



Growing Up in Energy Poverty: Health Inequalities, Policy Invisibility and Children's Agency

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Growing up in Energy Poverty: Health Inequalities, Policy Invisibility and Children's Agency

Irene González Pijuan

A thesis submitted in partial fulfilment of the requirements of Sheffield Hallam University
for the degree of Doctor of Philosophy

April 2026

Candidate Declaration

I hereby declare that:

1. I have not been enrolled for another award from the University or other academic or professional organisation, whilst undertaking my research degree.
2. None of the material contained in the thesis has been used in any other submission for an academic award.
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4. The work undertaken towards the thesis has been conducted in accordance with the University's Principles of Integrity in Research and Research Ethics Policy, and ethics approval has been granted for all research studies in the thesis as shown in the table below.

Ethics review reference number	Title of the research study	Approval date	Date of any post-approval amendment (if applicable)
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5. The word count of the thesis is 57,094.

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Abstract

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Energy poverty has become an increasingly prominent social concern across Europe, with growing evidence linking inadequate access to domestic energy services to housing inequalities, financial hardship and adverse health outcomes. While research and policy have made significant progress in documenting these impacts and in giving progressive space to lived experiences, qualitative and emotional aspects, the experiences of children remain largely absent from existing frameworks. Energy poverty is typically analysed and addressed at the household level, implicitly assuming that deprivation affects all household members in similar ways. As a result, children are often treated as passive dependents rather than as individuals whose well-being, development and everyday lives are shaped by the material conditions of the home.

The research intends to examine energy poverty from a child-centred perspective. It explores three interrelated questions: how energy poverty affects children's health and well-being, how children are recognised within energy poverty policy frameworks, and how children themselves experience and interpret energy deprivation in their daily lives. The research combines quantitative analysis, policy analysis and participatory research with children in order to capture the multiple dimensions through which energy poverty affects childhood.

The first empirical study uses secondary data from the Barcelona Health Survey to examine associations between energy poverty and children's physical and mental health outcomes. The second study analyses European and national policy documents to investigate the extent to which children are explicitly recognised within energy poverty policies and governance frameworks. The third study draws on participatory workshops and child-completed survey data in Barcelona to explore how children understand and navigate energy poverty within their everyday environments.

The thesis also builds a conceptual framework combining insights from energy justice and care ethics. Energy justice highlights structural inequalities and issues of recognition within

energy systems, while care ethics helps outline the relational and everyday dynamics through which energy poverty is experienced and managed within households.

The findings show that children are both materially affected by energy poverty and structurally overlooked within existing research and policy frameworks. By combining population-level analysis, policy examination and children's own accounts, the thesis demonstrates the limits of household-centred approaches and argues for a more explicit recognition of children as subjects of concern in energy poverty research and governance. In doing so, it contributes empirical evidence on the health impacts of energy poverty in childhood, highlights gaps in policy recognition, and introduces participatory approaches that foreground children's perspectives within debates on energy justice and care.

The empirical core of the thesis is presented through the following publications:

1. **Paper 1:** *The Association of Energy Poverty and Child Health in the City of Barcelona.* (<https://www.mdpi.com/1660-4601/18/11/5961>)
2. **Paper c2:** *Empowering Whose Future? A European Policy Analysis of Children in Energy Poverty.* (<https://www.sciencedirect.com/science/article/pii/S2214629623003882>)
3. **Paper 3:** *Children's Voices: Exploring Children's Perceptions of Energy Poverty in Barcelona (in revision)*

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List of abbreviations

APE – Alliance Against Energy Poverty

COVID-19 – Coronavirus Disease 2019

DoS – Director of Studies

EU – European Union

EU-SILC – European Union Statistics on Income and Living Conditions

WHO – World Health Organisation

Acknowledgements

It is often said that a doctorate is a long and solitary journey. Six years after beginning this adventure, I can confirm that it can be so, but that it also brings with it new people, ideas, and ways of seeing the world. In the current context, it is undoubtedly a privilege to devote time to reflecting on and studying what matters to us, concerns us, or sparks our curiosity.

I began this journey as a middle-aged woman during the pandemic, seeking to fulfil a goal that my 25-year-old self had set at the end of my undergraduate studies. After undeniable challenges related to health, finances, and caregiving, it seems that I have achieved it. For that, for having taken the step to begin, I am deeply grateful.

However, the reality is that I would not even have dreamed of reaching this point without the trust and support of my Director of Studies, Aimee Ambrose, who has always been by my side throughout this journey of ups and downs, as well as the rest of my supervisory team: Lucie Middlemiss, Sergio Tirado-Herrero, and Christina Fashanu. Thank you for guiding me along this path of learning.

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Preamble

The document is structured as follows. Chapter 1 introduces the thesis by setting out the context, aims and research questions, followed by Chapter 2, setting out the researcher's positionality and ethical considerations. Chapter 3 presents a critical review of the literature on energy poverty, childhood, health, justice and care, situating the research within existing debates and identifying key gaps. Chapter 4 outlines the research philosophy and methodological approach that guided the study.

Chapter 5 presents the three papers that form the core of the thesis. Each paper addresses a different dimension of childhood energy poverty: the first focuses on children's health and well-being in Barcelona, the second examines policy recognition, and the third explores children's lived experiences through participatory research. The document moves on to Chapter 6 and brings these strands together in a synthesis analysis, reflecting on how the findings relate to one another and what they collectively reveal about childhood energy poverty. Finally, Chapters 7 and 8 conclude the thesis by summarising the main contributions, reflecting on limitations, and considering implications for future research, policy and practice.

The publications included in this article-based thesis are summarised in the following table.

TITLE	PUBLICATION STATUS	ROLE
<i>The Association of Energy Poverty and Child Health in the City of Barcelona</i>	Published in <i>International Journal of Environmental Research and Public Health</i> 2021, 18(11)	Conceptualisation, methodology, resources, writing and review
<i>Empowering Whose Future? A European Policy Analysis of Children in Energy Poverty.</i>	Published in <i>Energy Research & Social Science</i> Volume 106, December 2023	Lead author
<i>Children's Voices: Exploring Children's Perceptions of Energy Poverty in Barcelona</i>	In review at <i>Energy, Sustainability and Society</i>	Lead author

Table 1: List of publications included in the thesis

Chapter 1: Introduction and contributions to knowledge

Energy poverty has become a major social concern across Europe, affecting millions of households and increasingly recognised as a key determinant of health and well-being (European Commission, 2020; Thomson et al., 2017). In 2024, more than 41 million people, around 9,2% of the European Union's population, reported being unable to keep their homes adequately warm, reflecting persistent problems of energy affordability (Eurostat, 2026). This proportion represented an increase compared with previous years, indicating that despite emergency measures responding to COVID-19 adopted by many Member States, a substantial share of the population continues to experience difficulties in accessing essential, adequate energy services (Eurostat, 2026; European Commission, 2023). During the course of this research, which started one month after the outbreak of COVID-19, energy poverty has been gaining more attention, something galvanised by the subsequent increase in energy prices after the invasion of Ukraine.

It is well known that the consequences of energy poverty extend beyond financial challenges and affect multiple dimensions of daily life and health (Liddell and Morris, 2010; Marmot Review Team, 2011). A growing body of evidence links inadequate access to energy services -particularly insufficient heating and cooling -to increased risks of respiratory and cardiovascular conditions, poorer mental health and reduced overall quality of life, especially among socially vulnerable groups (World Health Organisation, 2018; Thomson et al., 2017). Energy poverty is also closely connected to housing conditions, such as poor insulation, dampness and overcrowding (Bouzarovski & Petrova, 2015), and shows a clear social and geographical pattern across Europe, with higher prevalence in Southern and Eastern European countries (Bouzarovski, 2018; European Commission, 2023). Within the context of the energy transition, these inequalities have also gained political relevance, as climate and decarbonisation policies may either alleviate or increase existing forms of social vulnerability if their distributive effects are not explicitly addressed.

Over the past two decades, the study of energy poverty has also undergone a conceptual shift. Early approaches tended to frame energy poverty (usually referred to as fuel poverty in early scholarship) as a primarily techno-economic problem, centred on energy prices, household income and building efficiency. More recent research has moved towards a broader and more socially grounded understanding with significant underlying political driving factors, recognising energy poverty as a multidimensional condition shaped by housing systems, labour markets, welfare regimes and everyday practices (Bouzarovski, 2018; Day et al., 2016; Walker & Day, 2012). This shift has been accompanied by increasing attention to issues of vulnerability, lived experience and justice, and by the recognition that energy deprivation affects health, well-being, and social participation.

Despite this conceptual change, both research and policy have continued to rely predominantly on household-centred and adult-oriented frameworks. Energy poverty is most often measured, analysed and addressed at the level of the household, implicitly assuming that deprivation is experienced equally across household members (Middlemiss & Gillard, 2015; Thomson, Snell, & Liddell, 2016). Within this logic, children risk being treated as passive dependents whose needs are met only through parents or household-level interventions. As a result, childhood rarely appears explicitly in energy poverty frameworks, indicators or policy instruments, and children's specific experiences, vulnerabilities and forms of agency remain hidden (Middlemiss et al., 2019; Simcock et al., 2016). This persistent invisibility is striking given the established evidence that children are particularly sensitive to adverse housing and environmental conditions (World Health Organisation, 2018; Marmot et al., 2020; Thomson et al., 2017), and it points to a critical gap in both the conceptualisation and governance of energy poverty.

1.1 Research aims

Based on the research gap identified in literature, but also in policy and everyday practice, this study aims to explore energy poverty in childhood as an issue bound up with health, justice, agency and care, and to contribute to addressing the absence of children from energy poverty research and policy. Children are not passive members of energy-poor households; they deserve to be placed at the centre of the analysis, recognising them as individuals, as experts in their own lives, whose well-being, development and everyday lives are directly shaped by energy deprivation.

Specifically, the thesis seeks to understand how energy poverty impacts children's health and well-being, how children are recognised (or overlooked) within energy poverty policy frameworks, and how children themselves experience and interpret energy deprivation. By combining quantitative survey-based analysis, policy analysis and participatory research with children, the study develops a child-centred understanding of energy poverty that moves beyond household-level approaches. In doing so, it contributes to the literature -and seeks to influence posterior policy-, with empirical evidence, conceptual insight and methodological innovation to debates on energy poverty, energy justice and children's rights.

Beyond the specific case of energy poverty, the thesis also contributes to broader debates on children's rights and participation. It highlights the importance of recognising children not only as members of households, but as subjects with the right to be heard and taken into account in both research and policy processes. In this sense, energy poverty serves as a case through which to examine more general patterns of invisibility and under-recognition, which are also present across other policy domains.

While direct policy impacts are difficult to trace, the findings identify important gaps in existing frameworks and provide an evidence base to support more child-sensitive approaches to energy poverty and, more broadly, to the inclusion of children's perspectives in policy development and implementation.

To achieve this aim, the research is guided by the following research questions:

1. How does energy poverty impact children's health and well-being in a European context?

This question addresses the material and health dimensions of childhood energy poverty, examining the extent to which energy deprivation is linked to physical and mental health outcomes among children.

2. To what extent are children recognised within European and national policy frameworks addressing energy poverty?

This question explores the institutional and political dimensions of childhood energy poverty, focusing on the extent to which children are explicitly acknowledged as subjects of concern within energy poverty policies, and how this recognition -or lack thereof- shapes responses to energy deprivation.

3. How do children experience, understand and interpret energy poverty in their everyday lives?

This question centres on children's own perspectives, examining how they make sense of energy deprivation, how it affects their daily routines and relationships, and how they articulate ideas of fairness, responsibility and care.

It is clear that the research design and the focus of this research have also evolved over time in response to changing context, emerging empirical insights and practical considerations. At the proposal stage, the intention was to develop a comprehensive examination of childhood energy poverty through a mixed-methods approach, with a strong emphasis on health impacts, policy analysis and children's participation. While this general orientation has remained consistent, there have been some changes along the way. For instance, the geographical fieldwork objectives of the research were reduced to Spain (instead of including fieldwork in the UK as well) due to the restrictions imposed during COVID-19 and the consequent challenges in accessing vulnerable children and families elsewhere.

Also, the scope and depth of the participatory research with children became more clearly defined during the course of the project. Initial plans envisaged a broader engagement with multiple groups and settings; however, as fieldwork developed, it became evident that prioritising depth over scale was methodologically and ethically appropriate. This led to a more focused participatory study that allowed for sustained engagement with children and

greater attention to their voices, experiences and interpretations. At the same time, the quantitative and policy components of the research gained significance as complementary lenses through which to situate children's experiences within wider structural and institutional contexts.

Moreover, a significant part of the fieldwork has been taken out of this framework and is set aside as the focus of future publications and research proposals, although it has contributed to the perspectives and reasoning throughout the whole research. Several focus groups took place in early 2022 in La Cañada Real, a large informal settlement in the metropolitan area of Madrid (Spain), where between 700 and 1200 children live completely disconnected from the energy grid since October 2020 (Ruiz-Rivas Hernando et al., 2023). These children experience extreme cases of energy and social exclusion that constitute an independent line of research exploring dignity, citizenship, energy exclusion and urban settlements. Nevertheless, this research was supported by a Fuel Poverty Network Early Research Grant, and enabled the coproduction (with a group of mothers from the Alliance against Energy Poverty) of a children's booklet used for the workshops, and a pillar to the methodological proposal of this research.

Finally, while the research -mainly the third paper-is explicitly related to frameworks of energy justice and care, it is important to note that the role of care was not a prominent consideration at the beginning of the research. Early conceptual engagement with energy poverty drew primarily on relational understandings of energy deprivation, which emphasise the ways in which energy practices, vulnerabilities and inequalities are shaped through social relations, institutional arrangements and everyday life. These relational framings provided an important foundation for moving beyond technical and household-centred approaches. However, as the research progressed, and particularly through engagement with children's experiences and with questions of dependency, care emerged as a necessary analytical lens for understanding how energy poverty is lived within households, and how moral and political responsibilities for children's well-being are distributed and, at times, ignored. In this sense, care is not introduced as a pre-given framework imposed on the data, but as a concept that was progressively sharpened through dialogue with the evolving literature on energy poverty and through the findings of the thesis.

