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CRITICAL ANALYSIS OF HOUSING CONDITION IMPACTS ON RESIDENTS' WELL-BEING AND SOCIAL COSTS

ANÁLISE CRÍTICA DOS IMPACTOS DA HABITAÇÃO NO BEM-ESTAR DOS MORADORES E NOS CUSTOS SOCIAIS

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ABSTRACT:

Housing is fundamental to the welfare of people and society. On the contrary, housing may impose costs on users as regards their health and quality of life. These costs are not only individual but also social. Studies on the concept of social costs (SCs) related to living conditions of social housing (SH) are scarce, and the concept needs in-depth debates. A systematic literature review (SLR) was conducted to answer the primary research question: What are SCs, and what triggers them? The research specifically aims to identify spatial design factors and construction details of SH, which may cause adverse impacts and social costs and affect households' quality of life. The SLR results are analysed and discussed concerning the major concepts of SCs and social impacts (SIs). The visual representation and organization of data contribute to detailed and in-depth conceptual discussions to understand the factors that can induce actions to improve SH design and upgrading of the existing stock. Most publications emphasise physical and mental health risks. Poor thermal conditions cause illnesses, and depression is prevalent in many housing developments putting pressure on public systems and their health services. Social unrest and family conflict can impose further costs on policing and social assistance. Housing conditions' cause and effect are rarely detailed in the SC literature, which constitutes a research gap. New housing design, Upgrading or refurbishment initiatives should also effectively increase well-being, reduce environmental impacts, and ultimately contribute towards positive social and technological developments.

KEYWORDS: Social Cost; Social Impacts; Social Housing; Health; Behaviour; Improvements

RESUMO:

A habitação é uma necessidade fundamental para o bem-estar da sociedade. De contrário, a habitação pode acarretar custos para a sociedade em relação à sua saúde e qualidade de vida. Esses custos não são apenas individuais, mas também sociais. Estudos sobre Custos Sociais (CSs) relacionados às condições de vida em Habitação de Interesse Social (HIS) são escassos, e o conceito necessita de debates aprofundados. Uma Revisão Sistemática da Literatura (RSL) foi conduzida para responder à questão principal da pesquisa: O que são CSs, e o que os desencadeia? A pesquisa visa identificar os fatores de dimensionamento espacial e detalhes construtivos da HIS, que podem causar impactos adversos e afetar a qualidade de vida dos moradores. A representação visual dos resultados contribuem para discussões conceituais detalhadas para maior entendimento dos fatores que podem induzir ações para melhorar o design das HIS e modernização do estoque existente. Estudos nesta temática enfatizam os riscos para a saúde física e mental. Condições térmicas inadequadas causam doenças, e a depressão é prevalente em HIS, elevando a necessidade de uso de serviços de saúde públicos. A instabilidade social e os conflitos familiares também impõem custos ao policiamento e à assistência social. A relação causa e efeito das condições de moradia raramente é avaliada na literatura de CSs, o que constitui uma lacuna de pesquisa a ser investigada. Novas iniciativas de design e melhorias em HIS podem contribuir efetivamente para o bem-estar e desenvolvimentos sociais e tecnológicos, além de reduzir os impactos ambientais.

PALAVRAS-CHAVE: Custo Social; Impactos Sociais; Habitação Social; Saúde; Comportamento; Melhorias

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INTRODUCTION

Housing configurations typically focus on the dimensions and single or shared outcomes - such as affordability, quality, and neighbourhood characteristics (VILLA; ORNSTEIN, 2013; ESKES; VIEIRA, 2016; UNECE, 2006). However, housing influences people's lives in many ways, and these are essential social dimensions to consider when measuring the benefits of Social Housing (SH) programmes.

Studies on housing, geography, epidemiology, and economics have shown an association between housing, health, and welfare or wellbeing (BARROS et al., 2019; BAKER et al., 2017). Empirical studies have associated housing quality with quality of life, physical health, psychological wellbeing, social relations and general impacts (aesthetic, upkeep, use) on the physical environment (SOLARI; MARE, 2012; THE WHOQOL GROUP, 1998). Baker et al. (2017) and Bentley et al. (2016) also highlight effects on an individuals' health, employment, and educational opportunities. Such arguments are expanded in terms of the various effects discussed - health, behaviour, and performance or productivity, social relationships of residents, and privacy - of including externalities on a wider location, and on the safety of people, and community resources, at the unit, neighbourhood, and urban scales (WATSON et al., 2016).

In economics, externalities are considered the returns or costs to society as a whole, coming from production, and investment decisions of individuals, households, firms, or the public sector that affect people not directly involved in the economic transaction (KAPP, 1970). Studies on externalities or social costs (SC) of SH are essential to gauge urban, neighbourhood and individual home impacts. Location, design, and construction elements and their impact on dwellers' well-being are indicators of quality of life, not only on an individual level but with regard to societal issues and progress (SWOPE; HERNÁNDEZ, 2019; FIELD, 1997; McKIM, 1997). Specifically, the housing environment has to provide comfort, convenience, and safety, recognised as important factors in promoting quality of life (ORRELL et al., 2013).

According to Theofilou (2013), quality of life has many definitions, depending on the knowledge area, making this concept difficult to measure. Quality of life relates to the subjective condition of welfare experienced individually or collectively by people. Quality of life is strongly, but not only, related to health. Other factors play a role, such as employment, accessibility, local facilities, social activities and gatherings, education, family, wealth, safety, freedom, religious beliefs, and the environment (BARCACCIA et al., 2013; MOURATIDIS, 2018).

Housing indicators relevant to quality of life have three dimensions: design and construction quality, environment, and expenditure, according to Streimikiene (2015). Overcrowding rates or sufficient space is a significant housing quality element to meet people's need for privacy and avoid negative impacts on health and children's school performance. However, as an indicator, a dwelling's size depends on many other factors, such as available services in the home's near vicinity, family composition, number of rooms, and their dimensions. Sanitary facilities and general conditions (quality construction standards and good repair) of a home make a difference. In Europe, this is called the housing deprivation rate, which affects environmental comfort (thermal, acoustics, and lighting) (STREIMIKIENE, 2015).

Broader neighbourhood conditions also play a part in establishing quality of life parameters (ONO et al., 2018). Access to parks and green areas is vital for mental and physical health and increases people's satisfaction with their home environment (STREIMIKIENE, 2015). Access to quality services and institutions such as schools is positive, while noise, pollution, grime, crime,

violence, and vandalism are negative indicators. All these factors still depend on the family income and the ability to afford the home and pay the utility bills.

Eight essential housing quality components are frequently identified. Lawrence (2002) includes 8 housing elements: (1) site conditions, (2) buildings themselves, (3) water safety and provision, sewage and solid waste disposal, (4) pollution levels and interior air quality, (5) health conditions (infectious disease transmissions and prevention of injuries), (6) access to amenities and public/private services (7) food security, and (8) building structure propagated disease control.

These housing components should be reassessed from time to time. The Organisation for Economic Co-operation and Development (OECD) (2020) shows that some indicators had improved since 2002 when Lawrence outlined the eight housing essentials. However, housing affordability has not improved. The OECD well-being framework is increasingly qualitative with 11 key dimensions, and housing as a leading factor. The 2020 OECD report was published before the pandemic. Still, it is essential to note that job and environmental quality are highlighted, and a person's skills and acquired knowledge, as well as subjective welfare work-life balance, social connections and civil engagements were added to the 2013 list of Barcaccia et al. (2013).

Physical conditions that determine economic options of people are income and personal wealth, employment quality, as well as housing (OECD, 2020). Accordingly, when housing does not meet quality standards, it affects the quality of life, health, and welfare with personal costs and SCs. Many SH residents experience social exclusion, unemployment, inadequate services, poor health, and minimal social networks. Inadequate living conditions therefore tend to impose costs on low-income families (in this case individual costs), increase default rates and reduce positive social results, which impair achieving government-sponsored SH program goals (PARK; JUNG, 2019; PRECIADO-PÉREZ; FOTIOS, 2017; WEINHARDT, 2014).

Most housing studies investigate urban aspects and societal impacts of public policies and investments. Architectural design elements determine housing quality directly and show that they can affect health conditions. Poor quality housing is directly associated with physical and mental health problems of the population living in such developments (BARROS et al., 2019; BAKER et al., 2017). Poor design and construction of SH can potentially contribute to several other social problems. However, these problems are rarely evaluated in detail concerning broader issues of people's well-being (ORTIZ; JOHANNES, 2018; WATSON et al., 2016).

Housing close to pollution sources and insufficient access to clean drinking water supply and sewage treatment can trigger epidemics and other associated diseases that require interventions, imposing costs relating to infrastructure investments and public health services (PRETLOVE; KADE, 2016; HORNBERG; PAULI, 2011; MOLNÁR et al., 2010; BAKER et al., 2000). Location thus plays a significant role in families' well-being (VICENTIM; KANASHIRO, 2016; RUFINO, 2015).

SH neighbourhoods are also often associated with socio-spatial segregation, as the projects are frequently located in peripheral areas with little access to basic urban infrastructure, especially in developing countries (ACOLIN; HOEK-SMIT; ELOY, 2019; HAYWARD et al., 2015; CHASKIN; SICHLING; JOSEPH, 2013). Additionally, SH developments are in many cases characterised by user groups' anti-social behaviour, disorders and criminal activities, and drug trafficking (ANDRADE, 2015). In such SH areas, open spaces are often not adopted by the population. Parks and recreational areas tend to lack maintenance and become dangerous, vandalism-prone spaces, misappropriated for public drunkenness, drug dealing, and dwellers intimidation (MORRIS, 2012). Such situations impose costs on social assistance services and the need for increased policing.

