Review

Conceptual Approaches of Health and Wellbeing at the Apartment Building Scale: A Review of Australian Studies

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Abstract: The complexity of environmental challenges facing populations are pushing researchers to go beyond traditional study designs alone to investigate health within the urban environment using integrated coupled human-environment systems thinking. As high-density apartment living is increasing in Australia, it is important to understand the conceptual frameworks guiding research at this scale in Australia; therefore, this article provides a systematic search and review of residents-based studies exploring whether they conceptualised their approach to health using ecological systems thinking at the building scale. Residents-based research published in English between January 2011 and June 2021 was searched across six databases, with 1265 articles identified and six articles included for review. Findings demonstrate a lack of study designs that use systemic and integrated thinking. More specifically, complex systems thinking of health and the urban environment with coupled human-environment views are not fully grasped or reflected in current study designs. This gap is further complicated by a lack of explicit definition and conceptualisation of health and wellbeing and a diverse approach to their use. Future research should consider adopting relational and integrated thinking of health drivers along with an ecological perspective to address residents' multiple challenges and implement the United Nations Sustainable Development Goals (SDGs).

Keywords: housing; health and wellbeing; systemic thinking; ecological public health; buildings

1. Introduction

1.1. Background

In a historic move, the United Nations declared a healthy environment a human right, calling on nations to ensure that everyone has a right to a clean, healthy and sustainable environment [1]. Since around 90% of our time is spent in buildings, with two-thirds of this in the form of homes [2], it is critical that we understand how residential buildings affect health and wellbeing. Buildings matter significantly to our physical and mental health and holistic wellbeing. Various factors intersect buildings, the surrounding environment and health. These range from exposure to pollutants and hazards, building design, construction quality, installation, and maintenance to a sense of home, ontological security, privacy, safety, affordability, and secure housing [2].

Globally, the world's population has dramatically shifted towards increased urbanisation [3]. Projections indicate that approximately 70% of the global population, including Oceania, will live in urban settlements by 2050 [3]. In this Anthropocene era, the ability to understand how urbanisation and urban development are affecting health and wellbeing through the built environment becomes increasingly vital. The increasing expansion in urban settlements through cities and other areas presents complex challenges on unprecedented levels. Urbanisation is considered a critical driver of environmental change, with potentially damaging consequences for human and natural systems and our planet [4]. Adding to environmental change, are other pressing challenges, including climate change, health inequities, ageing populations, widening inequalities, the rise of communicable

and non-communicable diseases such as the recent COVID-19 pandemic, and changes in lifestyle, demography and social organisation [5,6].

This urbanisation has also been marked by rapid and poorly regulated developments across many countries. This is relevant to the Australian context, where compact city planning, characterised by higher-density residential developments and urban consolidation, came along in all states between 2002–2009 [7,8]. According to the Australian Bureau of Statistics (ABS), approvals of apartment buildings, especially four or more storeys, have increased over the last two decades [9]. During the same period, apartment take up by developers rose by almost 82% from 2004–2005 to 2018–2019, characterised by a change in composition that is dominated by medium-rise (four to eight storeys), high rise (nine to 19 storeys), and super high rise (20 or more storeys) apartment buildings [9]. Troy et al. [10] attributed this prominence of high-density multi-unit developments to the neoliberalisation of planning systems driven by market demand, economic viability and developers' influence. In this context, achieving transformative change toward healthy and sustainable dense living is a priority for Australia. This is particularly important as we implement the United Nations Sustainable Development Goals (SDGs) framework, which aims to create urban settlements by improving health and the environment through SDG3 (good health and wellbeing) and SDG11 (sustainable cities and communities) [11]. Both goals, alongside others, seek to create healthy lives, promote wellbeing and generate inclusive, resilient, safe and sustainable urban settlements [11]. Moreover, SDG target 11.1.1 advocates for access to adequate, safe and affordable housing.

At the housing scale, addressing and achieving the SDGs and their targets rely on integrating different aspects that interlink human health and housing in systemic ways [11]. Considering such complex challenges that underlie these goals independently while separating the agendas of healthy urban environments and sustainability at the housing scale is no longer viable. Health is complex and self-evolves in a dynamic, multi-level way across the life course (geographical space and time), where factors affecting health interact in a complex web of human-environment systems [12–16]. Consequently, studying a complex system such as buildings and health requires integrated and relational thinking to aid understanding instead of deterministic, reductionist approaches that separate drivers of health from societal context [17,18].

Additionally imperative to health is applying an ecological perspective, where the role of human-made social systems and ecosystems in the production of health becomes acknowledged and considered [19]. By systematically conceptualising the drivers of health and the home environment, any implications of the links between potential synergistic and antagonistic urban health and environmental aspects are explored and become explicit [17,20]. For example, stricter energy efficiency requirements to combat climate change have created airtight buildings in high-income countries [21]. Using a coupled human-environment systems perspective, researchers would see resident and environmental aspects being considered in one framework whereby any interconnections through buildings become understood and explained.

