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Central Heating: Uncovering the impact on social relationships and household management

A final report to the Eaga
Partnership Charitable Trust

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behalf of the Torbay
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Group
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Executive Summary

Background and Aims

The recently completed Watcombe Housing Project used a randomised design to assess the influence, if any, of improving housing conditions on the health of residents. This highly-structured quantitative design was transferred as far as possible from a clinical setting to a council-owned housing estate. One outcome was the obvious difficulty this design had in fully capturing the multi-faceted psycho-social dimension of people's lives that contributed to their emotional and physical health. A small integrated qualitative study identified several potentially important issues relevant to the health of residents which merited further exploration.

The present study was thus designed to draw upon these initial qualitative findings and, using semi-structured interviews, explore the social structures, processes and interactions associated with living in cold houses. A more quantitative approach using structured interviews on a larger sample was also employed, integrating with our qualitative survey, assessing generalisability of findings from the Watcombe Project. The intention of integrating quantitative and qualitative methods in this way was to promote understanding of the wider social issues of living in cold households by assessing:

- Use of the house, and the well-being, and relationships of the household and beyond.
- Energy use, methods of payment and costs.
- Respondents' perception of their dwelling and area.

To provide evidence to inform housing improvement strategy by assessment of:

- The factors influencing energy use of the household.
- Residents' knowledge of how to operate the heating system efficiently and effectively, and the importance of ventilation to the indoor environment.

To develop a questionnaire capable of being used in later work.

Design

The study had a before and after design with tenants whose houses had no central heating - but were about to - being interviewed. The interviews were repeated after the installation of central heating.

A total of 43 structured interviews were conducted pre central heating with a subset of 12 semi-structured interviews. Post central heating the same sample was approached and 38 agreed to participate again with the same 12 respondents to semi-structured interviews. Interviews were conducted between July and October 2002 and between February and April 2003 with the residents of Teignbridge Council houses and flats and those of the Riviera Housing Trust, both in South Devon.

Results

Pre central heating:

Living with cold was a main theme for most households and its subsequent effect on activities such as having to use only one room. The cost of heating was an issue for many households. Other themes drawn from the semi-structured interviews included self-esteem as a householder, the role of parent, lack of motivation to maintain the house, stress and conflict in relationships, lack of control as a social housing tenant.

Post central heating:

Householders reported using more of the house which was warmer and drier. Cost remained an issue but varied in importance. Opportunities for leisure and study improved, there was increased motivation to maintain the house and this resulted in more social interaction. There was a perceived improvement in relationships and health. There were also issues around the communication between householders, contractors and housing managers: information on the new systems was variable, the relationship between tenants and contractors reflected the residents' status as tenants.

Conclusion

The study has demonstrated the validity of the small qualitative element of the Watcombe Project. Most importantly the less obvious benefits, over and above thermal comfort of living in warmer houses, have been reinforced. Thus this much larger and robust study has provided persuasive and publishable findings which add new dimensions to the issues surrounding thermal comfort and concepts to explore in housing research. The complex, multi-level social constructs and influence on relationships revealed here have implications for the strategy of housing trusts, associations, and councils. The study also indicates the need for an increased emphasis on interpersonal relationships, educational attainment and emotional well-being, as outcomes in housing research, to complement health outcomes.

1 Aims

The aims of this study were:

- 1.1 To promote understanding of the wider social issues of living in cold households and then warmer ones by assessing:
 - Energy use, methods of payments and costs
 - Use of the house, the well-being of residents and relationships within the household and beyond
 - Respondents' perception of their dwelling and area.

- 1.2 To provide evidence to inform housing improvement strategy by assessment of:
 - The factors influencing energy use of the household
 - Residents' knowledge of how to operate the heating system efficiently and effectively, and their perception of the importance of ventilation to the indoor environment.

- 1.3 To develop a questionnaire capable of being used in later work. (The study was intended to build upon the retrospective, qualitative study undertaken as part of the Watcombe Housing Project. ^{1,2})

2 Background

- 2.1 A literature search was carried out using clinical databases, and included: the Dept. of the Environment, Transport and Regions; regeneration projects; the Joseph Rowntree Foundation; the National Centre for Social Research; the Economic and Social Research Council; housing journals; the National Research Register, and the King's Fund.
- 2.2 The association between damp housing and asthma has been well recorded in a review of studies which included Martin: 1987; Strachan: 1988; and Platt: 1989.³ The impact upon children's health is highlighted in these studies, especially where there is evidence of mould. Longitudinal studies have shown a link between children raised in poor housing (particularly in overcrowded and damp or mouldy conditions) and their health as adults, even where housing conditions are improved in adult life.⁴
- 2.3 The psycho-social aspects of the home conditions were explored in a multi-variate analysis by Kearns et al⁵, indicating that problems with dampness, lack of warmth and space had a corresponding effect on well-being, as well as exacerbating stress leading to ill health. More recent work by Sullivan, et al⁶ has reinforced the effect of housing conditions, particularly damp, on emotional well being. However, these and other similar studies have been quantitative, whilst Thompson et al⁷ argue that assembling evidence requires a holistic approach, combining quantitative and qualitative methods.
- 2.4 Two recent publications^{8, 9} reviewed research evidence of the affects of cold and poor housing on physical and mental health, including excess winter mortality, increased respiratory illness, accidents in the home and risk of heart attacks and strokes, worsening arthritis, and adverse effects on children's education.
- 2.5 Following many years of organisations raising the profile of housing and health, there is now the political will to tackle health inequalities, as evidenced by the Department of Health cross cutting review "Tackling Health Inequalities"¹⁰, which states as an aim, "Improving the quality and availability of housing, especially high quality supported housing, with adaptation if needed, for those who need it – above all for teenage parents, families with young children and for older people on low incomes."

2.6 Recent studies have used qualitative methodologies and lay knowledge to research elements of the impact of house improvements including one by Gemmell¹¹ which found that inadequate home heating is associated with the poor health of 55-60 year olds. However, little research has taken place based on the wider psycho-social aspect of health following installation of central heating. No studies were found that used qualitative interviews to explore subjectively the comparison of the use of the space of the house and changes to behaviour and relationships within the household, pre and post installation of central heating.

2.7 Much is still to be gained from a greater understanding of the relationship between process and outcome. It became apparent in the Watcombe Housing Project that the effectiveness (change in health status), of an intervention (housing upgrades), although immensely valuable, does not explain all of the complex issues that occur between the two, and that health status and comfort are not the only outcomes of housing upgrades. The qualitative study, completed as part of the Watcombe Project, of a purposive sample of the study population included the following key findings:

2.8 Pre central heating:

- Activities in the house and personal space were limited, due to the cold, leading to a conflict in relationships
- Lack of motivation to maintain the house.

2.9 The overall warmer temperature in the house post central heating resulted in all the rooms being utilised. The outcomes were:

- Improved health and relationships
- Increased opportunities for study and leisure
- Higher self-esteem and motivation to maintain the house
- Less time off school and work due to respiratory illness.

These findings were unexpected and potentially important to the continuing housing issues debate. Although there is a well established association between housing conditions and physical and mental health, the extent to which interpersonal relationships within the family and outside could be influenced by a warmer home was hitherto unclear. Households with small children seemed to benefit the most.²

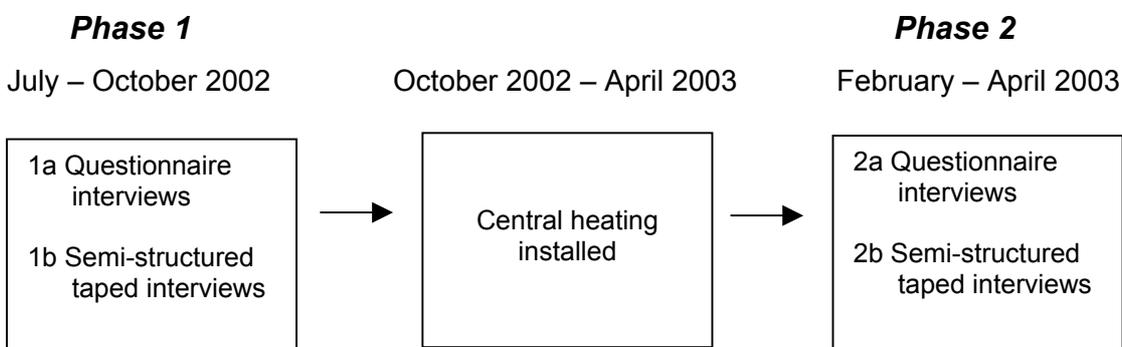
2.10 The present study will extend the knowledge of the socio-psychological effects upon households of a warmer and drier internal environment. Understanding the levels of householders' knowledge of how to operate the central heating systems effectively and efficiently is important. The costs of energy use could have important implications for housing strategy, service providers and Central Government with regard to the impact of the Warm Front Initiative. As Janet Rudge in her report for Eaga Charitable Trust¹² suggests, having central heating in the house does not mean that the householder can afford to run the system.

3 Design and Method

3.1 Study Design

The basic design is a before and after interview survey in households that had no central heating initially, but had it installed as part of the improvement programme of the Riviera Housing Trust and Teignbridge Council, who manage the social housing in Torbay and Teignbridge respectively. Two levels of personally administered interview were used.

Figure 1 - Study Timetable



3.1.1 *Phase 1A. Questionnaire interviews (see Appendix A).* 36 householders and 7 flat dwellers were interviewed in their own homes between July and October 2002. The resident who was at home the most was the target respondent. Demographic information about the households was collected with additional information about:

- Cost of heating, methods of payment, type and use of energy, comfort levels
- The respondent's understanding and knowledge of the importance of ventilation in reducing pollution indoors
- The use of the space of the house/flat and the effects of temperature on activities i.e. housework, decorating, studying and bathing
- Whether health of respondents and other members of the household were affected by the temperature in the house/flat
- Whether the temperature in the house/flat affects social activities e.g. inviting other people outside of the household into their homes
- Whether people like the area and the house/flat they live in.

- 3.1.2 *Phase 1B. In-depth taped interviews.* From the 43 householders interviewed by structured questionnaire, 12 chose to participate in semi-structured, taped interviews. None of the flat dwellers wished to be interviewed. The sample reflected a range of domestic situations, as well as levels of comfort (see Appendix B: Details of interviewees). The interviews were based on the simple question “What is it like to live in your house in wintertime?” with prompt questions being used to enlarge upon responses. The use of the house, and interactions within it, household’s social life with neighbours and friends and how these are manifested within social structures and processes were explored, as was the ability to pay for different forms of heating.
- 3.1.3 *Phase 2A. Questionnaire interviews.* Following the installation of central heating, which took place between October and March 2003, the two phases of interviews were repeated between February and April 2003. 35 households and 3 flat dwellers were re-interviewed using the same basic questions with “now that you have central heating” inserted. In addition, respondents were asked about any verbal or written information given, their understanding of how to use the new heating systems, and whether households had, and used, fixed ventilation systems i.e. fans or trickle vents. Respondents were also asked if they had had any energy efficiency advice since the previous interview and any comments they wished to make about the process of improvements. The interviews were conducted after the residents had had at least 6 weeks use of their central heating systems. The number of the questionnaire respondents was reduced in phase 2 because 3 of the flat dwellers refused to have the central heating installed, 1 flat dweller was unavailable, and 1 original house respondent declined to participate.
- 3.1.4 *Phase 2B. Twelve semi-structured interviews* were completed examining any changes that had occurred following the installation of central heating.
- 3.1.5 *Questionnaire development.* The tenant representatives who had been part of the previous Watcombe Project were involved in reviewing the questionnaire and the other literature, used to give information to potential study participants. From their comments text was amended if it was felt to be ambiguous or not easy to read. The structured questionnaire is attached at Appendix A.

3.2 Data Management and Analysis

3.2.1 *Ethical issues.* All households were given a study number for confidentiality and gave their written consent to participate in the study. Riviera Housing Trust and Teignbridge Council gave their permission to approach tenants and the Torbay Local Research Ethics Committee granted ethical approval.

