WELLBASED

D 4.5 Qualitative evaluation report

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WP4 – Evaluation and Data Analysis

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4	Noemi Garcia Lepetit	LNV	27/11/24	Final review

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List of Acronyms

- H2020 – Horizon 2020
- WP – Work Package
- Dx.x – Deliverable x.x
- GB – Great Britain
- TK – Türkiye
- HU – Hungary
- W1 - wave 1
- W2 - wave 2
- E# - Edirne interviewee reference number
- H#w# - Heerlen interviewee reference number, and interview wave number
- J#w# - Jelgava interviewee reference number, and interview wave number
- L#w#- Leeds interviewee reference number, and interview wave number
- O#w# - Obuda interviewee reference number, and interview wave number
- V#w# - Valencia interviewee reference number, and interview wave number

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Executive Summary

This deliverable principally summarises the findings from qualitative research undertaken as part of the Wellbased project. Qualitative research was planned to complement other forms of data collection, helping to explain how change was happening, or why things were staying the same for participants. The qualitative work took the form of individual or household interviews, which for most pilots took place in two waves between late 2022 and 2024: just after each intervention started (n=77), and approximately a year later (n=58). Our longitudinal qualitative data allows us to detail how people are living their lives, as well as how households experienced the interventions. We used a thematic analysis approach, while also comparing people's experiences before the intervention to their experiences afterwards, considering the broader lived experience, their energy access and their health. We have also included some longitudinal quantitative analysis in this deliverable, specifically looking at changes in energy and health in the intervention group between questionnaires T0 (baseline) and T2 (after 12 months).

Our key findings are as follows:

1. In our first interviews, we found people across all six cities experiencing the effects of the inflation and the energy crisis, which was in turn reflected in their energy practices and their consumption of energy. We found widespread evidence of people cutting back on energy to reduce their costs, and coping with excessive heat and cold, as well as with damp and mould. These are among the most efficient energy consumers in Europe, but efficiency comes at a cost: underconsumption can result in difficulties in maintaining good health and wellbeing in these households. This is covered in detail in part 2.1 and 2.2.
2. In our first interviews, we also found people across all six cities whose physical and mental health was affected by their lack of access to energy. This included health conditions being exacerbated by energy poverty, often associated with poor living environments and exposure to damp, cold or overheating. Some of our respondents had non-negotiable needs for electricity to power life-giving technology, which meant they were having to make compromises on energy use elsewhere. This is covered in detail in part 2.3.
3. We complemented our qualitative analysis by undertaking quantitative analysis to verify any changes happening between T0 and T2 for intervention group participants. We find a mixed picture across most pilot sites. Some people have warmer homes and do not have to engage in energy saving practices as frequently as they did, whilst others still struggle to keep warm or pay energy bills. In terms of health some report improvements but others are still experiencing physical or mental health issues. This is covered in part 3.2.
4. In our second round of qualitative interviews, we saw that participants in the Wellbased interventions reported mainly small improvements in access to energy, and small improvements to their wellbeing and health status. This varied across the pilot cases, given the different intervention designs. Where interventions mainly targeted people and/or community (Heerlen, Jelgava, Obuda and Valencia) the effects tended to be felt as small improvements in wellbeing, and reduced cost of energy bills. In the two pilot cases where building fabric and/or heating systems were renovated,

we saw different effects. In Edirne, people were happy to have heat throughout their homes, however the quality of coal available was reducing their ability to maintain this. In Leeds, the combination of insulation and a new district heating system made a substantial difference to people's lives, raising comfort levels at home, and increasing wellbeing. This is covered in detail in part 3.3.

5. Using a combination of first and second interviews, we were able to identify explanations for the change people experienced, as well as reasons why they did not access more energy services, or experience improvements in their health. We characterised these according to the positive change that the interventions were able to make: for example, people in Jelgava became more aware of the association between ventilation, air quality and health, and people in Valencia and Edirne found that additional warmth helped to alleviate pain. We also characterised the external conditions that shaped participant's experiences, and the possibility for the intervention to succeed. These included factors associated with energy supply arrangements, the state of repair of housing, poverty and climate change. This is covered in detail in part 4.

In preparing this report in collaboration with the team producing D4.3 (Final pilot sites analysis report), we note that there are some useful insights here which add nuance to the quantitative health, air quality and questionnaire data there. Specifically, in the qualitative data, and indeed in our additional quantitative analysis, we are able to pick up the small improvements in people's lives which might not register across the larger sample. In part 4, where we discuss the ways the interventions have changed lives, and the limitations to interventions, we also offer explanatory clarity on how this comes about. This report on qualitative findings should therefore be read as complementary to D4.3.

1. Introduction to the deliverable

1.1 Deliverable objective and scope

This deliverable reports on qualitative data collection and realist evaluation undertaken under Wellbased, as well as integrating some of the quantitative data analysis associated with energy and health (part 3.2). The deliverable sets out to address the following objectives:

1. Documenting participant experiences pre-intervention and in relation to energy use, health and wellbeing (part 2 of this report).
2. Documenting 'what changed for participants and what stayed the same' (part 3).
3. Analysing 'why change happens and why things stay the same' (part 4).

These insights provide explanatory findings for the project in general, and take a broadly realist approach, in showing how things worked and did not work for different participants in the different pilot sites.

1.2 Relation to other WPs and deliverables

This deliverable is complemented by D4.3 Final Pilot Sites Analysis Report (M45), D4.4 'Data platform with data gathered' (M45), and D4.6 'Report on status of posting results' (M45). The WELLBASED project will end in M48 (March 2025).

This deliverable is principally focused on WP4 task 4.5, with some attention also paid to task 4.3, both related to data analysis. It is also strongly linked to WP3, which was responsible for implementation of the six urban programmes and the evaluation study, and monitoring of recruitment and data collection. Equally, the research results will be exploited in WP5 and WP6, being publicly shared in a Policy Briefing and in a capacity building webinar. All WPs, tasks and deliverables that this deliverable relates to are presented in Table 1.1.

Table 1.1. Deliverable 4.5 in relation to other WPs and deliverables

WP	Deliverable/ Task	Description
WP3	D3.1	Implementation plan for each pilot site (Leader: LNV)
	D3.2	Midterm recruitment report (Leader: EMC)
	Task 3.2	Pilots' implementation and monitoring in the six adapted urban programmes (Leader: TNO)
	D3.3	Intermediary report on the implementation of the urban programme (Leader: ASIDEES)
	D3.4	Final report on the Implementation of the Urban Program (Leader: ASIDEES)

WP4	D4.1	Pilot sites evaluation framework (Leader: EMC)
	D4.2	Intermediate preliminary analysis report (Leader: EMC)
	Task 4.2	WELLBASED platform creation and data gathering (Leader: INCLIVA)
	Task 4.3	Data analysis: evaluation of the effects on health & well-being (Leader: EMC)
	Task 4.4	Data analysis: cost-effectiveness assessment (Leader: EMC)
	Task 4.5	Qualitative data collection and realist evaluation (Leader: UNIVLEEDS)
	D4.3	Final Pilot Sites Analysis Report (Leader: EMC)
	D4.4	Data platform with data gathered (Leader: INCLIVA)
	D4.6	Report on status of posting results (Leader: EMC)
WP5	Task 5.2	Upscaling and replication (Leader: DEM)
	Task 5.3	Capacity-building webinars (Leader: ENC)
	Task 5.5	Policy Recommendations for the scaling up and transferability of evidence-based urban policies to reduce energy poverty (Leader: LNV)
	D5.5	Policy Recommendations (Leader: LNV)
WP6	Task 6.2	Communication activities (Leader: ENC)
	Task 6.3	Scientific and academic dissemination (Leader: EMC)
	Task 6.4	Exploitation, innovation and business models development (Leader: KVC)
	D. 6.3	WELLBASED exploitation strategy (Leader: KVC)
WP7	Task 7.2	Ethics management (Leader: INCLIVA)
	Task 7.4	Data management (Leader: INCLIVA)

1.3 Target population in each pilot city

For the purposes of this report, we offer some key details about the targeted population in each city. These are summarised in table 1.2.

The qualitative data allowed us to add some detail to these rather broad-brush descriptions of our target households. For example, we noted that many of the dwellings that we visited were in a poor state of repair, with widespread conversations about leaks, damp, and mould. In many of our cities, people were unhappy

with their heating systems. In Leeds, the storage heaters provided inadequate heat in the evenings and were difficult to operate. In some homes in Jelgava and Obuda people had district heating that was turned on in autumn, and off in spring, with no control of heating levels in between, and with the date for the heating going on and off being at the whim of the building manager. In Edirne, heating systems consisted of a coal-fired stove in one room, with other rooms cold, and homes had draughty windows and doors. In Valencia heating systems varied, more had individual heaters in some rooms and a few participants had central heating. In the warmer cities (Edirne, Obuda, Valencia), temperatures regularly reached 35 degrees+ in summer during our study period, and there were also extensive concerns about summer heat, and discussions about access to air conditioning. Finally, we talked to several people in Leeds, Valencia and Jelgava who were living in overcrowded homes, or living with people out of necessity rather than choice.

Table 1.2: Key characteristics of households in each pilot case as they joined the Wellbased project

City	Socio demog. characteristics	Tenure	Building structures	Heating systems	Cooling systems
Edirne (Türkiye)	Roma neighbourhoods, mostly two or more adult households, mostly without children (57%), many unemployed.	Private owner occupiers in informal settlements	Detached houses	Coal fired stoves (in one room only)	Very rare air conditioning
Heerlen (the Netherlands)	Mostly households without children (about 75%), 88% born in NL, many unemployed.	Mostly social renters, some owner occupiers	Townhouses or apartments	Predominantly Central heating	About 15% have air conditioning
Jelgava (Latvia)	Mostly households without children (about 64%), many older people (31.5%), mostly employed.	Mostly owner occupiers, some social housing.	Medium-rise multi-unit apartment blocks, some townhouses	District heat, or central heating.	Very rare air conditioning
Leeds (United Kingdom)	Mix of immigrant and British born, diverse household types	Social renters, and leaseholders	High-rise multi-unit apartment blocks	Storage heating	Very rare air conditioning

City	Socio demog. characteristics	Tenure	Building structures	Heating systems	Cooling systems
Obuda (Hungary)	Mostly households without children (82%), many older people (39%), about half employed.	Mix of social renters, private renters and owner occupiers	High-rise multi-unit apartment blocks	Mostly district heat	About 32% have air conditioning
Valencia (Spain)	Mix of immigrant and Spanish born, diverse household types, many unemployed	Private renters; private owner occupiers	Medium-rise multi-unit apartment blocks	About 10% have central heating, the rest single heaters	About 50% have air conditioning

1.4 Intervention in each pilot city

The project aimed to design, implement, and evaluate a novel, comprehensive urban programme, based on the social ecological model, to significantly reduce energy poverty and its effects on citizen health and well-being. The design of the urban programme was built on evidence-based approaches, representing not only different urban realities but also a diverse range of welfare and healthcare models. The interventions were, however, rather different in the six pilot cities. More details on the implementation for each city is available in D3.1. For the sake of the reader, we characterise them in brief in Table 1.3.

Table 1.3 Wellbased interventions in brief

Pilot city	Wellbased interventions in brief
Obuda (Hungary)	Home energy audits; financial counselling; energy saving training; household management training, health examinations; attitude forming and community building activities; in-home air quality sensor installation; tailored appliance retrofit or upgrade.
Heerlen (the Netherlands)	Home energy audits; energy conservation training; energy debt counselling; installation of in-home indoor air quality displays.
Leeds (United Kingdom)	Retrofit of apartment buildings, referral to energy and financial counselling and social services.

Pilot city	Wellbased interventions in brief
Edirne (Türkiye)	Home socio-energy audits; new stoves fitted which provide heat throughout the home, and hot water; debt management counselling
Jelgava (Latvia)	Home energy audits; energy saving training including bill optimisation, energy kits.
Valencia (Spain)	Home socio-energy audits; energy bill counselling; debt management counselling; energy efficiency kit; energy conservation training, regular community gatherings.

1.5 The qualitative research process

The qualitative data collection consisted of individual (or where appropriate household) qualitative interviews with a diverse sample of participants from each pilot intervention. We visited participants towards the beginning of the intervention, and returned to see how the intervention had affected their lives (after approximately a year). We approached people individually rather than collectively due to the stigma of this experience: people are often uneasy about discussing such private matters in public. The data we collected offers a rich picture of the way that people are living their lives, and how the interventions affected them.

Data was collected in two waves: in late 2022-2023, at a timepoint fairly near the beginning of the intervention in each pilot, and late 2023-2024 approximately a year after the intervention in each pilot began. The only exception to this was in Edirne, where the intervention start was delayed, and as a result there was only time for one interview. The exact timing of interviews was in any case flexible according to the needs and interests of each pilot, with interviews taking place in the winter season in some cities (UK, LV, TR) and in both winter and summer in hotter cities (ES, HU). Each city team recruited a sample of interviewees with the intention of revisiting participants to find out how people were experiencing any changes. Altogether we talked to 77 interviewees in wave 1 (including the Edirne participants) and 58 interviewees in wave 2 (53 participants were interviewed in both waves 1 and 2 and are the focus of analysis in this deliverable).

Participants were recruited from the wider sample of Wellbased participants, many of whom were already meeting with colleagues regularly to offer responses to questionnaires or to have health measurements taken. This regular contact made recruitment straightforward: and colleagues who were in regular contact with participants were often the ones to invite people to interview. Colleagues in each city were asked to sample within their wider Wellbased sample for diversity: looking for a qualitative sample that was reasonably representative of the broader cohort. Information about the full qualitative sample is provided in table 1.4.

Interviews were covered by a separate consent process to the rest of the study, and interviewers took interviewees' consent before each interview, first by asking participants to read an information sheet and sign a consent form, and second by asking participants to consent orally. The first interview focused on the lived experience of energy poverty, as well as indoor air quality (principally damp) and health. Questions

were designed to get a good understanding of people's lives, including their energy use, their family and housing situation and their health (both mental and physical). There were also some preliminary questions about the intervention in the first interview, and questions about the kind of additional support people needed. The second interview was focused on the effects of the intervention, asking people how their health, energy use and general lives had been affected by the intervention. In Edirne, we combined questions about both of these matters into one interview. In this report, part 2 is based principally on the first wave of interviews, and gives a strong sense of the experience of energy poverty in the six cities in question. Parts 3 and 4 are based on the second interview and aim to capture change.

Interviews were undertaken by in-country teams, including professional researchers (UK, LV, TR, NL), and pilot team members (ES, HU), and in the language of the country. As such, not all interviewers were professional researchers, but the data quality was good. We were able to discuss the collection and analysis of the qualitative data at ad hoc meetings during the project, as well as at the regular consortium meetings. The interviews were transcribed and translated into English for analysis. The data collection process produced a very large set of qualitative data, which has proved very challenging to analyse, but also highly fruitful. Data analysis began early in the process of data collection. The University of Leeds team designed an initial set of codes which were refined as the coding process began in earnest. This represented the first step of data analysis, during which researchers and pilot team members worked together on coding the data from the first wave, according to this protocol. Altogether 11 people played a role in coding the data. Data was held centrally at the WELLBASED repository managed by Incliva in Spain, and we used the MaxQDA software tool to code the data. The second wave data had a different set of codes, more strongly focused on documenting change in response to the interventions.

The second step of data analysis was to look across codes to characterise people's experiences (for part 2) and then to document change (for part 3). We found MaxQDA enormously helpful for this part of the process; we were able to use the 'Quotes, Tables and Themes' tool to generate cross-tabulating tables, to pick out key quotes, and to bring together insights into a shareable space. To document change, we looked at both what people told us had changed, and how people reported their situation at the two time points. So, for example, we looked at the way that people talked about their health in the first interview and compared this with the way they talked about their health in the second interview.

In the following report we present some of our data in quote form, bringing the voices of the participants into our account of our findings. Whenever someone's words are quoted, we reference them using the first letter of the city they live in 'H' for Heerlen for example; the number of the interview, and then either a 'w1' for the first wave interview, or 'w2' for the second wave interview. So 'J21w1' is the 21st interviewee in Jelgava, in the first wave of interviews. Qualitative data is therefore reported anonymously here.

Table 1.4 Qualitative sample information

Variables		All countries			
		Round 1		Round 2	
		n	%	n	%
Age category	18-39	23	29.9	17	29.3
	40-59	32	41.6	22	37.9
	60+	22	28.6	19	32.8
	Total	77	100.0	58	100.0
Gender	Male	21	27.3	11	19.0
	Female	56	72.7	47	81.0
	Total	77	100.0	58	100.0
Born in Pilot Country?	Yes	64	83.1	48	82.8
	No	13	16.9	10	17.2
	Total	77	100.0	58	100.0
Belonging to cultural minority?*	Yes	8	10.4	7	12.1
	No	60	77.9	45	77.6
	Don't know	9	11.7	6	10.3
	Total	77	100.0	58	100.0
Employment Category	Part-time work (under 31hrs)	8	10.4	5	8.6
	Full-time work (32hrs+)	23	29.9	19	32.8
	Retired	16	20.8	16	27.6
	Unemployed (benefits)	10	13.0	10	17.2
	Unfit for work/disabled (benefits)	8	10.4	1	1.7
	Not in labour force	9	11.7	6	10.3
	Student	3	3.9	1	1.7
	Total	77	100.0	58	100.0
Household Composition	Single adult without children	17	22.1	16	27.6
	Single adult with children	8	10.4	6	10.3
	Two or more adults with children	23	29.9	16	27.6
	Two or more adults without children	24	31.2	16	27.6
	No data	5	6.5	4	6.9
	Total	77	100.0	58	100.0

*Note that the study in Edirne was undertaken in predominantly Roma neighbourhoods, but this question was not asked in Edirne.

1.6 Complementary quantitative analysis for this report

We conducted some additional complementary quantitative analysis using the self-reported questionnaires completed by the intervention group, to make this a mixed methods report. Specific responses were selected that complement the findings from the qualitative research. These were based on the themes of energy use, energy affordability, the presence of leaks, damp or rot and health. Participants' individual responses were compared longitudinally at T0 (baseline data before the intervention) and T2 (12 months later, post intervention). Due to low numbers of questionnaires completed by Leeds participants, they were not included. Analysis is therefore based on the 508 participants who completed a survey in both time periods in Spain, Hungary, Latvia, The Netherlands and Turkey (Table 1.5). For a detailed description of the full questionnaire content and data collection process please refer to D4.3, Section 3.3.

Table 1.5 Self-reported survey participant numbers by pilot site

Pilot Site	T0		T2	
	n	%	n	%
Valencia, Spain	145	24.6	112	22.0
Obuda, Hungary	82	13.9	78	15.4
Jelgava, Latvia	124	21.0	117	23.0
Heerlen, The Netherlands	117	19.8	86	16.9
Edirne, Türkiye	122	20.7	115	22.6
Total	590	100.0	508	100.0

For the analysis reported here, the selected variables have been recoded to reflect a change in experience that is either ***negative*** (for example started to engage in or increase the frequency of a negative experience or behaviour), **positive** (for example stopped or decreased the frequency of a negative experience or behaviour). They also reflect 'No change': this can be **negative** (for example still struggling or engaging in negative energy practices), or **neutral** (for example, continue to not have problems). An example of how variables have been recoded is presented in the Annex. Changes in experiences have been analysed by pilot site, reported in Section 3.2. and by gender reported in Section 4.8.

