

## The Effects of Housing on Health and Well-Being in Aotearoa New Zealand

### Ngā Pānga o Ngā Whare Noho ki te Hauora me te Toiora i Aotearoa

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## Abstract

Housing is part of our key physical and social infrastructure and an important determinant of health. This paper outlines the results of two decades of research in Aotearoa New Zealand, which has measured the effects of housing on health and well-being. The research encompasses social, cultural, economic and environmental determinants of health, to measure and analyse the co-benefits of improving housing standards, as well as the costs of inadequate housing. The quality of housing is strongly associated with tenure, as rental housing is generally older, colder, damper and mouldier than owner-occupied housing. Māori, Pacific, disabled and low-income people with lower rates of homeownership are more likely to be exposed to these poorer rental housing conditions and consequently have higher levels of potentially avoidable housing-related hospitalisations.

This New Zealand research helped to provide the evidence base for the 2018 World Health Organization's *Housing and Health Guidelines*, which in turn underpinned recent regulatory changes and programmes in New Zealand to prevent housing-related hospitalisations. The Government has introduced higher standards for all rental housing and signalled the introduction of more comprehensive energy efficiency standards; both new and remediated public housing are now being built to standards above the building code.

**Keywords:** housing, health, well-being, health inequalities, homelessness, severe housing deprivation, tenure, housing quality, Aotearoa New Zealand

## Whakarāpopotonga

Ko tēnei mea te whare noho tētahi wāhanga matua o tō tātou hanganga pāpori, he āhuatanga hira mō te whakatau i te hauora. E whakarāpopoto ana tēnei pepa i ngā haumāuiui o ngā rangahau e rua tekau tau te roa tērā kua ine i ngā pāpānga o te ngā whare noho ki te hauora me te toiora. Kua kapi i te rangahau ngā āhuatanga pāpori, ahurea, ōhanga, taiāo anō hoki ka whakatau i te hauora, hei ine me te tātari i ngā painga ngātahi o te whakapiki paearu mō ngā whare noho me ngā utu e ahu mai ana i ngā whare noho takarepa. He tino kaha te pāhono o te kounga o te whare noho ki tōna momo, inā hoki ko te tikanga he tawhito ake, he makariri ake, he haumākū ake, me te nui ake hoki o te pūhekaheka i roto, te whare rēti i tō te whare e nohoia ana e te rangatira o taua whare. Ka nui ake te tūponotanga ka pāngia ngā tāngata Māori, Moananui-a-Kiwa, hauā, pōhara hoki he iti ake nei tō rātou pupuri whare hei rangatira, e ngā āhuatanga rēti whare kino ake, me te aha ka nui ake te tūponotanga ka whakaurua rātou ki te hōhipera nā ngā āhuatanga whare noho ka taea pea te karo.

I āwhina tēnei rangahau nō Aotearoa ki te whakarato i te papa taunakitanga mō Ngā Aratohu Whare Noho me te Hauora a Te Whakahaere Hauora o te Ao, tērā ka noho hei pou here mō ngā panoni waeture, hōtaka hōu nei hoki i Aotearoa hei ārai i ngā whakaurunga ki te hōhipera ko ngā āhuatanga whare noho te pūtake. Kua whakamanatia e te kāwanatanga ngā paearu teitei ake mō ngā whare rēti katoa, ā, kua tohu i te whakaurunga o ētahi anō paearu whāmotanga pūngao; ka hangaia

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ināianei he whare noho hou me ērā kua whakahoutia kia tautuku ki ngā paearu i tua atu i ērā kei roto i ngā tikanga hanga whare.