Health issues related to housing conditions are strongly highlighted in investigations (LARCOMBE, 2020; CURL; KEARNS, 2015, HAYWARD et al., 2015). Health is determined not only by biological and behavioural but also – and to a large extent - by environmental and socioeconomic factors (DELONE, 2008). The effects of SH conditions on health are not necessarily immediate but instead mediated by spatial, temporal, and social aspects, as well as by building construction standards, infrastructure, lifestyle, and behaviour (HORNBERG; PAULI, 2011).

The 2020 COVID-19 pandemic reveals another critical health dimension. Evidence shows that overcrowding and cohabitation causes problems, where social isolation and distancing possibilities are hampered for a large number of people in the world. This was specifically shown for Brazil, caused by the country's continuous large housing deficit (ARANTES; ARRETCHE; MARQUES, 2020).

Public hospital services, the need for social assistance to support an individuals' well-being and productivity, or improve the community relations of a SH population can be shown to be affected by housing conditions (WATSON et al., 2016). Services and assistance programs have costs, and these should be investigated and mitigated through better design of SH (HERNÁNDEZ, 2016; MORRIS, 2012).

To investigate SCs caused by SH conditions was our motivation to conduct a systematic literature review. To uncover what is already known about this concept, identify cause and effects, and discover research gaps were further interests. From preliminary reviews, studies on the concept of SCs related to living conditions of SH are scarce, and the concept needs in-depth debates. Organising and presenting existing data through visual representations and diagrams was considered essential to advance investigations and produce scientific knowledge on SH quality's broader implications.

Although the relationship between living conditions in SH projects and social impacts (SIs) is well-known, it is not substantiated and detailed. Understanding such relationships can improve SH design, and advance the robustness of investment decision-making for upgrading or refurbishment projects.

Two research questions guided our systematic literature review:

- What are SCs, and what triggers them?
- How does the empirical literature address the interfaces between SH, health, and well-being?

The study aimed to organise research on the impacts of SH conditions found in the literature and visualize the issues involved. This organisation contributes to understanding these impact factors and supports an in-depth debate on the major concepts involved SC, SI, SH quality and dwellers' quality of life with attention given to social, health, economic and environmental issues. Actions favouring improved SH design and upgrading of the existing stock can then be based on scientific evidence and decision making can be justified and the implications of alternative proposals can be calculated.

Our research should demonstrate that SH quality, affordability, and location can directly affect SCs. Research gaps will be identified and should motivate studies to improve SH conditions by applying more precise and scientifically supported data. Neighbourhood conditions affect the quality of urban life as a whole; however, this broader concern is not part of our in-depth analysis here, nor do we focus on any specific country's public policies. The research

specifically aims to identify spatial design factors and construction details of SH, which may cause adverse impacts and social costs and affect households' quality of life.

SOCIAL COSTS: THEORY AND DEFINITIONS

In the long run, SCs are generated when conditions are not ideal and can - directly and indirectly - impact society (MATTHEWS; ALLOUCHE; STERLING, 2015; PEVALIN et al., 2017). SCs relating to SH are mostly studied through Post Occupancy Evaluations (POEs) of buildings, however often without adequate means to measure these and find ways to remediate them (FRANÇA et al., 2018; HUANG; DU, 2015; VILLA; ORNSTEIN, 2013; ONO et al., 2018). This may be because SCs are complex, not only in their calculation but also as precise definitions are difficult when related to SH.

The term SC is at least 50 years old, and a definition was given by the economist Karl William Kapp (1970). Accordingly, SCs are called externalities of industrialized productions or the costs shifted to society in an attempt by businesses to increase profits (KAPP, 1970). Environmental externalities are the most common costs and, in many countries, are the main reason for government interventions to minimize these. Kapp writes (1970): "Interdependencies and the causal chain which give rise to environmental disruption differ in kind and complexity from those with which economists have traditionally been concerned. Thus, waste products of various kinds may not only react upon each other but also upon other elements in the environment and in this way give rise to additional toxicological effects on plant, animal and human life with cumulative delayed consequences on human health." KAPP (1970) further states that "SCs have long been neglected or kept at the periphery of economic theory".

An important conference was held in 1995 on SCs and sustainability, discussing the valuation and implementation of this relation in the energy and transport industry (HOHMEYER et al., 2012). The focus of the conference was on finding economic ways to answer to the challenges of climate change caused by the transportation industry and its stationary energy conversion processes (HOHMEYER et al., 2012). Concerning housing, similar reflections are necessary.

SCs are economic losses due to annoyances of living in a specific place or because of some activities in the vicinity of a home or inappropriateness of design of housing (GILCHRIST; ALLOUCHE, 2005). Monetary losses may be calculated and losing one's income or some types of enjoyment are also called SCs (ÇELİK; KAMALI; ARAYICI, 2017). Thus, SCs may impact a person's life in many ways from loss of income, reduced productivity and time to spend on personal choice activities, as well as reduction in spending on goods (ÇELİK; ARAYICI; BUDAYAN, 2019). Quantification of SCs through known methods is complex as such costs have their origin in society and are not attributed to specific contractual agreements, as for instance in construction projects (GILCHRIST; ALLOUCHE, 2005; ÇELİK; ARAYICI; BUDAYAN, 2019).

SC definitions can be found in the infrastructure, and construction literature areas. However, the literature offers few concise definitions of SCs linked to SH, but can be said to be the overall impact of economic activities on society's welfare (BAKER et al., 2013; FIELD, 1997).

When referring to infrastructure, SC is defined as a correspondent economic value related to adverse effects. These can be: impacts on traffic conditions, environmental and safety costs, accelerated deterioration of road surfaces, reduced business activities, property values, and damages to neighbouring properties may occur (footings or utilities) (MATTHEWS; ALLOUCHE; STERLING, 2015). SCs linked to infrastructure, maintenance, and refurbishment may cause significant - but not easily quantifiable - disruption and inconvenience to a city and its population (RAHMAN; VANIER; NEWTON, 2005). In the construction sector therefore, SCs can be caused by: 1. public utility and infrastructure (location, traffic problems, noise, safety,

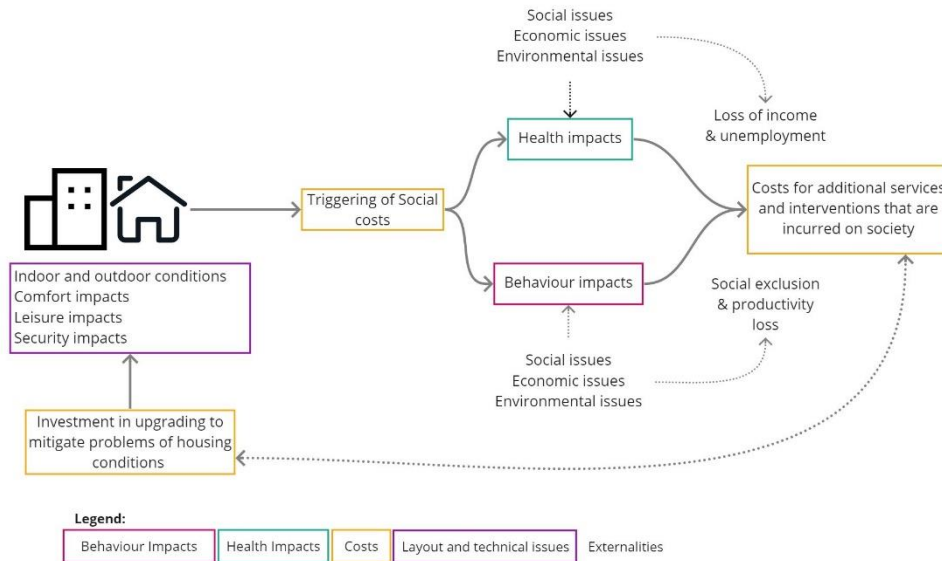
services, travel delay); 2. urban aspects (built environment, restrictions, mobility, economic activities, stigmatization, densities, insalubrious conditions); and finally, residential buildings themselves (space layout, health risks, rights, pollution) (ÇELİK; ARAYICI; BUDAYAN, 2019).

Housing conditions may have long-term consequences on inhabitants' health, implying that SCs are felt directly and indirectly by society (PEVALIN et al., 2017). They are also bidirectional, including poor health and social factors, with effects on education, ethnicity, and socioeconomic status which may ultimately impact the possibility to secure appropriate housing. SC is mostly referred to as a social determinant of health, linking housing to overall well-being (ZIERSCHE; DUE, 2018). Improving or upgrading housing conditions should thus be an essential measure, potentially mitigating or avoiding future SCs by investing in housing quality. Such investments should be only a small fraction of the SCs that would be incurred as a result of a large population living in less than desirable SH (Figure 1).

Theoretical discussions of the concept of SCs are complex but of prime importance is to find ways to mitigate the impacts of human activities on society. Few precise definitions of SCs for SH were found in our literature search. In general terms, they may be defined as costs incurred on society and the public sector by housing conditions (comfort, leisure, security, households' health, and behaviour) and surroundings (economic, social, and environmental issues).

Figure 1. Social costs triggered by Social Housing conditions

Source:
The authors



SOCIAL IMPACTS AND COSTS

A distinction can be made between social impacts (SIs) and SCs. The concept SI has no single, universally accepted definition. It can be both a positive and negative impact of planned actions (policies, programmes, strategies, projects) and also social change brought about by interventions with meanings to society and subjective (or communal) values (SAIRINEN; KUMPULAINEN, 2006). SIs can be tentatively defined as tangible effects on a community and their surroundings as a result of the action of policies (SERJE, 2017).

In general terms, impact is an effect over something or somebody and can be positive or negative. SI is a broader effect on people or whole communities due to some action and even inaction that may come from a specific activity or public policy.

