

**What Types of Evidence are Available for Translating Health Evidence
into Planning Strategies for Higher Density Living?
A Review of the Literature'**

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Abstract: Despite abundant knowledge and research highlighting the significance of urban planning for improving health outcomes, there remains an absence of understanding of how health evidence can be translated into planning policy and practice, particularly for higher density urban development. This paper presents the findings of combined systematic and narrative review of academic literature pertaining to urban planning for higher density living. The study examined: 1) What types of health-related evidence have been translated into current planning strategies; 2) What types of health-related evidence have been used to critique existing planning strategies; and 3) What types of health evidence are proposed for translation into planning policy and practice? The findings reveal that while health evidence is regularly used to critique existing planning strategies, it is rarely applied to the practice of planning and constructing higher density developments. This indicates there is a need to improve integration of health evidence within the planning stages of higher density development. Our review also exposes an extensive range of suggestions for embedding health evidence in future planning strategies to improve human and environmental health outcomes in higher density environments. We conclude that targeted transdisciplinary research is required to apply, test, and evaluate the implementation of health evidence within specific local higher density contexts. This is essential for ensuring that urban planning strategies can successfully enhance the health and wellbeing of the growing population predicted to be living in higher density urban environments in the future.

Key words: *Health Evidence; Higher Density; Translational Research; Policy and Practice; Healthy Planning.*

Introduction

Urban planning has been recognised as an important process for ensuring the health of the population (Barton et al., 2015; World Health Organisation, 2016) and an expanding body of research has linked urban planning to human health outcomes (Friel et al., 2011; Harris et al., 2018). Questions are now being asked as to how urban settlements can be better planned to promote health by creating the conditions for healthy behaviour, equitable communities and resilience to the health impacts associated with anthropogenic climate change (Barton et al., 2015; Harris 2018). This requires urban planning researchers and professionals to think critically about how spatial place-making and design principles can be re-orientated towards improving health (Lawrence, 2015).

Yet, while much progress has been made in the academic research on highlighting the links between health and urban planning, issues remain around translation of this evidence into planning policy and

practice (Kent et al. 2017). The translational approach, as a research paradigm, has emerged in recent years and is applicable to the issues faced by the health and urban planning scholarship and practice. Translational research seeks to understand how evidence can be transferred effectively between a variety of contexts: between disciplines such as public health (which include community health through to planetary health) and urban planning; from context to context; and from research to policy (Rychetnik, et al., 2012; Milat, et al., 2014; Nutbeam and Milat, 2017). This approach complements recent debates in urban planning on tensions between urban research and policy impact (Dai and de Vries, 2018), including barriers to the integration of health and planning (Lowe et al., 2018).

But despite the growing interest in translational research and abundant knowledge and research highlighting the significance of urban planning for improving health outcomes, it is currently not clear how health-related evidence obtained from research can be effectively translated and mobilised in planning policy and practice and used to critique existing planning strategy developments. Understanding how health-evidence can be used as a critique and can be successfully translated into planning strategy developments at the policy and practice level, as well as the challenges and opportunities that this embedding process may entail is crucial for enabling the successful mobilisation of health-focused research in urban planning developments.

Evidence is a 'highly contestable', concept and what counts as evidence varies across professions and disciplines (Davis and Parkin, 2015, pp. 115). The term 'health-related evidence' in its broadest form can however be used to refer to empirical data or findings from research from any academic discipline relating to any aspect of health, whether human health or environmental health, rather than only the results of research conducted by studies conducted within the health and medical fields (Nutley et al., 2007). This term is most often used within the Healthy Planning context to refer to data gathered and analysed according to pre-defined research protocols and techniques in order to draw conclusions to enhance understandings about the relation between particular attributes and processes of the urban environment and health outcomes and behaviours (Northridge and Freeman, 2011).