Even if representing a departure from the original aims set out in the proposal, these adjustments reflect on the adaptation to emerging insights, and strengthened the focus and coherence of the thesis, reinforcing its central contribution and opening up future lines of inquiry on energy exclusion in childhood or new methodological approaches, as expanding arts-based workshop design, or studying energy precarity in informal settlements across Europe.

Regarding research design and methodology, the mixed-methods approach was the most suitable option from the beginning. The combination of qualitative and quantitative methods offered the best response to the multidimensional nature of energy poverty, addressing the challenge of highlighting the broad trends regarding the magnitude of the impacts on children as a population, while still capturing their perspectives and experiences. It also responded naturally to my technical background as an engineer and the challenges of capturing children lived experience, rather than capturing through the narratives of adults. Finally, the research was also driven by a strong desire to influence relevant public policies, which made it essential to study current policies as a relevant source of data.

As a result, quantitative analysis is used to explore patterns and associations between energy poverty and children's health and well-being, providing insight into the scale and social distribution of impacts. Policy analysis allows for an examination of how energy poverty is framed within European and national contexts, and the extent to which children are explicitly recognised within institutional responses. These approaches are complemented by participatory research with children, which emerged as a particularly important and original component of the study (containing both quantitative and qualitative aspects). Engaging directly with children made it possible to move beyond indicators and policy categories, and to attend more closely to how energy deprivation is experienced and understood in everyday life. Together, these methods enable the thesis to capture the material, institutional and lived dimensions of energy poverty among children, and to develop a more coherent and child-centred analysis.

This thesis understands children as both relationally dependent and social agents. On the one hand, children's experiences of energy poverty are mediated through structures of care, household dynamics and adult decision-making, which shape their exposure to material deprivation. On the other hand, children are not passive recipients of these conditions, but individuals who interpret, experience and respond to energy poverty in meaningful ways. Recognising this dual position is essential. This perspective underpins both the conceptual framework and the participatory methodological approach adopted in the thesis.

Finally, three papers were developed and included in the thesis; they address energy poverty in childhood from distinct analytical perspectives. Paper 1 provides quantitative evidence on the association between energy poverty and children's health and well-being in the city of Barcelona. Paper 2 examines the extent to which children are recognised within European energy poverty policy frameworks. Paper 3 foregrounds children's own perspectives through participatory and child-centred research, also in the city of Barcelona. While each paper is methodologically and analytically independent and distinct from the others, their conductive thread is the shared concern with making children visible within energy poverty research and policy.

1.2 Contributions of the thesis

This thesis makes a set of interrelated contributions to knowledge across empirical, conceptual, methodological and policy domains.

Empirically, it contributes to the energy poverty literature by bringing children into focus as central subjects of analysis rather than as passive members of energy-poor households. It provides evidence on the relationship between energy poverty and children's health and well-being, contributing to a limited but growing body of work that recognises energy deprivation as a public health issue affecting children. In doing so, it highlights the uneven distribution of impacts and the ways in which energy poverty intersects with broader social and housing inequalities.

Conceptually, the thesis develops an integrated approach that combines energy justice and care ethics. This framework supports a more relational understanding of energy poverty, contributing to existing discussions around recognition, responsibility and dependency, and offering a perspective particularly suited to the study of childhood.

Methodologically, the thesis makes an important contribution through the use of participatory and child-centred research methods. By combining quantitative analysis, policy analysis and participatory approaches (including arts-based activities and creative workshops) it demonstrates how children's experiences of energy poverty can be meaningfully captured and incorporated into research. This approach contributes to broader methodological debates on researching children's everyday lives and supports the development of more inclusive research practices. Specifically, the design of appropriate arts-based workshops is in itself a contribution that can be used and adapted to future research on energy poverty and children.

Finally, the thesis also contributes to policy debates by examining how children are recognised, or overlooked, within energy poverty frameworks. By analysing policy documents across different levels of governance, the research reveals persistent gaps in the explicit consideration of children's needs and experiences, providing an evidence base to support more child-sensitive policy approaches.

The following table summarises the main contributions with their key elements.

CONTRIBUTION	KEY ELEMENTS
EMPIRICAL	Provides evidence on the relationship between energy poverty and children's health and well-being; demonstrates how impacts are unevenly distributed; highlights intersections with housing conditions and wider social inequalities
CONCEPTUAL	Develops an integrated framework combining energy justice and care ethics; advances a relational understanding of energy poverty centred on recognition, responsibility and dependency; extends these frameworks to better account for childhood
METHODOLOGICAL	Demonstrates the value of combining quantitative, policy and participatory approaches; develops specific, child-centred and age-appropriate methods (including arts-based and creative techniques) to capture lived experiences; contributes to wider debates on researching children's everyday lives
POLICY	Identifies gaps in how children are recognised within energy poverty frameworks; shows that children are often treated as indirect beneficiaries rather than policy subjects; provides an evidence base to support more child-sensitive policy development and implementation

Table 2: Main contributions to knowledge

Chapter 2: Ethical Considerations and Researcher Positionality

2.1 Statement on the researcher's background, assumptions, and relationship to the topic

In qualitative and participatory research, positionality refers to recognising that the researcher's background, experiences and perspectives shape the research process and its interpretation. While some research approaches aim to minimise researcher influence, interpretive traditions emphasise the importance of making this influence visible and reflecting on it (Greenbank, 2003; Cohen et al., 2019; Bryman et al., 2023). In this thesis, outlining my positionality helps to provide transparency about my role in the research and to situate the perspectives and choices that have shaped the study.

My engagement with the topic of energy poverty is undoubtedly connected to my personal and professional trajectory. Since 2015, I have been an active member of the Alliance against Energy Poverty (APE) in Barcelona, a grassroots organisation supporting households experiencing energy insecurity and advocating for structural change in energy and social policy. This involvement predates the doctoral research and has fundamentally shaped the way I understand energy poverty, as well as the questions I consider relevant, urgent and ethically meaningful. For this reason, I need to reflect openly on my positionality, assumptions and relationship to the topic.

My involvement in APE began with a broader concern with social justice, public health and the right to adequate living conditions, combined with my technical background as a Civil Engineer, which shaped my interest in how housing and energy infrastructures affect everyday living conditions and social inequalities. For 10 years now, I have been joining the biweekly collective assembly where people experiencing energy poverty share their concerns in an open but safe and non-judgmental space, looking for a solution for their specific situation. Over time, this engagement exposed me to the everyday realities of energy poverty in ways that academic literature alone could not. I witnessed families navigating disconnections, parents struggling to protect their children from cold or overheated homes, and households repeatedly confronting complex administrative systems that often appeared indifferent to their circumstances. These encounters were not episodic but sustained, and they gradually reshaped my understanding of energy poverty from an abstract policy issue into a lived condition characterised by insecurity, emotional strain and unequal power relations between families, institutions and energy services providers.

This experience profoundly influenced my assumptions as a researcher. I approach energy poverty from the standpoint that it is not an accidental or temporary hardship, but a form

of structural injustice embedded in the organisation of energy markets, housing systems and welfare regimes. I do not view this position as compromising academic integrity. Rather, it aligns with critical traditions in social research that recognise that knowledge production is always situated and shaped by the perspectives and values of the researcher (Haraway, 1988; Tronto, 1993). My aim has not been to adopt a position of neutrality, but to practise reflexivity by making my assumptions explicit and subjecting them to critical reflection throughout the research process (Finlay, 2002).

At the same time, my proximity to the issue required sustained attention to the boundaries between activism and research. I was aware that close engagement with advocacy work could shape both my expectations about the research findings and the ways in which I interpreted participants' experiences, for instance by anticipating particular forms of injustice or institutional failure. I therefore made deliberate efforts to always maintain analytical distance. Throughout the doctoral project, I distinguished clearly between my role as an activist and my role as a researcher. Data collection and analysis were conducted in accordance with established ethical and methodological standards, and I remained attentive to findings that complicated or challenged my initial understandings. The use of multiple methods -quantitative analysis, policy document analysis and participatory research- was central to this process, allowing different forms of evidence to speak to one another and reducing reliance on any single perspective.

My positionality also influenced the focus of the research in more subtle ways. Through my involvement with APE, I became increasingly aware that children were frequently present in energy-poor households and significantly impacted, yet rarely mentioned explicitly in policy discussions, institutional responses or even advocacy narratives. There was no family with children that did not mention them, or the worries about them, in the initial exposition of their situation. Children were visible in practice but invisible in discourse and policy. This tension prompted a central question that runs throughout the thesis: why are children, despite their clear vulnerability and dependence on adequate energy services, so often absent from research, policy and governance frameworks on energy poverty? This question emerged not from theory alone, but from sustained observation, and it shaped the design of all three studies included in the thesis.

My activist experience also informed my ethical approach to research methods. Engagement with households affected by energy poverty reinforced my unease with extractive forms of research and strengthened my commitment to approaches that recognise participants as expert sources. This commitment is most evident in the last paper, which sought to create safe, age-appropriate spaces for children to express their experiences, emotions and interpretations of energy poverty. In this work, I was particularly attentive to listening rather than speaking, and to allowing children's perspectives to emerge without being framed in advance by adult assumptions or advocacy goals. This

approach was informed both by children's rights frameworks, particularly the principle that children have the right to express their views in matters affecting them (United Nations, 1989; Lundy, 2007), and by my own learning through activist practice.

I am aware that activism can raise concerns about bias or over-identification with particular interpretations (Finlay, 2002). Rather than attempting to eliminate these tensions, I have treated them as an integral part of the research process. I addressed potential bias through reflexive practice, careful documentation of analytical decisions, triangulation of data sources and ongoing dialogue with supervisors and colleagues who were not involved in my activist contexts. In this sense, activist involvement was not a substitute for empirical analysis, but a source of contextual knowledge and motivation that was continuously examined and held accountable within academic standards of rigour.

Ultimately, I understand my positionality as a situated form of knowledge, and not a source of distortion. Being embedded in the social realities of energy poverty has allowed me to recognise dimensions of the problem that might otherwise remain unseen, particularly those affecting children, whose experiences are often marginalised or treated as less important. By acknowledging my relationship to the topic openly and reflexively, I aim to strengthen the transparency, credibility and ethical integrity of the research. This thesis is therefore situated within a tradition of engaged scholarship that seeks not only to analyse energy poverty in childhood, but also to contribute to more just and caring energy systems.



Figure 1: Extract of the booklet "And then there was light"

2.2 Ethical considerations and approval

Following the corresponding guidelines, this research was conducted in accordance with the ethical procedures of Sheffield Hallam University and received full ethical approval in July 2021, before the start of data collection. Ethical approval covered all stages of the research, including the analysis of secondary data and policy documents, as well as original empirical work involving children and families experiencing energy poverty. The ethical proposal was also nourished by the seminar *Navigating ethical dilemmas of conducting research with young children* by Dr Christina Tatham-Fashanu, ensuring an ethics in practice approach during the whole research.

Given the focus on children living in situations of social and material vulnerability, ethical considerations were central to the design and implementation of the study. The research was grounded in the recognition of children as competent social agents with the right to be heard in matters affecting them, in line with the UN Convention on the Rights of the Child (United Nations, 1989). At the same time, particular care was taken to acknowledge children's vulnerability and dependency, and to ensure that participation did not expose them to harm or distress. Ethical practice was therefore understood not as a one-off approval process, but as an ongoing responsibility throughout the research.

Informed consent procedures were carefully designed to reflect ethical requirements. Informed consent procedures were carefully designed to reflect recognized ethical standards for research involving human participants and were developed in accordance with the ethical guidelines of Sheffield Hallam University. Ethical approval for the study was granted by the university's research ethics committee. Particular attention was given to ethical considerations when working with children. In preparation for this work, I attended a seminar on research ethics and participation with children led by Dr Christina Fashanu, which informed the design of age-appropriate consent and assent procedures. Parents or legal guardians provided written consent for children's participation, while children themselves were invited to provide informed assent. Information about the study was presented in accessible language, and participants were reminded that their participation was voluntary and that they could withdraw at any stage without consequence.

The participatory methods used in the research, including arts-based activities, focus groups and creative workshops, were selected in part for their ethical suitability; a more detailed description of these methods is provided in the methodology section. These approaches were designed to be non-intrusive, allowing children to choose how they wanted to express themselves or their experiences in ways that felt safe and appropriate. Workshops were conducted in community settings (Casal d'Infants del Raval, community building in la Cañada Real) and supported by trusted adults from local organisations, who were present during the workshops to reinforce children's sense of safety. Group sizes were small (6 to 10 children), and particular attention was paid to creating an atmosphere of care, trust and

mutual respect. Where sensitive issues arose, emotional support was prioritised, and safeguarding procedures were in place to respond appropriately to any disclosures of harm or risk.

The ethics application also acknowledged and addressed potential ethical complexities arising from my involvement in advocacy work on energy poverty, as mentioned earlier in this document. This relationship was disclosed in the ethics application and managed through transparency and a clear separation between activist and research roles. Participants opted in with no persuasion, and care was taken to ensure that participation did not affect families' relationships with advocacy organisations or access to support. The ethics review process explicitly considered these dynamics and approved the safeguards put in place to manage them

From the early months of the research, the ethical framework was guided by principles of respect, care, transparency and justice. Ethical approval was not treated as a procedural requirement alone, but as a pillar for conducting research that is attentive to power relations, participant well-being and children's rights. This approach was then integral to one of the objectives of the thesis, the centrality of children's voices.