1.7 Limitations

The research, and the ensuing deliverable, was limited by a number of factors:

1. This is a very large quantity of data, and we have limited resources, time and indeed space in this report to explore the deeper differences between pilot cases. We have endeavoured to represent the overall findings from the project across all pilot sites, as articulating the lived experience, what

had changed as a result of interventions and why change occurred being our key objectives here (see1.1). In places this may lead to an over-simplification of a complex set of circumstances across the six pilot cities. In the main we focus on commonalities across the data set here, to be able to articulate a story of change. We hope to develop more nuanced outputs for each pilot site in future.

2. The political, social, and environmental context of these interventions has made accounting for change extremely challenging; with the war in Ukraine, ensuing inflation affecting energy prices and climate change related heatwaves resulting in a rapidly shifting landscape for our interventions. We have tried to overcome this using a longitudinal analysis of each participants' experience, however such a rapidly changing landscape is not conducive to controlled intervention studies.
3. The qualitative research (data collection and analysis) was undertaken by a large international team. This presents challenges especially given language differences and the differences in experience of and expertise in this kind of data collection. We commend our partners for their efforts in this regard, and we are confident in the quality of our data. However, we also recognise that large teams can dilute the consistency of qualitative results, and we see this as a limitation of our work.

2. Findings: Participants' experiences W1

2.1 Inflation and the energy crisis

2.1.1 "We all don't have money but we're trying to survive."

When asked about the effects of inflation and the energy crisis on their everyday lives, people were ready to talk about this, and were generally struggling to pay the bills. Our sample varied between those with previous experience of (energy) poverty, and those without, but all our participants recognised the impact of inflation and the energy crisis. Inflation had a substantial effect on people across all cities, including those that had paid employment and those that did not. As one of the participants in Edirne put it:

> *Well, life has become expensive. Making a living has become very difficult. We can't manage our household with the money we earn. It is really not enough; our income does not cover our expenses. E10*

Given the inflation rates in the run up to our interviews, across all the cities in which we are working, this is not surprising. People referred to the role of energy price as part of this 'shock':

> *the electricity was a big shock because we had a dynamic tariff and it was very good all the time, and then when the prices started to get so high, well then we were also looking at when to turn on the TV or not to turn on the TV. J21w1*

There is a strong sense across our sample that people were less financially resilient in the winter of 2022-3, in association with these rising prices. People also noted that wages were not going up, which was compounding the problem. Our participants were running low on savings, getting into debt, and feeling anxious about the future. For example, L3w1, a single parent with two children talked about not having any savings, and being chased by the energy company for debt repayments:

> *they are still telling me, "You're in debt, you need to increase a bit more", and I'm like, "No, I can't, I can't afford it, I only work 25 hours a week and with two kids it's not easy." L3w1*

The exception to this is in Heerlen, where some people seemed to have slightly more financial resilience, for example some still had some savings for hard times. One participant explained that they were able to miss a month's rent with their housing association if times were tough:

> *Worst case scenario, I don't pay the rent for a month [...] Then I will send an email to the housing association. (H2w1)*

This option was not a possibility for most in our sample. We also saw people postponing expenditure because of rising costs: including large expenses like getting married, or smaller costs, such as buying new shoes for a child.

Lack of financial resilience creates a sense of fear of the future among participants. For example, a Valencian participant saw her dependency on the benefits system as risky in the face of increasing prices:

> *I got really scared because I said, "I'm dependent on the aids I'm getting right now, if they keep increasing [prices], what am I going to do?" V2w1*

And we also found that fear was shaping the way people spend their money. In Obuda, for example, this participant was prioritising utility bills to stay 'safe':

> *These must be paid, and then I know we're safe. Because we are not threatened by turning off the electricity, or having to pay default interest. O6w1*

The lack of financial resilience also affected people's ability to invest in long term solutions. In Jelgava, where poor home conditions were often discussed, this participant talked about not being able to afford to take measures to prevent mould in the bathroom:

> *Now the bills have gone up, of course it takes the money away. Now the bathroom, yes, we need repairs there, there's that mould and there's no proper ventilation of it, but there's nothing left at the moment. J16w1*

While fear is present, in some cases there is a sense that costs associated with energy and other things are necessary, and that cost saving can only be taken so far. A participant from Heerlen talked about her husband who had limited mobility. As such his use of devices for entertainment and communication was essential, but still needed to be questioned, resulting in stressful choices:

> *The only activity he has when he is home – and we are home quite a lot – is his laptop and his iPad. And that uses power. How much will that use? Should we do that less? … it has made me pretty much over-stressed. H2w1*

2.1.2 "No luxuries anymore. Just basics"

Those participants particularly affected by inflation told us that they had pared spending back as much as possible, as in the quote above. People were making savings on clothing (especially for themselves when they have children), leisure and social activities, and cancelling hairdressing appointments. One of our Leeds participants, an immigrant, was cutting back, but also receiving care packages from her sister who lives in a lower income nation:

> *Because of energy bill, just this year really, I didn't buy a coat, I didn't buy boots, I didn't buy anything and my sister sent me from my country some gloves for warm, I didn't buy because of electric. Last year £5, this year is £10. L6w1*

We saw lots of evidence in our sample of people carefully planning their expenditure across all areas of life. That included this Valencian participant who worked hard to find savings while shopping:

> *So I'm always looking at all the coupons that they give out, that give you 50% off on soap. For the washing machine or... I don't know, I'm always trying to save as much as possible. If I have to buy something, I look at the prices a lot, I compare them V2w1*

In some cases, people were able to buy cheaply when prices are low, including planning well in advance. For example, this participant in Jelgava bought fuel wood in summer in preparation for winter:

> *I bought briquets in June, I don't remember how much I bought, but my garage was full, so I didn't have to buy them at the time when they became very expensive, and now when I have to buy them, they have fallen down in price again. J9w1*

Sometimes saving money by cutting back was really challenging. This Valencian was one of a number in our sample with medical needs, that created additional expenses, in this case for more expensive food:

> *Now they have changed my diet because of the problem I have, that my stomach swells up, so I can't eat everything a normal person eats, everything has to be very, very, very "delicate" and that's costing me a lot. V8w1*

We saw that in the process of cutting back, people were establishing priorities which were different between households and living situation. In Obuda a few participants emphasised prioritising medicine and bills, due to the rise in costs of medicine associated with inflation. Some people were going without medication, others were having to prioritise it to maintain their caring roles in the family, others were saving for possible need for medication in future. O8w1 talks about how things have changed for them:

> *I received infusion therapy last year due to my condition, I receive it every six months. The last such infusions six months ago cost me quarter of the amount they cost today. The whole package used to be less than HUF 3,000, and currently it's 9,000. I was shocked when paying at the pharmacy. I can still pay for it, I'm not a poor person, I don't live on a minimum pension. But if it goes on like this, sooner or later, I'll run out of money, that's it. O8w1*

Across the sample we saw numerous examples of people prioritising their children where possible, and putting themselves last:

> *We have to heat the house, we have to use the heaters for this house and the home for the baby because he's too small. We have to do the bath for him every time, and then we have to keep money for his milk and clothes, something like that. Then we have to think about ourselves. L1w1*

This included people prioritising their children's education where possible, although we also saw examples where people were having to drop children's clubs and tutoring because of rising costs such as this one in Edirne:

> *We told our son he had to quit wrestling. In fact, we forced him to quit. There's no way to support it. E9*

We also saw an instance in Heerlen when people were trading off energy-related improvements to their home with costs of children. As this interviewee put it:

> *because the kids are studying, for example, or need a laptop, need a bike. And that takes precedence over home insulation. H3w1*

There were instances in our sample of people skipping meals due to not being able to afford to eat. The lack of food was especially reported in Edirne where effects were also somewhat more extreme than in the other nations, including reports of children not going to school for financial reasons.

2.1.3 Energy bills and energy companies

Dealing with energy bills and energy companies is an important part of life when you are trying to save money and reduce expenditure. A few of our participants were in debt to energy companies, others were self-disconnecting to avoid the high costs of heat, especially since the energy crisis. We met people who were trading off one vector of energy against another according to price.

We heard examples of people having mixed experiences with energy companies. For example, L2w1 had been invited by her energy company to fix her tariff and as a result had managed to secure low bills in the winter of 2022-23, people were also able to secure reduced tariffs associated with disability, old age or low incomes (Edirne) or low incomes (Valencia). Most references to energy companies were complaints, however, about limited support. In Valencia, this participant complained about being offered a mere 10€ reduction:

> *I have gone to Iberdrola to complain about why the bill comes to me [so expensive]… They've given me 10 euros off, but what do I do with 10 euros? V10w1*

In Jelgava, debt was aggravated by the lack of ability to control district heating. This participant was paying for heating that they did not want during the Spring months:

> *Well, I paid the bills, now I have a little debt from March - April. House still had heating in April even if I told that it was extremely hot in here, but the house manager told that she feels cold. So I was still billed in April, and then there was the beginning of May. It was madness. J20w1*

In Obuda the 'on/off' cost of district heating, where you pay a flat rate for use, results in people self-disconnecting. As one participant put it:

> *Well, if I turned on the heating, it would cost me about twenty thousand forints more, that one little thing. O1w1*

One additional finding was that people were switching between energy vectors according to the price of each. So, for instance in Valencia, one participant who was very carefully following prices, switched from electric heating to gas and then back again to electric in order to save money:

> *Then we had to buy a gas heater because I only have that one radiator that runs on electricity, but because of the price of electricity, we had to buy a gas heater... now the electricity has gone up a lot, but even so I paid less with all electricity than when I had natural gas, that is to say, I took the gas off because it was at a price... [very expensive]. V9w1*

2.2 Energy practices

2.2.1 Cutting back on energy use to reduce costs.

In the previous section we discussed how our participants were commonly cutting back on general spending to make ends meet. This also applied to cutting back on energy use. We saw a range of restrictive practices across different households shaped by how challenging they found their financial situation, and by the needs that they have for energy. Across the sample, many were being careful about the energy that they used at home, and as a result people were often very conscious of the cost of energy needed for different practices. In many cases there was the sense that 'this year' (late 2022-2023) was different to previous years: that we need to be even more careful about energy use. As one participant in Jelgava put it, they needed to: "manage things differently [than] in other years" J8w1. Energy restrictive practices included the following:

- Not heating or partially heating the home, or restricting the temperature in the home;
- Changing cooking practices (batch cooking, buying in food to avoid using energy);
- Changing laundry practices (e.g. washing less, using a shorter wash cycle, using cheaper nighttime electricity);
- Turning off appliances and lights or not using appliances (e.g. tumble dryer, hair straighteners, using iPad instead of a TV), getting rid of appliances;
- Changing bathing practices (e.g. not using hot water in winter at all, washing from a bucket instead of a shower);
- Spending time in communal places.

Most people link these restrictive practices to having to save money. A few of our participants also linked these practices to their environmental values and climate change. We note that different housing conditions shape whether people can engage in all these restrictive practices (e.g. district heating controlled centrally in Jelgava and Obuda).

To give a few more detailed examples from our data of people cutting back on energy, a Leeds participant showed how much more expensive heating was this year, how much they understood the cost of energy, and how this resulted in a reduction in use.

> *It's very expensive, that one, by the way [referring to heater]. I've got a friend, he topped up £10, and then we start using that… after so many minutes, like half an hour in total, it already took £3, that heater, from £10, so can you imagine if it was going all day, what would happen. L3w1*

We also saw regular instances of people trying to trade off one energy need with another. This is well exemplified by this participant from Obuda:

> *For example, this speaker, TV, computer, they are powered from a common multi-plug socket which I always turn off. These are just the minimum. If we now consider, say, heating up an oven, or, I don't know, cooking a three-course meal with an hour and a half of cooking, I think I can balance it with 'turning off' for a month. Cooking one meal takes the same amount of electricity as charging your phone. So, I try to pay a little attention to this, but I haven't gone any further yet. O9w1*

We also saw instances of people trying to use energy when it was cheapest, as in the case of the participant in Valencia (V9w1) who does her laundry at the weekends.

We had some rather extreme practices in the sample, with, for instance, one of the Valencian participants (V1w1) never washing in hot water in the winter, one of our Heerlen participants (H9w1) washing in a bowl to 'save on gas', and an single older woman in Jelgava J19w1, who was not connected to mains water, either sending laundry to her sister, or washing smaller items by hand.

2.2.2 Coping with heat

Coping with heat was a bigger problem for those living in very warm countries. We began our interviews in the winter of 2022-23, and both immediately prior, and during the study period summer temperatures in hotter cities (Valencia, Obuda and Edirne) regularly went up to 35°C. While Leeds and Jelgava were a lot cooler in summer (low 20s°C), they had also experienced heatwaves. Coping with the heat was a very central concern in Valencia, and Edirne, and important in Heerlen and Obuda. One of the big challenges presented by the heat was sleep disturbance, and people talked about this regularly. For instance, in Valencia V7w1 talks about getting up in the night to have a cold bath 2 or 3 times, then feeling tired in the day. People used a range of measures to cope with the heat, including:

- Opening doors and windows, closing doors and shutters, closing curtains and blinds (note different practice in different households).
- Taking cold showers and baths, eating cold food, using ice packs.
- Going outdoors, in the garden (sometimes until late at night in Edirne) or going away to the countryside.
- Using fans in the house. Using air conditioning in some cases, although many cannot afford either installation or running costs.
- Sleeping downstairs.

Note that the construction of the home, and the immediate environment of the home were quite important here. Some participants reported not being able to open windows due to safety concerns from living in high rise, worries about pets, noise from traffic, or air conditioning outflow. In Obuda, some participants talked about being protected from the heat by other buildings or by trees. This Valencian participant explained their experience of heat in the summer, in a house which faces the sun:

> *In my room, which is that one, there's no chance anyone can sleep, because the sun shines on it all day … When August comes we have a terrible time. We also go out of the house a lot to drink cool things, like ice cream and at home a lot of cold water, and that's how we get by. It's just that you can't do anything else. V9w1*

Some of our participants benefitted from already renovated buildings. This participant compared the flat before and after insulation, saying that they thought it was permanently 22 degrees now that the insulation work was done:

> *Well, when my mother was sick, she had to use a wet towel, because the apartment got so hot. Insulation means a lot; it is very good. This is what I recommend everywhere, to insulate where there is none. O2w1*

In Leeds, L5w1 experience of coping in the heat was heightened by this single mother's concerns about her toddler being safe with windows open in a high-rise building:

> *We're on the side where we get all the sun and it is terrible. I am a bit paranoid about the windows because of [child] being the way he is and stuff and he likes looking out of them so we do have safety catches and stuff but we can't open them wide to get that air even when it's really hot air. L5w1*

In Obuda, another single mum living with her disabled daughter used air conditioning for the health of her child:

> *When we moved here, during the renovation, the person doing it offered us an air conditioner, with respect to the child. It is in the bedroom, it was necessary, because it is very hot here in the summer and the child can hardly breathe. So that's really necessary. O5w1*

2.2.3 Coping with cold

Coping with the cold is also a common feature across the sample, and many households were unable to keep the house warm enough. The exceptions were homes where people have district heating in Obuda and Jelgava, and homes which had been renovated. Where people do feel the cold, across the sample we found them engaging in the following coping practices:

- People heating only one space, moving heaters around depending on which rooms are being used, including sleeping together in one room to keep warm.
- Only using heating for visitors, or prioritising warmth for when children are in the house.
- Using additional or alternate heating sources for example an oven, or cooking to warm up the house.
- Wearing extra clothes and using blankets, using extra layers in bed.
- Blocking ventilation grilles (in Heerlen).

The experience of cold was central in Leeds participant's lives in the winter, with most people unable to achieve adequate indoor temperatures. As one of our Leeds participants, an immigrant, compares her experience with her niece who is also in Leeds:

> *This winter it's not warm in my house… my niece living here, she is living in a house and she has a gas radiator… when me and my daughter are going to her house, "Mummy please, her house is very warm!" but when we come back, I say … "We are living in Siberia," you know? Really cold. L6w1*

This is somewhat of a contrast to homes which have district heating, like this one in Obuda where temperatures are kept very warm:

> *The child told me last night that he was cold. Well, I told him, lay your blanket over your duvet. And how many degrees was it, about 22? 23. I don't know, I think we're used to a warm apartment. O3w1*

To offer some examples of the coping practices listed above, participants talk about their families keeping warm in one room, including sleeping together:

> *We all go to a room and there we all turn the heating on a little bit, we get a little bit of heat and then I have a movie there and that's it. V7w1*

Others discussed their priorities for heating being their children and visitors to the home:

> *When I'm working, and if I'm in the same room, and then the computer blows warm air, then I just warm up that space, because the kid's in kindergarten. If he is sick or somehow, a warm house is definitely kept. J15w1*

We had many examples of people wearing additional clothing or using additional layers in bed:

> *It's also nice not necessarily to use the energy … You put on one of those beanies they sell in Decathlon, or something like that, and you solve 80% of the cold. V6w1*

In homes that are heated by district heating (some in Obuda and Jelgava), people have little control over the temperature of their house due to the decisions about heat being off and on being made centrally. One participant talked about trying to get the municipality to change the settings, asking them to put the heating on when it is colder.

> *For many years, we have been trying to get the municipality to lower that temperature so that it turns on at, say, 10 degrees. We are unable to achieve it, we've been fighting for it for 14 years. O8w1*

The lack of control sometimes worked to people's benefit. Some participants had insulation and didn't need to heat their apartment even in winter (e.g. O2w1). In another case in Obuda, a participant took advantage of free heat from the distribution pipes (O9w1).

2.2.4 Coping with damp and mould

Damp and mould was not a problem for all of our participants, but clearly shaped by the climatic conditions in each city. Participants in Obuda were less likely to report damp for example, whereas there was lots of discussion of damp and mould in Leeds, Jelgava, Edirne and Valencia, and some in Heerlen. Where damp is present, it is linked to under-heating (making condensation more likely to form), lack of insulation (which increases wall temperature and prevents condensation), rising damp (in Jelgava), over occupation of homes (in Leeds) and inadequate ventilation. We met participants that had ongoing problems with leaks which resulted in damp and mould. Damp is exacerbated by drying clothes indoors, and given that many of our participants live in apartments, they do not always have a choice to dry outside.

People coped with damp and mould in a variety of ways:

- Opening windows to air out the building.
- Keeping the bathroom door open when having a shower.
- Regularly cleaning mould with bleach or vinegar (some were cleaning daily).
- Redecorating over the mould.
- Using a dehumidifier (where they can afford it).
- More extensive treatment and renovation (where they could afford it, or where landlord stepped in).
- In Edirne and Leeds some people had closed off areas of their home due to mould.