Despite improvements in urban health that conventional cause-and-effect reductionist approaches tend to address, traditional science thinking that focuses on separate elements in a multi-disciplinary fashion can no longer be used alone. Additionally, discipline-based methods are considered inadequate in addressing such complex challenges [22]. To implement the SDGs meaningfully, that is, to steer away from linear causal thinking and doing, we need to interrogate the values that underpin scientific research, including intentionality and worldviews [23]. The use of coupled human-environment systems thinking alters how researchers perceive, conceive and contextualise health understandings [24]. At the building scale, researchers need to rethink how they approach the design of their residents-based research studies to account for complex systems and ecological thinking.

As the global research community approaches urban health using coupled human-environment systems views, it is vital to understand the conceptual foundations guiding current research designs. The use of complex systems and ecological thinking in residents-

based research is explored in this paper. In particular, the exploratory case study aims to show whether such conceptualisations of health are reflected and fully grasped in the building context in Australian studies. To our knowledge, no literature reviews have been conducted on residents-based research. There is also currently no literature on whether such studies were conducted at the building scale in Australia. This exploratory systematic search and narrative synthesis aim to address these gaps.

Our review is structured in the following manner. The following section sets out the rationale for exploring study conceptualisations using ecological systems thinking for complex health and building systems. The methods section sets out the review process from the systematic search of Australian literature to the narrative synthesis of the selected articles. The results section provides an overview of the conceptual frameworks and other findings reported in each selected article. The next section discusses a gap in the current literature with difficulties encountered during the narrative synthesis process. The paper concludes with recommendations for future studies and reflections on the findings.

1.2. Rationale for Ecological Systems Thinking

Increasingly, researchers are demonstrating a shift towards holistic, complexity-based worldviews of health and housing. Traditional linear approaches that study health and wellbeing based on cause-and-effect conceptualisations alone are no longer considered sufficient [25]. This is attributed to the myriad dynamic interactions between multi-scalar and multi-level factors and actors related to diverse environmental, cultural, social, economic, and political systems [26]. In addition, the deteriorating natural environment with all its fragile interlinked systems along with the loss in biodiversity is prompting the need to consider the issue of the sustainability of population health in ecological terms [4,12,27]. Consequently, health becomes contingent not only upon connections between multiple factors but also on other life forms [16].

Contemporary epidemiological theories and frameworks and ecological models of individual, population and public health suggest that health is complex and self-evolves in a dynamic, multi-level way across the life course where factors affecting health interact in a complex web of systems [12–16]. At the heart of these theories and approaches sits an ecological perspective where humans are considered one type of species among others that cohabit, evolve and alter our dynamic planet [14–16]. By bringing an ecological perspective to health, attention shifts to a context where interdependencies take place between individuals and groups of humans and their environment [15].

Ecological thinking sees each 'living' level as a function of complex systems where the whole is greater than the sum of its parts [28]. Hence, ecological foundations of health emphasise the interwoven nature between the human and environment interactions—in other words, the 'social-ecological intertwinedness' [4,28–30]. By bringing these ecological principles, understanding health within urban environments becomes attuned to interdependencies, population processes and multi-level causality, typical of systems thinking [15]; consequently, the complexity of health and wellbeing drivers at the building scale breaks down with traditional study designs.

Traditional study designs affect the way data are analysed. Such study designs: assume linearity, homogeneity among parts, and reductionist takes; focus on single-level analysis and are temporally static [31]. In contrast, study designs that incorporate complex systems assumptions assume nonlinearity, heterogeneity of components and holistic takes; focus on interactions and multiple levels and are temporally dynamic with feedback [31].

This shift in scientific thinking brings a helpful way of conceptualising study designs that investigate health at the building scale. To understand the complexities involved, urban health researchers can adopt a complex adaptive systems conceptualisation of health, urban environments (e.g., buildings) as well as health within urban environments [20,26,32,33]. As a dynamic condition [34], health becomes a manifestation of a system where *"biology interacts with environments and individuals interact with each other and with environments over*

time" [35] (p. 1627), giving rise to states and patterns of health. This makes health an 'emergent' outcome of many processes instead of a static state of existence [16].

Therefore, health and disease self-evolve in 'space-time' due to complex dynamic non-linear interactions between biological and environmental factors [26]. These factors function at multiple levels (at the cellular, molecular, individual, population and societal levels of the organisation) as well as different contextual scales (e.g., cities, neighbourhoods, and buildings) [26]. Viewed as a continuum, these system components act synergistically or antagonistically where no factor acts in isolation or at a single scale [20]. Therefore, systems thinking brings a useful framework for studying factors and the links between factors while acknowledging changes in urban health patterns over time.