In addition, to understand how health-related evidence can be better translated into planning strategy developments, the terms 'planning' and 'planning strategies' need to be understood. According to Barton (2015, pp. 4), planning can include the 'bureaucratic' processes of 'land use control' and 'spatial planning' meaning the social, economic, ecological, and aesthetic' dimensions (Barton 2015, pp. 4). Barton (2015) suggests that planning strategies can be broken down into two key types: 1) Bureaucratic level-strategies, and 2) Action-Intervention level-strategies. Under the umbrella of bureaucratic strategies are: legislation, policies, plans, guidelines, and tools. Action-intervention level strategies follow on from bureaucratic strategies in that they are enacted or implemented in a real and/or physical sense. This may be after a plan has been documented, or, as part of the planning process. These interventions can include changes to: building controls (Barton 2015, pp. 6), infrastructure related to transport, street connectivity, energy, water, health and education (Barton 2015, pp. 6), site selection and appraisal (Barton 2015, pp. 6), design of buildings, streets and neighbourhoods (Barton 2015, pp. 6), and built environment features, such as location, height, land use mix and design (Davern et al., 2017).

Health is also a complex concept and different academic disciplines conceptualise health in different ways (Seltenrich, 2018; Whitmee et al., 2015), with each perspective reflecting different understandings of the relationship between health, place, humans and the natural and built environments (Barton et al., 2015). These differences are inevitably projected onto research agendas and their assumptions are used to frame outcomes. When translated into planning policy and practice, they have potential to shape the form, character, and resultant health-related outcomes of the city (Coburn, 2015; Hague, 2015). A recent review of the academic literature found that different paradigms of health feature in research on the link between urban planning and human health in higher density urban environment (Connon et al., 2018). While theoretical conceptualisations and understandings of the subject of health were found to vary according to different academic disciplines and sub-disciplines, the majority of the existing research on health and urban planning could be classified as pre-dominantly grounded within one of three key conceptual approaches: Traditional Global Public and Population Health; Social-Ecological Determinants of Health; and Planetary Health (Connon et al., 2018).

Research underpinned by approaches characteristic of traditional global public and population health is primarily characterised by a biomedical understanding of what constitutes human health outcomes, and thus understands health largely in terms of quantifiable, measurable empirical data pertaining to indicators of acute and chronic disease morbidity and mortality rates (Beaglehole and Bonita, 2010). Social-ecological determinants of health perspectives differ from traditional global public and population health-focused approaches because of their emphasis on the inter-relationship between social and environmental determinants of health (Atkinson and Joyce, 2011; Crommelin et al., 2017). They highlight the significance of relationships between social, economic, cultural and political factors in influencing health outcomes (Graham and White, 2016) and place emphasis on indirect as well as direct influencers of health, and use subjective as well as objective data to measure health issues. They focus on positive health outcomes, including mental wellness, human happiness, and quality of life, rather than solely concentrating on evidence of ill-health (Schulz and Northridge, 2006). Understandings shaped by a social-determinants perspective acknowledge the broad level influence of the natural environment for influencing human health outcomes through their impact on the forms that local built environment contexts may take (Bambra et al., 2010; Watts et al., 2015), however they place less emphasis on the role of the natural environmental for influencing health compared to the deep relational ecological perspective that characterises the planetary health perspective. The planetary health perspective emphasises a multi-directional relationship between the health of the planet and the potential for human health trajectories. This approach recognises the primacy of nature and humans as part of nature, and thus departs from the human-centric ideological underpinnings that characterise traditional global public health perspectives and social-ecological determinants of health perspectives (Prescott and Logan, 2018). This approach places greater emphasis on the health threats associated with climate change and emphasises the role that social processes, including urban planning practices, play in driving global anthropogenic climate change (Acunzo et al., 2018; Guitton, 2017). For full details about the differences between the theoretical understandings of health, please see Table 1.

However, despite what is known about the variance in understanding what is meant by health in the existing literature, it remains unclear whether and how research focused on the use of health-evidence in urban planning strategy developments for higher density living is influenced by these theoretical understandings of health that underpin the framing of the research and the resulting outcomes.

The aim of this study is to address these existing shortcomings in the translational research by examining the current literature focused on health in the context of higher density urban development in order to answer the following key research questions:

1. What types health-related evidence have been translated into existing planning strategies for higher density urban development?
2. What types of health-related evidence have been used to critique existing planning strategies for high density urban development?
3. What types of health-related evidence have been proposed for translation into planning strategies for higher density urban development?

