



HOUSEHOLD CROWDING AND RHEUMATIC FEVER STUDY¹: TECHNICAL REPORT

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Ramona Tiatia, Philippa Howden-Chapman, Bridget Robson, Michael Baker, Deirdre Brown,
Cheryl Davies, Margot McLean, Patricia Laing, Yun Sung, Dalice Sim, Lisa Early

He Kainga Oranga/Housing and Health Research Programme

University of Otago, Wellington

www.healthyhousing.org.nz

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¹ Also known as the HEART Study as a community-friendly title (Housing Effects About Rheumatic Fever Study)

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EXECUTIVE SUMMARY

This in-depth study was designed to look at the causes and drivers of functional crowding and explore the community's adaptive responses to the risks to their children's health.

Functional crowding is defined as children and other household members sleeping in the same room when there are enough rooms in the house, for example, to keep warm during cold winter months. By contrast, structural crowding follows the Canadian measure, which emphasises shortage of space, and takes account of social and demographic factors.

Method

After obtaining ethics agreement, we interviewed the parents of children, attending the 12 primary and intermediate schools, who were part of the Porirua Throat Swabbing Programme. We studied parents or caregivers in 70 index houses, as well as another 15 'spill-over' houses, where people had a high level of social contact, including sleep-overs, with the index households. In total, we studied 85 houses containing 326 people.

We carried out a semi-structured questionnaire, as well as in-depth interviews of living and sleeping patterns in the houses. As well, we recorded the physical layout of the houses and measurements of the bedrooms and living rooms in the houses, using a specially developed i-pad software development programme. Participants enjoyed telling their stories using the i-pad.

Results

In the 70 index houses, half were Housing NZ tenants, a third rented privately, 7 percent were boarders and 14 percent were owner-occupiers. Half of the people self-identified as Māori, 40 percent as Pasifika and 10 percent Pakeha. There were no discernible differences in living conditions, by these ethnic groups, except for the median size of households (5.3 people), which was larger for Pasifika households (6.2 people).

The median number of people living in the 3-bedroom houses suggests some structural crowding, but our main finding was that there were fluctuating numbers of people in the houses. A third of the households felt that they were crowded; a third felt they had enough room and a third felt they had spare room. However, many families raised the issue of how difficult it was to maintain their desired household management, especially sleeping arrangements and avoiding congestion in weekends. They observed that elderly family members and school-aged children had the highest mobility between households.

Most babies, children and teenagers slept in their own beds, but about a third of children slept with other children or adults. Two-thirds of households said that they used the

lounge 'occasionally' because of cold temperatures and crowding in the bedrooms. Heating houses was a recurrent problem, most houses had a heater of some type, but did not use them, because they could not afford the electricity and were worried about unexpectedly high bills. The house plan data showed that over a quarter of houses had no heaters at all. Nearly all households wanted more information about electricity plans, which would help them to budget. Most monthly power bills ranged from \$250 to \$500 for predominantly 3-bedroom homes, but bills included unpaid amounts as well as monthly payments. Those with high power bills were switching to pre-pay plans in an effort to reduce their electricity bills.

In most households, there were people with respiratory problems, including asthma and chest infections; six children had been diagnosed with Acute Rheumatic Fever (ARF) and in addition, nine children had recently been diagnosed with GAS positive sore throats. Most people were able to describe practices designed to keep their children well and had identified hazards, that could affect their children's health, such as having insufficient income to heat their houses. Over half the people talked about the importance of monitoring the warmth and cold in the house, and maintaining ventilation for the prevention of illness, but found it was difficult to maintain the standards they would have liked to. For example, people mentioned the difficulty of opening and closing windows.

People often talked about financial issues, such as worries about costs of medicines, doctors' visit and transport to medical appointments. Parents said they put up with being sick themselves to avoid medical bills and to focus on their children's health. This issue along with energy vulnerability highlights the underlying problem of low incomes and accumulating debt in some households.

Families had many practical and creative solutions for managing their households, from 'decluttering' their houses, to arranging 'spill-over' houses during major family events, such as holiday time and funerals. In two of the four in-depth household cases, there were children with strep throat and RF. These case studies highlighted the high risk of disease exposure for other children in the household, especially when there is a long waiting time for state houses.

As part of the partnership with the Porirua Social Sector Trial, households were offered a free building inspection and a third were provided with heaters, as well as wrap-around assistance for health and home improvement.

Conclusion

This in-depth study showed that a third of the households met the definition for structural crowding, but the lack of disposable income, particularly for paying fuel and medical bills, meant that functional crowding was an adaptive response to cold, damp bedrooms as well as hosting visitors. Households were well aware of the risks of crowding and described a number of ways, such as using 'spillover houses', to mitigate any risks to their children's health. The i-pad app developed for this project was well received and very informative.

KEY FINDINGS

- As cohort and case-control studies have shown that household crowding is strongly associated with close-contact infectious diseases, a cause of concern in this study is that the median number of people in the 3-bedroom houses was 5.3 people with the maximum reported regular number of people in the houses being nine.
- While there were fluctuating numbers of people in most households, households were evenly divided about whether the number of people living in their house was about right, crowded, or could accommodate more people.
- Families in the study had a deep understanding of how difficult it was to maintain household arrangements within a house space that was too small.
- The most common set of problems identified with crowding were *congestion, cramped space, wanting to get off the couch and out of the lounge, lack of space to eat as a family, lack of space to play or do things, dealing with family arguments, having enough resources to manage children and family sleepovers*.
- These identified problems of lack of space were amplified in relation to quality of life (*enjoyment/happy/helpful/comfort, feeling valued, children's independence and responsibility, stop arguments*) named by 18 participants (31.0%), sleeping issues (*age matching, sleep in own room, sleep in own bed*) by 16 (27.6%), privacy (*privacy for dressing or bathing, private space*) by 15 (25.9%), and storage (storage, clutter) by 14 (24.1%). Nine participants (15.5%) mentioned health, 8 (13.8%), home environment issues (*cold rooms, mould, ventilation damp, overheated room, light*), and one person (1.7%) mentioned work and school related issues (*home-based income or schooling*).
- Households identified practical ways of managing crowding and lack of space particularly for weekend and special events when there tended to be more people at index houses. Movements between index houses and 'spill-over' houses also helped to create more room at index houses when needed as observed with elderly and school aged children. Other such factors like the use of community buildings and key index houses for hosting family events, renovating, moving furniture and removing excess household furnishings and objects were practical measures of managing small spaces.
- Overall, two thirds were unhappy with some aspect of the home environment such as cold, damp, lack of insulation, and difficulty heating or ventilating their home.

- Most commonly identified as the ‘worst thing’ about the house they lived in (38 participants, 86.4%) were temperature and dampness issues. Over two-thirds (49, 69.0%) mentioned the home environment and temperature issues (*mould or mildew, cold, too hot, damp, draughts, ventilation, no carpet, no sunlight*). By contrast, 27 participants (40.3%) valued aspects of the home environment and temperature (*warm, sunlight, heater heat pump fireplace, ventilation DVS, insulation, carpet, thermal curtains*).

Sleeping arrangements

- Most babies, children and teenagers slept in their own beds, but about a third of children slept with other children or adults. In almost two-thirds of households (62%) people occasionally slept in the lounge, due to cold temperatures and crowding in the bedrooms.
- In six of the 63 houses (9.5%) the lounge was also used for sleeping, and in one (1.6%) the dining room was also used.
- Bed occupancy highlighted that households differentiated family members or visitors into groups that stayed ‘most of the time’ or ‘some of the time’. Generally, elderly family members and school aged children were observed as having highest mobility between households.²
- The two in-depth household case studies, where there were children with strep throat and ARF highlighted the high risks of disease exposure for other children in the households, especially when there is a prolonged waiting time for state housing. These case studies also outlined the severe and ongoing housing stresses for families with young children, living with extended families in small houses, whereas the third case study indicated that temporary crowding had fewer consequences.

² With additional funding, further analysis of the floorplans would be able to reveal more information about bed occupancy in association to the rooms, particularly with regard to the organisation of sleeping, rather than the movement between households.

Health effects

- Of the 44 households that responded to the health question, most (61.4%) had respiratory problems, including asthma and chest infections.
- Thirteen people (18.3%) specifically said their house was affecting the health of their children and teenagers, as well as making the adults sick.
- Health routines were raised by 13 people (21.3%) including sleeping with kids when they were sick or keeping close, getting rid of fleas bugs mice, healthy food no junk, washing hands routine, covering a cough, and a clean house. Seventeen people (27.9%) mentioned isolation or monitoring (*isolate, no visitors, manage isolation, watchful eye on allergies mood out of character*).
- Overall, the high level of crowding and co-morbidities in this population, including the six households with RF, are likely to be other risk factors for the spread of RF.
- Most households were able to describe household practices designed to keep their children well, in addition to the problems that they realised were hazards for their children's health, such as having insufficient income to heat their houses.

Fuel poverty

- Sixty-two people answered the question, *Are you worried about the power bill?* Half said no and half said yes.
- Most households had a heater, although most did not use them because they were unable to afford the electricity. More analysis is required to ascertain the numbers that had heaters, did not use them and so used warmer rooms to crowded levels.
- Twenty-two houses (28.2%) had no heaters, as shown in the house plan data.
- Some participants also did not use heaters or heat pumps when they had them, for fear of not being able to afford the power bill. When rooms were hard to heat through lack of insulation and heating, or through lack of money to pay for power, families crowded together in warmer rooms. This was done out of structural and financial necessity.
- Over half the people (33, 54.1%) talked about warmth or ventilation (*keep home / bed warm, heater / fire to warm house, more warm clothes, heat pump installed, monitor cold hazards in house, ventilation difficult / windows hard to open*).

- Unexpectedly high fuel bills were a recurring issue, irrespective of tenure. Nearly all households wanted information about affordable electricity plans, most stating that they did not know what heating and housing subsidies were available.
- Most monthly power bills ranged from \$251 to \$500, but as bills included unpaid amounts as well as the regular monthly payments, two households were billed between \$2,001 and \$4,500. Most of those who had received high power bills were considering, or in the process of switching to, prepay plans such as PayGo or GlowBug. Most concerning a few households went without power for days and some longer. In the case of the highest bill, of \$4,500, the family went without electricity for nearly four months.

METHOD

- Community interviewers recruited households where there was a child at a Porirua primary or intermediate school.
- Researchers asked parents for consent to a short survey at school and then gained consent to visit the family at their house for a follow-up interview. One adult was spokesperson for each household.
- Using a customised iPad app, interviewers and participants measured the living areas and bedrooms using a laser ruler and specified where all the sleeping places were and who slept in them.
- When extended families lived in close proximity, iPad house plans were also made of these houses as well as of available community buildings.
- Three indicative in-depth housing case studies illustrated the complexity of extended families living on low incomes with numerous stressors and the many reasons for changing houses and tenure types.
- Participants found that telling their stories using the iPad app was non-threatening and enjoyable.
- Further analyses of house plans are being undertaken to ascertain other functional uses of the house, including sleeping and living arrangements.

DESCRIPTION OF HOUSEHOLDS

- One hundred households from Porirua City were initially recruited for the study. Seventy households were considered the 'index' households, as they met the inclusion criteria of one or more children enrolled in the Ministry of Health's throat swabbing programme. The families in these households lived across 85 houses and formed the sample in this study. The 15 'other' houses additional to the 70 index houses included the families previous houses and their current 'spill-over' houses, e.g. Grandma's, weekend sleepover, Dad's houses; 44 people lived in these other houses.
- The total number of people living in the 85 houses for which house plans were recorded on the iPads was 326 people.
- Half the households self-identified as Māori, 40% identified as Pasifika people and 10% identified as Pākehā; there was no discernible differences in living conditions by ethnic group except for the average size of households, which was larger in the case of Pasifika households (6.2 people) compared to Māori (5.5 people) and Pākehā households (4 people).
- In the 70 index houses, 33 (47.1%) households were Housing NZ tenants, another 22 (31.4%) rented privately, five families (7.1%) were boarders and 10 households (14.3%) were owner occupiers with a mortgage. Most of the 15 spill-over houses were privately rented (86.7%), or contained households boarding with family (13.3%).
- However, household tenure appeared to make no significant difference to health status.
- Sixteen (57.1%) out of 28 people who responded to the initial screening question thought their house was crowded, although the initial high non-response rate to this question may be an indication of the social sensitivity of this question.
- In six households, a child was separated regularly from their parent and living elsewhere. For three of these families, the reason the child lived elsewhere in a 'spill-over' house was due to domestic violence. For four (6.9%) of the families, safety was a concern.

REGULAR HOUSEHOLD ROUTINES AND SPECIAL OCCASIONS

- Numbers in the household grew in the weekend compared to weekdays. Of the 65 people who responded to this question, 28 people (43.1%) said that there were more people living in their house in the weekend, 23 people (35.4%) said the same number, and 14 people (21.5%) said fewer people lived there then. For the households with more people at home in the weekend, extra organisation was required to manage resources and household movements such as holiday sleep-overs and special events, as well as older children studying, or living with other extended family members, who came home to spend time with their parents and siblings.
- For family events, 21 of the houses (30%) were 'index' houses, so named because they were the centre of extended-family activities, although other family houses might also be used for large events.
- Another 14 households (20%) used community buildings such as a marae, church, community hall, local sports club or local swimming pool for accommodation and hosting family events.
- Thirteen others (18.6%) expanded the family house when necessary by pitching temporary structures, or used a double garage.
- Apart from stress from such events, people mentioned their cost and the worry that their children might get sick.

SLEEPING ARRANGEMENTS

- Over half the 23 babies (56.5%) slept in their own beds. Other arrangements involved a baby sleeping with an adult in a single bed, as well as with an adult and a teenager in a single bed, or in double beds with various combinations of other babies, children, a teenager, or adults.
- Over half (57.1%) the 133 children slept in their own beds. For those sharing beds, mostly it was with one other child (18.1%) but nine children slept with three in a bed. In the remaining cases children slept in various combinations with a teenager, or one or two adults.
- Most of the 61 teenagers (85%) slept in their own bed; 40 (65.6%) in 23 households slept in single beds and 12 (19.7%) slept by themselves in a double bed. Other variations were two teenagers sharing a double bed and in another household a teenager sleeping in the same double bed with two adults.
- Most of the 148 adults shared beds. In 10 households 24 adults (16.2%) shared single beds; in another 10 households 20 adults (13.5%) shared double beds; and in one household three adults shared one bed. In 27 households 46 adults (31%) slept alone in a single bed; another 31 slept alone in double beds (20.9%). As reported above, in some households, adults shared with one or two children in both single and double beds.

HEALTH AND DISABILITY ISSUES

- Of the 44 households where a respondent answered the health question, most respondents (61.4%) reported respiratory problems, including asthma and chest infections.
- Six children (13.6%) had Acute Rheumatic Fever (four Pasifika and two Māori children), five Pasifika children were GAS positive (11.4 percent), and four children (of Māori/Pasifika ethnicity) had strep throats (9.1%). The story of a household with a child living with recurrent strep throat is told in Case Study 1, a child living with in Case Study 2 and a child with chronic health conditions in Case Study 3.
- Overall, a number of chronic illnesses were also mentioned; nine children had skin conditions such as eczema (20.5%).

- Seven households (11.5%) needed medical equipment, such as dialysis machines, oxygen tank, ventilation system, breathing machine, paraplegic toilets and ramp, wheelchair or catheter.

FAMILY ARRANGEMENTS TO PROMOTE HEALTH

- In terms of keeping their children safe and well, people identified regular health checks, regular meals, warm clothes, and keeping children home from school or isolating them when they were sick.
- Home hygienic practices were mentioned by half the sample including, as well as health routines such as having healthy food and no junk food, having a hand washing routine, covering a cough, and keeping a clean house with no fleas, bugs or mice.
- When a child was sick, adults would sleep with their child, keep close to them and keep a watchful eye on allergies or when they seemed more tired or out of character than usual.
- Thirty three people (54.1%) talked about warmth e.g. keeping home and bed warm, using the heater or fire to warm the house, more warm clothes, having a heat pump installed, and monitoring cold in the house. Some talked of the difficulty of ventilating the house when windows were hard to open.
- Eighteen (29.5%) people mentioned financial issues, such as worry over costs of medicine or doctors' visits, and transport to medical appointments. Parents in particular said that they put up with being sick to avoid medical bills; preferring to focus on the health of their children.
- In partnership with Porirua Social Sector Trial, households were offered a free building inspection and a heater if necessary, as well as wrap-around assistance for health and home improvement. Nineteen households were provided with heaters.

INTRODUCTION

This observational study was designed to explore the housing conditions which might drive high rates of Acute Rheumatic Fever (ARF) in Māori and Pasifika children in the Porirua community. Unlike the companion case-control study, it was not designed to establish specific causal factors for RF. This study was designed to explore the effect of the built environment on daily living arrangements, which are considered important mediating factors between housing and the rise in inequalities in close-contact infectious diseases.³

The central questions this research sought to answer were:

- What are the causes/drivers of functional crowding?
- Does the quality of housing limit the number of rooms that can be inhabited in the house, so leading to functional crowding?
- Does the quality of housing limit the number of rooms that can be inhabited in the house?
- Are there drivers of cross-cultural patterns and regional differences in functional crowding?

METHODOLOGY

Ethical approval (14CEN59) was given in April 2014. From May to November, our research team, in collaboration with an architectural researcher from the University of Auckland, designed and built a computer software application for use on a hand-held Apple iPad2. The HEART App (App) was designed to be used to collect qualitative and quantitative interview data, with scale drawings of participants' house layouts being used in preference to Photovoice. The App was pre-tested in fieldwork conditions by local interviewers.

³ Baker, M., Telfar Barnard, L., Kvalsvig, A., Verrall, A., Zhang, J., Keall, M., . . . Howden-Chapman, P. (2012). Increasing incidence of serious infectious diseases and inequalities in New Zealand: a national epidemiological study. *The Lancet*, 379, 1112-1119.

The interview team were selected on the basis of their knowledge of Porirua local networks and experience of interviewing families about sensitive health issues. We collaborated with several local agencies to conduct our fieldwork in Porirua. This included the field interviewers from the Māori research team from Tu Kotahi Trust, Kokiri Marae, and the Pasifika interview team of Dwell Trust.

Study participants were from families living in Porirua who had one or more children involved in the Ministry of Health's national throat swabbing schools programme.

Recruitment was from the 12 eastern Porirua primary and intermediate schools cluster, health and social services and local media networks. Participant information forms were distributed which outlined the requirements of the study and contact details of the research team. Approximately 100 households were recruited and these were reduced to 70 once the inclusion criteria were considered. The reasons for households being invited into the study were two-fold: one involved the health needs of the household, the other the housing needs.

Every participant who joined the study was offered a free house inspection, a free heater if necessary and housing assistance through the Regional Public Health Well Homes wrap-around service. This component of the study, called the Porirua Heating Project, was funded and supported by the Porirua Social Sector Trial, with whom we collaborated closely throughout.

A referral of a participant to the research team was followed up by phone call, email, text or visit to confirm the most suitable time and date for the interview. There were four main components of the interview process:

1. Part One: The aims and goals of the study were described, which were to understand how families regularly used their houses and how they organised day-to-day activities such as hosting visitors and responding to a sick family member. After the participant read an information sheet, written consent was collected at the school and some data about the participant and the house.
2. Part Two: After verbal and written consent was provided, a home visit was made and the participant was asked to make a scaled two-dimensional drawing of their house (identified as the 'index' house) and any additional house drawings (identified as

‘other’ houses) which might be relevant for the family in terms of hosting family events or having some significance to the history of the family (previous family homes or community spaces such as marae, churches, halls). The researcher and the participant did a ‘walk-around’ of the house to make measurements, with a laser ruler, of all living areas (bedrooms, lounge, hallway, kitchen, dining room).

3. Part Three: The researcher worked with the participant to complete the 37 item questionnaire on the iPad. The questions are in Appendix II.
4. Part Four: The researcher completed a referral form to Well Homes if the participant indicated that they would like some health and housing assistance. An interview lasted between 60 to 90 minutes and participants were also offered a \$30 PakNSave food gift voucher, or a parcel of fruit and groceries to the value of \$10 plus a \$20 PakNSave gift voucher.

Interviews revealed a diverse range of family arrangements and approaches with respect to the use of household spaces and perceptions about the indoor and outdoor environments. The qualitative data collected were used to compile case studies in order to illustrate the complex dynamics of the families involved. Three of these case studies are included in this report.

HEART SOFTWARE APPLICATION

The HEART interview application was designed in an object-oriented programming environment called Codea. This development environment was chosen because it was relatively easy to use and was suited to the design-on-the-go workflow we enjoyed. The HEART application is based on the notion of an infinitely large two dimensional flat plan. The plan is lined with a grid of points that represent a ‘unit’. The interviewer can move this plan around freely in the X and Y directions, as well as zoom in and out of the plan. Every other function is based around the plan; walls are created by running a finger along the grid of points, household objects are placed between points so they sit adjacent against walls, and tags are offset from the centre of the grid of points so as to be visible but out of the way.

As the project matured, new App functions such as tracking people movements, adding people to beds, consent forms, saving and loading from the server were developed. As the application was being tested in the field, nuances relating to how App functions behaved were adjusted to better meet the project requirements and to create a better working environment for the interviewer.

