Housing as a Determinant of Health 1

Housing as a social determinant of health: a contemporary framework

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Housing is a key social determinant of health. Healthy housing is affordable, suitable, and secure. It is characterised by warmth, dryness, and proper ventilation; free from hazards such as mould and toxins; accessible to occupants with functional limitations; and provides foundational security. Conversely, exposure to unhealthy home environments can negatively affect respiratory and cardiovascular health, mental wellbeing, infectious disease transmission, and injury risk. Housing-focused health interventions and programmes offer a unique opportunity to bridge the gap between housing and health, potentially leading to improved population health outcomes across various domains. This Series paper integrates contemporary understanding of housing and housing systems into a social and economic determinants framework. We illustrate how housing systems contribute to poor health outcomes and health inequalities, providing a foundation for exploring housing's potential to support health across jurisdictions globally. Although our framework can be used to examine the relationship between specific housing hazards (eg, mould, cold, or heat) and health, its primary focus is on understanding how these hazards are generated and distributed through characteristics of the housing system (eg, building codes or housing finance). By addressing these housing system determinants, we propose an alternative approach to achieving healthier housing. This framework aims to support the strategic use of housing to promote good health for all populations.

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This is the first in a **Series** of two papers about housing as a determinant of health

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For **UN estimates** see https://unhabitat.org/annual-report-2024

For more on the **US National Centre for Healthy Housing** see https://nchh.org/information-and-evidence/learn-about-healthy-housing/healthy-homes-principles/

Introduction

Home is a key setting where human health can flourish, but for too many people, it can be a site of profound harm to longevity and wellbeing. The UN estimates that 1·6 billion to 3 billion people have unsafe, inadequate, or unaffordable housing with effects on infectious disease transmission, respiratory problems, and mental health.[1,2] Our ability to respond to the challenges of rapid population growth and a changing climate is related to how well housing and housing systems can be harnessed to enhance and protect human health. This paper is the first in a Series of two papers exploring housing as a determinant of health and health inequalities. It offers a social determinants framing of housing and health. The second paper in this Series[3] focuses on the intersection of housing and health with climate.

1.12 billion people lived in informal settlements and slums in 2022, according to UN Habitat.[1,4] These are defined as groups of individuals living under the same roof in an urban area who lack: durable housing of a permanent nature that protects against extreme climate conditions, sufficient living space (not more than three people sharing the same room), easy access to safe water in sufficient amounts at an affordable price; access to adequate sanitation in the form of a private or public toilet shared by a reasonable number of people, and, security of tenure that prevents forced evictions.[5] Measures to reduce informal settlements to meet Sustainable Development Goals have been ineffective due to increased urbanisation and scarcity of housing.[6] In the first 20 years of the 21st century, the number of people living in informal settlements has increased by approximately 50% from 792 million to 1·1 billion (compared with a 25% increase in the world's population) and continues to remain high.[6]

However, these numbers only show the scale of the problem. A healthy home is one that is dry, clean, safe, well ventilated, free of pests and contaminants, well maintained, and thermally comfortable (according to the National Centre for Healthy Housing in the USA). WHO has generated guidelines for intervening on housing to improve population health,[7] including that homes should be accessible to all people, regardless of their age or if they are living with an impairment or disability. Furthermore, the WHO Urban Health agenda[8] identifies clean air and secure housing as priority areas for action to support healthy urban environments. Even in high-income countries, these standards are not fully achieved. Issues of energy poverty, poor ventilation, and cold and damp conditions in homes pose substantial challenges for public health.

The most recent report on progress on the Sustainable Development Goals highlights the urgent need to focus on policies for improving health, affordable housing, basic services, sustainable mobility, and digital connectivity.[6] To support these initiatives, we propose a housing-focused social determinants framework that enables identification of distal or upstream factors that shape housing and housing systems, and consequently, population health.[9] We position good housing as one factor important for good population health.[10–12] Acknowledging the value of such framing in linking research and policy across a range of relevant domains, and designing prevention strategies to improve population health, this Series paper aims to extend

current frameworks. Specifically, we seek to give explicit attention to the role of housing systems in distributing households into affordable, suitable, and secure housing. This approach is important for identifying how societies can respond to health challenges through legislation, governance, regulation, and financing of housing rather than focusing on housing conditions alone. Considering both proximal and distal determinants together links measures that protect health, such as insulation and temperature,[13–22] to broader social structures that govern their implementation and distribution. Moreover, we aim to position our framework within a global context, thereby offering a means of generating indicators from available similar national data that describe the health of housing systems across jurisdictions.

