Submission to Defining Energy Hardship Consultation – Fuel Poverty and Energy Hardship

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Introduction

The Affordable Housing for Generations (AHFG) research programme is funded within the Building Better Homes Towns and Cities National Science Challenge. The objective of AHFG is to "develop effective and practical approaches to alleviating the crisis of affordable housing and housing affordable to key workers through targeted research-based solutions which will sustain people in their homes and communities over generations and contribute to thriving regions." The research programme focuses on delivering robust science and research-based tools to enable Aotearoa/NZ to achieve:

- Affordable stock for diverse people and thriving communities.
- Affordable housing that works over the life cycle of the dwelling and a housing stock able to support the life courses of multiple generations.
- Solutions that address the limits of housing markets and policy, regulatory and investment settings for accessible affordable housing.

The research has five components (Infobox 1) which combined will contribute to transforming NZ Aotearoa:

Infobox 1 Research Components
C.A Markets, Housing Distribution and Wellbeing
C.B Price Points for Affordable Housing and Housing Affordability for Key Workers
C.C Meaning of Home & Dimensions of Affordability
C.D Affordable Housing and the Impact of Dwellings
C.E Realising Housing's Public Good - Funding & Developing Fit for People Housing Futures

From:
Being marked by housing driven inequality, structural under-supply of housing in general, and affordable housing in particular, costly poor building quality and dwelling performance, and homelessness;
To:
(a) Having an affordable stock for diverse people and thriving communities delivered through the diversification of design, tenure and locations of affordable housing;
(b) Building affordable housing that works over the life cycle of both the dwelling itself and across the life course for multiple generations through reduced energy and water consumption, improved resilience and reduced need for modification; and,
(c) Being able to address and mitigate the limits and inequities of housing markets, minimise homelessness, overcrowding, housing insecurity and housing-cost related inequality.

In AHFG's Component D, a key focus is the operating costs of dwellings and the way in which those can be minimised through improved dwelling performance. This work is of direct relevance to fuel poverty and energy consumption.

Amongst the AHFG team, are researchers with long experience in research exploring the interaction between dwellings, households and incomes: Dr Nigel Isaacs (School of Architecture, Victoria University) was one of the first researchers to uncover the excess winter mortality associated with poor dwelling performance; Dr Lynn Riggs (Motu) has been working on health and well-being among children, and housing; Vicki White (BRANZ) has led successive house condition surveys, and Dr Kay Saville-Smith (CRESA) is the co-leader of the AHFG, a housing expert who has also undertaken a succession of research around dwelling performance, heating and household exposure to fuel poverty as well as other forms of housing stress.

Within Component AHFG, this team are exploring ways by which the prevalence and distribution of fuel poverty can be estimated in the interim using existing data around, dwellings, households, and household incomes. This work is specifically designed to ensure household income and energy costs are understood in the context of likely dwelling performance. It recognises that household exposure to energy costs is mediated by the amenity delivered by dwellings. Fuel poverty can not be adequately understood without recognising the impact of a dwelling on the experience of households.

Some Relevant Preliminary Findings

This research is in early stages and reads to issues in Section 8 of the discussion document, similar to Lloyd (2006), with our results expected in early 2022. Some of our preliminary results using HES expenditure data, as well as other research that has been done in this area, indicate the additional factors that need to be considered when measuring energy hardship.

First, we have found that because HES extrapolates annual totals from the last energy bill, the month in which the survey was conducted makes a statistically significant difference to the annual household spend. Moreover, the distribution of household expenditure on energy for households surveyed in winter months (approximately one-quarter of the sample generally) is very different from the distribution of expenditure for households surveyed in other months (approximately three-quarters of the sample). We observed winter months having more dispersion than non-winter months (i.e., there is much more variance in household energy use in winter, which likely reflects highly variable heating habits and, subsequently, energy used for heating).