The use of systems approaches forces us to think beyond 'distal' versus 'proximate' factors defined at separate levels of organisation [17,22]. Instead of seeing the effects of factors as 'isolated' and 'independent', systems approaches emphasise the system's functioning as a whole [17]. Within this system, the whole is much greater than the sum of its parts because of the network of relationships and interactions between system components and actors [36]. Such approaches also consider adaptation and self-organisation properties, which affect how interventions are viewed at the building scale in that the system continuously adapts and responds to changes and is capable of self-organisation [32].

Finally, conceptualising health at the building scale also requires understanding the local area context. This is important as it means 'one-size fits all' interventions typically used in a top-down fashion become prone to failure [32]. Therefore, ecological systems thinking places the drivers of the health-building system within the local context where the susceptibilities and issues faced by specific populations are considered to create effective interventions [18,32]. Hence, we decided to focus our review on research that considered residents' views. Investigating how the built environment influences people subjectively—the cognitive and affective personal evaluation of one's life experiences and perception [37]—is imperative to reduce discrepancies between standards and policies that aim to protect health and their experiences locally.

1.3. Objectives

This review had two main objectives:

1. To explore whether current resident-based research conceptualises their approach to health and wellbeing using complex systems thinking.
2. To explore whether current studies use a coupled human-environment approach to their conceptual framings of health and wellbeing understanding.

Through this review, we unveil current ways of framing diverse research at the building scale, identifying future opportunities for researchers in urban health and high-density urban environments, and aim to inform the work of urban health professionals.

To realise these goals, this space is explored with the following broad questions:

RQ1. What conceptual framings guide the design of residents-based research at the building scale in Australia? And

RQ2. Is the design of residents-based research at the building scale in Australia underpinned by coupled human-environment systems thinking?

The research questions aim to establish whether research studies were framed and conducted based on the conceptualisation of health as a dynamic condition influenced by the relationships between different aspects using systems thinking. It also aims to verify whether these conceptualisations and approaches consider a coupled human-environment view of the drivers of health in urban environments when devising their residents-based qualitative, quantitative, or mixed methods.

2. Methods

2.1. General Framework

A systematic search and review was adopted based on an approach that combines the strengths of critical review with a comprehensive search methodology [38]. The methodology is considered suitable as the review aims to discover what is known for practice recommendations and limitation identification [38]. Like systematic reviews, the method is rigorous and transparent in its comprehensive search, though it does not commonly include quality assessments. The development of the methodology protocol was based on the guiding principles discussed by Bramer et al. [39] and Grant and Booth [38]: establishing a research question; a systematic search of relevant studies; selection of relevant papers; narrative synthesis with tabular summary and reporting what is known with recommendations for practice and limitations.

2.2. Search Strategy

A systematic search using six databases (ProQuest, Scopus, Medline-Ovid, Embase, PsychINFO, and Web of Science) was conducted in June 2021, with all references imported into Endnote. Other databases, such as Science Direct, Springer Link, ProQuest Health and Medicine, Psychology and Behavioural Sciences Collection, PubMed, Sage, Applied Social Sciences Index and Abstracts (ASSIA), were not included as it is believed that the above-selected databases would give enough coverage. The search was limited to peer-reviewed journal articles published in English over 10 years (January 2011–June 2021). Grey literature, letters, opinions, editorials, and thesis literature were excluded. The results were limited to Australia as the geographic area of search.

The six databases were used to perform searches using AND/OR Boolean operators to filter results based on thematic groupings. Headings and abstracts were searched to identify relevant publications based on thematic groupings and search terms as illustrated under Appendix A, and MeSH subject headings for PsychINFO, Medline-Ovid and Embase. The search included subject and text word terms for health and wellbeing (e.g., health, wellbeing), buildings (e.g., building, apartment), terms describing study methods and tools (e.g., empirical, survey*), terms related to high-density urban environments (e.g., higher density, high rise), and 'Australia' related terms where applicable (e.g., for Scopus, Web of Science, and ProQuest databases only).

2.3. Study Selection

One researcher conducted the review (the lead author of this study). The database search identified a total of 1265 articles which were all combined before further reduction. Duplicates were then removed, followed by screening based on titles and then abstracts. Abstracts were screened based on relevance to human health and wellbeing, residential buildings as the scale, subjective assessment research design, and Australia as the geographic location due to cultural, language, historical, area characteristics, and density profile differences between countries.

It is acknowledged that buildings are not isolated objects and that residential buildings exist in the context of neighbourhoods, communities and cities where impacts on health and wellbeing can be influenced by features surrounding the 'building' scale [2,40]. Therefore, research about other contexts was reviewed where scales are combined. However, the focus of this review was on the building scale; consequently, any papers that did not focus on this scale were excluded. This review also focuses on residential buildings; therefore, articles that targeted hostels, care homes, caravan parks, student accommodation, non-permanent properties, and properties that do not involve selling and buying for residential purposes were excluded. As this review used complex health and systems thinking-frame, we excluded any research that focused solely on one clinically diagnosable health and wellbeing condition and one factor or variable linked with health and wellbeing (e.g., physical activity and asthma).