Chapter 3: Literature Review

This literature review is organised to reflect the conceptual progression that has taken place within energy poverty research, and to situate the specific focus of this thesis -energy poverty in childhood- within that evolving field. It begins by examining how energy poverty has traditionally been conceptualised and measured, tracing the shift from predominantly technical and economic definitions toward more multidimensional and socially grounded approaches. The review then considers the links between energy poverty, housing conditions and health, before narrowing its focus to children and childhood inequalities, a dimension that remains underexplored in existing research.

Building on this, the chapter examines how children have been rendered largely invisible within energy poverty research and policy, often subsumed within household-level analyses and adult-centred frameworks. The later sections of the review engage with literature on participation, voice and knowledge production with children, as well as with emerging discussions around care, recognition and justice. All these threads constitute the conceptual and empirical foundations for the approach adopted in this thesis and clarify the gaps that the research seeks to address. In addition to this, each one of the articles produced during this research contains a literature review relevant to the specific focus on that paper; however, this chapter seeks to provide a broader context for the general purpose of the study.

3.1 Conceptualising energy poverty: from technical indicators to lived experience

Energy poverty has become increasingly recognised across Europe over recent decades, shaped by rising energy prices, income inequalities and inefficient housing stock. Early academic and policy discussions conceptualised energy poverty primarily as a technical and economic problem, centred on households' ability to afford adequate levels of domestic energy consumption. In this context, the concept of "fuel poverty" emerged in the United Kingdom in the early 1990s and was operationalised through expenditure-based indicators, most notably the proportion of household income spent on energy services (Boardman, 1991).

These early approaches played an important role in establishing energy poverty as a legitimate policy issue and in enabling its quantification. However, they were also subject to sustained critique. Expenditure-based measures were shown to be highly sensitive to fluctuations in income and energy prices, and to rely on assumptions about "normal" levels of energy consumption that do not hold across different household types or living conditions (Healy & Clinch, 2002; Hills, 2012). Moreover, such indicators could fail to capture situations in which households restrict energy use in order to cope with financial pressure, resulting in the statistical invisibility of severe deprivation (Thomson et al., 2016).

In response to these limitations, energy poverty research progressively moved toward broader and more multidimensional conceptualisations. Scholars increasingly emphasised the role of housing quality, energy efficiency, climatic conditions and social vulnerability in shaping exposure to energy deprivation (Bouzarovski, 2014; Bouzarovski & Petrova, 2015; Middlemiss & Gillard, 2015). This shift was accompanied by the development of alternative indicators, including self-reported inability to maintain adequate indoor temperatures, arrears on utility bills, and housing problems such as damp or inadequate heating (European Commission, 2021; Thomson et al., 2017). These measures, now widely used in European monitoring frameworks, marked an important step in capturing experiential aspects of energy poverty.

At the same time, a growing body of research argued that energy poverty cannot be fully understood through indicators alone (Day et al., 2016; Ambrose et al., 2021). Rather than being a static condition, it has increasingly been conceptualised as a dynamic, socially embedded and relational phenomenon, shaped by structural inequalities and institutional arrangements as well as by everyday practices within households (Middlemiss & Gillard, 2015; Shove et al., 2012; Hargreaves, 2011). Practice-based approaches, in particular, highlight that energy demand is produced through routine activities, social norms and material arrangements, challenging individualised and behaviour-centred framings of energy use (Hargreaves, 2011). From this perspective, energy poverty is not simply about insufficient access to energy services, but about how households manage energy absence, perceive comfort and prioritise needs under constrained circumstances. While these developments have significantly advanced the conceptualisation of energy poverty, the implications of this shift for understanding childhood remain underexplored. This gap is addressed in particular through Papers 2 and 3, which examine how children are recognised within policy frameworks and how energy poverty is experienced in everyday life.

This relational turn in the literature brought attention to the emotional dimensions of energy poverty, including stress, guilt, stigma, shame and the normalisation of discomfort. Qualitative studies have shown that people experiencing energy poverty often adapt their practices in ways that hide deprivation (Ambrose et al., 2021), such as under-heating homes, limiting the use of appliances, or reframing discomfort as responsible or necessary behaviour (Walker & Day, 2012; Middlemiss et al., 2019). These insights challenged technocratic framings of energy poverty and highlighted the need for research approaches capable of capturing lived experience alongside material conditions.

Parallel to these developments, energy poverty research has increasingly engaged with broader debates on energy justice and social inequality. From this perspective, energy poverty is understood not only in distributive terms -who has access to adequate energy- but also through lenses of recognition and procedure, focusing on whose needs are acknowledged and whose voices are included in decision-making processes (Walker & Day,

2012; Gillard et al., 2017). This work has been particularly important in questioning the assumption that households function as homogeneous units and in revealing the uneven distribution of energy-related burdens within domestic settings.

Within this broader social turn, a growing body of literature has highlighted the intersectional nature of energy poverty, showing how deprivation is shaped by overlapping dimensions of gender, family structure, disability and migration (Bouzarovski & Petrova, 2015; Petrova & Simcock, 2019; Middlemiss & Gillard, 2015; Snell et al., 2015). Gender-sensitive research has demonstrated that women are often disproportionately affected by energy poverty, also in family settings, due to their central role in unpaid care work, household energy management and responsibility for maintaining comfort, health and well-being within the home (Clancy et al., 2012; Petrova & Simcock, 2019). Under conditions of energy precarity, women frequently absorb the impacts of deprivation by restricting their own comfort, prioritising other household members' needs and managing the emotional consequences of hardship (Middlemiss et al., 2019).

These dynamics are particularly pronounced in single-mother households, which consistently show higher exposure to energy poverty across European contexts. Lone mothers often face a combination of lower incomes, precarious employment, caring responsibilities and limited housing options, which together reduce their capacity to cope with rising energy costs or poor housing conditions (Simcock et al., 2016; Sunnika-Blank & Galvin, 2021). Research in this area underscores how energy poverty is bound up with gendered labour markets and family structures, rather than arising solely from individual characteristics or behavioural factors.

Disability has also been identified as a key dimension shaping vulnerability to energy poverty (Snell et al., 2015). Households that include disabled adults or children often have higher and less flexible energy needs, related to medical equipment, reduced mobility, or the need to maintain stable indoor temperatures (Boardman, 2010; Longhurst & Hargreaves, 2019). At the same time, these households are more likely to face income constraints, barriers to employment and inadequate housing conditions, intensifying exposure to deprivation and its health consequences (Liddell & Morris, 2010; Snell et al., 2015). Energy poverty in these contexts can therefore exacerbate existing inequalities.

Also, a growing literature has documented the heightened exposure of migrant and racialised households to energy poverty. Across European contexts, migrant families are more likely to live in poor-quality, overcrowded or insecure housing, often within the private rental sector, where energy inefficiency and inadequate heating or cooling are common (Kajoskoski et al., 2025; Oliveras et al., 2021). These conditions are frequently compounded by precarious employment, legal insecurity, language barriers and limited access to social protection or energy support schemes. Experiences of discrimination and

low institutional trust can further constrain migrants' ability to seek assistance or challenge inadequate living conditions (Hernández, 2016).

Importantly, migrant households are often characterised by larger family sizes and younger age structures, meaning that children are disproportionately represented within contexts of energy deprivation. However, as with gender- and disability-focused research, studies on migration and energy poverty have largely approached vulnerability at the household level, with children appearing implicitly, but not as subjects of analysis in their own right.

Undoubtedly, intersectional research on gender, disability, family structure and migration has played a crucial role in challenging the assumption of households as uniform units and in revealing the unequal distribution of energy-related burdens. At the same time, this literature remains largely adult-centred, with children typically positioned as dependants within caring relationships rather than as individuals with distinct experiences, impacts and perspectives. Despite growing recognition that certain households face heightened risks of energy poverty, relatively little is known about how children themselves experience, interpret or are affected by energy deprivation in their everyday lives.

3.2 Energy poverty, housing and health

A substantial body of research has established a close and persistent relationship between energy poverty, housing conditions and physical and mental health outcomes (Liddell & Morris, 2010; Thomson et al., 2017; Oliveras et al., 2020). Energy poverty does not occur in isolation, but is deeply embedded within the material characteristics of dwellings, patterns of housing tenure and broader socio-economic inequalities (Bouzarovski, 2014; Boardman, 2010). Inadequate access to energy services frequently coincides with poor housing quality, including insufficient insulation, dampness, mould, inefficient heating systems and limited capacity for cooling during hot periods (Healy, 2004; Marmot Review Team, 2011). Together, these conditions create environments that pose both direct and indirect risks to health, while also contributing to debt accumulation and financial stress (Simcock et al., 2016; Recalde et al., 2019).

Early public health research drew attention to the association between cold homes and excess winter morbidity and mortality, particularly among older adults and other vulnerable populations (Marmot Review Team, 2011). Subsequent studies expanded this focus to examine a wider range of health outcomes linked to inadequate indoor temperatures, including respiratory and cardiovascular conditions, as well as adverse effects on mental health and well-being (Liddell & Morris, 2010). Living in an energy-poor household has also been associated with chronic stress, anxiety and reduced quality of life, reflecting both physical discomfort and the ongoing financial strain of meeting basic energy needs (Hernández, 2016).

Housing quality plays a central role in shaping the relationship between energy poverty and health. Poorly insulated or inefficient dwellings require higher levels of energy consumption to achieve thermal comfort, increasing costs for households already facing financial constraints (Boardman, 2010; Healy, 2004; Bouzarovski, 2014). As a result, households often adopt coping strategies such as under-heating, limiting the use of certain rooms, or relying on unsafe heating practices, which can further exacerbate health risks (Thomson et al., 2017). Dampness and mould, frequently linked to inadequate heating and ventilation, have been consistently associated with respiratory illness, asthma and allergic symptoms, with particularly strong effects observed among children (World Health Organization, 2009).

Research on energy poverty has also highlighted the importance of housing tenure and institutional context in mediating health outcomes. Studies have shown that households living in the private rented sector are disproportionately exposed to energy poverty due to a combination of poor housing standards, insecure tenure and weak incentives for landlords to invest in energy efficiency improvements (Ambrose, 2015; Miu & Meersman, 2020; Papantonis et al., 2020). Structural features of the housing system constrain tenants' ability to improve thermal comfort, even when they are aware of health risks and motivated to reduce energy costs. This highlights the limits of behaviour-focused or awareness-based interventions and underscores the role of housing regulation and landlord responsibility in addressing energy-related health inequalities.

Beyond physical housing conditions, qualitative research has drawn attention to the lived experience of managing poor housing and energy deprivation. Residents of low-quality housing can normalise discomfort, endure unhealthy conditions and develop coping strategies that conceal the severity of deprivation (Ambrose et al., 2021). These practices can delay recognition of health risks and reduce the likelihood of seeking support, particularly in contexts where responsibility for energy efficiency is displaced onto tenants rather than housing providers.

The health impacts of energy poverty are not limited to cold exposure. In warmer climates, and in the context of climate change, inadequate access to cooling and protection from excessive heat has emerged as a significant public health concern. Exposure to high temperatures has been linked to sleep disruption, heat stress and the exacerbation of existing health conditions, particularly among vulnerable groups (Vicedo-Cabrera et al., 2021). This highlights the need to conceptualise energy poverty as a year-round issue, encompassing both heating and cooling needs.

Importantly, the health consequences of energy poverty are often cumulative and long-term. Repeated exposure to poor thermal conditions, combined with financial stress and housing insecurity, can contribute to the development of chronic health problems and

reinforce existing social inequalities (Marmot Review Team, 2011; Hernández, 2016). These pathways are further shaped by intersections with other forms of material hardship, such as food insecurity or overcrowding, creating complex and mutually reinforcing risks to health and well-being (Loopstra & Tarasuk, 2013; Evans et al., 2008).

In addition to its well-documented physical health impacts, a growing body of research has also highlighted the mental health consequences of energy poverty (Liddell et al., 2012; Thomson et al., 2017; Khavandi et al., 2024). Living in an inadequately heated or cooled home, combined with ongoing financial strain related to energy costs, has been consistently associated with increased levels of psychological distress, anxiety and depression. These mental health effects are not only linked to physical discomfort, but also to feelings of insecurity, loss of control and chronic worry about meeting basic household needs (Hernández, 2016; Liddell & Morris, 2010). The home, typically understood as a place of safety and comfort, can become a source of stress and unease when energy services are insufficient or unreliable (Kearns et al., 2000).

Qualitative studies have further shown that energy poverty affects mental health through everyday emotional and relational pathways (Middlemiss & Gillard, 2015; Longhurst & Hargreaves, 2019). Experiences of shame, stigma and social withdrawal are commonly reported among households struggling to maintain adequate domestic conditions, particularly in contexts where energy deprivation is individualised or moralised (Walker & Day, 2012; Middlemiss et al., 2019). The need to constantly monitor energy use, negotiate household priorities and make trade-offs between heating and other essential expenses can generate sustained cognitive and emotional burden (Simcock et al., 2016). Over time, this can contribute to feelings of exhaustion, helplessness and reduced well-being, even in the absence of acute physical illness (Longhurst & Hargreaves, 2019).

Mental health impacts are also shaped by uncertainty and lack of predictability. Energy price volatility, fear of disconnection and insecure housing tenure can create a persistent sense of instability, which has been shown to exacerbate stress and anxiety (Marmot Review Team, 2011; Middlemiss et al., 2019). In this context, energy poverty operates not only as a material deprivation, but also as a form of psychosocial stress, with implications for emotional regulation, sleep quality and overall quality of life (Thomson et al., 2017). These effects may be particularly pronounced in households with caring responsibilities, where adults seek to protect others from discomfort while absorbing emotional strain themselves (Middlemiss et al., 2019).