There were however a number of limitations:

1. Reliance on interviewer to do accurate measures with a laser pointer measurement device. The input of room measures into the drawing is inefficient and does not readily integrate with the drawing.
2. Lack of funds and time to complete a second stage which includes software intelligence used for counting data, e.g. inability for the App to automatically detect bedrooms and relate beds/occupants to bedrooms.
3. Lack of software intelligence to detect context in input and drawing. The App needs to know when the interviewer is referring to a heating bill or a certain bed etc. to create a network of relationships between inputs and drawing which are contextually similar.
4. Lack of immediate processing of data and feedback. The current interview's data needs to be manually processed before it can become feedback and reflected upon by the interviewee. This long waiting time prevents clarity of reflection from occurring, because the interviewee has moved on to other matters.

Initially, Codea's development platform was sufficient for HEART, but we have since moved onto Swift 2.0 in Xcode. Its stability and usability has become critical to our project design and management, and allowed us deeper access to functionality on the iPad.

DATA ANALYSIS

The data analysis for the study relies on three sources, which are identified in this report. The first data source was from the consent form, the second was from the questionnaire survey recorded on the iPad App and the third was the visual and textual data from the house plan drawings. This methodology allowed for participants to be able to tell their stories using different modes of expression. We noticed that people were more open to

describe their day-to-day living arrangements more fluidly while drawing and talking about their house plans. The differences of responses recorded for each question varied according to participants' preferences. In terms of analysis, we found that specific questions were better answered and more accurately answered by the house plan drawings than in the questionnaire particularly the following questions: Question 4 about number of bedrooms; Question 5, the number of people that fit in the house; Question 8 where people sleep (bed occupancy); and Question 14 the kinds of problems would more rooms help fix for your family.

The information for each house consisted of the answers to 37 item questionnaire survey asked at the interview and recorded verbatim by the interviewer (see Appendix II). These responses were then encoded and summarised into topics. For example, when asked what problems could be solved if they had more rooms, the responses were categorised into 26 different possibilities. These 26 were then summarised into nine variables, for example all mentions of sleeping arrangements were summarised into one variable.

The full data categories are given in Appendix I of this report (i.e. all 26 possible responses), and the summarised variables are given in the body of the report. Data were also available from the consent form, which gave some information about the participants and why they were referred to the study.

This report presents the results of the quantitative analysis and then the qualitative case studies, with their associated house plans drawn with the interview participants using the iPad App.

ABOUT THE PARTICIPANTS

ETHNICITY

Of the 70 households, 47 participants identified their ethnicity, see Table 4. They could give multiple ethnicities ('total ethnicity' method), so the percentages add up to more than 100. The majority of household participants identified with Māori (23 participants, 48.9%) and Pasifika (28 participants, 59.6%).

Table 1 Ethnicity of interview participants

| Ethnicity | n | Percentage (of 47) |
|------------------|----------|-------------------------------|
| Māori | 23 | 48.9 |
| Samoa | 17 | 36.2 |
| Cook Islands | 9 | 19.1 |
| Pakeha | 5 | 10.6 |
| Tokelau | 3 | 6.4 |
| Tuvalu | 1 | 2.1 |
| Fijian | 1 | 2.1 |
| Spanish | 1 | 2.1 |
| Indian | 1 | 2.1 |

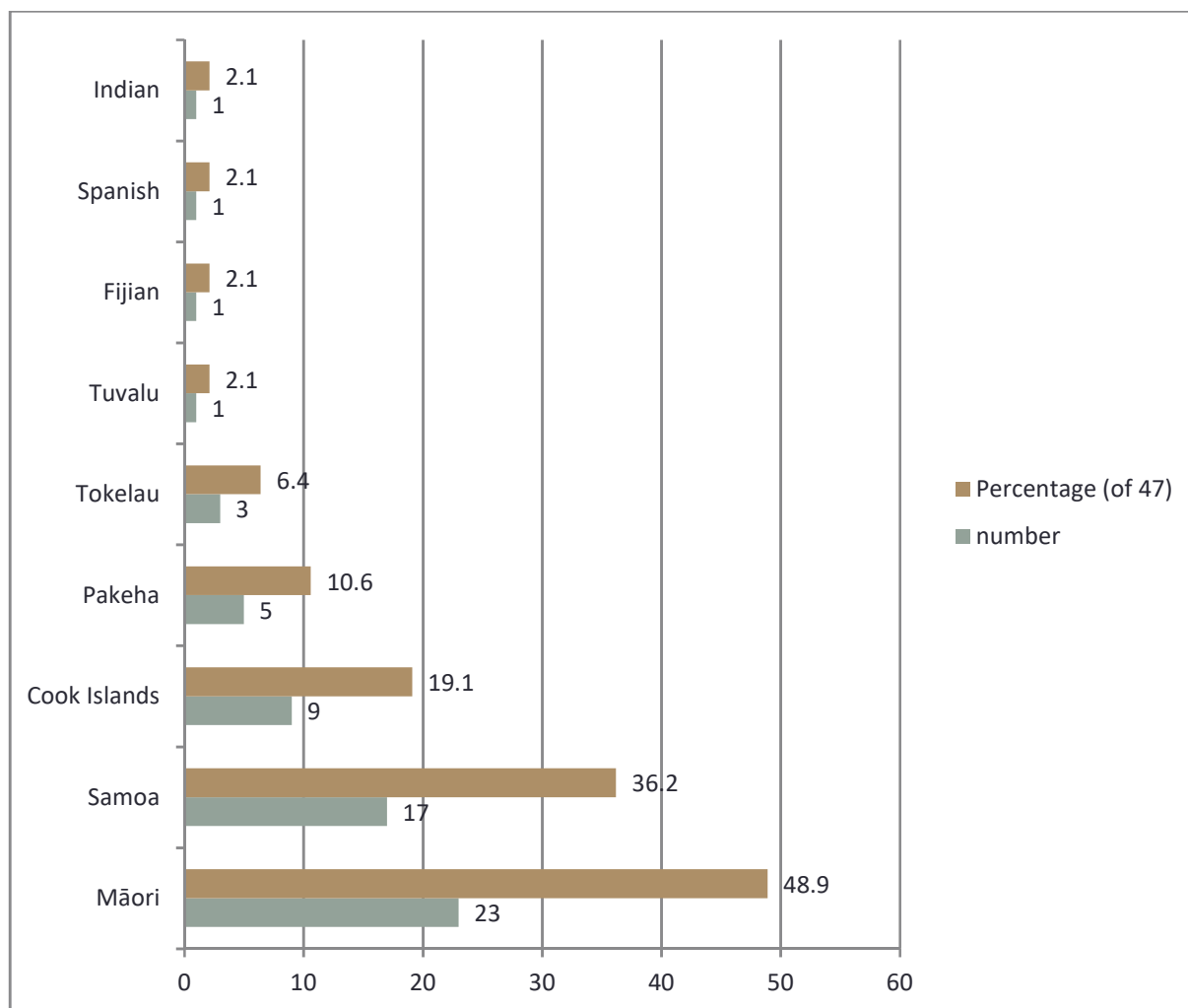


Figure 1 Household ethnicity

We also used a prioritised ethnicity categorisation to establish the average size of Māori, Pasifika and Pakeha households (see above Figure 1). The average size of households was larger in the case of Pasifika households (6.2 people) compared to Māori (5.5 people) and Pākeha households (4 people).

OCCUPANCY

We started by asking who occupied the house: *Who lives here?* and *How many people normally live here?* Of the 85 houses, we established the total number of people living in 71 of them, see Table 2. For 53 houses we also knew the number of adults and children in

the households. The median number of people per house was over five, with a range from one to nine.

Table 2: Total number of people living in the house

| | Total people | Adult | Children | People/ bedroom |
|----------------|---------------------|--------------|-----------------|------------------------|
| Mean | 5.3 | 2.1 | 3.5 | 1.7 |
| N | 71.0 | 53.0 | 52.0 | 64.0 |
| Std. Deviation | 2.1 | 0.9 | 1.7 | 1.1 |
| Median | 5.0 | 2.0 | 3.0 | 1.6 |
| Minimum | 0.0* | 1.0 | 1.0 | 0.0 |
| Maximum | 9.0 | 5.0 | 7.0 | 9.0 |

* Family caretakers in a hall

These histograms show the total of people living in a house, the total number of adults and the total number of children.

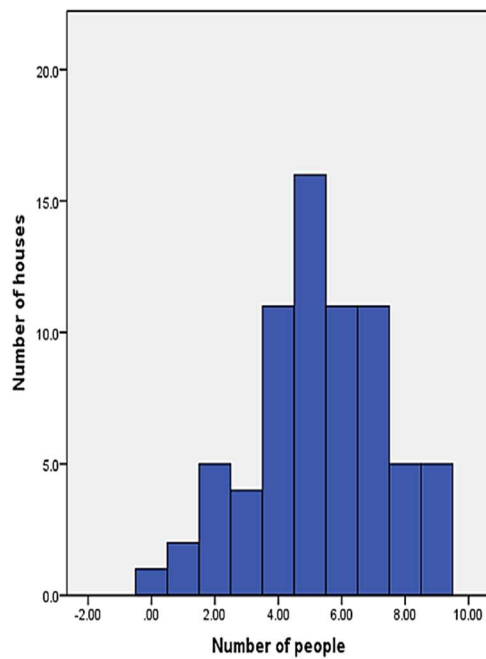


Figure 2 Number of people

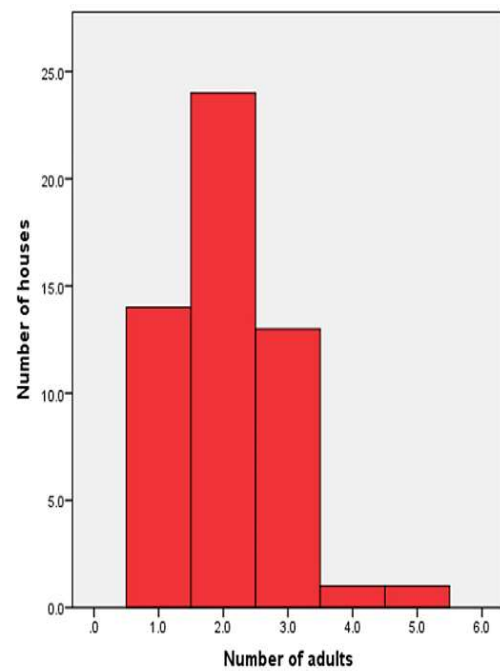


Figure 3 Number of adults

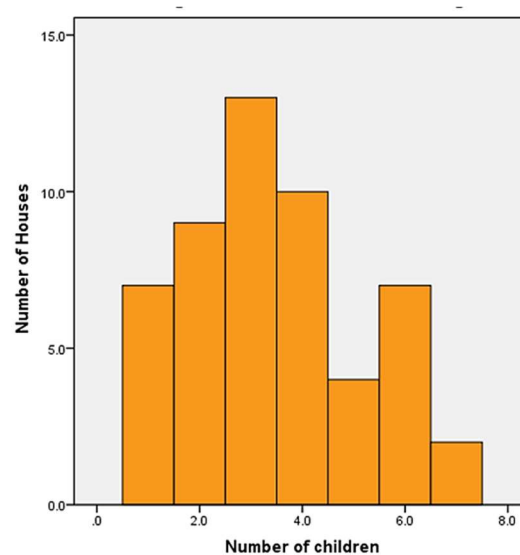


Figure 4 Number of children

In 19 out of 64 houses participants responded affirmatively to the question, *Do you have any pets?* This question was included in the study because family pets are often considered as important members of the household. Information about whether a pet

sleeps 'inside' or 'outside' of the house, how often the children played with the pet and the costs of caring for the pet were collected as an aspect of family life and household arrangements. Data collected require further analysis as to its relevance to the use of household space.

In relation to the occupancy of the house, as well as the questionnaire data discussed in this section, there were also physical data on heaters, beds and people recorded when house plans were drawn on the iPad. The two sets of data show some differences, for the following reasons. Participants answered the question, *How many people normally live here?* but when drawing the house plans and thinking about household arrangements and movements, they adjusted for people who stayed over during the week or in weekends. The section below on managing household movements shows that there could be a degree of movement between houses and a difference between the numbers of people in a house on week days and weekend days.

This indicated a difference in perception between *living here* and *staying here most of the time* and *staying here some of the time*. For example, Grandma might always be there in the weekend, and stay over one or two days a week, but live in the Hutt Valley, so be counted as an adult in a bed on the house plan, but not as a person who normally lived there. This linked with Question 19 in the section on household movements: *Who do you spend the most time with when you're at home?* In the case of this example, Mum was at home most with Grandma, because Mum was the main carer. We found quite a few examples where older people or children came often, and stayed often, but did not live at the index house.

Another possible reason for variation in answers between the questionnaire and the visual data of the house plans was that some participants may not have wished to draw attention to the fact that a child did, or did not, live in the house all of the time, because of implications for their tenancy, or other legal agreements.

HOUSING

TENURE AND HOUSE CONDITIONS

House plans data were collected for 85 houses; 70 families living in 'index' or primary houses. For each index household contacted for the study, it was found that the extended family unit actually lived, at least from time to time, in up to four other buildings. These included the houses of other family members, and sometimes church or community halls. The information for these other houses was stored as houses 2, 3, or 4 within the same household. The 85 files are summarised in Table 1.

Table 3 Household tenure of index and other houses

| Type of housing (index) | Amount | Percentage (%) |
|-------------------------|-----------|----------------|
| HNZ | 33 | 47.1 |
| Rent | 22 | 31.4 |
| Board | 5 | 7.1 |
| Mortgage | 10 | 14.3 |
| Total | 70 | |
| | | |
| Type of housing (other) | Amount | Percentage (%) |
| HNZ | 0 | 0.0 |
| Rent | 13 | 86.7 |
| Board | 2 | 13.3 |
| Mortgage | 0 | 0.0 |
| Total | 15 | |

In the 70 index houses 33 (47.1%) households were Housing NZ tenants, another 22 (31.4%) rented privately, and five families (7.1.2%) were boarders; 10 households (14.3%) were owner occupiers with a mortgage. Most of the other 15 spill-over houses were privately rented (86.7%), or the households boarded with family (13.3%). However, household tenure appeared to make no significant difference to health status.

We also asked a series of questions on tenure and on housing conditions, to explore the living conditions for the people and the possible nature of functional crowding. However, there were only 28 responses to the question, *Do you think your house is crowded?* While sixteen people (57.1%) thought their house was crowded, there was a high non-response rate to this question, which may be an indication of the social sensitivity of this question. However, as discussed later in the section on strengths and weaknesses of the study, people responded very positively to recording the visual data, so that participants' comments taken from the house drawings provide a more a comprehensive response.

There were 49 household responses to the question, *How many people should live here?* We then calculated the difference between the responses to this question against the number who currently live there. This gave the participants' perception of the number of crowded houses i.e. that more people currently live in than should as well as the numbers of houses that have capacity for more people. As Table 3 shows people were fairly evenly divided between those who thought that fewer people should live in the house more people should live in the house and those that thought the number was about right.

Table 4 Number of people that should live in the house

| | Frequency | Percent |
|--------------------|-----------|---------|
| Right amount | 17 | 34.7 |
| Too many live here | 17 | 34.7 |
| Room for more | 15 | 30.6 |
| Total | 49 | 100.0 |
| Did not answer | 33 | |
| Total | 82 | |

Nonetheless, 66 people answered the question, *How many extra rooms would make your family happier?* While there was a range of answers from 0-4 rooms, the mean number of rooms given was one.

Fifty eight people answered the question, *What kinds of problems would more rooms help fix for your family?* The detailed responses are given in Appendix I and summarised here. The most common set of problems identified were to do with crowding (*crowding, congestion cramped, off the couch and out of the lounge, space to eat as a family, space to play or do things, children family sleepover*). These were named by 34 participants (58.6%). Crowding was the word identified by participants, not by the interviewer. Families in the study had a deep understanding of how difficult it was to maintain household arrangements within a house space that was too small.

These identified problems of lack of space were amplified in Question 14 in relation to quality of life (*enjoyment/happy/helpful/comfort, feeling valued, children's independence and responsibility, stop arguments*) named by 18 participants (31.0%), sleeping issues (*age matching, sleep in own room, sleep in own bed*) by 16 (27.6%), privacy (*privacy for dressing or bathing, private space*) by 15 (25.9%), and storage (*storage, clutter*) by 14 (24.1%). Nine participants (15.5%) mentioned health, 8 (13.8%), home environment issues (*cold rooms, mould, ventilation damp, overheated room, light*), and one person (1.7%) mentioned work and school related issues (*home-based income or schooling*).

In six families, a child was separated regularly from their parent and living elsewhere. For three of these families the reason the child lived elsewhere was *violence at parents' home*. Indeed for four of the families (6.9%), safety was a concern.

We asked a series of questions about the structural features of the house. Sixty three people answered the question, *How many bedrooms are there?* The number of bedrooms ranged from 1 to 5, with a mean of 3.4, and a median of 3. In six of 63 houses (9.5%) the lounge was also used for sleeping, and in one (1.6%) the dining room was also used. Figure 5 shows these data on bedrooms together with the data above on how many people normally lived in the houses.

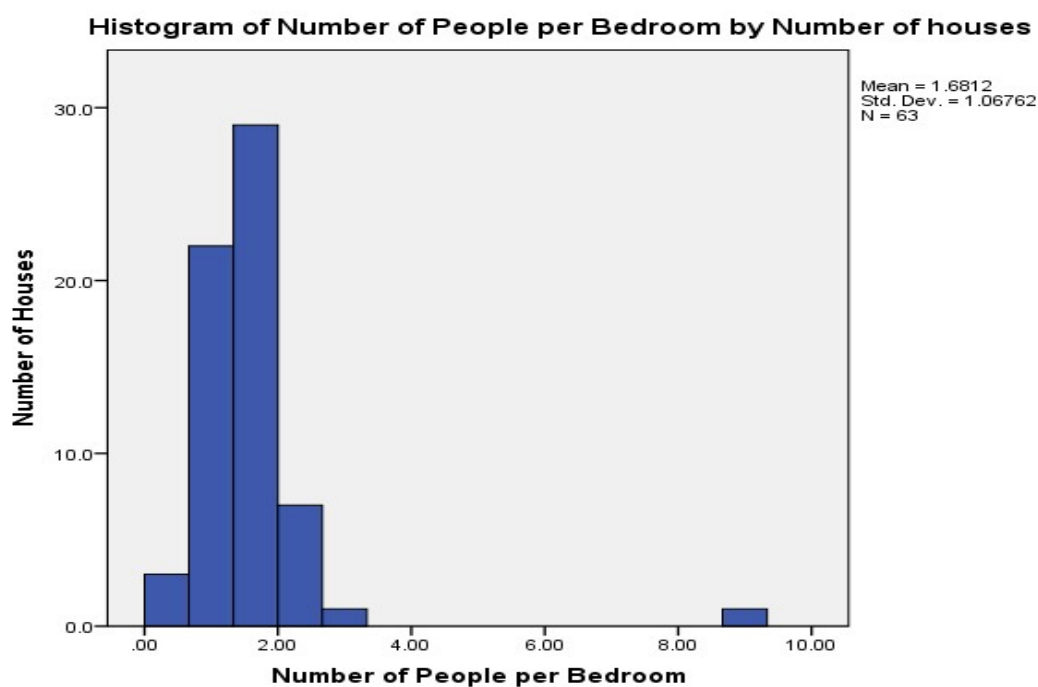


Figure 5 Number of people per bedroom

There were 64 responses to the question, *How many people can fit all together in your house?* These ranged from four to 90, with a mean of 19.9 and a median of 15.

The same number of people responded to the question, *What rooms are used for storage?* Eleven households (17.2%) had little or no room for storage, 36 (56.3%) had at least one single wardrobe, 10 (15.6%) had at least one double wardrobe, 10 (15.6%) had a linen cupboard, 26 (40.6%) had a storeroom, 15 (23.4%) had an outdoor shed, and two (3.1%)

had a storage container. Forty six people (70.8%) wished they had more storage when asked.

PARTICIPANTS' VIEWS OF THEIR HOUSES

From the preliminary housing questions administered at the school when the consent forms were obtained, 44 participants identified housing issues. The details are given in Appendix I and summarised here. Most commonly identified (38 participants, 86.4%) were temperature and dampness issues (*keeping warm, keeping dry, dehumidifier, leakage, cold, damp, wanting a heat pump, Warm Fuzzies Programme, draughty doors and windows, bad ventilation, mould, weepy window, low quality insulation, needing firewood and wood burner*).

For 25 participants (56.8%), there were other physical issues with the house (*keeping clean, being renovated, driveway resurfacing, needs paint, requires beds, rotten windowpanes, don't want elevated house, leakage, want larger house, lack of storage, rodents, no carpet, steep hill, rubbish, trim trees for light, window replacement, recently renovated, needs repairs, spouting, needs sunlight*). Two participants' responses (4.5%) could be categorised under house inspection (*wants subsidies, wants inspection, needs plumbing checked*).

Many (41 people, 57.7%) were unhappy with the infrastructure or maintenance of their homes (*leaky roof, guttering or spouting, drainage or plumbing, damaged weatherboard cladding of poor quality, no underfloor insulation, little insulation, broken window latches, renovations uncompleted*) and the outdoor section (*overgrown vegetation, no outside path lighting or no flood lighting, damage from natural disaster, pot holes on the section, pot holes so kids can't play, unstable foundation, elevated section, elevated potholes section difficult to maintain lawn garden, elevated section to washing line, no fence or gate damaged so kids on roads sweeping windows, garden not growing*).