The full text of all the remaining articles was examined and hand searched; Google Scholar and Scopus were used to obtain additional references identified. The selection process from initial paper searches to final paper selection is documented and presented in Figure 1.
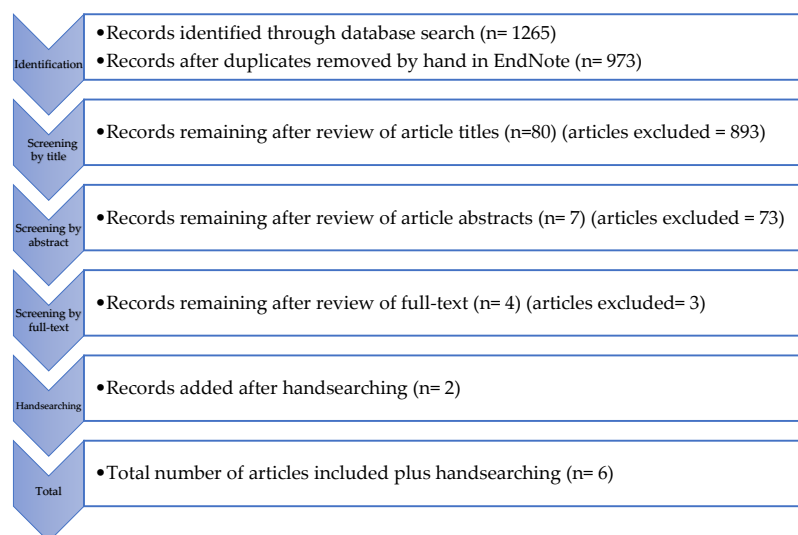

Figure 1. Article selection process.

2.4. Data Analysis and Synthesis

The six articles selected for inclusion were examined to narratively synthesise the conceptual approaches used in each study. The synthesis method used is a typical minimal narrative with tabular accompaniment [38].

The following data were extracted from the studies selected: geographic location in which the study was conducted, the research article type, the conceptual approaches of the study design, and whether these had any mention of complex systems and ecological thinking and coupled considerations of human health and wellbeing alongside ecosystems and planetary health. To identify the conceptual framings of each study (RQ1), we carefully examined each introduction and methods section for any explicit or non-explicit mention of conceptual frameworks, theories, or models that underpinned each study. To answer RQ2, we then subjectively interpreted whether each conceptualisation acknowledged and used complex systems thinking of health and the urban built environment with a coupled human and environment approach to study or understand health and wellbeing. We also extracted data related to how each article included, defined and conceptualised health and wellbeing. This step of data extraction also formed part of the analysis as it established whether a research gap exists. A gap was identified where no papers included informed their study design using complex systems and ecological thinking.

3. Results

3.1. Study Selection Results and Overview

The search retrieved 1265 records from which six articles were reviewed. As discussed earlier, this review adopted a systematic search and narrative synthesis methodology instead of a systematic review driven by the small number of screened studies and the difference in study design. Moreover, this review focuses on the conceptual design of each study rather than the quality of evidence used. Therefore, quality assessment was not deemed to provide useful insights at this stage.

Table 1 summarises each of the articles including the type of study, the conceptual approaches behind each study design, and whether these were underpinned by ecological systems thinking. Out of the six Australian studies included, two studies were based in New South Wales [41,42], three in Queensland [43–45], and one across the states of New

South Wales, Victoria, and Western Australia [46]. Two articles are protocols [41,46] with no relevant subsequent publications to this review's scope following Google Scholar and Scopus citation checks in August 2022. Publication alerts for all included databases have not yielded any additional studies.

Table 1. Gap analysis summary of articles included in the review.