3.2.2 *Data handling.* Data from the structured interviews were entered into SPSS and the content of the open-ended questions were analysed, numerically coded and entered with the other data. Descriptive statistics are presented in terms of means or medians, as appropriate. Associations between variables were explored using χ^2 tests. Inter-phase comparisons were made using Wilcoxon matched pairs or other tests, as appropriate. A confidence level of 5% was used throughout. Although a range of relationships was explored, only a limited number of *a priori* hypotheses were examined. Other significant associations should be regarded as hypothesis-generating rather than explanatory. The in-depth interviews were tape recorded and transcribed. Each line was numbered to facilitate retrieval of text. Data thus generated were analysed using a pluralistic methodology including grounded theory, a process of continuous comparison to identify patterns and irregularities in implicit and explicit psychosocial processes. In this way, theories were developed inductively, being tested in subsequent interviews. Using open coding, analysis led to the development of a conditional matrix which identifies the micro/macro influences on the data¹³. By this method the intervening or confounding factors can be recognised and form part of the analysis. Using the ontological perspective of people's experience, the interviews provided a wealth of in-depth qualitative data that cannot be captured by quantitative methods alone. A deeper understanding of the context of interactions and social problems, why they occur and how they are manifested was gained, particularly with regard to relationships within the household.

3.3 Intervention

3.3.1 *Heating.* Before the installation of central heating a variety of heating methods were used including free-standing electric heaters upstairs and down, fixed gas fires upstairs and down and in hallways. 3 houses only had one heated room with no other form of heating. Others had a variety of methods. It was clear that levels of thermal comfort and cost varied across our population. All households received full

gas-fired central heating systems installed between October 2002 and March 2003. Some households retained their open fire or gas fire in the living room. The gas wall heaters were removed from the hallway and upstairs and some chimneys were bricked up.

3.3.2 *Other improvements.* Additional measures to improve thermal comfort and efficiency were provided to some of the houses in both the Riviera Housing Trust and Teignbridge Council. These included wall cladding and insulation, roof insulation, or, in some cases, double glazing. In addition, some had security lights and smoke alarms. Without a factorial design it is not possible to tease out the influence of individual elements in a package (central heating alone, for example). What we have done, therefore, is to concentrate as far as possible on the effect of thermal comfort on the lives of respondents. Some additional interventions may add marginally to the warmth of the dwelling but we are not able to distinguish any separate influence.

4 Results

4.1 Response Rates

4.1.1 Of 145 households due to have central heating installed, 4 refused installation leaving 141 eligible for inclusion in the study. The response rates reflect the problem of having to approach many residents by post and via the landlord. Where a personal visit was possible, the response rate was higher.

4.1.2 Overall 65 (46%) households did not respond at all to the original letter. Of those that did 32 (23%) declined to participate.

4.1.3 **Phase 1 1a** 43 (31%) people took part in a personal interview (36 houses and 7 flats).

1b 12 in-depth taped interviews were completed. These were self-selected from the above sample.

Phase 2 2a 38 households took part in a second personal interview (35 houses and 3 flats).

3 of the flats refused central heating after completing the Phase 1 questionnaire. 1 house dweller declined to participate and 1 flat dweller was unavailable for interview. All houses had gas central heating installed except two, which did not have piped gas to the village and so had oil fired central heating installed.

2b 12 in-depth taped interviews were completed by the same sample as Phase 1b. All had had gas central heating installed.

4.1.4 The 3 flat dwellers who refused to have central heating installed were asked by the researcher, in a letter, if they would give the reasons for this. Their responses are given below.

Study No. 1 – female 74

“My first reason was I didn’t want the upheaval, secondly it was being done in the cold weather and even if they done one room at a time it would have left me without

heat for several days. Thirdly when I saw my neighbour's I didn't like it. My fourth reason is that I like the storage heaters."

Study No. 15 – female 64

"My reason for not having gas central heating installed is that I do not like gas and would like to keep with the storage heating I have already got."

Study No. 17 – male and female 67

1. "We are both satisfied with the N.S. heating (Night storage)"
2. "We did not want much upheaval. We saw what the lady in the flat below us had done. It was a good job she was away at the time."
3. "We are not keen on having gas, especially in a block of flats."

4.2 Demographic and Descriptive Details of the Study Group of 43 Households

4.2.1 *Residences.* In Phase 1 the study sample consisted of 7 flats, and 36 modern, older terraced or semi detached houses. None of the flats and only 9/36 houses had a separate dining room. All of the flats had 1 bedroom.

4.2.2 *Occupancy*

Table 1 - Number of occupants by number of bedrooms

	Number of occupants - houses							Total
Beds	1	2	3	4	5	6	7	
2	4	3	1	1	0	0	0	9
3	2	4	6	4	6	1	3	26
4	0	0	0	0	0	1	0	1
Total	6	7	7	5	6	2	3	36
	Number of occupants - flats							
1	5	2	0	0	0	0	0	7

Houses. As can be seen from Table 1, the 36 households range from single occupancy in two and three bedroom houses to 7 occupants in a three-bedroom house. Some houses are overcrowded using the Survey of Housing Definitions¹⁴.

4.2.3 Age

Table 2 - Age groups of people in houses and flats

Ages of people in houses										Total
Ages	0/5	6/15	16/25	26/35	36/45	46/55	56/65	66/75	75+	
Number	8	39	22	7	21	13	8	1	5	124

Ages of people in flats							Total
Ages	26/35	36/45	46/55	56/65	66/75	75+	
Number	1	0	0	3	4	1	9

As can be seen from Table 2, 8 of the 9 occupants of the flats were over 55 yrs. Of the 124 total occupants of the houses, 69 (56%) were under the age of 25. Large numbers of children contribute to overcrowding identified above.

4.2.4 Income and deprivation details

Table 3 - Net Income of households

Code	<£150/wk	<£200/wk	<£250/wk	<£350/wk	<£400/wk	£400+/wk	Refusal
Houses							
Phase 1	8	7	9	8	0	2	2
Flats							
Phase 1	6	0	0	0	0	0	1

The gross national average weekly wage was £465¹⁴ but in Torbay it was £340.20 and for Devon as a whole £376.70. Only two households were above this figure, with the majority being much lower. Two of the areas in the study are in the top quartile of the index of multiple deprivations, whilst the others are all ranked as deprived.¹⁵

4.2.5 *Methods of heating before central heating installed.* The heating systems of the houses varied and included: storage heaters, coal, calor gas, fixed gas fires and portable electric fires/radiators, but none used paraffin, oil or any other fuel. Twenty-one used gas for cooking, 14 electric cookers and 1 microwave. 19/36 (53%) houses had fixed gas fires up and down, usually including the hall. 8/36 (22%) houses had no gas, including one rural area, which had no piped gas to the village. The flats were heated by electric fires or storage heaters, with one using calor gas; there were no gas fires used at all.

4.2.6 *Fuel poverty.* 5 of the 7 flats and 8 houses (22%) received the annual government allowance for fuel of £200. Before central heating, 7 households (19%) had fuel bills of at least 10% of their income, the highest being nearly 17%. None of the occupants of flats had fuel costs as high as 10% of their income.

4.3 Respondents' Views Before Central Heating

4.3.1 *The area.* The large majority of house respondents (32 – 89%) and 4/7 of the flat dwellers said that they liked the area to some degree. Only 3 householders and 1 flat dweller did not like the area. The reasons varied but included familiarity, countryside views and being close to amenities, family and friends.

4.3.2 *The residence.* Some respondents disliked nothing about their house (15/36 – 42%) or flat (1/7). Reasons for disliking it included house design or heating, being draughty or having damp or condensation. Additional comments from the flat dwellers were about anti-social behaviour and noise through lack of soundproofing.

4.3.3 *Temperature and comfort.* Residents' perceptions of the temperature of various rooms in the house are displayed in Figures 2 and 3.

Figure 2 – Temperature levels in houses pre central heating

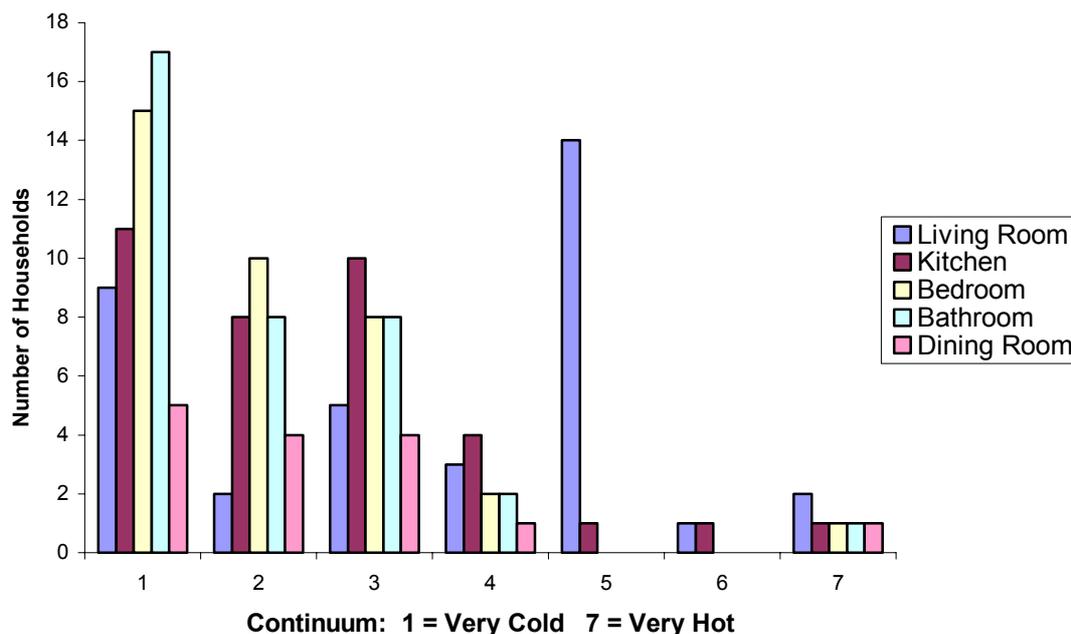
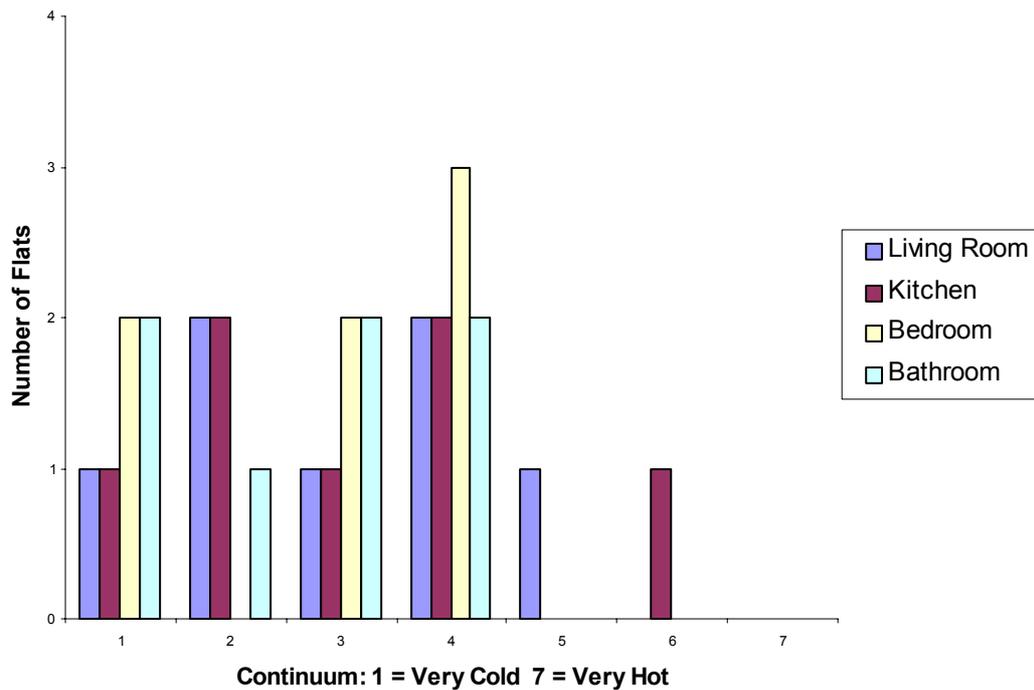


Figure 3 – Temperature levels in flats pre central heating



The majority of the house respondents reported that although they kept the living room fairly warm during the winter the rest of the house remained cold. Most of the flats show that temperatures generally were neither hot nor cold or on the cooler side. Figures 2 and 3 show this clearly. There were many complaints about the metal windows, in both houses and flats, which had become warped over the years and were very draughty and insecure. When asked to describe what feeling comfortable meant to them, the majority of people said warm, and/or cosy, and/or using all of the house/flat without being cold. It can be seen from Figures 4 and 5 that, except for the living room, few house/flat dwellers felt comfortable in their homes, the bedroom and bathroom being the least comfortable.

