The inter-relationship between housing and health outcomes.

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Refereed paper delivered to the Pacific Rim Real Estate Conference, Auckland N.Z. 2006

ABSTRACT: *It is widely acknowledged that a strong relationship exists between environment and human physical condition, with living conditions in particular contributing to the health and well being of particular population groups. More specifically, various research conducted throughout Australia and elsewhere has concluded that there are strong linkages between housing and health. For example, Currie and Carapetis (2000) infer that poor health is directly linked to poor housing and housing infrastructure.*

People with unmet housing needs tend to be socio-economically disadvantaged, and experience higher death rates, poor health, and are more likely to have serious chronic illnesses[1]*. Evidence suggests strong linkages between poor housing and infrastructure, and subsequent impact on health. However, whilst much of the research conducted has found statistical associations existing between housing aspects (tenure, dwelling quality and type, home and location) and health outcomes, there has been little investigation into determining how the various aspects relate to one another for particular population groups. Further, commonalities that may exist between both indigenous and non-indigenous communities have implications for improved planning especially in the area of public housing assistance.*

This paper provides an in depth commentary on the literature and in particular the key health issues related to housing. More importantly, it endeavours to research specifically in an Australian context enabling a comparison and determination of the real drivers and relationships that exist between several groups – the indigenous community, and selected sectors of the non-indigenous population. It will therefore cut across several disciplines including property economics, town planning, engineering and medicine.

KEYWORDS: *housing; health; housing tenure; house design; infrastructure; tenure; house design; indigenous; non-indigenous; property economics; town planning*

[1] ANHS - Australian National Health Strategy (1992)

Introduction

Housing and health is a complex field, requiring multi-disciplined understanding of key issues. The subjects are both individually multi-dimensional, yet the strong linkages that exist between housing and health are well established with a considerable amount of research having been conducted throughout the world over recent years. There are clearly significant economic, social, environmental and cultural outcomes. There is growing awareness of the importance of such connections whereby policies are being increasingly developed on the basis that major government support programs should ideally be linked with regional strategies incorporating the major drivers of housing, health, crime and community safety[2]. This is much broader perspective than a more narrow view arguably held by bureaucrats and policymakers in the past - fortunately, a more enlightened standpoint is now commonly held[3].

Despite the quantum of available research, academics such as Lawrence (2004) suggest that, primarily due to this complexity, there is no widely shared consensus about the nature of the relationship between health status and living conditions. He rightly notes the environmental, geographical and temporal complexity of the subject, as well as the diversity of ethnic, occupational, and other social groups living and working in residential neighbourhoods. The conclusion is that, whilst recognising the importance of narrowly defined research on specific issues, in an overall sense the relationship between housing and health is such that conceptual clarification and theoretical development is necessary. Smith & Alexander, et al. (1997) highlight other, but related, problems caused by this complexity, noting that the relationship between housing and health, despite a recent revival of interest, exhibits many facets that remain unexplained. They assert that most research focuses either on the impact of housing environments on occupants' health or (less often) on the consequences of health status for housing attainment.

Despite these complexities, many relationships between housing and health are well understood and clearly enunciated. For example, the Australian National Health Strategy (1992) says that people with unmet housing needs tend to be socio-economically disadvantaged. First, have much higher death rates compared with people from more advantaged backgrounds; secondly, they have the poorest health; and thirdly, are more likely to have serious chronic illnesses. To demonstrate this, a

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[2] A good example of this is noted by Bannan, M. and L. Watson (2005). In their "*Review of supported housing in South West England.*" They analysed a partnership of agencies in South West England whom commissioned a review of supported housing, with the primary aim of linking supported housing (and the Supporting People programme) with other regional strategies and initiatives. The review produced a new conceptual framework for the planning and management of housing and support services, with a strong emphasis on aims and outcomes.

[3] For example, Tsou (2005) – the President of the American Public Health Association, in recognising the need for a comprehensive, holistic and systems approach, states that "*in our efforts to eliminate health disparities, creating safe and healthy homes remains a key area. Most people spend about 90 percent of their time indoors, where unhealthy and unsafe conditions can increase the risk for disease, injury and premature death*". Tsou also emphasises the need for a commitment to improve collaboration within and among health, housing and environmental agencies and organizations at the federal, state and local levels. He suggests that "*The integration of housing, health and environmental activities offers agencies an opportunity to improve practice and service delivery while achieving program efficiencies, which is especially important during tight budget time*"

landmark study[4] of housing conditions and the health status of Aboriginal people in the Pitjantjara lands in South Australia found that improvements in essential health hardware (repairs, clean running water, waste drainage and removal), led directly to health improvements, especially for children. On the strength of such research there is general agreement that poor housing and infrastructure has a significant impact on health, with hospitalisations demonstrably arising from such environmentally related diseases.

Easterlow & Munro et al. (2003), in examining the relationships between housing and health inequalities, expand upon this by suggesting that housing actually contributes to the accumulation, or depletion, of the "*health capital of individuals and communities*". This study proposes that housing can either promote well-being or increase susceptibility to disease, and in some instances the housing system that generally appears therapeutic can even have the opposite effect for people whose resilience is low or whose health is in decline.

There has also been considerable research conducted into specific "primary" human health conditions arising from adverse living conditions, such as White[5] who concluded that prevention of streptococcal infections through improved economic and living conditions, and particularly the control of skin infections, is possible and should reduce the incidence of renal involvement. It is the results of this research that has led people like Atkins[6] to suggest that it will not be until fundamental changes take place in the social, economic and living conditions of our indigenous communities will such diseases be eliminated.

However, whilst much of the research conducted has found statistical associations existing between housing aspects (tenure, dwelling quality and type, home and location) and health outcomes, there has been little investigation into determining how the various aspects relate to one another for particular population groups. This is despite general agreement by many researchers like Brink (1997) who recognise the importance of integrating not only research, but also the service delivery of housing, income, health, and social services. One of the difficulties with conducting analysis of these aspects is that it cuts across several disciplines – property economics, town planning, social sciences, engineering and medicine.

