Ann Ig 2020; 32: (5 Suppl 1): 17-26 doi:10.7416/ai.2020.3391

Housing and health: an overview

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Key words: Housing, Health, Health inequalities, Evidence, Intervention, Neighborhood
Parole chiave: Abitazione, Salute, Disuguaglianze sanitarie, Evidenze, Interventi, Quartieri

Abstract

Living environment, and especially dwellings, affect directly and indirectly health in several ways end represent one of the key social determinants of health. The relationship between health and housing has long been recognized and, in the last decades, researchers developed several conceptual models to put in relation the numerous housing factors able to impact on inhabitants' health. For some authors, factors linked to housing and neighborhood conditions that influence health, can be grouped into four broad categories: first considers the health impacts of not having a stable home (residential instability); second, the financial burdens resulting from high-cost housing (affordability); third, the health impacts of conditions inside the home (the housing' safety and quality); lastly, the health impacts of neighborhoods, including both the environmental and social characteristics of where people live (neighborhood). It is evident that the theme of "housing and health" nowadays needs to be assessed with a multidisciplinary approach, because of the complexity and wideness of its components. Moreover it is today clear that to guarantee good health standards it is indispensable to direct political and administrative choices to improve the overall conditions of the neighborhood and of the buildings, and, At the same time, to dispose of a clear and updated regulatory system, since key factor to ensure Public Health protection and social justice.

Introduction

Housing is a basic human right, enshrined by the United Nations as the right not just to basic shelter but to "adequate housing," in terms of legal security of tenure; availability of services, materials, facilities, and infrastructure; affordability; habitability; accessibility; location and cultural adequacy (1). Then, housing as 'home' is not just a physical shelter, but also a foundation for social, psychological and cultural wellbeing.

In fact, in public health terms, housing affects directly and indirectly health in several ways, enough to represent one of the key social determinants of health (2).

The relationship between health and housing has long been recognized. In England, for example, the Victorians speculated an association between poor housing and ill-health and the solution they applied (slum clearance and improved sanitation) did much to improve health (3). Not much later similar solutions have been adopted in many countries, Italy included (3).

Looking back, it is clear today that dramatic improvements in death rates from infectious diseases such as typhoid, cholera, pneumonia and tuberculosis, has been owed as much to improved standards of housing as to medical intervention, like vaccinations and antibiotics (3, 4). As the knowledge

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of communicable disease and illness has grown, so has the awareness of the importance of dwelling quality to physical and mental wellbeing, as recently reaffirmed in the WHO' guidelines (5) and has been sadly documented by the recent COVID-19 pandemic (6).

During last century, the fall in mortality for communicable diseases and the exceptional life prolongation explain why chronic diseases became the predominant cause of death. Built environment and housing in particular, considering the duration of permanence of residents, assume a central role in terms of source of indoor pollutants, mainly in degraded housing where generally live economically disadvantaged people. In 2011 WHO estimated – per 100,000 population –13 deaths due to low indoor temperatures, 7 deaths due to Environmental Tobacco Smoke (ETS), and 2-3 deaths due to radon per year in the world. The use of solid fuels as a household energy source is responsible for 17 deaths and causes 577 Disability-Adjusted Life Years (DALY) per year per 100,000 children under the age of five. Mould in homes leads to the loss of 40 DALY per 100,000 children each year, while traffic noise exposure and lack of home safety features cause an annual loss of 31 and 22 DALY per 100,000 population, respectively (7).

A key point to consider is the large change in health problems during time. Today health can mean different things to different people. One of the most pertinent definitions of health is that from the 1948 Constitution of the World Health Organization (8). This statement is the evidence that 70 years ago, public health moved progressively away from the medical model - focused on the individual and on interventions targeted to treat disease - back towards a social model, considering health as an outcome of the effects of socioeconomic status, culture, environmental conditions, employment, community influences, but also housing condition in a broad term (8, 9).