**Ngā kupu matua:** whare noho, toiora, ngā ōritenga kore ā-hauora, korenga e whai whare, kore āhei ki te whare noho, whai whare, kounga ā-whare, Aotearoa

Children and older people in New Zealand households spend more than 90 per cent of their time inside, so the home is the main environment to which people are exposed (Baker et al., 2007). In the 2018 Census, 34 per cent of people reported that their homes were sometimes or always damp and 36 per cent reported their homes were mouldy (Stats NZ, 2018). Data from the General Social Survey showed that the average *daytime* temperature inside homes in winter is 19°C, with 33 per cent of homes below 18°C (Stats NZ, 2020). In houses with recorded temperatures lower than 16°C, 45 per cent said they could see their breath inside during winter, and 36 per cent rated their house as always or often cold. These results align with evidence that more than one-quarter of households are struggling with energy poverty; that is, paying more than 10 per cent of their income on household (non-travel) energy costs (Howden-Chapman et al., 2012).

Home is where we spend most of our time. Structural differences in health inequalities can be partly attributed to housing quality (Howden-Chapman et al., 2013). Māori, Pacific, disabled and low-income people have lower rates of home ownership. Owner-occupied houses are generally less crowded, newer, higher quality and better maintained, so Māori, Pacific, disabled and low-income people are more likely to be exposed to poorer quality rental housing and suffer potentially avoidable housing-related hospitalisations. BRANZ research has shown that private rental properties are three times more likely to be cold and damp than owner-occupied homes and, in the 2018 Census, rental properties were more likely to have visible mould (Buckett et al., 2012; White et al., 2017). The large quality differences between rental properties and owner-occupied houses are partly because most rental properties are older dwellings, built before the introduction of the 1978 Building Code.

In the latter part of this paper, we review the Government's regulatory responses to these challenges, but first we discuss what we have learnt from intervention programmes such as the Energy Efficiency and Conservation Authority (EECA) funding and auditing of retrofitted insulation into over 300,000 homes through Warmer Kiwi Homes and its predecessor programmes. These programmes have provided opportunities for experiments, where the interventions can be 'staggered', with the initial intervention stage being randomly assigned, but latterly provided to the control group. In other cases, roll-outs to the whole population at once provide opportunities for 'natural' experiments (Howden-Chapman et al., 2020).

### **New Zealand research evidence on improving house performance to improve health outcomes**

A small number of organisations have led housing and health research in New Zealand in recent years. The He Kāinga Oranga (HKO)/Housing and Health Research Programme has been funded for over two decades by the New Zealand Health Research Council to evaluate which housing interventions improve health and well-being. The HKO programme's multidisciplinary researchers have conducted six randomised community trials in partnership with iwi and communities. To evaluate a broad range of outcomes, the community trials have undertaken detailed monitoring of indoor temperature and relative humidity, electricity consumption, occupants' daily respiratory measurements and contact with health services, school and work absences, no-fault accident compensation claims, and mortality data. The results of these intervention studies have been monetised and the economic benefits are significant (Chapman et al., 2017). A further major research contribution has been made by Motu Economic and Public Policy Research. A feature of much of this research work has been collaboration among researchers from a range of academic organisations.

In the first community trial led by HKO, the Housing, Insulation and Health Study, insulation was retrofitted into

participants' houses in six communities, involving 1400 households with occupants who had a range of respiratory symptoms (Howden-Chapman et al., 2005). People in the intervention group houses, where insulation had been retrofitted, had significantly better physical and mental health than people in the control group (Howden-Chapman et al., 2007). The benefit-to-cost ratio was close to 2:1 (Chapman et al., 2009) and demonstrated that there were many social co-benefits, such as improved school attendance, and environmental co-benefits, such as reduced energy use, leading to carbon emission reductions (Howden-Chapman & Preval, 2014).

This trial was followed by the Housing, Heating and Health Study, in which the intervention was carried out in 409 households where there was a child with doctor-diagnosed asthma. The intervention, which involved installing effective, non-polluting heating in houses with retrofitted insulation, resulted in a significant reduction in wheezing and days absent from school (Free et al., 2010; Howden-Chapman et al., 2008). The Warmer Houses for Elderly New Zealanders (WHEEZ) study retrofitted insulation where it was missing and provided \$500 electricity vouchers to older people with chronic obstruction pulmonary disease (COPD). Participants were instructed to heat their houses when it was cold: "Heat is your medicine" (Viggers et al., 2013), and the homes of occupants with the vouchers were found to be heated more than the control homes (Viggers et al., 2019). This research underpinned the current Government's Winter Fuel Payment for beneficiaries and people who are 65 years and over. Meanwhile, the NEST study focused on ensuring that the houses of newborn babies were insulated and heated; in addition, babies were provided with warm 'grow suits'. The effects on the infants' health at two years are currently being finalised for publication.