Many people (39, 54.9%) were also unhappy with the inside structure or decor (*bathroom fixtures, old style decor, paint peeling on ceiling cupboards wallpaper, small kitchen dining, smells from kitchen, oven or other permanent fixtures, water cylinder, poor flooring, no heater, lighting fuses wiring, heater not effective, heater expensive to use, embarrassing state of house*).

Nineteen participants (26.8%) mentioned crowding (*crowded, have to use lounge to sleep, no space*), 15 (21.1%) said location (*not safe, problem neighbours, vehicle traffic noise, foot traffic noise, trespassing vandals, rubbish dumped by passers-by*), and 14 (19.7%) people said access (*access via long steep pathway or steps, bathroom had bad access for disability different level or outside, double or triple storey stairs*).

Results to survey administered in the participants' home

Though largely consistent, more detailed views were given about housing quality in response to the survey administered in the participants' home. Sixty seven people gave detailed answers to the question, *What's the best thing about your house?* The answers are in Appendix I, but are summarised here. Two-thirds (45, 67.2%) of participants mentioned location (*location, nice views, good outside area yard front trees, close to school, close to family friends, close to shops, close to chemist, close to doctor, location near work, location near church, close to park bush reserve, location near park pine cones fuel, close to public transport, workspace earn money, internet for kids*).

Over half (36, 53.7%) mentioned space (*enough rooms, big house, big kitchen, big bathroom, lots of space spacious storage, good car parks, easy to keep tidy and nice good size to watch kids, large section, big garage, outside storage, space for maintenance work*). Also valued by 27 participants (40.3%) was the home environment and temperature (*warm, sunlight, heater heat pump fireplace, ventilation DVS, insulation, carpet, thermal curtains*). Safety (*safe home for grandchildren, wairua, whakawhanaungatanga, good*

neighbours neighbourhood safe, fenced property) and privacy (*private and quiet, away from main road or long driveway*) were named by 20 (29.9%) and 17 (25.4%) respectively.

More people, 71 participants, answered the question, *What's the worst thing about your house?* Their full responses are in Appendix I, but are summarised here. Over two-thirds (49, 69.0%) mentioned the home environment and temperature issues (*mould or mildew, cold, too hot, damp, draughts, ventilation, no carpet, no sunlight*).

Thirteen (18.3%) said their house was affecting their health (*children getting sick, adults sick, teenagers sick, cockroaches, mice, stray cats*).

SLEEPING ARRANGEMENTS

We asked a number of open-ended questions about sleeping arrangements, such as, *Where does everyone sleep?* The interviewers asked, *Can we draw a plan of your house – would you mind showing me around the house?* These questions were asked as part of drawing house plans on the iPad App. In the iPad we saved house plans for 85 houses, but detailed sleeping arrangements for 70 households which specifically measured where adults, teenagers, children and babies usually slept.

The iPad enable us to identify the rooms where people were sleeping, number of beds, mattresses and couches and other places where people slept. This is an initial report of sleeping arrangements in both single and double beds. We recognise that as in all households, this is subject to change, whether there were visitors or not. The data are analysed in a prioritised manner for babies, children, teens and adults, so that each combination was only counted once.

Participants identified where people slept, used bed icons to describe them, and inserted beds and mattresses in the rooms on the plan. We were interested in how many beds were in rooms and how many people were sleeping in the same room and in the same bed as these are all measures used in different definitions of crowding. It should be noted that, where it was possible to distinguish the size of the beds, a note to the drawing (as a 'tag') was added by the interviewer. Tagged information provided details for example about whether there were two or more beds side-by-side; whether the beds were bigger than an average single or double bed. In this report, beds (below) are described as either 'single' or 'double' and were not distinguished by other features that were collected in the house plan drawings. For example, we found that several of the double beds were actually 'king size' (which is equivalent to the size of 1.5 or more double beds); and several single beds were described as 'super-size' (bigger than an average single bed).

While it was not always clear whether multiple occupancy of the single and double beds was at the same time or sequential, it is clear that in a minority of households there was considerable sharing of beds, with and without babies.

BABIES

As shown in Figure 6, over half the 23 babies (56.5%) slept in their own beds. The other arrangements involved a baby sleeping with an adult in a single bed, as well as an adult and a teenager in a single bed, or in double beds with various combinations of other babies, children, a teenager and adults.

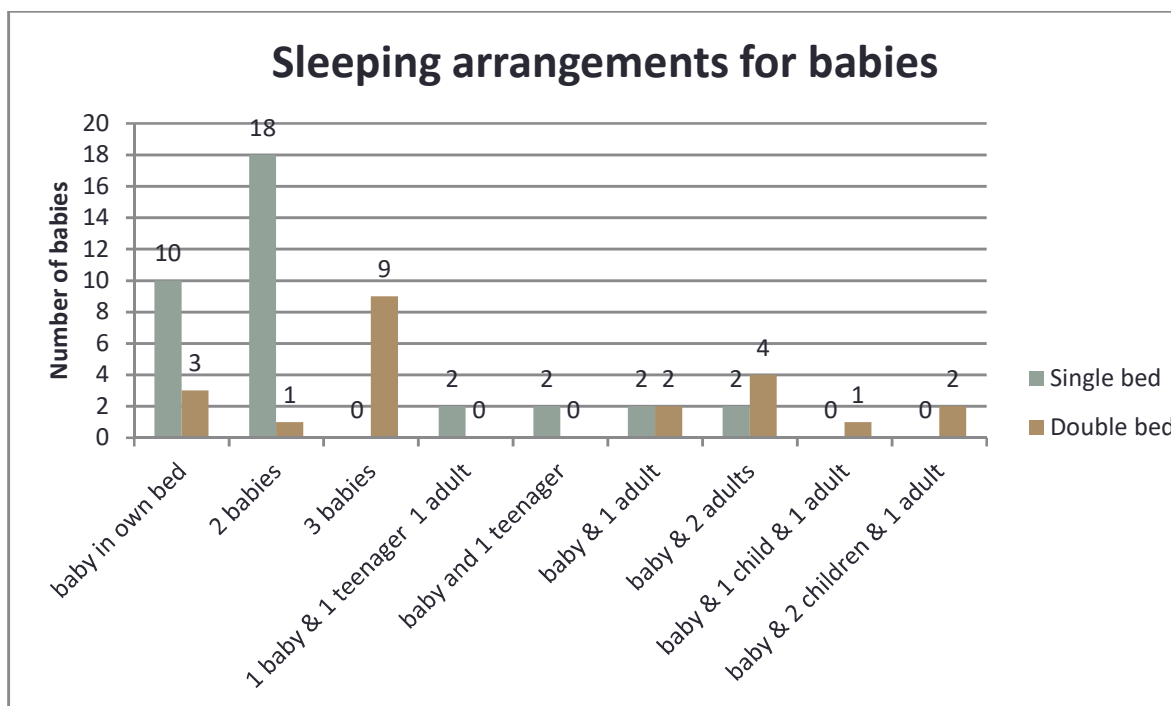


Figure 6 Sleeping arrangements for babies in the study

In five households 10 babies slept in single beds (43%) in a further three households a baby slept in a double bed, and in another household there were two double beds each slept in by a baby. In one household, two babies shared a double bed, in another house a baby shared with one child and in another house two children. There was one household with two single beds, in each of which a baby slept with an adult. There were two households where two babies either shared a double bed with a child, or in another house an adult. There were two households where a baby slept with two adults. In two households a baby slept with a teenager and an adult in a single bed.

CHILDREN'S SLEEPING ARRANGEMENTS

As Figure 7 shows, over half the 68 children (57.1%) slept in their own beds. For those sharing beds, mostly it was with one other child (18.1%), but nine children slept with three in a bed. In the remaining cases children slept in various combinations with a teenager, or one or two adults. In two households, a teenager shared a single bed with a child and in

another two households with single beds; each bed was shared by an adult and a child. In one house, two adults slept with a child in a single bed.

In nine houses, 12 children slept in a double-bed by themselves, but in seven households, each double bed usually had two children sleeping in it – 14 in total. Three households had three children sleeping together in three double beds, 9 children in all. There were also sleeping arrangements involving a child sleeping with a teenager (one household), sharing a double bed with one adult (three households), or two adults (one household). In two households two children shared a double bed with one adult, four children in all.

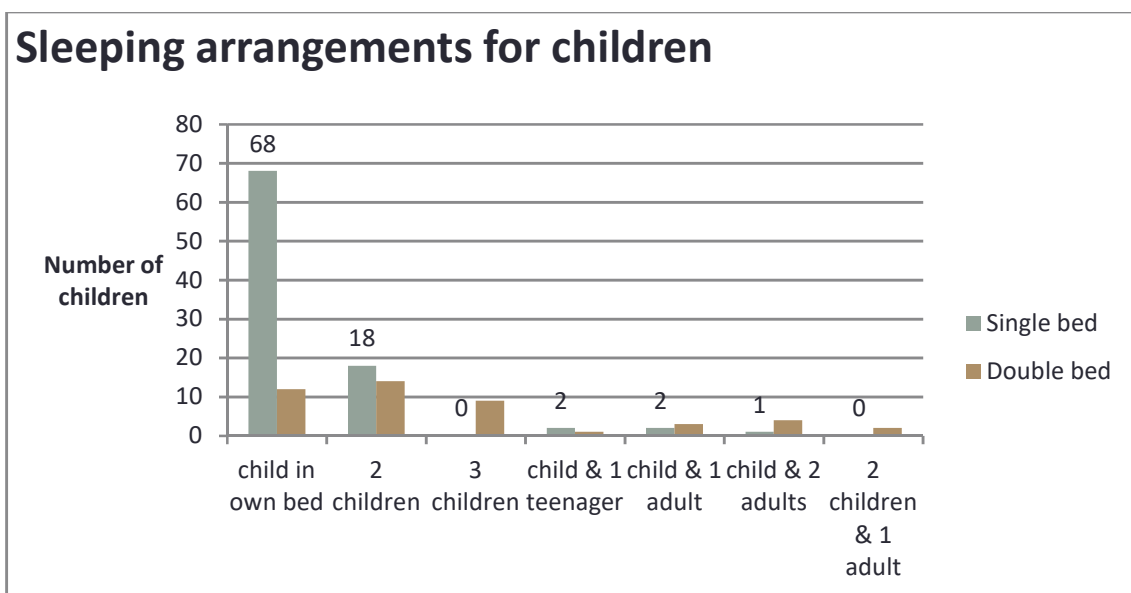


Figure 7 Sleeping arrangements for children in the study

TEENAGERS' SLEEPING ARRANGEMENTS

Most of the 61 teenagers (85%) slept in their own bed; 40 teenagers (65.6%) in 23 households in single beds and 12 by themselves (19.7%) in a double bed. ⁴In one household two teenagers slept together in a double bed, in another household a teenager slept in the same double bed with two adults. See Figure 8.

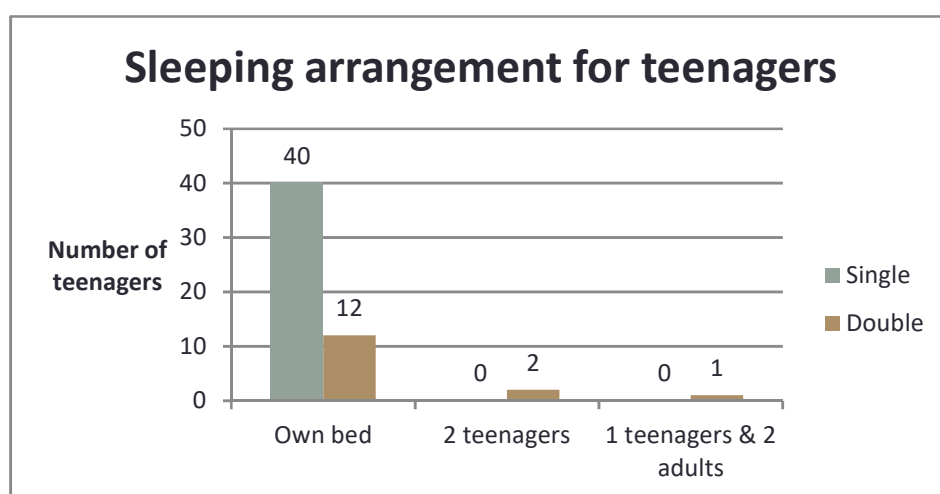


Figure 8 Sleeping arrangements for teenagers in the study

ADULTS

Most of the 148 adults shared beds, in 10 households 24 adults (16.2%) shared a single bed, in another 10 households 20 adults (13.5%) shared a double bed, and in one household three adults shared one bed. In 27 households 46 adults (31%) slept alone in a single bed, another 31 in double beds (20.9%) As reported above in some households adults shared with one or two children in both single and double beds. See Figure 9.

⁴ Further analysis will show the combinations of bed occupancies, ages/gender per rooms/per beds.

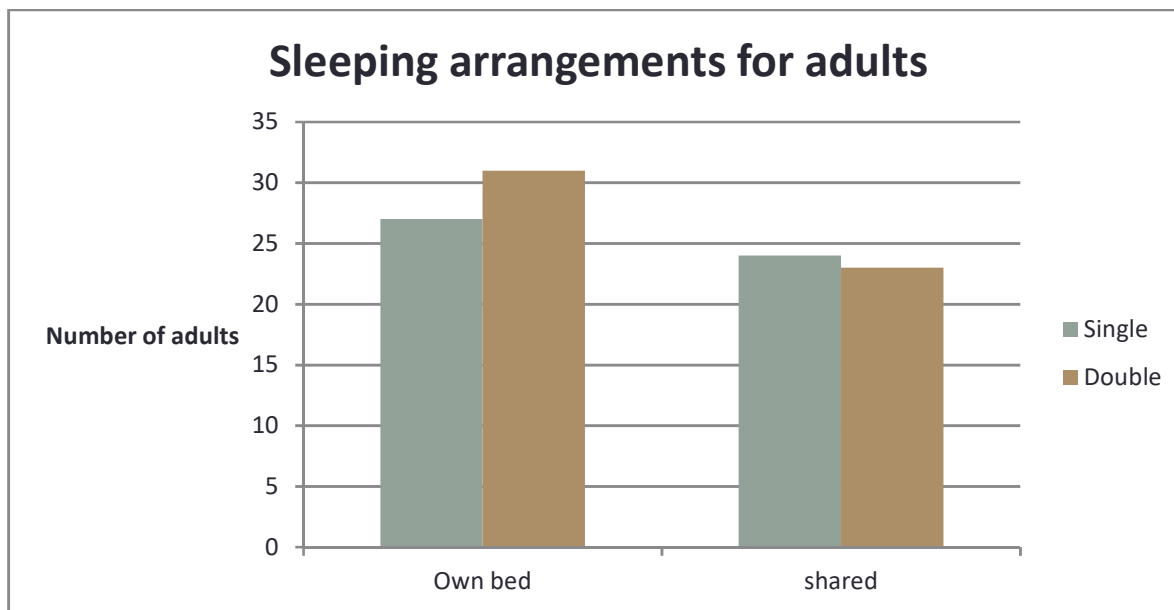


Figure 9 Sleeping arrangements for adults in the study

The data in this section came from the house plans drawn on the iPad App, which we consider the most accurate, not from the responses to the questions in the questionnaire (the differences between these is discussed in the section above on occupancy).

Because one of the possible risk factors for ARF is close contact between people, especially when sleeping, we asked a series of questions about children's sleeping habits in addition to the effects of the size and layout of the house on children's sleeping.⁵ In the house drawings, participants' comments about sickness events, physical conditions of the bedroom/room that made sleep difficult, sleep times, as well as bedding issues and strategies that parents and carers employed to help children to sleep when in close contact with other children, teenagers or adults, were added to their house plan drawings.

Thirty two participants responded to the question, *How much of a problem is the following for you? The time it takes my child to fall asleep*. Eight people (25.0%) said *no* problem, 17 (53.1%) said *some* problem and 7 (21.9%) said their children's sleeping was a *big* problem.

Similarly, 28 responded to a question asking, *How much of a problem is the following for you? My child's sleeping patterns or habits*. Twelve people (42.9%) said *no* problem, 11 people (39.3%) said *some* problem and 5 (17.9%) said a *big* problem. As some of the interviews were carried out during school holidays, it is possible that children's sleeping routines were different to those of a school week.

Interviewers then asked questions about napping, *Thinking about the past 7 days, how many naps did your child usually have during the daytime during the week (Monday to Friday)? During the weekend (Saturday and Sunday)?* These questions attracted a low response rate, but the minimum number of naps was 0, the maximum number of naps was 5. Only eight people answered the question, *Is your child transitioning away from napping (now not needing a nap every day)?* Five (62.5%) said *yes* and three (37.5%) said *no*.

⁵ It is important to note that Questions 24 to 28 are linked to the data that are yet to be analysed from the house plan drawing on beds and sleeping arrangements.

We asked a series of questions about household routine as our previous research had suggested that household management was critical to minimising the effects of crowding on health.

There were 64 responses to the question, *When there's a problem at home, how does it get sorted out?* Details of the responses are in Appendix I, summary variables are here. A quarter of participants (16, 25.0%) spoke of the importance of outside help (*@0800 health line, adult seeking advice from within family elder, talk to counsellor clergy expert school nurse or church minister*).

Over half of participants (38, 59.4%) discussed rules and boundaries (*mum talks and sets boundaries, grandma sets rules, punishment and consequences for fighting loss of privileges, separate kids if fight physically or verbally*). Half of participants (33, 51.6%) said talking (*talk about it, adults talk to each other privately, adults talk to children talk it over, evening talk prayer get plan of action*). Nearly a third (20, 31.3%) said how they would deal with it (*give kids chores, deal with it individually, give time to cool down leave, confront problem and stop escalation upfront*). Some participants (13, 20.3%) mentioned compromise (*come back try again compromise, apologise when appropriate show respect, console comfort, not try to blame*).

Sixty three people answered question, *Who's responsible for cleaning up at home?* Of these, 40 (63.5%) said mum, 24 (38.1%) said everyone, 20 (31.7%) said kids, 12 (19.0%) said dad, and 3 (4.8%) said a grandparent.

Forty five people responded to the question, *What chores do people have at home?* (*Kitchen duties/laundry/cleaning/care of children and elderly*). Common chores were cleaning the house (27, 60.0%), washing laundry (22, 48.9%), dishes (15, 33.3%) and vacuuming (10, 22.2%). Also named were cooking (6, 13.3%), rubbish (5, 11.1%), bathroom

(5, 11.1%), toilet (3, 6.7%), getting kids ready for school (3, 6.7%), garden or lawn (2, 4.4%), repairing the house (1, 2.2%) and looking after children (1, 2.2%).

Fifty three participants were asked, *Show us what do you 'normally' do from the time you go to sleep, wake up in the morning, leave for work/school, return home (movements of 24 hours)*. Of these, the most common activity was school (43, 81.1%), followed by work (22, 41.5%), cooking (21, 39.6%), cleaning (17, 32.1%), sports or exercise (14, 26%), church (7, 13.2%) and volunteering (6, 11.3%). For the full list, see Appendix I.

Home time was usually family time. Sixty two participants answered the question, *Who do you spend the most time with when you're at home?* Most people (51, 82.3%) spent their time with their children. Nine (14.5%) spent time at home with a spouse, eight (12.9%) with grandparents, four (6.5%) with a baby, and five (8.1%) with no one.

It was clear that many households had changing numbers of people in the home in the weekend compared to other weekdays. Sixty five people answered the question, *What's it like during the weekend – are there more people, or less people?* Twenty eight people (43.1%) said there were more people then, 23 (35.4%) said the same, and 14 (21.5%) said less. For the households with more people at home in the weekend, there was extra organisation required to manage household movements and resources. Household movements included sleepovers for holidays and special events, and also older children studying or living with other extended family members who came home to spend time with their parents and siblings.

Special events required even more organisation. There were 70 responses to the question, *What's it like when a family event, like a birthday party or funeral, happens?* Again, detailed responses are in Appendix I and summary variables are presented here. Special events were named by 32 participants (45.7%) and included *tangi*, weddings, *fa'alavelave*, birthdays, barbeques, *toana'i*, meals, and Christmas.

Interestingly, 21 participants (30.0%) reported using another family house for events (dad's, uncle's, mum's, grandad's, grandma's, in-laws', older sister's, older brother's, or other house). Fourteen participants (20.0%) used community buildings such as marae, sports club, church, community hall, or local swimming pool. Thirteen households (18.6%) expanded the family house by using a balcony, pitch-up gazebo, big area outside, or double garage. Six of the houses were "family bases". Of those, three hosted family events and three hosted small events only, one because the house was too small.

Twenty-four participants (34.3%) talked about the work involved (*chaos / crazy / busy / cramped, work together, cooking, mess to clean up*), while seven (10.0%) people talked about the fun and celebration (*fun, memories, loud noise, sports busy, celebrate kids see family*). Twenty-one (30.0%) people again talked about crowding (*crowded packed out, lots of kids people, eat in shifts, try to prevent crowding*) and 15 (21.4%) people mentioned sleeping issues (*overnight stay, kids give their room, elderly in separate room, sleep in lounge, marae styles, arrange furniture*). For eight people (11.4%), these events brought stress (*stress on kids, stress on everyone, need storage, extra toilet*) and for six (8.6%) financial issues (*hireage cost, financial stress, loan debt*).