For these reasons in the last decades researchers developed several conceptual models to put in relation the numerous housing factors able to impact on inhabitants' health (2, 10-13). Starting from the UN declaration of '90 - who considered housing as a basic human right, in terms of legal security of house's tenure; availability of services, facilities, infrastructure; affordability; habitability; accessibility; cultural adequacy, etc. - the relationship between "housing & health" moved from a vision centered on physical-biological-chemical factors, typical of classic hygiene, to a multidisciplinary vision aimed to include also other health determinants. In fact, it is known that much research has shown the close relationship between social, economic, political factors and housing wellbeing.

Although some basic models continue to be valid, with the knowledge advances the models' structure often has required to be integrated or modified, amplifying its complexity. In fact, causal pathways are often two-way and complex in their operation or connected with the negative health impacts of poverty or other external factors, so there is still a need to clarify some aspects of these relationship to define the real association level with housing (14).

Coming back to the models, for some Authors (11, 12), factors linked to housing and neighborhood conditions that influence health, can be grouped into three broad categories: area characteristics, internal housing conditions and housing tenure; all of these factors have been shown to have independent effects on health (2). More recently, Taylor (10), based on new evidence, modified and integrated these categories (called pathways). In particular, she identified four of them: first considered the health impacts of not having a stable home (residential instability); second, the financial burden resulting from high-cost housing (affordability); third, the health impacts of conditions inside the home (the housing's safety and quality);

lastly, the health impacts of neighborhoods, including both the environmental and the social characteristics of where people live (neighborhood). Figure 1 show the factors connecting housing and health. The arrows' thickness indicates the level of evidence of health impact.

Regarding **stability**, it encompasses residents' capacity to willingly remain in their homes free from harassment or dispossession. Scientific literature shows lots of evidence regarding its influence on health (15, 31). While individuals may move voluntarily for many reasons (e.g., for a new job or a larger home, for fear of crime), there are a number of conditions that involuntary moves (displacement) could occur, including inability to afford rising rents or mortgage payments, eviction or foreclosure, natural disasters, and government policies (15). Housing instability is associated with a wide range of adverse health outcomes, including poorer self-rated health, health care access, and mental health outcomes (15-17). Children and adolescents are particularly vulnerable from impacts of residential instability. This condition has been related to children poorer overall health, developmental and behavioral problems, lower school readiness and educational outcomes (15, 18, 19). In the context of climate change also, natural disasters are increasingly a major threat for displacement, as they can instantly damage and destroy massive amounts of housing, causing significant increases of health consequences (20, 21).

Affordability refers to the opportunity to get affordable housing options. Affordability can affect families' ability to make other essential expenses and can create serious financial strains. Living in an unaffordable housing is related to poorer self-rated health, hypertension, arthritis, and mental health (15, 22). Low-income families with