In the Home Injury Prevention Intervention (HIPI), a local builder was employed to identify and then remediate house trip and fall hazards (Keall et al., 2015). Unintentional injuries in homes are responsible for most payments from the New Zealand Accident

Compensation Corporation (ACC). Even modest remediations reduced the rate of injuries caused by falls at home per year by 26 per cent. Injuries specific to the home-modification intervention were cut by 39 per cent (Keall et al., 2017). Injury costs to ACC in the remediated homes, compared with the unmodified homes, showed a 33 per cent reduction in the costs of home fall injuries. The social benefits of injuries prevented were estimated to be at least six times the costs of the intervention. The benefit-to-cost ratio can be at least doubled for older people and increased by 60 per cent for those with a prior history of fall injuries (Keall et al., 2017). The Māori Home Injury Prevention Intervention (MHIPI) used a similar methodology and found even more positive results: injuries specific to the home-modification intervention were cut by 45 per cent per year (Keall et al., 2021). Studies such as the HIPI and MHIPI have shown that even if the same intervention is applied to all dwellings, health benefits (in this case, injuries prevented) are higher for groups such as Māori. These two studies showed that ACC costs, as well as the resulting pain and suffering from injuries, can be significantly reduced by remediating existing homes.

### **The 2018 WHO *Housing and health guidelines* and subsequent research**

The important foci of our community trials on the effects of housing on health and well-being have recently been validated by the World Health Organization (WHO). The 2018 WHO *Housing and health guidelines* address household crowding, cold and damp, excessive heat (a growing but under-researched problem in New Zealand), hazards in the house leading to falls, and accessibility (World Health Organization, 2018). Professor Howden-Chapman chaired the International Guidelines Committee and the New Zealand research on housing and health was an important contribution to the evidence base that ensured these WHO guidelines were eventually approved (Howden-Chapman et al., 2017).

The strongest international health effect reflected in the guidelines – the impact of severe household crowding on health – is mirrored in New Zealand (Baker, Goodyear, et al., 2012; Stats NZ 2018). Largely due to household crowding, infectious diseases are still the main reason for hospitalisations (Baker, Barnard, et al., 2012), including rheumatic fever (Oliver et al., 2017). Largely for socio-economic reasons, household crowding is particularly prevalent in households of Māori and Pacific peoples (Howden-Chapman et al., 2000; Stats NZ, 2019; Tiatia et al., 2017). Data from the 2018 Census, the General Social Survey and the Household Economic Survey show that household crowding has largely remained unchanged since the early 2000s, and that people in these households experience lower well-being on measures, such as life satisfaction and material well-being (Stats NZ, 2019).

As the community trials on retrofitting insulation and heating in existing housing described above have shown, lack of insulation and heating and poor ventilation lead to increased risk of respiratory infection. A prospective, unmatched case-control study of children under two years of age in two paediatric wards and five general practice clinics found that independently measured respiratory hazards, including mould, had a significant, adjusted dose-response relationship with hospital admissions for acute respiratory infections (ARI) (aOR 1.15/unit increase (95 per cent CI 1.02 to 1.30)). Interventions to reduce these harmful exposures could reduce the ARI rate of admission by 19 per cent, equivalent to 1700 fewer admissions annually (Ingham et al., 2019).