While much of the literature on energy poverty and health has focused on adult populations, particularly older adults, there is increasing recognition that children may be especially vulnerable to the health impacts of inadequate housing and energy deprivation, as studied in the following section. Children spend a substantial proportion of their time at

home and are physiologically more sensitive to environmental conditions, including cold, damp and overheating (Ormandy, 2014; World Health Organization, 2018).

3.3 Impacts of energy poverty on children and invisibility in research

Children's health and well-being are deeply shaped by the material and social environments in which they grow up, with housing widely recognised as a central social determinant of health across the life course (World Health Organization, 2018; Marmot, 2020; Barnes et al., 2010). Compared with adults, children are physiologically more vulnerable to adverse indoor conditions, spend a greater proportion of their time at home, and have little control over the quality of their housing or the availability of energy services (Ormandy, 2014; Evans, 2006). As a result, poor housing conditions and energy deprivation can have particularly significant and lasting consequences for children's physical health, emotional well-being and developmental trajectories (Evans, 2006; Evans et al., 2008; Barnes et al., 2010).

A substantial body of public health research has established strong associations between poor housing quality and adverse physical health outcomes in childhood. Dampness, mould and inadequate ventilation—conditions that are more prevalent in energy-inefficient and under-heated dwellings—have been consistently linked to respiratory symptoms, wheeze and asthma among children (World Health Organisation, 2009; Shenassa et al., 2007; Tod et al., 2016). Exposure to cold indoor temperatures has also been associated with increased risk of morbidity and hospitalisation in children, particularly in low-income households and in poorly insulated housing (Matte & Jacobs, 2011; Free et al., 2010). These exposures are socially patterned: children living in disadvantaged socio-economic circumstances, in rental accommodation, or in areas with poor housing stock are systematically more likely to experience unhealthy housing conditions, reinforcing health inequalities from an early age (Barnes et al., 2010; Evans et al., 2008; Bosch et al., 2019).

Energy poverty intensifies these housing-related risks by directly constraining households' ability to maintain healthy indoor environments. When families cannot afford adequate energy services, children may experience prolonged exposure to indoor temperatures below comfort and health thresholds during winter, or, increasingly, excessive heat during summer (Thomson et al., 2017; Appleton et al., 2019; Bardazzi et al., 2021). While early energy poverty research focused predominantly on cold homes and heating needs, more recent studies have highlighted the growing importance of overheating and insufficient cooling, particularly in Southern European contexts and under conditions of climate change (Vardoulakis et al., 2015; O'Sullivan & Chisholm, 2020; O'Sullivan et al., 2017; Appleton et al., 2019). Children are especially vulnerable to heat-related stress due to their developing thermoregulatory systems, with potential impacts on sleep, concentration and overall well-being (Scovronick et al., 2018).

Beyond physical health, a growing literature links poor housing and energy deprivation in childhood to mental health and psychosocial outcomes (Reiss, 2013; Mohan, 2021). Children living in inadequate, insecure or overcrowded housing environments are more likely to experience emotional distress, anxiety and behavioural difficulties, with effects that may persist across adolescence and into adulthood. Energy poverty adds an additional layer to these risks by introducing chronic stressors related to financial strain, uncertainty and the ongoing management of scarcity (Liddell & Morris, 2010; Snell et al., 2015; Awaworyi Churchill et al., 2020). Research on energy insecurity has shown that worries about energy costs, fear of disconnection and the need to constantly regulate energy use can shape the emotional climate of the household, affecting children even when they are not directly involved in financial decision-making (Hernández, 2016; Appleton et al., 2019). Evidence also points to the ways in which households are forced to make difficult trade-offs between essential needs, including heating and food, with consequences for children's nutrition and development (Bhattacharya et al., 2003; Frank et al., 2006).

Longitudinal evidence further suggests that energy poverty can affect children indirectly through its impact on caregivers' mental health. Studies using cohort data have shown that households experiencing energy poverty have higher odds of parental depression, particularly among mothers of young children (Mohan, 2021). Parental mental health is a well-established determinant of children's emotional security and development, indicating that energy poverty may contribute to intergenerational pathways of disadvantage through both material and relational mechanisms.

Educational and developmental implications form another important strand of the literature. Adequate thermal comfort, lighting and quiet space are essential for children's learning, rest and play, yet these conditions cannot be assumed in energy-poor households. Material hardship and poor housing quality have been linked to reduced cognitive performance, difficulties with concentration and lower educational attainment, partly through disrupted sleep and chronic stress (Evans, 2006; Evans & Kim, 2013; Barnes et al., 2010). Emerging research has begun to explore children and young people's own perceptions of thermal comfort and energy deprivation, including how cold or overheated homes affect daily routines, schoolwork and social participation (O'Sullivan et al., 2016, 2017; Teariki et al., 2020; Mohan, 2021). Participatory studies with adolescents have shown that young people are often acutely aware of energy-related constraints and articulate their impacts on peer relationships and educational engagement in ways that are rarely captured by standard household surveys (O'Sullivan et al., 2016).

Importantly, childhood exposure to energy poverty and poor housing is shaped by intersecting social inequalities, including income, migration status and housing tenure. Evidence from across Europe indicates that children in low-income and migrant families are more likely to live in overcrowded, poorly insulated or insecure housing, particularly in the

private rental sector, where regulatory protection and incentives for energy efficiency improvements are often weak (Bouzarovski & Petrova, 2015; Bouzarovski, 2017; Bouzarovski et al., 2022; Aristondo & Onaindia, 2018; O’Sullivan et al., 2017). Policy-oriented research frequently identifies households with children as a group at heightened risk of energy poverty, yet rarely disaggregates impacts at the level of children themselves or considers differences across age groups (European Commission, 2020; Bouzarovski et al., 2021).

A further limitation of existing research is its reliance on household-level indicators and caregiver reporting to understand children’s exposure to energy poverty. While such measures are essential for monitoring prevalence and informing policy, they risk obscuring intra-household dynamics and the ways in which deprivation is experienced and negotiated. Qualitative studies suggest that adults often seek to protect children from hardship by prioritising their comfort, restricting their own energy use, or normalising deprivation as temporary or unavoidable (Ambrose et al., 2021; Anderson et al., 2012; Middlemiss et al., 2019; O’Sullivan et al., 2016). These practices are rooted in care, but they can also render children’s experiences less visible to researchers and policymakers.

Recent debates on participation and voice can be further enriched by engaging with the concept of epistemic injustice (Fricker, 2007), which draws attention to the ways in which individuals or groups may be marginalised specifically in their capacity as knowers. Epistemic injustice occurs when certain forms of knowledge are discredited, ignored or rendered unintelligible within dominant frameworks, often affecting groups positioned as dependent or lacking authority. In the context of energy poverty, children’s experiences are not only underrepresented but also rarely treated as valid sources of knowledge in their own right. This reflects both testimonial injustices, whereby children’s accounts may be dismissed or given less credibility, and hermeneutical injustice, where the absence of appropriate conceptual frameworks limits the articulation and recognition of their experiences.

While energy justice frameworks have highlighted issues of recognition and participation, they offer more limited tools for analysing these epistemic dimensions. Recent work has therefore emphasised the need to understand energy justice itself as an epistemic concern, drawing attention to how processes of knowledge production, validation and exchange shape energy governance (Valkenburg, 2024). From a policy perspective, epistemic injustice has been shown to lead to incomplete understandings of complex issues such as energy and climate challenges, as dominant forms of knowledge—often quantitative and technocratic—are prioritised over contextual and experiential perspectives, limiting the effectiveness and equity of policy responses (Duchkova & Leventon, 2023).

More critical perspectives further highlight that epistemic injustice is not merely a matter of underrepresentation but is structurally embedded in systems of power, shaping which knowledge is considered legitimate and whose voices are systematically silenced. (Sultana, 2025). In this sense, children's 'invisibility' in energy poverty research and policy can be understood not only as a lack of recognition but as a form of epistemic marginalisation, where their knowledge, experiences and interpretations are excluded from dominant frameworks of analysis and governance. Integrating insights from epistemic justice, therefore, deepens the understanding of invisibility, linking it to broader dynamics of knowledge, power and exclusion.

This thesis responds directly to these gaps through its three empirical studies. Paper 1 examines the health impacts of energy poverty in childhood, Paper II analyses the extent to which children are recognised within policy frameworks, and Paper III explores children's own perspectives through participatory research. Together, these studies contribute to developing a more explicit and child-centred understanding of energy poverty.

Chapter 4: Methodology

This chapter outlines the analytical framework, research philosophy and methodological approach underpinning the research. It explains how the study was designed and conducted in order to address the objective of examining childhood energy poverty as a multidimensional issue spanning health, justice and care. The methods adopted reflect the central premise of the research: that childhood energy poverty cannot be adequately understood through a single analytical lens, but instead requires an approach capable of capturing its material, institutional and lived dimensions.

As set out in Chapter 2, the thesis is guided by three interrelated research questions concerned with children's health and well-being, policy recognition, and children's lived experiences of energy poverty. The methodological choices described in this chapter are therefore shaped by the need to respond to this complexity.

The study adopts a mixed-methods research design that combines quantitative analysis, policy analysis and participatory research with children. Rather than treating these methods as separate or sequential exercises, the research is structured around the idea that each method addresses a different but complementary dimension of childhood energy poverty. Quantitative analysis provides insight into the scale and distribution of health impacts associated with energy deprivation, allowing patterns of inequality to be identified. Policy analysis examines how energy poverty is framed and governed, and the extent to which children are explicitly recognised within institutional responses. Participatory research with children brings these dimensions together by centring children's own perspectives and experiences, offering insight into how energy poverty is lived, understood and negotiated in everyday contexts.

Energy poverty is understood as a dynamic and relational phenomenon, shaped by structural conditions, policy decisions and everyday practices. A single method would risk privileging certain forms of knowledge while obscuring others. By combining methods, the research seeks to address this limitation and to develop a more holistic and child-centred understanding of energy poverty.

This chapter also reflects on the epistemological and ethical assumptions that underpin the research. The methodological approach is informed by a critical and interpretive research philosophy, which recognises that social research is situated and shaped by values, perspectives and power relations. This is particularly relevant in research involving children and families experiencing social vulnerability. Ethical considerations, reflexivity and care are therefore treated as integral to the research design rather than as procedural requirements addressed in isolation.

The chapter is structured as follows. The next section outlines the analytical approach emerging from the process of literature review; then, the research philosophy and epistemological positioning of the study, explaining how this informed the choice of methods and overall research design. This is followed by an overview of the mixed-methods design and the rationale for combining quantitative, policy and participatory approaches. The following sections describe each empirical study in turn, detailing the data sources, analytical strategies and methodological considerations associated with the quantitative analysis, policy analysis and participatory research with children. More detailed explanations of the different approaches chosen for the empirical studies and how they were applied can be found in the individual papers.

4.1 Bringing together energy justice and ethics of care: a comprehensive analytical approach

A further reflection is required on the main theoretical approaches used to analyse energy poverty, which also helps to explain the conceptual evolution of this thesis over time. As discussed in Section 3.1, energy justice has, over the past decade, become a key framework for analysing inequalities in energy systems, particularly in relation to access, deprivation and broader social impacts (Walker & Day, 2012; Jenkins et al., 2016; Sovacool et al., 2016; Bouzarovski & Simcock, 2017). Drawing on broader traditions in environmental and social justice, energy justice reframes energy poverty as an ethical and political issue rather than a purely technical or economic problem. In the context of energy poverty research, this framework has been particularly influential in shifting attention towards questions of fairness, responsibility and inclusion within energy systems (Walker & Day, 2012; Sovacool et al., 2016). In doing so, energy justice has played a crucial role in legitimising energy poverty as a matter of social justice and human well-being.

Energy justice is most commonly articulated through three interrelated dimensions: distributional justice, concerned with how the benefits and burdens of energy systems are allocated; procedural justice, focused on participation in decision-making processes; and recognition justice, which addresses whose needs, identities and experiences are acknowledged or marginalised (Walker & Day, 2012; Sovacool et al., 2016). Applied to energy poverty, these dimensions have been widely used to highlight the unequal exposure of certain social groups, such as low-income households, renters and migrants, to inadequate energy services and unhealthy housing conditions, as well as their limited influence over energy-related decisions (Gillard et al., 2017; Bouzarovski & Simcock, 2017).

Within energy poverty research, energy justice has provided a powerful lens for critiquing policy approaches that prioritise efficiency, market mechanisms or behavioural change without sufficient attention to social consequences. Justice-oriented analyses have demonstrated how energy poverty is shaped by structural factors, including housing

systems, welfare regimes and energy markets, rather than by individual choices or behaviours alone (Bouzarovski & Thomson, 2021). In this respect, energy justice has been central to reframing energy poverty as a systemic condition linked to rights, dignity and social protection.

At the same time, a growing body of research has pointed out that justice-based frameworks do not always capture the everyday, relational and emotional dimensions of energy poverty (Middlemiss et al., 2019; Petrova & Simcock, 2019; Groves et al., 2021). While justice frameworks are well-suited to evaluating institutional arrangements and distributive outcomes, they offer more limited tools for understanding how energy deprivation is lived, negotiated and normalised within households and relationships (Middlemiss et al., 2019). This limitation becomes particularly evident in research concerned with children, whose experiences of energy poverty are rarely direct or autonomous, but are mediated through relations of care, dependence and protection. In addition, justice-based frameworks offer more limited tools for analysing how knowledge itself is produced and valued within energy poverty research and policy. In this sense, certain groups—such as children—may be marginalised not only in terms of recognition or participation, but also in their capacity as knowers, with their experiences and interpretations rarely treated as valid sources of knowledge.

In response to these limitations, recent energy research has increasingly engaged with ethics of care as a complementary analytical framework. Originating in feminist moral philosophy, care ethics foregrounds interdependence, vulnerability, responsibility and attentiveness to lived experience, rather than abstract principles of fairness alone (Fisher & Tronto, 1990; Tronto, 1993). When applied to energy systems, care-informed approaches shift analytical attention from whether outcomes are formally just to how needs are actually met, how responsibilities are distributed, and how care is organised and sustained across households, institutions and energy systems (Bartiaux et al., 2021).