Author(s), Year	Type of Article	The Conceptual Approaches Guiding Each Study	Study Conceptualisations of Health and Wellbeing at the Building Scale	
			Application of Complex Systems Thinking	**Application of Coupled Human-Environment Systems Views of Health**
Buys and Miller, 2012 [44]	Research study	No clear outline of a conceptual or theoretical approach.	Not reflected. Health and wellbeing are not the main target construct of the study. Residential satisfaction is the study's target construct.	Not discussed
Buys et al., 2013 [43]	Research study	The study is underpinned by the 'liveability theory of daily life' as discussed by new urban planning, design movements and prominent liveability theorists. Social sustainability pathways to long-term liveability also underlines the study design.	Not reflected. Health and wellbeing are not the main target construct of the study. Liveability and sustainability (as synonymous concepts) are the target constructs of the research with no clear links with health and wellbeing.	Not discussed. Social sustainability was considered with human-centred outcomes.
Carnemolla, 2020 [41]	Protocol	The study promises to generate a theoretical framework.	Not reflected. Wellbeing is considered one of many outcomes that address the needs of people with intellectual disability who live in apartment housing.	Not discussed.
Foster et al., 2019 [46]	Protocol	The study is underpinned by an 'ecological model'.	The conceptual framework acknowledges complexity through a multiple level view of health and wellbeing drivers and the constant interactions between individuals and their environment. Hypothesised pathways are confined between apartment design policy, apartment and building design, and their location within the broader neighbourhood context. Sociodemographic factors are viewed as potential confounding variables. Health and wellbeing are ultimately viewed as outcomes.	Unclear. The study's model adopts an ecological perspective acknowledging constant interactions between the individual and their environment. However, the coupled approach of human, ecosystem and planetary health is not explicitly discussed.

Table 1. *Cont.*

Author(s), Year	Type of Article	The Conceptual Approaches Guiding Each Study	Study Conceptualisations of Health and Wellbeing at the Building Scale	
			Application of Complex Systems Thinking	Application of Coupled Human-Environment Systems Views of Health
Reid et al., 2017 [45]	Research study	The study is underpinned by a feminist discursive approach/lens to examine women's experiences in high rise apartments.	Not reflected. The study links women's perspectives with liveability as the target construct of the study. Wellbeing and mental health are outcomes mentioned informally.	Not discussed. Social sustainability is mentioned informally in terms of its links with the implications of not accommodating women's perspectives.
Sajan, 2015 [42]	Research study	The study is underpinned by a framework that combines models that require the assessment of multiple attributes of the quality of the residential environment. The framework's indicators are derived from a model that links urban systems and perceived density indicators.	Wellbeing with its health and safety outcomes is considered as one of a number of attributes that aggregately make up residential satisfaction as the main target assessment of the quality of the residential environment. The complexity of the urban environment is acknowledged through the use of indicators of urban systems (social, built, natural, economic, and governance). However, wellbeing is viewed as an indicator of one system (the social urban system) and is separated from the other indicators.	Not discussed.

It was generally observed that health and wellbeing were the main concepts and outcomes measured in one article only [46]. In contrast, the remaining articles either targeted health and wellbeing alongside other concepts [41], or targeted other concepts without a clear description of their relationship to health and wellbeing, namely: liveability and sustainability [43], liveability [45], and residential satisfaction [42,44].

3.2. Conceptual Approaches

This section addresses RQ1 by showing an overview of the identified conceptual approaches (summarised in Table 1). Overall, the conceptual approaches of each study design varied considerably across the included studies depending on the target measure, which was not necessarily focused on health and/or wellbeing. Both the studies by Foster et al. [46] and Sajan [42] were explicitly guided by conceptual frameworks, while those by Buys et al. [43] and Reid et al. [45] were underpinned by conceptual theories. In contrast, the study method by Buys and Miller [44] was not underpinned by an explicit conceptual approach, while Carnemolla's [41] study promised to generate an appropriate theoretical framework. Those guided by specific conceptual framings adopted the following approaches: the liveability theory of daily life [43], an ecological model [46], a feminist discursive lens/approach [45], and a multi-attribute framework [42].

3.3. Complex Systems and Ecological Thinking

To address RQ2, we subjectively interpreted each study's approach to establish whether current research adopts an ecological systems view of health and wellbeing at the building scale. In general, the review of articles showed that the subjectively-based study designs were not underpinned by an ecological systems conceptualisation of health and wellbeing at the building scale; despite a recognition of the complexity of the environment

by some of the studies examined. None of the studies reflected a systematisation of variable relationships based on dynamic non-linear interactions between factors that intersect social and ecological systems at the building scale. There was also no explicit reference to the ecosystem or planetary health. Consequently, the studies did not consider coupled human-environment views of health and wellbeing from an ecological perspective.

The conceptual frameworks underpinning the research by Foster et al. [46] and Sajan [42] acknowledged the multiple attributes and levels of influence on residents' health and wellbeing stemming from the complexity of the urban environment surrounding one's home. Albeit, both approaches used by these two authors did not fully reflect the complexity of health and systematisation of variable relationships. The protocol by Foster et al. [46] did not extend complexity thinking beyond certain aspects. For example, the complexity of the influences on health and wellbeing was confined between the pathways connecting apartment design policy, the design of housing, and the location within the broader neighbourhood context, while sociodemographic factors and individual characteristics were viewed as possible confounders. In addition, health, alongside wellbeing, is viewed as an outcome of pre-defined and hypothesised impacts (i.e., sleep quality, housing satisfaction, social interaction, and neighbourhood related impacts) without acknowledging the dynamic nature of health based on complex non-linear interactions between various factors. In general, health and wellbeing were not explicitly defined by Foster except as outcomes. In combination, health and wellbeing appear to be operationalised as mental health, mental wellbeing, general health, respiratory health, and life satisfaction. Foster's framework also did not explicitly discuss the interdependencies between human, ecosystem and planetary health drivers.