Each year 28,000 children and 54,000 adults are admitted to hospital for potentially avoidable hospitalisations linked to poor housing (Oliver et al., 2018). To reduce these hospitalisations, the Healthy Homes Initiative (HHI) was set up to remediate the homes of children who had housing-related admissions to hospital (Pierse et al., 2020). The HHI interventions included retrofitted insulation, heating and draft stopping, providing energy efficiency advice, and new bedding where existing bedding was damp and mouldy. This

programme was initially instituted in partnership with nine district health boards and communities with cases of rheumatic fever in children and is currently being extended to all 19 district health boards. The HHI programme is being evaluated, not through community trials, but by using Stats NZ's Integrated Data Infrastructure (IDI), the linked administrative data base of all individuals in contact with government services. Evaluation of the HHI showed that in its first year, the programme prevented an estimated 1533 hospitalisations, 9443 GP visits and 8784 filled prescriptions. The savings to the health care system due to these reductions are estimated to be approximately \$10.4 million. In total, the HHI programme is expected to avert approximately \$30 million in health care costs over a 3-year period. The return on investment is expected to be realised in less than two years (Pierse et al., 2019).

A follow-up programme evaluating all houses in New Zealand in the Warmer Kiwi Homes programme had greater power to consider both hospitalisation and mortality and found an increased benefit-to-cost ratio of retrofitting insulation of 4.7:1 (Grimes & Preval, 2020). Another recent study found greater reductions in hospitalisation rates amongst Māori and Pacific peoples following insulation retrofits, particularly among those who remained in the same house throughout the six years covered by the study (Fyfe et al., 2020). These findings are particularly important as Māori and Pacific peoples have poorer health outcomes than European and other ethnicities in New Zealand. For example, in 2012, Māori hospitalisation rates for all infectious diseases were twice those for the European/Other population (rate ratio 2.1), with rates for Pacific peoples more than two times higher (rate ratio 2.3) (Baker et al., 2012).

### **Environmental burden of disease from unsafe and substandard housing**

As part of the process of becoming a WHO Housing and Health Coordinating Centre, He Kāinga Oranga conducted a study on the

public sector costs of the environmental burden of disease from unsafe and substandard housing conditions in New Zealand. Our estimates indicate that damp or mouldy housing conditions are associated with the most hospitalisations, with close to 6300 hospitalisations annually resulting in approximately 37,000 nights in hospital and \$36 million in direct costs to the health care system. Most of these nights in hospital and the resulting costs are from pneumonia and lower respiratory tract infections (approximately 28,000 nights in hospital and \$24 million annually). Overall, we estimate that direct public sector costs attributable to these unsafe and substandard housing conditions are approximately \$141 million but could range from \$127 to \$160 million. These numbers include an average of 6300 hospitalisations due to damp or mould, 1500 hospitalisations attributable to injuries, 625 hospitalisations due to cold housing, and 500 hospitalisations annually attributable to household crowding. In addition, we estimate 230 deaths are attributable to these housing conditions, of which more than half are attributable to damp/mouldy homes. When this mortality burden is monetised using estimates of the Value of Statistical Life to capture indirect and intangible costs (e.g. pain and suffering, productivity losses), the annual costs to society solely from these deaths are estimated to be approximately \$1 billion (June 2017, New Zealand dollars) (Riggs et al., 2021).

As well as the physical effects of housing, there are also important social and political effects. There is considerable international evidence that security of tenure is a significant indicator of the quality of people's environment. There is robust evidence that young children in low socio-economic areas and rental tenure are particularly vulnerable to frequent moves (Robertson et al., 2019). A recent study of residential mobility and socio-emotional and behavioural difficulties found a positive linear association between the number of moves children experienced by the age of four and difficulties evident in their Before School Check (Nathan et al., 2019).

Housing quality can affect mental health, although the evidence is mixed. An analysis of the 11,500 New Zealand households in the longitudinal Survey of Families, Income and Employment, conducted from 2002 to 2010, suggested that reductions in psychological distress were more likely to be seen through interventions that target individual socio-economic deprivation and severe household crowding (Pierse et al., 2016). In the UK, among retired people in the Whitehall study, anxiety about deferred maintenance on their house was more important than the effect of tenure on mental health (Howden-Chapman et al., 2011). More surprisingly, in the great East Japan Earthquake and Tsunami, people whose houses were seriously damaged or destroyed showed more cognitive decline than those who had friends or a family member who had died in the disaster (Hikichi et al., 2017).