Having people visiting was explored in the question, *Do you have any concerns when extended family / friends come over to the house? What are they?* There were 67 responses, either by giving a yes/no response or by giving a specific concern. Named concerns were:

- The house (*leaking house, messy house, damage caused during visits, ok house renovated fixed needs renovation, dusty, house looks tired old, shame embarrassed, bathroom toilet, furniture, maintenance, kitchen, walls, lights or fuses*) - 28 participants (41.8%);
- Space (*making people fit, overcrowded, storage, where to sleep people, lounge used for sleeping marae styles, lack of space, rooms small*) - 23 participants (34.3%);
- Inconvenience or privacy (*hosting have enough food, staying too long upsets people in the house, loitering, nothing for kids to do at home or community, rearrange routine,*

people coming into rooms, noisy no quiet, security intrusion strangers) - 17 participants (25.4%);

Sixteen households (23.9%) mentioned health concerns (*worried family member has chronic illness asthma, protecting kids from sick visitors, kids pick up germs from house, pest's nests rodents*). Other concerns were:

- Temperature (*cold to study, cold damp, not enough heating, mould, bedrooms freezing*) - 13 participants (19.4%);
- Accidents (*potholes in lawn, potential accidents injury dangerous, property not fenced, no handrail*) - 9 participants (13.4%);
- Money (*when short of money, cost of power*) - 8 participants (11.9%).

Fourteen people (20.9%) said they limited visits (*limit visitors, no visitors on purpose, limit visits to weekends, don't party here, and stress with Housing NZ, no sleepovers*). Nine people (13.4%) gave positive or neutral responses (*not really, not sure, OK enjoy visitors' company, don't have many visitors popping in, lots of bedding blankets*). Only 7 people (10.4%) said they did not have concerns.

Twelve participants responded to the question, *What are some of the things you do well to keep your children safe and well?* The list of replies is in Appendix I, but the common responses were *regular health checks, regular meals, warm clothes, and keeping them home or isolating when sick*.

ENERGY USE

The cost of electricity is a problem in many low-income households and our research on fuel poverty has documented the ensuing health problems [www.healthyhousing.org.nz], so we asked several questions about this.

Sixty-three people responded to the question, *What type of power/ energy does your house use?* Most people (96.8%) used electric power, smaller numbers used gas (3 people, 4.8%), oil (2 people, 3.2%), open fires (2 people, 3.2%) or a wood burner (1 person, 1.6%).

Sixty-two people answered the question, *Are you worried about the power bill?* Half said *no* and half said *yes*. Some of those interviewed for the study had received exceptional high power bills, which included their electricity arrears; the highest was \$4,500. Table 4 below shows the distribution of monthly accounts, which were noted from the households' last electricity bills.

Sixty-one people answered the question, *What kinds of things save/ waste power in your house?* The item named by 26 people was heating (42.6%), followed by turning off lights (19, 31.1%). Most of those who had received high power bills were considering or in the process of switching to prepay plans like PayGo or GlowBug. Most concerning, one households went without power for months at a time. While most households had a heater, many did not use them because they were unable to afford the electricity; twenty-two houses (28.2%) had no heaters.

Table 4 below sets out the number of references that participants made about their current monthly power bills, which included outstanding power bill debts that they were paying off. Some of these debts had been accruing from more than 12 months. The most common themes that emerged for the participants was the unaffordability of paying for

electricity, wood or gas and the very deliberate decisions made about ‘not’ having their power used for heating (see Case Study 3).

Table 5: Monthly power bill including debts

| Range of Electric Monthly Bills (\$) | Number of households |
|--------------------------------------|----------------------|
| 100-250 | 2 |
| 251-500 | 11 |
| 501-800 | 6 |
| 801-1500 | 10 |
| 1501-2000 | 1 |
| 2001-5000 | 5 |
| Total | 35 |

HEATERS

Most households used electricity as their main energy source. Twenty-two houses (28.2%) had no heaters. Most households had a heater, although most did not use them because they were unable to afford the electricity. More analysis is required to ascertain the numbers that had heaters, did not use them and so used warmer rooms to crowded levels.

Table 6 Energy source

| Type of energy | Amount |
|----------------|-----------|
| Wood burner | 1 |
| Fireplace | 2 |
| Electricity | 65 |
| Gas | 3 |
| Oil | 2 |
| Total | 73 |

There were 62 responses to the question, *If a natural disaster like an earthquake or tsunami hit your house, how well are you prepared? Do you have essentials like food, water and first aid kit in your house?* Over half (35, 56.5%) said *no*, a quarter (16, 25.8%) said *somewhat*, and some participants (11, 17.7%) said *yes*.

HEALTH ISSUES

In the consent forms, there were 44 participants who stated they had a health issue in their household. These details are in Appendix I and summarised here. Six people (13.6%) had rheumatic fever, five children were GAS positive (11.4 percent) and four children had strep throats (9.1%). The stories of a household with a child living with recurrent strep throat is told in Case Study 1; a child living with ARF in Case Study 2.

There were also 27 households (61.4%) that identified having a respiratory illness: asthma was the most common (38.6%), bronchiolitis (4.5), emphysema (6.8%), chest infections (6.8%), cold/flu symptoms (13.6%), pneumonia (2.3%) and tonsillitis (2.3%). Chronic illnesses mentioned were: dislocated shoulder (2.3%), end-stage kidney disease (2.3%), hip and knee replacements (6.4%), hyper anaemia (2.3%) and rheumatoid arthritis (2.3%). Skin conditions mentioned were: burns (2.3%), boils (2.3%), eczema (20.5%) and skin problems (11.4%). Mental health, intellectual and learning disabilities mentioned were: anxiety disorder (2.3%), Down's syndrome (2.3%), depression (2.3%), intellectual disability (2.3%), over-distress disorder (2.3%), suicide ideation/self-harm (2.3%).

Sixty-one answered the question, *Is your house used for any special medical equipment like dialysis machine, or home detention?* Seven participants (11.5%) said *yes* for medical equipment, and listed *dialysis, oxygen tank, ventilation system, breathing machine, paraplegic toilets and ramp, wheelchair and catheter*. Three participants answered *yes* for home detention.

Of the 44 participants who identified a health need, 27 said that one or more members of their household had a respiratory illness. We explored whether the tenure and occupancy statistics differed between households with and without respiratory illness, but as shown in Table 5, there was no statistically significant difference $X^2 = 1.552$, 2 df, $p = 0.460$.

Table 7 Home tenure (question 10) and respiratory illness

| | | Respiratory illness | | Total |
|------------|--------------------|---------------------|--------|--------|
| | | none | Some | |
| Tenure Q10 | Private rent Count | 5 | 6 | 11 |
| | % with diagnosis | 41.7% | 28.6% | 33.3% |
| | Housing NZ Count | 7 | 13 | 20 |
| | % with diagnosis | 58.3% | 61.9% | 60.6% |
| | Mortgage Count | 0 | 2 | 2 |
| | % with diagnosis | 0.0% | 9.5% | 6.1% |
| Total | Count | 12 | 21 | 33 |
| | % with diagnosis | 100.0% | 100.0% | 100.0% |

Descriptive statistics on occupancy by respiratory disease are in Appendix I. These statistics are illustrated in the following box plots (see Figures 10-13).

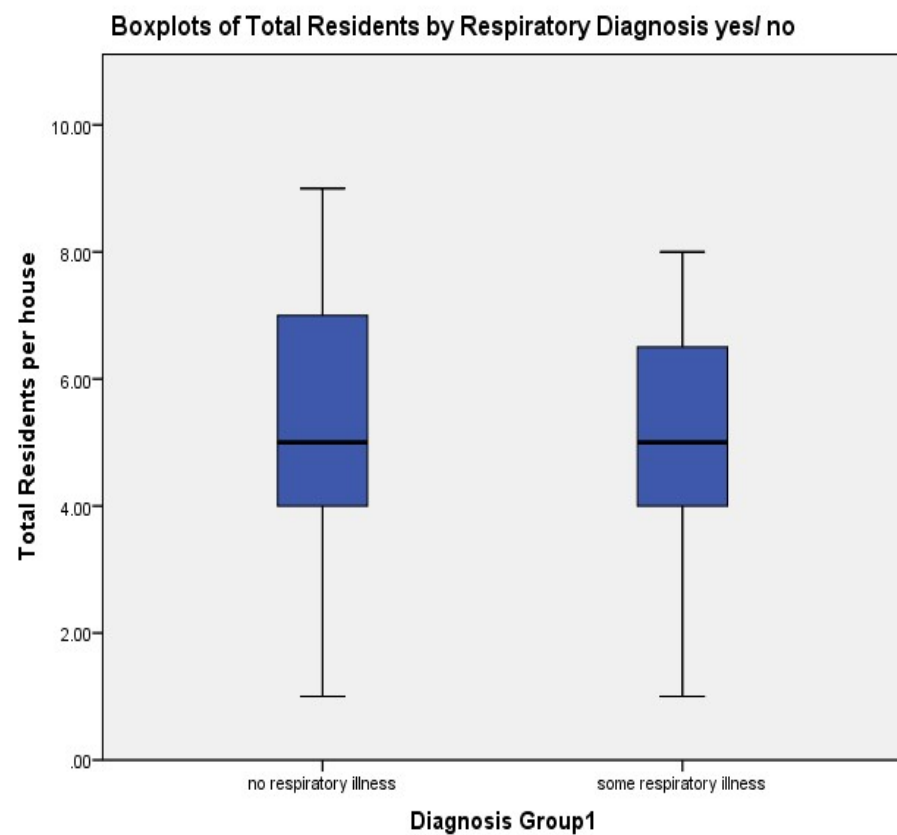


Figure 10 Total number of participants with self-reported respiratory illness

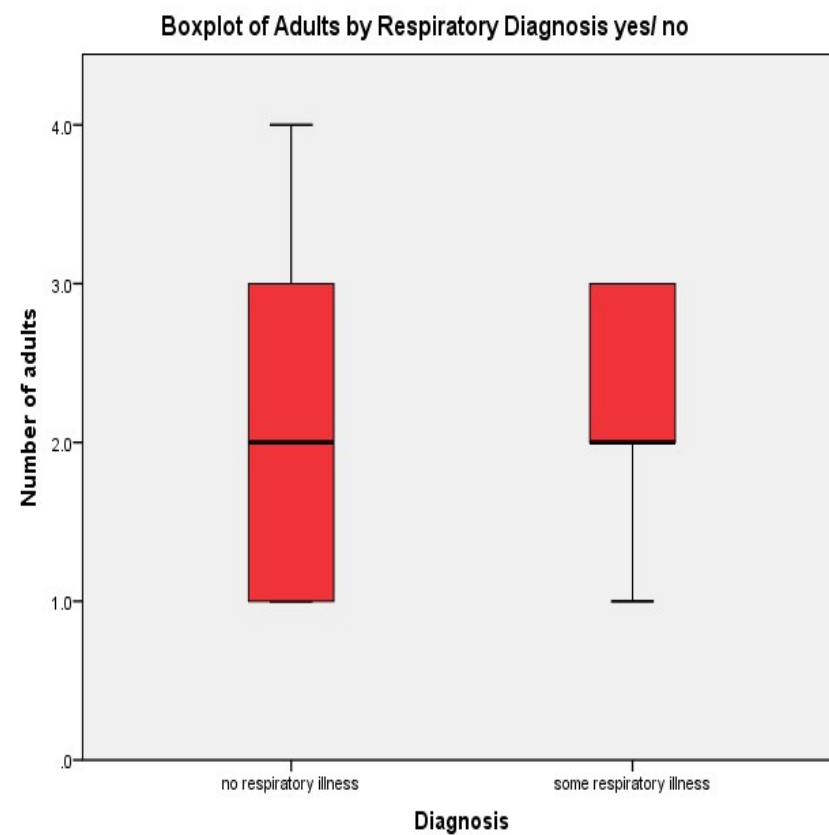


Figure 11 Number of adults with self-reported respiratory illness

Boxplot of Number of children by Respiratory Diagnosis yes/ no

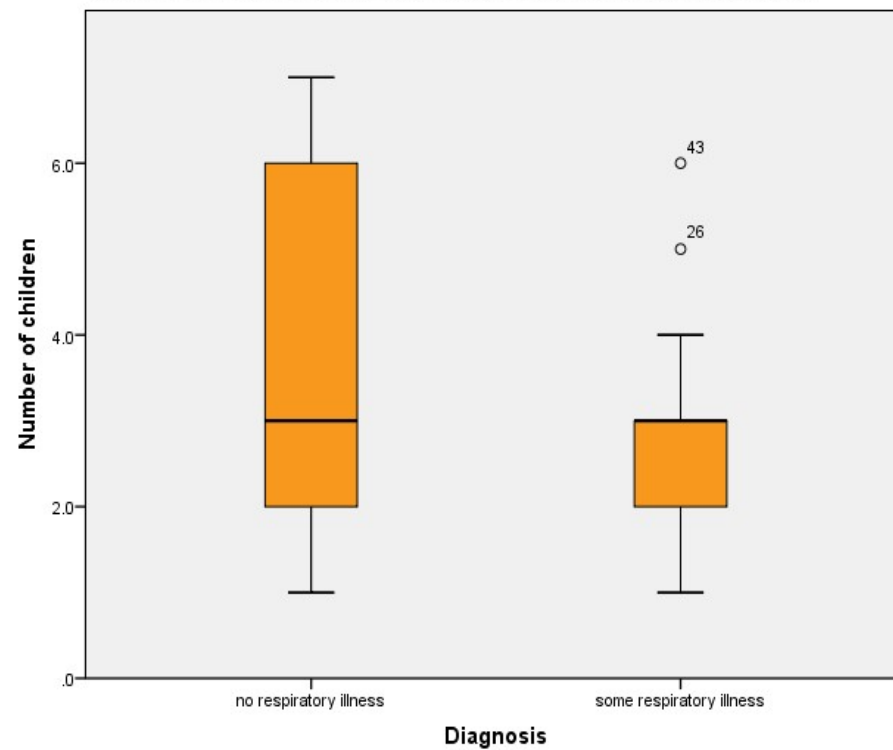


Figure 12 Number of children with respiratory illness

Boxplot of Number of People per Bedroom by Respiratory illness yes/ no

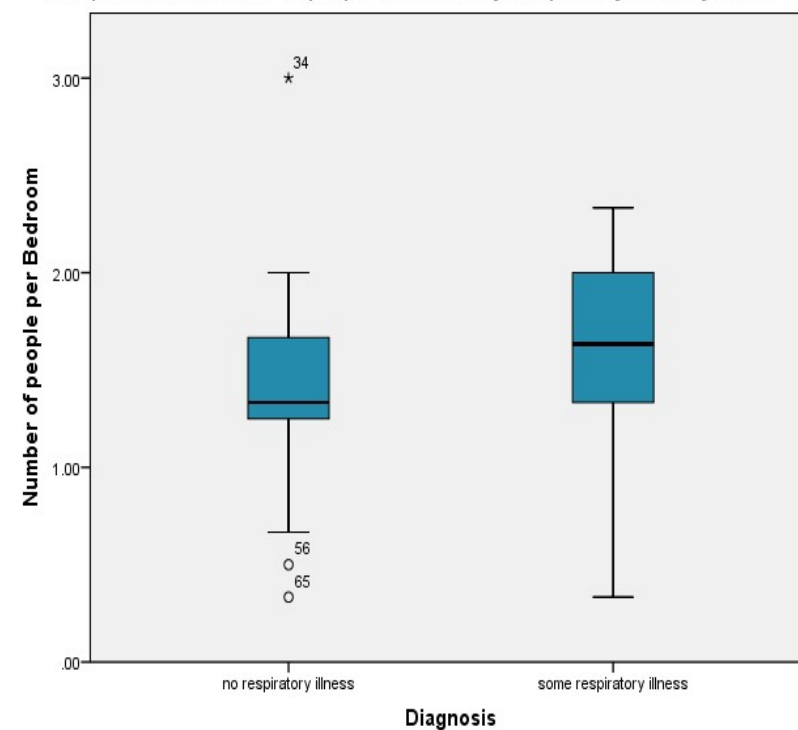


Figure 13 Number of people per bedroom by respiratory illness

Our research team were interested in the importance of household practices in keeping family members well, even in crowded housing. We asked a series of questions about this.

There were 61 responses to the question, *What happens when someone gets sick?* The responses are summarised here. Use of services was mentioned by 44 people (72.1%), including doctors, @0800 health line, hospitals, prescriptions, follow-up at schools and visits to asthma and skin nurses. Home treatment was discussed by 28 people (45.9%), including fluids, Pamol, soup, lemon honey, paracetamol, make comfortable, massage, *rongoa*, traditional healing, Vicks rub, finish medicine, antibiotics, and eczema cream.

Health routines were raised by 13 people (21.3%) including sleeping with kids when sick or keeping close, getting rid of fleas bugs mice, healthy food no junk, washing hands routine, covering a cough, and a clean house. Seventeen people (27.9%) mentioned isolation or monitoring (*isolates, no visitors, manage isolation, watchful eye on allergies mood out of character*). Over half the people (33, 54.1%) talked about warmth or ventilation (*keep home / bed warm, heater / fire to warm house, more warm clothes, heat pump installed, monitor cold hazards in house, ventilation difficult / windows hard to open*).

Eighteen people (29.5%) mentioned financial issues (*worry over costs of medicine or doctors visit, financial pressures, look for fuel deals, if parent sick put up with it get better fast avoid doctor cost*). For 14 people (23.0%) child care was a consideration (*organise childcare to get to work, drop kids to family, kids to help each other*).

There were 39 responses to the question, *Tell me about the kinds of things that were happening at home when your child got a sore throat / skin infection?* The full responses are included in Appendix I and summarised here. Symptoms (*sore throat, coughing*

asthma, skin sores and allergies, pneumonia, scratching body) were named by 29 participants (74.4%). Taking actions (*antibiotics, visit clinic*) were mentioned by 16 participants (41.0%).

CASE STUDIES AND HOUSE PLANS

For the purpose of illustrating the complex dynamics associated with the families that were interviewed, three case study profiles are included here. Case study 1 (Emily and Jackson⁶) are a young couple with three children who had little option but to return to their parent's house in Porirua. Challenging factors such as the short-term lease and maintenance problems had resulted in ongoing disputes with their private landlord. They, like many of the families in this study, had financial difficulties which had a direct impact on their housing decisions related to location, rental affordability, distance traveled to work and school, and feeling safe and secure in their home.

Case study 2 (Hannah and Jono), are a young couple with four children who waited five years to move into a Housing NZ home. At some point between shifting from her previous house (grandmother's house) and settling into her current HNZ house, one child was diagnosed with ARF.

Case study 3 (Debbie and Paulo) are siblings. They were raised in the family homestead that their father bought about thirty years ago. When Debbie moved out and started her family of seven children, she and her partner lived in a small three-bedroom HNZ unit. We interviewed Debbie twice for the study about her housing history. The first interview was when she was at her second HNZ house, where she and her children were given a 'Pay and Go' notice for rental arrears. The second interview was nine months later at her new private rental property. Paulo, Debbie's brother, told a different story as a family member

⁶ All names are pseudonyms.

actively involved with Debbie's family. He lived at the house where Debbie and her children often visited and stayed whenever there were family gatherings.

As illustrated in these three case studies, families made their homes as comfortable as they could and adapted to what were often severe challenges in their physical indoor environments and to the impacts these had on the health of their children. The roles of the landlords in the lives of these families varied as did the levels of advocacy and assistance provided by state agents and the families' own family networks.

CASE STUDY 1: EMILY AND JACKSON

Emily is a mother of one primary school aged child, two young toddlers and one teenager. In January 2014, when the lease of the private rental dwelling that she was living in ended, the family moved to her parents' two-bedroom Housing NZ house in Porirua. Living at the house were Emily's mother, father and her 20 year-old niece. Emily's mother converted the lounge into a bedroom and hired a cabin (see Plan 1) that was set up on the large section of the house and used as an additional bedroom.

The oldest grandchild, aged 20 years old, who normally lives at the family house with Emily's mother and father, was offered the cabin in exchange for giving up her bedroom as part of the new arrangements. Emily's mother believed it was important for the 20 year-old to have her own privacy and space to study, in addition to the fact that she was old enough to live in a dwelling separated from the main house. With one bedroom now available in the main house, Emily's father and one of the three younger grandchildren were able to move into it.

Emily made a drawing of her current living arrangements (Plan 1) and reflected on the spaciousness of her previous rental property (Plan 2). She considered the major stressors she experienced at the previous house related to an array of ongoing maintenance problems with electrical wiring, plumbing and rotten wall and floor boards. At the time of

interviewing Emily, she and her partner were in mediation with the landlord about their tenancy agreement. Unable to find an affordable rental in Wellington (landlords wanted single families, professional couples, older children and business couples), Emily was forced to approach her parents about moving back to Porirua so that they could “carry on house hunting and pay off their debts”. They had already rejected the first of three offers allowed for a HNZ property because it was too far away from her mother’s house and the children’s school.⁷ Emily said that she had “lost confidence” about finding a new place to live. At times it was stressful in her parents’ small house because Mum “likes to keep to her routine” and had strict rules about keeping the house clean and tidy. Emily said that she appreciated that everyone had their part to do in household chores and paying board. A recent trip away that Emily and Jackson took with the children helped to give “everyone a break”.