The effectiveness of home maintenance and home modifications in prolonging the safety and suitability of dwellings is also an important health consideration, along with related environmental factors such as high / low density environments, social relations in neighbourhoods and social isolation. The latter subject may have a particular impact for women.

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[4] Pholeros P, Rainow S and Torzillo, *Housing for Health: Towards healthy Living Environment for Aboriginal Australia*, Health Habitat, 1993, as extracted from *Housing and Health hardware*, The Fred Hollows Foundation (unpublished paper) 2005.

[5] White and Colleagues, research as quoted by Robert C Atkins, Professor of Medicine and Nephrology, Monash Medical Centre, as extracted from "*How Bright is Their Future*", MJA2001 174: 489-490

[6] Robert C Atkins, Professor of Medicine and Nephrology, Monash Medical Centre, op cit.

The Health Implications of Housing – A Primary Source of Life Fulfilment

Many commentators would agree with Brink (1997) who states that "*housing is the defining feature of quality of life*". Various studies have shown housing to have significance influence on, and a significant driver of, life fulfilment. Whilst recognising that a range of factors are associated and have influence on quality of life (e.g. in his study Collings [2000] suggests that unemployment, personal health issues and living with a spouse/partner all seem to be particular significance in life fulfilment), there are many studies such as Collings that consistently demonstrate people have a perceived high quality of life when there are strong or favourable family / social relationships, ample leisure time, and a high standard of housing.

The key findings in the Collings study are shown in the table below, typifying how people rate the importance of housing (in this case termed "happy where one lives") in comparison to other primary life circumstances. The table is based on a 20-item life fulfilment scale and reveal what is deemed important in life by the data sample, the nature of people's actual circumstances, and the degree of fulfilment on each of the scale items.

Desired circumstances, actual circumstances and fulfilment *(N=420)*

Item	Mean rating[a]	% Rating extr / v.imp[b]	% True[c]	Fulfilment[d] Mean	Fulfilment[d] SD
A good family life	3.6	94.9	77.7	7.1	3.0
Having good friends	3.3	85.8	82.8	7.2	2.5
Getting help with a problem	3.2	82.3	75.7	6.7	2.8
Happy where one lives	3.2	84.6	74.6	6.6	3.0
Trouble-free marriage or similar	3.3	83.0	36.9	4.4	3.6
Having children	2.4	51.2	40.3	5.1	2.8
Being able to do sport	1.9	32.4	38.0	5.1	2.3
Being in a club or organization	1.7	26.3	50.4	5.4	2.1
Regular holidays	2.3	46.1	66.6	6.0	2.4
Spend leisure as you wish	2.9	69.7	65.8	6.1	2.9
Free of family worries	2.8	67.5	27.1	3.7	2.8
Free of health worries	3.2	81.1	22.8	3.2	2.8
Free from conflict with others	3.0	75.7	40.1	4.3	3.1
Having self confidence	3.6	93.9	63.3	5.9	3.5
Having enough money	2.8	63.9	25.5	3.5	2.6
Able to save for emergencies	3.1	79.6	48.8	4.9	3.3
Having good accommodation	3.1	79.5	74.9	6.5	2.8
Secure job	3.3	87.3	36.9	4.2	3.4
Worthwhile job	3.5	91.1	39.7	4.4	3.5
Job allows use of special abilities	3.4	89.5	37.1	4.2	3.4

[a] Mean rating of item on a scale from 0 (of no importance) to 4 (extremely important).
[b] Percentage rating the item 'extremely important' and 'very important'.
[c] Percentage indicating the item was true for their life.
[d] Scores range from 1 (low fulfilment) to 9 (high fulfilment).
Extracted from Source: Collings, J. A. (2000). 1581

The above table shows that that having a good family life and possessing self confidence are perceived as being the most important sources of life fulfilment. The living scenario (loosely "neighbourhood", which includes housing) was rated next.

Whilst financial, health and accommodation concerns seemed high on people's agendas for life fulfilment, Collings comments that it is interesting that having enough money was not rated as highly as the aspects of life mentioned. The researcher concluded that the life domains of family/social relationships, self confidence, work, health and neighbourhood were thought to be the most important determinants of life satisfaction.

The implications of this kind of research indicates the importance, with regards helping people achieve quality of life, of doing so *in their particular context*. It is of some significance that housing that appears to of critical importance within the formulae. It would appear that simply providing greater quality leisure time, managing a financial situation, solving unemployment, repairing a broken or difficult marriage, or even solving a health problem itself, provides at best only partial solutions - a holistic approach is required.

It would also appear that obtaining quality of life in the context of housing is important not only to maintain well being, but also in the context of caring for the ill, even where the illness may be terminal. An example of this may cited via US based researchers Bowers & Fields-Gardner et al. (2003), who, in looking at nutrition management guidelines for paediatric HIV+ patients, concluded that cultural issues, family dynamics, inadequate housing, and health care access play a large role in the support of health and survival in the paediatric HIV patient, and in fact are often the higher priority above nutrition assessment and management. Research by D'Amico & Daniela et al. (2005) reports a similar experience with other kinds of illness, including mental illness, whereby it was established that risk and protective factors for substance use among impoverished women living in temporary shelter settings in Los Angeles County suggest that effective substance use programs may need an integrative approach that addresses other types of risk behaviours, as well as providing, inter-alia, better access to basic services (e.g., housing, health care)[7]. Similarly, Welch (1997), in highlighting the inequities in health care and housing access experienced by low-income women in the United States, emphasises the strong interrelationships that must exist between housing and health as experienced by low-income clients so that health care practitioners can begin to build active and effective health-promoting partnerships with clients, their families, and their communities.

