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Research-informed Public Policy a case study of housing

Abstract

Coordinating the timing and relevance of research for public policy is difficult. Based on ongoing early collaborations between researchers and policy analysts, this case study documents innovative research-led public policy. He Kāinga Oranga, the Housing and Health Programme addresses the determinants of population health by improving substandard housing and was developed in consultation with local and central government, iwi and communities. We outline our research goals and processes and the range and impact of our outcomes, and draw conclusions about the value of long-term government-funded research investment that is focused on key policy issues, to improve the effectiveness and equity of public policy.

Keywords housing, health, public policy, research methods

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The relationship between research and policy is contentious. The British Wanless report stated that ‘every opportunity to generate evidence from current policy and practice’ should be taken to provide more robust evidence of practical interventions that might help governments formulate effective policies (Wanless, 2004). Public policy institutions need relevant, robust research evidence, with an equity focus and strong theoretical frameworks (Petticrew et al., 2004). Independent researchers are driven by their own strategic goals and timelines, but, when asked to identify types of evidence known to provide evidence for policy, highlighted: showing the existence of the problem; narrative accounts of the impacts of policies from the household perspective; controlled evaluations; natural policy experiments; and historical evidence (Whitehead et al., 2004). Policy and research approaches can be difficult to reconcile, but developing an early, common understanding, which makes them more congruent, is important.

Here, we focus on examples of how practical public policy to reduce inequalities can be developed, coordinated, implemented and evaluated. We review the explicitly Tiriti-informed research by He Kāinga Oranga, the Housing and Health Programme, focused on improving substandard housing. The programme has systematically generated robust evidence to inform improvements in health and inequalities (Howden-Chapman, Crane et al., 2023). Programme researchers come from various disciplines: public health, Māori health, medicine, economics, social science, physics and engineering.

We concentrated on existing rather than new housing, because in the foreseeable future people will largely be living in houses that exist now, so improving the quality of those houses has the most impact on population health.

An analysis of the New Zealand Time Use Survey showed that people's homes are the key population environmental exposure: 70% of our time is spent at home, while for younger and older people it is around 90% (Baker et al., 2007). Consequently, improving substandard housing became the focus of our studies. Reviews of the literature clearly showed that warm, dry homes are essential for health, but many New Zealand homes are cold and damp with inadequate heating, and consequently mouldy (Howden-Chapman, Saville-Smith et al., 2005), which is highly problematic, particularly for the young and old (Howden-Chapman, Signal and Crane, 1999). Exposure to these conditions can cause, or exacerbate, major health problems which require hospitalisation: respiratory conditions, such as asthma and chronic obstructive and pulmonary disease (COPD), and cardiovascular conditions, such as atrial fibrillation. Moreover, many serious viral diseases, such as Covid-19, are now known

to be airborne and crowded houses, common among low-income households (Statistics New Zealand, 2018), are a serious risk factor for close-contact infectious diseases (Tiatia et al., 2016) such as meningococcal disease (Baker et al., 2000) and rheumatic fever (Oliver et al., 2017).

Successive population censuses have shown that there are housing inequalities in quality and tenure, which in turn drive inequalities in health, and this became another central concern of our programme. The highest rates of homeownership were in the late 1980s or early 1990s, when about three-quarters of all people in households

lived in an owned dwelling. Even then there were ethnic disparities, with nearly 80% of New Zealand European living in owned homes, but only about half of Māori or Pacific peoples. However, by the 2013 census, levels of homeownership had declined so that only about a quarter of Māori (28%) and a fifth of Pacific peoples (19%) were in owner-occupied dwellings, although over half of New Zealand European people (57%) were (Johnson, Howden-Chapman and Equb, 2018). These proportions were largely unchanged in the 2018 census, which also identified the poorer quality of private rental housing, which has become another major concern of the group (Statistics New Zealand, 2020).

Research methodology

Having identified that too much of New Zealand housing is substandard, we undertook a detailed programme of research to identify effective interventions which could plausibly be rolled out as public policies with the greatest benefit

to population health and safety while also reducing inequalities. To ensure that the evidence was as robust as possible, we carried out a sequence of randomised community trials (RCTs) – methodologically the gold standard for demonstrating causation.