In a separate interview with Jackson, Emily’s partner, the adjustment from Wellington to Porirua was said to create new stressors like the high cost of travelling 150km over 6 days to work. In his words, he and Emily were “trying to break the vicious cycle” of financial debt caused by outstanding car fines, rent arrears and casual employment contracts. They spent their life savings to cover the “high market rents” of their last home and had already gone through an “ugly mediation session” with HNZ about being prioritised for a house in Porirua. As Jackson talked about their previous house (Plan 3, the same house as Plan 2 but drawn in separate interviews) he reflected on the importance of having his in-laws’ support and the fact that the children loved being with their grandparents. Positive factors of the previous house were the location being close to work, school and friends. The worst factors were the house being cold, leaky and expensive at \$430 a week.

⁷ The ‘3 strike rule’ was changed very recently in December 2015. New tenants and current tenants have only 1 strike or opportunity to accept an HNZ property.

Table 8 Summary key characteristics for Case study 1

| Key characteristics | Primary house (Plan 1) Emily & Jackson | Movement | Previous house (Plan 2 and 3) |
|---|---|----------|-------------------------------|
| Tenure | HNZ | ← | Private |
| Number of occupants | 9 (5 adults, 1 teen, 1 children, 2 babies | | 5 (2 adults, 4 children) |
| Health of whanau | Children with repeat strep throat infections | ← | |
| Alternative space for family gatherings | 30 people plus | → | Sports club |
| Factors for moving from previous house to primary house | Short-term lease, high market rent for poor housing condition, financial debt | | Work in Wellington |
| Number of heat sources | 1 | | 2 |
| Best thing about primary house | Living with children's grandparents, close to school, close to friend and family networks, close to shops, big back yard to play, big section for additional bedroom/cabin/outdoor shed for storage | | |

Plan 1 Primary House (Emily's parents' house)

Key

6 = Emily still paying bills from old house

8 = kitchen/dining room main shared

space for family 22m²

9 = bathroom 11m²

10 = Grandad's room 22m²

11 = Emily & Jackson's bedroom (lounge) 15m²

12 = Grandma's room 4m²

13 = kitchen/laundry 11m².

15 = mother has lived here over 20 years HNZ

16 = shed used for storage

17 = 20 year old stays in cabin

shed/man cave

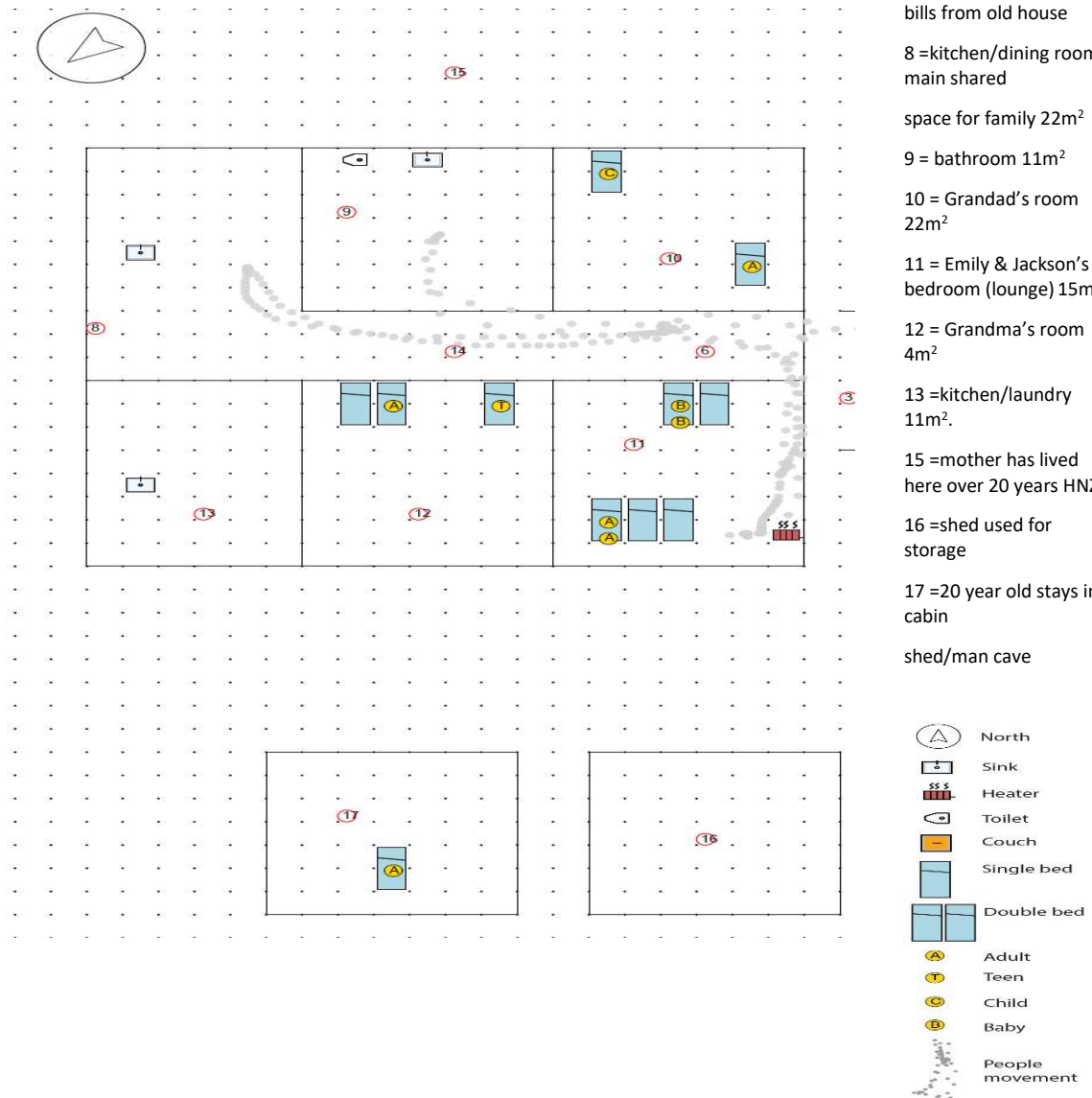
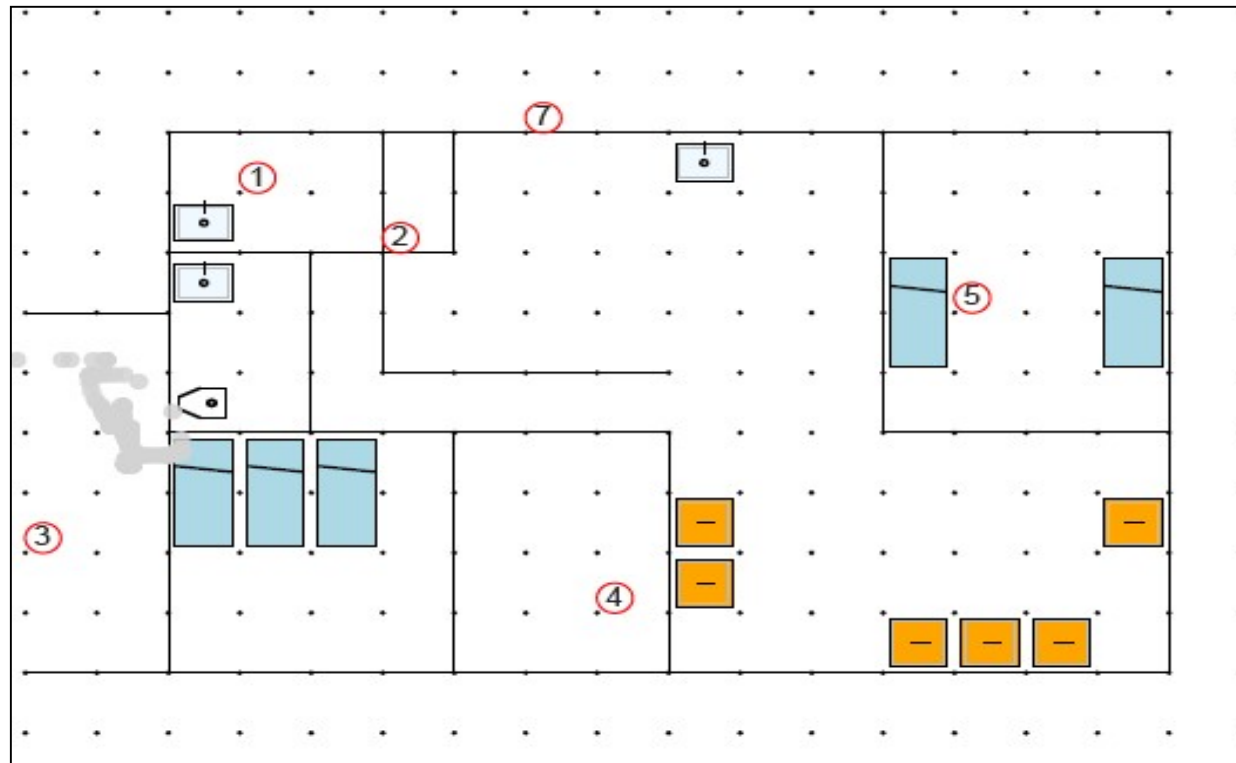


Figure 14 House plan one and two for case study 1

Plan 2 Previous House (Emily's picture)



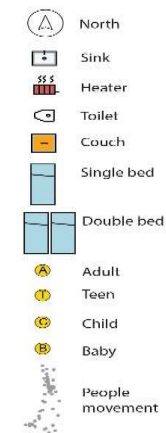
Key

1= entrance hallway

2= garage is joined onto garage of neighbours house

3= children moved into room together as children were scared of earthquakes

4= wiring children room short fused and no lighting for 12 months



Plan 3 Previous House (Jackson's picture)

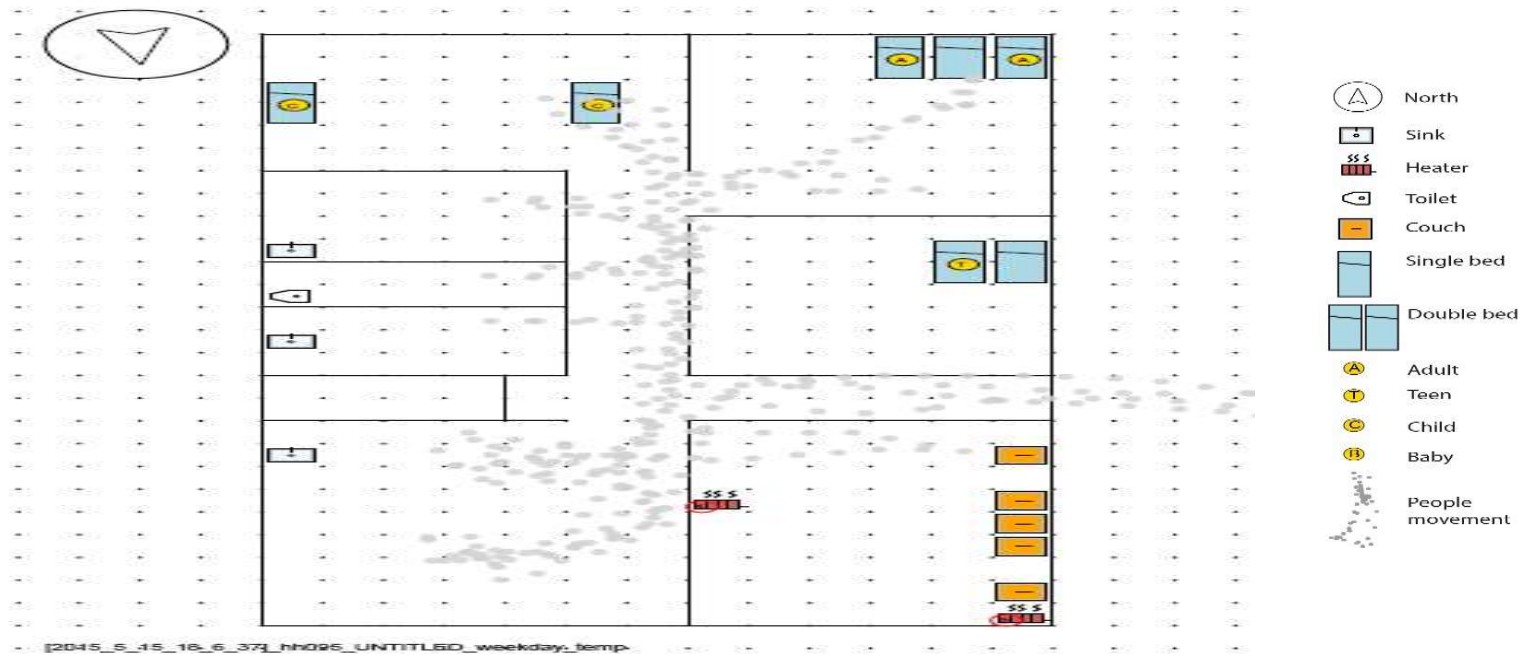


Figure 15 House plan three for case study 1

CASE STUDY 2: HANNAH AND JONO

Hannah is a mother of four young children whose ages range from three to eight years old. One of the children was recently diagnosed with ARF and was on a regimen of antibiotic penicillin injections provided monthly at home by the school-based public nursing team. The children's father, Hannah's partner Jono, shared a lot of the daily child care responsibilities, but lived with his mother in a different house a few streets away. When asked about the events surrounding her child's illness, Hannah described the five years that she, Jono and their three children (at that time) were living with her grandmother. Plan 2 shows her grandmother's three-bedroom HNZ unit Hannah occupied for five years as a teenage mother. Hannah and her two children lived downstairs, sleeping on the double bed sofa, while Jono took up one of the couches whenever he came to stay. Upstairs, there were Hannah's two grandparents, younger sister and uncle. She also had an aunty who lived in the neighbouring HNZ unit. Hannah stayed with her grandmother when she started college and got pregnant before finishing school. She waited five years for a HNZ property to become available and had two more children over that period.

When Hannah finally got prioritised for a house with HNZ (Plan 1), she was very excited to get a place of her own. She "loves this house" and spoke warmly of its different rooms while she sketched out rectangular shapes on the iPad (Plan 1a). Jono was the youngest of seven siblings so having a large enough space to host family during birthday parties and celebrations with their children was something they had both longed for. However, the move three years ago came with several major issues. The house had no carpet and was constantly cold. The only heating source was a fireplace which produced "so much smoke that it had to be blocked off". She made do with a few heaters, but could do nothing to warm up the children's room at the most south-eastern end of the house where it was always "dark and cold". For most of the year, especially winter, Hannah and the children slept in the lounge.

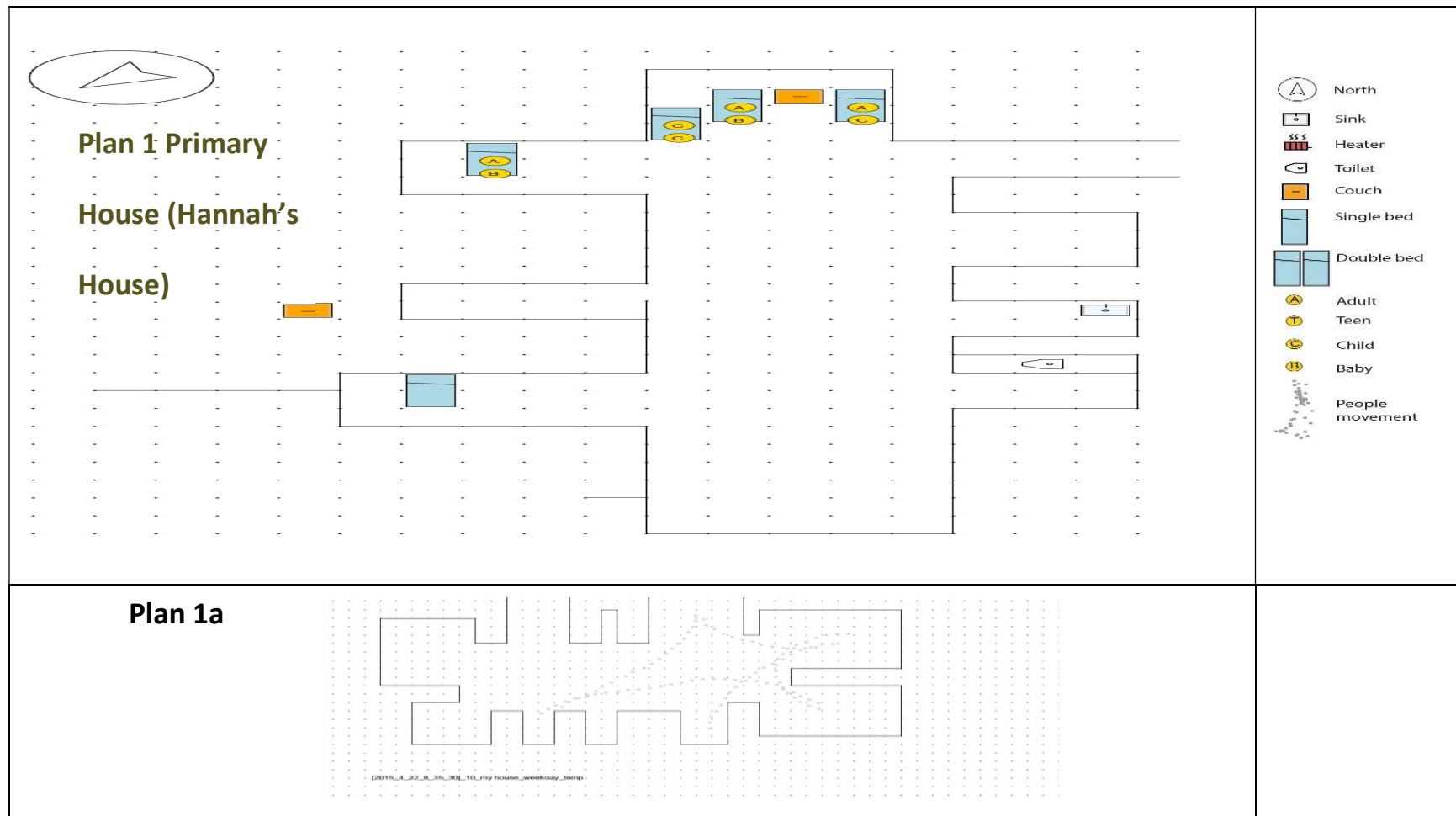
In January 2014, HNZ laid new carpet throughout the house - in the lounge and bedrooms. But it made little difference to their warmth. Six months later, a heat pump was installed in the lounge which made it more comfortable, but Hannah said it was "useless" because it could not warm up

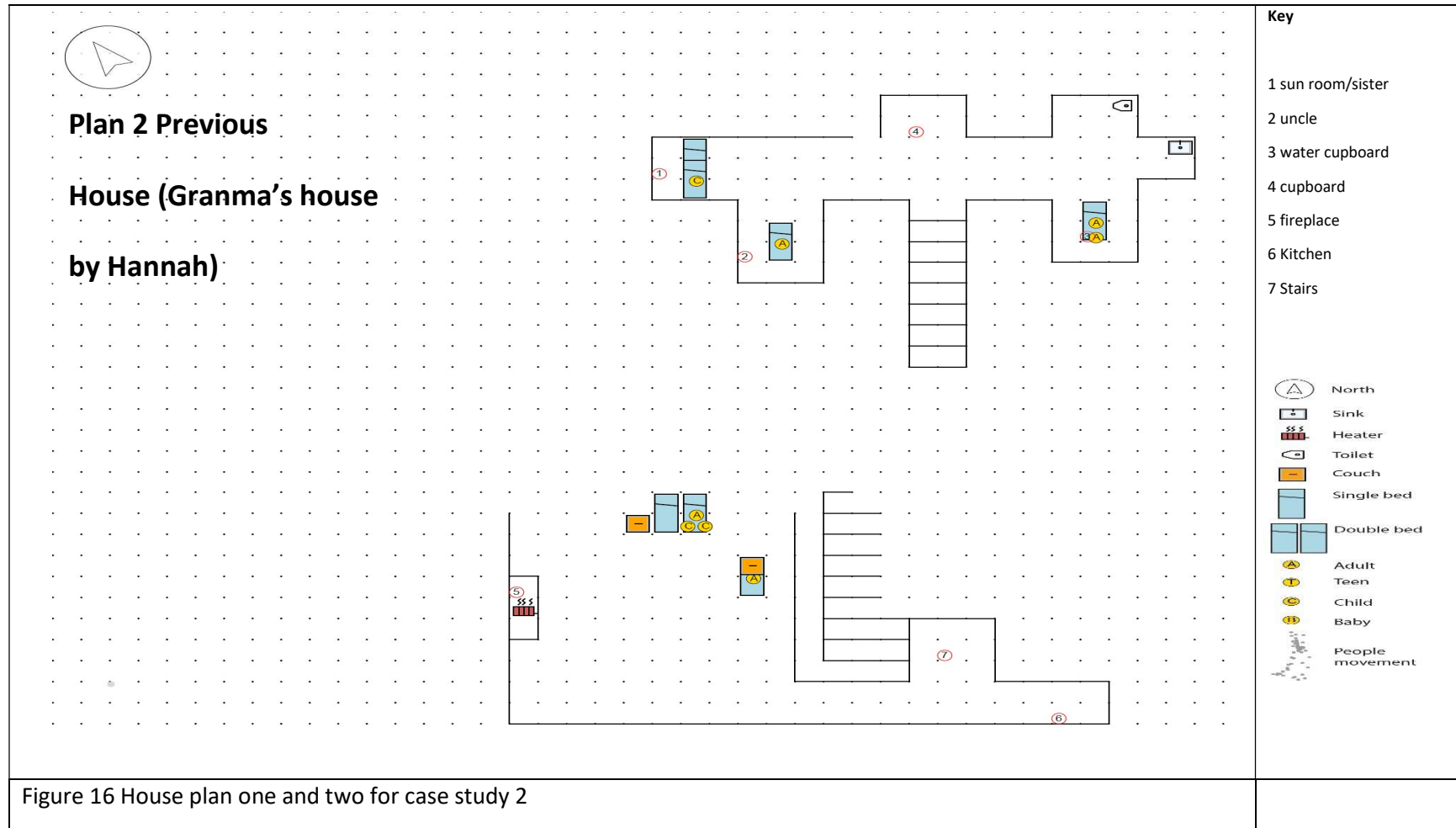
the hallway where they walked on cold bare floorboards or warm up the bedrooms. After receiving an electricity bill of \$1,140 from the power company Genesis, Hannah made the important decision to switch to a PayGo prepayment plan. At the time of interview, Hannah's power bill was significantly reduced to a weekly average total of \$20. The family no longer used the heat pump so that they could save on power. These changes helped Hannah from getting "stressed out" while trying to finish her studies at polytechnic and building her employment record through her part-time job.