The potential of housing to reduce health inequalities

One benefit of focusing on housing as an intervention point to improve health is its potential to substantially reduce socioeconomic health inequalities.[23] For example, if cold housing was eradicated in Australia, the per capita health gains have been estimated to be greater for the most deprived than for the least deprived.[24,25] From a global perspective, interventions that reduce informal settlements and enhance sanitation and water access have the potential to decrease health inequalities between high-income, middle-income, and low-income countries.

Intervening directly in inadequate home environments (eg, indoor temperature, dampness and mould, and injury risk) holds appeal because proximal intervention targets are likely to have the most immediate health benefit. Yet, in many cases, the further upstream the intervention, the greater the potential for more equitable outcomes (eg, targeting perverse tax incentives or affordability rather than subsidising retrofits). Intervening on the affordability, suitability, and security of a housing system, or—further upstream still—on the contextual drivers of housing systems, such as taxation, has the potential to yield far-reaching and sustained health benefits. Although these are often the most politically challenging interventions, policy makers should consider upstream systemic factors and their wider contextual drivers to avoid generating and perpetuating inequalities.

When examining housing and health inequalities, within-country and between-country differences should be distinguished between. Within-country inequalities often reflect socioeconomic inequalities, urban–rural divides, and racial or ethnic segregation. These disparities can manifest in varying housing quality, access to services, and exposure to environmental hazards, by social categories such as gender, age, and disability, leading to substantial health inequities among population groups within the same nation.

By contrast, between-country inequalities are often more pronounced than within-country inequalities, and reflect broader economic, political, and developmental differences. Low-income countries might struggle with basic housing infrastructure, leading to widespread health issues related to poor sanitation, lack of clean water, and overcrowding. Conversely, high-income countries might grapple with affordability crises or the health impacts of urban planning decisions. Addressing inequalities requires different strategies and levels of intervention depending on comparison points, from local policy changes to international development efforts.

A social determinants framework for healthy housing

Existing frameworks have highlighted the role of social, political, economic, and regulatory contexts in shaping access to adequate housing.[26–28] We add to this growing body of thought by providing a detailed treatment of housing as a system influenced by historical and contemporary contexts, which, in turn, determines access to affordable, secure, and suitable housing. This access directly and indirectly affects people's health and shapes housing-related health inequalities. We further position this framework within a global perspective, enabling cross-country comparisons of key indicators of healthy housing systems.

In our framing of housing as a social determinant of health, we start with social, economic, environmental, and political factors that shape housing markets and the availability of affordable, secure, and safe housing (eg, welfare regimes). We then consider the type of housing system that prevails because of this context and history (eg, reduced state provision of housing), followed by the capacity of a given housing system to provide affordable, secure, and suitable housing (eg, access to social housing), and finally the resultant nature of home environments across available housing stock within a system. We also acknowledge that people's health determines their access to affordable, secure, and suitable housing, and these loops reinforce health and socioeconomic inequalities.

To maximise the potential of housing to benefit health,[29] the social and economic role of housing in society and how it functions as a system that is influenced by its jurisdictional context should be understood. The layers of upstream factors that influence and shape our housing systems need to be examined. Each element of our proposed framework is described in more detail in the following sections (figure 1).

Historical legacy and contemporary social, commercial, and political context

Historical legacy

Housing is a material intervention into communities, and it creates especially durable path dependencies, where the positive and negative legacies of past policies are directly inscribed into places where people live. Contemporary access to housing resources is directly shaped by choices made decades, sometimes even