Figure 4 – Comfort levels in houses pre central heating

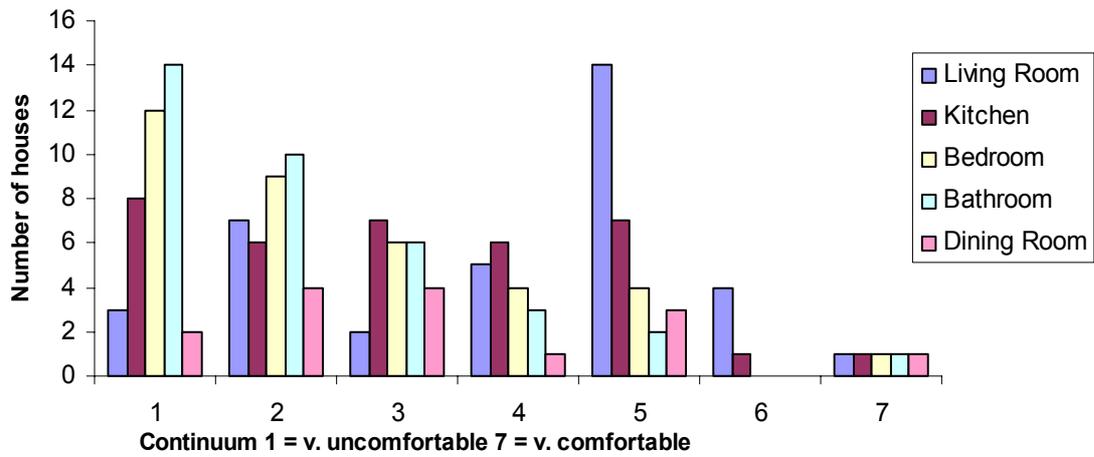
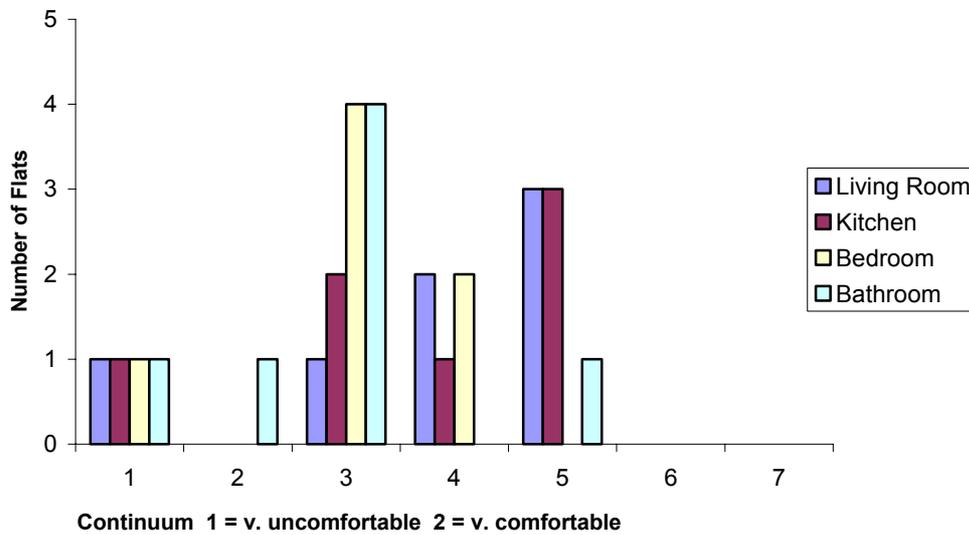


Figure 5 - Comfort levels in flats pre central heating



4.3.4 *Social and other activities.* The respondents were asked whether or not they used the rooms in the house/flat in wintertime differently or the same. The results are shown in Table 4. 22/36 (61%) of houses used the rooms differently in wintertime and 2/7 flats. 25/36 (69%) of respondents in houses and 6/7 in flats stated that the temperature in rooms did affect their activities in some way and, in their opinion, affected the lives of other members of the household in 27/35 (81%) of times (see Table 5). Studying and bathing by other members of the house are reported to be the activities most affected by the cold temperature in other rooms. The effect in flats appeared to be less noticeable. It can also be seen that 15/36 (42%) of house respondents felt negative physical/emotional effects due to the cold and 6/36 (17%) felt others in the house to be similarly affected. There is a clear perception of an adverse effect of low temperatures on activities and mood.

Table 4 – Different use of rooms in winter

No of houses	No of flats	What difference in use of rooms?
14	5	No difference at all
14	1	Stay in one room mostly
6	0	Restricts activities in other rooms
4	0	House ventilated more in summer
0	1	Use kitchen more to wash instead of bathroom
1	0	Move rooms to ensure they don't get damp
2	0	Go to bed early because of cold
1	0	Not nice to sleep in damp
1	0	Use heating more

(NB Numbers do not sum to 36 as respondents may give more than one answer)

Table 5 - Effects of temperature of house upon activities and mood (self and others)

Number of houses		Number of flats		Effects of temperature?
Self	Others	Self	Others	
11	7	1	1	Does not affect me
12	2	1	0	Don't want to do housework in cold rooms
15	6	1	1	Don't decorate as cold negatively affects outcome
5	16	1	0	Affects use of upstairs room to study
6	12	1	0	Puts off bathing/showering
2	3	1	0	Find warmer place to undress/dress/wash
18	9	1	0	Bath/shower quickly because of cold
15	6	1	0	Negative physical/emotional affects because of the cold
0	1	0	0	Not so much peace and quiet
0	6	0	5	No other people in household

(NB Numbers do not sum to 36 as respondents may give more than one answer)

4.3.5 *Health issues.* Table 6 indicates that 5/36 (14%) of house respondents felt that the temperature in the house affected their mental well-being and 2/7 of the flat dwellers also reported this. Pain levels, and/or circulatory disease, negatively affected 9/36 (25%) of house respondents, and 2/36 (6%) of other members of the household, with 3/7 of the flat dwellers also reporting pain levels being affected by cold. The perception of the influence of cold on health at this stage is not marked. However, colds and respiratory health generally is thought to be more influenced.

Table 6 - Explanations from respondents of the effects of temperature on health

Number of houses		Number of flats		Health effect
Self	Others	Self	Others	
12	8	2	2	Doesn't affect health at all
5	0	2	0	Cold makes me feel depressed/withdrawn/fed up
0	0	1	0	Wear different/more clothing
5	2	3	0	Cold affects level of pain
6	0	0	0	Don't want to do anything/lazier/reluctant to move
12	21	0	0	Increased illness mainly colds/respiratory
1	4	0	0	Mould affects health
4	0	0	0	Affects circulatory illness
0	1	0	0	Cold affects babies/sleep with adults
1	0	0	0	Not so comfortable
0	6	0	5	No other people in the flat/house

4.3.6 *Inviting other people into the house.* The majority 22/36 (61%) of respondents said that they did not feel that the temperature in the house affected whether or not they invited others into the house. 7/36 were non-committal and 7/36 thought it did affect them in some way. Only 1/7 of the flat respondents felt that it did affect them inviting people into their home.

4.3.7 *Ventilation.* The majority ventilated the house every day in wintertime with 33/36 (92%) stating that they felt it was important, compared to 4/7 in the flats. Several people commented that they did not ventilate when it was cold, if that meant that the heat was going to go out through the window.

4.4 Relationships Between Variables Pre Central Heating

4.4.1 *Number of people and the effect of cold on health.* The number of people in the house, the temperature and comfort were investigated using chi-squared tests. The responses to these questions were on a 7-point scale but this was reduced to three categories for the purposes of analysis (to allow sufficient numbers for the tests). There was **no evidence** of a relationship between the number of people and the effect of wintertime temperature on the respondents' health ($p > .2$), on other people's health ($p = .14$) or on inviting other people into the house ($p > .2$).

4.4.2 *Effect of living room temperature.* There was **no evidence** of a relationship between the *living room temperature* and the effect of wintertime temperature on the respondents' health ($p > .2$) or on other people's health ($p > .2$). However, **there**

was a significant relationship between the *living room temperature* and *inviting other people into the house* ($p = .02$). This indicates that people felt inhibited about inviting people into their houses because of the lack of comfort. One of the reasons given, by the majority, was because it was cold.

4.4.3 *Effect of bedroom temperature.* A significant relationship was also found between *bedroom temperature* and the effect of wintertime temperature on the respondent's health ($p = .02$). There was a *little* evidence of a relationship between *bedroom temperature* and the effect of wintertime temperature on other people's health ($p = .058$) but no evidence of a relationship between *bedroom temperature* and the effect of wintertime temperature on inviting other people into the house ($p > .2$). The majority of people had indicated in the descriptive details that the rest of the rooms in the house were much colder than the living room, and that they felt this affected their health.

4.4.4 *Effect of the level of comfort in the living room.* There was a **significant relationship between *living room comfort* and the affect of wintertime temperature on the *respondent's health* ($p = .04$),** but no relationship with other people's health ($p = .10$) or inviting other people ($p > .2$). This reflects the fact that, even though the temperature in the living rooms was higher than the rest of the rooms of the house, it was still not comfortable for some people.

4.4.5 *Effects of bedroom comfort.* There was a **significant relationship between *bedroom comfort* and the effect of wintertime temperature on *other people's health* ($p = .02$),** but not with respondent's health ($p = .12$) or inviting other people ($p = .14$). The descriptive details indicate that the upstairs level of comfort was low and related to parents' fears about their children's health.

4.4.6 *Effects of temperature and comfort on activities.* A chi-squared test was used to look for associations between temperature and comfort in all rooms except the dining room (too few had these) and activities. The temperature and comfort variables were, as before, reduced to 3 categories to give sufficient numbers for the tests although, in some cases, the numbers were still quite small. The significant ones

were: (p –values in brackets).

Temperature - Bedroom (.005) Kitchen (.010) Bathroom (.014)

Comfort – Bedroom (.011) Living room (.001) Kitchen (.043) Bathroom (<.001) were all associated with **decorating**

Temperature –Bedroom (<.001) Bathroom (<.001)

Comfort - Bedroom (.003) Bathroom (<.001) were all associated with **bathing**

Temperature - Bedroom (.027) and Kitchen (.002) were associated with **studying**

Temperature – Bedroom (.012) Bathroom (.024)

Comfort - Bedroom (.001) Bathroom (.026) were all associated with **others bathing**

Temperature – Bedroom (.009) Kitchen (<.001)

Comfort – Bedroom (.038) Living room (.018) were all associated with **others studying**.

4.5 **Quantitative Comparison of Pre and Post Central Heating**

4.5.1 *Respondents*. The number of people living in households participating in the second phase of the study had not changed except for one person no longer living at home. All households had gas central heating installed; the exceptions were two households who had no piped gas to their houses and so had oil-fired central heating installed.

4.5.2 *Liking the area*. Comparing the responses to what people liked about their house, replies changed from being mostly about the area and design of the house, to liking the comfort and warmth and more freedom to use the space of the house. Only one of the flat dwellers remarked on the warmth and comfort.

4.5.3 *Meaning of comfort*. There was almost exactly the same response pre and post central heating, as to what 'being comfortable' meant to people. Again responses referred largely to thermal comfort rather than any other. However, the increased warmth did not influence the residents' liking of the house or flat; those who initially said they disliked their flat or house still felt the same about it.

4.5.4 *Comfort levels.* It can be clearly seen in Figures 6 and 7 that the comfort levels in the bathroom and living room were virtually reversed, in that the majority placed their responses in the ‘comfortable’ half of the chart following the installation of central heating. The exception was the household that was having problems with their central heating working properly, and who felt very uncomfortable.