A growing body of energy scholarship has further demonstrated that everyday energy practices are deeply embedded in moral economies of care. Decisions about heating, cooling and energy use are not merely technical or economic choices, but are shaped by obligations to protect others, manage vulnerability and prioritise dependants within the household (Gram-Hanssen, 2024; Damgaard, 2020; Wågström & Michael, 2023). Practice-oriented research further shows that energy demand is produced through routinised activities, social norms and material arrangements, rather than through individual decision-making alone (Hargreaves, 2011). Also, it shows how caring responsibilities structure energy demand, flexibility and sacrifice, often leading individuals -particularly caregivers- to absorb the impacts of energy scarcity through emotional labour and self-deprivation in order to safeguard others' well-being (Middlemiss & Gillard, 2015; Petrova & Simcock, 2019). These

dynamics are central to lived experiences of energy poverty, yet remain difficult to capture through standard indicators and household-level measurements.

More recent contributions explicitly argue that care should not be treated as an ethical add-on to energy justice, but as a constitutive dimension of how energy systems operate and how vulnerability is produced and governed. Research on energy transitions and demand management highlights how energy systems rely implicitly on unpaid and undervalued care work, while simultaneously rendering this labour invisible within policy and governance frameworks (Groves et al., 2021; Powells & Fell, 2019; Wågström et al., 2023). From this perspective, care emerges not only as a moral concern, but as an infrastructural and governance issue that shapes responsibility, risk and exposure within energy systems (Groves et al., 2021).

Recent theoretical work has therefore advanced the argument that justice frameworks must explicitly attend to care relations and care infrastructures if they are to meaningfully address the needs of dependent groups and those with limited agency within energy systems (Middlemiss & Gillard, 2015; Groves et al., 2021; Zhang et al., 2021). Justice without care, from this standpoint, risks reproducing abstract notions of fairness that overlook how energy deprivation is actually experienced by those who rely on others for protection, support and advocacy.

The relevance of care-informed approaches is particularly clear in research concerned with children. Children's experiences of energy poverty are rarely articulated independently; they are mediated through caregiving practices, household routines and adults' efforts to shield them from hardship. Justice frameworks can identify the limited recognition of children within policy, but they offer fewer tools for understanding how energy poverty shapes children's everyday lives, emotional security and sense of well-being (O'Sullivan et al., 2016). A care perspective, by contrast, allows closer attention to relational dynamics, moral responsibilities and the often-invisible work involved in maintaining children's well-being under conditions of constraint.

This is particularly important given that childhood is fundamentally structured by relations of dependency. Unlike adults, children rely on caregivers for the provision of basic needs, protection and emotional support, and their well-being is therefore inseparable from the conditions under which care is provided. Ethics of care scholarship has long emphasised that vulnerability and interdependence are not exceptional conditions but central features of human life (Tronto, 1993; Held, 2006), and this is especially evident in the case of children. In contexts of energy poverty, this dependency becomes even more pronounced, as caregivers are required to absorb, manage and redistribute the impacts of deprivation in order to safeguard children's well-being.

At the same time, recognising children's dependence should not lead to their reduction to passive subjects. Research in childhood studies has consistently demonstrated that children are social actors capable of interpreting, responding to and articulating their own experiences, even within constrained circumstances (James & Prout, 1997; Christensen & Prout, 2002; Gallagher, 2019). This argument has also been developed in children's rights scholarship, where vulnerability and interdependence are understood as the basis of rights rather than a justification for diminished agency (Herring, 2022). An ethics of care perspective, therefore, needs to be combined with an explicit recognition of children's agency, understood as exercised within conditions of relational dependency rather than in opposition to it.

Bringing these insights together has important implications for both research and policy. A care-informed framework highlights that addressing childhood energy poverty cannot rely solely on household-level indicators or formal inclusion within policy frameworks. Instead, it requires attention to the care relations through which children's needs are met, including the often-unrecognised labour of caregivers and the conditions under which care is provided. At the same time, child-centred policy approaches must create space for children's perspectives and experiences to be meaningfully included, recognising them not only as recipients of care but as subjects with voices and insights relevant to the design of interventions (McMellon & Tisdall, 2020).

In this sense, integrating an ethics of care into the analysis of energy poverty provides a foundation for more relational and responsive policy approaches, which support both the conditions of care and the recognition of children's agency within energy systems.

Recent interdisciplinary research therefore increasingly supports hybrid frameworks that combine energy justice with care ethics and, in some cases, capability-based approaches (Groves et al., 2021; Bartiaux et al., 2021). These perspectives emphasise not only fair distribution and recognition, but also people's real freedoms to achieve well-being and to live with dignity under conditions of interdependence (Day et al., 2016; Middlemiss et al., 2019). Such frameworks are particularly well-suited to participatory and child-centred research, where understanding lived experience, dependency and relational contexts is central.

In this thesis, energy justice provides an essential framework for analysing the structural and policy conditions that shape energy poverty, particularly in relation to recognition and participation. At the same time, an ethics of care offers a complementary and necessary lens for interpreting children's experiences of energy poverty, given their dependence, vulnerability and social positioning. Justice and care are therefore treated as complementary rather than competing perspectives: justice identifies inequalities and exclusions, while care explains how these are lived, managed and felt in everyday life.

Building on this, the thesis adopts an integrated conceptual framework that combines the three dimensions of energy justice—distribution, procedure and recognition—with an ethics of care perspective. Within this framework, energy justice is used to identify structural inequalities and institutional gaps, while care ethics enables an understanding of how these inequalities are experienced and negotiated in everyday life. The framework operates across three interconnected analytical dimensions: (1) the distributive impacts of energy poverty on children’s health and well-being, (2) issues of recognition and participation within policy and governance, and (3) the relational and care practices through which energy poverty is lived within households. These dimensions are treated as interdependent, allowing the analysis to move between structural conditions, institutional processes and lived experience.

Together, energy justice and care ethics enable a more nuanced and child-sensitive understanding of energy poverty. Justice provides a language of rights, fairness and institutional critique, while care foregrounds relationality, responsibility and lived experience.

Adopting an ethics of care perspective in this research is not only a theoretical choice, but also a methodological and analytical one. Care ethics directs attention to relationships, dependencies and responsibilities, and therefore shapes how energy poverty is investigated and interpreted in this thesis.

First, it shifts the focus from the household as a homogeneous unit to the relational dynamics within it, recognising that experiences of energy poverty are unevenly distributed and mediated through caregiving practices. This is particularly important in research with children, whose experiences are often indirect and shaped by adult efforts to protect, prioritise or manage their well-being.

Second, a care perspective foregrounds everyday practices and lived experience. Rather than analysing energy poverty solely through indicators or institutional frameworks, the research pays attention to how energy deprivation is managed in daily life, how decisions are made within families, and how responsibilities and sacrifices are negotiated.

Third, care ethics informs the choice of participatory and child-centred methods. Engaging directly with children reflects a commitment to recognising them not only as subjects affected by energy poverty, but as individuals capable of expressing their own experiences and perspectives. This approach aligns with a broader understanding of research as a relational process that requires attentiveness, responsiveness and ethical responsibility towards participants.

In this sense, an ethics of care does not function as an abstract normative framework, but as a guiding principle that shapes both the design of the research and the interpretation of

its findings. It enables a more situated and relational understanding of energy poverty, complementing the structural insights provided by energy justice.

The conceptual framework developed in this section also informs the methodological choices made for the investigation. Understanding energy poverty as both a matter of justice and care, and recognising children as central subjects whose experiences are shaped by relational and institutional contexts, calls for research approaches capable of capturing structural patterns alongside lived realities. For this reason, the thesis adopts a mixed-methods design that combines quantitative analysis, policy analysis and participatory research with children. This approach enables the examination of distributive impacts on health, issues of recognition within policy, and children's own lived experiences shaped through care relations. The following chapter outlines the research philosophy, design and methods employed, explaining how these choices align with the conceptual framework presented here and support the child-centred focus of the study.

4.2 Research philosophy and epistemology

My approach to research has been shaped, since the beginning, more by the questions I wanted to address than by a prior commitment to a specific social science tradition. As my academic background is not rooted in the social sciences, I have adopted a pragmatic and reflective approach to research philosophy, aiming for coherence, transparency, and appropriateness rather than engaging in theoretical discussions. The purpose of this section is therefore not to engage in an extensive epistemological discussion, but to clarify the assumptions that guided my methodological choices and interpretation of findings (Creswell & Plano Clark, 2018).

At a general level, I understand energy poverty as a real and material condition, with established consequences for children's health, well-being and everyday lives. At the same time, I recognise that energy poverty is socially produced and mediated through material conditions, policy frameworks, market structures, institutional practices and family relationships. This position, from my understanding, is compatible with ideas from critical realism, which acknowledge the existence of material realities while emphasising that these realities are experienced and interpreted through social structures and contexts (Bhaskar, 1978; Archer, 1995). Rather than adopting critical realism as a formal framework, I found it useful as a way of thinking about how different levels of reality -material, institutional and experience- can be explored using different methods.

This background led me to adopt an interpretive orientation to knowledge production. I do not assume that there is a single, complete account of energy poverty in childhood that can be produced through one method alone. Instead, I view knowledge as partial and situated, with different methods offering insight into different aspects of the phenomenon. Quantitative analysis helps to identify patterns and inequalities at the population level,

policy analysis sheds light on how energy poverty is framed and governed, and participatory research with children provides insight into how energy deprivation is lived, understood and negotiated in everyday contexts, and can present inequalities obscured by the previous methods. These forms of knowledge are treated as complementary rather than hierarchical, reflecting established approaches to mixed-methods research (Creswell, 2014).

My epistemological positioning is then embedded with the decision of using a mixed-methods research design. Methods were selected on the basis of their capacity to address specific research questions, rather than to align with a predetermined epistemological guidance. This pragmatic orientation reflects both the interdisciplinary nature of energy poverty research and my own learning process over the course of the doctoral project, and in life itself (Creswell & Plano Clark, 2018).

I believe that the participatory aspects of the research were also influenced by the principles of participatory action research, particularly the emphasis on valuing participants' knowledge and reducing extractive research practices. While this study does not claim to be participatory action research in a strict sense, this tradition guided my commitment to engaging children as active contributors to knowledge rather than as passive subjects (Kindon, Pain, & Kesby, 2007). Working with children highlighted the importance of listening carefully, being responsive to context, and recognising that research itself is a relational process shaped by power and care.

Finally, I adopt a reflective approach to the research process, acknowledging that my background, experiences and values influenced the focus of the study and the interpretation of findings. Rather than attempting to eliminate these influences, I sought to address them transparently through ethical safeguards, reflexive practice and methodological triangulation. In this sense, reflexivity is understood not as a theoretical exercise, but as an integral part of conducting responsible research, particularly in studies involving children and families experiencing social vulnerability (Finlay, 2002).

My positionality regarding research philosophy was also dynamic, influenced by the data collection and methods progression. For example, the quantitative analysis presented in the first paper revealed clear associations between energy poverty and children's health outcomes, but it also raised questions that could not be fully addressed through statistical data alone. While these findings were important in demonstrating the scale and distribution of health inequalities, they offered limited insight into how energy poverty was experienced within households, how families managed everyday constraints, or how children themselves understood and responded to energy deprivation. This reinforced my sense that quantitative evidence, while necessary, was insufficient on its own to capture complexity.

Similarly, the policy analysis developed in the second paper highlighted the limited recognition of children within energy poverty frameworks, revealing a gap between institutional approaches and the realities observed at the household level. Engaging with policy documents made visible the abstract and often adult-centred nature of official responses, which contrasted with the caring practices I had encountered through long-term contact with families experiencing energy poverty, and their prioritisation of children's well-being. This tension between policy framings and lived reality reinforced my decision to adopt an interpretive and mixed-methods approach.

My engagement with families affected by energy poverty over an extended period is also a relevant fact that shouldn't be withheld. Being in regular contact with households experiencing energy precarity shaped my sensitivity to the importance of the emotional and relational dimensions of coping with the absence of energy, and to how energy poverty is often normalised, hidden or managed quietly within families, also for the sake of children's mental well-being. While this research is not ethnographic in a strict sense, this proximity to families provided an ethnographic sensibility characterised by attentiveness to context, relationships and lived experience.

This sensibility influenced not only the choice of participatory methods but also the way research questions were refined and findings interpreted. It reinforced the importance of listening carefully, avoiding assumptions, and recognising that children's experiences of energy poverty are embedded within family dynamics, caring relationships and moral responsibilities. In this respect, my research philosophy evolved through engagement with both the literature and the field, and reflects an effort to remain attentive to what the research context revealed, rather than being able to choose a theoretical framework from the outset.

4.3 Research design and methodology

The overall research design of this thesis tries to reflect the repeatedly mentioned multidimensionality and complexity of energy poverty. From the beginning, as stated in the previous chapters, I was aware that energy poverty could not be adequately captured through a single method or level of analysis. Instead, the study was designed as a mixed-methods investigation, combining different forms of evidence in order to better understand how energy poverty affects children's health, how it is addressed in policy, and how it is experienced in everyday life (Creswell & Plano Clark, 2018).

The thesis is organised around three progressively interconnected empirical studies, each corresponding to one of the core research questions. Together, these studies explore childhood energy poverty across material, institutional and lived dimensions, while maintaining a consistent focus on children. This approach reflects both the interdisciplinary

nature of the topic and the value of combining methods to address complex social issues (Greene, 2007).

The first study uses quantitative analysis to examine associations between energy poverty and children's health and well-being in the city of Barcelona. This component was designed to provide robust evidence on the scale and social distribution of health impacts, and to situate energy poverty in childhood within wider patterns of social and health inequality. While this analysis was essential in establishing the relevance and magnitude of the research problem, it also made visible the limits of population-level data in explaining how energy poverty is lived and experienced within households (Creswell, 2014).