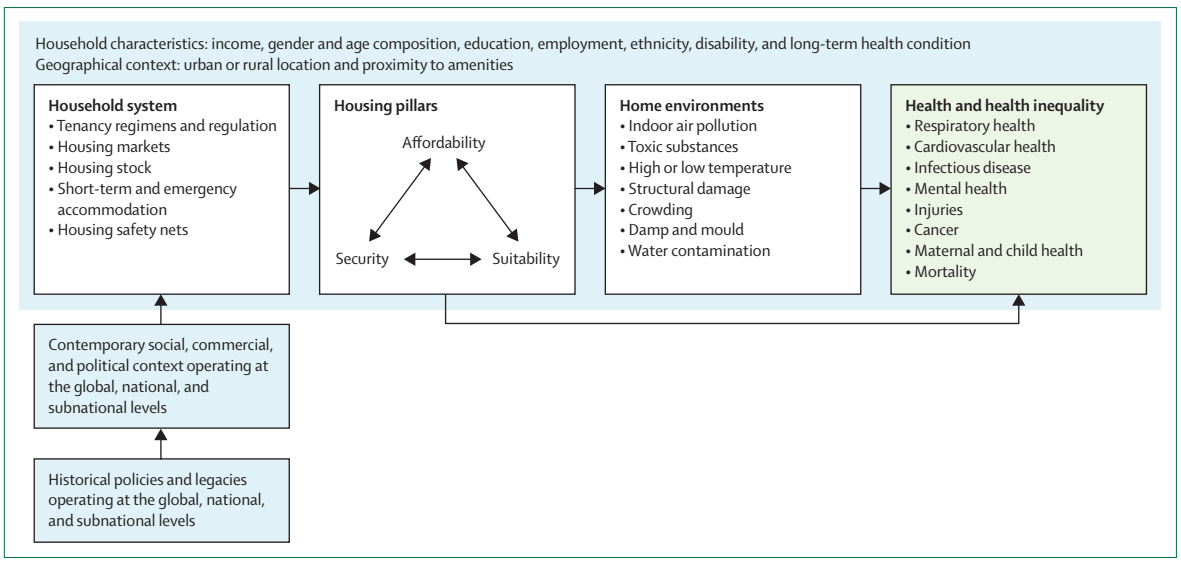

Figure 1: **Overall framework for housing as a social determinant of health and a reducer of health inequalities**

centuries, in the past. For example, race-based policies around house-building and mortgage lending in the USA have created, over time, spatial and social divides in communities that continue to shape health inequalities today,[30] in part through exposure to air pollution, poor quality housing, and differential access to medical care.[31] Such spatial divisions in housing conditions are pervasive, affecting most cities and communities, and are often the product of policy decisions, regulations, and social norms that continue to be correlated with inequitable access to goods and resources.[32]

Contemporary context

Countries take very different approaches to providing and maintaining housing for their constituents. Key elements that drive this variation include the country's wealth, political environment, governance and regulatory structures, policy landscape (including taxation), community expectations of living standards, and historical and cultural factors that establish where people live and their access to resources (particularly for countries with a history of racial, ethnic, or religious segregation).[33]

The stakeholders who care about housing are diverse (eg, landlords, tenants, owner-occupiers, developers, politicians, advocacy groups, and housing researchers), but their power to influence the housing system varies greatly by jurisdictional context. The political economy of housing varies across places and is partly rooted in norms of ownership versus renting, the kinds of housing markets shaped or created by government policy, historical investments in social housing, regulations governing what can be built where, and who has a say in these decisions, all of which structure the power imbalances among these stakeholders.[34] These institutional variations are the grounds on which healthy or unhealthy housing gets created. For example, in Denmark, there has been a longstanding expectation that safe and secure housing is a political priority which, building on its broader culture of social democratic institutions, has created an integrated housing market where non-profit rental providers, who give a voice to tenants, have a strong role.[35] The consequence has been one of the least precarious housing regimes in Europe,[34] one that appears to be better at creating health-protecting housing.

Intervening to change contextual forces and drivers of the housing system—as opposed to intervening on housing or housing systems themselves—has potential for large-scale benefits. For example, Australia's tax system supports negative gearing, whereby if an investor borrows money to purchase a property and the income generated from that property (usually rental income) is less than the cost of owning and managing it, then this net loss can be offset against other income to reduce the investor's overall taxable income. This approach incentivises investment in private rental property, which thereby increases the supply of rental housing, but contributes to a shortage of affordable housing for prospective owner-occupiers.[36] Reforming this aspect of the tax system has proven politically challenging, but such an intervention could have positive effects on the housing system by reducing inequalities within it.

In addition, recent work has highlighted how both colonialism and global capitalism have, historically and currently, shaped the availability and quality of housing in ways that affect health[37–39] and how important it is to consider what causes inequalities to arise and persist, who benefits from them, and how they operate transnationally. Understanding these influences allows

identification of distal levers tied to, for example, transnational operators including those regulating migrant labour from low-income countries into high-income countries, and recognition and remedy of historical wrongs.

Housing system

Housing systems include various components, including tenancy regimes and regulations, such as informal tenures, rental, ownership, and community housing; housing markets, covering prices, lending, and developments; housing stock—ie, the available physical infrastructure; provision of short-term and emergency accommodation; and housing safety nets such as public and social housing or housing payment supports. Most, if not all, housing systems share common elements. These include regulatory standards and their enforcement, the supply of affordable homes, and a diverse mix of tenures, ranging from social and public rental to private rental and ownership. They also involve the availability and allocation of emergency or short-to medium-term accommodation (eg, housing for women experiencing domestic violence), and the scale and distribution of housing welfare programmes (eg, how much public housing stock is available). Additionally, key aspects include the extent to which the property market drives the economy—through generating capital gain or as a source of tax—and the financialisation of housing, which refers to the role of financial markets and institutions, and their motives in turning housing into a wealth asset.