Figure 6 – Comparison of comfort levels of bedrooms in houses pre and post central heating

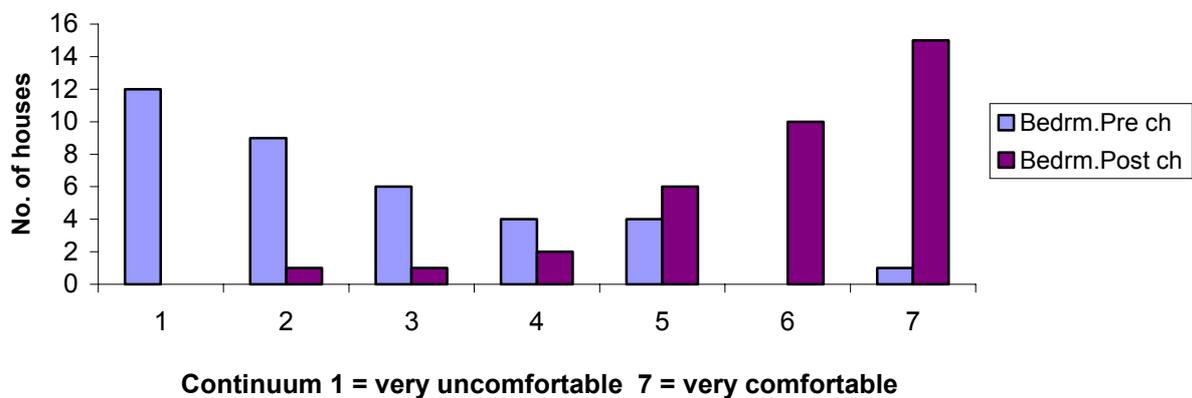
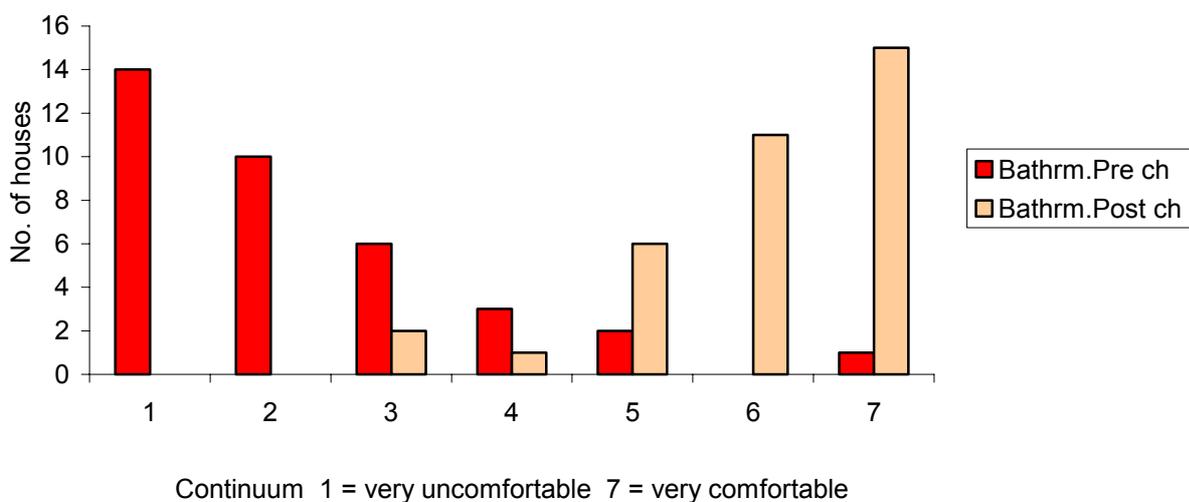


Figure 7 – Comparison of comfort levels of bathrooms in houses pre and post central heating



- 4.5.5 *Using the house differently post central heating.* 22/35 (63%) of householders indicated in their response that they had more freedom or that it was pleasant to use all the rooms in the house now that there was overall warmth.
- 4.5.6 *Effect on activities.* For housework and bathing, more respondents said that the temperature affected them post central heating but in a positive sense, as analysis of the open question asking why it affected them showed: 21/35 (60%) of respondents said they felt that baths were a pleasure or stayed in longer, 8/35 (23%) said they felt more motivated to do housework and decorating. A similar result was reported by the respondent for others in the house but with decorating and housework being the least reported by the respondent, whereas studying and bathing were the most affected. Again the responses to the open question elaborated on the reason for this change 17/35 (49%) of respondents said they thought that others in the house (mainly children or young adults) felt studying was more comfortable and that bathing was more of a pleasure for 22/35 (63%) of others in the household. The effect of having central heating, apart from the general comfort, was not reported by respondents living in a flat, to have affected any of their activities. The elements that respondents highlighted that they disliked about their flat in the open questions were mainly, for example, i.e. noise and anti social behaviour.
- 4.5.7 *Effect on inviting people into homes.* Almost one quarter (8/35, 23%) of respondents felt that the warmer homes influenced whether or not they were able to invite people in. As before central heating the majority (26/35, 74%) felt that it made no difference in this respect.
- 4.5.8 *Income, work and being at home.* Residents were asked to estimate their net weekly income. There were no major difference between the two phases. Table 7 shows the proportion in each income band by phase. Similarly the same numbers of residents reported being 'at home' during the day in both phases (26/36 and 22/35 respectively).

Table 7 - Levels of income pre (Phase 1) and post (Phase 2) central heating

WEEKLY INCOME (£)	<150	150-199	200-249	250-349	350-399	400+	Refused
HOUSES							
Phase 1	8	7	9	8	0	2	2
Phase 2	9	8	9	5	1	1	2
FLATS							
Phase 1	6	0	0	0	0	0	1
Phase 2	3	0	0	0	0	0	4

4.5.9 *Methods of payment for energy.* House respondents reported 15/32 (47%) used a key meter which is a method of buying electricity and gas at varied outlets, which is then charged to a card meter to be used in the house flat. 21/35 (66%) used a key meter for their electric.

4.5.10 *Standard assessment procedure (SAP) ratings.* Figures provided by the Riviera Housing Trust indicate that the SAP rating (energy efficiency) is varied. In Teignbridge sample figures for the changes in SAP were from 29 – 76 and 31 to 80 with a reported potential to halve their fuel costs. The savings to households for energy use could be considerable, but depend on the knowledge of the tenants to use the heating systems efficiently and effectively, the systems working properly, the number of people in the house and the activities of the household. SAP ratings depend on a range of variables. A SAP rating of 80 or above is considered a modern energy efficient dwelling for new build but a SAP rating of 70 is good for older houses.*

4.5.11 *Ventilation.* Houses had two types of ventilation systems other than windows: Trickle vents (slots that can be opened or closed) at the top of windows and, extractor fans. Each house varied with some having one but not the other, some having both, some neither. The majority of people said that they did use ventilation systems other than windows if they had them. 3/3 flats (in the second phase questionnaire) had extraction fans. No flats had trickle vents.

4.5.12 *Ventilation.* The majority ventilated the house every day in wintertime both pre and post central heating, although more people opened their windows everyday post central heating. 27/35 (77%) compared to 24/36 (66%) pre central heating. In the

* BRE Standard Assessment Procedure www.bre.co.uk

flats the majority felt ventilation was important pre (4/7) and post (3/3) central heating and people reported opening their windows most days. Some people commented that they did not ventilate when it was really cold outside, if that meant that the heat was going to go out through the window.

4.5.13 *Instructions on operating the equipment and its usefulness.* Respondents were asked if they had received any written or verbal information about how to use their new equipment. At the time of interview 8/35 (23%) had received neither verbal nor written instruction on how to use their equipment although some had been promised written information. All 27 households who had received instruction of some kind had found it helpful.

Table 8 - Respondents receiving verbal and written information

	Verbal information given		Written information given	
	Yes	No	Yes	No
Flats	2	1	2	1
Houses	27	8	27	8

4.5.14 *Understanding the new equipment.* When it came to understanding how their new heating was regulated, the majority of respondents felt they were able to use the timing mechanism (29/35 – 83%) but less were able to regulate the temperature (22/35 – 63%) well. There is room for improvement here and the topic was explored further in the tape recorded interviews as well as appropriate suggestions (see 4.6.16).

4.5.15 *Energy efficiency advice.* Residents were asked if they had received advice, not received advice or had received a letter but not responded yet, as it was known that in one area a special project was offering free energy advice service. One household had received advice, 29/35 had not, five had received a letter asking if they would like energy advice but had not responded at that time. One of the flat dwellers had received advice, two had not.

4.5.16 *Other house improvements.* Information was sought about other house improvements. As reported previously the improvements varied from house to

house and area and included double glazed windows and doors, roof and cavity wall insulation, outside cladding, security lights, smoke alarms, security lights, extractor fans and new electric wiring.

4.5.17 *Energy costs as a proportion of income.* It was the intention of the project team to assess the cost of energy to the household as a proportion of its income. This has been calculated in two ways. First, all respondents are included if they have access to a recent fuel bill and were able to estimate their monthly outgoings on fuel. Although this is our best guess for the majority of respondents, it is inevitably prone to some inaccuracies (due to recall bias, for example, and the billing period). Second, we have repeated the analysis restricting our data to those households, because of their method of payment, where we are confident that the figures accurately reflect spending on fuel. Numbers are smaller in Phase II calculations as fewer respondents were willing to provide us with income data and two elderly women had left their homes during the interviewing period.

4.5.18 *Fuel costs.* Table 9 shows fuel costs as a proportion of income based on all available data. There was a small but non-significant decrease in average percentage (Wilcoxon test, $p > .2$). Predictably, there was a strong negative correlation between income and proportion spent on fuel for both phases (Phase 1 $r = -0.41$, $p = 0.02$; Phase II $r = -0.65$, $p = 0.001$) i.e. the households with a higher income spent proportionately less on fuel. Using these data the proportion of households who were “fuel poor” (i.e. they spent more than 10% of their income on fuel) reduced from 8 of 34 (22%) to 5 of 24 (14%). However, the picture changes if we restrict our analysis to only those households who paid by key meter. There appears to be little difference in the level of expenditure pre and post central heating. There is a small increase in the proportion of income spent on fuel. This sub sample is small, however, and would be restricted to those least able to pay.

Table 9 - Fuel costs as % of income

Questionnaire	Mean	Median	Minimum	Maximum	Percentage Fuel Poor	n
Phase 1	7.21	6.6	2.1	16.7	22	34
Phase 2	6.55	6.4	2.5	16.7	14	24

- 4.5.19 *Temperature and comfort levels.* There was strong evidence of a change in temperature and improvement in comfort for all rooms ($p = <0.01$ in all cases).
- 4.5.20 *Effect of temperature on activities.* There was no evidence of an effect on activities. The nearest was decorating ($p = 0.059$).
- 4.5.21 *Perceived change in health status and social life.* Likert scaling was used to assess the extent to which respondents felt that their own health was affected, the health of others, and whether they felt that they were now able to invite people into their homes. The two sets of 7-point scales were compared using Wilcoxon tests. There was clear evidence of a perceived improvement in the health of the respondents ($p = 0.005$), slight indication that the health of others had been improved ($p = 0.06$) and none that people were more likely to invite others into their homes.

Table 10 – The effect of central heating on own health, health of others and willingness to invite people in

Quest 1 = Pre central heating: Quest 2 = Post central heating

Effect on:	Mean (Quest 1)	Mean (Quest 2)	Median (Quest 1)	Median (Quest 2)
Respondent's health (Q23)	4.4	3.2	4.5	1.0
Others' health (Q25)	4.2	3.7	5.0	3.5
Inviting other people (Q22)	2.9	3.0	2.0	1.0

- 4.5.22 *Fuel costs and knowledge of how to use equipment.* We postulated that there could be a relationship between the (new) cost of heating the house and the respondents' knowledge of how to use the equipment. Mann-Whitney* tests were used to compare average fuel costs and change in fuel costs as a proportion of income with written or verbal information. The only significant difference was for fuel costs by those who had received verbal information ($p = 0.03$). There were no

differences in change in fuel costs or change in fuel costs as a proportion of income (Kruskal-Wallis)*.

4.6 Results of Qualitative Interviews

4.6.1 *Preamble.* It was our intention to combine qualitative and quantitative methods to achieve a greater insight into the numerical data collected as part of this study, to explore issues raised (such as personal relationships) in limited previous work and perhaps also uncover new issues pertinent to the wider effects of living in a warmer home. Here we present the findings of the qualitative part of the study related, where possible, to the quantitative information that precedes it. The results tend to combine pre and post central heating findings exploring both the issue itself and the effect of the intervention. Our description of the results of this part of the study start with a general overview of findings and go on to describe issues raised in more detail. Numbers preceding quotations from respondents reference interview and line number.

