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Household Energy End-use Project 2:

Report on summer comfort, cooling and indoor temperatures (preliminary analysis)

Executive summary

HEEP2

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Executive summary

The Household Energy End-use Project 2 (HEEP2) is a comprehensive national study of energy use and conditions in New Zealand homes. Building on the foundational HEEP study (HEEP1) conducted from 1999 to 2005, HEEP2 aims to provide updated insights into household energy consumption and indoor environmental conditions in the early 2020s.

Households were recruited to the national HEEP2 study through the Stats NZ Household Economic Survey (HES) 2021/22, with additional recruitment through the 2023/24 HES. All household types and typologies were eligible to take part. Over 750 households are taking part in some capacity.

The HEEP2 data collection includes combinations of self-completion and on-site surveys, in-home monitoring and accessing metered energy data from retailers.

This report presents preliminary results, focusing on summer comfort and internal temperatures in homes. It draws on data from an in-home interview and building and appliance survey completed for 425 households. The preliminary analysis of internal temperatures uses a subset of this national sample comprising 151 households that were monitored over summer 2023/24.

All results reported here use unweighted data. Temperature monitoring data comprises a subset of the HEEP2 monitored dataset. These results must therefore be considered preliminary only. Similar analyses will be undertaken and reported using the complete and final dataset.

About the sample

- Households in the HEEP2 national sample are predominantly owner-occupied. HEEP2 respondents are slightly older and have slightly higher incomes compared to the national population. The regional spread reflects the national dwelling distribution with some exceptions due to fieldwork challenges (namely Tasman and Gisborne).
- The dwelling type and size of houses in the HEEP2 sample is consistent with previous national housing surveys with most homes being stand-alone single-storey dwellings.
- The building age distribution roughly aligns with other data, though there are possibly slightly fewer houses built pre-1920 and post-2000 in the HEEP2 sample.

Occupant comfort in summer and keeping cool

- Approximately 70% of the 425 respondents who completed an in-home interview reported their homes being warmer than desired at least some of the time during summer. For 22% of these, this was always or often warmer.
- The proportion of householders reporting their homes warmer than they would like in summer was higher than the proportion reporting their homes colder than they would like in winter – 14% always or often, 34% at least some of the time (Anderson et al., 2024).
- Younger respondents and those living in smaller houses were more likely to say that their house was always or often warmer than they would like in summer.
- Active cooling of living areas using heat pumps or air conditioners at least some time in summer was reported by 52% of all households, with 13% reporting using these every day or most days. Excluding those that did not have a heap pump or air conditioner, these proportions increase to 18% cooling their living area every

day or most days, 24% some days and 30% hardly ever. This equates to 72% actively cooling the living area at least some time in summer, even if on rare occasions.
- The rate of cooling of bedrooms and other areas of the home for HEEP2 households is lower, largely due to a lack of an appliance to do so. Overall, fewer than 1 in 20 households (3% of the sample) reported cooling bedrooms every day or most days. This increases to 13% cooling bedrooms, if those without cooling appliances in these rooms are excluded.
- Respondents in older age groups were less likely to report using their heat pump for cooling as were those in the lowest income bracket.
- Households were asked if they regularly did any other things to help keep their home cool in summer. Leaving windows open all day and opening doors and windows to create a cross-breeze were common behaviours among survey respondents, with around 4 in 5 households doing these things. Closing curtains/blinds and using electric fans were reported by around half of households. Using a heat pump on a fan setting and using external shading like awnings or louvres was infrequent in this sample.

Indoor temperatures

- Preliminary analysis of data from a subset of HEEP2 homes (151) monitored over summer 2023/24 (December to February) indicates the average temperature in living rooms and bedrooms were similar across the day, being warmest in the evenings at around 24°C.
- Almost half of living areas were above 25°C at 6pm, and 25% of bedrooms were over 24°C at 2am.
- A preliminary comparison of the HEEP2 summer 2023/24 subset with HEEP1 (1999–2005) suggests an increase in both external and internal temperatures. The average evening temperature reported in HEEP1 in living areas was 23.1°C compared to 24.4°C in HEEP2. The average night-time temperature in bedrooms reported in HEEP1 was 20.1°C compared to 22.2°C for the HEEP2 subset. These results are indicative due to differences in the regional distribution of the HEEP2 summer 2023/24 subsample and the HEEP1 sample. This analysis will be repeated with the complete set of HEEP2 monitoring data when available.
- Preliminary analysis of overheating in bedrooms using the industry standard CIBSE 1b criteria showed that 36% of the 310 monitored bedrooms in the HEEP2 summer 2023/24 sample were classed as overheating according to this methodology. This rose to 58% of the 45 Auckland bedrooms but was only 3% (one) of the 29 Wellington bedrooms monitored.

Conclusions and future work

- The results reported in this paper are intended to provide illustrative and preliminary analysis of some of the data being collected in the HEEP2 study.
- The survey results presented give an indication of householder experiences of comfort in their homes over summer and actions taken to keep the home cool.
- Preliminary analysis of internal temperatures for the partial HEEP2 summer 2023/24 sample showed expected differences across regions and indicate a potential increase in mean internal temperatures since the original HEEP study.
- Future work with the complete HEEP2 dataset will extend this analysis to provide a more detailed exploration of the factors affecting indoor summer temperatures and the risk of overheating.

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