Aligned with our social determinants framing, action to improve housing and health by acting to shift policy and practice within the housing system is a path to better population health. Examples of interventions targeting housing system changes include reducing grounds for eviction in the private rental market,[40] extending the length of tenancy agreements at the outset of lease arrangements, and capping the extent to which properties in regions of low supply of affordable rentals can be leased to provide short-term accommodation.[41]

Pillars

There are at least three cornerstones of housing systems that, actively and in combination, characterise housing (and shape home environments).[42] In line with Swope and Hernández,[28] we refer to these as the pillars of housing:[9] affordability, security, and suitability. The elements of a housing system described earlier combine to collectively establish the affordability, security, and suitability of housing within that system. These three pillars can affect health directly (eg, affordability affects mental health)[43,44] and indirectly through their effect on the quality of home environments. The capacity of housing systems to generate affordable, secure, and suitable housing can therefore be harnessed for prevention and intervention strategies to improve population health.

Affordability

Housing is unaffordable when its cost relative to income exceeds a particular threshold. Housing costs commonly encompass the sum of rent or mortgage payments, home repairs and maintenance, but also often include transportation (eg, for commuting) and energy costs.[45–47] The importance of housing affordability for poverty alleviation and health has been well described.[48] A large body of evidence describes a negative effect of housing affordability on mental health in particular, and in some jurisdictions, it could be worse for people in the rental sector.[49] The evidence linking affordability to physical health conditions is less clear than for mental health, and pathways are likely to be indirect and operate through the quality of home environments.

Security

Security in housing is the guarantee that occupants can reside in their homes without fear of forced eviction, harassment, or other threats. Consequently, housing security is often linked to the type of tenure.[50] Secure housing also encompasses affordable housing, as high housing costs can lead to undesirable or forced relocations. The term precarious housing is often used when affordability is a driver of insecure housing. Within housing systems, the provision of safety nets in the form of social or public housing supported by government or in partnership with the private or community sectors is an important way to foster a sense of security. The feeling of safety, control, privacy, continuity, and permanence of housing as a home is linked to the concept of ontological security: a sense of continuity and order, or security of being.[51] These psychosocial aspects of how people feel about their housing security are closely connected to their wellbeing and health.[52]

Recent scholarship—primarily in high-income settings, in particular the USA—has shown that insecure housing circumstances, including the threat or experience of eviction, negatively affect people's health and wellbeing. These effects include mental health,[53–55] birth outcomes and maternal health,[48,56] health-care access and use,[56] mortality,[57] risky sexual behaviour,[58] sleep,[59,60] and food insecurity.[61] Conversely, secure housing can provide a basis for maximising education and employment opportunities, and can lead to better health outcomes. Access to secure housing is a key driver of health inequalities in high-income countries and interventions to increase housing security (such as provision of social and community housing) are considered crucial for refugee resettlements and for enabling individuals to lead healthy and productive lives.[62,63]

Suitability

Suitability describes a dwelling's capacity to meet the specific needs of its inhabitants (eg, based on their age or ability) and maintain their good health, typically concerning its location, condition, size, and design.[64] As

such, it is a broad concept that encompasses elements such as a dwelling's physical properties, accessibility, cultural appropriateness, and sustainability. Although characteristics described in the framework as home environments and hazards contribute to whether a house is suitable for its occupants, these hazards stand alone and define population-wide thresholds that can be used in regulation (eg, indoor temperature goals for thermal comfort). The concept of suitability as a housing pillar more broadly references the relationship between houses and specific occupants' needs.

Interplay between housing system pillars, household characteristics, and location