For most of her tenure at this house, Hannah worried about her family's security and put in several requests to HNZ to have the latch fixed on the backyard gate. The house's location was next to a major walkway leading to the local rugby park so the front end of the house had high passer-by foot traffic. A few months ago, her partner was accosted and assaulted by a group of rowdy young males who had been drinking alcohol at the park that night and found Jono having a smoke on the front lawn. This shocked and terrified Hannah and she pursued a formal complaint to the police and the youths' secondary school. Hannah also had concerns about security at the back of the house where there was a long driveway for tenants to park their cars. Often the cars parked there, blocking Hannah's back entrance, belonged to her neighbour's visitors. While Hannah described her neighbour as a "nice lady", she worried about her visitors because they were patched gang members. Given that the children played outside every day, not having a secure gate was a real concern. Hannah asked the research team for assistance to get outdoor security lights installed around the perimeter of the house but was determined to continue living there despite the stresses she and her family had experienced: "I really don't want to move from this house, because it's a great house, but if I have to I will".

Table 9 Summary of key characteristics for case study 2

| Key characteristics | Primary house (Plan 1) Hannah | Movement | Previous house (Plan 2) Grandma's house |
|---|--|----------|--|
| Tenure | HNZ | ← | HNZ |
| Number of occupants | 5 (1 adult, 4 children) | ← | 8 (5 adults, 1 teen, 3 children) |
| Health of whanau | 1 child rheumatic fever, 1 child asthma/eczema | | |
| Alternative space for family gatherings | 20 people | → | Grandma's house; and Jono's older sibling's house |
| Factors for moving from previous house to primary house | Independence, own space | | Moved to grandma to go to college, then became pregnant while at college |
| Number of heat sources | 2 | | 1 |
| Key concerns | Cold house, fuel bills, security from neighbour, public walkway to main park, foot-traffic | | Space |
| Best thing about the primary house | Location, close to work, shops, school, enough bedrooms and space, sunny lounge | | Support from family |





CASE STUDY 3: DEBBIE AND PAULO

Debbie is a mother of seven children who agreed to be interviewed about two homes that she and her family lived in over two different periods of time. Debbie's first home was a five-bedroom state house where she lived with five of her children for nearly six years (Plan 1). Nine months later, Debbie moved out of that house and into a different house: a four-bedroom private property located in a different suburb in Porirua (Plan 2). Debbie's brother Paulo was interviewed as well about the family home where they grew up as children. Paulo lived there with his elderly father and 20-year old niece (Plan 3). As well as being a place where most of the extended family gathered for important celebrations and household activities, it was a place where Debbie and the children often visited and sometimes stayed.

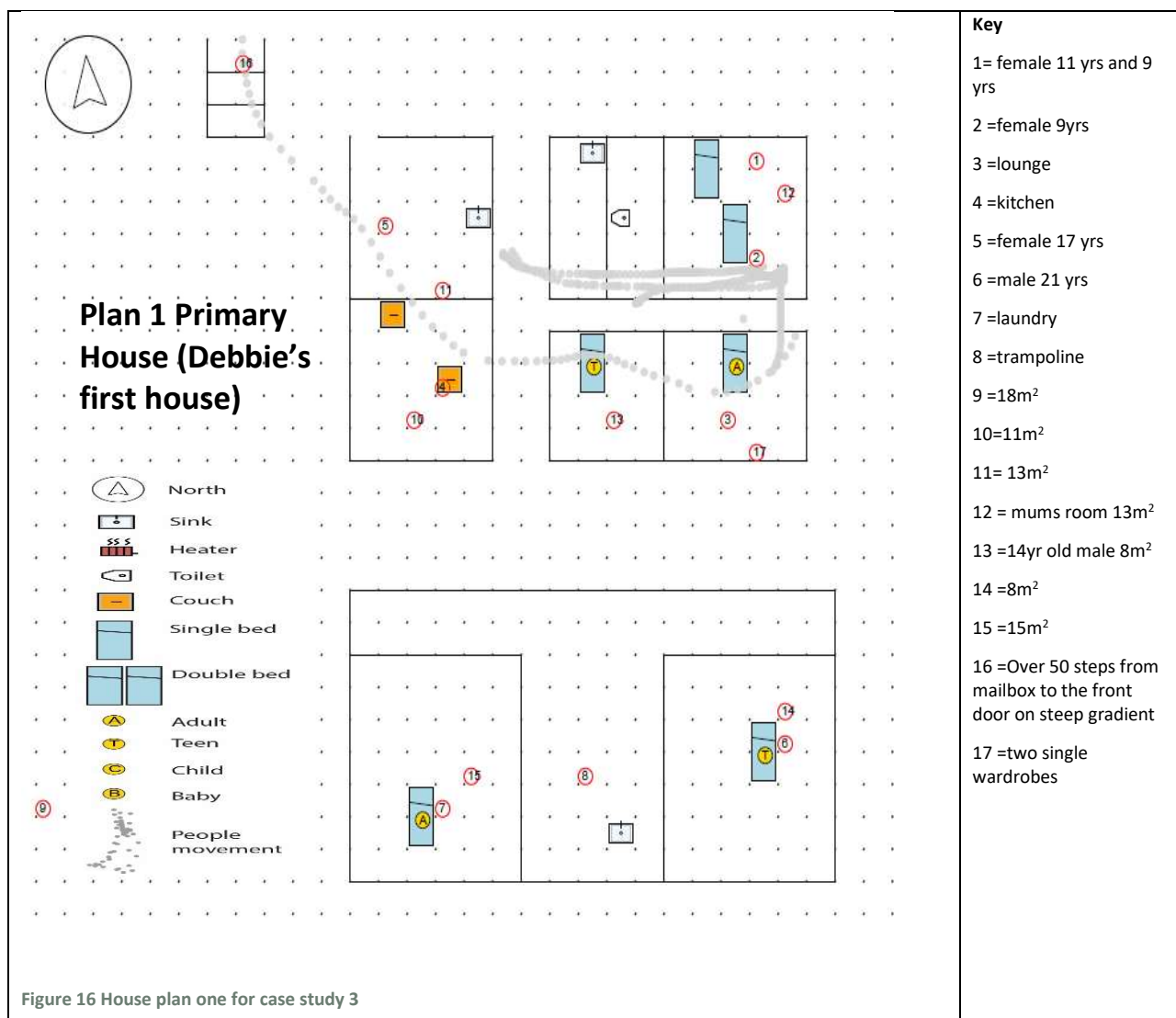
On the day before Debbie's interview, she was issued a 'Pay and Go Notice' (eviction notice) for missed rental payments on her state house (house 1). With support provided through the Porirua Heating Project,⁸ Debbie was granted financial aid from the Ministry of Social Development, Work and Income (MSD WINZ) to have her rental arrears, which was over \$1000, paid in full, as well as an overdue electricity bill of \$1,400. As a result of this, HNZ issued a 'Pay and Stay' notice that allowed the family to continue renting the house. The total amount of money paid out for Debbie's housing and fuel debts was recoverable. This meant that Debbie has to pay back the full amount to MSD WINZ over time.

The story behind Debbie's financial difficulties was made known through the interview process and at a tenancy review meeting that we attended with her HNZ tenancy manager. For the previous two years, Debbie had been struggling on her own to care for her two youngest children. Both had contracted chronic health conditions which involved surgery and long-term hospitalisation in medical wards outside of Porirua. Debbie stopped going to work to take care of

⁸ This is an inter-sectoral group of public services under the Porirua Social Sector Trial, set up to improve housing outcomes through improved pathways to public services. The Porirua Social Sector Trial is a central government led initiative funded by the Ministry of Social Development for more effective public sector services, integration and collaboration.

the children. Major bills like rent and electricity were suspended, because Debbie had to redirect her finances towards transportation to get to and from the hospital, doctor's surgeries and medical appointments. The major stress of this made it difficult to confide in or communicate with her housing tenancy manager, until she was eventually issued with an eviction notice. In Porirua, five-bedroom state houses were like "gold" and Debbie was reluctant to surrender the house because she had waited almost ten years to be prioritised for a house this size which could accommodate her family. Debbie's previous house before this one was a three-bedroom HNZ unit. She remembered the challenges of raising seven children in a small house where she shared her bedroom with her partner, new born baby and toddler, and where the three older girls were crammed into the second bedroom and the boys in the third bedroom. As a consequence of the cold, damp condition of the previous house, Debbie recalled how the three older children developed serious eczema and "they've been able to manage it as they've gotten older".

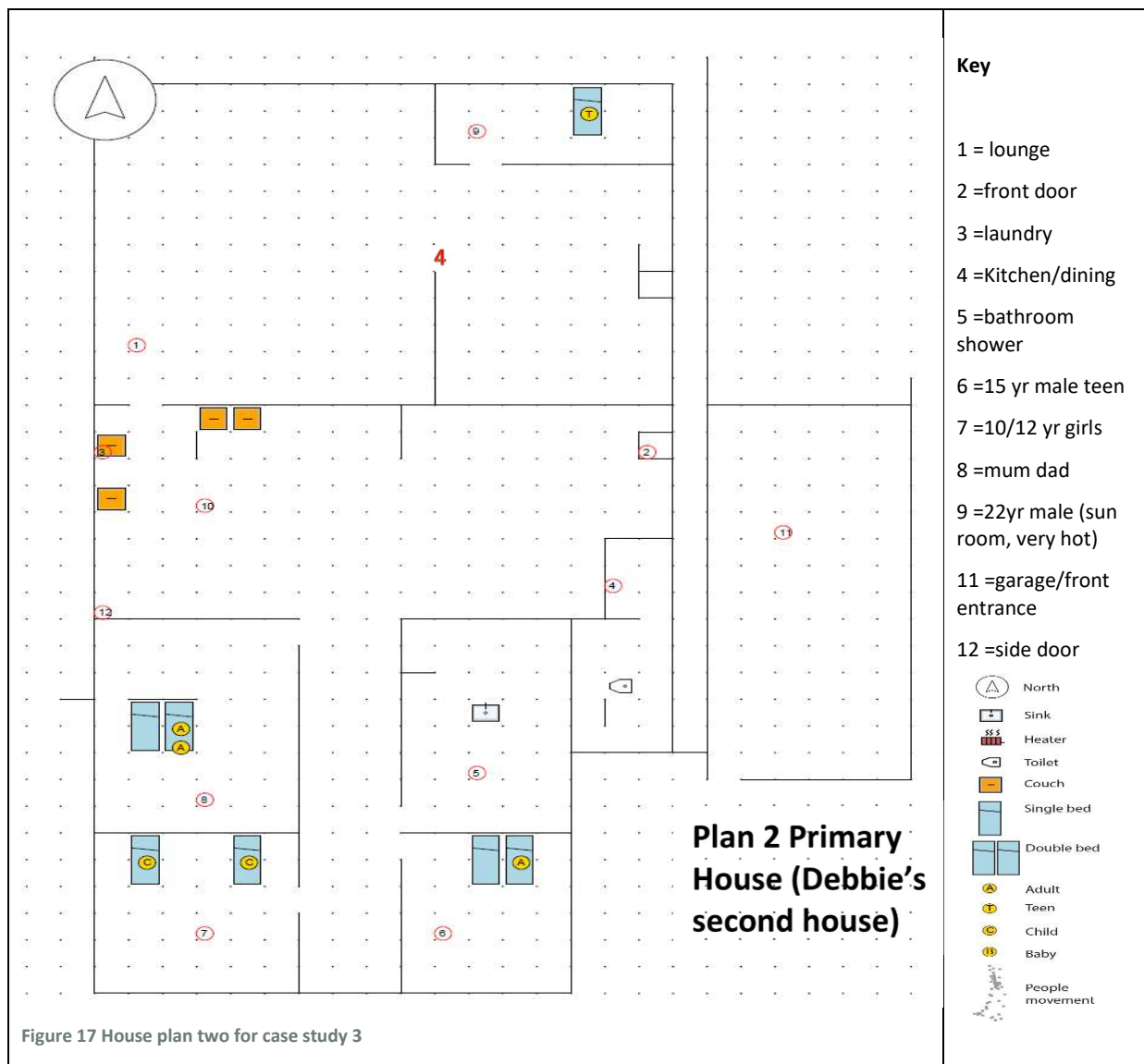
Like their previous house, the five-bedroom house was cold, had no carpet or floor coverings and no curtains. The only permanent heating fixture was a small fireplace in the lounge which proved ineffective in a large two-storey house. The external steps leading from the main road to the house had a steep gradient which required extra care to climb. About a year prior to our meeting with Debbie, a heat pump, stove range hood and bathroom extractor fan were installed as part of HNZ's renovation programme. However, Debbie refused to use any of these appliances because she wanted to "save power". On the day that the technician came to install the heat pump, Debbie removed the batteries from the remote control so that the children could not use it in order to reduce the power bill. Consequently, the 11-year old child developed asthma and was admitted regularly into Kenepuru and Wellington hospitals, something which Debbie knew was attributed to the coldness of the house ("...usually have blanket wrapped around you when moving around the house").



Nine months after the first interview, Debbie was given another 'Pay and Go Notice' from HNZ, two weeks before Christmas. Financial struggles continued to plague her, but this time it was because she had been unable to secure permanent employment at her organisation after it lost the bid for a services contract. Out of work, Debbie used whatever funds she had to put food on the table for her children. Again she was in rent arrears. Instead of meeting with her tenancy manager, she acted quickly to find a four-bedroom private rental property (house 2) for her family to move into. A meeting with HNZ for another tenancy review was something she preferred to avoid.

When she moved into the four-bedroom private rental, Debbie described it as "downsizing". The children were adjusting to the small size of their bedrooms and living areas; they were restricted

from having television in their rooms. More seriously, there was an infestation of fleas and cockroaches, and leaking kitchen sink and pipes. The children complained of itchy bites and skin sores. A positive aspect of the new house was its location, which was walking distance to a park where the children and youth could meet their friends and cousins. At their previous house, there was no park nearby and so the children spent a lot of time indoors at home.



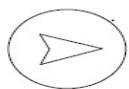
Paulo, Debbie's brother, lived with their elderly father (house 3). He had no child dependents and was often involved with the medical appointments and sports activities of Debbie's household. The family homestead was mostly quiet, but regularly taken over when his nephews and nieces came to visit and on some occasions they stayed over. Paulo's niece was staying with

them because she needed space to study and relax. She was close to Paulo and her grandfather and relied on them for a ride to school when needed. At the back of the main house, there was a large double garage with comfortable couches and a ping pong table. It was used often for the family's celebrations, as was the main house when any of the family needed to stay. In the past, Debbie and her children had come back home whenever they needed to. Paulo said that he often watched over and cared for the younger children, especially the three youngest who had been in and out of hospital over the last two years. One of the concerns he had with Debbie taking her last job was the unstable nature of the contracting environment of the communications sector that she was part of. Paulo saw his role within the family as being able to help out with all the children and young people and to make sure that his father was happy. He was recently part of the submission that his neighbour put together to have traffic islands put into his street to prevent car racers speeding past his house. The family homestead Paulo described, was a place that the family could come to whenever there was "chaos and [they] need time out".

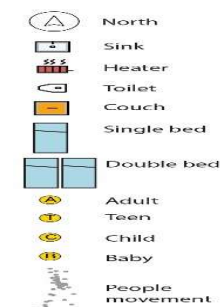
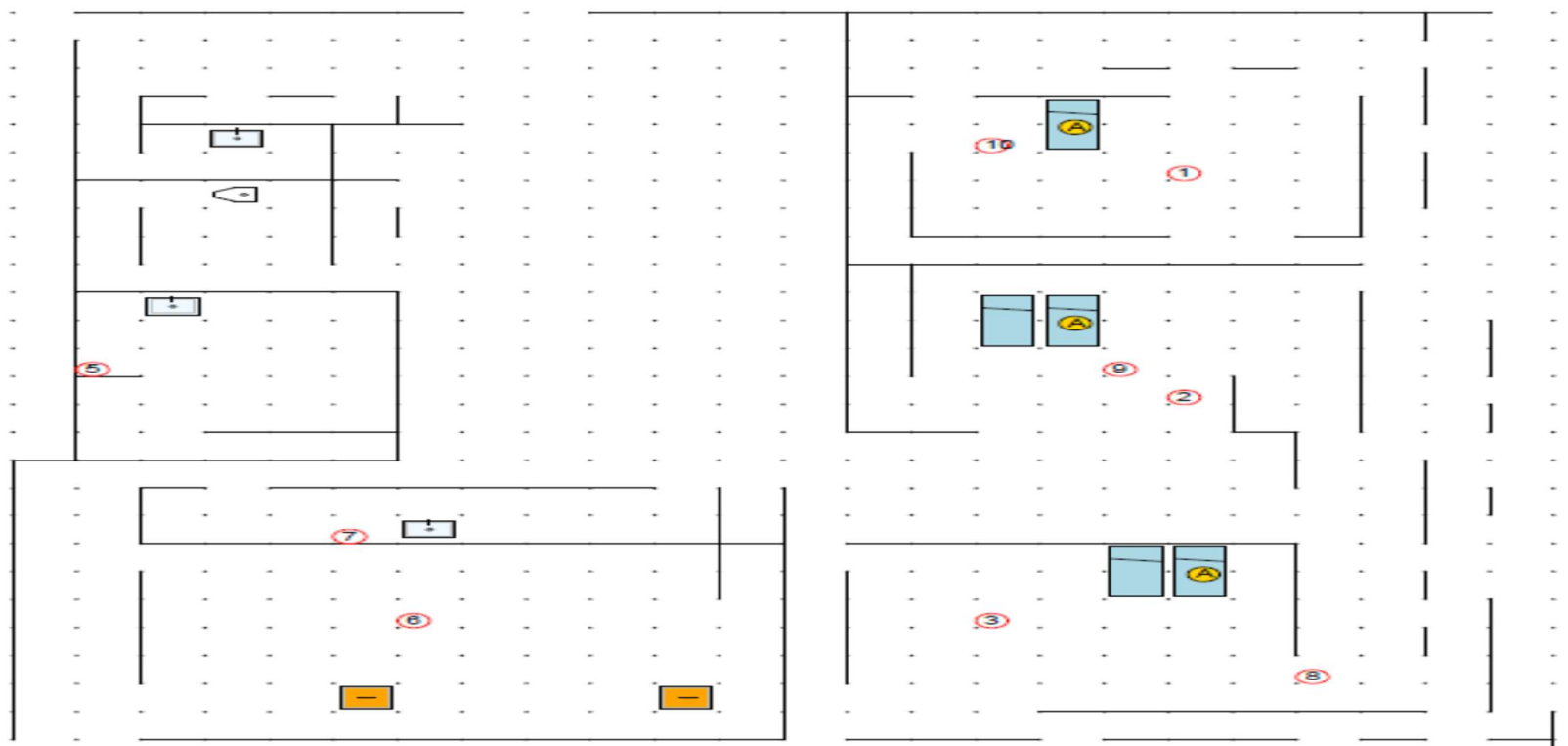
Table 10 Summary of key characteristics for case study 3

| Key characteristics | Primary house 1 (Plan 1) Debbie | Movement | Primary house 2 (Plan 2) Debbie | Movements | Alternative house (Plan 3) Paulo's house |
|----------------------|---|----------|---------------------------------------|-----------|---|
| Tenure 1 (Debbie) | HNZ | ← | HNZ | ← | Family homestead/Father owner-occupier |
| Tenure 2 (Debbie) | Private house | ← | HNZ | | |
| Number of occupants | 6 (2 adults, 3 children, 1 teen) | ← | 7 (3 adults, 3 children, 1 teen) | | |
| Health of whanau | 3 children chronic illness (asthma, fracture, skin) | | Eczema, asthma | | |

| | | | | | |
|---|---|---|--|---|--|
| Alternative space for family gatherings | 20 people | ➡ | Dad's house | ➡ | Family gatherings, events |
| Factors for moving from previous to primary house | Allocated 5 bedroom HNZ house after 5 years | | Pay and Go (eviction notice) and failed tenancy review | | |
| Number of heat sources | 2 | | 1 | | 0 |
| Key concerns | Cold house, fuel bills, rent arrears, unemployment | | Lack of space | | Assist children's health and education |
| Best thing about the primary house | Location, close to work, school, lots of extra space, enough bedrooms and space, sunny lounge | | Location, close to school, park nearby, close to children's friends and family, garage to hang out, compact outdoor area, single level, no steps | | |



**Plan 3 Paulo's
house (also
Debbie's family
homestead)**



Key

- 1=19yr old niece, a student at polytechnic
- 1= Paulo's room
- 2 =Dads room
- 3 =front door entrance
- 4 =back door
- 5 =18m²
- 6 =34m²
- 7 =15m²
- 8 =15m²
- 9 =8m²
- 10= 84m²
- 11 =84m² outdoor garage used for family gatherings

Figure 18 House plan three for case study 3

STUDY SUMMARY

MIXED METHODS

Using a mixed methods approach, we were able to describe housing designs and conditions, living arrangements and practices, including patterns of structural and functional crowding, health literacy and cross-cultural differences, in a high risk community.

