient of an ICREA Acadèmia (Generalitat de Catalunya). OM is funded by a Ramón y Cajal fellowship (RYC2020-029441-I) awarded by the Spanish Ministry of Science and Innovation. The authors would like to acknowledge Gaetano Vaggione and Samantha Genova for their assistance on a preliminary search.

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