In addition, in order to understand where and at what level health evidence has been incorporated or suggested for incorporation in planning strategy development, the study also analyses the use and proposed use of health evidence at different levels of planning strategy development, and analyses how the use and suggested use of health evidence is influenced by the theoretical understanding of health that each article is embedded upon.

Methodology

The study combined systematic and narrative techniques to review the literature. This approach was chosen because as it allowed the literature search to be conducted in a way that adheres to the key principles of systemic reviewing, while simultaneously allowing for subjective evaluations of the literature to determine relevance (Snilsveit et al., 2012).

Table 1. Key Defining Attributes Associated with Each Theoretical Perspective of Health

Comparison of attributes associated with each theoretical perspective of health			
Defining Attribute	Global public and population health	Socio-ecological determinants of health	Planetary health
Relationship between human health, the built environment and natural environment	Focus on how human health is affected by the built environment. Natural environment conceptualised as space where human health outcomes take place, i.e. drought influences child morbidity rates.	Focus on how human health is affected by the natural and built environment. Recognition that the built environment can influence the natural environment, but primary focus is on human health. Social environment as important influencer of human health outcomes.	Focus on the primacy of the health of the planet for human health. The built environment is seen to not only directly influence human health outcomes, but to influence the natural environment upon which the sustainability of human health ultimately depends.
Focus of health outcomes and measurable data	Individual health outcomes.	Individual health outcomes as determined by socio-cultural, economic, and political factors. Focus on health equity. Focus on health of community.	Planetary health of which human health and the health of the natural environment form a part of.
Scale of health evidence, intervention, and analysis of evidence	Global, regional, and national scale, less emphasis at local scale.	Predominantly local scale.	Planetary scale and local scale for benefits at planetary scale level.
Direction of relationship between determinants of health	Linear, one-directional relationships.	Focused on interplay between multiple determinants. Greater differentiation between direct and indirect determinants, and Attention to variation in strength of inter-relationships.	Non-Linear, multi-directional, direct, and indirect relationships and complex feedback loops.
Data analysis	Deductive	Inductive and deductive	Inductive and deductive. Predictive conclusions. Narratives of culture/value change and critiques of scientific method of inquiry

Source: Authors

The systematic aspect of the review drew on Bryman's (2012) approach to conducting a systematic review in the social sciences and was also influenced by the work of Weaver et al.'s (2002) cross disciplinary methodology for conducting systematic reviews of research on the built environment and public health. First, a broad list of 11 databases was drawn up to reflect the transdisciplinary nature and translational dimension of the research problem. These were: Scopus, Medline, Science Direct, Sociological Abstracts, Health Collection Database, Web of Science, Wiley Journals Database, APAIS Health and Australian Public Affairs Database, ATRI Transport Database, Health and Society Collection, and Humanities and Social Science Index. Five key themes relevant to the research question were identified: higher density, urban planning, health, environmental sustainability, and methods. Higher Density was identified as the primary focus of the research, where the other thematic areas converged upon.

The five themes were translated into specific keywords: Higher Density Development; Higher Density Development Planning and Health; Higher Density Development Environmental Sustainability; Higher Density Development Environmental Sustainability Planning and Health; Higher Density Development Methods; and Higher Density Development Methods Planning and Health. A second set of keywords were then devised to reflect thematic subdomains that did one or more of the following: 1) enabled

specification of the topic context and/or geographic area, e.g. 'Urban' and 'Metropolitan'; 2) were related to institutional or bureaucratic actions, processes and outcomes, e.g. 'Research', 'Policy', 'Strategy', 'Tool', 'Legislation, or 3) referred to actions and processes relevant to individuals and/or groups, e.g. 'Walking', 'Cycling', 'Gardening'. In total, 119 subdomains were included in the search. The search was conducted using the broad domain keywords and combining each of the subdomain keywords with each broad domain keyword: ("High density development" OR "High density development health and planning" OR "High density development environmental sustainability" OR "High density development environmental sustainability planning and health" OR "High density development methods planning and health" OR "High density development methods") AND ("Australia", "Metropolitan", "Policy"). A total of 714 keyword searches were performed for each of the 11 databases ("6 domains" AND "119 subdomains"), resulting in 7845 searches.