The Impact of Housing on Mental Health

An apparent lack of research into the impact of housing on mental health prompted Evans & Moch et al. (2003) to undertake a critical review of existing research, and did so considering housing type (e.g., single-family detached versus multiple dwelling), floor level, and housing quality (e.g., structural damage). Evans's relevancy is in pointing out the fact that whilst people invest more financial, temporal, and psychological resources in their homes than in any other material entity, research on

[7] This 6-month prospective study identified psychosocial, behavioural, and economic predictors of drinking to intoxication, crack use, and marijuana use in a probability sample of 402 women living in temporary shelter settings in Los Angeles County with a simple majority of homeless residents (92% of these women had a history of homelessness). In acknowledging alcohol and drug use as being significant public health problems facing homeless women, the study examined risk and protective factors for substance use in this population.

housing and mental health is remarkably underdeveloped. Conceptually, they discover that nearly all studies in this area examine the main effects of housing characteristics on mental health without taking into account the variables that might moderate the relation between housing and mental health. In addition, they determined that few studies examined what underlying psychological processes (i.e. mediators) might explain how and why housing can affect mental health. The researchers attempted to develop a preliminary taxonomy of these processes which they believe may account for linkages between housing, and psychological well being. These include identity (given the symbolic nature of the house reflecting our accomplishments and what we stand for, means that failure to reside in a place that is consistent with an individual's own ideals might influence self-esteem); insecurity (poor housing quality often affects safety, hygiene, local crime rate, hassles with increased maintenance, etc.); social support (isolation and loneliness, and lack of garden / play space); parenting (parenting practices in inadequate housing, especially if suffering from self-esteem and confidence, might include more rigid, restrictive control on activities); and control (poor housing quality reduces behavioural options, diminishes mastery, and contributes to a general sense of helplessness – size and quality of space can also restrict flexibility and disallow multiple uses of space).

The consistent theme emphasising the importance of intersectoral linkage – this time in the context of mental health (i.e. "active" interagency collaboration by mental health professionals) – caught the attention of Meehan & Drake et al. (2002) whose Queensland (Australia) based research was primarily concerned with the equitable delivery of public housing services to people with mental illness. Their conclusion was that the delivery of appropriate housing services to people with mental illness could be significantly enhanced by the formation of interagency service agreements (e.g. between the Departments of Health, Housing and Disability Services). Ideally, this would be combined with appropriate training programs, and case conferencing strategies[8].

Another perspective o mental health is given via recent studies undertaken by Colliver (2005) suggesting that the reason why many communities are loose, uncommitted liaisons is because the initial step of bonding has not effectively happened. Effective housing sets the scene for what Colliver calls the "*missing piece in the jigsaw of community and small groups… personal bonding*".

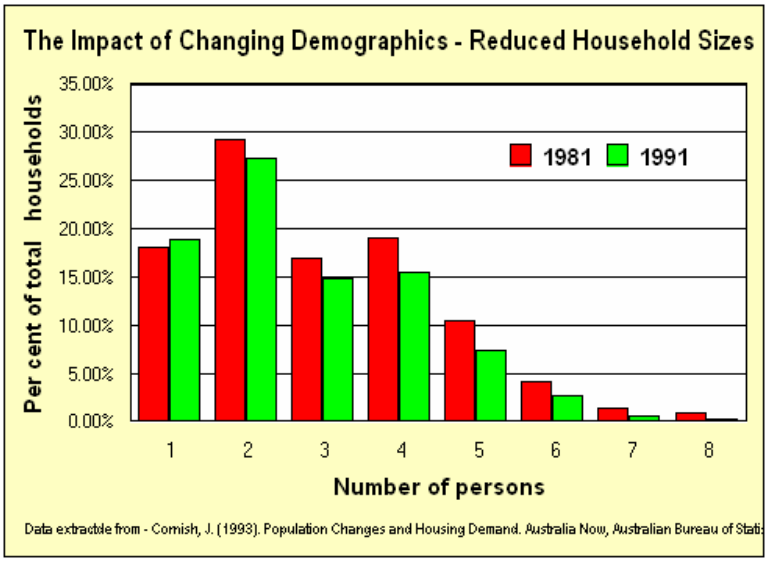
Allan (2004) looked at the perspective of housing and mental health (and associated issues), primarily in the context of regeneration. Allan suggests that the links between poor housing and ill health are obvious. Her research, based in the UK, determined that people living in the 88 local authorities qualifying for the Neighbourhood Renewal Fund have a lower life expectancy than people in other areas, while 30% to 50% of rough sleepers have mental health problems, and children whose families live in bed and breakfast accommodation have an increased risk of low birth weight and a greater likelihood of illness.

[8] Meehan and Drake submit that the establishment of intersectoral links is a key element in the overall provision of quality care. They cite an instance in the UK, where collaboration between the National Housing Federation and the Mental Health Foundation led to the development of the 'Housing, Care and Support Code of Conduct'. This code forms part of a guide to good practice for managers of voluntary sector housing provision who are dealing with people with mental illness on a daily basis.

Welch (1997) examined the mental health effects of substandard housing, based on the experiences of women in a Chicago public housing focus group study. They described "intense loneliness," fear, chronic stress, suspicion, and mistrust of fellow tenants, all of which they attributed to the unpredictable environment in which they live. In this study, crowding, litter, and poor maintenance of facilities was suggested as factors contributing towards creating an environment of ambivalence and hopelessness. The findings also suggested that the mental health of adolescents may also be negatively affected by high levels of neighbourhood violence. Welch commented that in a study of black teens living in public housing, depression was highly correlated with exposure to violence and the perceived probability of not being alive by the age of 25.

Impact of Changing Demographics – Focus on Population Density & Reduced Household Sizes

Housing factors can influence demographic changes. Cornish, J. (1993) points out that changes in the composition and location of the population and the structure of households have a major impact on the housing requirements of Australian society. He suggests that reduced affordability and availability of housing may necessitate the change to dual income households or cause a decline in household formation and even birth rates.



The demographic shift in the Australian population is characterised by several significant changes. Firstly, we have an ageing population[9]. Secondly, there has been an increase in life expectancy over the last century[10]; and thirdly, although there are more households, they have less people in them[11]. This augurs with global trends –

[9] According to the Australian Bureau of Statistics, the median age of the population has risen steadily from 22.5 years in 1901 to 30.7 years in 1947. It then decreased during the 1950s and 1960s because of both the high fertility and high level of immigration during the period. It then resumed its steady increase in the 1970s. In 1992, the median age of the population was 32.7 years. with 31 per cent of the population 25-44 years old. The proportion of the population aged 65 and over increased from 4 per cent in 1901 to 11 per cent by 1992, whereas those aged under 15 have decreased from 35 per cent to 22 per cent.