On a positive side, the OECD can be shown to be a SI association that can foster improvements in social conditions through the development of economic and social policies

(<http://www.oecd.org/>). Social conditions can also have negative SIs. For instance, as stated before, the pandemic demonstrates that certain living conditions impact the virus's spread and cause health problems.

In economic terms, impact is measured through the difference of a specified indicator with and without a specific intervention (action or programme). Impacts are not always of an economic nature. In public policy design, aspirations and risks should be considered for investment decisions (PEERSMAN et al., 2016).

From literature, we know that SH impacts employment, education, health, incarceration, and ultimately homelessness (PRENTICE; SCUTELLA, 2020). In most cases, these impacts are positive, depending on the quality of SH and its location. However, the literature on SH does not give precise answers to impacts. The income effect is mentioned by Shroder (2010). It can be negative, as SH (subsidised housing) provides more disposable income, making people less inclined to work. On the positive side, more income can be spent on education and health.

The literature presents categories of SIs linked to the built environment (Table 1). Carmona (2019) categorizes impacts dividing these according to health, society, economy, and environmental issues, and defines what he calls Place Value in the SH context. Hornberg and Pauli (2011) present categories of causes and pathways of health inequality due to substandard housing, and Gilchrist and Allouche (2005) present the potential impacts and define SC parameters linked to construction activities.

Although the reasons for health impacts are at times unclear, a large body of research indicates that an increase in functional space in SH, may also increase thermal comfort. Affordable warmth for cold and temperate climates, can have many benefits for householders, and this, in turn, may lead to improved general physical and mental health (THOMSON et al., 2013).

	Health	Society	Economy	Environment
	Green spaces and physical health, Psychological well-being, Place quality and mental/physical health, Walkability, Mobility and health issues.	Street and building design and crime, Street layout and accident control, Place and liveability quality, Urban liveliness, Social inclusion and capital, Facilitative environments, Places for playing and learning.	Housing values and green spaces, Urban design and property values, Investments in street and public realms, Public expenditures.	Urban morphology, density and energy consumption, Transport, technology and pollution reduction, Thermal comfort and energy efficiency and associated pollution, Ecological resilience.
Place value framework and public policy dimensions covered (CARMONA, 2019)				
	Traffic prolonged	Pollution	Economic activities	Ecological/ social/health
Adverse impact	Prolonged closure of road space Detours Utility cuts	Noise Dust Vibration Air/water pollution		Surface/subsurface disruption Damage to recreational facilities

Table 1. Social impact categories

Fonte: Based on Carmona, 2019; Gilchrist; Allouche, 2005; Hornberg; Pauli, 2011

Social cost indicator	Lack of parking Additional fuel consumption Travel delay Increased traffic accidents rate Wear and tear of roads		Income insecurity Productivity reduction Loss of tax revenues Property damage	Treating compromised Physical/mental health Reduced quality of life Restoration cost
SIs and SCs parameters linked to construction activities (GILCHRIST; ALLOUCHE, 2005)				
	Direct		Indirect	
	Individual/household level			Area/neighbourhood level
Structural and material dimensions of housing	Physical effects of housing on health Housing type (public housing, private housing, rented, or own) Age of dwelling Physical condition of housing unit Indoor air quality (mould/dampness, noise, thermal conditions, cockroach allergens, pests, building emissions, ETC, sanitation, etc.) Homelessness	Socioeconomic status Income Assets/wealth Rent-to-income ratio		Recreational areas Room for physical activities Features of the natural and built environment
		Proximity to services and facilities		Noise Air pollution Lack of recreational areas Transportation and traffic patterns
Social dimensions of housing	Substandard housing impacts on mental health Overcrowding Fear of violent crime	Housing/area culture and behaviour		
	Feeling of 'home' Ontological security Perceived stress Family conflict			Residential stability Human capital (employment rate, education) Neighbourhood income Social capital, social fragmentation Ethnic density Segregation/integration Lack of control, etc.
Causes and pathways of health on substandard housing (HORNBERG; PAULI, 2011)				

SCs, previously defined, are considered negative. Cost is primarily related to expenditure in economic terms but can also be a sacrifice, a penalty, or price to be paid for a specific decision made by people, firms, or governments (HAHN, 1996). Costs, concerning SH, are first and foremost, affordability for low-income families. The cost of housing itself (rent and mortgage payments), and utility bills and mobility costs must be considered. In the case of homeowners, taxes and maintenance expenditures must be included (KOWALTOWSKI et al., 2018). Costs also relate to expenditures by governments and private firms to build and maintain SH.

METHODS

A systematic literature review (SLR) was applied to evaluate SCs in SH. SLRs methodically seek to assemble empirical studies related to a specific research question to analyse and interpret the context's information. Quantitative and qualitative analyses are applied to a final paper sample, selected through SLR protocols.

Specific procedures are essential to conduct a rigorous SLR. The process requires a protocol to distinguish a systematised review from a conventional literature review (TRANFIELD; DENYER; SMART, 2003; KITCHENHAM et al., 2009; XIAO; WATSON, 2019).

Our review observed the following steps:

- identify the purpose and intended goals; draft a detailed protocol to conduct the SLR;
- define inclusion and exclusion criteria;
- identify publications to be included in the review; extract applicable information from each study;
- evaluate the quality of the studies according to the previously established criteria (whether quantitative, qualitative or both analyses); and
- describe the SLR protocol in detail, for replication sake (OKOLI, 2015; CHEN; SONG, 2019).

The research data were retrieved through 'StArt', a software to search for evidence in the scientific literature and automate coding processes through qualitative and quantitative methods (BHATTACHERJEE, 2012; FABBRI et al., 2012). StArt stands for 'State of the Art through SLR and was developed by the Federal University of São Carlos's (UFSCar) LaPES (Laboratory of Research on Software Engineering. This tool facilitates access to information and data visualization that support a quantitative and qualitative SLR characterisation (FABBRI et al., 2016).

DATABASE AND STRINGS

The SLR encompassed research papers indexed by the Scielo database, including ScienceDirect, Scopus, and Web of Science databases. We adopted our inclusion and exclusion criteria shown in Table 2.

Inclusion (accepted papers)	Exclusion (rejected papers)
<i>Impacts:</i> social impacts, cost benefits, social needs, socioeconomic factors and status, social inequalities, social support, social instability, public costs, externalities costs, additional costs, productivity, income, opportunities.	Animals studies, social (interaction, isolation, behaviour and housing).
<i>Health:</i> welfare or well-being, mental health, determinants of health, health status, health inequalities, diseases, quality of life, life satisfaction.	Health and behaviour issues not associated with social housing and households' welfare.
<i>Behaviour:</i> social attitudes, goodwill, social values, social goals, social cohesion, life benefits, environmental values, sense community, social perceptions, whole-life values, social interaction, neighbourhoods' interaction, social influences,	Not specified: social costs, social housing or social health.

Table 2. SLR inclusion and exclusion criteria

Source:
The authors

social inclusion, social exclusion, fear (insecurity), low cognitive development, distrust between users, neighbourhood instability, urban violence, vandalism, conflicts, neighbourhood risk factors, neighbourhood disorder.	
<i>Housing</i> : social housing, affordable housing, mass housing, low-income housing, public housing, substandard housing: housing attributes, housing conditions, performance, housing functionality, physical design, comfort, security, density, crowding, indoor quality, outdoor spaces, performance, leisure.	Studies with similar concepts, however, not matched with SC, behaviour and health on social housing.

A number of terms were combined to cover associated issues and form eight strings detailed in Table 3.

Table 3. Strings used in the SLR

Source:
The authors

Strings	Description - ScienceDirect, Scopus, Web of Science
String 1	"Mental health" AND "Social cost" AND "Social Housing" AND "Housing conditions" AND ("Social attitudes OR behavi*r) AND (Physical design OR Configur* OR layout OR attributes)
String 2	Health AND ("Social housing" OR "Affordable housing" OR "Mass housing") AND ("Social perspective" OR outcomes OR Satisfact*) AND (Improve* OR Upgrad* OR Intervent*)
String 3	Health AND (well-being OR welfare) AND (Social behavi*r) AND (Quality of life OR Life benefits OR Environmental value) AND (hous* Functional*) AND Performance
String 4	behavi*r AND "social housing" AND vandal* OR conflict
String 5	("Social housing" OR "Affordable housing" OR "Mass housing") AND ("social cost" OR "Social impacts")
String 6	Health AND "social housing" AND well-being
String 7	Health AND "social housing" AND "housing conditions"
String 8	"Social cost" AND health AND "social housing"

DATA ANALYSIS

Many papers cover the defined strings and topics of interest (Figure 2). We adopted a practical screening procedure to select or exclude papers from the StArt's software. The score citation automatic selection strategy was applied. This method semi-automatizes the evaluation of studies in a SLR based on a score and the number of citations (FABBRI et al., 2016).

The method for score value calculations considers keywords in title, keywords in abstract, keywords in keywords (FABBRI et al., 2012). Thus, studies fall into four quadrants (Q): i) Q1 – papers with large scores and one citation shown; ii) Q2 – studies with large scores, but without citations; iii) Q3 – studies with small scores and one citation shown; and Q4 – studies with small scores but without citations (FABBRI et al., 2016). Using StArt, Studies of quadrant 1 should be accepted, quadrant 4 should be rejected, considering that those studies do not match keywords in title, abstract and keywords. Quadrant 3 and quadrant 2 should be manually reviewed.