The second study focuses on the analysis of policy documents related to energy poverty at the European and national levels. This policy analysis examines how energy poverty is framed, which populations are prioritised, and the extent to which children are explicitly recognised within institutional responses. Engaging with policy texts allowed me to explore the gap between official framings of energy poverty and the realities suggested by empirical evidence, and to consider how children's needs and experiences are often neutralised within household- or adult-centred approaches, a limitation that has been highlighted in previous research (Middlemiss & Gillard, 2015; Thomson, Snell, & Liddell, 2016).

The third study adopts a participatory approach to explore children's own experiences of energy poverty. This study combines qualitative participatory methods with a quantitative analysis of survey data answered directly by children, produced by the Children's Institute from Barcelona, an approach that remains relatively uncommon in energy poverty research, where surveys are typically completed by adult household members or household representatives. This approach is consistent with perspectives in childhood research that emphasise children's agency and competence as social actors (Christensen & Prout, 2002). The inclusion of a child-completed survey allowed for the identification of patterns across a wider group of participants, while participatory and creative methods provided depth and context, enabling children to articulate their conception of energy poverty, and how it shaped their everyday routines, emotions and relationships.

The three empirical studies are not treated as independent. The thesis follows a paper-based structure with an explicit integrative focus, culminating in a synthesis chapter that brings together findings across methods and studies. This synthesis provides an opportunity to reflect on how quantitative evidence, policy framings and children's accounts intersect, and how these intersections can be understood through the conceptual lenses of energy justice and care. It also critically reflects on the methods used - their advantages and limitations-, what they could reveal, and what they could not.

4.3.1 Quantitative analysis

The quantitative component of this thesis had two complementary aims. First, to examine whether energy poverty in childhood is associated with measurable inequalities in children's health and well-being using a large, established secondary dataset (Paper 1). Second, to generate quantitative evidence that is rarely available in this field by analysing an existing survey answered directly by children, developed by the Barcelona Children's Institute and including questions relevant to energy poverty (Paper 3). By focusing analytically on these questions within a child-completed dataset, the study offers insight into children's own experiences and perceptions of energy deprivation, rather than relying on adult reporting.

4.3.1.1 Secondary quantitative dataset (Paper 1)

Paper 1 is based on secondary quantitative data drawn from the Barcelona Health Survey 2016. This survey covers a representative sample of the non-institutionalised population in the city and includes a specific questionnaire for people under the age of 15 years. This population includes infants through to adolescents. This study includes all the children who participated in the survey, which represents a sample size of 481 children, sufficient to obtain representative population estimates of percentages with a precision of $\pm 4.5\%$. The questionnaire was completed by the child's usual caregiver. This dataset was selected because it allows analysis of (i) energy poverty (or closely related indicators), (ii) socio-demographic characteristics, and (iii) child health and well-being outcomes within a consistent analytical framework. Using secondary data also enabled the team conducting the study to situate energy poverty in childhood within wider patterns of social inequality and to draw on indicators that are widely used in public health and social policy research.

Children's health and well-being were assessed using a range of validated indicators. General health was measured through caregiver-reported child health and dichotomised into good versus poor health. Mental health was assessed using the Strengths and Difficulties Questionnaire (SDQ), analysing both the total difficulties score and specific subscales related to emotional problems, conduct problems, hyperactivity and peer relationships. Health-related quality of life was measured for children aged 6 to 14 years using the KIDSCREEN-10, which provides a continuous summary score. In addition, two specific health outcomes commonly associated with adverse housing and living conditions -asthma and being overweight- were included. Overweight was calculated using caregiver-reported height and weight, applying age- and sex-specific international reference standards.

Energy poverty was operationalised using caregiver-reported difficulties in maintaining an adequate indoor temperature during the cold and/or warm months. A household was considered energy poor when caregivers reported being unable to afford adequate thermal comfort in at least one of these periods. In order to capture the multidimensional nature of

energy poverty, the analysis also incorporated a broader set of socioeconomic and housing-related variables, including arrears on utility bills, food insecurity, housing tenure, dampness, lack of heating or cooling systems, and not using available systems when needed.

Sociodemographic variables included children's age and sex, household composition, and parents' country of birth, which was categorised according to international income classifications (between low- and high-income countries). Socioeconomic position was assessed using indicators such as parental occupational social class, material deprivation, housing tenure and food insecurity. These variables were included both to describe the distribution of energy poverty and to account for the wider context of social disadvantage in which energy poverty occurs.

The analysis proceeded in several stages. First, descriptive statistics were used to characterise the study population and to estimate the prevalence of energy poverty overall and across sociodemographic, socioeconomic and housing categories. Differences between groups were assessed using statistical tests appropriate for complex survey designs. Second, the prevalence of health and well-being outcomes was compared between children experiencing energy poverty and those who were not. Finally, regression models were used to estimate both absolute and relative differences in health outcomes associated with energy poverty.

Given that energy poverty often occurs within a broader context of socioeconomic disadvantage, analyses were conducted both before and after adjustment for social class, used as a proxy for household socioeconomic position. All analyses accounted for the complex sampling design of the survey, and statistical analyses were carried out using appropriate survey-weighted procedures.

4.3.1.2 Primary child-completed survey (Paper 3)

The second quantitative dataset analysed in this thesis is drawn from the Enquesta de Benestar Subjectiu de la Infància a Barcelona (EBSIB) 2021, a large-scale survey developed by the Institut Infància i Adolescència de Barcelona. The EBSIB was designed to collect information on children's subjective well-being and everyday living conditions by asking questions directly to children, rather than relying on adult or household proxy respondents. This approach is well established within childhood and well-being research, but remains relatively uncommon in the field of energy poverty, where quantitative evidence is typically derived from adult-completed household surveys.

The EBSIB 2021 was administered in school settings and targeted children in primary education in the city of Barcelona. The questionnaire was specifically designed to be age-appropriate and accessible, covering multiple dimensions of children's lives, including

emotional well-being, relationships, material conditions and experiences within the home. Importantly for this thesis, the survey includes a small number of questions related to housing conditions and material deprivation, which make it possible to explore aspects of energy poverty from children's own perspectives (Institut Infància i Adolescència de Barcelona, 2022).

Rather than generating a new survey instrument, the contribution of this thesis lies in the analytical use of an existing child-completed dataset to examine energy poverty, a topic that is rarely addressed using children's direct responses. By identifying and analysing energy-related items within the EBSIB, Paper 3 explores how children report experiences linked to inadequate housing conditions, thermal comfort and material constraints, and how these experiences relate to indicators of well-being.

The quantitative analysis of the EBSIB data was primarily based on descriptive statistics, reflecting both the structure of the dataset and the exploratory nature of the research questions. Descriptive analyses were used to summarise children's responses to energy-related items and well-being indicators, and to examine patterns across the sample. This use of descriptive statistics is appropriate in exploratory research aiming to document distributions and highlight emerging patterns, particularly when working with secondary datasets not originally designed for a specific analytical purpose (Field, 2018). Where appropriate, these descriptive findings were complemented by exploratory analyses of associations between reported energy deprivation and selected well-being outcomes.

The EBSIB dataset is not intended to be representative of all children experiencing energy poverty, but it offers a rare opportunity to incorporate children's own quantitative accounts into energy poverty research. Used alongside secondary population data and qualitative participatory material, the survey contributes to a more child-centred and multidimensional understanding of energy poverty, consistent with the overall aims of the thesis.

4.3.2 Policy analysis

The policy analysis component of this thesis was designed to examine how energy poverty in childhood is conceptualised, recognised and addressed within existing policy. The analysis presented in this section draws primarily on Paper 2, which focuses on the recognition of children within energy poverty policy frameworks. Policy analysis has become an important approach within energy poverty research, reflecting the recognition that energy deprivation is not only a material condition but also a policy-constructed issue. The ways in which energy poverty is defined, measured and addressed are shaped by institutional frameworks, indicators and governance priorities, which influence both the visibility of the problem and the design of policy responses. Previous research has shown that policy frameworks play a key role in determining which populations are recognised as vulnerable and what forms of support are considered appropriate (Bouzarovski, 2014; Thomson et al., 2017). In this sense,

policy analysis enables a critical examination of how energy poverty is constructed as a policy problem, and how this construction shapes the scope and limits of intervention.

The study is based on a qualitative review of policy documents related to energy poverty at European and national levels. These documents were selected because they shape the formal definition of energy poverty, influence policy priorities, and inform the design of measures intended to protect vulnerable populations. The analysis does not evaluate policy effectiveness or implementation, but focuses instead on how energy poverty is framed in policy, which groups are rendered visible or invisible, and whether children are explicitly recognised as affected subjects.

Policy documents were analysed using a thematic and interpretive approach, focusing on the language, categories and assumptions through which energy poverty is addressed. Particular attention was paid to the presence or absence of references to children, childhood or child-specific needs, as well as to the implicit assumptions that children are protected within households or adequately covered through adult-oriented measures. This approach aligns with existing work in energy poverty research that highlights the importance of recognition, framing and justice in shaping policy responses (Walker & Day, 2012; Middlemiss et al., 2019).

The analysis in Paper 2 revealed that, despite growing policy attention to energy poverty as a social and public health issue, children rarely appear as a distinct group within policy frameworks. Where children are mentioned, they are often subsumed within broader household categories or referenced indirectly through concerns about family vulnerability. This finding informed both the design of the participatory study and the synthesis of the thesis, reinforcing the need to complement policy analysis with empirical evidence that foregrounds children's own experiences.

Methodologically, the policy analysis was iterative and reflexive. Initial readings of policy texts informed the identification of key themes, which were then refined through comparison across documents and through engagement with the empirical findings from the other components of the thesis. This process allowed the analysis to remain grounded in the research questions while also being responsive to emerging insights.

Policy analysis provides an essential bridge between population-level evidence and lived experience. By examining how childhood energy poverty is (or is not) recognised within policy discourse, this component contributes to a more comprehensive understanding of the structural and institutional factors that shape children's exposure to energy deprivation and the limits of existing policy responses.

4.3.3 Qualitative analysis

The participatory and qualitative component of this thesis was designed to explore energy poverty in childhood integrating the voices of children and young people themselves, addressing a gap identified in both the academic literature and the policy analysis. While quantitative data and policy documents provide important insights on the issue, they offer a limited understanding of how energy deprivation is experienced, interpreted and how it impacts, in an emotional sense, those affected in their everyday lives. This approach therefore aims to highlight children's and young people's voices through participatory and arts-based methods, recognising them as active contributors to knowledge rather than as passive subjects of adverse conditions.

The design of this component was mainly used in the participatory study presented in Paper 3, but has been developed and implemented over the course of the research, and was the main focus of primary data collection. These activities were systematised and critically reflected upon in a complementary methodological guide authored as part of the doctoral process (*Drets energètics en mans de la infància*) (Gonzalez Pijuan, 2022), which documents the rationale, structure and ethical considerations of working with children on issues related to energy poverty. While this guide was produced for applied and practitioner audiences, it also constitutes an important methodological output of the thesis and informs the analysis presented here. The guide is also a document made for the social entities where the workshops took place (Casal d'Infants del Raval¹), as a way of giving back part of the research. As explained in the section on ethics, I wanted to distance myself from the extractivism that can occur in fieldwork, and that is why I am making the methodology open access, to be applied in future work on energy poverty with children.

4.3.3.1 Arts-based and mosaic approaches

The participatory work was informed by arts-based research literature and by the mosaic approach to research with children (Clark & Moss, 2001; Clark, 2017; Gauntlett, 2007). Arts-based methods have been widely used in research with children to support expression of complex, sensitive or abstract issues, particularly where verbal articulation alone may be limiting (Leavy, 2015; Mannay, 2016). In the context of energy poverty, experiences of deprivation are often embedded in emotions, relationships and everyday practices, making creative and visual methods especially appropriate. Also, children from socially vulnerable contexts may also face language challenges due to the high percentage of migrant families; arts-based proposals help them to express themselves using different forms of expression that they are more comfortable with.

¹ The *Casal dels Infants del Raval* is a community-based organisation in Barcelona that supports children, young people and families in situations of social vulnerability, particularly in the Raval neighbourhood. Its work focuses on education, social support and equal opportunities, promoting inclusion and holistic development.

The mosaic approach (Clark & Moss, 2001) provided a flexible conceptual framework for combining multiple modes of expression -such as drawing, storytelling, discussion, role-play and the use of material artefacts- to build a more inclusive and nuanced understanding of children's perspectives. This approach does not rely on a single method, but recognises that meaning emerges through the combination of different forms of communication, and that children's engagement varies according to age, confidence and context. Based on these principles, a series of arts-based and participatory workshops was designed and implemented with children of different age groups, reflecting sensitivity to developmental differences and communicative preferences.

The first type of workshop was conducted mainly with younger children (approximately 6-8 years old) and relied heavily on play-based, visual and narrative methods. Activities included collective storytelling, drawing, model-building, role-play and the use of everyday objects to explore how energy is used in the home and how it shapes daily routines. These workshops focused on concrete experiences -such as warmth, lighting, studying, sleeping and play- and enabled children to express feelings of comfort, fear, embarrassment or care without requiring abstract reasoning or technical vocabulary.

In particular, the series of workshops included:

- First session orientated towards creating a rapport and introducing ourselves with the use of Playmobil² to present our families, or the people we live with, and where.
- Storytelling with the children booklet "And then there was light", created for the purposes of the doctorate; one copy was also given to children so that they could share the content and experiences with their families.
- Playmobil workshop to understand why is energy so important in our daily lives, and which activities or appliances need energy to function.
- Arts and craft workshop creating a house with a small light inside to casually discuss about the importance of light in the place we live in.
- Role-playing around energy poverty situations.
- Evaluation of workshops and drawing on: what does energy poverty mean according to what I know, or feel?