4.6.2 *Respondents and respondent feedback.* Twelve residents who had been interviewed with the structured questionnaire agreed to participate in the tape recorded semi-structured interviews. They were all interviewed both before and after the installation of central heating. All of this sample lived in houses as those living in flats either did not wish to participate or, in one case, had only recently moved in. It is standard practice to allow participants in qualitative studies the opportunity to comment on the researcher's interpretation of the information provided. They are invited to point out areas where they disagree or ask for any quotes they had made to be withdrawn. There were no requests to remove any of the data and two respondents wrote to say that they agreed with the interpretation in the report and to say they had enjoyed participating in the study.

4.6.3 *Overview: pre central heating.* The main element common to all households, except one, who had gas wall heaters or fires in every room (and felt comfortable most of the time), was living with cold. There were differences in both the degree of cold felt, types of heating and the effects on the household. During wintertime, most residents tended to stay in one room downstairs, as the rest of the house

* Mann-Whitney and Kruskal-Wallis are non parametric statistic tests used to find differences between two or more groups based on their rankings on the variable in question. They are used when parametric assumptions are not met.

was so cold. Some reported being unable to afford to use electric heaters upstairs, as they were too expensive to run. Several households also complained about their metal framed windows, which had warped over time, and let the heat out, cold air in, and caused anxiety because of the safety and security risks. Several households secured the windows with either strong string or wire to lessen the risk of children falling out of them or burglars getting in.

For the majority of the householders interviewed, living with cold resulted in the following key issues:

- Utilisation of space – a lack of choice of activities due to the minimal warm space available, particularly for children doing homework
- Parenting and providing a safe, warm home
- Being a social housing tenant - lack of control in making decisions about the maintenance of the house. A sense of not being part of modern society
- House management - lack of motivation to maintain the house due to the conditions of cold, damp, mould and condensation
- High energy costs - unaffordable for some people, resulting in a reduction of comfort levels
- Well-being and everyday life - stress and conflict in relationships of house members through the conditions of the house, lack of warmth and personal space.

4.6.4 *Overview: Post Central Heating*

4.6.4.1 Space. The catalyst for change was that the entire house was used due to the increased warmth in all rooms. This resulted in:

- Perceived improvement to health, well-being and relationships of household members
- Houses were drier with reduced condensation, damp and mould although houses with metal-framed windows still had problems with draughts
- Energy costs varied but most reported a benefit as the whole house and water was now heated with the new systems
- Opportunities for leisure and study, and relationships within the household improved

- Self-esteem and renewed pride in the home increased motivation to maintain the house with a by-product of increased social activity.

One person summed up the changes by saying

5.2.93 “You wouldn’t think that something as simple a thing like central heating could make such a difference but it does.”

4.6.4.2 An exception to this general rule was one household that had had many problems with the heating system, which appeared to be partly from air in the pipes. This situation had not been rectified at the time of the interview. As a result, the latter household felt the house was colder than it had been previously, when she had gas fires and a gas wall heater downstairs in the hall, and that her previous system, which provided constant hot water, was much better.

4.6.4.3 Lack of communication.

- Information about the use of the new systems that was given to households following the installation of central heating, was varied. Some households reported receiving very little or none, and others were given good, verbal and written information.
- Negative and positive issues about the process of installation and being a social housing tenant were reported.

Each element of these findings is illustrated below.

4.6.5 *Utilisation of space*

4.6.5.1 The fact that most of the house was cold during wintertime impacted considerably on the use of the space within the house, which in turn permeated all aspects of people’s everyday lives.

6.1.4 “Everybody basically lives out of the lounge.”

11.1.2 “We all tend to live down here.”

4.6.5.2 Strategies for dealing with the cold had been developed, with several families saying that they had slept downstairs to keep warm, when they couldn’t afford to heat upstairs or when the children were ill. Common to the majority was wearing

extra clothing, as was having extra bedding and some people sleeping together for warmth.

21.4.171 "You end up wearing a lot more clothes."

20.2.55 "They're like Eskimos wrapped up."

4.6.5.3 Post central heating all the rooms in the house were being utilised, with an increase in activities within the household. The catalyst for these changes was the increased warmth in all the rooms.

4.6.5.4 Children, teenagers and adults now took the opportunity to 'spread out' into the other rooms of the house rather than being confined to just one room downstairs.

26.1.90 "We are now using the whole house ..."

5.2.53 "... the kids had to play in here and do their homework whereas now they just roam around the house like."

5.2.68 "We don't have to wear thick woolly tights."

4.6.5.5 Bedrooms became playrooms for children, or places to study away from shared living space and other people watching television or listening to music.

20.3.100 "If they want their music on they can go off up to their rooms. You can spread a bit and concentrate on something because you are not all sat together."

19.4.190 "They will sit and do more now [homework] rather than just enough to get by ... because it is warmer."

7.3.134 "Well before the PC [computer] was in the hallway and we never used to even do anything you know. 7.7.325 ... whereas now it's on the computer and you print it off."

4.6.5.6 The exceptions to this were the several households who had had problems with the heating systems.

6.1.7 "It is better now because we can use the whole house although it is not as warm as I expected it to be ... but then that is partly due to the windows".
[Draughty metal frames]

9.2.96 "I was looking forward to getting the central heating I really was, but now I am not happy."

7.1.12 "I am waiting for them to right some bits and pieces and that, finish it off. I will feel the benefit more then especially upstairs because it is still cold".

4.6.6 *Parenting and providing*

4.6.6.1 Pre central heating. Many of the dimensions of living with cold affected the parental role of providing a warm and safe environment, which was also seen as acceptable within the social norms.

11.5.247 "I just think you want your children to be warm and healthy and fed well and everything and I do my best to feed them and clothe them and make sure they are alright ... they're just cold and their little hands are freezing."

4.6.6.2 Some parents talked about their priority of keeping a roof over their heads and keeping warm so that their children did not suffer.

21.2.7 "We will go without if necessary if that is what we have to do to have a warm house."

4.6.267 "I would sooner have heat than go and buy a piece of fillet steak. Heating would be my priority."

4.6.6.3 One parent reluctantly decided to send her children to school even when they were 'off colour' as it was warmer there.

6.7.291 "Unless they are really poorly I send them to school ... because it is warmer ..."

4.6.6.4 A common theme, pre central heating, particularly for those households with several children, was that parents were in a 'no win' situation, and perhaps felt anxious that they weren't providing for their children, as they would like to be doing.

11.3.153 "He [husband] says 'I am trying my best' "

5.1.19 "We try our best, the kids don't use upstairs much."

4.6.6.5 Post central heating. The stress and anxiety that parents felt previously was no longer apparent, and some even found that they felt completely different about their house.

7.5.212. "I found before it was never really a home ... it's like the door used to be locked and you'd go to bed whereas now, I dunno, it's like a glow now isn't it?"

11.1.3 *"It's a completely different house it's so much warmer, it's nice to come home to. I don't get worried about them being cold at night time ..."*

21.2.74 *"I used to worry about him [baby] getting cold ... I don't worry about that at all now."*

5.6.287 *"... and the kids I mean you used to worry before obviously because they would be freezing and there was nothing you could do ... but now they use the whole house, do their own things so it is much easier."*

4.6.6.6 Fulfilling the basic needs of shelter, warmth and food was still a priority of households, particularly for those with children.

11.1.38 *"I think it's worth it anyway, you know to get the house warm and dried out."*

7.6.257 *"I think you have to have a meal and you have got to be warm."*

4.6.7 *Being a social housing tenant*

4.6.7.1 There were many elements to this theme, which affected householders considerably both physically and emotionally, including:

- People's expectations of the council/housing trusts in return for the rent paid
- Lack of control in decisions about the maintenance and improvement of the house
- Frustrations over repairs and quality of workmanship

4.6.7.2 People's expectations of the council/housing trust for the rent paid. The rent paid was the same for all households whether the house had been improved/modernised or not. When asked how it made him feel, one person said (of another area):

5.7.332 *"Annoyed ... you go down the road and they're not just getting central heating, they are getting windows done and bathrooms and kitchens done all in one fell swoop, yeah. I can't figure out why ... for a house that is not all that old and we've got a post-war house which is exactly as it was built." "We both go out to work ... pay our full rent ... and nothing is done in the house."*

10.6.306 *"You are paying the rent and someone else is having the full whack of everything I am paying the same and I haven't got nothing."*

Following the installation of central heating, one interviewee still felt aggrieved at her family's experiences over the years, of trying to get their house improved to a standard they felt others already had, when a neighbour told them, that they had 'refused to move in until central heating was installed'.

6.6.284 *"I know standards have changed and all this that and the other but it doesn't half rub your nose in it."*

4.6.7.3 Although the majority of householders were affected in some way, those with children expressed most concerns, about not being in control of what maintenance and improvements were completed in their own home.

4.6.7.4 Several tenants spoke of waiting for improvements over several years and feeling 'in limbo' because they did not want to waste money on decorating when the council 'may' be going to improve the houses. Personal choice for some people meant not paying for improvements that they felt housing managers should provide for the rent they paid for the house.

4.6.7.5 Pre central heating people said -

20.2.81 *"There is a certain standard you expect from your home. You expect it to be dry and you expect it to be warm. I mean you pay rent and you expect to have certain things in your house."*

5.4.177 *"We daren't do anything because the council may have come in and messed it all up."*

Others, however, were prepared to put up with it –

11.5.237 *"We just grin and bear it. I can laugh about it now because I can see the light at the end of the tunnel."*

However, this was said after being told that the house would be improved with double-glazing and central heating being installed.

4.6.7.6 Post central heating similar sentiments were expressed as to the benefits of a warm house that people had been waiting for when it could have been installed a long time ago.

27.1.12 *"I tell myself I have waited all these years."* One person asked to turn her heating off as it was a temporary connection replied –

20.5.215 *"I said you must be joking I have waited seven years and he wanted me to turn it off!"*

7.6.296 *"I think it is something I should have had well years ago."*

4.6.7.7 One person succinctly said

20.6.249 *"I just wish that they had done it before ... why did they wait for people's houses to get damp and cold."*

4.6.8 *Communication*

4.6.8.1 There appeared to be a lack of communication and understanding, between tenants and housing managers, of the constraints of improving houses and the reasons for some households not having any improvements, whilst others were considerably improved. This resulted in tenants feeling frustrated and angry at their current circumstances.

4.6.8.2 An example of poor communication was when some householders hadn't realised that it was their responsibility to apply for a meter from the gas supplier of their choice, when the Housing Trust/Council had sent a letter to this effect. Either the letters sent out to them had not been received, had been mislaid, or the householders had not understood that they had to take any action.

4.6.9 *Draughty windows*

4.6.9.1 Many people were of the opinion that it was a waste of money having the heating installed without changing the draughty, insecure windows.

11.3.125 *"All the glass is falling out and gales blow through it."*

20.3. 93 *"Wind goes through the window frames and it is just very cold."*

9.6.242 *"You open the window and then it drops and the frame won't fit back in again."*

10.2.80 *"Very draughty windows none of them closed sufficiently to make them secure." and "Tied up with string ... very insecure, unsafe."*

4.1.31 *"I have to wire them [windows] up ... security wise they are not safe."*

26.2.54 *"It's not good having just the central heating without looking at the rest of the house, windows, doors and the roof, loft insulation."*

21.3.111 *“I would think it would defeat the point of putting central heating in if you had draughty windows. You don’t realise how much you are losing until you have double-glazing. I noticed it is a lot warmer since we have had the windows done even before we had the heating put in.”*

4.6.9.2 The heat loss through the windows was also mentioned because even though people knew they were getting central heating installed, they couldn’t understand why the windows weren’t done first, as:

4.1.4 *“Personally I would prefer to have my windows done and no heating because I can make myself warm”.*

11.5.241 *“It’s just more money going straight out of the window.”*

7.1.15 *“I couldn’t see the point of having central heating. I thought the windows were more important.”*

5.4.152 *“They [windows] need doing because there is a lot of draughts ...”*

4.6.10 *Repairs to houses*

4.6.10.1 This was another major issue, with many complaining of poor workmanship both pre and post central heating. This issue applied to both the Riviera Housing Trust and Teignbridge Council.