The affordability, suitability, and—to a lesser extent—security of housing can often only be understood relative to the characteristics of the resident household. For instance, assessing the suitability of housing requires consideration of the occupants' specific needs, such as age, disability, or household size. A two-bedroom dwelling, for example, would be inadequate for a large family consisting of two adults and five children, as it fails to meet the occupants' spatial and privacy needs. Similarly, affordability is determined in part by household income, and housing stability can be affected by a range of household characteristics. Additionally, resident characteristics, such as age, might inform how housing affects health. Housing disadvantage in childhood is associated with poor health at the time and later in life.[65] This association underscores the crucial role that housing has throughout the life course, as early experiences can have long-lasting positive and negative effects on health. Children living in substandard housing conditions might face immediate risks to health such as respiratory issues,[66–70] injuries from unsafe structures,[71] or increased susceptibility to infections due to overcrowding.[72] Their vulnerability to their immediate environment is linked to stages of development and behaviour as they progress through childhood and adolescence. Early adversities (eg, infections from mould exposure) can predispose individuals to chronic health problems that persist into adulthood. Moreover, housing instability during childhood, including frequent moves or homelessness, can disrupt education, social connections, and access to health care,[73] further compromising long-term health outcomes. As individuals progress through different life stages, the cumulative effects of poor housing conditions can manifest in various ways, from increased susceptibility to mental disorders to higher rates of chronic diseases. In fact, policy evidence indicates that housing programmes have greater long-term effects when experienced in childhood.[74]

Location, including access to amenities, or geographical context is both a component of suitability, and separately interacts with affordability, security, and suitability, in ways that can influence health. The location of housing within jurisdictions and relative to amenities such as transport, health care, education, and employment plays a crucial role in shaping access to health and health-promoting resources.[75] A well located home can enhance

	Affordability: average percentage of household income spent on housing	Suitability: overcrowding rate	Security: percentage of social housing of total housing stock
Australia	23·2%	..	3·2%
Austria	24·1%	11·7%	23·6%
Belgium	25·7%	4·0%	4·2%
Bulgaria	18·4%	23·0%	..
Canada	25·0%	0·7%	3·5%
Chile	15·0%	9·3%	..
Colombia	15·0%	32·2%	0·0%
Costa Rica	15·6%	8·0%	..
Croatia	14·9%	22·9%	..
Cyprus	16·8%	1·3%	..
Czechia	26·0%	10·9%	3·6%
Denmark	29·1%	8·4%	21·3%
Estonia	22·5%	12·6%	1·1%
Finland	29·7%	10·3%	10·9%
France	26·2%	7·4%	14·0%
Germany	24·6%	9·0%	2·6%
Greece	19·2%	17·9%	..
Hungary	22·6%	8·9%	2·6%
Iceland	23·2%	9·2%	11·1%
Ireland	28·0 %	2·8%	12·7%
Israel	25·0%	..	1·8%
Italy	24·8%	16·9%	2·4%
Japan	26·0%	1·6%	3·1%
South Korea	17·3%	4·0%	8·9%
Latvia	21·3%	32·8%	1·9%
Lithuania	16·4%	17·3%	0·8%
Luxembourg	21·5%	4·8%	..
Malta	13·9%	1·1%	..
Mexico	17·2%	30·0%	..
Netherlands	23·4%	3·5%	34·1%
New Zealand	26·5%	0·7%	3·8%
Norway	22·9%	7·0%	4·1%
Poland	18·9%	28·4%	6·6%
Portugal	17·3%	4·3%	1·1%
Romania	18·4%	24·9%	..
Slovakia	30·3%	22·7%	2·5%
Slovenia	18·9%	8·5%	4·7%
Spain	22·3 %	3·8%	1·1%
Sweden	25·3%	15·7%	..
Switzerland	26·9%	5·0%	8·0%
Türkiye	12·4%	23·8%	..
UK	26·5%	0·8%	16·4%
USA	18·2%	4·4%	3·6%
Average	21·8%	11·5%	7·1%

Data are from the Organisation for Economic Co-operation and Development (OECD) housing affordability dataset from 2022 or the most recent available.

Table 1: **Organisation for Economic Co-operation and Development affordable housing data categorised by housing pillars**

For **OECD dataset** see https://www.oecd.org/en/data/datasets/oecd-affordable-housing-database.html

quality of life by reducing commute times,[76] improving access to essential services, and fostering community connections.

The interplay with location is complex and multifaceted. For example, a seemingly affordable home in a remote location might become less economical when factoring in transportation costs and limited access to services. Similarly, a well located property might be unaffordable for many, potentially leading to overcrowding or substandard living conditions as families attempt to remain in desirable areas. A small apartment might provide sufficient space for a household, but only when the restricted indoor area is offset by nearby provision of public and green spaces.