[10] The Australian Bureau of Statistics also record that throughout this century there has been a constant increase in life-expectancy. For males, the life expectancy at birth has changed from 55.2 years at the start of the century to 74.5 in 1992. For females, life expectancy at birth has increased from 58.8 to 80.4 years over the same period. Females can expect to live longer than males, this being one of the reasons for an increase in the proportion of one person households.

[11] Cornish (op cit.) summarises that over the last two decades or so, the pattern of formation of Australian families has changed substantially. The age at first marriage has continued to rise, and the teenage marriage rate is now at its lowest level. Fewer people are opting for formal marriage and the

urbanization, and population aging - which, according to Brink (1997) are occurring concurrently.

Both Cornish and Brink agree that the age structure is an important factor in determining the housing requirements of a population, as different age groups have varying housing needs. For example, the elderly are the group most likely to live in one person households (in the 1991 Australian Census, 41 per cent of all persons who lived alone were at least 65 years old) and one person households are more likely than other households to live in dwellings other than separate houses (56 per cent of persons who lived alone were in dwellings other than separate houses). This is similar to the European experience as evidenced by Evans (2003) who also suggests that, given current demographic trends, much more attention is called for on mental health of the elderly in relation to housing and neighbourhood characteristics as well[12].

With regards changes in household size, the data would suggest that there will be an increasing demand for smaller size dwellings. However, it would seem the reverse situation has occurred – at least for Australia. As Cornish points out, other than a growing demand for a more diverse housing stock, the average size of houses has actually continued to increase - demonstrated by progressive rises in the size distribution of occupied private dwellings counted in the censuses as measured by the number of rooms, as well as an increase in the floor space of new private homes (e.g. from 130 square metres in 1970 to 187 in 1989).

It does not follow, however, that a significant decrease in population density will always result in favourable human health outcomes. There is a growing body of research which suggests that the reduction in household sizes, especially towards one-person households, rather than being a positive factor in human health terms, in fact represents a potentially unhealthy outcome.

It is recognised that increased population density has been traditionally thought of as being undesirable, especially in third world countries where there are various unfavourable impacts - many of which are caused by poor sanitation and related matters. Improved public health housing standards can alleviate such poor health outcomes, especially overcrowding and associated disease proliferation. On the other hand, Holma (1977) correctly asserts that in more developed countries of the world, extreme conditions such as overcrowding, lack of basic sanitation, garbage accumulation and poor construction, are seldom apparent. In this context, the impact of increased population density may be quite different. For example, it is being increasing demonstrated that house-sharing arrangements – if done well – can have the opposite effect whereby positive health outcomes can be established. Research conducted by Holma et al as early as 1975 reveal contradictory or negative results obtained in developed countries with respect to the relative importance of overcrowding, socioeconomic conditions, occupation, education, housing conditions

number of defacto unions has risen. The divorce rate has also risen, as has the proportion of remarriages. The average number of children a woman of child bearing age could be expected to give birth to in her lifetime remained reasonably steady throughout the 1980's, at 1.9. This is currently well below the long-term population replacement level (i.e. without overseas migration, Australia's population will at some stage start to decline). These factors, along with the changing age composition of the population, are resulting in changes to the structure and size of households and families.

[12] Evans quotes source: Administration on Aging, 2000; Markham & Gilderbloom (1998)

and other factors. In this study of six residential areas in Copenhagen, Denmark, the effect of over 100 social, medical and housing factors for predicting health and potential proliferation of diseases in public housing apartments was examined with a view to improving public health housing standards[13]. Rather than determining that the greatest impact on disease proliferation was overcrowding, this study showed that housing standard and personal hygiene (or components of these group factors) were the most important predictors for the health of the population studied. One exception existed here, and that was in relation to the health of children below 3 years of age where the best predictor for the health of people in this category was the number of rooms used for sleeping purposes.

Later studies such as Killon (2000) and Ahrentzen (2003) also support the notion that in some circumstances increasing population density can have a positive effect. The former study, involving young homeless African American women and elderly marginally housed African American women, found both advantages and disadvantages of house-sharing, but concluded that co-residential living is an option worth considering. In this case, establishing alliances between two groups (young struggling to find affordable housing, and the old having difficulty in maintaining their homes), established a means to promote health and strengthen "family" in both populations. The study investigated the uniqueness of "common yet divergent life courses, and collective responses to family life situations, societal trends, and policies" as they applied to the separate population groups. Moreover, the study concluded that even though each population group have health, housing, and personal concerns specific to their age cohort, they also have parallel and complementary needs. This preliminary study paved the way for additional work in exploration of factors that either facilitates or hinders linking the two groups of women for mutual assistance in houses-haring arrangements.

Similarly, the Ahrentzen study, responding to what the researchers called "doubling up" or shared housing increasing in the United States, looked at the physical, psychological, social, and economic health consequences of these living conditions. It considered – in a more productive line of discussion - how specific social and physical environmental factors of shared housing may foster or deter healthy living situations for various household arrangements. This study looked at possible ways that such arrangements could represent viable and healthy housing solutions, particularly for those in "transitional" life stages. The health effects of shared housing were examined in terms of physical, psychological, economic and social health. Whilst avoiding definitive conclusions, but at the same time acknowledging that shared housing is not a common or normative housing arrangement in the United States except among certain population groups (e.g. students), Ahrentzen did establish that some socio-psychological, cultural and physical environmental conditions may play an important role – perhaps mediating, perhaps interacting – in facilitating or deterring healthy outcomes for home-sharers. The study suggested that these housing

[13] This study was conducted on a population sample of 2,096 individuals studies in 881 apartments. A secondary predictor of health outcomes (in terms of adult morbidity) was the total yearly income of the family. The analysis methodology conducted both single and multiple regression analysis techniques. The results of this study were found to contrast sharply with much earlier research completed by the University of Copenhagen (Christensen, 1956) especially with regards the poor correlation between morbidity and the area (size) of the dwelling, and morbidity for children supposedly increasing with the size of the family.

arrangements can be an aid during critically changing life circumstances, such as caring for an elderly parent, losing income, having a child, coping with a disability, leaving a marriage or a violent home, and the like (Hemmens, Hock & Caro1996; Després, 1991). Ahrentzen's study noted that statements are often casually made by the popular press about the deleterious effects of such living arrangements, but such opinions often based on unsubstantiated or slanted interpretations of the research literature on crowding, extrapolated to suggest that doubling up circumstances – reflecting increased household density – results in poorer health. The implication is therefore to look critically at policymakers whom often view this arrangement as an unacceptable housing condition.