The search process resulted in 652 articles of potential relevance to the research question. Each article was scanned to evaluate relevance using a set of inclusion/exclusionary criteria (Weaver et al., 2002). Articles published prior to the year 2000 were removed. Articles where the focus on health, density and/or urban planning was potentially peripheral were also evaluated for relevance and excluded or included on evaluation. A total of 53 articles were selected for inclusion in the review.

A narrative review process was deployed concurrent to the systematic review process described above. In developing the research project, the research team identified three works of relevance to the context of the review (Easthope and Judd, 2010; Haigh et al., 2011; and Giles Corti et al., 2012). The reference lists and citations of these works were collated and scanned for relevance using the inclusion/exclusion criteria applied to the systematic component of the review. This resulted in the addition of 88 sources for review.

A total of 141 papers were identified as relevant to the study. These were sourced from a broad range of journals, which evidences the transdisciplinary nature of the research themes. They included original empirical research articles, including case studies from Australia, the UK, US, Canada, and China, theoretically focused articles, commentaries, conference proceedings, and literature reviews of existing studies.

Coding was undertaken in five stages using qualitative descriptive analysis (Sandelowski, 2000). Stage one involved taking a ground-up approach to reviewing the contents of each article to examine what types of evidence they discussed that had been translated into planning strategies. Stage two involved examining the contents of each article to uncover the types of evidence used to critique existing planning strategies, while stage three involved scoping for the types of health-related evidence proposed for translation into planning strategies. Articles were divided according to their use or proposed use of health-related evidence in bureaucratic and/or action-implementation level developments for each of the three research questions. Finally, each article was reviewed again to understanding its theoretical underpinnings and coded accordingly, using the framework presented in Table 1. An additional category of 'Other' was initially included to code articles that did not fit in either of the three perspectives, with the aim being that any articles in this category could be examined and used to add perspectives using a ground-up approach to development of theory (Strauss and Corbin, 1998). At the conclusion of the initial coding task, however, none of the articles were placed within the category 'Other', providing assurance that our initial framework of three theoretical approaches was adequate.

The initial article screening process, application of the inclusion/exclusion criteria, and coding of articles was undertaken by two members of the project team. Initial results were cross-checked by another member of the project team to ensure the validity of the findings. For details of the steps undertaken for this review and the number of articles selected for inclusion/exclusion at each stage, please see Figure 1.

Figure 1. Steps undertaken for the combined systematic and narrative review of the literature showing number of articles selected for included/excluded at each stage

Step 1 Systematic Keyword Search: 652 articles selected for initial review
Step 2 Application of Inclusion/Exclusion Criteria: 53 articles deemed relevant; 599 excluded
Step 3 Narrative review of reference list and citations of 3 relevant texts of interest 88 additional sources selected for inclusion
Step 4 Coding Stage 1 a) Content review of all articles (N=141) b) Results of a) coded for bureaucratic level and/or action-implementation level c) Results of b) coded for theoretical perspective of health
Step 5 Coding Stage 2 a) Content review of all articles (N=141) b) Results of a) coded for bureaucratic level and/or action-implementation level
Step 6 Coding Stage 3 a) Content review of all articles (N=141) b) Results of a) coded for bureaucratic level and/or action-implementation level c) Results of b) coded for theoretical perspective of health
Total Number of Articles Included in the Final Pool: N=141

Source: Authors

Findings

The study found that health-related evidence has been used to influence planning strategies for high density urban development at both the bureaucratic and at the action-implementation levels by: 1) having been translated into actual planning strategies, 2) being used to critique existing planning strategies; and 3) being proposed for incorporation into future planning strategies. Furthermore, the types of health-evidence used and proposed were found to vary according to the theoretical conceptualisation of health that underpinned each article. The following sub-sections explore in detail each of the three main ways in which health-related evidence has been utilised in planning strategy development.

Types of health-related evidence translated into existing planning strategies

The study found that only 11 out of the total of 141 articles within the sample discussed how health evidence has been translated into planning strategies at the bureaucratic level. Of the 11 articles, two were embedded upon a Global Public and Population Health perspective, three upon a Planetary Health perspective, and six were framed within a Socio-Economic Determinants of Health perspective. Both articles embedded upon a Global Public and Population Health perspective discussed how health evidence has been integrated into existing planning policy using evidence from previous studies to support arguments and to draw conclusions about the feasibility of existing planning policy for improving health outcomes.