Some people reported very severe problems, as did this participant in Heerlen:

> *Due to something the wall in my living room went all … turned completely black and on the inside too. And I had leakage from the roof leaking. H9w1*

Our participants seemed to have a good understanding of ways of preventing mould (particularly ventilation), but these strategies were not always possible, or indeed did not resolve the problem:

> *Now the windows and the laundry are cleaned constantly, inside. We clean with bleach every day. We clean the walls. What a smell. We open the windows and doors. E3*

People were also concerned about security when leaving windows open, some kitchens and bathrooms did not have windows, and some in colder countries had to make a trade-off between cold or mould. This participant in a high-rise block was worried about leaving windows open when the children were home:

> *Sometimes I do open my windows to get fresh air in, but if it's cold, when my kids are here I don't open it when they are cold, because I am also afraid of the windows. L3w1*

Those that did not have mould problems were more consistent in ventilation practices, developing strategies that worked, or were just lucky that when they ventilated or painted this had a positive effect. For example:

> *I close the kitchen, I put the [wet] clothes in the kitchen, I open the window all night. L7w1*

> *Well, anyway, the thing is that everything is clean now, everything is painted with anti-mould paint and it seems that I'm controlling it. V9w1*

The presence of mould had an important effect on people's lives, increasing the amount of cleaning they needed to do, and sometimes damaging their belongings. This Leeds participant explained how her damp problem had damaged furniture:

> *The wardrobe is connected to the bathroom wall so it's coming from the bathroom but they say don't put any furniture along this wall because that's where the damp comes as well but like I say, we're in a one bedroom flat, there's nowhere to put all else so we've just had to keep rearranging. I do get mould and that at the back of the sofa but I'm not too [bothered], because it is an old sofa, I just cover it … I'm forever cleaning. L5w1*

The other major issue associated with mould and damp is who takes responsibility. We had a few examples in our data of people who failed to get their landlords to fix leaks. Normally the landlord understood that it was their responsibility to fix the home, but in Valencia, one of our respondents had been told to fix that leak themselves.

> *Sure, I told him that… what he wrote to me this: "you fix it". I didn't say anything back. "You fix it and pay for it"… No, no, I'm not going to pay for that pipe because it is not a cost I have to assume. V8w1*

2.3 Impact of Energy Poverty on health and wellbeing

Here we describe people's health and wellbeing before the intervention, and how participants in our interviews understand their health and wellbeing to be linked to their difficulties in accessing adequate energy services. We paint a picture in which:

- Participants understand respiratory problems to be associated with exposure to cold, damp and resultant mould.
- Participants note some exacerbation of existing health conditions due to exposure to heat, cold, and damp. This includes physical and mental health conditions.
- People's wellbeing was affected by their inability to access adequate energy services, including worrying about exposure to extreme temperatures, exposure to mould, and the lack of control over these circumstances.
- People told us how inflation and the energy crisis had made people's lives a lot more stressful financially.
- People's social lives were sometimes shaped by their energy poverty, with tensions associated with visitors to the home and their energy needs, as well as tensions in relationships. People

expressed frustration with accessing support, and in some cases resentment against others that had received supports.

Note that in the literature the relationship between energy poverty and health is thought of as two-directional: health and wellbeing impact on energy poverty, as well as energy poverty impacting on health and wellbeing (Middlemiss, 2022). We mainly heard about the impact of energy poverty on health and wellbeing from our participants: this may have been due to the way in which people were questioned. Note also that we are not formally identifying a causal pathway here: this is beyond the scope of qualitative research.

2.3.1 Physical and Mental health

Given that ours is a diverse sample, our qualitative interviewees had a range of health conditions. Here we only report on health conditions that people believe to be exacerbated by their inability to access energy services. We also only report mental health effects here where people discuss their diagnosed mental health problems. More general wellbeing effects are covered in the next section.

Mental and physical health effects of inadequate access to energy services vary between nations, due to the nature of the sample and the climate. Typically, these effects are associated with cold, damp, overheating, access to medication and the triggering effects of living with inadequate access to energy services on mental health conditions. Quite a few of our participants report how the general condition of the house is a trigger for poor physical and mental health. As one of our Edirne participants puts it:

> *I wish for them to come and live in this house for a week, then let's see if they end up in a faculty hospital or something. Is it a liveable place? They would be hospitalized due to illness. E9*

Some people in our sample were reliant on energy for their health, as in the case of this participant in Heerlen whose husband uses a machine to aid his breathing. This is increasingly challenging with the rise in energy costs:

> *The power fee is 6 cents per hour, still, even after the rise. That is not proportionate. He uses that thing [breathing apparatus] 10 hours a day, that's easy money… Someone who is sick has to spend more than someone who is not sick. H2w1*

The most reported physical health conditions associated with energy access are respiratory conditions, especially in children. People also reported increased incidents of colds and flu in the winter across all cities. A participant in Jelgava, connected their inability to adequately heat the home to the health problems that their family was experiencing.

> *… the kids have never gotten sick like they did last fall and this winter. And especially now the little one is 4 months old and has had bronchitis 3 times, and the doctor says that this [the cold] could be one of the cornerstones of why he might have such health problems. J14w1*

Respiratory conditions were linked by our respondents to the presence of damp and mould (related to the cold) and to heat. People felt frustrated at their lack of agency to change living conditions for themselves and their family:

> *So with the child it's like, it can't go on like this with his health, but I can't do anything about it. Because that mould appears again and again, no matter what I put on it, no matter how I put it on. O6w1*

We also saw lots of concern about how the presence of damp and mould, and living in cold conditions impacted health. For some this exacerbated other health issues. For example, a participant in Leeds (L4w1) was affected by long covid, which affected her physical and mental health. Her breathing difficulties and mental health are exacerbated by the damp and mould which is particularly bad in her bedroom due to an ongoing unfixed leak. Others were concerned about the health of their children. A child from Obuda was diagnosed with an allergy but the parents were not able to get any help to remove the problem. In Leeds one of our respondents who was pregnant saw both the mould and the treatment for it (bleach) as dangerous for health, but had little choice as to how to resolve this:

> *A health visitor came here and asked me about mould and house, I told her I use bleach, she said it's not good for baby, and I said, "I know it's not good because I read everything about it, it's not good for health, but what should I do, mould is not good for my baby also." (L1w1)*

In another example, a respondent also from Leeds diagnosed with OCD described her need to clean mould daily as linked to her anxiety, and concern for her child's health:

> *They tried to give me antidepressants to help with my anxiety to try and calm me down and just to sit down and relax but it's only me and him so I feel like I need to get it all done, otherwise if I leave the damp and mould, we are going to get poorly and I don't want us to get asthma and stuff. L5w1*

Across the cities, extremes of temperature whether warm or cold affect people's ability to live ordinary lives. For example one of our Valencian participants talked about how damp in winter exacerbates muscle pain, and makes it hard to get out of bed. In the cities which experience hot summers (Valencia, Obuda, Jelgava, Edirne), there was considerable discussion of the impacts of heat on physical health. This included having 'heavy heads' or headaches, being lethargic and listless, due to it being difficult to sleep. As one respondent in Jelgava put it:

> *when it's hot and you can't cool down, for example, then yes, I was tired and in a bad mood, you wake up in the morning all crumpled up, bloated J6w1*

This is also widely reported in Valencia. One participant talks about not being able to sleep at night meaning "the next day I am broken" (V2w1). For this participant, the heat is on a par with her health condition in terms of how much it affects her life. The effect of heat on people's blood pressure is also widely spoken about. In

Edirne, our participant talked about her sister who has an underlying health condition needing to sit still, because of the effects of heat, as she describes:

> *She (referring to her sister) slowly gets up, as if she has drunk alcohol... She gets dizzy ... I say quickly hold her arm, so she doesn't fall. E1*

2.3.2 Wellbeing

The examples in the previous section provide evidence of mental ill-health conditions exacerbated by living conditions, including stress associated with mould, although people were less likely to talk about this in detail, perhaps because of the stigmatised nature of mental health conditions. Participants were more likely to express emotions or concerns about their circumstances and the impact this was having on other family members. We look at this broader understanding of mental wellbeing issues in this section.

People were worried and anxious about being unable to access adequate energy services. This included the inability to control the temperature inside the home (whether too hot or too cold). People were also worried about the effect of mould, and the bleach used to clean it. For those that are unable to keep their homes warm enough, the general feeling is summed up by our Heerlen participant: "you don't feel happy because it's too cold in winter" H6w1.

People reported the extremes of temperature (too hot or too cold) being frustrating and difficult. In extremes, people could not live their lives as normal. Lots of participants felt that having a warm home in the winter was important for wellbeing generally. The cold and being ill from the cold making people feel depressed, as this respondent in Jelgava articulates:

> *when it's cold, I want to wrap myself in a blanket and do nothing at all. Well, that depressing feeling here is yes. Not really nice. J4w1*

We saw multiple instances of parents worrying about their children, often linked to damp or mould and living in cold conditions as noted in the previous section. One of our participants in Edirne found the presence of mould and damp unbearable, as she put it: "the more I look at it. The more it breaks my spirit" E1. In Leeds and Valencia parents were concerned about children getting cold in their sleep. As one of the Valencian respondents said, the concern about children creates worry, and sleeplessness for parents:

> *when the little ones wake up, they uncover everything and you find them there all frozen... As a mother myself, it doesn't let me sleep peacefully, I wake up several times… V2w1*

People expressed raised stress and anxiety linked to having very limited money to spend, needing to make trade-offs between different types of spending, and adjusting energy use in order to compensate for relatively lower budgets. For example, in Valencia, one of our respondents was setting an alarm for the middle of the night, to allow her to put her washing machine on when electricity is cheaper, disturbing her sleep. This could have considerable impact on people's wellbeing, as for this Heerlen participant:

> *It was just enough to make you cry, truly. I really cried because I thought you know, I had times when I had it really bad financially and there was basically nothing…. H8w1*

This was strongly apparent in our interviews, in some cases people also talked about how different the trade-offs had become since prices got higher. We noted examples of people working longer hours, people restricting all discretionary spending, and articulating the fear of receiving bills as the costs went up.

One of the Valencian participants reported the relief of having a more automated way of reducing the power being used by appliances on standby. This gave them a sense of control over their energy consumption, which reduced the worry.

> *I disconnected all the appliances, now with the trick of the programmer... Well, it's under control, but otherwise I had to live worrying about the light in the microwave. (V2w1)*

2.3.3 Social interactions and relationships

Here we emphasise specifically how social lives, and people's relationships with others around them are affected by energy poverty in our sample. There was a lot of discussion of visitors across the sample, and how the home temperature needed to be modified when people were there. Others talked about being embarrassed by the cold in their homes and by the damp and mould. In some cases people were unable to bring the temperature up to their visitor's standards, and ended up seeing less of their families as a result. A participant in Valencia, for instance said:

> *Because the last time a sister came to visit me, she said, "Oh, sister, I don't know how you manage to stay here, it's freezing in here. I put a blanket there to keep her warm. Then she got bored and left, of course. V8w1*

One of our Turkish participants talked about being ashamed of the damp conditions in their house:

> *Now when someone comes, they won't look at my face. They would say, talk, but their eyes were always on the ceiling. I was very embarrassed then. It hurt me a lot. E3*

Some people across all the cities talked about not inviting people at all because they could not afford to adjust summer or winter temperatures.

We also saw some examples of relationships coming under strain due to coping with constrained financial circumstances, as well as aspects of energy poverty. For example, one of the Jelgava participants lives with her brother, due to costs of accommodation they cannot afford to have separate homes. She pointed out that while they have a 'civilised relationship' this is not a choice for them: "if I would want to help him buy something to have a separate place, that's not an option" J9w1. Another older woman from Obuda talks about the challenges of navigating her difficult relationship with her adult son who lives with her, while not being able to top up the electric meter herself. This left her feeling 'very nervous':

> *I told the dumb kid to top-up the prepaid electric meter. And he asked if he could do it later. No, do it now, you son of a bitch, if I tell you to top it up, why do you ask?...I don't know how to top up the meter. O1w1*

People's difficult circumstances sometimes resulted in people making comparisons between their own situation and others, often leaving them frustrated and causing arguments within the home. In Heerlen we saw this led to people feeling like they were getting a worse outcome than others, due to the levels of support available to those in different places on the income scale, or for immigrants.

> *I just think it's a shame when hardworking people have nowhere to turn to. It's not that I begrudge those people that, who have less money. But what is actually left for the people who both work? … People who are both sitting at home on the dole just get it, and basically I don't think that's fair. H3w1*

2.4 Summary of pre-intervention findings

We met our interviewees at a time when inflation was hitting them hard, people were struggling to manage family budgets and cutting out all but essential spending. This included cutting back on energy use and reducing energy spending. Our participants had developed extensive coping mechanisms for hot and cold weather and were having to manage damp and mould in their homes carefully, to mixed effects.

These experiences of not having adequate energy services had important impacts on people's health, especially their wellbeing. Here we saw people frustrated that they were unable to help themselves, worried about their finances, and having to modify their social lives in response to the availability of energy. We also saw some people's mental and physical health conditions exacerbated by exposure to cold, heat and damp, especially respiratory conditions, increased incidence of colds and flu, as well as low wellbeing. In part 3, we move on to discuss the impacts of intervention on our participants.

3. Findings: What changed for participants, and what stayed the same.

3.1 Introduction

Here we report on two sets of data to explain what changed for participants and what stayed the same. First, we profile our longitudinal analysis of the questionnaire data collected at T0 and T2 (as introduced in section 1.6 above). This documents how people's use of energy, affordability of energy, housing conditions and health changed during the intervention in the five pilot sites for which we have adequate data. Note that we document some positive and some negative outcomes here. Second, we draw on the second wave of qualitative interviews to profile experiences of change in each pilot, showing how people talked about the effects of the intervention in each city. Again, we note some improvements in people's lives in association with the intervention, as well as other aspects of their lives that have stayed the same.

3.2 Quantitative analysis of the impact of interventions on energy poverty

In this section we present the findings from longitudinal analysis of the quantitative survey data responses of the intervention group. Changes in experiences are analysed by pilot site (except Leeds due to low sample size) and gender (reported separately in section 4.8). The approach used complements the analysis reported in D4.3 adding more depth to the findings, as well as providing more breadth to the qualitative analysis reported below in Section 3.3.

The results are presented in themed sections reflecting energy poverty experiences around energy use, energy affordability, damp and health. Results are summarised reporting the main impact whether this is a negative, neutral or positive outcome. Full results are reported in the Annex.

3.2.1 Energy use

Across the pilot sites there are statistically significant differences in energy use and practices to maintain thermal comfort in the home, keep warm, save energy or save money on other expenditure in order to pay for energy bills between T0 and T2 (Table 3.1).

Table 3.1: Statistically significant changes in energy use between T0 and T2.

Energy Use		Mostly positive, negative or neutral effect	Cramer's V	P-value
Thermal comfort	Keeping home comfortably warm in winter	Negative	0.390	***
	Keeping home comfortably cool in summer	Negative	0.205	***
Mechanisms to keep warm	Wear Extra Clothes	Negative	0.408	***
	Go to bed in daytime	Neutral	0.346	***

	Using public buildings to keep warm/cool	Neutral	0.225	***
	Going to neighbours/friends/ family to keep warm/cool	Neutral	0.263	***
Save energy to save money	Turn heating/cooling off	Positive	0.308	***
	Only heating one room	Positive/neutral	0.367	***
	Turn lights off in room using	Positive	0.225	***
	Bathing/showering less	Neutral	0.263	***
Saving on other expenditure	Not eating/cooking	Neutral	0.310	***
	Avoid going to the doctor	Neutral	0.514	***

P-value ***=0.001; **=0.01; *=0.05; ns=not significant

In achieving thermal comfort experiences mostly change for the worse (Figure 3.1). Participants struggle to keep homes comfortably warm or cool after the intervention. Keeping homes warm in winter was particularly problematic for participants in Edirne (72%) and Valencia (42%). Whilst keeping homes cool in summer was a problem in all pilot sites, but particularly so in Edirne (79%) and Valencia (70%).

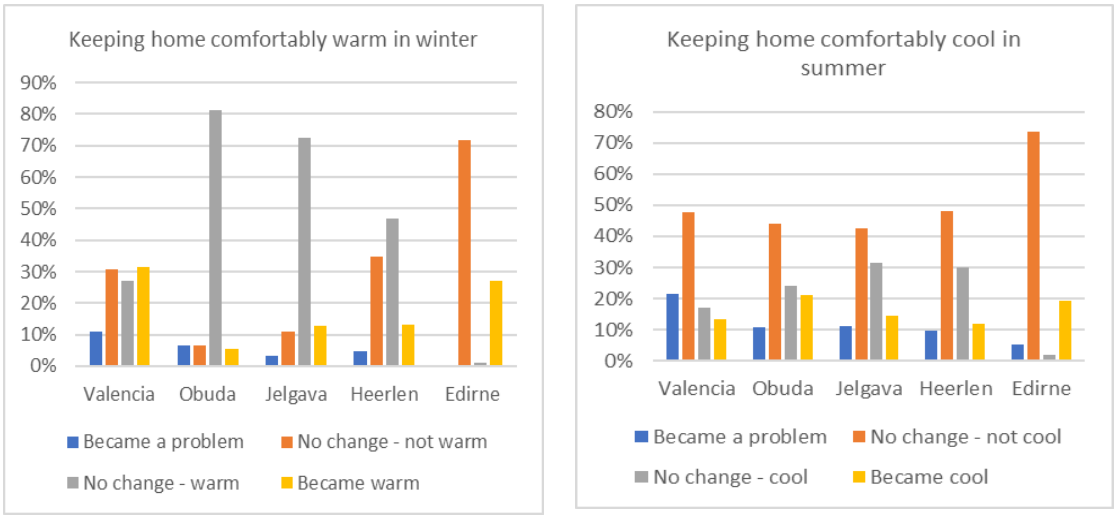


Figure 3.1: Changes in thermal comfort

Participants were asked about different ways that they try to keep warm. Between T0 and T2 the majority of people tend not to go to bed during the daytime (61%) or go to neighbours, friends or family members' homes or use public buildings (80%) (see Annex). Participants were more likely to have started or to have increased how often they wear extra clothes to keep warm, particularly in Valencia (84%) and Heerlen (52%), whilst in Edirne (83%) they were more likely to have stopped or reduced the frequency.