The issues involved are often contradictory, confusing and complex. Another experience entirely is evidenced by Canadian researchers Johnson and Wasylishyn (1999) whom, in the process of undertaking a qualitative study to understand the health beliefs, concerns, and practices of women living on a low income, eventually came to uncover the concerns of people experiencing living in a housing co-operative[14]. As a consequence, the effects of housing on health came to have great importance. In this instance the major health issues that arose for the women focused around the concepts of the identity, environment and control. Whilst the housing co-operative itself was assumed to be an interesting environment with the potential to reduce the women's sense of isolation, the social context of the co-operative, however, was often cited as a source of stress rather than support. The study reported that one of the most striking and unexpected findings was that the women did not identify with one another, perceiving themselves as a diverse group without a common identity. This may have been due to the women's difficulty in setting limits on their personal relationships and possible "fear" of becoming entangled in one-another's lives. Therefore, Johnson concludes that without a clear sense of boundaries, many of the women in the cooperative initially withdrew from one another. However, over the course of the data collection process of the study, the women in the cooperative were reported to slowly develop their social support of one another which was viewed as a very positive aspect of life in the cooperative. The study therefore concluded that a major research question is posed: what are the long term health benefits of living in a cooperative style of housing? The proposition that when women identify the co-operative as providing them with a sense of greater control over their lives, they are, in essence, describing an improved state of health.

[14] The housing co-operative where the study took place was reported as being a new, four-story building located in an upper middle class neighbourhood of a major Canadian city. For many of the women, the move to the co-operative represented a considerable change from previous neighbourhoods characterized by noise and the perception of high crime rates. The women lived in small, one-bedroom suites on the upper three floors. The suites were bright with sliding glass doors opening onto small balconies, and came in four levels of adaptability for the disabled. The concept of "community" within the urban environment (Cooper and Rodman, 1994) is one of the main goals of cooperative housing. Members of a co-operative purchase shares, providing them with joint ownership and control over their living space. The concept provided that the residents of the building are not merely neighbours, but they are partners in the operation of their home. In this particular housing co-operative the residents were not only required to participate in the management of the co-operative, but they shared the additional challenge of setting up the initial structures and laying the foundation for future operation. Assistance in learning to run the co-operative was provided by a consultant who offered guidance and organized workshops on different aspects of co-operative management.

Another interesting demographic – and one where it would appear there has been little research conducted - is that of older people whose living arrangements and lifestyles diverge from majority, middle-class pathways. For example, single, poor, insecurely housed older men pose a number of challenges for researchers and policymakers. Russell & Porter (2003), as part of their three-year ethnographic study, suggest that this group are a "deviant population" in two key senses. First, as a statistical minority, they deviate from the average older man who is married and living in relative comfort. Secondly, many are normatively deviant in terms of their lifestyles and the moral values with which the worth of individuals typically are judged. Nonetheless, in an effort to investigate how older people themselves conceptualize and talk about what they do with their time, Russell & Porter proceeded with their study which specifically looked at the health, housing, and service use of low income, single, non-home owning men aged 50 years and over, living in the inner city of Sydney, Australia. The findings highlight the extent to which the men's everyday lives are constrained and curtailed by economic disadvantage and health deficits. At the same time, the men invest their activities with a range of sociocultural meanings that do not always match professionally constructed categories and understandings. In particular, social relationships with other men appear to be central to the meanings they confer on everyday life. The study revealed that, unlike much of the other research conducted which revealed the importance of housing, in this instance, for all of the men, the single most important external determinant of their lifestyle was money. Russell comments that "*the content and temporal rhythms of life were built around the common constraint of limited funds. The extent to which money framed and regulated everyday life is reflected in the way many men narrated what they could do on an average day in relation to the two-weekly pension cycle*". This research is in direct conflict with Collings (2000) which, although investigating a more affluent data sample, found that although financial, health and accommodation concerns were seen as priorities, having "enough money" was not rated as highly.

Much of the foregoing has direct application in the Australian context, however in more general terms, it can be reasonably suggested that research on the effects of socioeconomic well-being on health is important for policy makers. This is especially important in developing countries, where limited resources make it crucial to use existing health care resources to the best advantage. Researchers such as Fotso & Kuate-Defo (2005) have developed various measures of socioeconomic status indicators for predicting health status in developing countries, enabling them to construct socioeconomic indexes that capture both household and community attributes allowing the separation of social from the purely economic dimensions of the socioeconomic status within a cross-national perspective[15]. Their objective is to achieve an understanding of the inequalities in health and survival, underlining the

[15] The methodology involves three socioeconomic indexes defined at the household and community levels, constructed using principal component analysis (PCA). PCA is a statistical technique that linearly transforms an original set of observed variables into a substantially smaller and more coherent set of uncorrelated variables that capture most of the information through maximizing the variance accounted for in the original variables, thus solving the problem of weights. The technique was originally conceived by Pearson (1901) and independently developed by Hotelling (1933). In the eventuality of multicollinearity threat and subsequent imprecise regression parameters due to highly correlated independent variables or conceptual uncertainties regarding index construction, the PCA method has been shown to have special appeal (Jolliffe, 1986; Dunteman, 1989). Methodologically, principal components analysis was first used to combine socioeconomic indicators into a single index (Boelhouwer and Stoop, 1999)

importance of going beyond the purely economic view of socioeconomic status to cover the multidimensional as well as multilevel concept of economic and social inequality.