Of the six articles embedded upon a Socio-Ecological Determinants of Health perspective four discussed how evidence from land use design, density, air pollution statistics and transport infrastructure influenced urban consolidation policies in Australia. Another used evidence from surveys of walking behaviour to discuss how evidence focused on human health can be incorporated into walkability indexes that are designed to influence planning developments (Cowie et al., 2016), and one focused on how quantifiable empirical data focused on density, activity levels, mental health, social interaction, and children's health from existing/secondary datasets was used to develop Health Impact Assessments (Haigh et al., 2011).

Of the three embedded upon a Planetary Health perspective, one discussed how evidence from green infrastructure research has been applied within existing planning policy (Bellamy et al., 2017). Another highlighted how data from existing research focused on food security and environmental biodiversity has been used to address food insecurity at the megacity planning policy level in Singapore and New York City (Jowell et al., 2017). Ren et al., (2013) discussed how evidence from thermal and wind measurements was used to develop an urban climatic map for use in a Geographic Information System.

Only two out of the 141 articles within the total sample discussed how health evidence has been embedded in existing planning practice at the action and implementation level.

The two articles that discussed how health evidence has already been incorporated into current planning strategies at the action and implementation stage were embedded upon a Planetary Health perspective (Davern et al., 2017; Jowell et al., 2017). Jowell et al., (2017), discussed how evidence pertaining to food security and human well-being has been used in greening technology and urban design to improve water storage in global megacities, while Davern et al., (2017) explained how evidence of urban heat and the viability of tree species has been used to improve urban greening practices.

See Table 2 for a comparative summary of the different ways in which health-related evidence has been translated into existing planning strategies at the bureaucratic and action-implementation levels across the different theoretical perspectives of health.

Table 2. Types of Health-Related Evidence Translated into Existing Planning Strategy at the Bureaucratic and Action-Implementation Levels and for Each Perspective of Health (N=141)

Articles that discuss types of health-related evidence as translated into planning practice (n=11)					
Health-related evidence translated at the bureaucratic level (n=11)			Health-related evidence translated at the action-implementation level (n=2)		
Global public and population health (n=2)	Socio-ecological determinants of health (n=6)	Planetary health (n=3)	Global public and population health (n=0)	Socio-ecological determinants of health (n=0)	Planetary health (n=2)
Evidence from previous research (n=2)	Evidence of land use design, density, air pollution statistics and transport on health outcomes (n=4). Surveys of walking behaviour (n=1). Quantifiable empirical data from existing datasets (n=1).	Evidence from greening research (n=1). Evidence of food security and biodiversity (n=1). Temperature and wind measures (n=1)			Evidence of food security and human well-being (n=1). Temperature measurement, assessment of viability of tree species (n=1)

Source: Authors

Types of health-related evidence are used to critique existing planning strategies

Thirty-nine out of the 141 articles discuss the failures and limitations of existing bureaucratic-level planning strategies by drawing on various types of health evidence and research.

Five out of the 39 articles were embedded upon a Global Public and Population Health Perspective, while 16 were framed upon a Socio-Ecological Determinants Perspective and 18 upon a Planetary Health perspective. The five embedded upon a Global Public and Population Health perspective all discussed how current planning strategies lack the preparedness to cope with the health impacts of increasing urbanization and 21st century demographic change.

Of the 16 articles embedded upon a Socio-Ecological Determinants perspective, three drew on evidence from resident survey questionnaires to argue that current planning strategies remain overly focused on individual rather than community satisfaction and quality of life. However, the most common type of evidence used to critique existing planning strategies by articles embedded upon this perspective was evidence of local contextual socio-demographic, socio-economic and socio-cultural characteristics of sample populations, with nine articles criticising existing approaches to planning on the basis that planning strategies tend to view health factors supporting positive health outcomes in isolation rather than in terms of specific local contexts (Allen and Blandy, 2004; Duff, 2012; and Gunn et al., 2017; for examples).