Thus, for analysis and final sample definition (Figure 3) papers which do not cover the main topic and strings, quadrant 4, or present exclusion contexts, were automatically excluded. Also, studies without permitted full text access were excluded. For critical decisions, we also developed a manual analysis, using our inclusion and exclusion criteria, through reading the abstracts. Finally, for quality and data synthesis, all previous accepted studies were read and information extracted. The type of data extracted is based on the research questions

established during the protocol phase. Thus, information on housing, neighbourhood and urban impacts, as well health and behaviour effects were extracted and grouped according Figure 5. Data were organized by categories, with information to explain how housing conditions and externalities cause impacts and costs, and affect health and behaviour of dwellers (Figure 6 and Figure 7).

SAMPLE DESCRIPTION AND ANALYSIS

A panorama of results was generated, and the publications found in the databases are shown, presented in Figure 2. The final studies accepted following an analysis process is presented in Figure 3. Quantitative and qualitative analyses outcomes are detailed.

Though most strings returned numerous hits, the majority of the studies were rejected because inclusion and exclusion criteria and valid papers in each of them represented only a fraction of the initial findings. String 1, string 6, and string 7 presented most papers included in the sample. Thus, we considered 'health', 'social housing', 'well-being', and 'housing conditions' as the acceptable terms for our investigation.

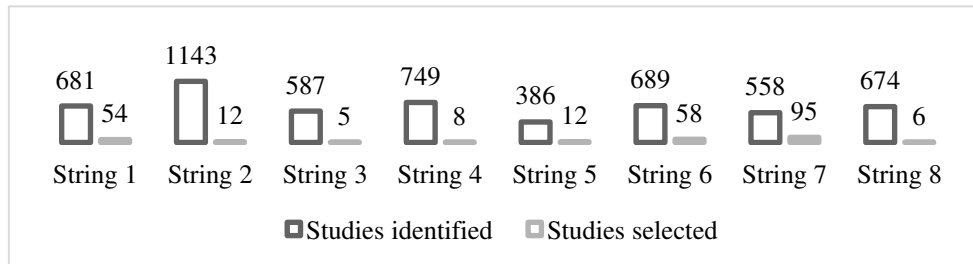


Figure 2. Studies identification and selection in relation to SLR search strings

Source:
The authors

After considering inclusion criteria, general analyses, and full paper assessment, only 97 studies – drawn from over 5000 papers - composed our final sample (Figure 3), covering the period between 1978 and 2020.

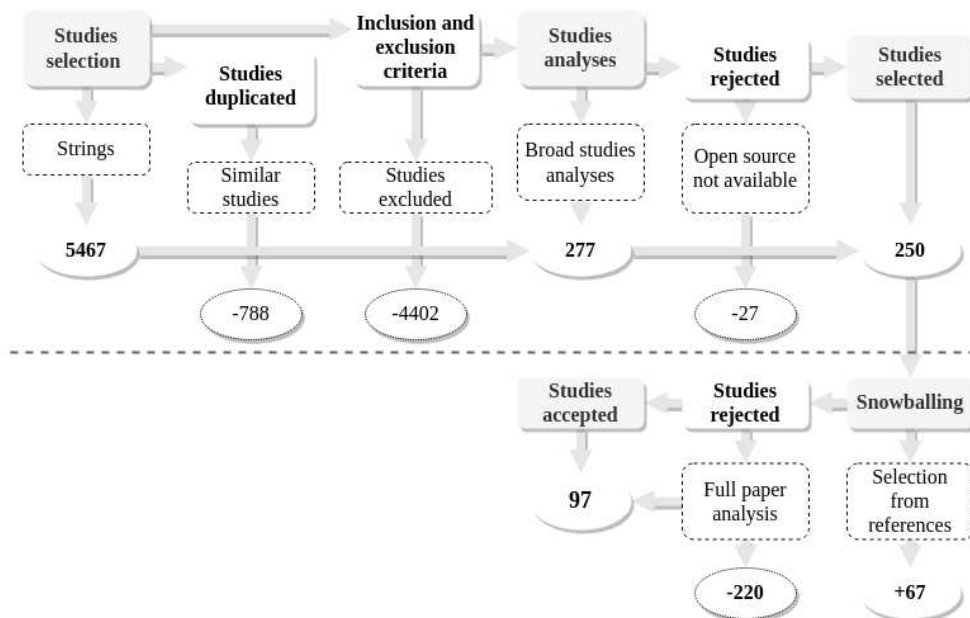


Figure 3. Number of studies analysed and final sample definition

Source:
The authors

The selection result confirmed the limited availability of publications on SCs. The breakdown of papers examined per issue, shows that most studies are associated with the topics “health and housing impacts, 32 papers” and “housing and neighbourhood impacts, 29 papers” (Figure 4). About one-quarter of the studies simultaneously associated “health and behaviour and housing impacts, 25 papers”.

Figure 4. Breakdown of papers per main issues investigated

Source:
The authors

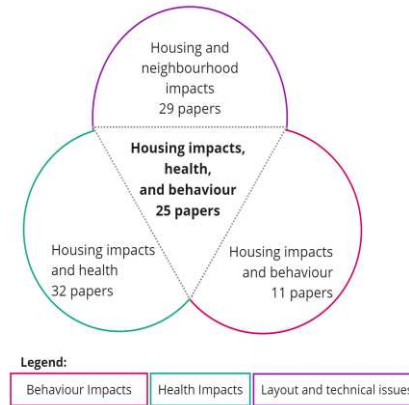


Table 4 presents studies on the issues and complements Figure 3 and Figure 4. The studies cover a period from 1978 to 2020.

Table 4. Issues and studies

Source:
The authors

Issue	Studies on the issues (Authors)
Health and housing impacts	Gray, 1978; Hopton; Hunt, 1996; Brugge et al., 2001; Thomson; Petticrew; Morrison, 2001; Leventhal; Brooks-Gunn, 2003; Richardson et al., 2006; Shortt; Rugkåsa, 2007; Gibson et al., 2011; Bentley et al., 2011; Egan et al., 2013; Thomson et al., 2013; McGill; Qin; Oyedele, 2014; Curl; Kearns, 2015; Thomson; Thomas, 2015; Maqbool; Viveiros; Ault, 2015; Novoa et al., 2015; Soares et al., 2015; Bentley et al., 2016; Hanapi; Ahmad, 2016; Hernández, 2016; Boomsma et al., 2017; Mari-Dell'olmo et al., 2017; Pevalin et al., 2017; Novoa et al., 2017; Thompson et al., 2017; Park; Jung, 2019; Poortinga et al., 2017; Diaz et al., 2018; Walton, 2018; Boomsma et al., 2019; Vakalis et al., 2019; Xiao et al., 2020
Behaviour and housing impacts	Djebarni; Al-Abed, 2000; Vera-Toscano; Ateca-Amestoy, 2008; Mohit; Ibrahim; Rashid, 2010; Aziz; Ahmad, 2012; Karim, 2012; Teck-Hong, 2012; Chaskin; Sichling; Joseph, 2013; Said; Yulastuti, 2013; Weinhardt, 2014; Acolin; Hoek-Smit; Eloy, 2019; Raynor et al., 2020
Health, behaviour and housing impacts	Yeung, 1983; Evans, 2003; Sandel; Wright, 2006; Guite; Clark; Ackrill, 2006; Mueller; Tighe, 2007; Jackson et al., 2009; Ruel et al., 2010; Kelaher et al., 2010; Lee; Kim; Lee, 2010; Molnár et al., 2010; Hornberg; Pauli, 2011; Suglia; Duarte; Sandel, 2011; Solari; Mare, 2012; Cotter et al., 2012; Zainal et al., 2012; Hayward et al., 2015; Soares et al., 2016; Andersen et al., 2017; Baker et al., 2017; Ortiz; Johannes, 2018; Sánchez-Guevara; Sánchez; González; Hernández Aja, 2018; Kopal Grum, 2018 ; Mouratidis, 2019; Swope; Hernández, 2019; Ortiz; Itard; Bluysen, 2020
Housing and neighbourhood impacts	Kellekci; Berköz, 2006; Kowaltowski et al., 2006; Salleh, 2008; Juan et al., 2009; Kowaltowski; Granja, 2011; Boeri; Gabrielli; Longo, 2011; Boeri; Gabrielli; Longo, 2011; Morris, 2012; Tan, 2012; Ibem et al., 2013; Stafford, 2014; Newman; Holupka, 2014; Matthews; Allouche; Sterling, 2015; De Jong; Schout; Abma, 2015; Higham; Fortune; Boothman, 2016; Omar et al., 2016; Ozariso; Altan, 2017; Petković-Grozdanović et al., 2017; Wright; Zeeman; Whitty, 2017; Tibesigwa; Hao; Karumuna, 2017; Sosa; Correa; Cantón; Preciado-Pérez; Fotios, 2017; San Miguel-Bellod; González-Martínez; Sánchez-Ostiz, 2018; Kowaltowski et al., 2019; De Wilde, 2019; Buregeya; Loignon; Brousselle, 2019; Bardhan; Sunikka-Blank; Haque, 2019; Larcombe et al., 2020; Lowe; Chiu, 2020

RESULTS AND ANALYSIS OF FINDINGS

Figure 5 divides the investigated aspects into categories visually represented on different issues (economic, social, and environmental) and scales (urban, indoor and outdoor spaces).

Most papers focused on urban and neighbourhood issues and the widespread social and economic impacts of SH (Figure 5).