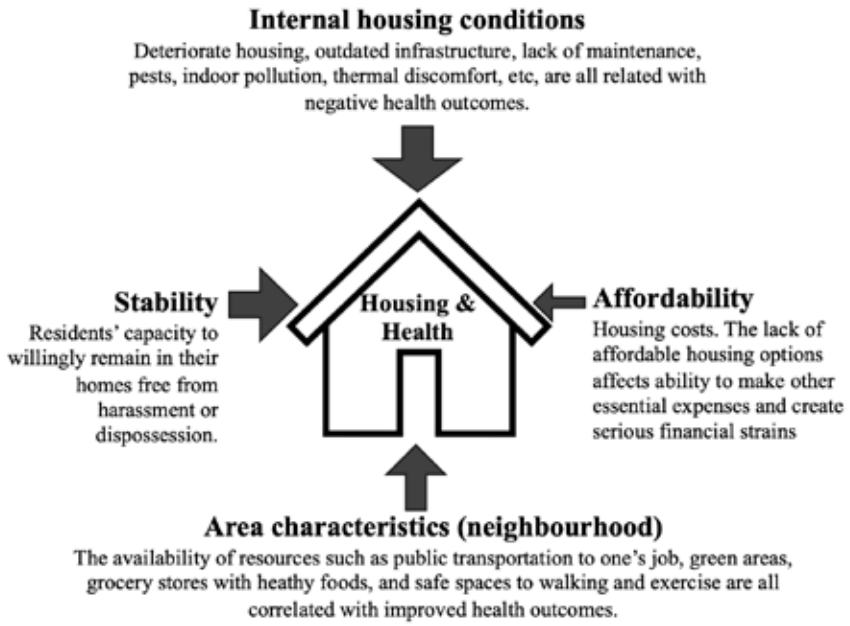

Figure 1 – Factor connecting housing and health (from Taylor 2018, modified)

difficulty paying their rent or mortgage or their utility bills are less likely to have a usual source of medical care and are more likely to postpone needed treatment than those who enjoy more-affordable housing (10). Additionally, unaffordability impacts health indirectly by draining financial resources that could otherwise be used for health-related expenses such as food (15, 23) and child development resources (24). A common coping strategy among low-income people to reduce high rent burdens is to share housing with someone else, frequently leading to overcrowding (15). Despite the financial advantages, overcrowding is associated with adverse health effects, including mental health outcomes (5, 25) infectious diseases (e.g. tuberculosis) (5, 7), behavioral issues such as hostility (26) and scarce children's educational outcomes, due to the impossibility to satisfy their need for quiet space to concentrate on schoolwork (27-29). However, the affordability issue shows some aspects needing other studies, in order to understand how people set priorities among basic needs and make decisions in conditions of scarcity.

Internal housing conditions refer to the numerous physical characteristics of housing correlated with poor health. Immigrants and marginalized populations are at higher risk, since they are more likely to live in deteriorate housing stock, outdated infrastructure, and lack of maintenance; such exposures are often exacerbated by unequal power dynamics between landlords and tenants (10, 15, 30, 31). Frequently they live in semibasements or garrets, with insufficient heating, lighting and spaces and other several environmental problems (31, 32).

In-home exposure to chemical pollutants (e.g. lead, volatile organic compounds - VOCs, combustion pollutants, etc.), induces several effects: from airways and mucous membrane irritation (e.g. by VOCs), to irreversibly damages the brains and nervous systems of children (e.g. lead), but also several chronic diseases and cancer (5, 7). Substandard housing conditions due to water leaks, poor ventilation, dirty carpets, and pest infestation have been associated with poor health outcomes, most notably those related to allergic sensitization and asthma (3, 5, 7, 31, 33). Most of these problems show highest prevalence in the homes of disadvantaged people, because they often live in damaged housing (15, 31, 34).

Additionally, exposure to high or low temperatures is correlated with adverse health events, including cardiovascular events, particularly among the elderly. Residential crowding has also been linked to both physical illness (for example, infectious disease) and psychological distress (5).

Regarding these factors, a large number of interventional studies, including randomized controlled trials (RCT), demonstrate the health's improvements related to a positive variation of housing quality and safety (10, 15, 31). Studies in which asthma triggers are removed have repeatedly demonstrated health improvements and cost reductions among both children and adults. Interventions that improve thermal comfort (e.g., insulating) significantly improve physical and mental health and have been robustly examined in the literature (35-37).

Injuries in the home is an important health burden worldwide too (35-37). Injuries in the home include falls, burns, poisonings, ingestion of foreign objects, smoke inhalation, drowning, cuts and collisions with objects, and crushing and fractured bones as a result of structural collapse. Based on available evidence, WHO (5) suggests housing to be equipped with safety devices (such as smoke and carbon monoxide alarms, stair gates and window guards) and to take measure to reduce hazards that lead to unintentional injuries.

Several evidences of the risks associated with housing deficits and the potential health gains of providing housing or improving conditions inside the home are available,

although many of the studied interventions targeted health impacts more frequently than cost impacts for health systems, payers, or society. More integrated research projects, aimed to carry-out cost-benefits analysis of housing interventions, could add useful information for the decision makers. As Taylor argued (10), these evaluations should consider costs related to social services and the criminal justice system also.