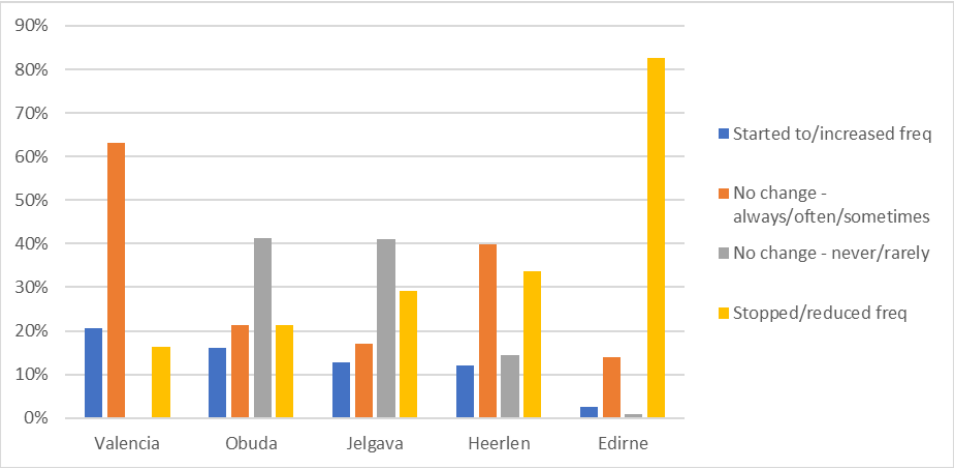
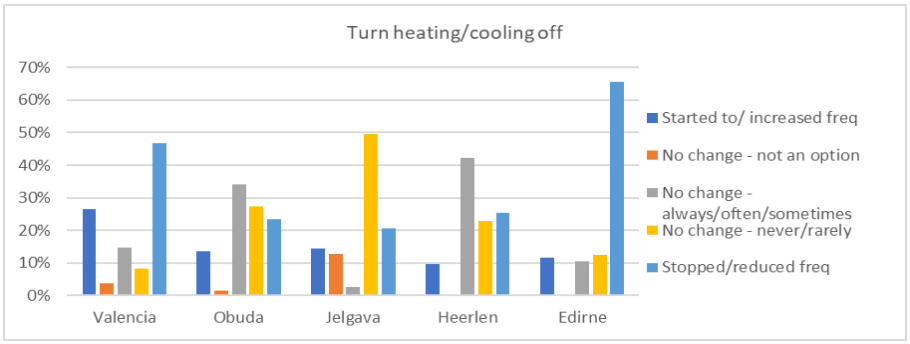
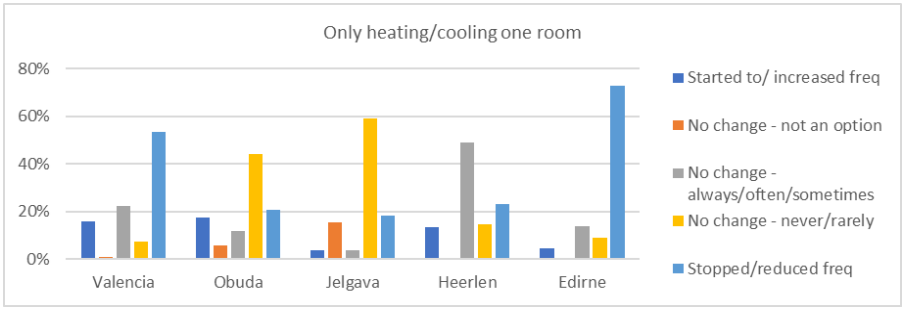


Figure 3.2: Change in wearing extra clothes to keep warm

Changes in energy saving practices between T0 and T2 were mostly positive. Participants were not turning heating/cooling off (particularly in Edirne 66% and Valencia 47%); were less likely to be heating only one room (e.g. Edirne 73%, Valencia 53%) or turning off lights in the room they were using (e.g. Edirne 63%, Valencia 41%) in order to save money (Figure 3.3). Bathing or showering less to save energy is a practice that most people did not engage in as was saving expenditure on cooking/food or avoiding the doctors (see Annex).





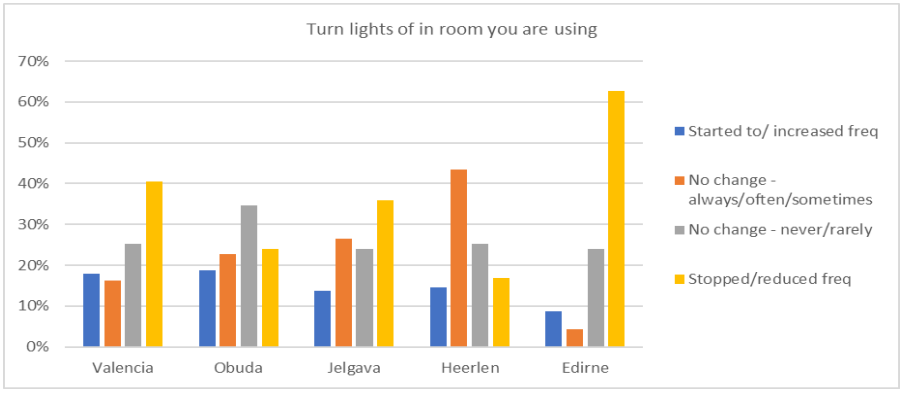


Figure 3.3: Changes in energy saving practices to save money

3.2.2 Energy Affordability

The majority of participants had not been in arrears on their utility bills in the past 12 months, and this did not change over the 12 month period ranging from 69% in Valencia to 86% in Jelgava. In Edirne things did not improve after the intervention; 76% continued to be in arrears and 16% went into arrears (Figure 3.4). The differences in ability to pay utility bills across pilot sites is statistically significant (Cramer's V = 0.4; p>0.001).

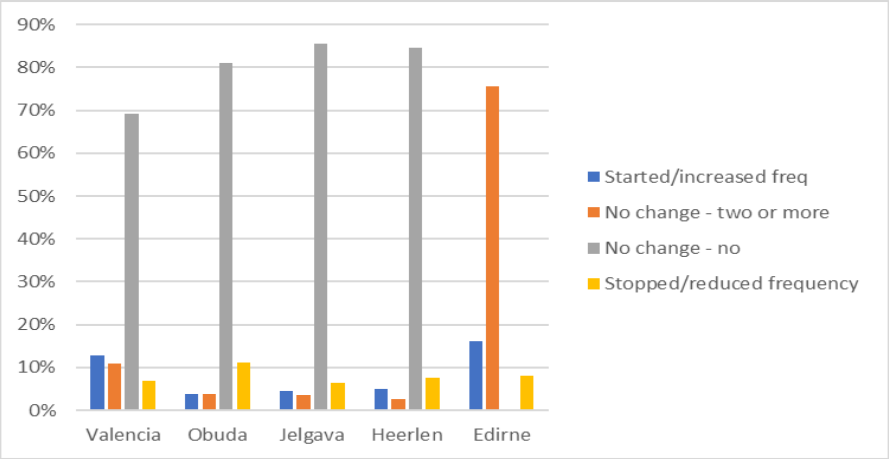


Figure 3.4: Changes in arrears on utility bills in past 12 months

3.2.3 Housing Conditions: Damp

The majority of participants in Obuda (94%), Valencia (62%) and Jelgava (57%) did not have problems with leaks, damp or rot. The exception being Edirne where 90% of participants continued to have problems in T0 and T2. It is also worth noting that participants in some pilot sites were more likely to start or continue to have problems with damp (Valencia 31%, Jelgava 31%, Heerlen 41%) than to have the problems resolved by the intervention (8%, 13% and 10% respectively) s (Figure 3.5). These differences in experiences of leaks, damp and rot across pilot sites are statistically significant (Cramer's V=0.336; p<0.001)

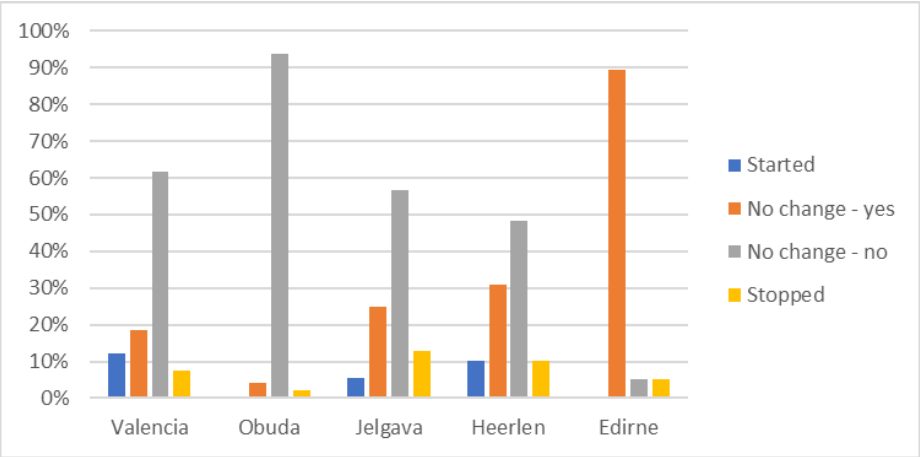


Figure 3.5: Changes in problems with leaks, damp or rot by pilot site

We also explored whether differences in housing conditions was related to the composition of the household. Leaks, damp and rot tend not to be a problem for single person households (80%), compared to single parents (48%),or two or more adults with children (41%) or without children (42%), where they continued or started to have problems (Cramer's V=0.189: p<0.001) (See Annex).

3.2.4 Health

There were statistically significant differences in health between T0 and T2 (Table 3.2). Using a scale from 100 (best possible health) and 0 (worse possible health) health got worse in Valencia (a fall on average of 6.6 points) and Heerlen (a fall of –1.8 points) and better in Edirne (an increase of 8.8 points on average), Jelgava (increase of 2.7 points) and Obuda (increase of 1.7 points) (Pearson's R=0.221; p<0.001) (Figure 3.7).

Table 3.2: Statistically significant changes in health status between T0 and T2

Health	Mostly positive, negative or neutral	Pearson's R	P-value
Health barometer	Positive	0.221	***
		Cramer's V	
Pain or discomfort	Negative	0.255	***
Depression	Neutral	0.256	***
Anxiety	Neutral	0.238	***
Stress	Neutral	0.251	***

P-value ***=0.001; **=0.01; *=0.05; ns=not significant

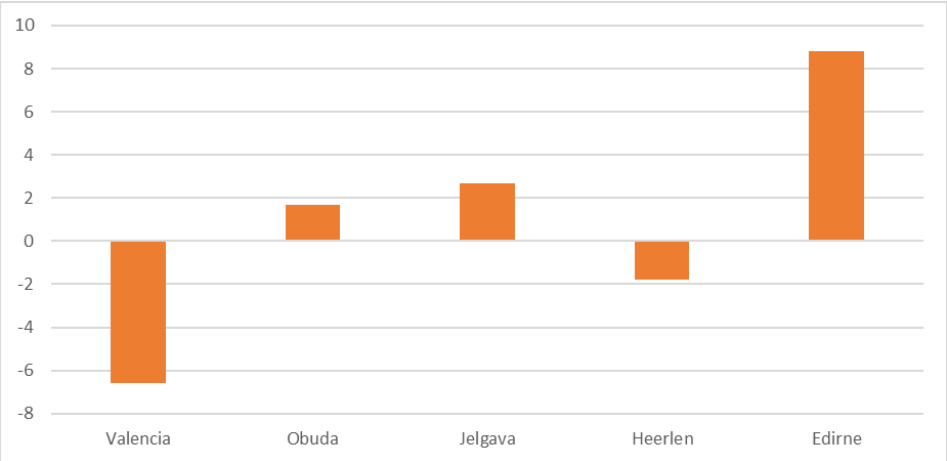
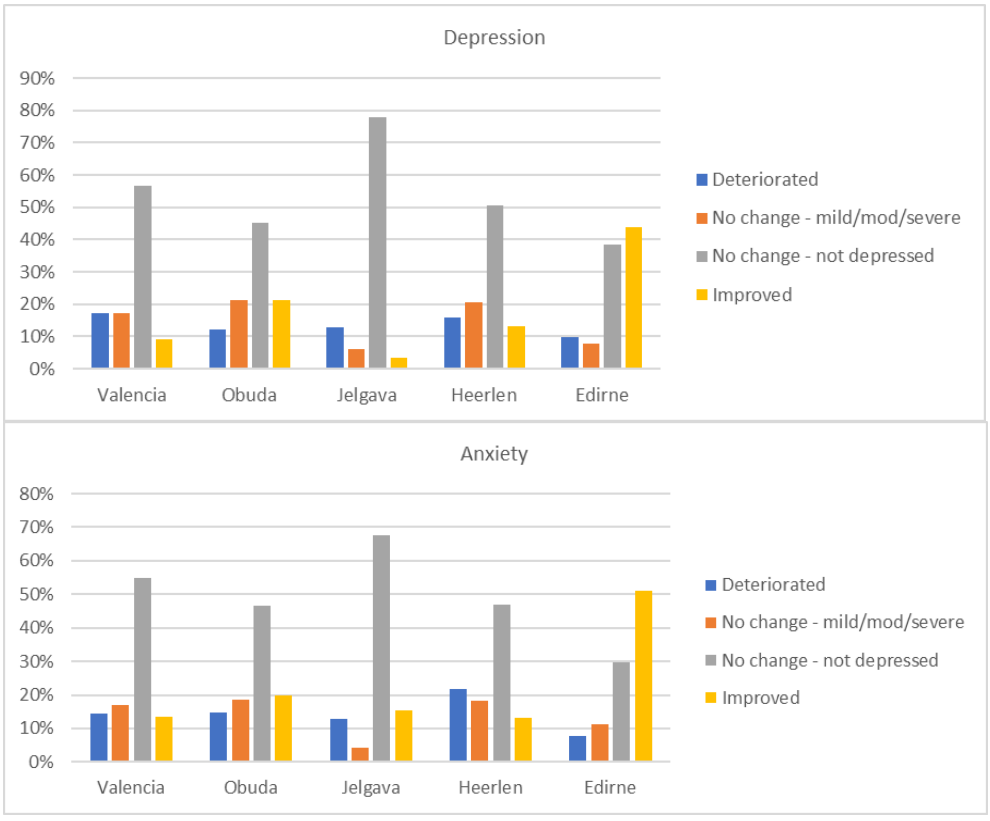


Figure 3.6: Changes in Health Barometer scores

Most participants in the intervention group did not report problems with anxiety, depression or stress. Between T0 and T2 in Edirne participants reported improvements in depression (44%) and anxiety (51%) and there was some improvement in stress in Edirne (35%), Valencia (27%) and Obuda (27%) (Figure 3.8). Participants experienced an increase in pain or discomfort in Heerlen (77%), Valencia (55%) and Obuda (48%), whilst in Edirne pain or discomfort had decreased (45%) (Figure 3.9).



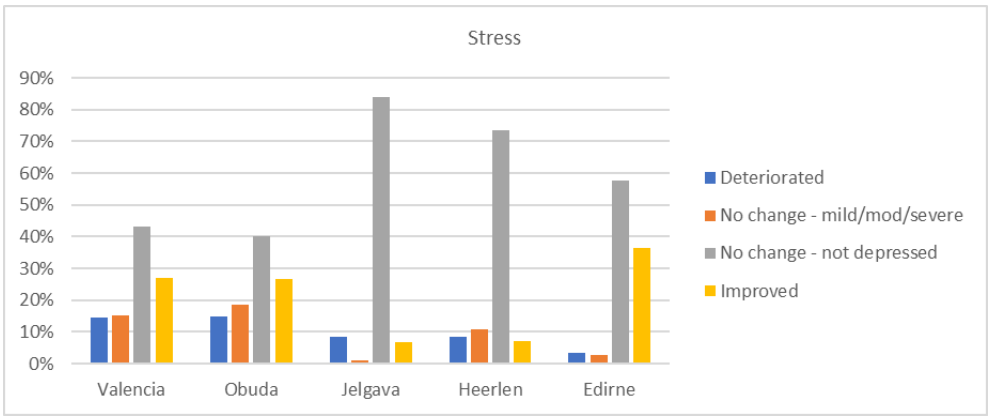


Figure 3.7: Changes in Depression, Anxiety, and Stress

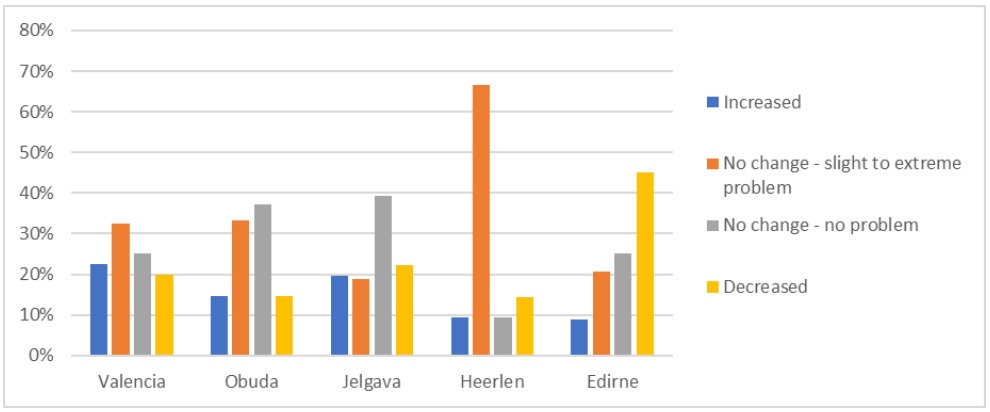


Figure 3.8: Changes in Pain or Discomfort

3.3 Impacts of the intervention by pilot (w2)

In the following sections we will describe what changed for people and what stayed the same in each pilot drawing on the qualitative data. We do this to paint a clearer picture of the contrasting effects of the intervention across the different cities. We start with the three most similar pilots: where people and community-oriented interventions were implemented across the layers associated with the socio-ecological model (Jelgava, Obuda and Valencia). We then describe Heerlen – as the pilot which engaged in community-oriented changes only. We finish by describing the two cases that included interventions in the building fabric associated with warmth: Edirne (measures aimed at people, community, and heating system) and Leeds (measures aimed at building fabric and heating system only). A summary of interventions is offered in Table 3.3.

Table 3.3: Summary of the interventions in each city

	Jelgava	Valencia	Obuda	Heerlen	Edirne	Leeds
Layer 1: individual	All	All	All		All	
Layer 2: community		Half	Most	Half	All	
Layer 3.1: building fabric					All	All
Layer 3.2: appliances			Most			
Layer 3.3: energy kit	All	All				

Layer 1: energy audit, health coaching, energy bill advice, training materials
Layer 2: group meetings
Layer 3.1: new heating system, home insulation, windows replacement, etc.
Layer 3.2: washing machine, stove, AC, fridge etc. replacement
Layer 3.3: energy kit

3.3.1 Jelgava: "Latvians are used to putting up with things".

The intervention in Jelgava involved energy advice and an energy saving kit, which included items such as an extension cord, LED bulbs, and insulation tape. Overall, the intervention made small differences to participants' lives. Small changes included: energy-saving habits being reinforced, as well as monitoring indoor air quality and health increasing participants awareness of these. Many participants already understood energy efficiency and regularly practiced energy saving habits, which meant that energy advice did not offer new information. Participants expressed a need for new appliances or changes to the building fabric, but they often could not afford these changes.

Methods for keeping warm or keeping cool did not change because of the intervention. Many participants did not find the energy advice useful because it was not new information for them; they understood energy efficiency and were already carrying out energy-saving habits.

> *I cannot highlight any major changes. The project has reinforced existing habits. J1w2*

Some participants made small changes to their energy practices following the energy advice as part of the intervention, for instance doing laundry in the evening. The energy advice also improved energy literacy in some cases.