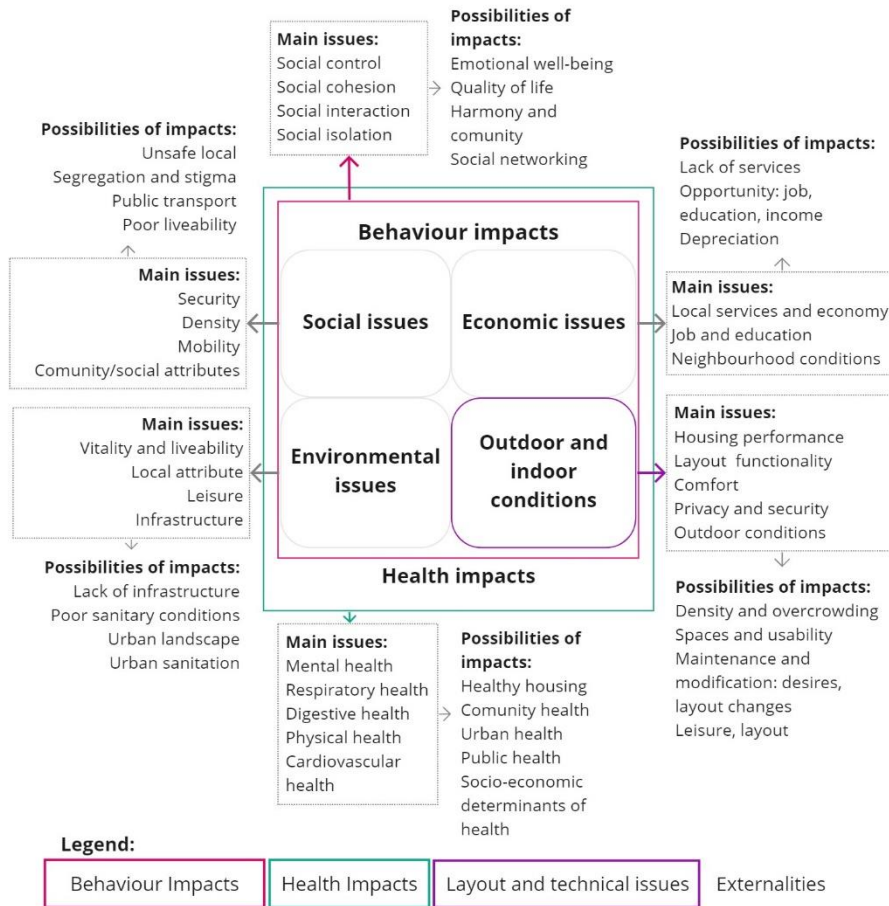


Figure 5. Categories of urban indoor and outdoor issues.

Source:
The authors

Within this housing context, mental health is considered the major health impact of housing conditions. Content analysis within the six categories in Figure 5 identified social costs caused by housing unit conditions (Figure 6 and Figure 7) and pathways at the urban and neighbourhood scales (Figure 8).

The theoretical foundation provides an understanding of SCs and the relation between cause and effect in this context. Multiple factors can have impacts in a specific situation. For example, as shown in Figure 6, inferior quality construction materials and acoustic isolation directly impact acoustic discomfort, and inadequate thermal insulation can cause heat gains from solar radiation, creating uncomfortable thermal conditions. Also, the relation to public space, low quality, or problematic access to recreational and leisure facilities directly increases psychological insecurity, which reduces outdoor space use, which, in turn, impacts both the physical and psychological health of people. The following analysis complements Figure 6, Figure 7 and Figure 8.

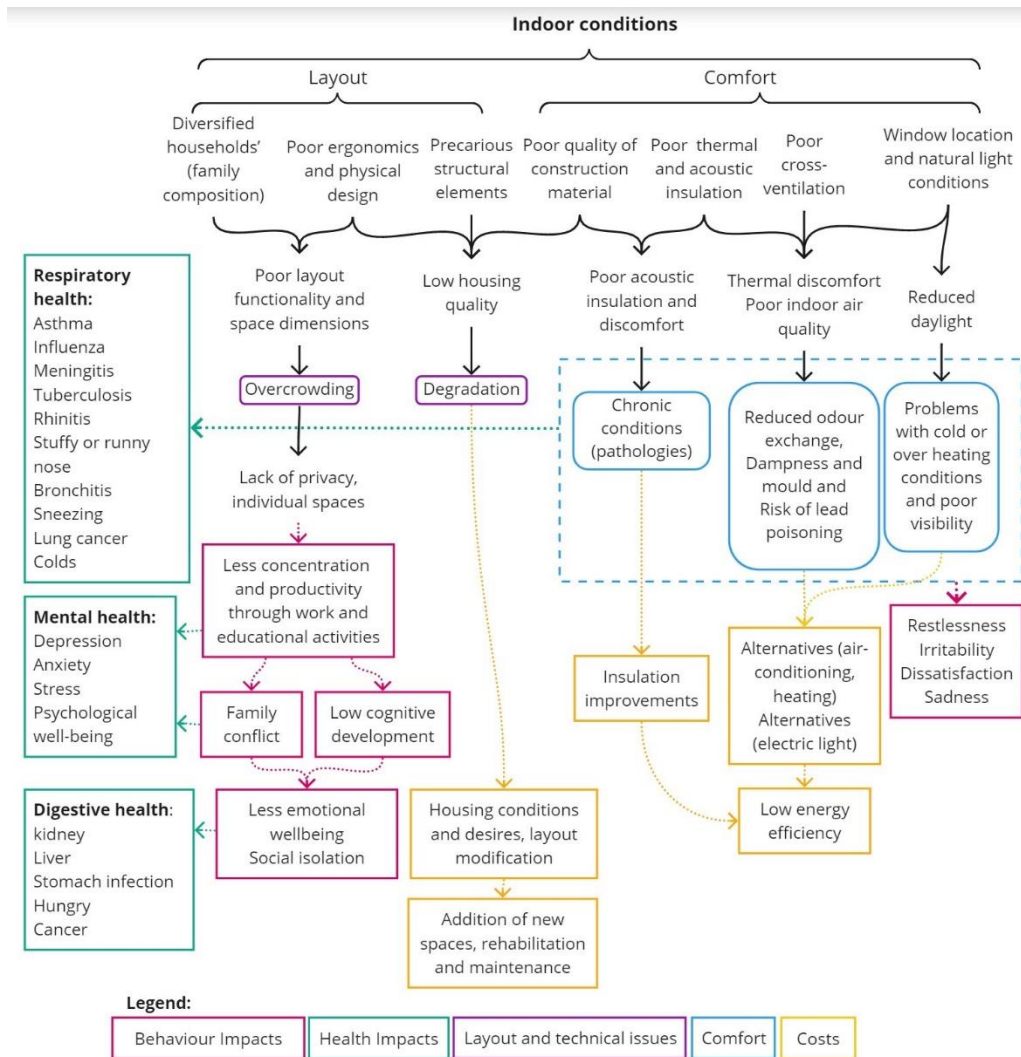
Housing scale

Housing at the residential unit scale has impacts coming from indoor and outdoor conditions. Figure 6 focuses on the housing unit scale to describe how internal conditions have technical

and SIs, ultimately evolving into behavioural and health impacts that finally turn into potential SCs.

Figure 6. Social costs, causes and pathways at building and housing unit levels – indoor conditions

Source:
The authors



In this context, the main issues are poor housing layouts and construction quality and the quality of common outdoor areas (ORTIZ; ITARD; BLUYSEN, 2020; VAKALIS et al., 2019; POORTINGA et al., 2017; BOOMSMA et al., 2017). Poorly designed SH projects impose costs on dwellers during their lifetimes and affect neighbours and society (TIBESIGWA; HAO; KARUMUNA, 2017). Inadequate internal space organizations, or the layouts of homes, affect a dwelling's functioning, as arrangements of housing elements and spaces must satisfy users' daily routines (BARDHAN; SUNIKKA-BLANK; HAQUE, 2019; SOARES et al., 2016). Poor internal layouts are often associated with less than adequate space dimensions, which impact houses or apartments' functionality. Although focusing on shelter, affordability, availability, and accessibility, SH and its spaces should be functional and offer positive social interactions among dwellers (OMAR et al., 2016).

While internal design elements directly affect functional issues, structural problems resulting from poor-quality construction are shown to lead to chronic conditions (pathologies) of housing units (HANAPI; AHMAD, 2016; TECK-HONG, 2012; SWOPE; HERNÁNDEZ, 2019). Most defective installations, infiltrations, cracks, moulds, and dampness are related to low-quality material and construction execution and subsequent lack of maintenance. These conditions

configure substandard housing resulting in devaluation and place stigma (SWOPE; HERNÁNDEZ, 2019). Furthermore, low quality construction and the use of poor and toxic materials can also cause low thermal control of homes, discomfort, high solar radiation, and health risks (NOVOA et al., 2015; VAKALIS et al., 2019).

Various other types of discomfort can be identified, as well. Inadequate acoustic insulation has direct impacts on annoyance with noise, and privacy issues, while lack of proper thermal insulation can cause extreme home temperatures, overheating, or cold rooms with excess dampness and mould depending on climate (SWOPE; HERNÁNDEZ, 2019; VAKALIS et al., 2019; MCGILL; QIN; OYEDELE, 2014). Low indoor air quality can be caused by blocked or inadequately located windows and directly affect occupant health.

Opening dimensions and their location will impact levels of natural lighting in functional spaces and possibilities of cross-ventilation (SOSA; CORREA; CANTÓN, 2018). Poor lighting affects manual home tasks, reading and studying activities, and the need for additional artificial light with consequential higher electricity bills, and continued spending, can both increase costs and reduce income (XIAO et al., 2020; BAKER et al., 2019; MARÍ-DELL'OLMO et al., 2017). Lack of adequate ventilation hampers odour removal, creating olfactory discomfort, and can cause mould and dampness, that affect occupants' health directly (ORTIZ; ITARD; BLUYSSSEN, 2020; THOMSON et al., 2013; SAN MIGUEL-BELLOD; GONZÁLEZ-MARTÍNEZ; SÁNCHEZ-OSTIZ, 2018; PRECIADO-PÉREZ; FOTIOS, 2017).