Eighteen articles were embedded upon a Planetary Health perspective and all used evidence from existing research and systematic literature reviews to highlight how little attention has been given to addressing the problems caused by anthropogenic climate change on human health (see Bellamy et al., 2017; Davern et al., 2017).

Nine out of 141 articles use health evidence and evidence from health-focused research to critique existing planning strategies at the Action-Implementation level. None of the articles using health-related evidence for critiquing existing planning strategies at the action-implementation level were embedded upon a Global Public and Population Health Perspective. Six articles framed upon a Socio-Ecological Determinants of Health Perspective drew on evidence from reviews of existing literature to highlight how current power trajectories of information sharing limits innovation and creative change within planning. All three articles embedded upon a Planetary Health perspective drew on evidence from existing research examining the viability of the natural environment for supporting human health (Davern et al., 2017; Pattanayak and Haines, 2017; Watts et al., 2015).

Table 3 presents a comparative summary of the ways in which health-related evidence has been used to critique existing planning strategies.

Table 3. Types of Health-Related Evidence Used to Critique Existing Planning Strategies at the Bureaucratic and Action-Implementation Levels and for Each Perspective of Health (N=141)

Articles that discuss how health-related evidence is used to critique existing planning practice (n=48)					
Health-related evidence targeted at the bureaucratic level (n=39)			Health-related evidence targeted at the action-implementation level (n=9)		
Global public and population health (n=5)	Socio-ecological determinants of health (n=16)	Planetary health (n=18)	Global public and population health (n=0)	Socio-ecological determinants of health (n=6)	Planetary health (n=3)
Evidence from research: how planning strategies lack preparedness to cope with the impacts of increasing urbanization (n=5).	Resident survey questionnaires (n=3). Randomised controlled evidence and epidemiological measurements of health (n=6). Evidence of local contextual socio-demographic, socio-economic and socio-cultural characteristics (n=9).	Evidence from existing research and systematic literature reviews (n=18).		Evidence from reviews of existing literature (n=6).	Evidence from existing research examining the viability of the natural environment for supporting human health (n=3)

Source: Authors

Types of health-related evidence proposed for translation into planning strategy developments

Forty-eight out of the 141 articles discuss types of evidence proposed for integration in bureaucratic-level planning strategy development.

Seven articles were embedded upon a Global Public and Population Health Perspective. Two of these drew upon evidence from existing literature to argue that empirical data focusing on health inequality should be used to advance the development of multi-scaled, inclusive approaches to improving human health. Five articles emphasised that a transdisciplinary approach needs to be taken to meet the challenges associated with increased urbanisation and changing demographic profiles of urban residents. Table 4 lists the other types of health evidence proposed for translation from articles embedded upon Global Public and Population Health perspective.

Thirty-four articles utilised a Social-Ecological Determinants of Health perspective. Twenty-nine suggested that planning strategies can be improved by undertaking greater consideration of the local and regional social health determinants when developing guidelines and plans and by drawing on evidence at different scales (see Allen and Blandy, 2004; Gunn et al., 2017). Ten proposed greater use of evidence of how the built environment overlaps with social factors to optimise healthy behaviours (see Haigh et al., 2011 and Kent and Thompson, 2014). Another ten suggested that approaches to planning strategy development need to involve evidence of resident satisfaction from different socio-demographic groups to improve health equity. Seven suggest that planning should be guided by considerations for improving health equity in a way that ensures that planning professionals understand their own specific roles in promoting health equity (See Gunn et al., 2017 and Haigh et al. 2011). See Table 4 for other types of health-related evidence proposed for consideration in planning strategy development by articles embedded upon this perspective.

Seven out of the 20 articles were embedded within a Planetary Health Perspective. All seven emphasised that planning and health professionals need to consider evidence of the human and environmental health impacts of anthropogenic climate change when planning for higher density neighbourhood development. Six proposed drawing on evidence from existing research focused on collaborative, transdisciplinary approaches aimed at improving urban planning development processes at multiple densities. Five drew on evidence from existing studies of human and environmental health outcomes to argue that planning professionals need to consider to a greater extent the role that the natural environment plays in supporting human health.