The potential of "**area characteristics** (context)" on health is a something recognized from long time, with an increasing evidence in the last few years. The context includes a broad set of structural, cultural and functional aspects of the physical and social environment whose impact on the health of individuals is difficult to quantify as a whole, but which, nevertheless, exerts a powerful influence on how a society distributes resources among its members and consequently on the health opportunities of the population.

The relevant aspects of the "context" can be summarized in the following main elements: physical characteristics of area, culture and social values, but also governance, social and economic policies. In order to better understand the relationship between living environment, human behavior and health, it is necessary to underline the complexity and the interactivity of the relationship between context and individual.

Frequently, in the scientific literature, the compact city with high density has been considered facilitating healthier choices, at least in terms of attitude toward physical activity, than urban forms characterized by scattered settlements and low residential density; in fact, the presence of a land-use mix, the frequent road intersections between residential and commercial areas, etc., facilitate direct pedestrian paths between the various destinations (38, 39). At the same time, density can increase air pollution, heat island and noise, if neighborhoods are not well projected and managed. On the other hand, the widespread city, with a low density, defined in relation to health as Obesogenic Urban Form (40), is generally characterized by residential areas, commercial and offices far from one another, which requires daily travel, mostly by private transportation, reducing active mobility, with the potential to increase several environmental pollutants.

In terms of health impacts, WHO recognizes the influence that adequate living conditions have on public health (41). Air quality, noise, water supply, management and collection of municipal solid waste, transportation, green and blue areas, etc. represent features of the built environment directly and indirectly impact on citizens' health (42, 43). If well managed these factors contribute to fight climate changes (44), and their consequences, like natural disasters. Adequate living conditions thus necessitate healthy environments and promoters of active lifestyles (45). At the same time, in order to reach sustainable development goals (SDGs) for 2030, a strong synergy among local governance and community is required.

Inequalities across and within cities are one aspect of social injustice in health (46-48). Those that are consequences of environmental inequalities are part of the so-called environmental justice domain (47). Environmental hazards (e.g., waste processing facilities) are mainly located in peripheral areas, where generally live low-income communities. In these context it is easy to find urban voids, abandoned buildings and degraded lots, all conditions related to segregation and to an increased risk of violent assault (42, 49). Neighborhood segregation is also related to health disparities by determining access to schools, jobs, and health care; influencing health behaviors; and increasing crime (15, 50). In particular, fear of crime is one of the most significant social problems in cities, negatively influencing people's habits and lifestyle (51). In general, this type of urban insecurity is related to other

uncertainties regarding labor, economic, or social insecurities arising from changes in welfare state policies. As already described, the most severe expression has been found in badly maintained housing estates with large housing blocks, little maintenance, and large public open spaces with unclear management responsibilities (13, 42). Evidence indicates that remediation programs (e.g., greening lots and remediating doors and windows) or regeneration one, reduce firearm violence and stress and increase physical activity also (42, 47).

Conclusions

The living environment, and especially dwellings, represents one of the major health determinants. To build evidence on the relationship between housing and health is a complex issue and those today available have shown to be strictly related with social and economic ones. Actually, it is often difficult to perform researches for assessing the independent effects of housing conditions alone on health (3), excluding the effects of other factors (poverty, unemployment, etc.). For instance, in a context of housing affordability reduction, low-income people will be forced to accept substandard living conditions, with higher hazards. These exposures can trigger asthma and increase other negative health effects frequency (e.g. depression, obesity, etc.). At the same time, these people may also be forced to relocate to areas far away from social and family support networks or, in some cases, become homeless (31, 52), increasing their vulnerability. To evaluate the attributable risk to each factor is difficult since they belong to a complex network of factors. One fundamental advantage is that, modifying one of them, all the network move and the benefits can be larger than the expected one.