27.7.16 *“Couldn’t get no satisfaction ...”*

10.5.235 *“The way the council run the housing situation on repairs is diabolical.”*

4.6.10.2 Post central heating, reports about the workmanship and attitudes of contractors installing the heating systems was varied, with some being positive but with others voicing concerns about the poor workmanship, and attitudes of contractors when asked to investigate a complaint. Houses were inspected following the improvements to ensure the work had been completed satisfactorily, which was appreciated by tenants. No further action being taken following complaints was also a course of resentment. Others households said they had few complaints.

4.6.10.3 Negative and positive comments included:

19.5.115 *“Just little leaks [in central heating pipe work] but as soon as I said ‘well that isn’t right’ they came and did it.” “... he tidied up and everything, absolutely brilliant.”*

One householder's electrical wiring system was found to be faulty when checked, which could have had adverse consequences for the resident:

27.2.49 "... it was to do with the earth wires it was ... took him three hours and ten minutes to re-do wiring."

However, this elderly householder also found one of the plumbers really helpful, in changing over a gas fire whilst her heating system was fitted. Other people said that they found that some contractors were helpful and tidy.

4.6.10.4 Many people found the response to complaints frustrating.

20.1.34 "I have still got the wind blowing under the door with bits of blue packing they just didn't cement it and finish off the door. So instead of a spy hole to see who is knocking at the door we just look through the frame."

4.6.10.5 Several people commented in one area about whistling windows, even though double-glazed glass had been inserted into the old PVC frames.

20.6.282 "The frames fit tightly at the bottom where the handles are but they are very loose at the top. They don't actually shut tight together." and "... they [inspectors] said we will get something done with your whistling windows ... and that was five weeks ago. But after eleven calls ... you just think well I will just have to live with this."

The latter householder joked that the council should be on her 'friends and family' reduced telephone call list.

4.6.10.6 One householder highlighted the lack of communication that could occur.

6.1.50 "She [the inspector] said she would get the men to fit them [hoods on extractor fans] but we haven't seen anybody since January." It was then March. "She might tell the workmen to do it, but they don't always follow it up or they just bodge it."

9.1.52 "Friday of the fourth week that I actually got them [contractors] to do the shower and that was by phoning and ringing them and hounding them every day."

Many householders were still waiting for adjustments or repairs at the time of the interviews.

4.6.11 *Housing management*

4.6.11.1 This included dimensions of:

- Maintenance, decorations
- Budgeting.

4.6.11.2 Maintenance. Pre central heating, condensation, damp and mould were problems in several of the houses, especially those with the metal-framed windows.

5.3.103 "Every day battle just to try and keep them [window frames] clean."

19.2.53 "All the windows need wiping in the morning otherwise you do get black mould all around the rubber seals on the window." The latter house had secondary double-glazing.

11.2.53 "You go up and it's all wet, soaking down the walls and it just smells as well."

6.1.23 "The condensation is the worst because it drips and ruins everything."

Motivation was lacking in wintertime, particularly for doing chores outside of the one heated room and decorating was off the agenda for many, as they saw it as wasted money, because of the damp and mould.

6.1.40 "You get so disheartened by it that you just don't bother."

Post central heating there was little condensation and damp reported in houses including the households with the metal window frames.

26.5.201 "It's dried the house out definitely ... now they have done the window along with the radiator being there ... we should be able to decorate without the paint falling off."

There was more motivation to maintain the house following the heating being installed.

11.1.15 "It's made me more motivated. I want to do more in the house and everything." "... instead of putting paper on the wall and it just falling off after about 6 weeks."

4.6.11.3 Budgeting

Pre central heating. All of the houses had immersion heaters, which can be an expensive method to heat water. There were differences of opinion, however, as

to whether it was more economic to leave them on all the time, or put them on when needed. Some people said they had worked it out that it was more economical to leave them on, but one householder laughed and said:

26.3.115 "They said to you it was cheaper to leave them on but it isn't. It was cheaper to not use it."

Households with several children appeared to have most problems affording the heating, possibly because far more water was used in bathing, washing and general maintenance of the house.

5.7.312 "Expensive on bath days – basically five tanks of water every time we have a bath."

One householder with a coal fire as the only form of heating said:

26.4.192 "I would maybe light a fire in the morning and let it go out all day and then light it again at 6 or 7 in the evening. I was getting to the point where I couldn't spend that amount of money constantly". (£14 a week was being spent on coal plus the electric immersion heater costs.)

Another house with storage heaters using 'Economy Seven' meant that water was heated during the night so that only a certain amount was available. Thus the use of the hot water had to be planned in advance.

Others mentioned the fact that even though they did have electric heaters they could not afford to use them, as they were so expensive to run. Some put extra clothes on rather than the gas fire:

6.3.106 "If I am in here on my own in winter I don't have the fire on."

Post central heating. Householders felt far more in control of the budget for heating as they could thermostatically control the radiators in each room. The majority reported that they thought their electric costs had reduced whilst the gas had increased, so that costs were either less or the same. The whole house and water was now being heated by the gas system, whereas previously an immersion heater had to be used for the water with minimal heating of the house.

11.1.34 "Well definitely less electricity. I mean there might be more gas ... I think it will balance out really."

19.2.52 "The electric's less because we don't have an immersion heater so what we don't pay on that I put on the gas."

26.1.33 "I can have it as warm as I want it, because it is thermostatically controlled and it's on when I want it without costing me extra money."

If people were at home during the day the central heating tended to be used more and this affected the level of individual household's costs, as well as such things as tumble driers that were reported to use a lot of electricity. There was certainly a sense of people not wanting to go back to having a cold house. One householder's husband had switched the kitchen radiator off and it had become cold. She said,

5.6.264 *"I thought no way, I am not going back to that, so I just turned it on,"* then she laughed.

People found it less stressful not having to worry about how much the electricity used was costing.

21.1.40 *"The whole thing is a lot more relaxed because you aren't putting it on for half an hour and then turn it off ... to see how much money you have used ... with the gas you are all right because you know that you are not wasting loads of money and with the double glazing as well."*

4.6.12 *Well-being and everyday life*

The dimensions of these were:

- Health
- Relationships with partners, children, and between siblings
- Feeling socially excluded from modern society and socialising
- Bathing

4.6.12.1 *Health*

Pre central heating. Living in a cold house resulted in relationships within the family being affected, as well as the health of residents, particularly their stress levels.

Poor security and potential accidents by children, due to warped metal window frames have already been mentioned as causing anxiety. Several parents worried about their children's health and their own, particularly if they already suffered from a respiratory illness and the house was damp and suffered from mould.

5.4.197" *You can smell it in the air and you know it gets on your chest and just breathing it in and it's horrible."*

Post central heating. Health appeared to improve in some people with a predisposition to respiratory illness, with a reduction in children's coughs and bronchitis. One adult no longer used an inhaler.

6.4.176 *"He hasn't had it this year yet, whereas before it didn't matter what you did it would turn into bronchitis."*

21.2.66 *"I am not using my inhaler as much when I used to use it loads. I definitely feel that my son is not coughing as much and we haven't had any 'flu' or colds as such."*

One householder reported increased comfort during an illness, as the temperature in the house was warm overall rather than being cold in some rooms.

Other people found the central heating too stuffy, the air too dry and complained of catarrh and discomfort, especially in the bedroom at night.

26.3.120 *"I find it difficult to breathe especially first thing in a morning ... if you have forgotten to open the vent or something."*

6.4.163 *"I must admit I have turned my radiator off in my room because I haven't been sleeping properly."*

Aches and pains that had been suffered previously and had been exacerbated by the cold, had improved for some people whilst for others hadn't. However, this could have been due to the degree and type of illness suffered.

Prior to the central heating being installed, many people found the housing conditions depressing:

26.2.90 *Yeah fed up depressed ... we were just dreading every winter"*

21.5. 352 *"... more stressed in winter."*

4.3.151 *"I don't like the cold in winter I feel miserable. I don't like it at all."*

For one person, the personal impact was considerable. This person used to go to bed and watch TV with the children at six or seven o'clock in the winter because it was warmer.

7.6.28 *"I even used to see the kids off to school and go back to bed. I feel more alive ... I dress more like a woman now [not wearing layers of clothes]. You think, Christ, this is what I have been missing all these years."*

Others said:

21.2.68 *"I just think it makes you a lot more relaxed because when you are cold ... your body tenses up and that makes you stressed out."*

11.5.205 *"I used to get terribly down, really thinking about the kids ... you want to come down in pyjamas in the morning at Christmas, this Christmas was brilliant."*

4.6.13 *Relationships with partners, children, and between siblings*

4.6.13.1 Pre central heating. Relationships were affected by the general stress of coping with the cold housing conditions and being in one room most of the time. The households most affected were those with several children. Parents were continually harassing children to close the doors to keep the heat in.

6.3.149 *"You get on each other's nerves, you've got no space of your own."*

21.8.363 *"It is stressful because we are always under each other's feet, everything is on top of you".*

11.1.34 *"It can be quite annoying and cause arguments and upsets".*

Homework tended to be done downstairs which caused problems as other activities were going on at the same time.

6.3.137 *"Tend to annoy each other."*

20.4.138 *"... they are both trying to concentrate ... when one wants to watch TV the other wants to do her homework."*

4.6.13.2 Post central heating

19.3.103 *"It does make a difference, which is nice – a positive difference. To everything ... [we] tend to sort of talk more and do more now."*

26.3.112 *"We were grumpy with each other in the wintertime, I don't think I am so grumpy now."*

5.6.277 *"They would bicker if they were down here together but now they do their own thing up there [bedrooms]."*

5.4.190 *"I suppose the kids really are, really more happier."*

11.2.57 *"She [child 10 yrs.] is in her bedroom all the time, her friends stay, she does her homework up there."*

6.3.20 *"They still have their fights now but it is not so much because they are not all in one room."*

Those with a more 'laid back' attitude to life were less likely to feel stressed. One such person said:

7.3.124 *"I think we are more close because we have more time for each other. In winter all the family get in bed together to watch TV".*

Post central heating this changed –

7.3.142 *“I find that we all argue now because we are busy doing something or other in each room. Whereas we didn’t before we were all in together ... it was too cold to argue.”*

The explanation given for the arguments being that the children did not want their activities interrupted by others. In this household the children were restricted in their activities by being in bed very early (6pm) to watch TV but, perhaps once they had the choice, they then resented any interruption to their new found freedom.

For some households having a warm dining room and eating together proved beneficial.

19.2.89 *“We do tend to eat in there, [dining room] which is nice because I think when you sit to a table especially at the end of the day you talk about your day.”*

20.2.88 *“We eat out here, which was what the dining room was meant for to have the family meals.”*

For several households, relationships between partners had improved.

11.2.75 *“It is lovely because we have quality time on our own now as well. It’s taken a lot of stress and strain because of obviously having the children with you all the time ... it has meant a lot of pressure off our relationship.”*

However, other households found some negative differences and adjustments to different circumstances needed. One parent with teenage boys actually missed their presence, because now they spent a lot of time in their rooms.

5.7.298 *“I don’t see them now,”* and said in a childlike voice, *“Kids come down and see me,”* and then laughed.

4.6.14 *Feeling excluded from modern society and socialising*

4.6.14.1 Pre central heating. Some people expressed views of feeling outside of modern society. 2 households that had metal-framed windows, installed when the house was built approximately fifty years ago, said –

7.1.39 *“I do feel behind the times really I think it is disgusting really that we have to live like this.”*

6.6.285 *“ ... as soon as the house came empty surely they should have brought it up to the standard of all of the other houses.”*

Others said:

19.3.146 *"Some sort of efficient heating in every house really, as a norm, as a standard".*

20.2.81 *"There is a certain standard you expect from your home".*

21.4.186 *"... with the technology that is available you wouldn't think ... have I got enough to heat my home".*

5.8.392 *"You would think in this day and age ... people expect your mod cons".*

There was also the social culture of the house being part of the self-esteem and standing of people in their community. Inviting people into the cold house was a problem for those houses with damp, as they felt embarrassed that other people should see it, and consequently they had a restricted social life:

11.4.1666 *"You get embarrassed ... I say you'll have to excuse this and that."*

6.5.218 *"You hate inviting people round because it looks so bad."*

Others just told people before they visited to expect it to be cold and to put more clothes on.