Impact of Design

There has been little research located that deals specifically with linkages between housing design and health outcomes. Yet, design of housing logically forms a critical part of the human health outcome. Many design principles have been long established as providing the basis for proper hygiene and safe living. Perhaps one of the outstanding examples of this is the work of August Gärtner – called to the first Chair of Hygiene in Jena, Germany in 1886 - whose requirements to ensure adequate insulation, e. g. a ratio between window area and floor area of 1:8-1:10, have remained valid until today. Fielder (2000) also quotes Gärtner as having provided impulses decisive for the development of hygiene in the fields of construction, housing and communities, having formulated important requirements for indoor climate, e. g. for heating, ventilation, indoor air temperature, indoor air humidity, avoidance of temperature asymmetry and thermal insulation of houses.

Impact of Upgrading or Improving Housing Conditions

With regards the improvement of human health condition being achieved as a direct result of improvements being made to housing conditions, it would appear that the primary benefits to be achieved inevitably involve the controlling or moderating of indoor temperature, and the elimination of dampness and mould[16]. The other important feature here is that much of the research seems to indicate two main things. Firstly, there needs to be strong involvement and understanding by the participants (house occupants) if there a significant and positive outcome is to be achieved. And secondly, the improvements or upgrades need to be strongly tailored to the particular situation.

(The extent of research into the impact of improving housing conditions through various interventions can be gauges by looking at a structured review completed by Cooperman-Mroczek, & Freudenberg, et al. (2003) which attempted to evaluate the success of public health interventions related to housing by analysing 72 articles

[16] Mould in particular seems to be a major issue for many countries. Wakefield (2004) suggests that as a result of an unprecedented run of flooding and other water damage, attention is turning once again to the health effects of toxic mold infestation. Exposure to mold in residential, public, and commercial buildings is thought to have caused health problems ranging from bleeding lungs to hair loss-even to death. Flooding is also a particularly hazardous event. Euripidou & Murray (2004) comment that floods are particularly important in public health terms as they may have multiple environmental consequences. This researcher suggests epidemiological evidence shows that chemical material may contaminate homes and that in some cases flooding may lead to mobilization of dangerous chemicals from storage or remobilization of chemicals already in the environment, e.g. pesticides. In addition, hazards may be greater when industrial or agricultural land adjoining residential land is affected.

selected from 12 electronic databases for interventions over the period 1990 to 2001.[17])

Reverting again to the importance of occupancy involvement and the need for strategic improvement is something exemplified in Baker's (2005) study, involving over 1,352 households (over 4,000 people) where the single-blinded, clustered and randomised trial of the health impacts of insulating existing houses was conducted[18]. The key research question attempted was whether this intervention increased the indoor temperature and lowered the relative humidity, energy consumption and mould growth in the houses, as well as improved the health and well-being of the occupants and thereby lowered their utilisation of health care. Whilst concluding that there was ''prima facie'' evidence for the effects of poor housing on health being sufficiently powerful that there is a strong case for housing concerns being an integral and explicit part of health research and policy, it is interesting to note that the researchers concluded that the critical success factors are effective community involvement and an intervention that is valued most by the participants. In addition, Baker clearly demonstrated that housing interventions need broad intersectoral action (involvement of people and agencies across the health, housing, building and community sectors) if they are to be effective and sustainable. Kellet & Garnham (2000) agree with this approach, with their Columbian-based research demonstrating that significant improvements in living conditions will only be possible if the energy and resources of the poor are maximised, with the role of the state being to support and facilitate such efforts. In this case the research concluded that a primary driver is cultural values impacting the ability and motivation of households to consolidate their housing situation in self-help settlements

The Baker study referred to commenced with the initial assertion that surprisingly little is known about the specific health effects of the indoor environment in individual dwellings (Howden-Chapman, 2004), other than an acknowledgement that "*warm, dry housing is a fundamental human need*". It demonstrated that if intervention was contemplated, regardless of the potential for human health improvement, there needed to be a commitment and / or involvement from the housing occupants themselves. This is supported by other research conducted in various parts of the world, including, for example, in the United Kingdom. In this instance Richardson, et al. (2005) undertook a significant research project commencing in 1999, which became known as The Watcombe Housing Study. It commenced with the notion that there can be noteworthy improvements to health of

[17] This review reported that ninety-two percent of the interventions addressed a single condition, most often lead poisoning, injury, or asthma. Fifty-seven percent targeted children, and thirteen percent targeted seniors. The most common intervention strategies employed a one-time treatment to improve the environment; to change behaviour, attitudes, or knowledge; or both. Most studies reported statistically significant improvements, but few (14%) were judged extremely successful. Cooperman-Mroczek's study suggests that current interventions are limited by narrow definitions of housing and health, by brief time spans, and by limited geographic and social scales.

[18] In this study, households in which at least one person had symptoms of respiratory disease were recruited from seven predominantly low-income communities in New Zealand. These households were then randomised within communities to receive retrofitted insulation either during or after the study. Measures at baseline (2001) and follow-up (2002) included subjective measures of health, comfort and well-being and objective measures of house condition, temperature, relative humidity, mould (speciation and mass), endotoxin, beta glucans, house dust mite allergens, general practitioner and hospital visits, and energy or fuel usage. All measurements referred to the three coldest winter months, June, July and August.

occupants as a result of improvements being made to housing conditions – however such improvements need to be strategic and "tailored"[19]. The basis of this research was the idea that there is a growing understanding that the indoor environment, particularly indoor air quality, can affect health and that personal exposure to pollutants can often be greater indoors than outdoors (Clayton et al 1993). In particular, several indoor environmental variables are commonly cited as having an association with health; this includes cold (associated with increased cardio-respiratory mortality and morbidity)[20], and dampness and relative humidity.