We concentrated on existing rather than new housing, because in the foreseeable future people will largely be living in houses that exist now, so improving the quality of those houses has the most impact on population health. Along with researchers in other countries, such as England, we first focused on evaluating interventions that were targeting retrofitted insulation to reduce cold indoor temperatures (Hong, Oreszcyn and Ridley, 2006). We began working with the Building Research Association of New Zealand and the Energy Efficiency and Conservation Authority (EECA), a Crown agency established in 1989 after the 1973 and 1979 oil shocks to promote energy efficiency and conservation.

EECA has managed a succession of government-subsidised home energy efficiency programmes to retrofit insulation, which began with small projects in the late 1990s. EECA collaborates with community organisations including businesses, trusts and councils, and now Te Whatu Ora, that have also made financial contributions to the programme. By the early 2000s local community projects were installing mutually agreed interventions. From 2009 the Warm Up New Zealand programme was implemented nationally; the initial four-year programme had the intention of retrofitting insulation in the 188,500 houses estimated to be insufficiently insulated (EECA, 2011).

Collaboration and public policy dilemmas

Critically, although focusing on subsidies for energy efficiency, EECA agreed to support the programme's housing, insulation and health RCT study by accommodating the necessary random sequencing of the insulation within their retrofitting schedule (Howden-Chapman et al., 2007). This was despite discussion in the Department of the Prime Minister and Cabinet about possible public policy dilemmas. These dilemmas are where policy costs are largely borne by one agency,

but the benefits flow more widely to other outcomes for which several other agencies are responsible: for example, if the primary public benefit was expected to be improved health and education outcomes, the established view was that the intervention costs should also be borne by Vote: Health and Vote: Education, rather than by Vote: Energy alone. However, without research evidence on outcomes, it was not clear *a priori* how the funding costs should be divided.

We found that indoor temperatures in the intervention houses with retrofitted insulation were significantly higher than in the control houses, but below the recommended World Health Organization (WHO) indoor temperature then suggested, and since confirmed, of 18°C (World Health Organization, 1990, 2018). Nonetheless, there were self-reported health improvements and reductions in energy use (Chapman et al., 2009).

The public policy dilemma first identified in the insulation study, where health benefits outweighed energy savings, also occurred in the subsequent 2009 housing, heating and health RCT study (Howden-Chapman et al., 2008). The intervention, funded by EECA and Contact Energy, consisted of replacing old heaters with the choice of more energy efficient, safe and sustainable options – heat pumps, wood pellet burners or flued gas heaters. The old heaters were either ineffective plug-in electric heaters, or unflued gas heaters, a major environmental and health risk.

These studies showed that in existing houses, both retrofitted insulation and effective heating were necessary, but not sufficient, to maintain a healthy house at the WHO recommended temperature. Nevertheless, the results were promising: people felt warmer; condensation was reduced; there was less mould and fewer mouldy smells reported and dioxide levels halved (Gillespie-Bennett et al., 2008); levels of wheezing and coughing halved in children with asthma (Pierse et al., 2013); and average school absence reduced to two days (Free et al., 2010), with effects being more marked in low-income families (Howden-Chapman et al., 2009).

A subsequent quasi-experimental study of energy impacts was carried out in a larger sample of 12,000 houses from the 46,655

Warm Up New Zealand households that had received insulation, and in some cases heaters, between 2009 and 2010. Conducted with a number of electricity retailers, this study showed a statistically significant reduction in metered household energy consumption of almost 2% (Grimes et al., 2016). The results were also promising for energy efficiency, with the effects more marked in low-income families, but the cost of energy remained an ongoing barrier for households wanting to heat their homes adequately (Howden-Chapman et al., 2012).

Fuel poverty

In response, we piloted an intervention which could address fuel poverty by

people (53%) whose meters were disconnected in the previous year were without electricity for up to 38 hours (O’Sullivan et al., 2016). The second study involved interviewing schoolchildren about their homes. Households with children were more likely to see so-called ‘dragon breath’ condensing inside and children reported that their school performance, as well as their physical and mental health, were adversely affected (O’Sullivan et al., 2017).