Fifty-four out of 141 articles within the sample presented a range of suggestions for improving existing planning strategies at the action-implementation. Three out of the 54 articles were embedded upon a Global Public and Population Health perspective. Two of these proposed that planners draw upon evidence of density and dwelling size and its impacts on health (Easthope and Judd, 2010; Giles-Corti et al., 2012). Giles-Corti et al., (2012) also proposed greater inclusion of evidence from cross-sectional studies of epidemiological data pertaining to human health, human activity levels and transport provision. King (2018) proposed greater recognition of evidence of the mental health impacts associated with the design of public spaces.

Thirty-six articles were embedded upon a Socio-Ecological Determinants of Health perspective. The most common type of evidence proposed for inclusion focused on the importance of design space for meeting the health needs of residents at different stages of their lives (n=11). Other types of evidence proposed are listed in Table 4.

Fifteen articles were embedded within a Planetary Health perspective. Key suggestions included incorporating evidence of the impact of green space and wildlife gardens for human and environmental

Table 4. Types of Health-Related Evidence Proposed for Translation into Planning Strategies (N=141)

Articles that discuss how health-related evidence is proposed for translation into planning practice (n=102)					
Health-related evidence proposed at the bureaucratic level (n=48)			Health-related evidence proposed at the action-implementation level (n=54)		
Global public and population health (n=7)	Socio-ecological determinants of health (n=34)	Planetary health (n=7)	Global public and population health (n=3)	Socio-ecological determinants of health (n=36)	Planetary health (n=15)
<p>Evidence from existing literature pertaining to health inequality (n=2).</p> <p>Cross-sectional epidemiological data (n=1).</p> <p>Evidence from transdisciplinary approaches to improving urban health (n=5).</p> <p>Evidence of good practice in health governance (n=4).</p> <p>Quantifiable empirical data pertaining to disease morbidity and mortality across different (n=5).</p> <p>Evidence of how international political and economic forces affect health (n=3).</p> <p>Evidence from the World Health Organisation Healthy Cities project (n=1).</p> <p>Evidence of local socio-economic factors (n=2).</p>	<p>Evidence of local and regional socio-environmental determinants (n=29).</p> <p>Evidence of how the built environment & social factors optimise health behaviours (n=10).</p> <p>Evidence of resident satisfaction (n=10).</p> <p>Evidence of the role of planning professionals in improving health equity (n=7).</p> <p>Evidence of the effectiveness of cross-sectoral partnerships (n=5).</p> <p>Evidence from health mapping (n=2).</p> <p>Evidence of health behaviour (n=3).</p> <p>Evidence of community health (n=3).</p> <p>Evidence from upstream participation (n=1).</p> <p>Evidence of investment in active & public transport (n=1).</p> <p>Evidence from application of existing checklists (n=1).</p>	<p>Evidence of the human and environmental health impacts of anthropogenic climate change (n=7).</p> <p>Evidence from existing research focused on collaborative, transdisciplinary approaches aimed at improving urban planning development processes at multiple densities (n=6).</p> <p>Evidence from reviews of existing studies of human and environmental health outcomes (n=5).</p>	<p>Evidence of density and dwelling size and its impacts on health (n=2).</p> <p>Evidence from cross-sectional studies of epidemiological data pertaining to human health, human activity levels and transport provision (n=1).</p> <p>Evidence of the mental health impacts associated with the design and availability of public spaces, transport networks, street networks (n=1).</p>	<p>Evidence of design space for meeting the health needs of residents at different stages of their lives (n=11).</p> <p>Evidence of neighbourhood factors for improving quality of life (n=10).</p> <p>Evidence of how to improve ventilation (n=8).</p> <p>Evidence of the effectiveness of specific design features of the built environment (n=7).</p> <p>Evidence of benefits of land use mix (n=6).</p> <p>Evidence of amenity provision on health behaviour (n=6).</p> <p>Evidence of interaction in public spaces (n=1).</p> <p>Evidence of the importance of access to green space (n=1).</p> <p>Evidence of minimum standards for indoor space (n=1).</p>	<p>Human and environmental health evidence and indicators (n=5).</p> <p>Evidence of the impact of green space and wildlife gardens for both human and environmental health outcomes (n=7).</p> <p>Evidence pertaining to building morphology, pollution dispersal and air quality (n=7).</p> <p>Evidence of the implementation of sustainable energy sources (n=4).</p> <p>Urban climate knowledge(n=1).</p>