4.6.14.2 Post central heating. Several said that instead of wearing 'layers' they were wearing 'normal' clothes now, similar to people who already had central heating in their houses. Parents said that, both they and their children, found a social benefit with the improved warmth of the house. Children could invite friends to play in their own room upstairs, and adults said that when they invited people to their home, they no longer kept their coats on.

6.5.218 *"It is nice to have people come into your house ... at least it is warm when they come in and they can take their coat off whereas before it was the same temperature in the hallway as it was outside."*

Friends visiting for dinner -

19.5.109 *"... whereas now if they come ... we can actually sit in there and enjoy it rather than 'for God's sake let's get out of here it's freezing."*

A parent said that one of her children felt a sense of pride in her room, following redecoration in a house that previously had damp and mould in the bedrooms.

11.3.138 *"I mean she has been so proud of her bedroom she has told everybody at school. Yeah, she tidies her bedroom, it is immaculate now."*

4.6.15 *Everyday life – bathing*

- 4.6.15.1 One of the everyday facts of life that affected many people because of the cold was getting bathed or showered. For the majority it was a quick affair, pre central heating, because of the cold and many dressed their children and themselves downstairs. Children were less inclined to want to get bathed.

7.2.104 “the kids don’t like the water because it is too cold”.

One householder, whose system heated the water during the night and had only a tankful of hot water per day, put it quite eloquently:

21.9.422 “... you should be able to relax and enjoy a bath, it might be the only chance you have got to yourself ... the only sort of luxury that you get that day, a hot bath”.

After the improvements the same person said:

21.1.36” It’s brilliant, really brilliant, the bathroom is warm for the first time ever ... you put the hot water on whenever you want.”

The majority reported a big difference now they had continuous hot water which took very little time to reheat, giving people freedom of choice of when to have a bath. Previously families had shared bath water.

20.1.45 “... whichever of them [boys] was the cleanest would get in the water first ...” but now *“within an hour you could all be in and out bathed, washed and proper.”*

Everyday household tasks were made easier because of the continuous hot water.

4.6.16 *Use of equipment and ventilation post central heating*

- 4.6.16.1 Information given to residents about their new systems was varied, with the majority receiving written and verbal information but some receiving none. Again although the majority found the information useful, some mentioned that the verbal information was given too quickly or was not very good. Others received helpful advice from neighbours who understood the system.

27.2.88 “Nobody told me, nobody told us anything. It is wrong really with people who have never had central heating before, I mean they’ve got to stop and think and I am a pensioner they should explain it to you really.”

Later an electrician who came to check the wiring did explain it:
27 “... which I was more than pleased with, he was really good.”

Other households found the instruction booklets that they were given easy to understand, and knew how to work the system once they had read them. The majority liked the fact that they were in control and had the choice of regulating the temperature in each room to how they wanted it.

A person who was still having problems with the heating, and had not been given any information said:

9.3.143 “I haven’t touched anything because I don’t want to b..... it up basically.”

Methods of ventilation of the house were also varied, with some having windows that could be locked slightly open, others having extractor fans in the kitchen and bathroom and a few having trickle vents (sliding openings at the top of the window frame). Most households felt that ventilation was important, but some said they would not open their windows if it was really cold, as it would let the heat out. Those that had the metal-framed windows reported that ventilation naturally occurred, as many of the windows didn’t shut properly. 2 households had complained about the extractor fans being extremely draughty and were waiting for hood covers to be fitted.

5 Discussion

5.1 Methodological Issues

5.1.1 *Mixed methods.* The study has combined qualitative and quantitative methods: a highly structured interview schedule was administered to a larger number of respondents and semi-structured interviews to a much smaller sub-set of interviewees. On the whole, this has been successful with a wealth of rich qualitative data illustrating interactions and significant findings from the quantitative interviews, as well as drawing out new themes around thermal comfort.

5.1.2 *Mixed intervention.* The study was originally concerned with the effect of central heating in social housing in Torbay. However, it became apparent that both in Torbay houses and the more recently recruited houses and flats in Teignbridge, the landlords were using the opportunity to make other improvements to the property. The results could more accurately be attributed to mixed levels of intervention. However, by far the largest intervention both in terms of cost and influence on temperature was the installation of central heating. Other interventions were not only relatively minor but tended to vary from house to house. We are therefore confident that our findings result from central heating and not, for example, central heating and cladding.

5.1.3 *Community involvement.* The tenant representatives who were part of the previous Watcombe Project were involved in reviewing the questionnaire and the other literature, used to give information to potential study participants. In the light of their comments, text was amended if it was felt to be ambiguous or not easy to read. Contact was made with various groups in Teignbridge and Torbay to involve and inform the local communities. Presentations about the aims of the project and the methods to be used were given to the Torbay Tenants and Residents Group, whose membership is of representatives from almost all parts of Torbay. Discussion following the presentation ranged from ethical issues of consent and issues of confidentiality to sharing information with other parties. Meetings were held with local councillors and residents groups in other areas of the research study. At the end of the study a draft report of the qualitative

interviews was sent to all 12 households, for them to have the opportunity to comment on and withdraw any dialogue if they so wished. Two written replies were received, saying that they agreed with the content and had enjoyed participating in the study, and a few others responded verbally. There were no requests to amend the text. A summary of the project results will be sent to those who completed the questionnaires. The findings of the study will be presented to Riviera Housing Trust, Teignbridge Council and tenant participation groups in the near future.

5.1.4 *Recruitment.* Potential participants were sent an explanatory letter about the study, followed by a reminder two weeks later. However, it was not until a personal visit to households was made that more people agreed to participate, as people said they had forgotten about responding. The response rate in this study was 31%. Popay et al ¹⁷ in a recent study describes targeting a higher sample in disadvantaged areas compared to those in relatively affluent areas because of the “expectation of differing response rates across the two sets of localities”. In the latter study, households were first contacted by letter and then by a home visit.

5.1.5 *Questionnaire development.* A minor objective of the study was to aid the development of a quantitative questionnaire to be used in later work. In particular we have initiated a larger study on the various impacts that housing upgrades might have. Such potential benefits obviously include health but, as a result of this and earlier work, may be said to include interpersonal relationships within the family, social activities and a perception of self in society, and even educational attainment. We thus have a quantitative tool capable of scoring all of these dimensions with only minor amendment.

5.2 **The Households' Activities**

There was a marked difference in the way in which household temperature affected activities between phases. Everyday activities such as housework, bathing, homework and decorating are all influenced positively by a warmer environment and the qualitative data richly illustrate why this might be so. Quantitatively, there were significant differences in both decorating and

homework between phases. Homework in particular was highlighted in the taped interviews and, of course, has implications for future education and life opportunities (argued in Fuel Poverty and Health ⁸).

5.3 **Health**

5.3.1 Other negative health effects, outlined in both the taped interviews and the open questions, about why cold affected respondents' health, was the effect upon people's mental well-being. Several respondents felt that they, and others in their household, were happier because the house was warmer. Respondents with young children who were interviewed indicated that they were stressed on occasions by being confined to one room. Overcrowding has been evidenced in several studies to cause mental ill-health. ^{5, 18, 19}

5.3.2 The perception of an effect of room temperature on health was clearly illustrated in both the questionnaire and the in-depth taped interviews, as was the improvement in temperature and comfort in all households. During the taped interviews post central heating, several people with a predisposition to respiratory illness reported that they had fewer symptoms. However, a few people said that following the installation of central heating they initially suffered more from feeling stuffy and having headaches. Others said that it was too soon to tell.

5.4 **Relationships Within the Households**

A key issue that the structured questionnaire did not capture was the change in relationships within the household: between parents and children, and between adults in the house. This seemed to be because all rooms could be used. When children used their bedrooms to study and play there was less conflict in relationships and some parents found that they had more time to themselves, which improved their relationships. Others with older children reported a sense of loss, and found that they were forced to adjust to not having their children's presence all the time. Individual personalities, ages of children and circumstances all played a part in the differences expressed.

5.5 **Macro Influences**

5.5.1 The impact of government policy in encouraging and making it possible for social housing tenants to buy their properties is considerable. Many people, having bought their houses, have then used the opportunity to move out of the area in which they lived to more affluent and what are seen as more socially desirable places to live. This has resulted in there being a smaller pool of social housing accommodation for those households on low incomes and those who are more disadvantaged through ill-health, educational opportunities, employment or other factors. The deprivation levels in the study (see 4.2) corroborate this. Some of the older residents, when commenting about what they disliked about their flat, cited the influx of new people with anti-social behaviour tendencies such as drug dealing and vandalism as one of the reasons. Others mentioned noise and the lack of sound proofing as a factor. Further study of these issues may be useful in highlighting problems affecting health that are specific to residents in blocks of flats.

5.5.2 *Communities and social capital.* The social capital that used to be found in some communities has dissipated as a result of anti-social behaviour and may affect elderly people, particularly resulting in isolation. However, in this study in one particular area, people living in a small cul-de-sac, where several elderly people lived and knew each other more, the opposite was true, in that they visited each other and helped each other in time of need. An example of this was highlighted during the qualitative interviews when it was explained that a younger person, who understood the new heating systems, was able to visit and explain it to those who could not. A similar situation arose in one block of flats when four of the residents said they 'kept an eye on each other' but at the same time ignored one of the other residents, whom they were slightly wary of because of what they perceived to be "odd " behaviour.

5.6 **Home as an Expression of People's Identity**

Other research has indicated that a home is an expression of people's self-identity and self-esteem, providing stability and security and somewhere to invite people socially^{18, 20}. These factors were certainly evidenced in the qualitative

interviews and in the questionnaire. It was found that there was a significant relationship between the temperature in people's living rooms and inviting other people into their homes. Respondents expressed their dismay, at the perception people would get on entering their house, when they were unable to decorate and maintain the house to their satisfaction. In the questionnaire, following installation of central heating, there was no significant relationship in the taped interviews between the increased temperature and inviting people into the house. However, it was reported that people were more likely to invite others into their home, now that it was drier and they could decorate and improve it. The influence of this housing intervention clearly has a profound effect on self-esteem and social intercourse. Future research should reflect this finding but our understanding is still imperfect.

5.7 Lack of Control Over Outside Factors

People's lack of control over the process of social decline in areas was mentioned by several respondents, but not as much as the powerlessness people felt regarding the decisions made and process of, house or flat improvement. The study participants made comparisons between the level of comfort through house improvements that some people enjoyed and others, like themselves, who had had no improvements to their housing, but paid the same rent. Some people, at this perceived inequality, showed anger and resentment towards the housing managers. The repairs systems to houses caused additional frustration and stress to respondents, who reported in both the taped interviews and the open questions in the questionnaire, lack of consultation, poor communication and workmanship. A specific question asking whether people felt that the process of improvements was satisfactory may have elicited different responses and association with other variables. As Dunn ²⁰ reported there are few places in an individual's everyday life over which people exercise exclusive control, one of them being the home. Lack of control in the process of house improvements and regeneration, was highlighted by Allen ²¹ as a crucial element of importance to the individual particularly its negotiability. The ethos of professional control as a social structure can be disempowering for individuals and communities, contributing to the erosion of health and well-being. Although it may seem impractical, recognition should be given to the effect such

powerlessness has on emotional state. This is relevant to those undertaking house improvements and for future research.

5.8 **Energy Efficiency and Fuel Poverty**

Not all houses had drafty windows repaired or replaced, depending as it did upon the landlord. The central heating was therefore less effective, more costly and influenced health less. The wider health effects of the draughty windows were emphasised far more in the qualitative interviews, than the questionnaire, indicating the mental stress it could cause. Other research has shown that people living in houses with draughty windows are more likely to report mental health problems than those with none or minor draughts.²² The extent to which residents understand how to use the new equipment (see 5.9) is also an important factor in its efficient use.

5.9 **Use of New Equipment**

It is axiomatic to claim little point in installing new equipment of any kind if the residents cannot use it. There was wide variation in the extent to which the heating systems were understood by residents, as well as variation in the quantity of information provided. From the questionnaire responses it is apparent that there are gaps in the information given and the understanding of it. One of the recommendations from the taped interviews was that one organisation or person, with clear knowledge of the systems, perhaps the manufacturer or housing managers, be responsible for giving the information to avoid any confusion. Clearly the system for giving information is not working as well as it should, and/or the written information should be easily accessible to people of all reading abilities. Sometimes it is difficult to take on board a lot of verbal information at once and therefore accessible written material is important to be able to read at leisure.