The conceptual framework by Sajan [42] was derived from combined models that focus on the quality of the residential environment using residential satisfaction as an outcome measure. Sajan's study used five indicators to measure residential satisfaction that assess the quality of the residential environment [42]. The residential satisfaction variables, of which wellbeing is one, were derived from a model that linked elements of the urban system (the built, economic, governance, natural, and social systems) with the perceived dimensions of urban density, suggesting a systems thinking of the urban environment. Nonetheless, wellbeing was viewed as an indicator of only the social urban system and detached from the influence of the other systems.

Similar to Sajan's study, Burys and Miller's [44] research focused explicitly on residential satisfaction as their main outcome measure. In general, health and wellbeing were not mentioned in their study. The study aimed to understand and identify the specific elements of high-density residential environments that lead to residents' satisfaction as a multi-dimensional construct and linked these with the concept of sustainable urban planning through environmental indicators.

Distinctively, inclusion was viewed as the main cause driving the research subject by Carnemolla [41] and Reid et al. [45], thus dictating the focus of their research study design. Carnemolla's protocol stated that their research aims to generate a theoretical framework that would produce knowledge about factors that influence the wellbeing, independence, autonomy, support provision, and participation of people with intellectual disabilities who live in high-density apartments. Consequently, Carnemolla's protocol was not underpinned by a conceptual framework. The proposed study is focused on the needs of people with intellectual disabilities by examining design aspects related to apartment rooms, the apartments themselves and the site, sense of home, quality of life, and social participation outcomes. Wellbeing was one of many outcomes with no clear ecological views or reflections in their study protocol.

The research by Reid et al. [45] was based on a feminist discursive materialist lens specifically designed to acknowledge the *"spatial and structural dimensions of women's everyday accounts of living in high-rise developments"* [45] (p. 18). The study by Reid and colleagues focused on women's perspectives—how women use, manage, and experience 'space' in and around high-rise settings—by examining liveability aspects in high-rise communities [45].

Wellbeing and mental health were considered outcomes mentioned informally within their data. Reid and colleagues also linked the implications of not accommodating women's needs and perspectives with social sustainability and physical design; however, no further explanation was provided as to why this was important [45].

Finally, liveability (particularly 'liveable place')—synonymously viewed alongside the concept of sustainability—was considered the main concept framing the research by Buys and colleagues [43]. Their study was underpinned by the 'liveability theory of daily life' and 'liveable place', which were derived from contemporary urban planning and design movements and prominent liveability theorists. Although liveable places and liveability were viewed in a complex and multi-faceted way, only built/physical attributes were considered factors affecting residents' liveability. Despite acknowledging health and wellbeing, the study's focus was on measuring the liveability of specific features of the home and building as well as aspects within the broader neighbourhood [43].

4. Discussion

This paper is the first to explore the application of complex systems and ecological thinking of health and wellbeing within research studies at the building scale in Australia. Our results show that despite acknowledging the complexity of interactions between residents and their surrounding environment in some of the studies, the use of conceptual frameworks to study health and wellbeing based on complex systems and ecological thinking remains lacking at the scale of high-density apartment buildings. This can be considered a significant finding, regardless of the number of studies identified. Similar findings have been highlighted in international studies. For example, Carmichael's et al. [21] study on public health integration within UK building-related policies identified a lack of systems thinking where climate change mitigation measures were advocated at the expense of public health. Therefore, considering interdependencies between potentially antagonistic factors affecting public health is seen as needed instead of focusing efforts on environmental quality, climate resilience, or the reduction of building carbon footprint in isolation. Carmichael et al., also strongly advocate for the use of an integrated framework based on the SDGs where multiple health drivers, such as climate change, sanitation, affordability, and equity, are considered together rather than one driver at the expense of another [21].

In general, the narrative review of included papers found that the conceptual framings of the research were diverse with mixed theoretical and conceptual basis. This challenged the reviewer as it meant having to establish and, in some cases, interpret the conceptual framings of their study design subjectively. Hence, analysing the conceptual framings of each study was a difficult task, especially for papers that did not explicitly outline a conceptual framework. Despite the potential limitation of such a subjective interpretation in this review, it can be considered a discovery worth mentioning. Researchers argue that the foundations of conceptual approaches depend upon human cultural constituents, including motives, intentions, conceptions, perceptions, and values [23,24]. Such approaches, whether frameworks or models, represent assumptions and concepts, with implicit or explicit descriptions or representations of the phenomenon [47]. Hence, interrogating and paying close attention to these values is imperative to remove barriers, especially to implementing the SDGs.