The three housing pillars of affordability, suitability, and security are also themselves interrelated. Unaffordable housing can directly and indirectly have an effect on housing security and suitability through mechanisms such as the risk of eviction, overcrowding, restricting neighbourhood choice, and impacting a household's ability to maintain the condition of their dwelling.[64] It also affects other domains of living, such as household expenditure on food, fuel, and medical care,[77] which can result in a range of adverse health and wellbeing outcomes, particularly in relation to mental health.[43]

Monitoring affordability, suitability, and security at the country level

For the **OECD housing database** see https://www.oecd.org/en/data/datasets/oecd-affordable-housing-database.html

Standardised measures of affordability, suitability, and security could be used to monitor healthy housing internationally. For example, drawing on the Organisation for Economic Co-operation and Development's current data collection on housing affordability and using available measures to examine each pillar of housing, could provide insight into jurisdictional variations in housing systems (table 1).[78] Examining the correlation between items with Pearson's correlation function suggests that affordability and suitability are negatively correlated (–0·35); likewise, suitability and security (–0·26). This negative correlation suggests that decision makers might be making trade-offs, prioritising affordability and security over the suitability of housing within housing systems. Notably, affordability and security are positively correlated (0·33) suggesting that they are related housing features, and in fact, they are intertwined concepts.

Data across these three pillars illustrate how widely housing systems vary between countries. For example, although a country such as Colombia rates better for affordability than other jurisdictions such as the UK and Canada, it has one of the highest rates of overcrowding and no government provision of social housing (indicating no safety net), signalling that security and suitability of housing are of concern. In the Netherlands, there is high security and suitability of housing, with more than a third of housing stock dedicated to social housing provision and low rates of overcrowding. However, households spend, on average, around a quarter of their income on housing, which is higher than in many other jurisdictions. Considering information across a range of measures allows identification of countries doing well in terms of providing a high standard of housing and gain of useful insights for targeted housing reform strategies.

Home environments and hazards

WHO Housing and Health Guidelines have been important in establishing a thorough assessment of research evidence, and the types of factors within people's homes that directly protect or harm their health.[29] These are referred to as home environments. Home environments are the most proximal determinants of housing-related health effects. Air quality, temperature, security, accessibility, noise, and exposure to toxic substances have been identified as being related to the health of occupants (figure 2).

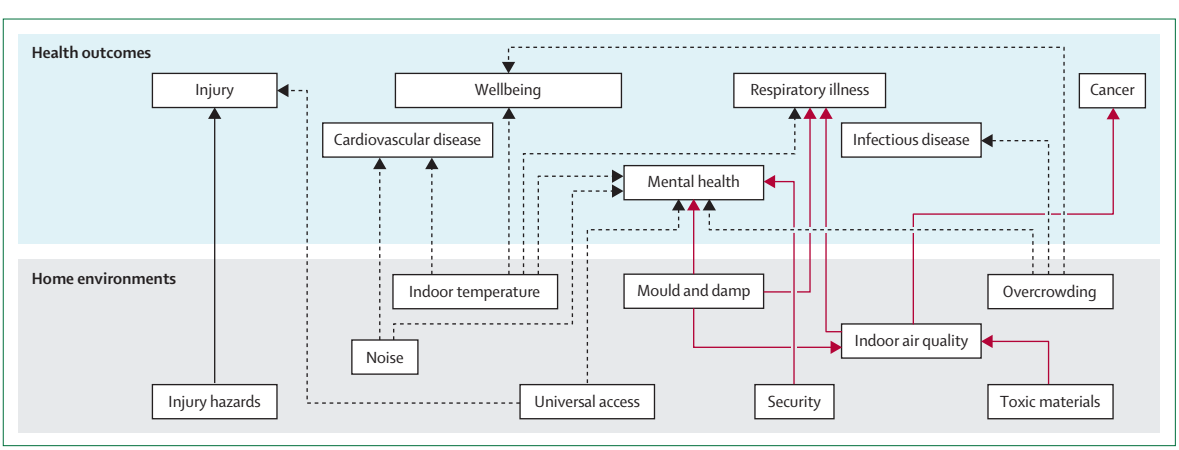

Figure 2: **Pathways between home environments and health**
Dashed lines indicate weak/moderate evidence. Solid black lines indicate strong evidence. Solid red line indicates evidence has not been mapped specifically in WHO Housing and Health Guidelines.[29] Ratings of strength of evidence on pathways were assigned by the WHO Housing and Health Guideline Development Group using the Grading of Recommendations Assessment, Development and Evaluation rubric and the diagram is based on WHO 2018 healthy housing priorities.[31]