As part of the inspection following the improvements, there could be a check on whether householders have received the correct information and understand how to regulate the temperature, timer and systems installed. This would be particularly pertinent to those houses which had a pressure dial, as part of their

system, as several householders did not appear to understand its purpose or that it should be checked at intervals. If the information given to people is not understood properly, the central heating system could be less energy efficient, and costs to the householder could rise as a consequence. Efficient ventilation systems are also important, as some householders are loathe to open windows, believing that it would waste heat and therefore increase costs.

5.10 **Communication with Managers**

The majority, particularly regarding the current system of repairs to houses, highlighted communications with housing managers as needing improvement. Factors that could affect how much the changes impacted on households were:

- Households with younger children appeared to be more affected by a cold house
- Attitudes and coping skills of individuals depended on people's support systems, their circumstances and negative or positive attitudes
- Levels of income were a factor for some in their energy use
- Health of individuals with a predisposition to respiratory illness or disability
- Knowledge and understanding of how to use heating systems effectively and efficiently.

6 Recommendations

6.1 Policy

6.1.1 Housing improvements, especially central heating, influence a wide range of dimensions of residents' lives, over and above the degree of comfort they experience. Recognition should be given to the fact that providing greater warmth to families has a beneficial effect on, for example,

- Emotional well-being
- Interpersonal relationships within the house
- Feeling part of the community
- Increased motivation to improve the fabric of the house
- Enhanced satisfaction in role as parent

6.1.2 Our interviews indicated that control over the physical environment of the home was an important element in residents' emotional well-being. We thus recommend, where this is not done already, that

- potential improvements be discussed with tenants (what, when and how, for example) to increase their feeling of control.

6.1.3 Respondents displayed a lack of satisfaction with communication generally with landlords. Where possible, therefore,

- communication between landlords and tenants be improved ensuring as far as possible transparency of decision making. (For example, accurate and timely feedback from residents' representative groups.)

6.1.4 Both structured and unstructured interviews demonstrated a range of understanding of how to use new equipment. We therefore recommend

- that education in the use of new equipment be accessible to all recipients and that information be checked for accuracy by those qualified to do so.

6.1.5 To improve understanding of new equipment we recommend also

- that where possible there be one point of contact for residents needing further advice on new equipment, preferably someone with expertise in its use.

6.2 Methodological

6.2.1 Both in the present study and the Watcombe Housing Project we have successfully combined quantitative and qualitative methods. This has resulted in statistically robust studies which not only allow results to be explored but have the potential to reveal unanticipated explanatory variables. We recommend

- that housing and health research continue to combine methods in this way

6.2.2 We have demonstrated here that a much wider range of outcomes can be influenced by improved thermal comfort than are conventionally measured in similar research. We therefore recommend

- that questionnaires and other instruments assessing the impact of central heating measure variables over and above physical health, including

Emotional health

Interpersonal relationships within the family (between couples, between siblings, and between parents and children)

Relationships with the rest of the community

Feelings of self-esteem

Educational attainment

6.2.3 Our efforts to gain an accurate picture of actual energy use from respondents demonstrated how difficult this could be. Where practical, therefore, we recommend

- that researchers use meter monitoring to assess variations in energy use.

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Appendix A

Structured Questionnaire

Thank you for taking part in this.

We would like you to tell us some general details about your house and who lives there

Q 1 Please tell us how many people, including children, normally live in your household

Q 2 What are the ages/sex of each person (in years or state months eg 6 months)

	Person 1	Person 2	Person 3	Person 4	Person 5	Person 6	Person 7	Person 8	Person 9
Age									
Sex									

Q 3 Please state which of the above people you are Person No

Q 4 Are you normally at home during the day? **Tick** Yes No

Q 5 Do you live in a house or flat?

House

Flat

Please tick

Q 6 Please tell us what rooms you have

Please write number

Kitchen	
Sitting room/lounge	
Dining room	
Bedroom upstairs/downstairs/house	
Bedrooms in flat	
How many bedrooms are shared?	

Q 7 What kind of heating do you have in your: **Please tick all that apply**

House

Open fire (eg coal)	downstairs	<input type="checkbox"/>		
Gas central heating	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Electric fires/radiators	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Storage heaters	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Gas fire	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Paraffin	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Calor gas	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Oil	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>
Other	downstairs	<input type="checkbox"/>	upstairs	<input type="checkbox"/>

Flat

Gas central heating	<input type="checkbox"/>
Electric fires/radiators	<input type="checkbox"/>
Storage heaters	<input type="checkbox"/>
Gas fire	<input type="checkbox"/>
Paraffin	<input type="checkbox"/>
Calor gas	<input type="checkbox"/>
Oil	<input type="checkbox"/>
Other	<input type="checkbox"/>

Q 8 What kind of cooker do you use in the house/flat? **Please tick those that apply**

Gas	<input type="checkbox"/>
Electric	<input type="checkbox"/>
Dual – both electric and gas	<input type="checkbox"/>
Other	<input type="checkbox"/>

The next questions are about what it is like to live in your house/flat, particularly in wintertime

Q 9 What are the things you like about living in this house/flat?

Q 10 Is there anything that you dislike about living in your house/flat?
Please tick Yes or No

Yes No

Q 11 If you answered 'Yes' to Q 9, please tell us what you dislike.

Q 12 Some people like the area in which they live, others don't. On a scale of 1-7, 1 being 'Don't like the area at all' and 7 being 'Love the area'

Where would you put how you feel? **Please circle**

1 2 3 4 5 6 7

Q 13 We would like you to tell us about the temperature levels of the house/flat in wintertime. What is the nearest to how you feel the temperature in the house/flat is most of the time following installation of central heating?

On a scale of 1-7, 1 being 'very cold' – 7 being 'very hot'.

Please circle

Living room/lounge	1	2	3	4	5	6	7
Kitchen	1	2	3	4	5	6	7
Dining room	1	2	3	4	5	6	7
Bedrooms	1	2	3	4	5	6	7
Bathroom	1	2	3	4	5	6	7

Q 14 How comfortable are you in this temperature?

On a scale of 1-7, 1 being 'Very uncomfortable' – 7 being 'Very comfortable'

Please circle how comfortable you feel in wintertime most of the time

Living room/lounge	1	2	3	4	5	6	7
Kitchen	1	2	3	4	5	6	7
Dining room	1	2	3	4	5	6	7
Bedrooms	1	2	3	4	5	6	7
Bathroom	1	2	3	4	5	6	7

Q 15 How would you describe what feeling comfortable in your house/flat means?

Q 16 ***In your opinion*** do you or the people who live in your house/flat use the rooms differently or the same since central heating has been installed?

Same Differently

Q 17 If the answer is 'Differently', please explain how

Q 18 Some people say that if they feel too cold or too hot it affects how well they do things in the house/flat e.g. 'Don't want to move from the fire' or 'The heat makes me tired'. Does it affect YOU at all in wintertime doing the following, now you have central heating?

Housework	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Decorating	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Studying	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Having a bath/shower	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

Q 19 Can you describe how it affects you?

Q 20 ***In your opinion*** does it affect other people who live in the house/flat in a similar way? **Please tick boxes that apply or go to Q 23 if not applicable.**

Housework	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Decorating	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Studying	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Having a bath/shower	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

Q 21 Can you describe how?

Q 22 Some people think that the temperature in their house in wintertime affects whether they invite other people into the house – others disagree. Where would you put how you feel post central heating?
Please circle number.

On a scale of 1-7,

1 being 'I definitely disagree that it affects my inviting people into the house/flat'

7 being 'I definitely agree that it affects my inviting other people into the house/flat'

1 2 3 4 5 6 7

Q 23 Please explain why if your answer is different to before you had central heating installed?

Q 24 On a scale of 1-7 **in your opinion** do you think that the house/flat temperature in wintertime has an effect on your health at all post central heating?

1 being 'Not at all' – 7 being 'Definitely yes'

Please circle

1 2 3 4 5 6 7

Q 25 If it does affect you, please explain why

Q 26 **In your opinion** on a scale of 1-7, do you think the temperature of the house/flat in wintertime has any effect on other people's health who live in the house/flat post central heating? If this is not applicable, go to Q 28.

1 being 'Not at all' – 7 being 'Definitely yes'

Please circle

1 2 3 4 5 6 7

Q 27 If it does, please explain

Q 28 Some people believe that ventilation (eg opening windows) is important in improving the indoor air, others don't. What is your opinion on a scale of 1-7 post central heating.

1 being 'Definitely not important' – 7 being 'Very important'.

Please circle

1 2 3 4 5 6 7

Q 29 We would like to tell us how often, if at all, windows are opened to ventilate the house in wintertime on a scale of 1-7 now you have central heating.

1 being 'Definitely not important' – 7 being 'Very important'.

Please circle

1 2 3 4 5 6 7

Q 30 It is important for the research that we understand what impact the costs of heating, lighting etc have on the budget of the household and how different companies charge for the use of gas, electric etc they provide.

Please tell us the method of paying for your heating, lighting etc. **Put a cross where not applicable.**

	Direct Debit	Budget Plan	Key Meter	Quarterly	Cash/Stamps
Gas					
Electric					
Coal etc					
Paraffin					
Calor Gas					
Oil					
Other Fuel					

Q 31 It would help us to have an accurate cost of your fuel use post central heating. Please tell us how much you pay in the appropriate column. **Put a cross where not applicable.**

	Reduc. Direct Debit	Standing Charge	Key Meter Charge	Weekly	Monthly	Quarterly	Budget Plan
Gas							
Electric							
Coal etc							
Paraffin							
Calor Gas							
Oil							
Other Fuel							

Q 32 It is important that we are able to calculate how much of your income is spent on fuel. We would like you to tell us the approximate total income of your household, including wages and any benefits awarded eg family allowance, family credit after tax, etc.

If you do not wish to give this information, please leave blank

Please state the nearest figures to your total income net

Less than	£7,800	£150 per week	<input type="checkbox"/>
Less than	£10,400	£200 per week	<input type="checkbox"/>
Less than	£13,000	£250 per week	<input type="checkbox"/>
Less than	£15,600	£350 per week	<input type="checkbox"/>
Less than	£20,800	£400 per week	<input type="checkbox"/>
More than	£20,800		<input type="checkbox"/>

The following questions are about the use of your new central heating system.

Q 33 Please tell us if you received either verbal or written instructions as to how to use your central heating system. **Please tick box**

Yes I received verbal written instructions

No I did not receive verbal written instructions

Q 34 Did you find the information useful? Yes No

Q 35 Do you understand how to regulate the temperature overall of your central heating?
Please tick one box

Very well Some of it Not at all

Q 36 Do you understand how to use the timer of the central heating system?

Please tick one box

Very well Some of it Not at all

Q 37 Do you have trickle vents in your windows? Yes No

Do you have a ventilation fan in the kitchen? Yes No

Do you have a ventilation fan in the bathroom? Yes No

Q 38 Do you use them? Yes No

Q 39 If the answer to the above question is No, please say why.

Q 40 We would like you to tell us if you have received any energy efficiency advice since the last interview?
Please tick box.

Yes, I have received advice

No, I have not received any advice

Have received letter but not responded yet

Q 41 Please list below any improvements to your house since last June other than installation of central heating eg insulation, double glazed windows.

Appendix B

Details of Respondents in Qualitative Interviews (sex, age, family and house size)

Study No	Sex	Age	At home	Beds
4	female	64	Yes	3
5	male	43	Yes	4
	female	34		
	male	16		
	male	15		
	male	12		
	male	10		
6	male	34	No	3
	female	33		
	female	12		
	female	10		
	female	6		
7	female	38	Yes	3
	male	20		
	male	16		
	male	11		
	female	10		
9	female	42	Yes	3
	female	14		
	male	8		
10	male	53	Yes	3
	female	48		
	male	27		
11	female	37	Yes	3
	male	33		
	male	15		
	female	10		
	male	3		
19	female	45	Yes	3
	female	18		
	male	15		
	male	12		
20	female	42	Yes	3
	female	12		
	female	10		
21	female	39	Yes	3
	male	37		
	female	19		
	male	12		
	male	3mths		
26	male	53	No	2
	female	33		
	male	10		
	male	1		
27	female	77	Yes	2

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