Another key finding that complicated the narrative synthesis of this review was the use of other terms, including liveability and sustainability, quality of the residential environment, and residential satisfaction as the main constructs of some studies with an often unclear relationship with health and wellbeing. Consistent with this finding, systematic and other reviews by Krefis et al. [48], Pineo et al. [49], and Mouratidis [50] showed that terms, including quality of life, liveability, happiness, and satisfaction are being used interchangeably with wellbeing, and in the same context—a finding that was also iterated by Hanc and colleagues following their recent systematic review of wellbeing conceptualisations in buildings [40]. Hanc et al., [40] argued that the focus of academia

on wellbeing dimensions has resulted in various measurement methods of wellbeing. In their literature review, van Kamp et al. [51] encountered different meanings of the terms quality of life and liveability alongside sustainability and environmental quality within the urban health literature, citing little consensus on the relationship between these concepts and the domains they examine. Consequently, a significant overlap exists between the terms, especially when examined within the urban health and urban environment literature, complicating matters further [48–51].

In relation to health and wellbeing, the review showed a mixed approach to their conceptualisation and definition. Concurring with this finding, Krefis et al. [48] argued that the multifaceted nature of wellbeing, the varied ways of measuring it, and the use of other terms in the same context as wellbeing add to an ambiguous relationship between urban health and wellbeing. This lack of clear conceptualisation and definition of both terms, whether as the main concepts of measurements or through the casual use of both terms giving the impression that their meaning is already known, was another key finding in this review.

Finally, the lack of clear conceptualisation and definition of health and wellbeing is also complicated by most studies adopting a mixed approach to their conceptual definitions. In that regard, health and wellbeing were viewed as the main conceptual target values. Conversely, others used them as outcomes or determinants of other 'measurable' constructs, such as residential satisfaction, quality of the urban environment, and liveability and sustainability. This aligns with the findings by Hanc et al. [40]. They argued that the question of how buildings and the wider built environment should be designed and managed to support wellbeing *"cannot be suitably addressed by studies that do not differentiate between wellbeing as an outcome and the 'determinants' of wellbeing. In fact, such studies may end up simply perpetuating existing design paradigms"* [40] (p. 780). While this is not a surprising finding given the confusion surrounding this area of research, it highlights the need to explicitly discuss how constructs and concepts are generally conceptualised and approached within residents-based research concerning the urban environment.

5. Limitations

There are limitations to this literature review. First, we acknowledge some of the limitations of using a systematic search and review method. For example, the synthesis process relies heavily on subjective interpretations without the need for a clearly defined process of synthesis. The study also adopts a broad scope that integrates multiple study types being subjected to the same underlying criteria. However, the aim of our study is exploratory to identify the best available evidence by addressing broad questions on an ignored topic. The method is considered suitable as it provides a picture of the prevalence of research on the topic by showing what is known with recommendations for practice and further research. Another limitation of the method could be its reliance on the selection of relevant terms during the systematic search phase given its cross-disciplinary nature. Despite this search strategy limitation, we believe the search terms used, thematic groupings, truncation, masking, phrase search, and combination of keywords can provide a useful platform for other researchers conducting similar cross-disciplinary reviews and studies in the future. Secondly, the inclusion/exclusion criteria would have affected the group of articles included in the review. For example, the inevitable option to use Australian states and capital cities as a search theme in three databases might have excluded studies that referred to specific case studies within Australia. However, this would not have made the search strategy feasible without the reference to states and capital cities. Thirdly, the systematic search only targeted academic research without the inclusion of grey literature. This presents an opportunity for future research in this area to explore any differences between research and practice.

It is also worth noting that Informit Complete was excluded from the list of searchable databases attributed to web page outages during the initial review period. However, we believe the databases used would have given enough coverage of the literature. Finally, the

subjective nature of synthesis to establish the research gap was challenged by a lack of clear definitions of health, wellbeing, and other terms used as the main concepts behind most studies. This aligns with the conclusions other researchers discussed earlier regarding the unclear definition of wellbeing and the interchangeable use of terms.

6. Avenues for Future Research

This review illustrates a gap in the use of integrated approaches that account for systems and ecological thinking at the building scale in Australia. The clear gaps this review illustrated give an opportunity for the academic research community to address some of the challenges and study design holes identified. Some recommendations are discussed for future research concerning the health and wellbeing of residential buildings whether in Australia or elsewhere.

To progress in this area of research, it is important that the research community not only outline their conceptual approaches explicitly but address any conceptual barriers to relational and ecological thinking. This requires a holistic conceptual framing where humans and natural ecosystems become interdependent as they intersect human culture and its various social systems [23]. Hence, researchers need to interrogate the central values that underpin the interpretation of situations and problems. To overcome such conceptual barriers, Lawrence [23] suggests an explicit inclusion of values and worldviews using qualitative meanings without isolating a situation or an issue from its real-world context.