> *There was a young man, we talked with him ... he said that you can save at night, do the laundry. That's what I do. J18w2*

There were no consistent changes to energy bills because of the intervention, however a few participants' bills have decreased, and these participants thought it could be linked to a change in habits because of the energy advice. Around half of the participants switched energy suppliers between the first and second interviews, but it was not clear if this is related to the intervention. Since the intervention, there were no changes in how energy bills affect other spending. Participants continued to be very conscious of spending on food, travelling, clothes and entertainment:

> *We plan out meals more rationally, shop less often. We try to manage on one soup for several days. We cooked smaller quantities so that there was no food waste, no food to throw away or something left in the fridge. J14w2*

Most participants were still experiencing humidity, damp and mould since the intervention. Participants continued to try to manage the mould, but they were aware that these issues will require more substantial changes to the building fabric to be resolved. The indoor air sensors improved some participants' ventilation habits.

> *At home, my son and I like the little device that shows the temperature and air quality. We like it. We tend to move it to another room so we can keep an eye on it. I like it. I can keep track of things I didn't do before. J9w2*

There were no clear changes to participants' health because of the intervention, but the ability to regularly monitor health metrics and indoor air quality was useful for the participants and could improve health long-term.

> *I had to take my blood pressure a lot during the project, and it was often elevated, three times it was elevated ... I wouldn't even know if I hadn't taken it, there were no signs. J13w2*

3.3.2 Obuda: "this feeling that someone cares about us"

The intervention in Obuda involved an energy audit, energy efficiency training and choice of new appliance. Overall, the intervention had a small impact on participant's lives. Participants were already using as little energy as possible. Some participants welcomed the social aspects of the project which was good for their wellbeing.

Some participants found the energy training interesting and potentially useful, but generally participants did not feel it had any impact on their energy habits or use. Most participants already consume as little energy as possible to keep bills manageable.

> *what they wrote here for us that we should save on everything ... I think we save as much as we can, because poor people pull their belts tight wherever they can. This should not have been aimed at us, but to those flying in planes ... I forgot it all in 10 minutes. O1w2*

There was no change in energy affordability or impact on how energy bills affect other spending. Most participants continued to manage bills by being as energy efficient as possible. Most are also in apartments connected to a district heating system which limited their ability to manage heating or change supplier.

There were no changes in thermal comfort for our participants. Some managed to keep homes warm, and some still struggled. To keep homes cool, participants continued to use ventilation and blinds or air conditioning where they have it. One participant had air conditioning installed as part of the intervention but had not experienced the summer at the time of interview.

> *No-no the heating system is completely good. There is a transition [period], October, when it is not yet turned on, but it is already cold outside and this concrete radiates cold. It's not insulated, and then we're cold, but I have an air conditioner that is also good for heating. Those who don't have it are cold. Their feet and hands almost freeze and they just sit there, old persons, so I don't know...." O8w2*

> *And in winter, if it is cold, you can always put on more clothes. O10w2*

Damp and mould was not an issue for most participants. One participant had resolved problems with mould by installing new doors and windows but this was not part of the intervention.

Some participants did enjoy the social aspects of the energy training and health screening which enhanced their wellbeing, although participants did not report any changes in their health linked to the intervention.

> *Well, it has improved my mood, yes. So, to have hope, to say the least – but I may not be expressing myself well –, I have this feeling that someone cares about us. Just this one conversation is enough for me for a month or two months. O7w2*

3.3.3 Valencia: "more peace of mind"

The intervention in Valencia involved energy efficiency training, financial counselling, and low-cost unintrusive energy efficiency improvements such as draught excluding strips, as well as regular community gatherings. The intervention had some positive impacts on participants lives, particularly those who were helped to apply for the social bonus which improved financial and mental wellbeing. Mostly participants were already knowledgeable about energy efficiency habits and continued to save energy where they could.

Most participants were positive about the project. For some this was due to engagement in the workshops and the practical support and advice they were given, for others it was because of the social aspects of community meetings or relationship developed with the intervention team not the intervention per se.

> *The truth is, yes, you always got something out of it. You learnt something new and you put it into practice, of course. V3w2*

Participants were already energy conscious and saved energy where possible, meaning there was relatively little impact of the intervention on energy use. Getting the social bonus reduced energy bills considerably. For one participant this enabled increased spending on children, but for another the savings (and peace of mind) was offset by the rise in, and concerns about, water bills.

that 30€ that I could save on the one hand, goes to another bill. V1w2

It substitutes... For something for the kids and stuff. V7w2

There were no changes in how people kept their homes warm or cool. Some participants did report their homes were warmer however this was due to it being a milder winter rather than the intervention. In the summer, participants still struggled to keep homes cool.

One participant did report lower humidity. However, some participants continued to deal with damp and mould, by cleaning or painting problem areas. There were some improvements in health. These were mostly linked to improved mental wellbeing due to savings on energy bills, although one participant also reported improvement to physical health.

Yes, in terms of breathing, in terms of... even in terms of pain. Look, yes, because my legs ached and so on and I said... I don't know if it's a coincidence, you know? [laughs] Because... I don't know, but it does [has improved]. V1w2

3.3.4 Heerlen: "I have already done quite a lot"

The intervention in Heerlen involved energy training provided through community meetings. Overall, participants enjoyed the social aspects of attending the meetings, but reported little impact on energy habits or energy affordability. Participants felt that the Government could do more to support them.

Some participants enjoyed attending the meetings. This was mainly due to the social aspects of meeting others in the neighbourhood and learning that they were either better off, or that others experienced similar problems. One participant did put in place energy saving measures, but for many the meetings had little impact on energy habits or energy costs.

I'm just a bit more conscious, that I'm going to look at that everywhere now. H1w2

Participants reported no impacts on energy use or thermal comfort. In winter participants still struggled to keep homes warm and continued to wear extra layers. In summer they struggled to keep homes cool, using air conditioning or closing blinds. Some participants also continued to deal with damp and mould. As one participant explained:

Here things are ventilated. That's purely because those walls here too, from below... That stays moist. I can open anything I want, but... It doesn't work. H4w2

Participants reported no impact on energy affordability. Most participants were already pro-active in changing energy contracts and were on fixed tariffs. Participants were concerned about the end of the contract and securing another fixed deal. Some participants felt the Government could do more to cap energy prices and provide financial support for energy costs.

Yes, I was lucky for three years. But now I get a one-year contract. I don't know what I will do this year. H9w2

Participants did not report impacts on their mental or physical health.

3.3.5 Edirne: "This is a rich person's stove; you have to keep feeding it"

The intervention in Edirne included energy efficiency advice, financial counselling, and changes to building fabric. Overall, homes are warmer, but this comes at a cost in terms of fuel expenditure. The lack of broader renovation to people's homes (which was originally planned but ended up being outside the budget) limited the impact of the intervention. For some the coal dust added to health problems.

Participants received new stoves and heating systems. Some were satisfied with their new stoves, but most participants were negative about the intervention due to the poor-quality coal they were given by the government, but which could not be used in the new stoves. People still needed to restrict when heating was on.

> *R: I can't warm up there is not fuel*
>
> *I: So, you can't warm up with just coal?*
>
> *R: If there was wood it would warm up, you need to put wood with coal [...] I've been like this for days. What can two or three planks do for you? You burn them in the morning, and you are cold all day. E5*

Homes were warmer and the heating system spread heat throughout the home., But for many this came at a cost as they need to use more fuel.

> *I think it is better now ... The bedroom is heated, the kitchen is heated, the living room is heated, it becomes warm ... For it to be like that [as warm as they would like] there needs to be more money. E3*

Some participants continued to have problems with damp and mould. This was due to the poor state of repairs to walls and roofs. This also made homes draughty which limited the impact of the intervention.

> *R: Now, when the weather gets slightly cold, the walls get damp.*
> *I: Maybe you need to keep it warm all the time then*
> *R: I used two tons of coal, sister. E7*

The intervention focussed on problems with keeping the home warm, rather than addressing the challenges of keeping cool during the summer. Some participants like the heat of summer, and others try to keep cool by opening windows or using fans. In Edirne it is not uncommon for people in the Roma community, not just our participants, to sit outside until the early hours of the morning.

> *People sit outside until two or three o'clock. Neighbours can't sleep because of the heat. The go out and sit in front of their doors. They chat, drink tea and such. But they wake up at 12. E11*

One participant reported the positive impact that the warmth had on easing back pain caused by asthma. – For some participants respiratory problems were exacerbated by coal dust and continued presence of damp/mould

> *The good part is that all the rooms are warm. We liked that, but we didn't like the coal dust E10*

> *I have asthma. When I light the stove, I have to go outside, I start coughing, you understand? ... Our lungs are finished. All of us. Our lungs are finished because of that damp house E9*

3.3.6 Leeds: "I like the way it's a lot warmer in here."

The intervention involved insulating the outside of the buildings and installing new heating systems in the flats. Overall, the intervention made it easier for participants to keep their homes warm, however there were no clear or consistent changes to energy bills or health. In general, participants were positive about the intervention and were pleased with the heating and insulation. Some had an increased sense of pride in their homes, as the buildings look smarter and cleaner since the cladding was added.

> *I love it, absolutely love it. I like the way the outside looks. I like the way it's a lot warmer in here. It was looking a bit grubby outside. ... I think they've done a nice job and it's significantly warmer. L2w2*

Participants found it easier to keep their homes warm due to the new heating systems, which were more controllable and powerful, heating the entire flat. Some did not need to use their heating as much because their home felt comfortable enough due to the insulation. However, others found it difficult to assess whether the insulation had made a difference, possibly due to a mild winter.

> *Being able to put them [the heaters] on and off and having the radiators in every room means that I don't have to worry about it being cold in one room and not in the other and things like that. L10w2*

> *I was out ... and I came back and the temperature felt really nice, it felt nice and comfortable. There was no heating on though, but the temperature was maybe 1 degree outside. L9w2*

The intervention did not have a noticeable impact on keeping homes cooler, and participants needed more time to assess this.

Since the intervention, some participants were getting more energy services for the same cost, some were spending less on energy and using the extra money for other spending, and others had not seen a change in bills yet but anticipated that they will be cheaper. As one explained:

> *I get the feeling from what I've seen of the units used that it is much cheaper to use. I'm probably getting a much better deal out of it. I think I'd have the heater on in an*

> *evening programmed from about 5:00pm to about 9:00pm each night from October through to April, whereas I can switch these heaters on, have a bath and things like that and it's probably costing me the same. L8w2*

Households that were experiencing damp and mould in the first interviews saw improvements although in some cases problems were not completely resolved.

Participants give mixed responses about the impact of the intervention on their health; some have had improvements in physical health, while others have not. The main positive impact was to wellbeing: as some participants feel happier and more positive as the home looks smarter and cleaner.

> *The fact that the block of flats looks so much better, that has improved my mood and just my general happiness of my home because I feel like it's one step closer to inviting people round, so taking pride in your home, so I am pleased with that. It's improved my mood, and I feel a lot better looking out my windows at the surrounding environment. L10w2*

3.4 Summary of 'what changed and what stayed the same'

We have shown that in most pilot sites people reported small changes in access to energy services, and small changes in health status. This was particularly the case in interventions which principally targeted people or community (for example providing advice, coaching, group meetings and some form of relatively small energy technology in the home). This included Obuda, Jelgava, Valencia and Heerlen. Here the main changes that came about from qualitative analysis were the positive wellbeing effects of being part of the study, and/or being part of the community-based activities undertaken in these pilots. The quantitative analysis showed slight improvements in overall health status in Obuda and Jelgava. Some participants spoke to us about other changes, for example when helped to apply for bill support in Valencia. This is supported by the quantitative analysis where there were more positive outcomes in Valencia in terms of thermal comfort and not having to engage so much in energy saving measures in order to save money.

In pilots where more changes were made to the building fabric and/or heating system, we saw a mix of outcomes. For example, in **Edirne**, where new stoves were fitted with linked radiators in all rooms of the house, participants spoke to us about increased warmth in the home, and better heating throughout the home. The survey analysis also showed they were less likely to engaging in energy saving practices such as turning heating off or only heating one room as a means of saving money. However, these improvements were somewhat undermined by the poor-quality coal that our participants were given by government, which could not be used in the new stoves making homes more expensive and more challenging to heat. This was reflected in the quantitative analysis with participants still reporting being in arrears in paying energy bills. Participants told us that the poor-quality coal also had a negative impact on their respiratory health in some cases, although overall participants were more likely to report improvements in health and reductions in pain, depression and anxiety in the self-reported surveys.

In **Leeds**, the blocks of flats were fitted with insulated cladding, some windows were updated, and the old storage heating system was replaced with district heating. People were pleased with the result, feeling more comfortable and happier in their homes, and having a sense of pride associated with the renovations. Participants reported more substantive effects on energy access. For example, people talked about saving money on their energy bills to spend elsewhere or accessing additional energy services for the same costs. Only some participants reported change to their health status because of the intervention.

4. Analysis: Why change happens, and why things stay the same.

Here we add analytical depth to our short pilot summaries and the quantitative findings in part 3 above. Specifically, we use our qualitative data to explain why change happens, and why things stay the same. We do this by discussing a combination of: how change was triggered by interventions and how change was prevented from occurring, and the external conditions that shaped both participants' experience, and the possibility for the intervention to succeed.

It is worth noting first that Wellbased interventions were designed in real world situations, with limited budgets, and with the need to be accepted politically. As a result, and as we reported at the beginning of section 3, many of our interventions target energy and health through people and communities, rather than implementing more expensive measures which address the building fabric. We would not, therefore, expect these interventions to have major life-altering outcomes. We can, however, report here on how changes came about through these interventions, which is an important learning point for other cities planning interventions on energy poverty and health.

In researching these attempts to improve lives through interventions, we must take account of external factors that impact on participants' lives, and the extent to which interventions can be effective in the context of these. In our study, there were numerous and important external effects, including ongoing and new challenges for households arising during the study period. For example, we saw evidence of the role of energy markets in shaping energy poverty, and the importance of the state of housing and experiences of poverty in each nation. These factors played a role in limiting the impacts of Wellbased interventions.

Alongside this, there were time-specific elements to our work: we conducted our research post COVID-19, in the context of the energy crisis associated with the war in Ukraine and rising energy prices, and in the context of inflation across other essential goods. We also saw measures introduced during the period of study in many of our pilot cities to help citizens deal with these pressures on household budgets. Further, during the period of data collection, some of our pilot cases were facing unusually high summer temperatures associated with climate change. Here, as part of our analysis of why change happens and why things stay the same, we document how and why these existing and new external factors have shaped the effects of the intervention from the perspective of our participants.

We approach this section of the report, by identifying how change happened and how it was prevented from happening for some key outcome categories: Awareness, Practices, Market, Buildings, Health, Poverty, Environment and Gender.

4.1 Energy and Health Awareness

Many of our interventions aimed to raise awareness among our participants of the links between health, internal air quality and access to energy services. Some also promoted good ventilation practices, and

energy saving practices through raising awareness. Here we deal specifically with awareness raising efforts (see the following section for practice change).

In our qualitative interviews, most people already had a reasonably good understanding of energy saving, and participants report only moderate learning about this. Some people appreciated the reminder of how to save energy, others pointed out that this was not particularly helpful for them. In all our pilot cities people also had an awareness of the risks to health associated with cold, heat, damp and mould. Internal air quality is a newer issue for people, and we saw changes in awareness with regards ventilation and health in some of our pilot cities.

Table 4.1: Awareness changes because of the interventions

Awareness changes because of the interventions	Positive, negative or neutral effect?	Where present?
Increased awareness of the association between ventilation, air quality and health and how to address this.	Positive	Jelgava Valencia Heerlen
Heightened awareness of energy using lights and appliances, including how to use these efficiently, and of the cost of energy at particular times.	Positive	Jelgava Valencia
Useful practical information about using energy more efficiently.	Positive	Valencia

We already saw some examples of these changes in the pilot descriptions above. Here we see an additional example from a participant in Jelgava discussing their increase of awareness of the importance of ventilation:

> *This project made me think about it, it made me question myself about this idea. Because for example in the bathroom there is mould, I know in my mind that it can cause problems, but we have this air meter, it means that I have enough oxygen, I must get used to living with it. (J1w2)*

4.2 Energy Practices

We saw in our summary of participants' lives at the beginning of this report, that people are already engaged in a range of energy saving practices (part 2.2). Some energy saving practices have positive effects: where money can be saved but health is not compromised by actions. Others are more negative: where money saving drives underconsumption of energy and results in poor health. For our participants, positive change was explained by people having better control over energy, in Leeds and Valencia. The interventions also sometimes reinforced the more positive energy saving practices, and reduced the need for the negative

practices. Here we see an example of one of the Leeds participants discussing the improved control of heating that they have in their home:

> *It's a general improvement because you kind of switch the heaters on instantly. You don't have to look at the weather forecast for the next seven days ... you don't have to think 'Is it going to be cold tomorrow? Therefore, I'll switch my heater on'. (L8w2)*

A summary of mechanisms associated with change in practices is given in table 4.2.

Table 4.2: Energy using practice changes because of the interventions

Energy practice changes because of the interventions	**Positive, negative, neutral effect?**	**Where present?**
People continue to engage in healthy energy saving practices to save money on bills (e.g. optimising their spending to avoid waste).	Positive	All pilots
People continue to engage in unhealthy energy saving practices to save money on bills (e.g. avoiding using what might be considered 'essential' energy).	Negative	All pilots
People prevent damp and mould using ventilation (these are sometimes continued practices, but reinforced by the intervention)	Positive	Leeds Heerlen Jelgava
More control over heating systems, due to following Wellbased advice on programming heating and hot water.	Positive	Valencia
New heating systems are more responsive, allowing for more flexibility of use, and less mental space taken up in forward planning.	Positive	Leeds
Warmer homes are allowing people to air dry washing rather than using the tumble drier.	Positive	Leeds
Wearing less layers, sleeping with less blankets and being more comfortable.	Positive	Leeds
Some are still using portable heating systems to keep warm, including the household that did not accept district heating.	Negative	Leeds

We also saw participants across all six cities reporting continued engagement in the wide range of coping practices documented above (see part 2.2), some of which will reduce energy use but have detrimental effects on health. This includes limiting use of heat in winter and lowering home temperature, and other actions associated with laundry, food preparation and lighting practices, as well as having to tolerate the heat in the summer. We present some examples of underconsumption or changing consumption below – from participants in Obuda and Valencia.

> *Well, only the hallway, that is, the living room is very hot, in the summer heat. In winter, if it is very, very cold, only then I turn on the heating. Otherwise, I don't. O5w2*

> *in the evenings I'm tired and I don't feel like putting the washing machine on. But of course, I do it to try to save money. V3w2*

We also saw participants in Jelgava reporting a continued lack of control over their district heating: with little choice as to when it is turned on and off, with debates within housing blocks and between tenants and building managers. As one participant explained:

> *I would like to regulate the temperature in the apartment myself ... The building manager needs to be negotiated with, the heating supplier needs to be negotiated with, the allocators need to be installed. I understand that in apartment buildings either everybody does it or nobody does it. J6w2*

4.3 Energy supply arrangements

Some of the interventions set out to intervene in energy supply arrangements. This included giving advice on energy bills where possible (Obuda and Jelgava), and in the Valencia pilot specifically helping people to apply for their entitlements to a 'social bonus' on their bills, to understand their bills and the basics of the energy market. In the Leeds case, the city council took over provision of heat to the intervention group, offering district heating at a reasonable price. Intervention group members in Leeds were effectively taken out of the commercial energy market and offered energy provided by government.