² A Playmobil is a small plastic toy figure, typically representing people, animals or objects, used in themed play sets such as homes, schools or workplaces. They are designed to encourage imaginative and role-based play, allowing users to create and act out everyday or fictional scenarios.



Figure 2: Workshop series

A second type of workshop was developed with older children (approximately 11-12 years old), whose greater cognitive and reflective capacities allowed for more explicit dialogue and reflexive engagement with the topic of energy poverty. While these workshops also incorporated creative and visual elements, they placed greater emphasis on facilitated discussion, collective reflection and critical questioning. Children were invited to reflect on issues such as fairness, responsibility, rights, inequality and the role of institutions, as well as on how energy poverty is talked about, or rendered invisible, in society. These sessions demonstrated children's capacity to engage critically with complex social issues when appropriate methodological spaces are created.

4.3.3.2 Focus-group-style sessions with adolescents in contexts of extreme energy poverty and exclusion

In addition to the workshops reported in Paper 3, the wider research process also included a series of group-based, discussion-oriented sessions with teenagers aged approximately 13 to 17 years living in La Cañada Real, a context characterised by prolonged and extreme energy exclusion since October 2020. Conducted after more than a year without electricity in the area, these sessions were designed in a format closer to focus groups, explicitly recognising young people as experts in their own situation. The sessions created space for collective reflection on experiences of prolonged electricity disconnection, schooling, family

life, stigma, protest and institutional neglect, and allowed participants to articulate emotions in their own terms.

Although these sessions generated rich and powerful qualitative material, they were not included in the empirical analysis of the thesis papers. This decision was taken deliberately and reflexively, as the conditions experienced in La Cañada Real represent an extreme case of energy exclusion that differs qualitatively from the situations analysed in the other empirical components of the thesis. Including this material alongside other datasets risked conflating analytically distinct forms of deprivation and obscuring interpretive clarity. At the same time, these sessions revealed dimensions of energy exclusion -such as prolonged darkness, disruption of education, criminalisation of protest and deep feelings of abandonment- that go beyond conventional framings of energy poverty.

These sessions are not treated as marginal or excluded data, but as pointing towards a different and highly relevant direction for future research. They highlight the value of dialogical, youth-led spaces in which teenagers can connect personal experience with broader structures of inequality and injustice, and they reinforce the importance of taking young people's political and ethical interpretations seriously (Cahill, 2007; Morrow, 2008; Wyness, 2012).

4.3.2.4 Analysis of qualitative datasets

The qualitative material generated across workshops and group sessions -including drawings, written reflections, verbal discussions and observational notes- was analysed using a thematic and interpretive approach, with attention to shared patterns, contrasts and age-related differences in how energy poverty was framed and understood.

The analysis was informed by reflexive thematic analysis as developed by Virginia Braun and Victoria Clarke (2006, 2021), which conceptualises themes as actively generated through the researcher's engagement with the data rather than as pre-existing categories. This approach is particularly suited to participatory and child-centred research, as it allows for attention to both shared patterns and divergences in meaning while recognising the interpretive role of the researcher. The analytic process involved iterative engagement with the material, including coding across different forms of data (visual, written and verbal), and the development of themes through comparison within and across age groups. Consistent with this approach, the analysis prioritised depth, coherence and reflexivity, enabling attention not only to what children expressed explicitly, but also to how meanings were shaped through context, interaction and the research process itself. While younger children tended to emphasise immediate and emotional experiences, older children and adolescents more frequently articulated relational, moral and structural interpretations, including concerns about care, responsibility and recognition.

Methodologically, this component represents a contribution of the thesis by demonstrating how participatory workshops, arts-based and mosaic approaches can be adapted across age groups, and how participatory research can move from expressive methods toward more explicitly critical and reflexive engagement as children grow older. By systematically designing, documenting and reflecting on these methods, the research extends participatory approaches into the field of energy poverty, where children's perspectives have largely been absent.

Throughout the participatory process, I adopted a reflective position, remaining attentive to power dynamics, emotional responses and my own position as a researcher with long-standing engagement in energy poverty advocacy. Particular care was taken to avoid individualising responsibility or framing energy poverty as a personal failure. Instead, activities were designed to situate children's experiences within broader social and institutional contexts, while ensuring that participation remained voluntary, supportive and ethically grounded, as discussed further in the ethics and positionality sections of the thesis.

4.3.2.5 Data integration toward synthesis

Given the mixed-methods and article-based structure of the thesis, after the three empirical studies, the main challenge was also to bring the different methods together, creating a comprehensive analysis. From the outset, I did not approach the quantitative analysis, policy analysis and participatory research as separate or self-contained strands. Instead, I understood integration as an interpretive and iterative process, developed over time as the research progressed and as my understanding of energy poverty in childhood deepened.

Integration did not follow a formal mixed-methods sequence or a predefined hierarchy between methods. Rather, it emerged through engagement with the findings of each component and through reflection on what each method could -and could not- capture. The quantitative analysis provided evidence on the scale and distribution of energy poverty and its association with children's health and well-being, but it also raised questions that could not be answered through indicators alone, particularly in relation to recognition, meaning and everyday experience. The policy analysis offered insight into how energy poverty is framed institutionally and highlighted the limited visibility of children within existing policy responses. These findings, in turn, shaped my engagement with participatory and arts-based research, which brought forward children's own accounts of how energy poverty is experienced in daily life. These accounts helped to interpret the statistical associations identified in the quantitative analysis, and to make visible dimensions -such as emotional responses, coping practices and intra-household dynamics- that remain absent from policy frameworks and are not captured through standard indicators.

The main site of integration is the synthesis in chapters 5 and 6, where I bring together findings from the three papers rather than presenting them as cumulative knowledge. In

this chapter, I examine how results generated using different methods intersect, complement or challenge one another. For example, associations identified in the quantitative analysis are considered alongside policy framings that fail to explicitly recognise children, and alongside participatory material that illustrates how energy poverty is experienced and understood in everyday life. This approach allowed me to move beyond method-specific findings and to develop a more holistic and child-centred account of energy poverty.

Conceptually, as discussed at the beginning of this chapter, I was guided by an understanding of energy poverty as a multidimensional and relational condition, shaped by material constraints, institutional arrangements and inequalities within households. Rather than seeking to reconcile all findings into a single explanatory model, I chose to hold different forms of evidence, recognising that each method illuminates particular aspects of the phenomenon while leaving others in the background. This was particularly important given the focus on children, whose experiences are often obscured within household-level data and adult-centred policy categories.

Reflexivity was central to this integration process. Decisions about how findings were connected, prioritised or contrasted were shaped by ongoing reflection on the research aims, my positionality, and the ethical commitments of the study. Material that was not included in the empirical papers, such as participatory work conducted in contexts of extreme energy exclusion, nevertheless informed my interpretation of the findings and helped identify directions for future research.

Chapter 5: Overview of publications

Chapter 5 brings together the three publications that constitute the empirical body of the research and offers an integrated synthesis and discussion of their findings. My intention with this chapter is not to repeat the content of individual papers, which are to be found as appendices to improve readability, but to step back from them and reflect on how, taken together, they contribute to a coherent set of knowledge.

As set out in the introduction, the three papers included in the thesis are the following: Paper 1 provides quantitative evidence on the association between energy poverty and children's health and well-being in the city of Barcelona. Paper 2 examines the extent to which children are recognised within European energy poverty policy frameworks. Paper 3 foregrounds children's own perspectives through participatory and child-centred research, also in the city of Barcelona.

This chapter examines the findings of the three papers in relation to one another and situates them within the wider literature discussed in Chapter 3. By bringing quantitative, policy and participatory findings into dialogue, the chapter highlights how childhood energy poverty operates simultaneously as a material condition affecting health, an institutional issue shaped by policy recognition, and a lived experience embedded in everyday life and relationships of care.

In doing so, the chapter also provides a space for reflexive discussion. The use of multiple methods generates different types of evidence, each with its own strengths and limitations. This reflexive perspective is particularly important in research with children, where questions of voice, representation and power are central. At the end of the chapter, I also add a reflection on the data generated and yet left out of the thesis.

The chapter is structured as follows. Section 5.2 provides an overview of the three publications, outlining their aims, methods and analytical focus in order to orient the reader. Section 5.3 presents a thematic synthesis and discussion of findings across the papers, organised around identified key themes. Section 5.4 articulates the original contributions that the thesis makes to knowledge, organised in empirical, methodological and conceptual dimensions. Section 5.5 closes the chapter with a reflection on the limitations of the research and on the positional and methodological challenges encountered in studying childhood energy poverty.

5.1 Main contributions of empirical studies

5.1.1 Paper I: “The Association of Energy Poverty and Child Health in the city of Barcelona”

The first paper (Oliveras et al. 2021) provides the empirical point of departure for the thesis by demonstrating that energy poverty constitutes a concrete and measurable public health problem for children. Drawing on representative data from the Barcelona Health Survey, the study reveals that more than one in ten children live in households unable to maintain adequate home temperatures, and that this deprivation is associated with worse outcomes across general health, physical conditions such as asthma, mental health, and weight status.

What makes this study distinctive is not only the strength of the associations observed but the clarity with which childhood emerges as its own axis of vulnerability. Although energy poverty is often treated as a uniform condition affecting “the household,” the analysis shows that children’s health is significantly and disproportionately affected compared to adults. Moreover, the social patterning of these effects, concentrated among children in single-parent households, families with migrant backgrounds, and those experiencing other dimensions of material hardship, highlights that energy poverty operates as a mechanism that reproduces broader social inequalities during the earliest phases of the life course.

The paper thus reframes energy poverty as a determinant of health that interacts with and amplifies pre-existing vulnerabilities. This is a critical point: childhood is not simply another demographic category but a stage of heightened sensitivity in which environmental, material and emotional conditions have profound developmental consequences. The findings challenge the dominant household-level paradigm and demand a child-centred understanding of energy deprivation.

Moreover, Paper 1 situates energy poverty within everyday practices that sustain well-being -sleeping, playing, studying, eating, and maintaining personal hygiene. It shows that deprived thermal conditions, inadequate lighting, or compromised food preparation environments do not simply signal economic stress but shape children’s daily routines and embodied experiences of home. This resonates with the broader argument of the thesis: energy poverty is not merely a technical or economic deficit, but a social condition with acute implications for children’s physical, emotional and relational lives.

5.1.2 Paper 2: “Empowering Whose Future? A European Policy Analysis of Children in Energy Poverty”

If the first paper establishes the empirical urgency of childhood energy poverty, the second paper (González-Pijuan et al. 2023) asks a different, more structural question: why does such a clearly vulnerable group remain unrecognised in policy frameworks designed to tackle energy poverty? The analysis of National Energy and Climate Plans across 28 EU Member States reveals a pervasive absence of children as an explicit policy subject. Even countries that acknowledge vulnerable consumers seldom articulate children as a distinct group, and even fewer provide targeted measures addressing their needs.

This absence is not a matter of oversight but a reflection of deeper conceptual assumptions embedded in European energy policy. First, the household-centric logic of EU-SILC indicators³ and energy poverty definitions positions the family unit as the actor and site of intervention, erasing differences within the household unit. Second, the focus on economic and infrastructural solutions (such as renovation strategies and tariff reforms) crowds out considerations of social vulnerability that do not conform to adult-centric models of citizenship and participation. Third, the policy language itself tends to frame protection in terms of “consumers,” a category that implicitly privileges adult rational actors and obscures children’s dependence on collective forms of care.

The paper uncovers a profound recognition injustice: children are not seen as energy subjects in their own right. It also identifies a procedural injustice: children have virtually no access to the processes through which energy poverty policies are designed, evaluated or refined. In this sense, the invisibility documented in the policy analysis is not simply descriptive, it is constitutive. It illustrates how institutional frameworks shape who is considered a subject of justice and who is rendered outside the frame of political concern.

Linking back to the empirical findings of Paper 1, the second article shows that the children who are most affected by energy poverty are those least recognised in policy. The structural marginalisation documented here helps to explain why the harms identified in Paper 1 persist and why there is little political momentum for addressing energy deprivation during childhood. It also provides the conceptual space for the third paper by finally shifting the analytic focus to children’s own understandings and voices.

³ EU-SILC (European Union Statistics on Income and Living Conditions) includes a set of commonly used indicators to measure energy poverty across Europe. These are based on self-reported conditions and include the inability to keep the home adequately warm, arrears on utility bills, and housing conditions such as damp or leaks

5.1.3 Paper 3: “Children’s Voices: Exploring Children’s Perceptions of Energy Poverty in Barcelona”

The third component of the thesis, Paper 3, moves beyond analysing children as objects of measurement or policy omission and instead positions them as subjects capable of producing valuable accounts of their own conditions; they are experts in their own experiences and lives. Conducted through a large-scale well-being survey and participatory workshops with children aged 6-12 in Barcelona, this study reveals that children experience and interpret energy poverty in ways that fundamentally reorient adult-centred understandings.

Younger children’s descriptions of energy deprivation are marked by notions of the absence of light, warmth, comfort, privacy, and safety. They articulate emotional responses such as fear, embarrassment, frustration and sadness, revealing how energy poverty affects not only bodily comfort but also self-esteem, social participation and a sense of belonging. Importantly, children often see energy deprivation through relational lenses: they link it to disrupted routines, family tensions, and compromised care.

One of the study’s most compelling insights is the ethical depth of 11-12-year-old children’s reflections. Many express concerns about fairness and collective responsibility, often framing energy as a shared good that should be equitably accessible. They frequently propose solutions that emphasise solidarity, community support and institutional responsibility, rather than framing the issue as a matter of individual household failure. These perspectives challenge dominant narratives that locate energy poverty primarily within economic behaviour or inefficiency of the built environment.