Living in uncomfortable and overcrowded homes may put residents at risk, which can cause respiratory infections a major risk for the elderly or may cause the spread of infectious diseases (CURL; KEARNS, 2015). Overcrowding has various causes. It may be due to the number of dwellers living together in a housing unit and the unit size or functional area available per family (SOLARI; MARE, 2012; TIBESIGWA; HAO; KARUMUNA, 2017).

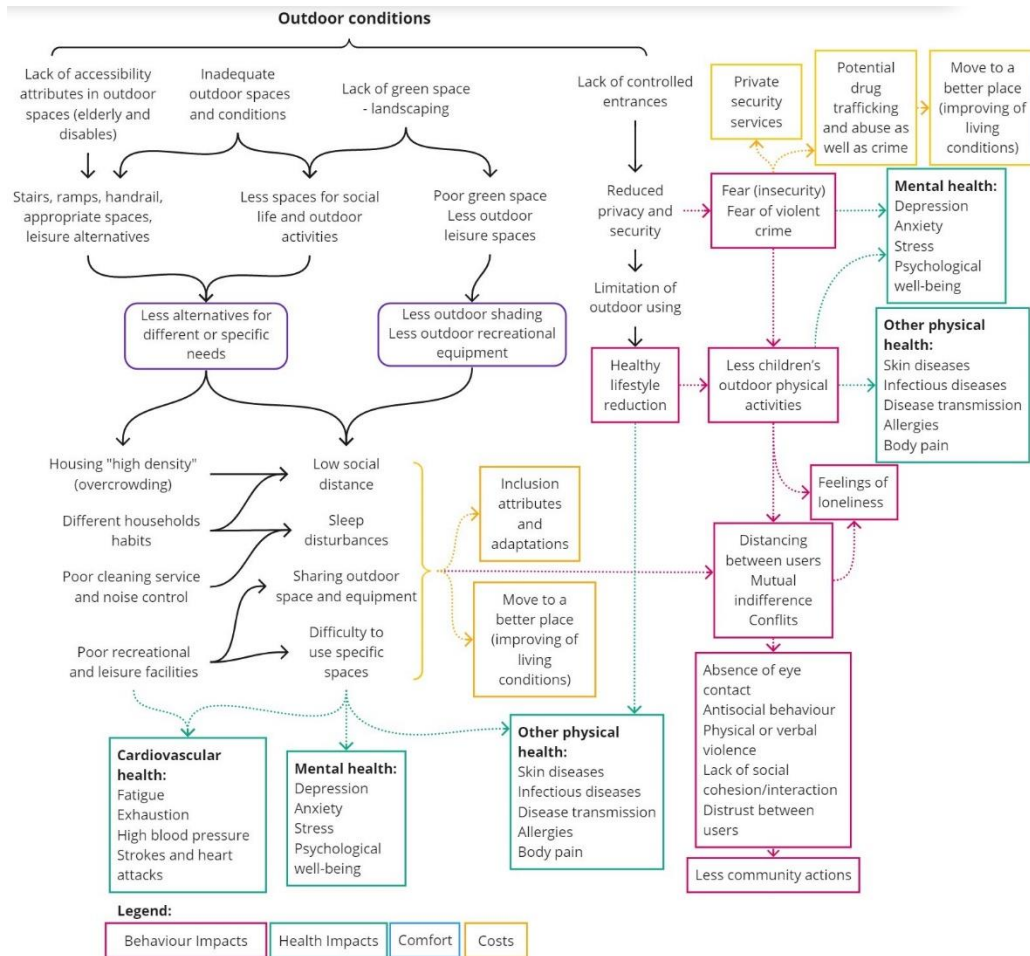
Crowding may curtail everyday indoor activities such as preparing and eating family meals, homework for children and youth, as well as play (SOLARI; MARE, 2012). In some extreme cases, turns are taken in executing activities, including sleeping, with negative consequences on families' normal functioning. Overcrowding is therefore linked to adverse health outcomes, such as psychological and cognitive impacts, increased infection rates, and other comorbidities (SWOPE; HERNÁNDEZ, 2019; MUELLER; TIGHE, 2007; SANDEL; WRIGHT, 2006).

A large number of studies are published in medical areas, concentrating on respiratory health improvements. Moreover, although many studies point out that cognitive health problems are frequent, specific care for mental health needs are rarely included in house improvement projects.

Inadequate indoor conditions, found in our SLR, mention design and layout problems that are also not attended in most refurbishment programs. Fire, accident, and exposure to toxic materials prevention measures, which are part of most building regulations and codes, should be priorities in such programs, but surprisingly, according to THOMSON et al. (2013), were excluded in the criteria for housing improvement interventions. This finding indicates that refurbishments are triggered not by demonstrated needs but by mandatory agendas. A review of minimum code standards may be needed to raise general SH quality.

Figure 7. Social cost, causes and pathways at building and housing unit levels – outdoor conditions

Source:
The authors



Problems with outdoor activities also exist. Outdoor spaces of SH represent the connection and relationship of users with other people surrounding them. In SH developments, these spaces represent semi-private housing elements to visually or physically control access and provide for leisure through common shared spaces and equipment (KARIM, 2012). However, in many SH complexes, dwellers avoid the use of outdoor spaces, as extensions of living units, for various reasons (AZIZ; AHMAD, 2012). Unsafe community conditions and a general lack of security are considered the main issues of user dissatisfaction with SH (SOARES et al., 2016; IBEM et al., 2013; HAYWARD et al., 2015). Neighbourhood and housing safety issues curtailed outdoor activities, especially of children, with negative consequences on their health and development (HANAPI; AHMAD, 2016).

Inadequate distances between buildings, insufficient numbers, and size of equipment, as well as accessibilities in general, can lead to social isolation. Dwellers may retreat from one another, avoiding eye contact and developing mutual indifference. Loneliness feelings, alienation, apathy, and depression may result (KOBAL GRUM, 2018).

Some psychological problems, such as emotional distress and depression, are very high and chronic in many SH complexes (HOPTON; HUNT, 1996; MATTHEWS; ALLOUCHE; STERLING, 2015). Interpersonal conflicts, depression, anxiety, and other psychological issues that may afflict grownups and children can reduce concentration and productivity of work and educational activities (MARÍ-DELL'OLMO et al., 2017). The quality of social interactions is related to how people can live in harmony and to avoid conflict among neighbours and thus may reduce SCs (SAID; YULIASTUTI, 2013).

External issues

Figure 8 details how the neighbourhood physical design influences economic (Figure 8.1), social (Figure 8.2), and environmental (Figure 8.3) issues, which ultimately evolve into behaviour and health impacts that finally turn into potential social costs.

Economic issues

Most deprived neighbourhoods have high concentrations of unemployment and low qualification rates among its residents. High building density, overcrowding, and low-quality construction standards are associated with such areas as well (WEINHARDT, 2014). Poor neighbourhoods limit social development and economic activity opportunities (KELAHHER et al., 2010; MOLNÁR et al., 2010).

The developments' peripheral urban location may increase expenditures in mobility and affect unemployment (ACOLIN; HOEK-SMIT; ELOY, 2019). Enhanced opportunities for low-income populations have been shown to improve access to social advances (SOLARI; MARE, 2012). Greater economic and social opportunities may, in turn, result in better physical and mental health in adults and increase feelings of their socioeconomic status (XIAO et al., 2020; HAYWARD et al., 2015).