In the Canterbury earthquakes, broader societal and political factors provided an example of the Inverse Care Law; that is, those on low income who had not insured their houses were thereby ineligible for Earthquake Commission compensation. Disproportionate numbers of renters and people living in boarding houses lived in inner Christchurch and were consequently displaced, which led to a rise in homelessness in Christchurch and a decline in well-being (Howden-Chapman et al., 2014). People with disabilities and other vulnerabilities also assessed themselves as having negative well-being scores after the earthquakes (Morgan et al., 2014).

Less dramatically, but more perniciously, the interminable consequences of dealing with so-called 'leaky buildings', caused by a combination of unintended consequences of regulatory changes, have had huge health (Chapman, 2010) and financial (Howden-Chapman et al., 2010) consequences for homeowners, among others.

## Homelessness and severe housing deprivation

In this paper we have largely concentrated on research on the health effects of the quality and affordability of housing. However, we have also been monitoring the prevalence and impacts of homelessness and severe housing deprivation (Amore et al., 2013; Amore et al., 2021) and the combined efforts of government and community agencies to address it through Housing First and other policies (Pierse et al., 2019).

In line with other social democratic countries, the Government introduced protective housing policies during the 2020 COVID-19 lockdowns. While eviction was illegal during this time, New Zealand residents returning from overseas were able to evict tenants from houses they owned, at a time when rents in private rentals are again rising higher than the rate of inflation. The increase in unemployment during the pandemic and the end of the wage subsidy programme have left many households unable to pay these market rents. Consequently, despite an ambitious, well-funded public housing programme by Kāinga Ora – Homes and Communities, there has been a substantial increase in the public housing waiting list to over 23,6880 applicants (Howden-Chapman, 2020).

## Discussion

Health inequalities across social and ethnic groups are an important health and social issue but can be reduced by improving poor housing conditions. Although measures are targeted at disadvantaged groups, New Zealand has a mobile population, so individuals rarely stay in one dwelling for long periods. The housing stock therefore needs *general* improvement to benefit vulnerable groups, particularly those in private rental housing (Bierre et al., 2015). This implies that the recently introduced minimum standards for rental housing, the Residential Tenancies (Healthy Homes Standards) Regulations 2019, which build on the prototype Rental Warrant of Fitness (Telfar

Barnard et al., 2018) and incorporates the *WHO Housing and health guidelines*, are an important step forward.

As well as addressing inequalities in tenure, the Government has an important role in facilitating the supply of housing and regulating the demand for it. The Government influences immigration and financial factors affecting housing demand. The Government is working with councils, property developers, community housing organisations, iwi, hapu and Māori urban authorities to increase the supply of affordable, quality dwellings, including papakāinga housing. In the medium term, by addressing critical developing issues such as urban form and climate change, the Government can also have an important influence on the environmental factors bearing on housing quality and community formation.

In conclusion, housing and health research in New Zealand can be construed as collective action that has led to what Elinor Ostrom (2000) called the “evolution of social norms”. Extensive, multidisciplinary research on housing, health and well-being has led to a wide, public and political sense that warm, dry, safe and affordable housing is the minimum that we should accept in a functioning social democracy. Moreover, the 2020 election suggested that a majority of the population considers that a key function of central government is to partner with councils, business, iwi and community organisations to achieve these progressive aims. Nonetheless, demand for housing has increasingly outstripped supply. Housing is an asset, and in the absence of taxation of asset value gains, prices are being rapidly inflated by the monetary easing associated with the COVID-19 recovery strategy. Ensuring a supply of quality, secure housing, particularly for the growing proportion of children and older people who are not living in owner-occupied or public housing, remains a major policy challenge.

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