Hence, distributional measures using annual medians may not accurately estimate the percentage of households experiencing energy hardship if the distribution is based on all households. While households surveyed in summer months may look much more like other households, they could in fact exceed the threshold (i.e., experiencing energy hardship) if they had been surveyed in winter. For example, a household surveyed in a summer month may report household energy expenditures of $100 for the previous month, which would give an annual estimate of $1200. However, the same household surveyed in a winter month may report $400 in household energy expenditures for the previous month, which would give an annual estimate of $4800. Generally, households will provide an annual estimate for income which is less likely to change depending on the survey month; therefore (in this example), the ratio of energy expenditure to income of the same household surveyed in winter is likely to be 4 times that of the household if it had been surveyed in summer. Then, lining up all these households using these ratios from smallest to largest to determine the median ratio value, means that the same household surveyed in summer would likely end up in a much lower percentile than if the household had been surveyed in winter. Now imagine that 75% of the sample is surveyed in summer months and 25% of the sample is surveyed in winter months – the median value is then much more likely to be based on households surveyed in summer. This may be fine if income measures also varied in the same way; however, household income measures appear to be fairly consistent across the year (at least based on our preliminary analysis). So, even though HES is designed to be representative in every month in terms of socio-demographic characteristics and geography, one single month does not represent 1/12 of household expenditures for household fuels.

In other research, we have found that the survey month also matters when asking people to report on their indoor environment (dampness, heating their homes) even when the question explicitly asks about the conditions in winter. In Riggs et al. (2021)[1], survey respondents interviewed in a winter month were significantly more likely to report dampness or mould in their home than respondents surveyed in non-winter months. Moreover, these respondents were significantly less likely to report not heating their homes if surveyed in winter. Reports of household crowding, on the other hand, were not found to vary for those surveyed in winter compared to those surveyed in other months. Hence, when estimating measures that are likely to vary by season, there should be some consideration of the time of year in which the information was collected.

[1] Riggs, L., Noy, S., Devlin, M., & Howden-Chapman, P. (2021). *Housing, Health, and the Well-Being of Children*. Ministry of Social Development. https://www.msd.govt.nz/documents/about-msd-and-our-work/publications-resources/research/housing-health-wellbeing/housing-health-and-the-well-being-of-children.pdf.

Our preliminary results also indicate that the dwelling characteristics matter, a finding which matches with the laws of heat flow. For example, preliminary results from our regression analysis (using a variety of controls) indicate that the number of bedrooms, the dwelling type (i.e., stand-alone versus connected), the region and housing tenure significantly affect expenditures on household fuels even after controlling for income. Our results are stronger when looking at the lower end of the income distribution as opposed to including all households. Hence, using a distribution that combines all households may less accurately assess the extent of energy hardship than one that combines households with similar location, building type (e.g. construction, thermal insulation, stand-alone or attached, etc), and occupancy. Not all of these variables are collected by standard statistical surveys, so will require future changes. New Zealand housing and climate varies more than is typically found in many other countries (e.g. a wider variety of house styles and construction methods.) This means international comparisons must be used with care.

The key issue with the proposed measures based on median expenditures relative to household income is that there are a number of factors that could have confounding effects over time (e.g., changes in energy prices, incomes, housing costs, dwelling characteristics, weather, survey timing), which could shift the distributions and mask actual changes in the proportion of households experiencing energy hardship. It would be better if measures closer to the underlying issue – the relative quantity of energy required relative to the quantity of energy that was used (i.e., affordable) – were used. Moreover, determining the optimal set of households upon which to build the distributions should be done carefully.

Finally, results from the Warm-Up New Zealand: Heat Smart programme also indicated that households in the programme used much of the energy savings from their newly installed heating and insulation to increase the temperatures in their homes rather than reduce their energy payments (Grimes et al., 2011)[2]. This concept of takeback effect indicates that people wanted warmer homes but, prior to receiving the energy efficient improvements, were unable to afford them and hence suffered a cold home.

Given the above and what we know about household tendencies to under-heat or ration energy use, how much a household is currently spending on household fuels cannot be considered a reliable indication of the level of energy service they are getting from that use. It also limits the efficacy of policy and targeting towards addressing the thermal performance of the dwelling as one of the key factors that help reduce households' vulnerability to energy hardship. Understanding the scale and distribution of energy hardship in New Zealand should include an understanding of household energy requirements to meet household needs to support wellbeing and the thermal performance of our housing stock.

[2] Grimes, A., Young, C., Arnold, R., Denne, T., Howden-Chapman, P., Preval, N., & Telfar-Barnard, L. (2011). *Warming Up New Zealand: Impacts of the New Zealand Insulation Fund on Metered Household Energy Use* (p. 87) [Paper prepared for Ministry of Economic Development]. http://www.healthyhousing.org.nz/wp-content/uploads/2012/03/NZIF_Energy_report-Final.pdf.

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