Table 4.3: Energy supply arrangement changes because of the interventions

Energy supply arrangement changes because of the interventions	Positive, negative, neutral effect?	Where present?
Energy bills are lower due to participants newly claiming entitlement to social bonus due to intervention, and / or removing insurance costs from bills.	Positive	Valencia
Participants do not expect the introduction of district heating to change energy bills, but some households are already getting more access to heat for the same cost as before.	Positive	Leeds
Not wanting district heating for fear of price rises due to lock-in once the fixed price ends.	Negative	Leeds

In the main the positive energy supply arrangement effects were seen in Valencia and Leeds. Valencian participants that newly claimed the social bonus entitlement were very happy with it, reporting reduced stress associated with energy costs. Note that as with other interventions, there were some participants who were already claiming the social bonus and therefore saw no effects. We also saw examples of people passing on information about the entitlement to friends and family:

> *I applied on behalf of them [her parents] ... because I started to inform myself and I thought well, I'm going to apply to them because they are pensioners. And they granted it to them as well. V3w2*

Leeds participants were a little cautious about welcoming the change to district heating, although the control over heating that the new system introduced was very welcome, and some participants talked about getting more access to heat for the same cost as before (as we saw in part 3.2: Leeds). One of our Leeds interview participants refused to have the district heating system fitted. She was concerned about the risk of exiting the energy market, seeing the government provided district heat locking her in to one supplier. Given experiences in Jelgava associated with lack of control over district heating, this fear was not unfounded. The Leeds participant was concerned that costs could rise, and she would not be able to change suppliers.

> *I've told them I don't want it… the thing is I wasn't sure about it from even before… I thought, "Once this is in, that's it. You're stuck with it. You can't change to anything else. You've got this system and that's the end of it. L2w2*

L2w2 had seen a programme on TV where a similar scheme was introduced in London, and where costs went up dramatically for tenants. This was a particular concern for this participant because she was an active market participant, who was used to seeking the lowest price among energy suppliers.

Table 4.4: Other changes in energy supply arrangements that affected the outcomes of the intervention.

Effects of other changes in the energy supply arrangements outside the intervention	**Positive, negative, neutral**	**Where present?**
No change in bills due to price increases wiping out savings, or to bills being fixed. Many also experienced fluctuating energy bills due to changing energy prices and differences in state compensation.	Negative	Jelgava Heerlen Leeds Obuda Edirne
Bills made up of supplier costs, not consumption costs, resulting in people being unable to lower their bills by consuming less.	Negative	Obuda
Quality of coal (main heating vector) supplied by the state is lower, resulting in an increase in fuel use (have to use more to get the same heat effect) and an inability to keep warm.	Negative	Edirne
Coal price increased resulting in an inability to afford to keep warm.	Negative	Edirne
Using the cheapest form of energy available – including burning wood and even furniture, or heating with an air conditioning unit.	Negative	Edirne

Alongside these interventions, we also saw numerous changes in energy supply arrangements during our period of study (summarised in Table 4.4) which had a large effect on participants. The six city pilots were operating in the context of different national energy markets, although all participants faced rising energy costs during the period of study. As mentioned above, there were different support mechanisms in place for our participants in the six cities, which operated alongside the interventions for Wellbased. Some of the important changes included: any bill savings being wiped out by the overall increased cost of energy.

> *Then I still had a contract, and then last year I was able to get a contract, but then they just came up with the fixed-rate contract… I actually pay twice as much now. H3w2*

Also changes to coal prices and coal availability in Edirne meant that people were less able to heat.

> *R: I buy coal. But 4 lira [...] 4 billion per ton.*
> *I: Does 1 ton last for a winter?*
> *R: How will it last, sister? Of course, it doesn't. At least 3 tons.[...] these stoves burn more, more than other stoves. E2*

4.4 Building fabric and heating systems

Only a few of the interventions made specific interventions to the building fabric, with the most substantial changes in Leeds and Edirne. Valencia offered more minor small measures to reduce draughts. Interventions to the building fabric mostly delivered positive effects, although, as we will see, they were in some cases insufficient to address people's needs for warm, cool and dry homes.

Given that most of our pilots did not intervene with the building fabric and heating systems in people's homes, or only partially address these things, we also documented some important unmet need for housing improvements through our interventions, listed in table 4.6. This table includes some of the things that had not been improved through intervention in Edirne.

To give some more detailed examples of this, we see a participant in Heerlen discussing their damp problem:

> *I still have single glazing. There are dormers, I think they are made of papier mâché or something…It's just cold. Cold wet mould. H8w2*

A participant in Obuda pointing out the need for better insulation:

> *The other one is that the municipality should have the apartment insulated all around. It would be much cooler now, and much warmer in winter. So I'm not saying it's so terrible, I'm not cold, but I'm not sure that another person who's older and has worse blood circulation, that he is not cold. People are cold here. O8w2*

Finally, a Valencian participant pointed out the need for air conditioning in the context of very hot summers:

> *I would ask for air conditioning. Really, because it gives a standard of living... V8w2*

We did meet some participants that had managed to pay for home improvements themselves (in Jelgava and Heerlen). This was only something that wealthier households could afford to do. One participating

household in Heerlen also moved into a better insulated home, which was warmer and less damp. Other households in all our Wellbased cities took small measures to improve their home (e.g. washing away mould, or using anti-mould paint).

Table 4.5: The effect of building fabric changes associated with the intervention, grouped by type.

Change type	The effect of building fabric changes associated with the intervention	Positive, negative, neutral	Where present?
Insulation	Insulation made house warmer and more comfortable. Some households noted that the house felt more comfortable with both insulation and new heating.	Positive	Leeds
	Insulation and window replacements have reduced noise from wind.	Positive	Leeds
Heating system	New heating system makes the house warmer.	Positive	Edirne
	New heating systems heat the whole house.	Positive	Leeds Edirne
	New heating system also delivers hot water, and has resulted in hot water being more available to participants than previously.	Positive	Leeds
	One participant reverting to the old stove system because the new one does not keep the heat.	Negative	Edirne
	One participant rejects the new heating system due to concerns about running costs (as above).	Negative	Leeds
Air quality changes	Damp and mould reduced due to warmth and ventilation improvements.	Positive	Leeds Edirne
	Warm home can make the air stuffy people are ventilating by opening windows.	Positive	Leeds
	New stoves fitted by Wellbased produce less smoke, improving air quality.	Positive	Edirne
Small measures	Homes warmer due to weather strips preventing draughts.	Positive	Valencia

Table 4.6: Unmet needs for housing improvement

Unmet housing improvement needs	Where present?
Participants widely articulated a need for more basic repairs (of leaks and ventilation), as well as upgrading windows and appliances. These repairs were needed to resolve draughts, access to warmth in winter, and to reduce damp and mould.	Jelgava Edirne Valencia Heerlen
Homes still cold in winter due to lack of insulation.	Jelgava Edirne Obuda
Homes still hot in summer and lack air conditioning.	Valencia

4.5 Health and wellbeing

We discussed the links people made between their health and their access to energy services in section 2.3 above, noting that many of our participants were well informed about this link. We also noted that we have a diverse sample, including people with ongoing health conditions, and others without. Further, some of our participants' ongoing health conditions were not affected by energy poverty. Given this range of health statuses among people in our sample, and the scope of interventions (generally addressing people and community rather than more expensive building fabric measures), we were unlikely to be able to help people achieve substantial physical health improvements. In effect, people's health was not fully in the control of intervening partners in Wellbased.

However, we did note some positive outcomes associated with increased wellbeing and some evidence of small effects on people's physical comfort and respiratory health. We also noted that some participants reported negative health effects of their living conditions continuing. For example, in Edirne, people continued to experience respiratory problems associated with cold and damp. Mechanisms related to participant health and wellbeing are summarised in table 4.7.

Some examples of these positive health outcomes included participants from Jelgava and Obuda telling us about the benefits of health monitoring:

> *It is very good that there is a blood pressure and oxygen monitor, it makes me wonder a little sometimes whether I should check the readings. It pays attention and if it didn't, one would live without even knowing that the blood pressure is above normal. (J9w2)*

> *I really love medical examinations, I love them so much, I am looking forward to them now, so I was very happy to participate in them. (O4w2)*

Another participant in Leeds talked about how the renovations have led her and her family to decide not to move away.

> *It's good, before we think about moving and apply to house but now not. We have a plan to buy because everything is change and this cladding is reduced money and warm, it's good for us because I have just one child and we have two bedrooms. Before no, before we thought about moving because it's not clean and freezing, not cold, freezing, now I am happy. (L6w2)*

Table 4.7: Changes to participant health and wellbeing associated with the intervention (grouped by type)

Change type	Change to participant health or wellbeing associated with the intervention	Positive, negative, neutral effect?	Where present?
Physical health	People feel more comfortable at home due to the home being warmer.	Positive	Leeds Edirne
	Warmth alleviated pain for some participants	Positive	Edirne Valencia
	Greater awareness of personal health due to regular monitoring of health metrics as part of the intervention	Positive	Jelgava
Respiratory health	Children's allergies reduced due to reduced damp and mould	Positive	Leeds
	Coal dust adds to respiratory problems	Negative	Edirne
Wellbeing	Involvement in the Wellbased project improved people's mood and made them feel cared for. This includes people enjoying the social aspects of community activities.	Positive	Obuda Valencia Heerlen
	People were happy with the general renovation works around the building, such as improving the look of the building, improving security at the entrance doors to the blocks of flats and dealing with a rat and mice problem.	Positive	Leeds
	Satisfaction with homes since the intervention has encouraged participants to stay in homes rather than move elsewhere.	Positive	Leeds
	People are more likely to invite guests round, as homes are warmer and they feel proud of their space.	Positive	Leeds

4.6 Poverty

We talked in detail about people's experiences of inflation and the energy crisis in part 2.1 that were documented in our first interviews with participants. These issues were also ongoing at the time of the second interview. In some cases, this interfered with the impacts of interventions. When we returned to participants after the intervention, we still saw people struggling to make ends meet, due to a range of increasing costs, and the need to make savings resulting in people reducing their energy consumption. The impacts of poverty are summarised in table 4.8.

Table 4.8: Poverty and its impacts on interventions

Poverty and its impact on interventions	Where present?
Increased costs of other goods and services (water bills, mortgage costs) negating any benefits of energy savings.	Valencia Heerlen
Struggling to afford household expenditure, including having to cope with additional costs elsewhere, careful budgets resulting in continued pressure on energy spending.	All pilots
Not able to use the new cooker provided by Wellbased, because they could not afford food.	Obuda

These are sometimes rather extreme circumstances, as with the participant from Obuda that was unable to buy food to cook on their new cooker.

> *I: you've just got a cooker in January? What's changed, do you cook more often? R: No, unfortunately, I have nothing to cook from. Well, if you don't have anything to cook, you don't cook. (O1w2)*

We also noted that interventions could be shaped by people's expectations., These are expectations associated with what they should endure, as well as expectations associated with their feelings of entitlement to support. Expectations have an impact on the outcomes of interventions, because they reduce the chance of people complaining when things go wrong, or approaching the Wellbased partners that are offering these services. These are summarised in table 4.9.

Some more detailed examples of these expectations, include a participant from Edirne who sees Roma people consistently being put last:

> *Our people are the last to get anything. It always happens last, sister. What should I tell them [the Municipality]? E3*

And participants from Valencia, Jelgava and Heerlen were similarly despondent about the levels of support offered by the state:

> *And in terms of energy, I feel cheated by the government, deceived. And by the Valencia City Council as well ... Because they are all the same ... V1w2*

I don't know, because it's so unfair how the State treats its people, whom the people trust... I'm not sure, then I realised that I can only trust myself and my family. J21w2

I've totally had it. With all that government and that thingy. They just need to be honest for once in this country. H4w2

There was some recognition in Obuda that municipalities have limits to their budget and are trying to do what they can.

I think that so much money has been taken from the municipality that it cannot do more, it cannot help us. Because we still get everything. Those who are dissatisfied should change it and see how much money they have on their budget. O10w2

Table 4.9: Expectations of poverty, and their entitlement to help

People's expectations of poverty, and their entitlement to help	Where present?
"Latvians are used to putting up with things".	Jelgava
"Poverty is beyond our control, it is God's will"	Edirne
Roma people feel that they are not prioritized by the government	Edirne
People don't expect government help	Leeds
People have low expectations of municipalities and the likelihood they will act to solve problems.	All pilots
People are proud not to be taking support from government.	Leeds

4.7 Climate change and other environmental factors

During the period of study, we saw a step change in temperatures in the southern cities, where temperatures were often reaching 35°C+ in the summer. None of our interventions set out to substantially address summer heat, and in Valencia, Obuda and Edirne our participants faced major problems with heat (as we saw in 3.2.1). Some of the interventions that we delivered under Wellbased may even have created worse conditions in the summer, and there are risks associated with interventions for creating warmth in winter, where the impacts on living temperatures in the summer are not thought through. These impacts are summarised in table 4.10.

To give some more detailed examples here, we saw participants in Edirne and Obuda discussing the challenges associated with extreme heat:

> *We struggle with the heat [...] It is hot until a certain hour. After 12-1pm is starts to cool down. E10*

> *Well, when I can't stand it, yes, because the sun heats this side all morning. If it weren't for the air conditioner, we wouldn't be able to survive. O3w2*

one Valencia participant described their experience of a milder winter:

> *this year almost, as these climates have been strange [...] I haven't even turned on the heating.... only two days I think we turned it on and the rest we didn't turn it on because I didn't feel like the year before... that I had to turn it on! V7w2*

Table 4.10: Climate and environmental factors impacting on people's experiences of indoor climate

Impact type	Climate and environmental factors impacting on people's experiences of indoor climate	Positive, negative, neutral	Where present?
Keeping cool in increasing temperatures	Homes still hot in summer due to facing the sun.	Negative	Jelgava
	No change in being able to keep the home cool.	Negative	All pilots
Keeping warm	A milder winter meant that people were not using heating as much.	Positive	Valencia

4.8 Gender

Gender plays a statistically significant role in shaping participants' experiences of energy poverty, through energy-related practices and health outcomes. For example, 48% of women started or increased the frequency of wearing extra clothes to keep warm compared to 34% of men. Whereas 45% of men stopped or reduced the frequency of wearing extra clothes compared to 35% of women (Cramver's V=171; $p<0.01$). Men (47%) were also more likely to stop only heating one room to save money compared to women (36%) (Cramer's V=0.161; $p<0.05$) and were also more likely to stop or reduce the frequency of turning heating or cooling off to save money (men 43%, women 35%; Cramer's V=0.61; $p<0.05$). Men (30%) were however more likely to be in arrears in paying utility bills than women (17%) and more likely to start or continue to have problems with leaks, damp or rot (men 39%, women 33%) although these differences are not statistically significant. Women were more likely to report deteriorating or ongoing health problems such as being in pain or discomfort (women 31%, men 18%; Cramer's V= 0.129; $p<0.05$), or anxiety (women 33%, men 17%; Cramer's V=0.176; $p<0.001$) (Figure 4.1). Full results are presented in the Annex Table A.2

Even though statistical significance is not always achieved, the gendered nature of these responses is important: it suggests that interventions will have different effects for households with different gender mixes.

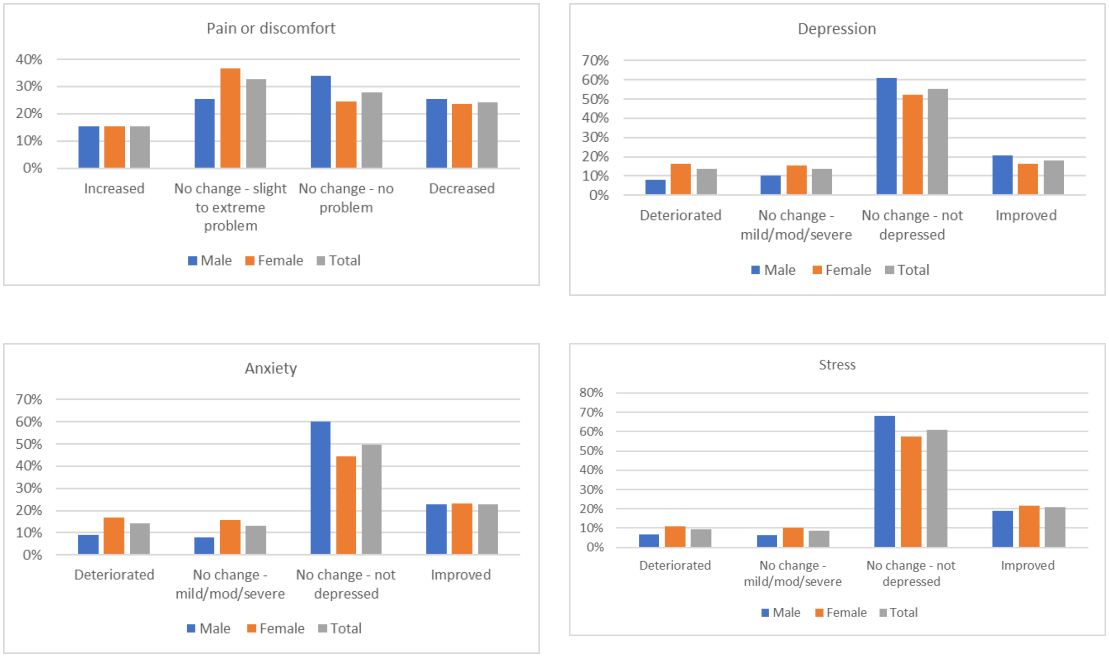


Figure 4.1: Change in health status by gender

Differences in gender responses also emerged in the qualitative data, specifically with relation to the gendered roles people sometimes adopt, and the gendered differences that people note in thermal comfort.

Table 4.11: Gender and participant responses to energy poverty interventions

Gender and participant responses to interventions	Positive, negative, neutral	Where present?
Some gendered expectations associated with caring roles: women taking responsibility for heating in the home, including lighting the stove and cleaning it in Edirne.	Neutral	Leeds Jelgava Edirne
Some gendered expectations associated with income: men being expected to provide income to pay for necessities and to take financial responsibility.	Neutral	Edirne Jelgava Heerlen
Some gendered expectations associated with home improvement: men being expected to take on this work, sometimes for extended family.	Neutral	Jelgava Obuda Valencia
Gendered differences in thermal comfort	Neutral	Leeds Valencia

We interviewed participants that had strongly gendered understandings of care and responsibility in the household. For example, for some of our participants, a women's role in the household was to cook, clean and care. A mother in Leeds prioritised heating, food and clean clothes for children based on her understanding of her role as a mother:

> *I think woman in a family is the centre of the family. You have to cook. You have to clean. You have to change. You have to care for your husband. L1w2*

Some male participants in Edirne had expectations, or were expected, to provide for their family and support them financially, and were clearly distressed when they were unable to fulfil this role, which included providing an income to pay for warmth and food:

> *I see people, for example, in the morning their spouses make breakfast, the children have breakfast and go to school. But for us, the kids wake up and go to school on an empty stomach. How can you fill that gap. My kids don't even get a penny. I don't have anything to give them. We don't have anything to give. Don't I want my children to wake up in a warm house, with a ready breakfast? There is none. No breakfast, no bread. E9*

We also met families in which the husband was supporting their family by working extra 'side' jobs.