	Household air pollution from burning solid fuels (% of global total)	No access to handwashing facility (% of global total)	Unsafe sanitation (% of global total)	Unsafe water source (% of global total)	Low ambient temperature (% of global total)	High ambient temperature (% of global total)
African region	36 336 305·70 (40%)	21 773 939·00 (64%)	24 732 936·90 (60%)	34 995 080·30 (54%)	1 006 701·41 (4%)	3 198 303·09 (27%)
Eastern Mediterranean region	9 884 893·45 (11%)	3 144 316·76 (9%)	3 963 154·62 (10%)	7 095 538·89 (11%)	2 441 970·19 (9%)	1 947 226·89 (17%)
European region	774 999·17 (1%)	202 903·93 (1%)	281 728·97 (1%)	459 447·44 (1%)	6 434 314·57 (25%)	90 757·52 (1%)
Region of the Americas	1 934 120·14 (2%)	696 750·58 (2%)	741 120·37 (2%)	1 325 792·19 (2%)	2 920 161·02 (11%)	616 000·05 (5%)
South-East Asia region	30 002 833·30 (33%)	7 493 001·05 (22%)	10 824 491·30 (26%)	19 499 543·40 (30%)	3 072 238·80 (12%)	5 086 268·88 (44%)
Western Pacific region	12 468 813·60 (14%)	727 654·88 (2%)	838 740·31 (2%)	1 673 515·52 (3%)	10 055 620·20 (39%)	749 697·86 (6%)
Total	91 401 965·40 (100%)	34 038 566·20 (100%)	41 382 172·60 (100%)	65 048 917·74 (100%)	25 931 006·19 (100%)	11 688 254·29 (100%)

Table 2: **Disability-adjusted life-years attributable to measures of home environments**

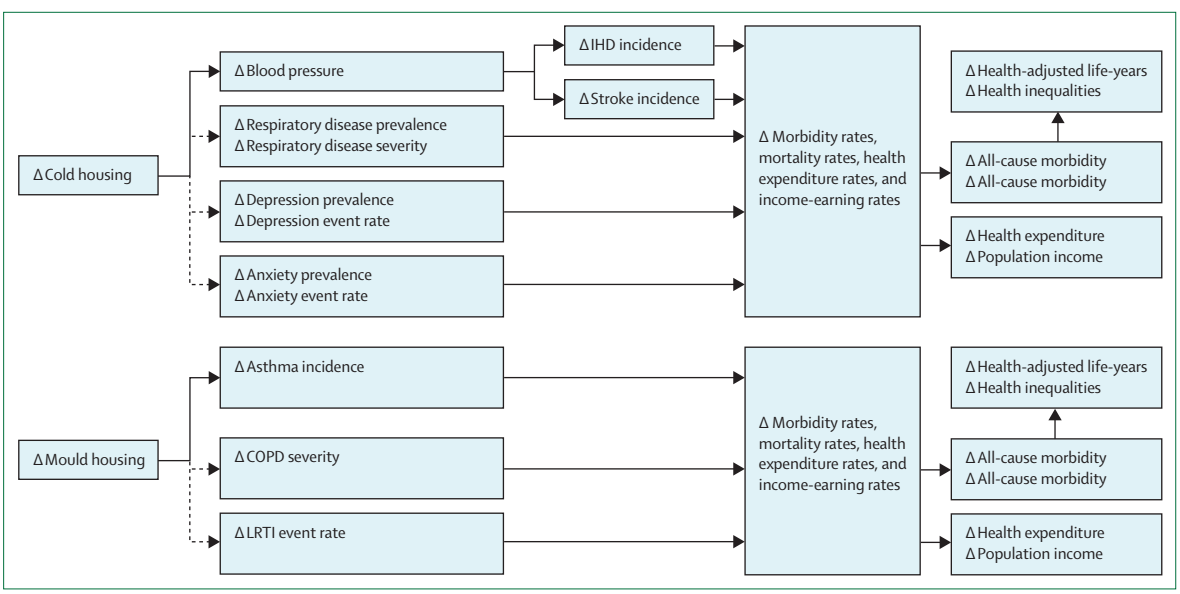

Figure 3: **Health effects of cold housing and mould**
Solid-line arrows to diseases indicate strong evidence for the strength of the link between indoor environment and disease. Dashed arrows indicate moderate evidence, for which the disease is causally associated, but the magnitude of the association is poorly ascertained, requiring use of other methods to specify the effect size. COPD=chronic obstructive pulmonary disease. IHD=ischaemic heart disease. LRTI=A: lower respiratory tract infection. Δ=change.