MOSTLY STATE HOUSES

The majority of the households we interviewed were living in state houses; the remainder were in private rentals, and only a few owned the houses they lived in. There was considerable residential mobility of households from state to private rental housing.

AVERAGE OF FIVE TO NINE PEOPLE PER HOUSE

On average, there were five people, including three children, in each house, but up to nine people in some houses. Numbers might also swell with visitors during events such as celebrations or tangi. Households, regardless of ethnic background, were notably dynamic in composition.

AN EXTRA BEDROOM TO ALLEVIATE HOUSING STRESSORS

There were multiple housing stresses within families. Some families felt that their households were crowded and many said that they needed an extra bedroom.

MORE PEOPLE AT HOME IN THE WEEKENDS

Over two fifths of participants said there were more people at home in the weekend than during week days.

MULTIPLE FAMILY HOUSES NEARBY

While most families lived in one house, some households reduced the stress by occasionally moving people to other nearby relatives for periods. One household used four separate houses or buildings, two households used three separate houses, and seven households used two separate houses.

DESIGNATED HOMESTEAD FOR FAMILY EVENTS

Families, particularly those with young children, often had a designated family homestead that they returned to when house hunting or when financial resources were restricted. At the homesteads, there might be indoor and outdoor spaces for key events like family talks, fa'alavelave, tangior celebrations.

COMMUNITY BUILDINGS

Many participants (30.0%) reported using another family house for events, and some (20.0%) used community buildings such as marae, church or community hall. For major events, where 50-80+ people might turn up, households used community spaces to reduce crowding, underlining the importance of infrastructure for maintaining cultural and social capital.

HOME-BASED CARE

Significant organisational effort was required to manage household movements, space and resources. This is an important consideration with the concept of 'hospital as home'. Seven participants had stories of the complex medical equipment they needed at home, for example for respiratory problems or dialysis.

COMPLEX HOUSEHOLD ARRANGEMENTS

We were interested in the interaction between household practices and the built environment and gained insights into the way families managed their day-to-day household activities, i.e. the care of children, household chores and so on. There were complex patterns associated with the way households exercised responsibility for the ongoing day-to-day care of their children, both within the nuclear family and their extended family network.

MANAGING ILLNESS EVENTS

Our research also generated knowledge about how households arranged and managed episodes of illness among children. Although our previous epidemiological research has shown that household crowding is associated with the higher risk of close-contact infectious diseases in Pasifika and Māori children, this is the first mixed-methods study that has researched this link. People had many ways of ordering their households to try to keep their children well. Most households had some awareness about the risks of rheumatic fever. When children were sick,

parents took them to a doctor or other health services, treated them at home with a range of remedies, and tried to isolate them from the rest of the household. Around half of participants were aware of housing factors that could affect health such as keeping the house warm, dry and well-ventilated, but some found this difficult to address because of low incomes or financial pressures.

EARLY CHILDHOOD HOME-BASED CARE

Some houses in the study were legally used for early childhood care; a maximum of four children were allowed, depending on the size of the house. The implications of this for the spread of close-contact diseases have been ignored for health policy (as it has been for child-care centres in general).

HIGH RESPIRATORY ILLNESSES

Of the 44 who had a recent doctor's diagnosis, 27 had a respiratory illness. We found no statistically significant link between incidence of respiratory illness and housing tenure or house occupancy numbers. Those houses with a respiratory illness had a slightly higher mean number of people per bedroom, but it was not statistically significant.

MAINTENANCE AND POOR HOUSING CONDITIONS

Over half of participants were unhappy with the state of maintenance of the house and the unsuitability of the section for family use. Nearly one fifth said their house was negatively affecting their health. Bedrooms and lounges were sometimes described as "nice, warm and sunny", but many bedrooms were "dark and cold", which might affect health outcomes for children such as lung function. Two thirds were unhappy with some aspect of the home environment such as cold, damp, lack of insulation, and difficulty to heat or ventilate.

HIGH ENERGY POVERTY

Unexpectedly high fuel bills were a recurring issue, irrespective of tenure. Nearly all households wanted information about affordable electricity plans, most stating that they did not know what heating and housing subsidies were available.

A QUARTER OF HOUSES WITH NO HEATERS

Twenty-two houses (28.2%) had no heaters, as shown in the house plan data.

HEATERS NOT TURNED ON FOR FEAR OF ELECTRICITY BILLS

Some participants also did not use heaters or heat pumps when they had them, for fear of not being able to afford the power bill. When rooms were hard to heat through lack of insulation and heating, or through lack of money to pay for power, families crowded together in warmer rooms. This was done out of structural and financial necessity.

CASE STUDIES AND RICH VISUAL AND QUALITATIVE DATA

We collated a number of case studies from the families we interviewed, which relate the families' stories to the use of their houses. These are a rich source of qualitative data. For example:

- On rooms in the house, a mother of 5 boys in 3 bedrooms said, "I'd love to have another room, because they're getting older and they need their space".
- On family gatherings, a mother of 4 in a double-storied state house, whose brother-in-law lived across the road, stated, "We don't usually use the family house for gatherings, because it's too small and wouldn't fit everybody, so we go to grandad, or hire the hall down the road".
- On security, a grandparent with 9 grandchildren said, "This house is a safe house because my daughter is in a violent relationship and the children come here when they need to."

POOR OUTDOOR SPACES TO MAINTAIN AND PLAY

When describing the outdoor space of their houses, some appreciated having the space. However, sections were often elevated and difficult to access and maintain. Several, while spacious, could not be used for play or gardening because of potholes and soil quality issues. As Teri, mother of seven, stated, "Grandma fell off the chair because the lawn is uneven and hard for the kids to play on it". For elderly family members and children with disability or chronic health problems, these features of the outdoor spaces influenced their perceptions of satisfaction about home life.

PREVALENCE OF RISK FACTORS AND PROTECTIVE FACTORS FOR RHEUMATIC FEVER

All the children in the households were at higher risk of rheumatic fever. Six people in the sample had been diagnosed with rheumatic fever, but our study was not designed to show causation between GAS carriage and pharyngitis and living arrangements and practices. Our study was designed to illuminate social and environmental factors that made children vulnerable to close-contact infectious diseases. With the help of the families, we were able to identify which practices appeared to be preventive, such as using adjunct houses to relieve crowding, taking measures in the household such as isolation of children in their own rooms and beds, and working with the doctor and school nurse. We explored with the families which long-term interventions were likely to reduce crowding in Māori and Pasifika populations and therefore the incidence of RF and other infectious diseases.

HEALTH ENHANCING PRACTICES AND RESOURCES

We identified a number of health-enhancing practices in households, as well as a number of stressful determinants that contributed to ill health. Within their resource constraints, the health, education, welfare and wellbeing of children was highly prioritised. Both use of money and use of space were carefully budgeted, and this required good organisation and management, as well as planning for expected events such as a birthday celebration and unexpected events such as illness. Households also called upon the wider resources and spaces in their extended families and community, and in this respect the resilience of the community was very important. Health-enhancing practices could be further developed with the community and policy-makers, and stressors contributing to ill health could be remediated with coordinated social sector support, for example help with managing debts and managing home heating.

PORIRUA EAST PRIMARY CARE SERVICES – AN EXEMPLAR FOR HEALTHY HOUSING

The primary care services in East Porirua are exemplary of the way in which health services personnel can work together with schools, NGOs and social sector agencies. We received the utmost co-operation from these groups to identify the families we approached to interview. However, many of our findings related to MSD and the housing agencies in control of state housing, where most of the families lived. Housing is a key lever to improve the families' living conditions. Inadequately sized housing and insecure leases for the regular occupants were a common problem and need to be considered a health problem. Improving the poor housing

conditions of those who lived in private rental housing requires the introduction of a rental warrant of fitness by the city council or central government. Policy interventions also need to address fuel poverty, a major problem that compounded the physically inadequate condition of much of the housing in this study.

‘NO SURVEY WITHOUT SERVICE’ AND THE PORIRUA SOCIAL SECTOR TRIAL

On the principle of ‘no survey without service’, we linked households in this study with the Porirua Social Sector Trial (PSST). An indication of what can be achieved was that the PSST provided funds for the purchase of heaters (17 portable / 2 heat pumps) and comprehensive house inspections from the Sustainability Trust, which were made available to participants of the study. The funds were administered through the Porirua Heating Project (PHP), an inter-sectoral group consisting of Regional Public Health, MSD WINZ, HNZC and collaborating agencies Sustainability Trust, Dwell Trust, Porirua City Council and Ngāti Toa Rangatira Inc.

STRENGTHS AND WEAKNESSES OF THE STUDY

Our mix of qualitative and quantitative methods generated insights into what are usually private household practices, social networks and family bonds. This is the first study of its kind that we know of anywhere. He Kainga Oranga has worked on partnerships with community organisations for two decades and the project manager, Dr Ramona Tiatia, is well known in the area. Drawing on the high level of trust, awareness of the importance of eradicating ARF in the community, and the engagement of local Pasifika and Māori interviewers, we were able to go into people's homes and have frank conversations with them about their living and sleeping arrangements. As most of the participants were Housing NZ tenants, and this organisation has strict rules about occupancy and sub-letting and has been tightening up enforcement and penalties, the level of trust and insider knowledge was a major strength of this study.

We explored the use of new technology for the collection of health-related housing data. The innovative iPad App developed for this study was another major strength and we know of nothing similar. Although the App took longer than expected to develop, it was a practical and creative use of visual mapping of the indoor environment of houses and has many possibilities for the wider physical and geographical landscape. Because it could be used for measuring housing dimensions, and recording sleeping arrangements and household management arrangements, as well as recording answers to the survey, it was very versatile. Participants were easily engaged and seemed to enjoy the experience. It enabled us to compare the household's perceptions of housing with the actually sleeping arrangements and number of rooms and bedrooms in the houses, and to better understand the utilisation of community infrastructure like marae, church halls, sports and recreational halls for family gatherings and events.

Weaknesses of the study were that the local interviewers, though well-trained, did not always pursue the participants' answers in depth, so that in some sensitive areas there was some ambiguity. In addition, conducting the study over school holidays and close to the public holidays of Christmas and New Year may have affected accounts of numbers in the house, use of

children's bedrooms, and accounts of sleeping in the lounge. This is likely to be reflected in differences between numbers said to normally live in the house and numbers said to be using each bed and bedroom in the house. For example, there was a higher report of children sleeping on mattresses in the living room in December compared to other months when interviews were conducted, as children were at home during school holidays.

This study was promoted by the PHP as a survey with services, which ensured that families received relevant health promotion information and housing assistance from existing public services in Porirua. This was supported by a systematic referral process that was set up between the research team and Well Homes, Regional Public Health.⁹ The Well Homes service will be evaluated by *He Kainga Oranga* / Healthy Housing Research Programme at the University of Otago over a period of 5 years as a separate research project called SHELTER.

The computer software application (HEART App) technology is being further developed by our research team for adaptability in other research studies. We are working with Victoria University and the Telethon Kids Institute, Western Australia on reformulating Benzathine Penicillin G (BPG) towards a new Penicillin for rheumatic fever and rheumatic heart disease. In addition we hope to collaborate with them on using the HEART App for housing research amongst indigenous communities. In another collaboration which is with the World Health Organization in Samoa, we have been asked to develop an app to assist them with similar data collection on a non-communicable diseases programme in Samoan villages.

We see considerable scope for further analysis of the data, were resources to be available. For example, we have collected detailed data on energy use in the homes, including size of bills from the power companies, amount of debt incurred from energy use, and responses to energy poverty such as using prepay or not using heating sources. These could be explored along with data on housing problems such as cold and damp, and data on illnesses, to see what factors might be contributing to financial stress and ill health in those households. There is also house plan data that gives not only the occupancy and use of each room, but also the size of each room in square metres, plus extra data tagged in the iPad App to each room feature such as beds, mattresses and heaters. This is a unique dataset which promises to yield further information on

⁹ A family that required a “health” or “housing” or “both” follow-up/visit was provided for by public health housing specialist nurses and a care plan for the individual or the whole whanau put in place.

functional and physical crowding and its relationship to illness. At the moment we can do manual counts of this data in the App, but will look for funding to create an algorithm that can do an automated count of data. Further work might examine the links between these data and incidence of rheumatic fever, and might focus in depth on those households in the study where a person had been diagnosed with the disease.

APPENDICES

APPENDIX I: STATISTICAL DATA

Q 14: WHAT KINDS OF PROBLEMS WOULD MORE ROOMS HELP FIX FOR YOUR FAMILY?

| Problem | n | Percentage (out of 58) |
|--------------------------------------|----|------------------------|
| None | 12 | 20.7 |
| Age matching | 12 | 20.7 |
| Arguments | 12 | 20.7 |
| Children family sleepover | 8 | 13.8 |
| Cluttering | 6 | 10.3 |
| Cold rooms | 5 | 8.6 |
| Congestion cramped | 10 | 17.2 |
| Crowding | 11 | 19.0 |
| Enjoyment/ happy/ helpful/ comfort | 8 | 13.8 |
| Feeling valued | 5 | 8.6 |
| Health | 9 | 15.5 |
| Home-based income | 1 | 1.7 |
| Home schooling | 1 | 1.7 |
| Children independence responsibility | 6 | 10.3 |
| Light | 2 | 3.4 |
| Mould | 3 | 5.2 |
| Off the couch out of lounge | 8 | 13.8 |
| Privacy dressing bathing | 5 | 8.6 |
| Private space | 14 | 24.1 |
| Sleep own room | 11 | 19.0 |
| Sleep own bed | 6 | 10.3 |
| Space to eat as family | 6 | 10.3 |
| Space to play do things | 18 | 31.0 |
| Storage | 11 | 19.0 |
| Ventilation damp | 3 | 5.2 |
| Overheated room | 2 | 3.4 |

Q 15: WHAT'S THE BEST THING ABOUT YOUR HOUSE?

| Item | n | Percentage (out of 67) |
|--|----|------------------------|
| Nothing | 1 | 1.5 |
| Warm | 17 | 25.4 |
| Sunlight | 9 | 13.4 |
| Heater/ heat pump/ fireplace | 10 | 14.9 |
| Ventilation/ dvs | 3 | 4.5 |
| Insulation | 6 | 9.0 |
| Carpet | 7 | 10.4 |
| Thermal curtains | 1 | 1.5 |
| Nice views | 3 | 4.5 |
| Enough rooms | 11 | 16.4 |
| Fenced property | 11 | 16.4 |
| Good neighbours, neighbourhood safe | 7 | 10.4 |
| Single storey house | 8 | 11.9 |
| Big house | 11 | 16.4 |
| Big kitchen | 7 | 10.4 |
| Big bathroom | 3 | 4.5 |
| Lots of space | 14 | 20.9 |
| Easy to keep tidy/ good size/ watch kids | 9 | 13.4 |
| Good car parks | 4 | 6.0 |
| Better than last house | 8 | 11.9 |
| Good outside area yard front trees 11 | 11 | 16.4 |
| Location park pine cones fuel | 2 | 3.0 |
| Location | 19 | 28.4 |
| Location close to school | 21 | 31.3 |
| Location close family friends | 11 | 16.4 |
| Location close shops | 13 | 19.4 |
| Location close chemist | 1 | 1.5 |
| Location close doctor | 6 | 9.0 |
| Location work | 6 | 9.0 |
| Location church | 1 | 1.5 |

| | | |
|-----------------------------------|----|------|
| Close to park bush reserve | 6 | 9.0 |
| Close to public transport | 11 | 16.4 |
| Private quiet | 14 | 20.9 |
| Away from main road long driveway | 7 | 10.4 |
| Large section | 12 | 17.9 |
| Big garage | 1 | 1.5 |
| Outside storage | 2 | 3.0 |
| Not enough storage | 3 | 4.5 |
| Space to maintenance work | 2 | 3.0 |
| Safe home for children | 13 | 19.4 |
| Workspace earn money | 3 | 4.5 |
| Internet for kids | 2 | 3.0 |

Q 16: WHAT'S THE WORST THING ABOUT YOUR HOUSE?

| Item | n | Percentage (out of 71) |
|------------------------------------|----|------------------------|
| Nothing | 2 | 2.8 |
| Access long steep pathway steps | 7 | 9.9 |
| Mould mildew | 15 | 21.1 |
| Cold | 42 | 59.2 |
| Too hot | 2 | 2.8 |
| Damp | 19 | 26.8 |
| Old style decor | 5 | 7.0 |
| Draughts | 16 | 22.5 |
| Ventilation | 9 | 12.7 |
| No carpet | 9 | 12.7 |
| Bathroom bad access for disability | 3 | 4.2 |
| Bathroom fixtures | 2 | 2.8 |
| Small kitchen dining | 7 | 9.9 |
| Smells from kitchen | 1 | 1.4 |
| Oven other permanent fixtures | 3 | 4.2 |
| Leaky roof | 8 | 11.3 |

| | | |
|--|----|------|
| Paint peeling ceiling cupboards wallpaper | 6 | 8.5 |
| Guttering spouting | 3 | 4.2 |
| Water cylinder | 1 | 1.4 |
| Crowded | 9 | 12.7 |
| Drainage plumbing | 5 | 7.0 |
| Have to use lounge to sleep | 9 | 12.7 |
| Temporary stay looking for house | 5 | 7.0 |
| No space | 12 | 16.9 |
| Children getting sick | 10 | 14.1 |
| Adults sick | 5 | 7.0 |
| Poor flooring | 5 | 7.0 |
| Double triple storey stairs | 4 | 5.6 |
| Damaged weatherboard cladding poor quality | 7 | 9.9 |
| No sunlight | 4 | 5.6 |
| No underfloor insulation | 5 | 7.0 |
| Little insulation | 5 | 7.0 |
| No heater | 9 | 12.7 |
| Overgrowth vegetation | 3 | 4.2 |
| No outside path lighting | 2 | 2.8 |
| Bad location far from school/ work | 1 | 1.4 |
| Damage from natural disaster | 6 | 8.5 |
| Teenagers sick | 3 | 4.2 |
| Teenagers/ children difficult to adjust to new house | 7 | 9.9 |
| Cockroaches | 3 | 4.2 |
| Mice | 2 | 2.8 |
| Stray cats | 1 | 1.4 |
| Lighting fuses wiring | 2 | 2.8 |
| Garden not growing | 1 | 1.4 |
| No follow-up post inspection of house | 1 | 1.4 |
| Pot holes on section | 3 | 4.2 |
| Pot holes kids can't play | 3 | 4.2 |
| Unstable foundation | 1 | 1.4 |

| | | |
|---|----|------|
| Elevated section | 7 | 9.9 |
| Elevated potholes section difficult to maintain | 7 | 9.9 |
| Elevated section to washing line | 2 | 2.8 |
| Renovations uncompleted | 5 | 7.0 |
| No fence or gate | 7 | 9.9 |
| Can't afford costs to fix property | 11 | 15.5 |
| Broken window latches | 7 | 9.9 |
| Weeping windows | 9 | 12.7 |
| HNZ no help | 12 | 16.9 |
| Private landlord no help | 3 | 4.2 |
| Embarrassing state of house | 6 | 8.5 |
| Heater not effective | 11 | 15.5 |
| Heater expensive to use | 16 | 22.5 |
| Rent arrears debt | 5 | 7.0 |
| Not safe | 6 | 8.5 |
| Problem neighbours | 6 | 8.5 |
| Vehicle traffic noise | 7 | 9.9 |
| Foot traffic noise trespassing vandals | 8 | 11.3 |
| Rubbish dumped by passers by | 2 | 2.8 |
| Tenancy review mediation tribunal | 1 | 1.4 |
| Photos provided | 10 | 14.1 |

Q 18: SHOW US WHAT YOU 'NORMALLY' DO (MOVEMENTS OF 24 HOURS)

| Activity | n | Percentage (of 53) |
|----------|----|--------------------|
| Cooking | 21 | 39.6 |
| Cleaning | 17 | 32.1 |
| Work | 22 | 41.5 |
| Shopping | 1 | 1.9 |
| Exercise | 2 | 3.8 |
| School | 43 | 81.1 |
| Sports | 13 | 24.5 |

| | | |
|--------------------|---|------|
| Community events | 4 | 7.5 |
| Picnics BBQ | 1 | 1.9 |
| Volunteer | 6 | 11.3 |
| Doctor appointment | 3 | 5.7 |
| Church | 7 | 13.2 |