Other research conducted in the UK by Allan (2004) – mentioned earlier in this report in the context of housing and mental health – has looked at research conducted by the Royal Institution of Chartered Surveyors. She suggested that this provided stark evidence of the value of improving poor housing by comparing the health of residents on three east London estates, one of which had been refurbished. The study found that people living on the un-refurbished estates were seven times more likely to become ill, resulting in an increased average cost to the NHS of more than L400 per household per year.

Another UK study - said by the researchers to be the first evaluation in the UK of health outcomes following housing improvements - had the objective of evaluating the use of NHS money to improve health by improving housing conditions. Somerville & Mackenzie, et al. (2000) examined whether installing heating in homes, i.e. installation of central heating, improved the health of children with asthma. Whilst it was clear that the intervention improved the energy efficiency of the housing, the children's health (a symptom-based outcome measure for asthma and time lost from school) showed that respiratory symptoms were significantly reduced after intervention Although a lack of a comparison group meant that effects of age, season and biased reporting could not be eliminated (and therefore concluded by Somerville that more work was needed to substantiate results), it nonetheless gave strong preliminary results demonstrating the value of improved housing conditions.

If the intervention being contemplated extends to complete re-housing, then some of the research indicates that breaking the link between housing deprivation and health inequalities depends on retaining a social role for housing policy. According to Smith & Alexander, et al. (1997) the link between housing and health is the residential mobility (or otherwise) of people with health problems. In their report they assert that whilst residential change is usually thought of as stressful, and, if anything, harmful to health, typically welfare state societies have traditionally used rehousing as a way to

[19] The Watcombe Study was a relatively large-scale three-year study (completed in 2001) designed to assess the effect of improving housing conditions in 3–4 bedroom, single-family unit, social rented sector houses on the health of the occupants. Discrete measurements were made of indoor environmental variables in each house, to assess the short-term effects of improving housing conditions on the indoor environment. The study concluded that whilst the housing upgrades produced a substantial increase in the energy efficiency of the houses, the extent to which such upgrades can be expected to improve the indoor environment may be limited, as occupants, their habits and indoor activities remain substantially the same and influence the variables measured. It demonstrated that well tailored interventions are needed to impact on the indoor environment to directly influence health.

[20] In as far as cold homes are concerned, the Watcombe Study cited Press (2003) as the primary source for this assertion. The Study also stated that the UK Department of Health has recommended that temperatures should be 18–21°C in living rooms and 18°C in bedrooms to improve comfort and prevent health problems (DTI and DEFRA, 2001).

improve the accommodation options for people with health and mobility needs. Their research indicated that the effectiveness of rehousing as a health intervention shows that the housing system can be health selective in favour of sick people. In practice, Smith believes that the relationship between housing and health is made up of both the impact of housing on health, and the impact of health on housing outcomes. The conclusion is that rehousing on medical grounds is "*something more than a mirage, but rather less than a miracle*". In a society which assigns a social role to (some) housing interventions, these interventions can, in theory and in practice, be a way of mediating health inequalities.

Impact of Ecology & Environment

The impact of ecology has been demonstrated to be a major driver in public health. Quality of life (life satisfaction) and the environment and community in which one lives (neighbourhood satisfaction) are typically the yardsticks used when endeavouring to determine the extent or lack of human happiness. As succinctly put by Westaway (2004), "*good health is essential for life satisfaction, and housing is the most important aspect of neighbourhood satisfaction*".[21]

The concept of "neighbourhood" is well recognised in the social sciences, and is usually linked to the ecology of human existence, or otherwise linked to the environment. The term "human environment" has been defined[22] as not only referring to those characteristics which people have constructed, modified or perceived as components of human settlements but also interpersonal relations and social organisation which effect both physical and mental health and psychological well being. The "human ecology" perspective may be described as that which "*interprets the processes, patterns, products and mediating factors that regulate human behaviour in residential environments using a systemic framework*"[23].

[21] Westaway conducted a repeat longitudinal, intervention-evaluation study in 1999 (baseline), 2001 and 2002 in an informal settlement in Soweto, where an improved housing project (relocation to a new housing estate) was implemented in 2000. The aims of the study were to ascertain group and time effects on satisfaction with the personal and environmental domains of quality of life, and determine personal and environmental predictors of life and neighbourhood satisfaction.

[22] Lawrence, R. J. (2004). "*Housing and health: from interdisciplinary principles to transdisciplinary research and practice*." Futures 36(4): 491. His paper suggests that the environment of any living species is multidimensional and extremely complex. Therefore, residential environments should not be interpreted as a neutral background for human behaviour. Lawrence therefore presents a powerful argument that an interdisciplinary approach is therefore necessary to deal with the multiple components of residential environments and the interrelations between them.

[23] Lawrence, R. J. (2004). Op. cit. 491. Lawrence further points out (497) that the term ''ecology'' derives from the ancient Greek words ''*oikos*'' and'' *logos*'' and means ''science of the habitat''. He agrees with a commonly held consensus that this term was used first by Ernst Haeckel (1834–1919), a German zoologist, in 1866. Lawrence expands upon this by explaining that the word ecology designates a science that deals with the interrelationships between organisms and their surroundings. He suggests that human ecology explicitly deals with people-environment relations , providing a conceptual framework for academics and practitioners from both the natural sciences (e.g. biology, chemistry and geology) and the human sciences (e.g. anthropology, epidemiology, sociology and psychology) to accept divergent disciplinary concepts and methods and develop an integrated approach. Lawrence also points out that this kind of approach is being currently applied in the National Environmental Health Action Plan (NEHAP) for Switzerland.

Recent studies (e.g. Kingsley, 2003) confirm the critical importance of neighborhood conditions to health. The Kingsley study, conducted in North America, suggests that in virtually all regions of the country, health problems are highly concentrated in a small share of all neighbourhoods—typically those that rate highest on a number of indicators of distress. The study attempts to explain this outcome in two ways: the first is to note evidence that the types of people (low-income people of colour for the most part) have much higher probability of poor health, and are highly concentrated in these distressed neighbourhoods. The second is to rely on what Kingsley sees as growing evidence that other conditions in those neighbourhoods (e.g., high levels of crime, deteriorated but still high-priced housing, etc.) have an effect in undermining health that may be independent of the race and income of the residents. Kingsley concludes that the more we learn about troubled neighbourhoods, the more we recognize the interconnectedness of the issues they face

Regardless, it is difficult to avoid the conclusion that the role played by housing is particularly important.