Reducing injuries

We have been less successful in influencing policy choices to reduce home injury risks, although the WHO highlighted

... a survey of pre-pay meter users, which identified that these meters were more expensive than having an account, and that over half the people (53%) whose meters were disconnected in the previous year were without electricity for up to 38 hours ...

modifying the UK winter fuel payment. The New Zealand intervention was a winter energy subsidy for older people with COPD, based on a calculation that a \$500 subsidy together with the exhortation, ‘Heat is your medicine!’, would enable people to stay warmer during winter and would be politically feasible to implement (Viggers et al., 2013). The subsidy led to an increase in electricity use and the winter subsidy was adopted by the government as the winter energy payment for older people and people on benefits (Viggers et al., forthcoming).

The importance of addressing fuel poverty was reinforced by two qualitative studies, which attracted considerable media attention. The first was a survey of pre-pay meter users, which identified that these meters were more expensive than having an account, and that over half the

this as a priority in its 2018 International Guidelines for Housing and Health. We strategically built up an evidence base on the importance of reducing home injuries (Keall et al., 2008), highlighted the social cost of these injuries (Keall et al., 2011) and formulated a programme of repairs to reduce structural home injury hazards (Keall et al., 2013). The programme then conducted two successful randomised community trials of home remediation, the housing injury prevention intervention (Keall et al., 2015) and the Māori housing injury prevention intervention (Keall et al., 2021). These trials showed that more than a quarter of all injuries from falls could be prevented by simple home modifications. Both trials were highly cost-beneficial, particularly for Māori with larger families.

Despite these positive outcomes, the home remediation designed to substantially

reduce risks for slips, trips and falls has not yet had any apparent impact on policies. Following our rental warrant of fitness pilot (Telfar-Barnard et al., 2017), the Healthy Homes Guarantee Act 2017 specifies minimum standards for insulation, heating and ventilation, but there is nothing about safety. The globally unique Accident Compensation Corporation (ACC) was purposely and primarily established to enact policies to prevent injuries and otherwise to cover medical and rehabilitation costs. However, despite clear communication of our trials' results (Bierre, Keall and Howden-Chapman, 2022), ACC has failed to negotiate the specification of features to reduce known

In 2011, the New Zealand Integrated Data Infrastructure (IDI) was set up by Statistics New Zealand, with strict ethical requirements, to enable public-good research using the population's census and survey data, as well as incorporating contact with both government agencies and non-government services – for example, health visits, pharmaceutical usage, housing tenure, social services, education etc. (Milne et al., 2019). The IDI is a more economical and comprehensive means of analysing longitudinal data to explore new policy issues, both before and after individuals receive a policy intervention, although it is very difficult to randomise the roll-out of a policy

insulation intervention significantly improved occupants' health and strongly support our previous research findings, which had relied in part on self-reported health. Because hospitalisation is a relatively rare event, sampling the whole population enabled us to determine that the intervention reduced hospital admissions by 9.26 per 1,000 people per year compared to a control group, and showed that there was a greater effect for specific cold-associated illnesses. Furthermore, the analysis of pharmaceutical data suggested that the intervention reduced the incidence of respiratory diseases and helped people to manage their symptoms.

Severe housing deprivation describes people living without housing, or in housing that lacks at least two of three basic requirements – privacy and control, security of tenure, and structural adequacy – due to an inability to access appropriate housing.

risks for household falls in the Residential Tenancies (Healthy Homes Standards) Regulations 2019.

Long-term outcomes and new IDI methodologies

Our randomised controlled trials, accompanied by cost-benefit analyses (Chapman, Preval and Howden-Chapman, 2017), were designed to highlight cost-effective interventions that could be rolled out to improve housing and health. With the exception of lack of public policy interest in injury reduction, publicised results from the trials were largely successful in promoting effective public policies. However, RCTs are very expensive and complicated to run and there is now another robust way that researchers can explore the effectiveness and equity of public policies.

intervention at a national level. The data is updated about four times a year and, as we now have access to the total New Zealand resident population, there is considerable statistical power to detect policy benefits.