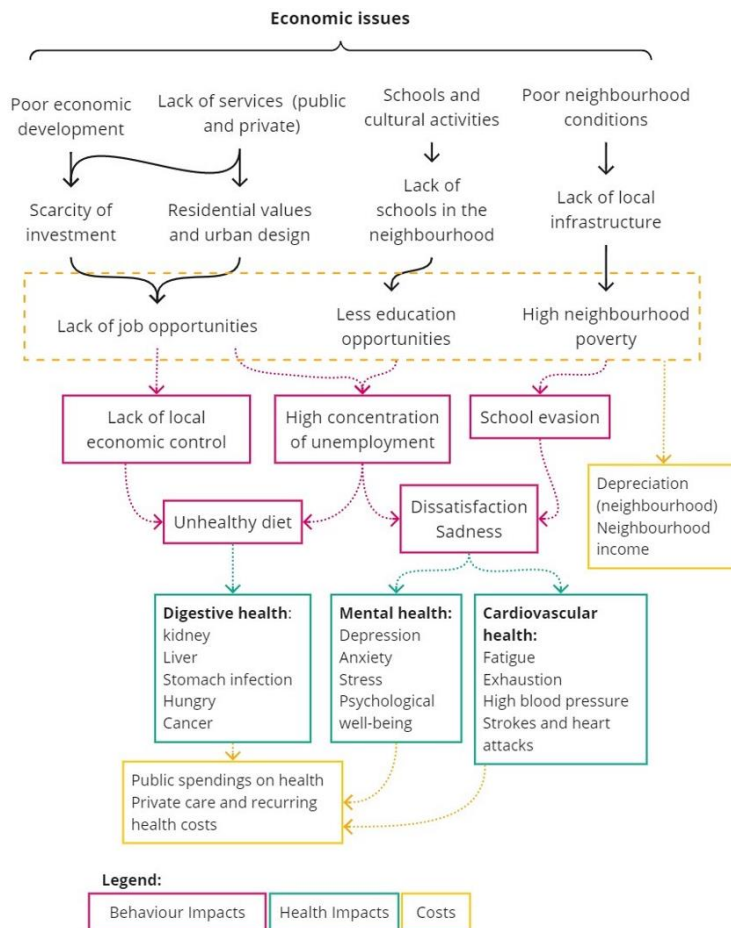


Figure 8.1. Influence of neighbourhood physical design on economic issues

Source: The authors

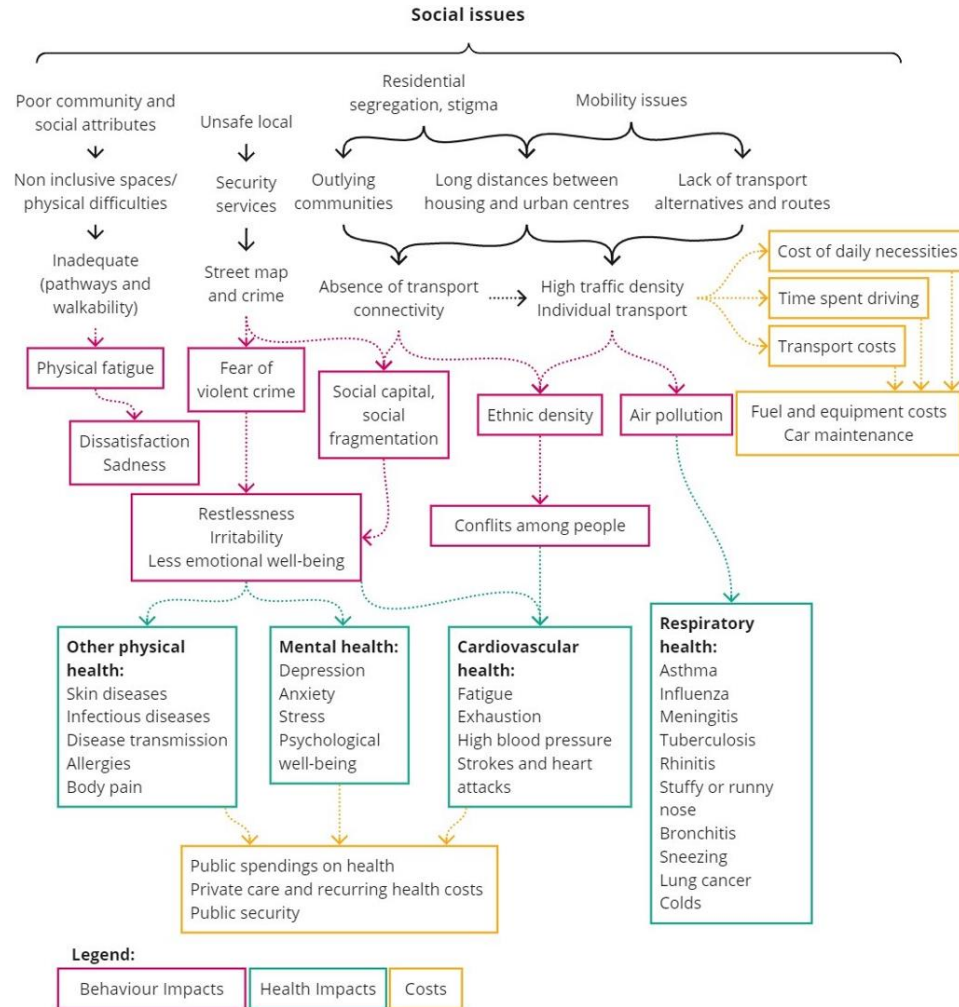
Social issues

Besides the physical housing context, SH dwellers also need to confront social issues. Commonly, social and community attributes do not meet dwellers' needs and expectations in a SH developments (ORTIZ; JOHANNES, 2018; IBEM et al., 2013). The planning and design of SH complexes ought to consider the physical accessibility of neighbourhoods (location), mainly through urban mobility.

SH areas should promote a sense of community and privacy and allow for social, cultural, educational, and physical activities (WRIGHT; ZEEMAN; WHITTY, 2017). Poor community and social attributes have also been shown to reduce social networking and its social consequences (ORTIZ; JOHANNES, 2018; AZIZ; AHMAD, 2012).

Figure 8.2. Influence of neighbourhood physical design on social issues

Source: The authors



As mentioned before, location and mobility are the main problems affecting SH dweller's health, behaviour, and income (BARDHAN; SUNIKKA-BLANK; HAQUE, 2019; DIAZ et al., 2018; OZARISOY; ALTAN, 2017; SOARES et al., 2016; IBEM et al., 2013). These problems are related to being segregated from the central business district. Difficult access to amenities and services found in shopping centres often exist in such projects. Schools may be far and transportation poor (KOWALTOWSKI et al., 2019).

Time spent traveling and public transportation expenses compress family income and affect health and public costs (TAN, 2012). The quality of public transportation, inadequate distances,

and pathways between bus stops and housing units may expose people to crime in specific situations and are significant problems in this context (OMAR et al., 2016). Over an often-long commuting time, people experience stress, irritability, and are exposed to pollution (KOBAL GRUM, 2018; TAN, 2012; TECK-HONG, 2012). The dwelling's location related to access to outdoor leisure activity spaces is of important concern to promote greater well-being (WRIGHT; ZEEMAN; WHITTY, 2017).

General neighbourhood conditions, pollution, and crime are essential items for assessing households' surroundings (TECK-HONG, 2012). In poor urban neighbourhoods' residents feel unsafe walking out alone after dark in neighbouring streets. Higher-income areas, their counterparts at a national level, demonstrate that residents feel less insecurity both in their homes and in the immediate neighbourhood (HAYWARD et al., 2015). The lack of quality schools, less likely present in outlying SH neighbourhoods, is also considered an essential determinant of long-life opportunities, such as jobs, financial stability, and even a healthy diet (ANDERSEN et al., 2017; MAQBOOL; VIVEIROS; AULT, 2015).

Environmental issues

Poor neighbourhood conditions may impact the environment in more than one way. Low-quality services, lack of local amenities, recreational areas, and less urban greenness decrease social activities. Walking, considered healthy, is reduced in such neighbourhoods and long commute times expose users to pollution (HANAPI; AHMAD, 2016; MOURATIDIS, 2019). Thus, high traffic density, poorly connected public transport systems, lack in neighbourhood upkeep and of schools, health centres in the area, as well as exposure to pollution and overpopulation are considered the main negative aspects associated with typical housing projects in outlying urban areas found mainly in developing countries (KOBAL GRUM, 2018).

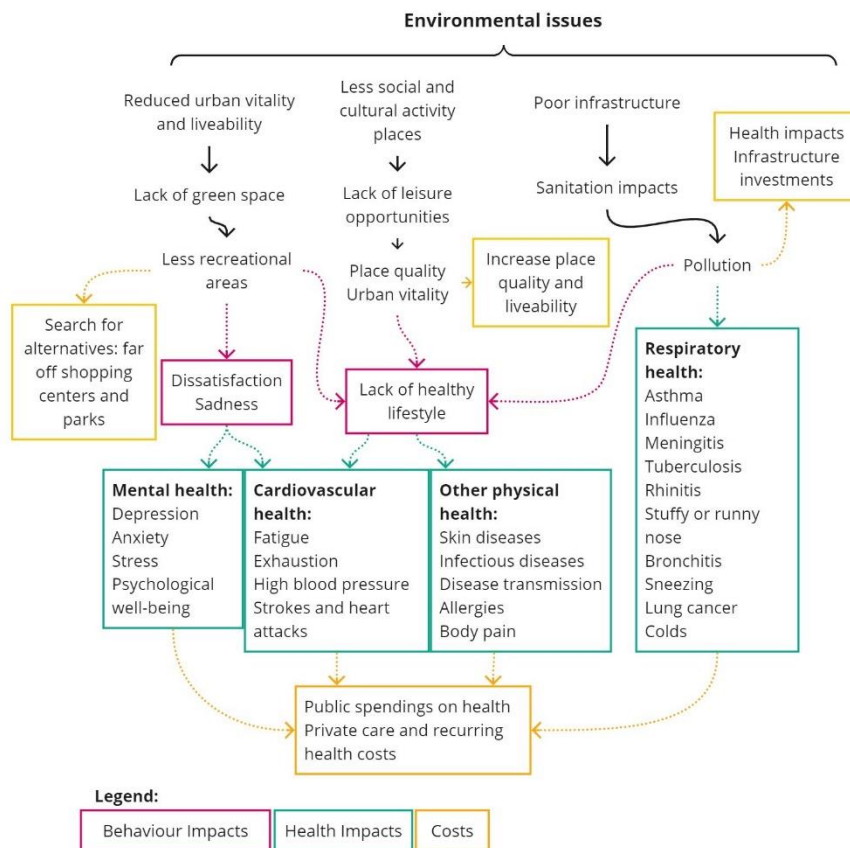


Figure 8.3. Influence of neighbourhood physical design on environmental issues

Source:
The authors

Also, insufficient or inadequate green spaces and leisure opportunities directly reduce people's well-being, urban vitality, and the neighbourhoods' habitability (MOURATIDIS, 2019; THOMSON; THOMAS, 2015; WEINHARDT, 2014; THOMSON et al., 2013; DJEBARNI; AL-ABED, 2000). On the positive side, studies show that green spaces have a strong positive impact on satisfaction with recreational opportunities and environmental issues (MOURATIDIS, 2019).

Also, a list of facilities provided and aspects considered, such as: community and recreation areas, commercial and service centres (urban centrality), carefully designed socio-physical aspects of housing, good mobility possibilities, access to a variety of social services and amenities, playgrounds, cultural and recreational activity facilities, and security have positive impacts on satisfaction rates of housing complexes. These facilities are part of planning and design recommendations that improve the environmental quality of SH complexes (KELLEKCI; BERKÖZ, 2006).

An analysis on Brazilian SH studies was developed by the “*Observatório das Metrópoles*”, “*Laboratório de Habitação e Assentamentos Humanos - LabHab*”, “*Rede de pesquisa cidade moradia*”, and journal publications which contemplate different metropolitan regions to understand how housing and externalities issues impact Brazilian SH dwellers were identified in our SLR.