Source: Authors

health outcomes (n=7), and evidence of building morphology to illustrate how environmental health can be improved through the enhancement of pollution dispersion to improve air quality (n=7). Four articles discussed how tall, high-rise buildings present important opportunities for implementing sustainable energy sources to enhance environmental health. One article suggested that urban climate knowledge can be promoted in higher density planning to visually and spatially highlight the critical importance of urban greenery, urban air paths, open spaces, water bodies, and building morphology, for enhancing health (Ren et al., 2013).

Discussion

The findings indicate that little academic research is currently available that focuses on how health evidence has been incorporated into planning practice to date. Most of the 141 documents did not focus directly on types of evidence that had been translated into planning strategies for higher density living currently, although they drew on evidence focused on a range of human health outcomes to criticise existing approaches to planning. It is possible that in many cases the research was used to inform changes to planning that occurred later, however this remains unknown from this review of the literature. However, in general, the study suggests that there is a paucity of evidence being translated for embedding and use in the actual development of strategies for higher density urban living. This suggests a need for health and planning professionals to collaborate on planning strategy developments for healthy higher density living at an early stage.

The findings indicate that a considerable wealth of research exists that proposes a variety of different types of health-related evidence for embedding in higher density planning policy and practice to improve human and environmental health outcomes. However, while this research has led to the emergence of various proposals for integrating health evidence in planning policy and practice, it remains unknown whether and how these suggestions may be mobilised in actual planning strategy developments, and what challenges or barriers may influence the extent to which this evidence may be successfully integrated within specific local contexts. This strongly indicates that a need for research focusing on the actual process of the implementation and mobilisation of evidence to understand the challenges and opportunities that influence processes of evidence translation.

The findings also highlight that most of the small number of articles that explore how health evidence has been integrated into planning policy and practice focus on the integration of evidence at the bureaucratic level. Similarly, most of the health-focused evidence that it used to critique existing planning strategies is focused at the bureaucratic level. However, over half of the articles that draw on health-related evidence to argue for integrating health-evidence in planning practice discuss how this may be achieved at the action-implementation level. The gulf between research focusing on how health evidence has been translated into planning practice at the action-implementation level and the amount of research that proposes ways for health-evidence to be integrated at this stage suggests that significant opportunities exist for further research to be undertaken that applies these proposals in practice in order to evaluate the suitability and limitations of embedding these suggestions within a real-world context.

The study also shows how theoretical perspectives influence what types of health-focused evidence are applied in planning strategy development and what types of health-related evidence are proposed for integration in planning policy and practice. This shows that what is considered to refer to 'health-related evidence' is not universally understood and its meaning cannot be taken for granted. This is especially important for consideration in the development of future studies that seek to apply and evaluate the translation of proposed types of health-related evidence into actual planning practice as it cannot be assumed that all planning professionals will understand the term 'health-related evidence' in the same way.

Furthermore, the absence of articles embedded upon both a Global Public and Population Health and a Socio-Ecological Determinants of Health perspective discussing the implementation of evidence at the action and implementation level may possibly reflect a situation whereby there has been little interaction

between health professionals, policy makers, and planners in research and practice to date focusing on improving health outcomes in the higher density urban context.

Therefore, although existing research suggests that there exists a limited number of opportunities for health researchers to influence planning at the policy and bureaucratic level, there remains little interaction at the local action-level. This therefore may be suggestive of a need to for more research looking at collaborative transdisciplinary approaches to higher density urban development.

Conclusion

To conclude, while a range of health-related evidence is proposed in the existing research for translation and implementation in future planning strategies, there exists a significant need for targeted transdisciplinary research in order to apply, test and evaluate the implementation of health evidence within local higher density contexts, and to understand the opportunities, challenges and barriers that influence the integration of health-related evidence in planning policy and practice to enable opportunities to be maximised. This is essential for ensuring that urban planning strategies can successfully enhance the health and wellbeing of the growing population predicted to be living in higher density urban environments in the future.

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