Q 21: WHAT'S IT LIKE WHEN A FAMILY EVENT, LIKE A BIRTHDAY PARTY OR FUNERAL, HAPPENS?

| Item | n | Percentage (out of 70) |
|--------------------------------|----|------------------------|
| Chaos crazy busy tragi cramped | 22 | 31.4 |
| Work together | 7 | 10.0 |
| Cooking | 5 | 7.1 |
| Overnight stay | 5 | 7.1 |
| Long days nights | 5 | 7.1 |
| Quiet no family | 1 | 1.4 |
| Contacted landlord help | 2 | 2.9 |
| Crowded packed out | 10 | 14.3 |
| Lots of kids people | 11 | 15.7 |
| Mess clean up | 2 | 2.9 |
| Stress on kids | 5 | 7.1 |
| Loud noise | 3 | 4.3 |
| Fun | 4 | 5.7 |
| Memories | 2 | 2.9 |
| Stress everyone | 5 | 7.1 |
| Kids give their room | 3 | 4.3 |
| Elderly separate room | 2 | 2.9 |
| Sleep in lounge | 7 | 10.0 |
| Marae styles | 5 | 7.1 |
| Arrange furniture | 3 | 4.3 |
| Need storage | 4 | 5.7 |
| Extra toilet | 2 | 2.9 |

| | | |
|----------------------------------|----|------|
| Try prevent crowding | 3 | 4.3 |
| Hireage cost | 1 | 1.4 |
| Marae | 1 | 1.4 |
| Church | 5 | 7.1 |
| Local swimming pool | 1 | 1.4 |
| Travelled out of town | 2 | 2.9 |
| Tangi | 11 | 15.7 |
| Wedding | 4 | 5.7 |
| Fa'alavelave | 2 | 2.9 |
| Birthday | 21 | 30.0 |
| BBQs tonai lunch meals | 3 | 4.3 |
| Sports busy | 1 | 1.4 |
| Christmas | 2 | 2.9 |
| Celebrate kids see family | 3 | 4.3 |
| Financial stress | 5 | 7.1 |
| Eat in shifts | 2 | 2.9 |
| Loan debt | 4 | 5.7 |
| Balcony | 3 | 4.3 |
| Index pitch up gazebo | 3 | 4.3 |
| Big area outside | 6 | 8.6 |
| Index we don't host events | 8 | 11.4 |
| Index host only small events | 12 | 17.1 |
| Index family base | 6 | 8.6 |
| Index used to be family base | 3 | 4.3 |
| Dad's house | 5 | 7.1 |
| Uncle's house used | 2 | 2.9 |
| Mum's house used | 4 | 5.7 |
| Grandad's house used | 1 | 1.4 |
| Grandma's house | 2 | 2.9 |
| In-laws' house used | 2 | 2.9 |
| Index better than previous house | 4 | 5.7 |
| Community hall | 5 | 7.1 |

| | | |
|-----------------------|---|------|
| Marae | 3 | 4.3 |
| Double garage | 3 | 4.3 |
| Dining room small | 2 | 2.9 |
| Kitchen small | 3 | 4.3 |
| Corridor | 1 | 1.4 |
| Older sister's house | 1 | 1.4 |
| Older brother's house | 1 | 1.4 |
| Other house | 8 | 11.4 |
| Index house too small | 6 | 8.6 |

Q 22: DO YOU HAVE ANY CONCERNS WHEN EXTENDED FAMILY / FRIEND COME OVER TO THE HOUSE?

| Item | n | Percentage (out of 59) |
|---|---|------------------------|
| Hosting have enough food | 6 | 10.2 |
| Yes at previous house | 7 | 11.9 |
| Yes when moko stay | 4 | 6.8 |
| When short of money | 8 | 13.6 |
| Make people fit | 7 | 11.9 |
| Leaking house | 3 | 5.1 |
| Cost of power | 8 | 13.6 |
| Overcrowded | 9 | 15.3 |
| Cold to study | 9 | 15.3 |
| Cold damp | 7 | 11.9 |
| Not really | 3 | 5.1 |
| Storage | 6 | 10.2 |
| Not sure | 1 | 1.7 |
| Prioritise moko | 5 | 8.5 |
| Messy house | 8 | 13.6 |
| Damage caused during visits | 7 | 11.9 |
| Staying too long upsets people in house | 6 | 10.2 |
| Nothing for kids to do | 5 | 8.5 |

| | | |
|--------------------------------------|----|------|
| Not enough heating | 6 | 10.2 |
| Ok enjoy company | 5 | 8.5 |
| Don't have many visitors | 4 | 6.8 |
| Ok house renovated | 6 | 10.2 |
| Dusty | 1 | 1.7 |
| Limit visitors | 10 | 16.9 |
| Limit visits to weekends | 4 | 6.8 |
| Rearrange routine | 5 | 8.5 |
| Where to sleep people | 5 | 8.5 |
| People coming into rooms | 5 | 8.5 |
| Noisy no quiet | 1 | 1.7 |
| No sleepovers | 1 | 1.7 |
| Lounge used for sleeping marae style | 7 | 11.9 |
| Lots of bedding blankets | 3 | 5.1 |
| Don't party here | 4 | 6.8 |
| Worried family member has asthma | 8 | 13.6 |
| Potholes in lawn | 3 | 5.1 |
| Potential accidents injury dangerous | 6 | 10.2 |
| Property not fenced | 5 | 8.5 |
| Security intrusion strangers | 4 | 6.8 |
| House looks tired old | 5 | 8.5 |
| Shame embarrassed | 10 | 16.9 |
| Bathroom toilet | 6 | 10.2 |
| Furniture | 1 | 1.7 |
| Maintenance | 6 | 10.2 |
| Mould | 4 | 6.8 |
| Kitchen | 3 | 5.1 |
| Walls | 3 | 5.1 |
| Bedrooms freezing | 3 | 5.1 |
| No handrail | 2 | 3.4 |
| Lights fuses | 2 | 3.4 |
| Stress with HNZ | 6 | 10.2 |

| | | |
|------------------------------------|----|------|
| Protecting kids from sick visitors | 8 | 13.6 |
| Kids pickup germs from house | 4 | 6.8 |
| Lack of space | 11 | 18.6 |
| Rooms small | 6 | 10.2 |
| Pests nests rodents | 4 | 6.8 |
| Garage mum's house | 1 | 1.7 |
| In-laws' house | 1 | 1.7 |
| Hall | 1 | 1.7 |

Q 23: WHAT ARE SOME OF THE THINGS YOU DO WELL TO KEEP YOUR CHILDREN SAFE AND WELL?

| Item | n | Percentage (of 12) |
|---|---|--------------------|
| Good education | 7 | 58.3 |
| Public transport | 2 | 16.7 |
| Skin care insect repellent school based nurse | 7 | 58.3 |
| Regular health check | 9 | 75.0 |
| Regular meals | 9 | 75.0 |
| Keep them home | 9 | 75.0 |
| Isolate when sick | 9 | 75.0 |
| Turn heater on | 6 | 50.0 |
| Warm clothes | 9 | 75.0 |
| Supervise closely | 8 | 66.7 |
| Helpless against police social workers | 1 | 8.3 |
| Violence drugs impacted family wellbeing bullying at school | 4 | 33.3 |

Q 29: WHAT HAPPENS WHEN SOMEONE GETS SICK?

| Item | n | Percentage (out of 61) |
|---|----|------------------------|
| Doctor | 42 | 68.9 |
| Worry costs medicine doctors visit | 12 | 19.7 |
| Financial pressures | 8 | 13.1 |
| Declined help from WINZ | 5 | 8.2 |
| 0800healthline | 2 | 3.3 |
| Sleep with kids when sick keep close | 5 | 8.2 |
| Get prescription | 6 | 9.8 |
| Hospital | 14 | 23.0 |
| Keep home keep warm bed | 24 | 39.3 |
| Organise childcare get to work | 13 | 21.3 |
| Drop kids to family | 6 | 9.8 |
| Kids to help each other | 8 | 13.1 |
| Heater fire warm house | 7 | 11.5 |
| Look for deals fuel | 7 | 11.5 |
| Rid fleas bugs itchy skin mice | 4 | 6.6 |
| Fluids, Pamol soup lemon honey Paracetamol | 13 | 21.3 |
| Healthy food no junk | 1 | 1.6 |
| Wash hands routine cover cough | 4 | 6.6 |
| Clean house | 5 | 8.2 |
| Make comfortable, massage traditional healing, Vicks | 12 | 19.7 |
| Finish medicine antibiotics eczema cream | 16 | 26.2 |
| Isolate no visitors | 12 | 19.7 |
| Manage isolation | 8 | 13.1 |
| More warm clothes | 9 | 14.8 |
| Parent sick put up with it get better fast avoid doc cost | 12 | 19.7 |
| Heat pump installed chronic condition | 3 | 4.9 |
| Monitor hazards cold in house | 8 | 13.1 |
| Follow up school asthma skin nurse visit | 9 | 14.8 |
| Ventilation difficult windows hard open | 5 | 8.2 |
| Watchful eye on allergies mood out of character | 10 | 16.4 |

Q 30: TELL ME ABOUT THE KINDS OF THINGS THAT WERE HAPPENING AT HOME WHEN YOUR CHILD GOT A SORE THROAT / SKIN INFECTION

| Item | n | Percentage (out of 39) |
|--------------------------|----|------------------------|
| Clothing | 6 | 15.4 |
| Carpet | 2 | 5.1 |
| Heater | 2 | 5.1 |
| Sore throat | 18 | 46.2 |
| Coughing asthma | 6 | 15.4 |
| Skin sores and allergies | 12 | 30.8 |
| Pneumonia | 1 | 2.6 |
| Scratching body | 2 | 5.1 |
| Antibiotics | 8 | 20.5 |
| Visit clinic | 10 | 25.6 |

Q 31: WHEN THERE'S A PROBLEM AT HOME, HOW DOES IT GET SORTED OUT?

| Item | n | Percentage (out of 64) |
|--|----|------------------------|
| 0800healthline | 3 | 4.7 |
| Talk about it | 11 | 17.2 |
| Adults talk to each other privately | 11 | 17.2 |
| Adults talk to children talk it over | 25 | 39.1 |
| Mum talks sets boundaries | 27 | 42.2 |
| Grandma sets rules | 8 | 12.5 |
| Punishment consequences for fighting loss privileges | 10 | 15.6 |
| Adult seek advice from within family elder | 13 | 20.3 |
| Evening talk prayer get plan of action | 6 | 9.4 |
| Separate kids if fight physically verbally | 9 | 14.1 |
| Give kids chores | 3 | 4.7 |
| Deal with it individually | 6 | 9.4 |
| Give time to cool down and leave | 12 | 18.8 |
| Confront problem stop escalation upfront | 12 | 18.8 |
| Come back try again compromise | 7 | 10.9 |

| | | |
|---|---|------|
| Argue due to financial stress | 4 | 6.3 |
| Apologise when appropriate show respect | 7 | 10.9 |
| Console comfort | 9 | 14.1 |
| Not try to blame | 4 | 6.3 |
| Talk to counsellor clergy expert school nurse church minister | 6 | 9.4 |

Q 36: WHAT KINDS OF THINGS SAVE/ WASTE POWER IN YOUR HOUSE?

| Item | n | Percentage (out of 61) |
|-----------------------------|----|------------------------|
| Heating | 26 | 42.6 |
| Turning off lights | 19 | 31.1 |
| Electric plugs | 17 | 27.9 |
| Tablets phones computers | 14 | 23.0 |
| Television | 13 | 21.3 |
| Hot water cylinder | 13 | 21.3 |
| Fridge/ freezer | 9 | 14.8 |
| Washing machine | 6 | 9.8 |
| Firewood | 5 | 8.2 |
| Dryer | 5 | 8.2 |
| Shower | 5 | 8.2 |
| Insulation | 4 | 6.6 |
| More clothing | 3 | 4.9 |
| Gas bottle cooking | 3 | 4.9 |
| Oven | 3 | 4.9 |
| Hair straightener | 2 | 3.3 |
| Heat loss windows doors | 1 | 1.6 |
| Electric blanket | 1 | 1.6 |
| Running taps | 1 | 1.6 |

HEALTH ISSUES IDENTIFIED BY PARTICIPANTS FROM THE CONSENT FORM

| Illness | n | Percentage (of 44) |
|--|----------|---------------------------|
| Tonsillitis | 1 | 2.3 |
| Hay fever | 3 | 6.8 |
| Boils | 1 | 2.3 |
| Overweight | 1 | 2.3 |
| Hyper anaemia | 1 | 2.3 |
| Depression | 1 | 2.3 |
| Over distress disorder | 1 | 2.3 |
| Hip replacement | 1 | 2.3 |
| Hip strengthened with screws | 1 | 2.3 |
| Skin problems | 5 | 11.4 |
| Intellectual and learning disabilities | 1 | 2.3 |
| Anxiety disorder | 1 | 2.3 |
| Broken fingers | 1 | 2.3 |
| Dislocated shoulder | 1 | 2.3 |
| Sore throat | 5 | 11.4 |
| Attempted suicide | 1 | 2.3 |
| Sleep apnoea | 2 | 4.5 |
| Emphysema | 3 | 6.8 |
| Kidney dialysis/ Haemodialysis | 1 | 2.3 |
| Chest infections | 3 | 6.8 |
| Knee replacement | 1 | 2.3 |
| Down syndrome | 1 | 2.3 |
| Cold/flu | 6 | 13.6 |
| Respiratory problem | 3 | 6.8 |
| GAS positive | 5 | 11.4 |
| Asthma | 17 | 38.6 |
| Major burn | 1 | 2.3 |
| Bike accident | 1 | 2.3 |
| Rheumatoid arthritis | 1 | 2.3 |

| | | |
|-----------------|---|------|
| Eczema | 9 | 20.5 |
| Pneumonia | 1 | 2.3 |
| Bronchiolitis | 2 | 4.5 |
| Strep throat | 4 | 9.1 |
| Rheumatic fever | 6 | 13.6 |
| Coughing | 1 | 2.3 |

HOUSING ISSUES FROM THE CONSENT FORM

| Issue | n | Percentage (of 44) |
|---------------------------|----|--------------------|
| Keep clean | 1 | 2.3 |
| Being renovated | 2 | 4.5 |
| Driveway resurfacing | 1 | 2.3 |
| Draughty | 1 | 2.3 |
| Want subsidies | 1 | 2.3 |
| Want inspection | 1 | 2.3 |
| Need plumbing checked | 1 | 2.3 |
| Need paint | 1 | 2.3 |
| Require beds | 1 | 2.3 |
| Rotten window panes | 1 | 2.3 |
| Don't want elevated house | 1 | 2.3 |
| Asked for wood burner | 2 | 4.5 |
| Keeping warm | 4 | 9.1 |
| Keeping dry | 1 | 2.3 |
| Crowded | 4 | 9.1 |
| Dehumidifier | 1 | 2.3 |
| Leakage | 3 | 6.8 |
| Want larger house | 3 | 6.8 |
| Cold | 20 | 45.5 |
| Damp | 5 | 11.4 |
| Lack of storage | 4 | 9.1 |

| | | |
|------------------------|---|------|
| Want heat pump | 9 | 20.5 |
| Rodents | 3 | 6.8 |
| No carpet | 3 | 6.8 |
| Electricity bill debt | 1 | 2.3 |
| Steep hill | 1 | 2.3 |
| Rubbish | 1 | 2.3 |
| Warm Fuzzies | 1 | 2.3 |
| Drafty windows | 4 | 9.1 |
| Ventilation | 1 | 2.3 |
| Mould | 7 | 15.9 |
| Window weepy | 1 | 2.3 |
| Insulation low quality | 3 | 6.8 |
| Trim trees for light | 1 | 2.3 |
| Window replacement | 1 | 2.3 |
| Recently renovated | 3 | 6.8 |
| Need firewood | 1 | 2.3 |
| Need repairs | 1 | 2.3 |
| Spouting | 1 | 2.3 |
| Need sunlight | 1 | 2.3 |
| No storage | 1 | 2.3 |
| No floor coverings | 1 | 2.3 |
| Clean moss from window | 1 | 2.3 |

DESCRIPTIVE STATISTICS ON OCCUPANCY BY RESPIRATORY DISEASE

| | | Total people | adult | children | Ppl/bedroom |
|--------------------------|----------------|----------------------|--------------------------|--------------------------|--------------------------|
| no respiratory illness | Mean | 5.2941 | 2.000 | 3.846 | 1.4011 |
| | N | 17 | 14 | 13 | 15 |
| | Std. Deviation | 2.36550 | .9608 | 2.1153 | .64447 |
| | Median | 5.0000 | 2.000 | 3.000 | 1.3333 |
| | Minimum | 1.00 | 1.0 | 1.0 | .33 |
| | Maximum | 9.00 | 4.0 | 7.0 | 3.00 |
| some respiratory illness | Mean | 5.2963 | 2.188 | 2.824 | 1.5788 |
| | N | 27 | 16 | 17 | 26 |
| | Std. Deviation | 1.65981 | .6551 | 1.3339 | .46252 |
| | Median | 5.0000 | 2.000 | 3.000 | 1.6333 |
| | Minimum | 1.00 | 1.0 | 1.0 | .33 |
| | Maximum | 8.00 | 3.0 | 6.0 | 2.33 |
| Total | Mean | 5.2955 | 2.100 | 3.267 | 1.5138 |
| | N | 44 | 30 | 30 | 41 |
| | Std. Deviation | 1.93595 | .8030 | 1.7604 | .53533 |
| | Median | 5.0000 | 2.000 | 3.000 | 1.5000 |
| | Minimum | 1.00 | 1.0 | 1.0 | .33 |
| | Maximum | 9.00 | 4.0 | 7.0 | 3.00 |
| ANOVA F, df | | F=0.000, df=1, 42 | F = 0.399, Df = 1, 28 | F = 2.625, Df = 1, 28 | F = 1.050, Df = 1, 39 |
| | | p = 0.997 | P = 0.533 | P = 0.116 | P = 0.312 |

There were no statistically significant differences between the two groups for any of the occupancy parameters. Those houses with a respiratory illness had a slightly higher mean number of people per bedroom but it was not statistically significant. These analytic results were confirmed using nonparametric (Wilcoxon test) methods.

NUMBER OF HEATERS SHOWN IN HOUSE PLANS

| Number of Heaters | Frequency | Percent |
|-------------------|-----------|---------|
| 0 | 22 | 28.2 |
| 1 | 39 | 50.0 |
| 2 | 11 | 14.1 |
| 3 | 4 | 5.1 |
| 5 | 2 | 2.6 |
| Total | 78 | 100.0 |

Occupancy

1. Who lives here?
2. How many people normally live here?
3. Do you have any pets?

Structural features of the house

House plan / Measuring distances of the main living areas

4. How many bed rooms are there?
5. How many people can fit all together in your house?
6. What rooms are used for storage?
7. Do you wish you had more storage areas in your house?
8. Where does everyone sleep?
9. Can we draw a plan of your house – would you mind showing me around the house?

Tenure and house conditions

10. Do you rent/board/mortgage?
11. Do you think your house is crowded?
12. How many people should live here?
13. How many extra rooms would make your family happier?
14. What kinds of problems would more rooms help fix for your family?
15. What's the best thing about your house?
16. What's the worst thing about your house?
17. Is your house used for any special medical equipment like dialysis machine or home detention?

Managing household movements

18. Show us what you 'normally' do from the time you go to sleep, wake up in the morning, leave for work/school, return home (movements of 24 hours)
19. Who do you spend the most time with when you're at home?
20. What's it like during the weekend – are there more people or less people?
21. What's it like when a family event, like a birthday party or funeral happens?
22. Do you have any concerns when extended family/friends come over to the house? What are they?
23. What are some of the things you do well to keep your children safe and well?

Sleep and napping

24. How much of a problem is the following for you? The time it takes my child to fall asleep
No problem/Small problem/Moderate problem/Large problem
25. How much of a problem is the following for you? My child's sleeping patterns or habits
No problem/Small problem/Moderate problem/Large problem
26. Younger (pre-school) children and napping: Thinking about the past 7 days, how many naps did your child usually have during the daytime, during the week (Monday to Friday)?
27. During the weekend (Saturday and Sunday)?
28. Is your child transitioning away from napping (now not needing a nap every day)?

Yes (does not nap every day)/No (naps every day)/Has stopped napping completely/Don't know

Managing illness

29. What happens when someone gets sick?
30. Tell me about the kinds of things that were happening at home when your child got a sore throat/skin infection?
31. When there's a problem at home, how does it get sorted out?
32. Who's responsible for cleaning up at home?
33. What chores do people have at home? (kitchen duties/laundry/cleaning/care of children and elderly)

Fuel poverty

- 34. What type of power/energy does your house use?
- 35. Are you worried about the power bill?
- 36. What kinds of things save/waste power in your house?
- 37. If a natural disaster like an earthquake or tsunami hit your house, how well are you prepared? Do you have the essentials like food, water and first aid kit in your house?