The studies contemplate the metropolitan areas of Rio de Janeiro: Rio de Janeiro Queimados, Belford Roxo, Madureira (CARDOSO; MELLO; JAENISCH, 2015; ANDRADE, 2015; De SOUZA; ARRUDA; MARY, 2016); the Baixada Santista: Itanhaém, São Vicente (RUFINO et al., 2015); Belém: Ananindeua (LIMA et al., 2015); Belo Horizonte BH: Betim, Ribeirão das Neves, e Viçosa-MG (NASCIMENTO et al., 2015; CARVALHO; STEPHAN, 2016); Fortaleza: Fortaleza, Maracanaú, Caucaia (PEQUENO; ROSA, 2015); São Paulo: São Paulo, Osasco, Cidade Tiradentes (PAZ et al., 2015; SERAPIÃO, 2016; RIZEK, 2015); Campinas: Campinas, Hortolândia (VANNUCHI et al., 2015); Natal: Ceará-Mirim, Extremoz, Macaíba, Parnamirim, São Gonçalo do Amarante, Natal (SOBRINHA et al., 2015; MOURA, 2014); Paraná: Londrina (VICENTIM; KANASHIRO, 2016) and Sertãozinho a city in the centre of the state of São Paulo (LOPES et al., 2015).

The same framework presented in Figure 5 was applied to organize an outlook of Brazilian SH studies (Figure 9), revealing both gaps and peculiarities. Less attention was generally given to impacts associated with health and behaviour issues, even though households living in vulnerable conditions are exposed to respiratory, digestive, and mental or cognitive issues. Indeed, studies developed during the COVID-19 pandemic in Brazil reported that people living in low-vitality/liveability places show increased mental health problems (ConVid Behavioural Research, 2020).

Behavioural impacts are frequently associated with metropolitan regions with high crime rates, causing insecurity, distrust among users, drug abuse, increased crime rates and drug trafficking, noise disturbances, and distancing of users (ANDRADE, 2015; RUFINO et al., 2015; NASCIMENTO et al., 2015; PAZ et al., 2015; VANNUCHI et al., 2015). In Brazil, most studies highlighted urban and neighbourhood impacts rather than housing and unit impacts. The main problems identified, mainly due to location of SH projects were, job opportunities, lack of services and economic status, residential segregation, community attributes, and urban mobility (VICENTIM; KANASHIRO, 2016; ANDRADE, 2015; RUFINO et al., 2015; PONTES et al., 2015; NASCIMENTO et al., 2015; PEQUENO; ROSA, 2015; LOPES et al., 2015; RIZEK, 2015; SOBRINHA et al., 2015).

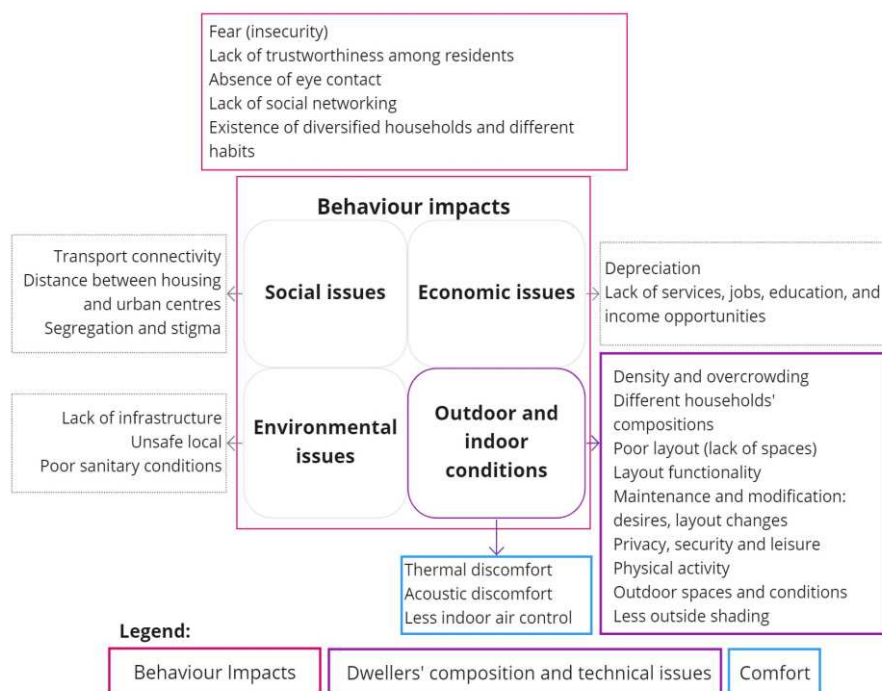


Figure 9. Social Costs related to Brazilian Social Housing studies

Source:
The authors

Source: The authors

DISCUSSION AND FINAL REMARKS

This study brought to light definitions of what constitutes SCs in relation to SH and what triggers these is represented in structured results of our SLR, visually represented on different issues (economic, social, and environmental) and scales (urban, indoor and outdoor spaces). A large volume of research addresses the interface of SH, health and well-being. However, the available literature on SCs presents as yet few studies directly relating to SH design and construction variables.

We know that the SH stocks are large worldwide, and problems linked to them are recurrent. Also, although political programmes have broad social goals such as, to reduce homelessness and increase affordability of minimum standard housing, these are rarely associated with SCs.

Policies envision qualitative targets such as: SH corresponding to changing and special needs of different segments of the population, quality of buildings and the housing neighbourhood environment. In most countries, goals include combating social exclusion and avoiding segregation as well as eviction protection. In developed countries, due to global agendas, increasing energy efficiency of SH has become mandatory. Most programmes also require user or tenant participation in decision making processes relating to housing interventions.

However socially conscious and engaged these goals are, most SH production does not specifically consider well-known associated SIs and possible SCs. In cold and temperate climates, health risks are connected to poor thermal conditions of social housing, which can directly affect an individual's care costs. Poor housing conditions therefore can exert considerable pressure on the capacity to provide quality public health.

Social unrest and family conflict related to crowding and low-quality housing are further factors that came to light in this study. These can impose costs on local services such as policing and social assistance. It is our contention therefore that quality parameters for housing and

urban insertion should include equations between land and production costs, as well as SCs to ensure adequate quality of life, living conditions, work opportunities, access to education, health, culture, leisure, and services in general.

Design, construction, and maintenance quality are considered elements of what is called Place Value in the literature. Positive impact factors found in our SLR of Place Value were generic descriptions of urban form, mobility, vitality, walkability, accessibility, availability of services, safety, greenness, and recreational areas. Liveability, privacy with controlled entrances, and environmental comfort on the residential unit level were included. Although in most research these factors are not detailed, liveability may include cleanliness, lack of dampness and mould, and pests and toxic materials.

Some more specific negative impact elements can be identified, such as segregation and stigmatisation, noise, air pollution, dust, crime, and overcrowding on the neighbourhood scale. For the design of homes, factors such as diversification of layouts, ergonomics (form and dimension of spaces), construction and finishing quality, thermal and acoustic insulation, and window location and dimension are mentioned in the literature. Warmth and reduced drafts are the main issues for SH in cold or temperate climates, while some articles mention the importance of cross ventilation and shading for hot and tropical climates.

The literature gives few detailed design directives to mitigate negative impacts. Creative, positive factors that increase people's satisfaction with their home environment are also rarely brought forward. Improvement interventions are primarily to correct structural problems, increase energy efficiency and warmth. Although most studies concentrate on health problems, interventions to meet mental health and other specific care needs are rare. Our SLR also showed that housing design and layout problems are not attended in most upgrading or refurbishment programs. Thus, importance is primarily given to mandatory items such as improving projects' energy efficiency, and surprisingly, building code-related safety and prevention measures are rarely priorities in such programs.

Our review results present an overview of how housing can impact people's health, behaviour, and trigger SIs, both positive and negative, as well as costs. The study organised research on impacts of SH conditions found in the literature. The visualization of the various issues involved contributes to understanding the relationship between housing conditions and SCs. This new understanding should induce, on the one hand, investigations to improve SH design and its upgrading. On the other hand, identified research gaps should stimulate investigations to uncover specific housing elements associated with SCs. Also, even with an expressive number of studies presenting SH impacts on health and behaviour issues, investigation results are mostly in the form of subjective interpretations, presented in generic terms.

There is a lack of detailed research to contribute and expand knowledge on the reasons for health and behaviour problems. The specific design elements that contribute to these negative impacts should be further pursued in studies. Also, what constitutes positive factors should be highlighted. Do people perceive specific attention given to design details and management particulars, are questions to investigate. To envision housing improvement initiatives that effectively increase well-being, reduce environmental impacts and cost of living, contributing to positive social and technological development, robust scientific data is essential.

SC assessments offer new insights on possible actions to incorporate into housing systems designed for vulnerable population segments. SC information may direct investments to reduce future impacts and costs. Public policy and construction companies should encourage alternatives that can reduce the recurring social impacts associated with SH. Deploying a methodical approach to incorporate SCs into upgrading project evaluations is critical to advance long-term, sustainability-oriented solutions.

Further research should focus on specific findings to create strategies to improve SH and increase its beneficiaries' quality of life. Specific analyses should be undertaken to consider various contexts, map SCs, and identify specific SH attributes that may be altered through upgrading programs to mitigate deleterious social impacts.

Collaborative studies and actions are essential. These should rely on partnerships involving key stakeholders, such as users, designers, producers from the construction industry, and public agents or housing associations. Actions should promote social innovations and permit the creation, development, testing, and implementation of new housing design solutions. Social innovations should rely on an effective partnership of stakeholders and respect for various viewpoints and agendas. These innovations can then serve as important vehicles to produce new insights, gain trust amongst various stakeholders, and effectively improve the quality of life of low-income families living in SH while ultimately reducing SCs.

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