The findings in this article further support the need for integrated approaches that account for interdependencies and embrace relational thinking between broad health and wellbeing drivers from multiple human and environmental systems. Such approaches should also consider competing aspects across temporal scales while addressing the agendas of a healthy urban environment and sustainability [5]. Using an overarching framework based on the SDGs, which accounts for competing domains at the building scale, including climate change, sustainable development, equity, affordability, sanitation, and human health, could help those conducting research at the building scale. Such a framework should also be ecological because human health depends on the natural environment and coexistence with our environment at a planetary scale. The lack of coupled human-environment views that this review revealed in most studies is a stark reminder of the need to integrate the health and sustainability agendas if we are to address the environmental crisis and act on the SDGs and their targets by 2030 and beyond. Despite the pragmatic challenges such thinking may create in practice; paying close attention to context and the use of integrated coupled human-environment frameworks will ensure any trade-offs are acknowledged and addressed without potentially compromising one goal or multiple goals against others at the expense of residents and the planet. Ultimately, transformative urban changes to address human health and sustainability require an active role by everyone, including the scientific community [52].

Future research should also clearly define health and wellbeing. The use of other terms, such as liveability, quality of life and residential satisfaction, need to be clarified in relation to how they link with health and wellbeing along with their conceptual nature and the reasons for their inclusion. In this context, Hanc et al. [40] iterated the need to state whether health and wellbeing is an outcome or a determinant of other outcomes where other constructs are used. Perhaps an agreement within the academic community is needed on what concepts and constructs should be used at the building scale to avoid perpetuating the issue further.

Finally, the exploratory nature of our review to establish the best available evidence on an ignored topic within a specific geographic location (Australia) presents an opportunity for further in-depth work on the subject. Here, there is the potential for research involving other countries or cities where the method could be tested and critiqued and where similarities and differences of evidence could be further explored and advanced.

7. Conclusions

This paper provides a systematic search and review of research conceptualisations of health and wellbeing understandings at the building scale in Australia. It notes a gap in the literature in relation to conceptualising study designs based on systems and ecological thinking despite acknowledging the complexity of systemic health and wellbeing drivers within some papers. In addition, discussions of the need for coupled human-environment views where social and natural systems are considered together in the local context are lacking. To the best of our knowledge, this review is the first to explore conceptualisations of residents-based research that account for complex systems and ecological thinking of health and wellbeing at the building scale in Australia. Considering the rapid increase in high-density multi-unit developments in Australia and the myriad challenges facing our health and wellbeing, future research studies must move beyond traditional scientific thinking alone and embrace integrated, relational and ecological thinking if we are any closer to achieving the Sustainable development Goals and their targets by 2030.

Appendix A

The appendix presents the literature review search strategy including relevant search terms, thematic groupings, truncation, masking, phrase search, and combination of keywords (Boolean operators).

Table A1. Literature review search strategy.

Theme	Health and Wellbeing	Buildings	Study Methods/Tools	High Density Urban Environments	Australia
	AND	AND		AND	AND
Search terms	(health* OR wellbeing OR "well-being" OR liveab* OR livab* OR "quality of life" OR illness OR ill-health OR wellness OR comfort OR "sick house syndrome" OR "sick building syndrome" OR "life quality" OR disease*)	(building* OR "building structure" OR "residential building*" OR "apartment building*" OR apartment* OR condominium OR dwelling* OR "multi-unit" OR "multi-storey" OR "multi storey" OR "multi-owned propert*" OR "multi-family" OR "multi-dwelling" OR strata OR "high-rise*" OR "high rise*" OR "apartment tower" OR "tower building")	(empirical OR survey* OR questionnaire* OR focus* OR "self-report*" OR assessment* OR evaluat* OR interview* OR scale* OR measure* OR "co-design" OR participatory OR observation* OR "audio recording" OR photograph* OR "video recording*" OR probe* OR toolkit* OR prototype* OR game* OR story OR stories OR recording* OR "mobile app*" OR "smartphone app*" OR experiment* OR map* OR camera OR cards OR props OR diaries OR experience* OR "multi-method*")	("high-density*" OR "higher density*" OR "high density*" OR "medium density" OR compact* OR infill* OR intensification OR consolidation OR gentrification OR regeneration OR renewal OR "transit-oriented development*" OR "high-rise" OR "high rise")	(Austral* OR Sydney OR Brisbane OR Adelaide OR Perth OR Hobart OR "Northern Territory" OR "New South Wales" OR "Queensland" OR "South Australia" OR Victoria OR "Western Australia" OR Tasmania OR "Australian Capital Territory" OR Canberra)

* Truncation symbol used to search for all the variations of the truncated words.

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