In relation to energy, men were sometimes seen as responsible for paying for energy, or more generally for the household finances (as here in Jelgava and Heerlen):

> *[Participant's husband] also just likes to figure things out. And he is just a bit better at numbers and financial things. And that's not really my cup of tea. H11w2*

Men were also often referred to as responsible for repairs or renovation work:

> *My husband worked on insulating the foundation of the house so that the damp didn't come in. J5w2*

> *The wind doesn't blow through my door, so if the window is open at the end of the corridor and my door is closed, it won't let the draught through because my husband repaired it. O8w2*

> *My husband painted with a special paint [for the mould], and from then on there was no more. V7w2*

This extended beyond the immediate household, especially, for example, for older women living alone, who talked about receiving everyday support from their families, which is part of accessing energy and other services.

> *My son in law and a grandson live in a street nearby, they bring me water, lunch, they come over to chat if necessary. O7w2*

Finally, we saw differences in thermal comfort, with participants from Leeds and Valencia noting different responses to cold and heat:

> *There's only my daughter, all this complaining for her. My son is always in t-shirts, he's always warm, he runs around, he never gets cold. L3w2*

> *In summer it's hotter, especially my husband, who feels more the heat, and he'll be putting the air conditioning on in no time. V17w2*

4.9 Summary of 'why change happens and why things stay the same'

In summary, change resulting from Wellbased interventions was triggered by the provision of information and advice, as well as through intervening in energy supply arrangements. These interventions tended to be more successful when carefully tailored to the recipients: we noted that people were well versed in saving energy to save money, so advice needed to offer new and useful information that people could put into practice.

Where we intervened in the building fabric (Leeds), participants reported substantial positive effects in their access to energy services, and their control of energy. The intervention in Edirne, providing new stoves, was rather undermined by the quality of the coal available to participants, although some did report the benefits of being able to heat multiple rooms. Participants were generally very articulate about their unmet needs for housing improvement, where interventions did not have the capacity to address these issues.

Addressing health and wellbeing, proved to be more challenging as these factors were not fully in the control of the intervention. Nevertheless, we did note some positive improvements for participants here. We also note that the intervention was shaped by experiences and expectations of poverty, climate change and other environmental factors, and also by gender. Again, these factors are largely outside of the control of the intervention.

5. Conclusions

Under the Wellbased programme our pilot partners undertook a wide range of interventions, in a group of diverse cities, working with a range of socio-demographic populations facing energy poverty. In our qualitative work we were privileged to spend time with some of the Wellbased participants who generously gave their time and shared their experiences to allow us to write this report. This conclusion represents an opportunity to summarise the experience of these interventions across our six pilot cities, and to offer some recommendations based on this large body of data, about interventions for energy poverty and health.

Firstly, our key findings concerning the interventions and how they were experienced by participants:

1. **People appreciate interventions that recognise them and their problems**. Recognising the specific challenges that our participants are facing was an important first step for our intervention teams, and some of our participants reported wellbeing outcomes merely from being involved in a project which saw energy and health as linked, and which was trying to help them improve their lives.
2. **People experiencing energy poverty are often energy literate**. Many of the people we met through our research were aware of how to economise on energy in the home, and also understood the links between energy and health (4.1). At the beginning of the project, we found that many participants already had ways of coping with heat, cold and damp and mould (2.2). Not all of these coping strategies are positive for households: sometimes people under-consume energy out of necessity, and indeed energy advice can be used to reduce consumption, or to develop energy consumption habits that are less healthy. Giving energy advice in this context is quite complex: it requires an appreciation of lived experience expertise, alongside a recognition of the likely trade-offs households are making between heating and other essential services.
3. **Housing quality is key and requires more substantial financial investment.** We saw this in the outcomes for participants in Leeds (3.3.6) where renovation and retrofit was widely welcomed and had a substantial impact for participants. Many of our participants in other pilot cities had a clear idea of how their home needed to be fixed. We saw in 4.4 a clear recognition of the unmet needs for fixing leaks, addressing mould, adding insulation and changing the heating systems. A critical part of this work is basic property maintenance, which was not always forthcoming (in rented properties) or possible (owner occupied) for our participants. Our participants knew that they also needed better insulation, and to be able to control heating in winter. Wellbased pilots mostly delivered interventions which did not affect the building fabric, due to relatively small budgets in the project. To effect substantial change, our pilot partners needed more substantial budgets.
4. **Current energy supply arrangements create substantial problems for people experiencing energy poverty**. People really struggled with the 'shock' of rising prices, which were of course accompanied by wider inflation. However, the very reliance on a market system for the distribution of energy was not working for those households that we met on the lowest incomes. Some people were able to control their costs by fixing tariffs or shopping for briquettes when the price was low. However, most were having to reduce their energy use to unhealthy levels to cope with high prices.

5. **Summer heat will play an increasingly large part in the link between energy and health.** None of our interventions dealt with this satisfactorily, and yet in warmer countries this was an important part of their energy and health experience. We have more to learn about how to address this effectively.

Building on these key findings, and on the rest of the insights from our report, we would also like to offer some principles for those undertaking interventions in energy and health.

1. **Find practical solutions that are not already in use**: given people's understanding of energy costs, any advice needs to be additional to what people know, and within people's capacity to act. An emphasis on practical solutions, and particularly solutions that help people avoid unhealthy coping strategies is key. We think that Valencia's action on helping participants to access the social bonus was a good example of this.
2. **Listen to what people want and tailor interventions to their needs**: given that people have a relatively high level of energy literacy, and that people know what is wrong with their own homes, a willingness to help people with the things that are important to them is key. This was challenging in the context of a project that was planned and budgeted in advance of delivery. Funders also need to think about the importance of enabling flexibility in project delivery, through more flexible funding mechanisms.
3. **Secure the resources to deliver more substantive interventions**: in our Wellbased projects, the Leeds pilot drew on funding available from a separate budget to renovate three apartment blocks. In the qualitative interviews, this was the intervention with the most substantial positive effects on participants. Future interventions should emphasise securing more substantial budgets to address energy poverty.
4. **Improving health through a short term intervention is challenging**: in Wellbased we attempted to improve both energy poverty and health status in a population that was only slightly less healthy than average, over a relatively short period of time. The impact of most of our interventions was likely to be rather gradual for individuals, reducing the exacerbation of health over time that results from energy poverty. Indeed, interventions for energy poverty are likely to have a broader effect on population health over a long period of time rather than individual health in the short term. We can imagine, for instance, that the renovation of apartment blocks in Leeds will have small ongoing effects for the forthcoming 20 years on the residents. Measuring health improvements in this context is rather challenging, and needs to account for incremental change over time, as well as acknowledgement of the broader mental wellbeing of participants.

Annexes

List of annexes

- References
- Qualitative Interview Protocols for interview 1 and interview 2
- Qualitative coding frameworks for wave 1 and wave 2
- Longitudinal quantitative analysis: variable coding and results

References

Middlemiss L. 2022. Who is vulnerable to energy poverty in the Global North, and what is their experience?. *Wiley Interdisciplinary Reviews: Energy and Environment*. 11.6

Qualitative interview protocols

Interview 1: months 0-3

Pre-amble

I would like to find out about your experiences with paying for and using energy at home, and whether this has changed recently. When we talk about using energy in the home, we mean heating and cooling your home, heating up water to wash, cooking, lighting, washing and drying clothes and using electrical appliances. During the interview I will ask about these experiences, and how you manage to access adequate energy to meet your needs. I will also ask you about the [intervention]. I would also like to discuss your energy use in relation to some wider issues such as your health, wellbeing and social life.

I have given you a detailed information sheet about our research project, did you get a chance to read that? *If no, take them through the info sheet in more detail; if yes*: Just to say that the WELLBASED study aims to find out how city projects on energy can improve people's health and wellbeing. *[Add specific information about pilot intervention]*. As part of this study we also want to gather some detailed information about how people are affected by these projects. This will help us to understand your energy use and health and wellbeing experiences, as well as what happens to you as the project goes on.

- Consent form: The form we are asking you to sign is to say you are happy to take part in the research. Some of the things on the form that I want to point out to you are:
    - You are free to withdraw at any time without giving any reason and without there being any negative consequences.
    - You can choose not to answer particular questions.
    - Your responses will be kept confidential, and only shared with the research team.
    - You will not be identified or identifiable in the reports that result from the research.

- Our conversation today will be recorded, and then transcribed (typed out). The transcription might be used in future research, and will be stored in an anonymised form in a data archive at the University of Leeds.
- There is no obligation for you to participate in the research.

- Are you happy with these conditions*? Ask participant to sign consent form before starting the recording.*
- *Check it is ok to audio record the interview. [turn on recording]*
- *Check the participant's unique identifier with them.*
- *Ask if they have any questions before we start asking questions.*

About the house/home/household and you

1. How did you come to live in this house?
   - How long have you lived here?
   - What does it mean to you?
   - Do you want to stay here? If not where next?
2. Who lives here with you?
   - Is there anyone else who visits regularly?
3. Can you explain how each person uses the house in a typical day? (include regular visitors)
   - When are people in and out of the house?
   - Identify specific needs from the home (e.g. working from home, being at home a lot, particular people's energy needs)

About energy use in your home

4. How easy is it to keep your house at a good temperature?
   - Challenges in keeping warm enough
   - Challenges in keeping cool enough
5. How affordable are your energy bills?
   - *If bills unaffordable* – how do high bills affect your energy use?
   - How do high bills affect your spending elsewhere?
   - Have you changed energy supplier recently? (*if possible*) Did this help to make bills more affordable?
6. Do you have any mould or damp in the house?
   - *If yes* can you tell me more?
   - Where do you have mould and damp?
   - Do you know why it is mouldy/damp?
   - How do you manage mould and damp?
7. Do you have all the electrical appliances you need at home? (e.g. washing machine, fridge, freezer)
   - *If not*, which ones are you missing and what difference does that make?

What you do in your home to make it work

We know that people find ways to make things work, despite the challenges they face in affording/accessing adequate energy.

8. What sort of things do you do to cope in your home when it is too cold?

9. What sort of things do you do to cope in your home when it is too hot?
10. How do you manage to keep the electricity bill affordable?
11. Do you have to change your spending on other things to make it possible to pay your energy bills?
    - Prompt for travel costs and food

Wider effects

Given everything that we've talked about so far, I'd like to talk about how any challenges you face with energy use that affect your life in a wider sense.

12. What are the effects of [cold/heat/damp/electrical access] on your physical health?
13. What are the effects of [cold/heat/damp/electrical access] on your mental health and sense of wellbeing?
14. What are the effects of [cold/heat/damp/electrical access] on your social life?
    - Inside the home
    - With friends and family outside the home
    - In your neighbourhood
    - At work
15. How are other people in your home affected by your situation [cold/heat/damp/electrical access]? Does their experience differ from yours?

Intervention (interview 1)

You are being involved in [describe intervention]

16. What do you think about the [intervention]?
17. Do you think that the [intervention] will have an impact on your life, or on the lives of other people that live with you?
    - Ask them to explain their answer (*prompt for*: physical health, mental health, social life, work life, school life, finances, relationship with landlord, conditions in your home – *note only ask where appropriate*).
18. Do you think that the [intervention] will change anything that you do? Please explain.
    - Health choices
    - Energy choices
19. What else would you like to happen to make your life easier?
    - By [city administration]
    - By national government
    - By energy companies
20. What do you think about government commitments to reduce energy use to combat climate change? How do you think these will affect you?

Closing

21. Do you have any questions for us?

[point out that we will return for interview 2 and remind them of when this will be]

Interview 2: months 12-15

Pre-amble

I would like to find out about your experiences with paying for and using energy at home, and whether this has changed recently. When we talk about using energy in the home, we mean heating and cooling your home, heating up water to wash, cooking, lighting, washing and drying clothes and using electrical appliances. I will also ask you about the *[intervention*]. I would also like to discuss your energy use in relation to some wider issues such as your health, wellbeing and social life.

Reminder of consent process and gaining continued consent

- Last time I visited I asked you to sign a form to say you were happy to take part in the research. Some of the things on the form that I want to remind you about are:
    - You are free to withdraw at any time without giving any reason and without there being any negative consequences.
    - You can choose not to answer particular questions.
    - Your responses will be kept confidential, and only shared with the research team.
    - You will not be identified or identifiable in the reports that result from the research.
    - Our conversation today will be recorded, and then transcribed (typed out). The transcription might be used in future research and will be stored in an anonymised form in a data archive at the University of Leeds.
    - There is no obligation for you to participate in the research.
- Does this sound ok?
- Would you like any reminders about the bigger research project?
- *Check it is ok to audio record the interview.*
- *Check the participant's unique identifier with them (on tape)*
- *Confirm orally that participant is happy to continue your involvement in the project while recording is in progress.*

About the house/home/household and you

1. How do you feel about living in this home?
    - Do you want to stay here? If not where next?
2. Did anything change in your household since our last visit?
    - Health changes
    - People living here/regularly visiting
    - Changes to the home (not associated with intervention)
3. Did anything change in your neighbourhood, or in your city since our last visit?
4. Are there any changes in how each person uses the house in a typical day? (include regular visitors)
    - When are people in and out of the house?
    - Identify specific needs from the home (e.g. working from home, being at home a lot, particular people's energy needs)

Intervention

You have been involved in [describe intervention]

5. What did you think about the [intervention]?
6. Did the [intervention] have an impact on your life, or on the lives of other people that live with you?
    - Ask them to explain their answer. (*prompt for*: physical health, mental health, social life, work life, school life, finances, relationship with landlord, conditions in your home – *note only ask where appropriate*).

About energy use in your home

Now we have an overview of what has changed for you, we'd like to ask you a few more detailed questions about your energy use.

7. How easy is it to keep your house at a good temperature?
    - Challenges in keeping warm enough
    - Challenges in keeping cool enough
    - Has this changed since the intervention, how and why?
8. How affordable are your energy bills?
    - *If bills unaffordable* – how do high bills affect your energy use?
    - How do high bills affect your spending elsewhere?
    - Have you changed energy supplier recently? (*if possible*) Did this help to make bills more affordable?
    - Has this changed since the intervention, how and why?
9. Do you have any mould or damp in the house?
    - *If yes* can you tell me more?
    - Where do you have mould and damp?
    - Do you know why it is mouldy/damp?
    - How do you manage mould and damp?
    - Has this changed since the intervention, how and why?
10. Do you have all the electrical appliances you need at home? (e.g. washing machine, fridge, freezer)
    - *If not*, which ones are you missing and what difference does that make?
    - Has this changed since the intervention and how?

What you do in your home to make it work

We know that people find ways to make things work, despite the challenges they face in affording/accessing adequate energy.

11. What sort of things do you do to cope in your home:
    - when it is too cold?
    - when it is too hot?
    - Have these things changed since the intervention?
12. How do you manage to keep the electricity bill affordable?
    - Do you have to change your spending on other things to make it possible to pay your energy bills?

- Has this changed since the intervention?

Wider effects

Given everything that we've talked about so far, I'd like to talk about how any challenges you face with energy use that affect your life in a wider sense.

13. What are the effects of living in this house on your physical health?
    - cold/heat/damp/electrical access
    - changes with regards the intervention
14. What are the effects of living in this house on your mental health and sense of wellbeing?
    - cold/heat/damp/electrical access
    - changes with regards the intervention
15. What are the effects of living in this house on your social life?
    - cold/heat/damp/electrical access
    - changes with regards the intervention
16. How are other people in your home affected by living here? Has the intervention changed this?

Further needs for change

17. What else do you think needs to happen to make your life easier?
    - By [city administration]
    - By national government
    - By energy companies

Closing

18. Do you have any questions for us?

Qualitative coding frameworks

Coding Framework Wave 1

Topic Code	Sub-code	Sub-sub-code
Personal circumstances: Circumstances of people's lives including how long they have lived here, who is in the house or regularly visits/stays in the house, caring responsibilities, work/life balance. How the house is occupied (eg who is in the home during the day) and any plans to move house in the near future.		
Personal circumstances	People living or regularly visiting/staying in the house	
	Occupancy patterns	
	Plans to move house	
Energy use and practices: When people use energy to heat/cool their home. Problems with keeping home warm/cold, and how people manage this or not.		
Energy use and practices	Heating patterns	
	Dealing with cold	Heating too expensive

		Inadequate heating
		Mechanisms for keeping warm
	Dealing with heat	Mechanisms for keeping cool
	Energy literacy	
Housing conditions: Description of housing conditions including the local environment. Any electrical appliances they have or need. What heating system they have, how do they work and how they feel about it. Whether damp/mould is an issue and how they deal with this.		
Housing conditions	Humidity, damp or mould	No damp or mould
		Dealing with humidity, damp or mould
	Electrical appliances	
	Heating and cooling system	
	Living conditions in and around the building	
Energy costs: Any discussion on the costs of energy including how people pay for and manage energy costs, including their energy supplier.		
Energy costs	Energy supplier	Changed energy supplier
	Energy payment method	
	Affordability/managing energy bills	Save energy Financial support Support from family Cut expenditure Bills affordable
Cost of living crisis: Any discussion on wider cost of living issues that impact ability to manage household budgets. This includes any changes in spending habits or trade-offs to manage essential bills or how they are prioritising spending		
Cost of living crisis	Affected by cost of living crisis	Social comparisons Financial constraints/arrears Not affected (yet)
	Coping strategies of cost of living crisis	Saving on expenditure
		Saving on energy
Health: Any health problems that people have. Whether these are affected by the conditions of the home, or the intervention.		
Health	Mental health	
	Physical health	
	How heat/cold/damp impacts health	
	How intervention impacts health	
Social interactions or activities: Any aspect of social interaction/activity including having people round, visiting friends/family, or generally going out. Whether social activities/interaction are impacted by housing conditions including cold/damp/heat		
Social interactions or activities	How cold/heat/damp impacts social activities	
	How intervention impacts social activities	
Wellbeing: Any discussion of how people feel about their home or circumstances, or how their home/personal circumstances are impacting their sense of happiness or ability to live their life as they wish		
Wellbeing	Feelings about home/ current situation	