It follows that the theme of "housing and health" nowadays needs to be assessed with a multidisciplinary and transdisciplinary approach in both research and practice (53), because of the complexity and wideness of its components. Transdisciplinary knowledge production has to move beyond conventional research agendas, to address real world concerns, to address societal challenges in many domains that require collective understanding, political commitment, and innovative responses (9). There is a transversal need of sharing knowledge, instruments and methods, for all the figures involved in the planning process, to develop a real multidisciplinary approach.

In recent years an increasing number of researches demonstrated the potential for improving health, through improved living environment (10). These results offer several indications for the development of good practices to be made available for various stakeholders. In fact, it is today clear to guarantee good health standards it is indispensable to direct political and administrative choices to improve the overall conditions of the neighborhood and of the buildings (5, 6, 31, 54). At the same time, it is necessary to dispose of a clear and updated regulatory system, since key factor to ensure Public Health protection and social justice. In a previous paper (55, 56), we stressed the need of new and updated regulatory instruments for building hygiene should be developed in Italy, relying on the most recent acquisitions of international scientific literature. This need also regards Italian health and hygiene legislation dealing with urban health, since it is fragmented and not coordinated with the regulation about environment and city planning. The overlapping of legal competences between different authorities and the conflict of attribution between the central state and regional Governments deeply contributed to generate uncertainty and confusion (57, 58).

Finally, several new research issues need to be addressed. For example, the recent lockdown due to COVID-19 pandemic,

which has undoubtedly had the merit of having reduced the impact of the disease, has brought to everybody's attention the housing crisis of the whole country (6). Indeed, the consequences of the pandemic, and the imminent risk of its repetition, highlight the need to apply a new concept of health, in terms of indoor well-being, to housing policy. Some dwelling' characteristics, like the availability of visible and accessible green elements and spaces, the housing spaces flexibility and the implementation of wifi systems and automation, need for more research in tems of health impact, feasibility and safety.

Health care sector, businesses, community-based organizations, and government each of them have a unique roles to play in improving housing conditions. In fact, to face up to complex issues like this, whose causes lie beyond the traditional remit of the health sector, it is necessary to share knowledge from many sectors (9, 59, 60). Therefore, collaborative activities involving professionals trained in different cultural areas need to be further implemented in the next future (9).

Riassunto

Abitazioni e salute: una panoramica

L'ambiente di vita, e in particolare le abitazioni, influenzano direttamente e indirettamente la salute in diversi modi e rappresentano uno dei determinanti sociali chiave della salute. Il rapporto tra salute e abitazione è da tempo riconosciuto e negli ultimi decenni i ricercatori hanno sviluppato diversi modelli concettuali per mettere in relazione i numerosi fattori abitativi in grado di impattare sulla salute degli abitanti. Per alcuni autori, i fattori legati alle condizioni abitative e di vicinato che influenzano la salute, possono essere raggruppati in quattro grandi categorie: in primo luogo considera gli impatti sulla salute del non avere una casa stabile (instabilità residenziale); secondo, gli oneri finanziari derivanti da alloggi ad alto costo (accessibilità economica); terzo, gli impatti sulla salute delle condizioni all'interno della casa (sicurezza e qualità degli alloggi); infine, gli impatti sulla salute dei quartieri, comprese le caratteristiche ambientali e sociali del luogo in cui le persone vivono (quartiere). È evidente che il tema "casa e salute" oggi necessita di essere valutato con un approccio multidisciplinare, per la complessità e l'ampiezza delle sue componenti. Inoltre, è oggi chiaro che per garantire buoni standard sanitari è indispensabile indirizzare scelte politiche ed amministrative per migliorare le condizioni generali del quartiere e degli edifici, e, al contempo, disporre di un sistema normativo chiaro e aggiornato, poiché fattore chiave per garantire la protezione della salute pubblica e la giustizia sociale.

Funding: CCM 2015 Project "Identification of best practices and health performance objectives, in terms of sustainability and eco-compatibility in the buildings' construction and renovation actions, aimed to draft the further building hygiene codes". Codex CUP: B86D15001870001

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