Although recognising the centuries old tradition of "*architects, medical practitioners, novelists and social reformers observing relations between the housing conditions of people and their ill health*"[24], the ecological perspective gives rise to a growing emergence of the importance of the modern "interdisciplinary approach". One example of an interdisciplinary approach is an ecological perspective which has been applied to interpret the multiple factors that influence both housing and health. Lawrence (2004) highlights the difference between a biomedical model that often adopts a symptom-treatment interpretation of housing and health, and a holistic or integrated model that combines biological, cultural, economic, political, psychological and social factors in a new way. He argues that an interdisciplinary approach can be the foundation for transdisciplinary research and professional practice, and in so doing redefine the traditional roles of scientists and
professional practitioners. This in turn overcomes the shortcomings in academic research and professional practice which are, according to Lawrence, mainly the result of a narrow vision that does not address the fundamental issues at stake.

An interesting twist on the multi-disciplinary approach is provided by Hartig & Lawrence et al. (2003), and associated research continued with Hartig &. Johansson, et al. (2003) whom relate residence to health within a social ecological model of stress and restoration. Their approach, given the scope and complexity of housing – residence – health relations, was to "re-characterise" the housing and health field as one of inquiry into the residential context of health. Their model indicates how processes operating above the household level can affect health by modifying the quantity, quality, and distribution of demands, resources, and restoration opportunities within and across the settings of everyday life, including the residence. The utility of the model for environmental interventions intended to alleviate health-threatening chronic stress is discussed, with a conclusion that the residence-health issues relate to a wide range of other social issues, including stigmatization, environmental justice, the protection of privacy, and health care delivery. The proposition put forward suggests that increased understanding of the relationship between housing and health will improve with closer attention to the characteristics of residents, their activities in

[24] Lawrence, R. J. (2004). Op. cit. 487.

relation to their housing, and social ecological factors that set the boundaries for those activities.

The impact of policy, and research itself, on ecology and environment, cannot be underestimated. A quantum of literature exists on this subject, with one notable effort fairly recently undertaken whereby drawing on psychological, health, and social science literature, Evans & Saegert (2003) developed a housing niche model that focuses on (a) housing markets and other societal processes that constrain residential choice, (b) effects of residential environments on health and access to human and social capital, and (c) family dynamic effects on health and the intergenerational consequences of particular housing niches for future health and housing choices. The model suggested future directions for research and policy including: the extent that poverty and racism lead to residence in environments that expose people to higher levels of environmental stressors; details of multilevel social processes that offset or magnify the negative consequences to environmental stressors and risks; and the mediation effect of social and human capital of poor people towards accessing housing environments.

Another important demographic is that related to young people. The effect of housing on children's health and the translation of research findings into practical activities in home construction, rehabilitation, and maintenance has been a focus of Breysse & Farr et al. (2004). Their research is specifically interested in looking at the relationship between housing and health, but in the context of “Children at Risk.". This research emanated from a major US based conference was held in 2002 where the disciplines of health, housing, and environment were gathered. Whilst the investigation covered four key areas (asthma, neurotoxicants, injury, and translational research), it became apparent that there is currently a distinct lack of consensus on standard measurements, incomplete understanding about the interaction of home hazards, inadequate research on the effectiveness of interventions, and insufficient political support limiting current efforts to achieve healthy housing. It is interesting to note that, as a consequence of this research, consistent with other studies conducted in various parts of the world, four major themes have emerged: (1) Although all of the mechanisms are not yet well studied and described, the built environment, including residential housing, is an agent of health (or illness) for children; (2) The body of research around lead toxicity can serve as a model for analysis and exploration for other environmental hazards; (3) Studies that can establish linkages among the residential environment, children’s health status, and interventions face ethical and practical constraints, which may limit the range of options available; (4) Social determinants influence who is at risk for exposure or injury, how they react to those substances or risk factors, and the efficacy of interventions.

Conclusions

It is clear that housing plays a critical role in impacting health, which is in turn impacted by changing demographics, design, and improved conditions (environmental and ecological). Housing represents a primary source of life fulfilment and is inexorably connected with the “health equation”. Therefore, health issues are not going to be fully addressed if housing issues are not addressed as well. It is difficult to disagree with researchers such as Kingsley (2003) and Lawrence (2004) who have

determined that creative partnering by professionals in traditionally separate fields is redefining the research requirement, and that a multidisciplinary approach is critical since it is clear that the relation between housing and health involves a good deal more than the impact of specific physical factors in residential environments on the inhabitants. This represents a powerful argument for shifting from disciplinary to an interdisciplinary approach. This concept appears to be gaining increasing acceptance with policy makers both within Australia and elsewhere.

Further, the Breysse & Farr (2004) research contains important findings that should not be ignored - there needs to be consensus on standard measurements (work undertaken by researchers such as Fotso & Kuate-Defo [2005] needs to be built upon further), better understanding about the interaction of home hazards, a greater quantum of research on the effectiveness of interventions, and greater awareness to engage the political process to support efforts to achieve healthy housing.

In addition, further research needs to be conducted in the context of both indigenous and non-indigenous communities in an effort to establish the real drivers and relationships that exist. In this way commonalities of particular population groups can be better understood and ultimately result in better planning for both the forms of, and aspects of, public housing assistance. It also has the potential to impact impending policy issues involved in home ownership, particularly in an indigenous context) – an examination of Australian tenure and governance models of community land holdings needs to be undertaken. There may also be design and functionality issues in this latter regard.

In summary, a better understanding needs to be developed to allow for increased appreciation of the relationships between housing and health inequalities. Helping people achieve a better quality of life is the objective. It is only through gaining understanding about the aforementioned relationships - achieved via improvements in "*the defining feature of the quality of life*" - that will more likely lead to an enhanced quality of life.

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