To fully harness housing as a positive social determinant of health, data are needed. The need for comprehensive housing data has been a longstanding concern. As far back as 1954, the UN Economic and Social Council noted that "the lack of statistics concerning housing in most of the world is one of the principal obstacles of a successful pursuit of…practical action to improve housing conditions".[79] Although some progress has been made, substantial obstacles remain. Some aspects of home environments, such as indoor air quality, cooking with solid fuels indoors, and access to clean water, are included in The Global Burden of Disease 2021 statistics, allowing cross-national comparison on a subset of indicators (table 2).[80] To enable countries to be compared using a common metric, the overall burden of disease is assessed using the disability-adjusted life-year (DALY). This is a time-based measure that combines years of life lost due to premature mortality (death before age 64 years) and years of life lost due to time lived in states of less than full health, or years of healthy life lost due to disability. One DALY represents the loss of the equivalent of one year of full health. This comparison reveals a high burden of disease associated with the burning of solid fuels for cooking and unsafe sanitation, particularly in the Africa and South-East Asia regions. Also of note are regional variations in the burden of disease attributable to either high or low (ambient) temperatures, with low temperatures causing the greatest burden in the Western Pacific and Europe, whereas high temperatures cause the greatest burden in the African and South-East Asia regions.

However, for the most part, data are scarce and there is little consensus on standards of measurement for many home environments. Because most measures of home environments are not standardised (eg, there is no set definition of thermal comfort thresholds), comparisons across jurisdictions cannot be made which restricts the

ability to fully estimate the extent of housing-related health burden globally. For example, surveys on mould vary widely in how they collect information, making the comparison of prevalence across settings difficult. Climate change—including increased risk of storms and floods—makes mould even more important to track over time. In general, when standards are validated, quantification of disease burden from housing is possible; for example, lead contamination in housing and its correlation with blood lead concentrations have enabled global estimates of elevated blood pressure and learning disabilities.[81]

Moving forward, evaluating evidence-based approaches to healthy housing inspection, remediation, medical treatment for housing-related disease and injury, and financing options are all important research priorities. It could be argued that, in many settings, neither the health nor housing sectors focus sufficiently on the prevention of disease and injury through housing interventions. This oversight unnecessarily, and inefficiently, shifts the costs of poor health from inadequate housing onto the medical profession. Unless a home has been remediated, releasing patients back to it makes little sense. Therefore, elucidating the costs and benefits of healthy housing interventions, and optimising existing housing inspection and improvement mechanisms, presents valuable opportunities for research.

To quantify the health effects of housing interventions for decision making, researchers have estimated the contribution of eradicating cold housing to reductions in population disease burden, gains in future health-adjusted life years, and health system expenditure, based on using a structured simulation model linking housing risk factors with diseases and all-cause mortality and morbidity.[82] In doing so, the health effects of exposure have been mapped in more detail for cold housing and mould based on stringent reviews of the evidence (figure 3).[24] Importantly, WHO notes that, in some countries, housing interventions are usually done as an integrated package, not one at a time.[7] This integration reinforces the benefits of using a wider framework to consider healthy housing rather than focusing on single exposures. Moreover, the potential importance of other pathways that have been less well researched to date (such as the effect of affordability on fertility decisions) should not be ignored.[83,84]

Conclusion

Providing affordable housing with basic utilities and services is a priority challenge in the 21st century. The UN Sustainable Development Goals include targets to ensure access for all to adequate, safe, and affordable housing, and basic services and upgrade slums by 2030, with a key indicator being a reduced proportion of urban populations living in slums, informal settlements, or inadequate housing. WHO has identified air quality (indoor and outdoor) and housing affordability as priorities in setting their urban health agenda. Across all jurisdictions, the extent of private and government influence on housing systems, including housing markets, is subject to legislation, regulation, lending practices, insurance, and construction and building codes. To achieve better housing conditions, the many layers that influence affordability, security, and suitability internationally across high-income and low-income and middle-income countries need to be acted on. Better surveillance of the pillars of healthy housing is needed: with affordability, security, and suitability as key drivers. Crucially, to adopt a true social and economic determinants of health perspective and to implement large-scale structural changes, it is important to consider housing system levers such as regulation, building codes, and the financialisaton of housing, which vary across settings and shape inequalities. To do so, it is crucial to develop ways that demonstrably ensure housing policies meet health needs while acknowledging other societal purposes of housing systems, including cultural requirements and utility gains. Creating a health and housing framework, defining research needs, and implementing evidence-based inspection and remediation protocols that integrate the housing and health sectors through the lens of social determinants of health is essential.

Contributors

RB and KM conceptualised and designed the paper, and drafted the initial manuscript. All authors contributed to reviewing and revision of the manuscript.

Declaration of interests

PH-C is a board member of the New Zealand Crown Entity He Kāinga Oranga—homes and communities, and received Director payments in 2019–24. All other authors declare no competing interests.

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