An example of a longitudinal policy evaluation now possible using the IDI was the revisiting of the housing, insulation and health study. Rather than our initial RCT of 1,400 households, we had access to the records of the people in 204,405 households nationally who had received the ECEA Warm Up New Zealand insulation subsidy. We were able to follow them for three years before and after insulation was retrofitted, and with the larger sample size we were able to show enhanced health outcomes in terms of chronic respiratory diseases (Fyfe et al., 2022) and hospitalisations (Fyfe et al., 2020). These results showed that the home

Exploring broader outcomes with the IDI

Using data from the census, which is included in the IDI, has also enabled us to measure both homelessness and housing that lacks access to basic amenities, as well as estimating the overlap between the two important concepts. We have also been able to evaluate the effectiveness of two community-based programmes, Housing First and the Healthy Housing Initiative, both of which are supported by government agencies, as well as charities.

Severe housing deprivation describes people living without housing, or in housing that lacks at least two of three basic requirements – privacy and control, security of tenure, and structural adequacy – due to an inability to access appropriate housing. Repeated analysis of census data has shown relatively stable rates of people living without shelter, in temporary accommodation, or sharing accommodation in a severely crowded dwelling (Amore, Viggers and Howden-Chapman, 2021). But new questions in the 2018 census allowed us to estimate the number of people suffering from both lack of income and inadequate housing lacking basic amenities, and this showed that most people experiencing severe housing deprivation had not been identified previously. The two most commonly lacking amenities across all tenures and housing types were drinkable tap water and electricity. Children and migrant communities were particularly exposed to these substandard conditions. Around two-thirds of people in dwellings lacking basic amenities were

not in low-income households and were therefore not considered severely housing deprived under the definition used, although they would have been living in unpleasant conditions (Viggers, Amore and Howden-Chapman, 2021). This data is now used for locality-based planning for public housing.

Housing First is a Canadian-initiated programme that sees secure housing as the first necessary step for people who are homeless, before other effective support can be provided. It was implemented in New Zealand by community groups before there was any government funding. Using the IDI, researchers at the programme have evaluated Housing First at two and five years (Ombler et al., forthcoming) and clearly demonstrated that people who have been housed under this programme have experienced increasing benefits. Consequently, Housing First is now part of the Ministry of Housing and Urban Development-led Homelessness Action Plan.

The community-led Healthy Housing Initiative is designed to prevent the reoccurrence of respiratory and infectious diseases in children whose families have low income by providing a package of interventions similar to the healthy homes standards. Whānau can self-refer to get help to get insulation, heating and minor repairs from community service providers,

or can be referred from the health services. As part of a policy to eradicate rheumatic fever, the service is now fully funded by EECA warmer Kiwi homes grants for owner-occupiers. The Healthy Housing Initiative became nationwide in 2023. Comparing the health of the households before and three years after the home interventions showed large benefits (Pierse et al., 2022).

Discussion and conclusion

Our strategic research on housing and health and its population health impact has been extensive. Improving people's living conditions could substantially reduce total hospitalisation costs and potentially improve quality of life. In economic terms, a robust burden of disease study in 2021 found that damp and mouldy housing accounted for a substantial proportion of New Zealand's burden of disease. The direct public sector costs attributable to these housing conditions were approximately NZ\$141 million annually. The costs to society from the 229 deaths annually attributable to adverse housing were around \$1 billion (Riggs et al., 2021).

Deep long-term partnerships with both communities and government agencies are important enablers of research-informed policy. Partnerships with communities led to greater participant and retention rates in our randomised controlled trials, and

are also vital to collecting high-quality, timely and consistent data in the IDI. Partnership with government agencies is helpful in designing policy-ready interventions and identifying champions to build awareness and understanding of the research. These partnerships can also have an impact on the thinking and policy preferences of elected members at various levels of government and can build cross-party coalitions to support policy initiatives.

The success in uptake of the insulation and heating was due in part to EECA's willingness to engage with the research to strengthen the outcomes from their programmes. Conversely, the failure to embrace proven falls prevention measures may be due to ACC seeing large-scale intervention programmes as beyond their remit.

In conclusion, we have identified a number of cost-effective housing interventions which can improve the health and wellbeing of occupants: retrofitted insulation and heating, and reducing injury risks. We have provided evidence for effective government policies and regulations which, if fully implemented, can reduce inequalities, both in New Zealand and internationally (Howden-Chapman, Crane et al., 2023; Preval et al., 2019).

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