	How intervention impacts wellbeing	
	How heat/cold/damp impacts wellbeing	
	How cost of living crisis impacts wellbeing	
Intervention: Any discussion about the intervention. People's expectations and their positive/negative experiences as the intervention is being put in place. This includes any negative/positive effect or consequences of the intervention		
Intervention	Expectations about the intervention	
	Experiences with the intervention	
	Negative effect of the intervention	
	Positive effect of the intervention	
Support: Any support that people receive from family members outside the home, or external organisations such as charities or government including public health or government benefits. This also includes any discussion of people being reluctant to ask for support or feeling bad about being on benefits.		
Support	Support from external organisations	Municipality Financial Energy advice
	Support from friends/family members	
	Reluctant to ask for support	
Future needs/interventions: Are people aware of any further interventions planned for their home. Is there anything else people feel energy companies or the council could do to help or support them more		
Future needs/intervention	More responsive services	
	Lower costs	
	Better heating system	
Government efforts to address climate change: People's thoughts on government efforts to reduce energy use or combat climate change, and whether people think this will have any effect on them		
Government efforts to address climate change		

Coding Framework Wave 2

Main code/Theme	Sub-code	Sub-sub-code	Description
Theme: Home & Environment Circumstances Any information about the home situation, and feelings about this. Includes discussion of any changes in the home situation since the last interview.			
Home and household	Feelings about living in home		Positive or negative emotions or feelings about living in their current home. This includes any discussion about preferring to stay in their current home or move home. Will also include discussion if people have already moved home and why.
	People in the home		Discussion of people living or regularly visiting the household and any changes since the last interview
	Condition of home		Discussion of the physical condition of the home, or building, and any changes since the last interview that are not related to the intervention
	Neighbourhood		Any changes in the neighbourhood or city since the last interview
Use of home	No change in use of home		Discussion or confirmation of how people use the home and that this has not changed since the last interview
	Change in use of home		Any changes in how each person uses the home in a typical day, including regular visitors. This will include changes in home working or being at home more (or less) that will impact people's energy needs/use.
	Intervention impact: use of home		What if any impact the intervention has had on how the home is used by different people living in or visiting the home.
Theme: Intervention Any discussion on the intervention including people's perceptions of the intervention and any impact this has had on them or any changes in behaviour as a consequence of the intervention.			
Intervention	Thoughts on Intervention		Any discussion on what people thought about the intervention
	Intervention impact		General discussion of what, if any, impact the intervention has had. ***NB: use only for issues that cannot be coded under specific themes identified in other sections below.***
Theme: Energy Use Any information about the challenges people face in keeping their homes warm or cool. Includes concerns about affordability of energy and the ways in which people change their behaviour or spending in response to their energy bills			
Energy use	Keeping home warm		Any discussion of whether people find it difficult or easy to keep their home warm. What challenges or problems they may have. What mechanisms or process they use to keep their home warm
	Keeping home cool		Any discussion of whether people find it difficult or easy to keep their home cool. What challenges or problems they may have. What mechanisms or process they use to keep their home cool
	Intervention impact: Energy use		What if any impact the intervention has had on energy use in the home – including keeping the home warm/cool. What are the processes or mechanisms that

			have brought about the change in energy use. Specifically, how the impact or change came about.
Energy affordability			Any discussion on how affordable (or not) energy bills are
	How energy bill effects use		How people respond to energy bills particularly how this impacts their energy use
		How energy bill affects other spending	How people change or adjust spending in other areas in response to their energy bills.
		Intervention impact: energy affordability	What if any impact the intervention has had on energy bills and affordability. What are the processes or mechanisms that have brought about the change in energy affordability. Specifically, how the impact or change came about.
Energy Supplier	Not Changed energy supplier		People have not changed energy supplier recently. Includes discussion on why not, and what impact (if any) this is having.
	Changed energy supplier		People have changed energy supplier recently, including any impact this has on energy bills or affordability of energy use.
Energy literacy			Any discussion on people's understandings of energy sources, use and costs and the issues that impact on this
Theme: Housing condition Any discussion on the condition of the home including damp and mould, and the availability/use of electrical appliances.			
House condition	Does not have humidity/damp/mould		There is no damp or mould in the house. Includes discussion of if this has changed since the last interview.
	Does have humidity/damp/mould		There is damp or mould in the house. Includes discussion of where the damp is, why the damp exists and whether this has changed since the last interview.
	Intervention impact: humidity/ damp/ mould		What if any impact the intervention has had on damp or mould in the home. What are the processes or mechanisms that have brought about the change in damp/mould.
	Electrical appliances		The electrical appliances that people have in their home. This includes discussion of any appliances they would like to have and what difference this would make
	Intervention impact: electrical appliances		Are there electrical appliances they no longer need or have had to get as a result of the intervention. Why is this?
Theme: Coping financially			
Coping financially			How people manage to keep their electricity bills affordable. This includes changes to, or trade-offs with, any other household budgets
Theme: Personal effects Any impacts on health or social life. What else needs to change			
Health			Discussion of the health of members of the household and any changes since the last interview, including any effect that living in a cool/hot/damp home has on health

	Intervention impact: health effects		Any discussion about the intervention and how this has (or not) impacted on health
Social life			Any effect that living in a cool/hot/damp home has on social interactions or activities
	Intervention impact: social life		Any discussion about the intervention and how this has (or not) impacted social interactions or activities
Future change			What else would people like their city administration, national government or energy companies do to make their life easier.
Theme: Mechanisms & Strategies Any discussion or description of the process or mechanisms for change, or how people are coping after the intervention			
Explanation for change			
Explanation for no change			
Coping practices post intervention			

Longitudinal Quantitative Analysis: Variable coding and results

Creating Change Variables

The table below provides details of how variables have been re-coded using two different types of categorical variables as examples.

Variable in T0 and T2	Responses in each time period		Change variable
	T0	T2	
Keeps home comfortably warm in winter Yes No			*Change in keeping home warm*
	Yes	No	Become a problem
	No	no	No change – not warm
	Yes	Yes	No change -warm
	No	Yes	Become warm
Coping mechanisms: Wearing extra clothes to keep warm Always/Often Sometimes Never/Rarely			*Change in coping – Wearing extra clothes*
	Never/Rarely	Sometimes / Always/often	Started/increased frequency
	Sometimes	Always/often	
	Always/often	Always/often	No change – always/often/sometimes
	Sometimes	Sometimes	
	Never/Rarely	Never/Rarely	No change – never/rarely
	Sometimes/ Always/often	Never/Rarely	Stopped/reduced frequency

Table A.1 Change analysis by Pilot Site

Variable / categories	Valencia	Obuda	Jelgava	Heerlen	Edirne	Cramver's V	p-value
Energy Use							
Keeping homes warm in winter	n=111	n=75	n=117	n=83	n=114	0.390	***
Became a problem	11%	7%	3%	5%	0%		
No change - not warm	31%	7%	11%	35%	72%		
No change - warm	27%	81%	73%	47%	1%		
Became warm	32%	5%	13%	13%	27%		
	100%	100%	100%	100%	100%		
Keeping homes cool in summer	n=111	n=75	n=117	n=83	n=114	0.205	***
Became a problem	22%	11%	11%	10%	5%		
No change - not cool	48%	44%	43%	48%	74%		
No change - cool	17%	24%	32%	30%	2%		
Became cool	14%	21%	15%	12%	19%		
	100%	100%	100%	100%	100%		
Wearing extra clothes to keep warm	n=111	n=75	n=117	n=83	n=114	0.408	***
Started to/increased freq	21%	16%	13%	12%	3%		
No change - always/often/ sometimes	63%	21%	17%	40%	14%		
No change - never/rarely	0%	41%	41%	15%	1%		
Stopped/reduced freq	16%	21%	29%	34%	83%		
	100%	100%	100%	100%	100%		
Go to bed in the day time to keep warm	n=111	n=75	n=117	n=83	n=114	0.346	***
Started to/increased freq	31%	17%	1%	13%	4%		
No change - always/often/ sometimes	3%	13%	3%	6%	6%		
No change - never/rarely	52%	48%	94%	70%	37%		
Stopped/reduced freq	14%	21%	3%	11%	53%		
	100%	100%	100%	100%	100%		
Using public buildings to keep warm/cool	n=111	n=75	n=117	n=83	n=113	0.225	***
Started to/increased freq	24%	4%	2%	6%	0%		
No change - always/often/ sometimes	3%	0%	1%	2%	1%		
No change - never/rarely	64%	93%	95%	83%	91%		
Stopped/reduced freq	9%	3%	3%	8%	8%		
	100%	100%	100%	100%	100%		
Visit neighbours/friends/ families homes to keep warm/cool	n=111	n=75	n=117	n=83	n=113	0.263	***
Started to/increased freq	21%	1%	2%	5%	7%		
No change - always/often/ sometimes	1%	0%	0%	2%	1%		
No change - never/rarely	73%	95%	97%	81%	62%		

Stopped/reduced freq	5%	4%	2%	12%	30%		
	100%	100%	100%	100%	100%		
Turning heating/cooling off to save money	n=109	n=73	n=111	n=83	n=113	0.308	***
Started to/ increased freq	27%	14%	14%	10%	12%		
No change - not an option	4%	1%	13%	0%	0%		
No change - always/often/ sometimes	15%	34%	3%	42%	11%		
No change - never/rarely	8%	27%	50%	23%	12%		
Stopped/reduced freq	47%	23%	21%	25%	66%		
	100%	100%	100%	100%	100%		
Heating/cooling one room to save money	n=107	n=68	n=110	n=82	n=114	0.367	***
Started to/ increased freq	16%	18%	4%	13%	4%		
No change - not an option	1%	6%	16%	0%	0%		
No change - always/often/ sometimes	22%	12%	4%	49%	14%		
No change - never/rarely	8%	44%	59%	15%	9%		
Stopped/reduced freq	53%	21%	18%	23%	73%		
	100%	100%	100%	100%	100%		
Turning off lights in room you are using	n=111	n=75	n=117	n=83	n=114	0.225	***
Started to/ increased freq	18%	19%	14%	15%	9%		
No change - always/often/ sometimes	16%	23%	27%	43%	4%		
No change - never/rarely	25%	35%	24%	25%	24%		
Stopped/reduced freq	41%	24%	36%	17%	63%		
	100%	100%	100%	100%	100%		
Bathing/showering less	n=111	n=75	n=117	n=83	n=114	0.263	***
Started to/increased freq	15%	8%	5%	11%	0%		
No change - always/often/ sometimes	0%	5%	3%	21%	0%		
No change - never/rarely	79%	69%	87%	53%	96%		
Stopped/reduced freq	5%	17%	5%	16%	4%		
	100%	100%	100%	100%	100%		
Not eating/cooking to save expenditure	n=111	n=75	n=117	n=83	n=113	0.310	***
Started to/increased freq	35%	12%	0%	10%	0%		
No change - always/often/ sometimes	2%	5%	2%	13%	0%		
No change - never/rarely	59%	72%	97%	69%	100%		
Stopped/reduced freq	5%	11%	2%	8%	0%		
	100%	100%	100%	100%	100%		
Avoid going to doctor to save expenditure	n=110	n=53	n=116	n=81	n=114	0.514	***
Started to/increased freq	0%	8%	8%	11%	10%		

No change - always/often/sometimes	0%	4%	0%	11%	1%		
No change - never/rarely	0%	74%	90%	75%	89%		
Health care is free	100%	6%	0%	0%	0%		
Stopped/reduced freq	0%	9%	3%	3%	1%		
	100%	100%	100%	100%	100%		
Energy Affordability							
Arrears in Utility bills in last 12 months	n=101	n=54	n=111	n=39	n=37	0.400	***
Started/increased freq	13%	4%	5%	5%	16%		
No change - two or more	11%	4%	4%	3%	76%		
No change - no	69%	81%	86%	85%	0%		
Stopped/reduced frequency	7%	11%	6%	8%	8%		
	100%	100%	100%	100%	100%		
Housing condition							
Presence of leaks/damp/rot	n=107	n=48	n=108	n=29	n=38	0.336	***
Started	12%	0%	6%	10%	0%		
No change - yes	19%	4%	25%	31%	90%		
No change - no	62%	94%	57%	48%	5%		
Stopped	8%	2%	13%	10%	5%		
	100%	100%	100%	100%	100%		
Health							
Pain or discomfort	n=111	n=75	n=117	n=84	n=111	0.255	***
Increased	23%	15%	20%	10%	9%		
No change - slight to extreme problem	32%	33%	19%	67%	21%		
No change - no problem	25%	37%	39%	10%	25%		
Decreased	20%	15%	22%	14%	45%		
	100%	100%	100%	100%	100%		
Depression	n=111	n=75	n=117	n=83	n=114	0.256	***
Deteriorated	17%	12%	13%	16%	10%		
No change - mild/mod/severe	17%	21%	6%	21%	8%		
No change - not depressed	57%	45%	78%	51%	39%		
Improved	9%	21%	3%	13%	44%		
	100%	100%	100%	100%	100%		
Anxiety	n=111	n=75	n=117	n=83	n=114	0.238	***
Deteriorated	14%	15%	13%	22%	8%		
No change - mild/mod/severe	17%	19%	4%	18%	11%		
No change - not depressed	55%	47%	68%	47%	30%		
Improved	14%	20%	15%	13%	51%		
	100%	100%	100%	100%	100%		
Stress	n=111	n=75	n=117	n=83	n=113	0.251	***
Deteriorated	14%	15%	9%	8%	4%		

No change - mild/mod/severe	15%	19%	1%	11%	3%		
No change - not depressed	43%	40%	84%	74%	58%		
Improved	27%	27%	7%	7%	36%		
	100%	100%	100%	100%	100%		
Health Barometer	n=111	n=75	n=117	n=84	n=70	Pearson's R	
Change T0-T2	-6.6	1.7	2.7	-1.8	8.8	0.221	***

P-value ***=0.001; **=0.01; *=0.05; ns=not significant

Table A.2: Change analysis by Gender

Variable / categories	Male	Female	Total	Cramer's v	p-value
ENERGY USE					
Change in keeping home warm in winter	n=175	n=329	n=504		ns
Became cold	5%	5%	5%		
No change - not warm	35%	31%	33%		
No change - warm	41%	44%	43%		
Became warm	20%	19%	19%		
	100%	100%	100%		
Change in keeping home cool in summer	n=175	n=329	n=504		ns
Became hot	9%	13%	12%		
No change - not cool	52%	52%	52%		
No change - cool	19%	21%	20%		
Became cool	20%	14%	16%		
	100%	100%	100%		
Wear extra clothes	n=175	n=329	n=504	*0.171*	**
Started to/increased freq	14%	12%	13%		
No change - always/often/sometimes	20%	36%	31%		
No change - never/rarely	22%	17%	18%		
Stopped/reduced freq	45%	35%	38%		
	100%	100%	100%		
Go to bed in daytime	n=175	n=328	n=503	*0.176*	***
Started to/increased freq	6%	16%	12%		
No change - always/often/sometimes	3%	7%	6%		
No change - never/rarely	65%	59%	61%		
Stopped/reduced freq	26%	18%	21%		
	100%	100%	100%		
Turn heating/cooling off	n=172	n=321	n=493	*0.161*	*
Started to/ increased freq	15%	17%	16%		

No change - not an option	3%	4%	4%		
No change - always/often/sometimes	11%	22%	19%		
No change - never/rarely	29%	22%	24%		
Stopped/reduced freq	43%	35%	38%		
	100%	100%	100%		
Using public buildings to keep warm/cool	n=175	n=328	n=503	*0.145*	*
Started to/increased freq	3%	10%	7%		
No change - always/often/sometimes	3%	1%	1%		
No change - never/rarely	86%	85%	85%		
Stopped/reduced freq	7%	6%	6%		
	100%	100%	100%		
Using Neighbours/friends/family home to keep warm/cool	n=175	n=328	n=503	*0.149*	*
Started to/increased freq	3%	10%	8%		
No change - always/often/sometimes	0%	1%	1%		
No change - never/rarely	87%	78%	81%		
Stopped/reduced freq	10%	11%	11%		
	100%	100%	100%		
Heating/cooling one room	n=171	n=314	n=485	*0.161*	*
Started to/ increased freq	6%	12%	10%		
No change - not an option	2%	6%	5%		
No change - always/often/sometimes	16%	21%	19%		
No change - never/rarely	28%	25%	26%		
Stopped/reduced freq	47%	36%	40%		
	100%	100%	100%		
Turn off lights	n=174	n=329	n=503	*0.167*	**
Started to/ increased freq	10%	16%	14%		
No change - always/often/sometimes	16%	24%	21%		
No change - never/rarely	34%	22%	26%		
Stopped/reduced freq	41%	37%	38%		
	100%	100%	100%		
Bathing/showering less to save money	n=175	n=329	n=504	*0.193*	***
Started to/increased freq	3%	10%	8%		
No change - always/often/sometimes	3%	6%	5%		
No change - never/rarely	90%	73%	79%		
Stopped/reduced freq	4%	11%	9%		
	100%	100%	100%		
Not eating/cooking	n=175	n=328	n=503	0.111	ns
Started to/increased freq	7%	13%	11%		
No change - always/often/sometimes	3%	4%	4%		
No change - never/rarely	86%	77%	81%		
Stopped/reduced freq	3%	6%	5%		

	100%	100%	100%		
Avoid going to doctor	n=169	n=308	n=477	0.085	ns
Started to/increased freq	6%	8%	7%		
No change - always/often/sometimes	2%	3%	3%		
No change - never/rarely	70%	62%	65%		
Health care is free	20%	26%	24%		
Stopped/reduced freq	2%	2%	2%		
	100%	100%	100%		
ENERGY AFFORDABILITY					
Change in arrears in Utility Bills	n=111	n=234	n=345	0.144	ns
Started/increased freq	12%	6%	8%		
No change - two or more	18%	11%	13%		
No change - no	62%	75%	71%		
Stopped/reduced frequency	8%	7%	8%		
	100%	100%	100%		
HOUSING CONDITION					
Leaks, damp, rot	n=110	n=223	n=333	*0.111*	*ns*
Started	5%	8%	7%		
No change - yes	34%	25%	28%		
No change - no	56%	58%	57%		
Stopped	6%	9%	8%		
	100%	100%	100%		
HEALTH					
Pain Discomfort	n=174	n=328	n=502	0.129	*
Increased	16%	16%	16%		
No change - slight to extreme problem	25%	37%	33%		
No change - no problem	34%	24%	28%		
Decreased	25%	24%	24%		
	100%	100%	100%		
Depression	n=175	n=329	n=504	*0.147*	*
Deteriorated	8%	16%	14%		
No change - mild/mod/severe	10%	15%	14%		
No change - not depressed	61%	52%	55%		
Improved	21%	16%	18%		
	100%	100%	100%		
Anxiety	n=175	n=329	n=504	*0.176*	***
Deteriorated	9%	17%	14%		
No change - mild/mod/severe	8%	16%	13%		
No change - not depressed	60%	44%	50%		
Improved	23%	23%	23%		
	100%	100%	100%		

Stress	n=175	n=328	n=503	*0.113*	*ns*
Deteriorated	7%	11%	10%		
No change - mild/mod/severe	6%	10%	9%		
No change - not depressed	68%	57%	61%		
Improved	19%	22%	21%		
	100%	100%	100%		
Health Barometer	n=148	n=313	n=461	Pearsons	p-value
				-0.008	*ns*
Male	0.5				
Female	0.2				
Total	0.3				

P-value ***=0.001; **=0.01; *=0.05; ns=not significant

WELLBASED

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