By relying on children’s voices, Paper 3 not only addresses the procedural injustice identified in Paper 2 but also expands the conceptual framework of energy justice. The children’s accounts bring into focus dimensions of care, relationality and emotional experience that are often marginalised in energy debates. In this sense, the study performs the recognition that policy frameworks neglect: it demonstrates that children are capable, articulate participants in discussions about energy deprivation and justice, revealing distinct perspectives.

5.1.4 Integrating the empirical studies

This section brings together the three empirical studies, highlighting how they address complementary dimensions of childhood energy poverty. While each paper is analytically distinct, they are connected through a shared focus on making children visible within energy poverty research and policy.

A first point of connection across the papers concerns the material and embodied nature of childhood energy poverty. The quantitative analysis presented in Paper 1 identifies associations between energy poverty and children's health and well-being outcomes, demonstrating that energy deprivation has measurable effects. These findings are complemented by the participatory research in Paper 3, where children describe experiences of discomfort, disrupted routines and emotional responses linked to inadequate thermal conditions. Together, these studies show how childhood energy poverty can be examined both through population-level indicators and through children's own accounts.

A second area of connection relates to issues of recognition. Paper 2 shows that children are rarely explicitly addressed within energy poverty policy frameworks, where they tend to appear indirectly within household categories. This contrasts with the empirical evidence presented in Papers 1 and 3, which highlights children's direct experiences of energy poverty. Taken together, these studies point to a gap between policy framings and how energy poverty affects children.

The papers also connect through their attention to the relational contexts in which energy poverty is experienced. Across the studies, children's experiences emerge as embedded within family dynamics and shaped by caregiving practices. In Paper 3, for example, children's accounts refer to how parents and caregivers manage energy scarcity within the household. This complements the broader focus of the thesis on understanding energy poverty as a condition that is experienced within social and relational contexts.

A further point of connection concerns the use of multiple methods. The three studies illustrate how quantitative analysis, policy analysis and participatory research each provide different forms of insight into childhood energy poverty. Quantitative data identifies patterns and inequalities, policy analysis examines institutional frameworks, and participatory approaches capture children's perspectives. Considered together, these methods contribute to a more comprehensive understanding of the issue.

Finally, the studies also highlight some shared methodological challenges. Participatory approaches raise questions about representation and the extent to which children's perspectives can be generalised or translated into policy contexts. At the same time, quantitative and policy-based approaches may overlook aspects of children lived experience if not complemented by more qualitative forms of inquiry.

These connections between the papers provide the basis for the synthesis and discussion developed in Chapter 6, where the findings are examined in relation to the conceptual framework of energy justice and ethics of care.

Chapter 6 Discussion and synthesis

Chapter 5 brought together the three empirical studies included in this thesis, highlighting how they address complementary dimensions of childhood energy poverty. It showed how quantitative analysis, policy analysis and participatory research provide different but interconnected forms of insight into the material, institutional and lived aspects of energy deprivation among children.

Building on this, Chapter 6 develops a synthesis and discussion of the findings in relation to the literature review, the identified gaps in knowledge, and the conceptual framework outlined in Chapter 4. This chapter interprets the papers together, examining what they collectively reveal about childhood energy poverty and how they advance existing debates within the literature.

The discussion is guided by an integrated framework combining energy justice and the ethics of care. Energy justice provides a lens for analysing structural inequalities, distributive impacts and issues of recognition within policy and governance. Ethics of care complements this perspective by foregrounding relationality, dependency and the everyday practices through which energy poverty is experienced and managed within households. Bringing these approaches together allows for a more nuanced and child-centred understanding of energy poverty, one that accounts for both structural conditions and lived realities.

Importantly, it also engages with the tension between children's dependency and their agency. While children's experiences of energy poverty are shaped by relations of care and protection, they are not passive recipients of these conditions. The findings presented in this thesis show that children are capable of interpreting, responding to and articulating their own experiences, even within constrained circumstances. The discussion, therefore, considers how care and agency can be understood as complementary rather than opposing dimensions, with implications for both research and policy.

The chapter is structured around four key themes. Section 6.1 examines the material and health impacts of energy poverty on children, drawing on the quantitative findings. Section 6.2 explores issues of policy recognition and institutional framing, highlighting gaps in how children are addressed within energy poverty governance. Section 6.3 focuses on lived experience, emphasising relational and care-based dimensions of energy poverty within households. Finally, Section 6.4 brings these strands together to develop a theoretical integration of energy justice and care ethics, outlining the broader conceptual contribution of the thesis.

6.1 The impacts of energy poverty on children

While the research has a strong reflective and theoretical approach, this framework has been constructed around deep material evidence throughout the studies: the material and health (both physical and mental health) impacts of energy poverty on children. Across the three papers, energy poverty consistently appears not as an abstract household condition, but as a lived reality with tangible consequences for children's bodies, emotions and everyday functioning.

Paper 1 provides the most direct evidence of these impacts through quantitative analysis of population-based health data. The findings show that children living in energy-poor households experience poorer general health, worse mental health outcomes and lower health-related quality of life than their peers. Importantly, these associations persist even after accounting for broader socioeconomic factors, suggesting that energy poverty constitutes a distinct dimension of disadvantage rather than simply a proxy for income poverty or social class. From a justice perspective, these findings also highlight a clear distributional injustice, where children in energy-poor households bear a disproportionate burden of health-related harms.

Even if such quantitative evidence is crucial for establishing the scale and public health relevance of childhood energy poverty, it provides limited insight into how these impacts are experienced and understood in everyday life. Also, the evidence studied in Paper 1 comes from surveys answered by caregivers, and their indirect perception of impacts on the children they care for. This is where the participatory findings presented in Paper 3 play a critical complementary role. Children's accounts of feeling cold or overheated at home, struggling to sleep, having difficulty concentrating on schoolwork, or feeling physically uncomfortable during daily activities give concrete meaning to the statistical associations identified in Paper 1. These narratives do not contradict the quantitative findings, but help to explain the mechanisms through which energy poverty translates into diminished well-being.

An additional insight emerging from this analysis concerns the importance of who reports energy poverty and its impacts, and how this shapes the quantitative results that are produced. Paper 1 relies on caregiver-reported data, reflecting the dominant approach in large-scale surveys, where adults act as proxies for children's experiences. While this approach enables population-level analysis and comparability, the findings from Paper 3 suggest that caregiver reporting may only partially capture the lived realities experienced by children and young people. Differences emerge not only between households within and outside of energy poverty, but also between how adults, children and adolescents perceive and report discomfort, constraints and impacts on daily life.

The child-completed survey analysed in Paper 3 also indicates that, compared to other large-scale surveys conducted in secondary schools in Barcelona (ASPB,2021) and teenagers may report experiences of thermal discomfort, limitations in everyday activities or emotional responses that are less visible in caregiver-reported data and that are uneven between them. Adolescents, in particular, appear more likely to articulate energy-related constraints linked to autonomy, privacy and social participation, dimensions that are rarely foregrounded in adult-centred measures. These differences do not imply that caregiver reports are inaccurate, but that they reflect a distinct perspective shaped by caregiving responsibilities, protective intentions and normative assumptions about children's well-being.

Also, in the same city, same environment, a larger percentage of teenagers seem to be affected by energy poverty compared to children, which also indicates how the perceived impacts can change during life. From a mental health perspective, this is very relevant and cannot be captured with one study, but by taking the papers together.

From a methodological and analytical perspective, this finding has important implications for how material outcomes of energy poverty are measured. Quantitative results are not neutral reflections of reality, but are shaped by the standpoint of the respondent and by assumptions embedded in survey design. When material deprivation is assessed exclusively through adult proxy reporting, certain dimensions of children's experiences may be underreported or normalised. By contrast, incorporating data reported directly by children and adolescents makes it possible to identify additional forms of material impact that would otherwise remain obscured. This reinforces the argument that understanding the material consequences of energy poverty in childhood requires attention not only to indicators and outcomes, but also to whose voices are used to produce them.

The synthesis of Papers 1 and 3 also demonstrates the value of combining epidemiological evidence with child-centred qualitative data. Quantitative analysis establishes that energy poverty "matters" for children's health at a population level, while participatory research reveals *how* and *why* it matters in practice. Together, these findings challenge assumptions that children are effectively protected from material hardship within households. Although caregivers may attempt to prioritise children's comfort -for example, by limiting heating use for themselves or concentrating warmth in shared spaces- the evidence suggests that such strategies may not be able to fully protect children from the embodied effects of energy deprivation.

From an ethics of care perspective, these findings are particularly significant. Care-based frameworks draw attention to vulnerability, dependence and the relational contexts in which well-being is produced, but more fundamentally, they reframe these conditions as central to social life rather than as exceptional states. Individuals are understood as

inherently interdependent, with well-being sustained through ongoing practices of care, responsibility and attentiveness (Tronto, 1993; Held, 2006). This shifts analytical focus from abstract principles of fairness towards the concrete ways in which needs are recognised, negotiated and met in everyday contexts.

In the case of children, this perspective is particularly significant. Children's heightened sensitivity to cold, damp and thermal discomfort reflects not only biological vulnerability but also their reliance on adult decision-making, caregiving practices and household infrastructures. Their experiences of energy poverty are therefore mediated through relationships of care, including how resources are allocated within the household, how discomfort is managed, and how protection is prioritised.

Applying an ethics of care lens to the findings of this thesis allows these relational dynamics to become visible. While energy justice frameworks identify inequalities in distribution, recognition and participation, a care perspective reveals how these inequalities are lived and managed within everyday life. It highlights, for example, the often-invisible work undertaken by caregivers to mitigate the impacts of energy poverty, as well as the ways in which children's needs are prioritised, negotiated or, in some cases, constrained.

In this sense, care does not replace justice, but deepens its analytical reach. It enables a more grounded understanding of how structural inequalities translate into lived experiences, particularly for groups such as children whose well-being depends on others for protection, advocacy and support. This has implications for policy, as addressing energy poverty among children requires not only redistributive measures but also support for the care relations through which children's well-being is sustained

The synthesis also highlights that the impacts of energy poverty on children are not limited to extreme or marginal cases. Even within a high-income urban context characterised by relatively extensive welfare provision, energy poverty is associated with detectable inequalities in children's health and well-being. This challenges narratives that position energy poverty as a residual problem affecting only the most deprived households and instead supports an understanding of energy poverty as a continuum of risk. For children, relatively small deficits in thermal comfort or housing quality can have cumulative effects on well-being, particularly when experienced over time.

Importantly, the discussion across papers suggests that health impacts should not be understood solely in physical terms. Children's accounts point to emotional and psychosocial dimensions of energy poverty, including feelings of discomfort, frustration, embarrassment and anxiety. These experiences resonate with broader literature on housing insecurity and child well-being, which has long emphasised the links between poor housing conditions and emotional distress, behavioural outcomes and reduced life chances

(Evans et al., 2008; Harker, 2006; Liddell & Morris, 2010; Marmot Review Team, 2011). A growing body of research has also examined the impacts of energy poverty on children specifically, particularly in relation to physical health outcomes and exposure to cold housing conditions (Mohan, 2021; Powell-Hoyland et al., 2016; Sen et al., 2023; Zhang, 2021). While this work has been essential in establishing the vulnerability of children within energy-poor households, it has tended to focus more strongly on measurable health outcomes than on children's subjective and emotional experiences.

By integrating quantitative indicators with children's own narratives, this study extends existing literature by demonstrating that childhood energy poverty affects not only physical health outcomes but also children's sense of comfort, emotional security and everyday normality. In doing so, it directly addresses the gap identified in Chapter 3 regarding the limited attention to children's subjective and psychosocial experiences within energy poverty research.

Another important insight emerging from this analysis is the growing relevance of energy poverty during summer months, an aspect that has historically received less attention than cold-related deprivation. Energy poverty research has traditionally focused on inadequate heating, excess winter mortality and cold-related health risks (Boardman, 2010; Liddell & Morris, 2010; Marmot Review Team, 2011; Recalde et al., 2019). However, increasing attention has been given to overheating and the risks associated with high indoor temperatures, particularly in the context of climate change, building design and urban environments (Chen et al., 2025; Sánchez-Guevara et al., 2019; Thomson et al., 2019). Despite this, children's experiences of summer energy poverty remain underexplored.

The findings across the papers suggest that exposure to excessive heat and the inability to cool the home constitute a significant dimension of material deprivation for children. Quantitative evidence indicates that difficulties in maintaining adequate indoor temperatures are not limited to cold seasons, while participatory findings reveal that children experience overheating as a source of physical discomfort, fatigue and disruption to daily activities. These results contribute to emerging debates by reframing energy poverty as a year-round condition with seasonally differentiated impacts, rather than a problem confined to winter. This also responds to the gap identified in Chapter 3 concerning the predominance of winter-focused analyses by demonstrating the importance of considering seasonal variations in children's experiences of energy poverty.

The material generated through child-centred research in Paper 3 is particularly revealing in this regard. Children and adolescents described experiences of heat that affected their sleep, concentration and willingness to remain at home, as well as strategies such as limiting movement, altering routines or seeking cooler spaces outside the dwelling. These accounts resonate with emerging research on thermal comfort, adaptive practices and everyday

responses to energy constraints (Gram-Hanssen, 2024; Middlemiss & Gillard, 2015; Petrova & Simcock, 2019), but also extend this work by foregrounding children’s perspectives, which are rarely captured in existing studies. Importantly, these findings highlight forms of material and embodied impact that remain largely invisible within conventional energy poverty indicators, which continue to prioritise heating affordability and winter adequacy. From a care perspective, summer energy poverty also places additional strain on caregiving practices, as families attempt to protect children from heat-related discomfort or health risks under constrained conditions.

By bringing attention to summer energy poverty through both quantitative patterns and children’s own accounts, the thesis contributes to emerging debates on overheating, climate vulnerability and energy justice, and highlights the importance of incorporating children’s lived experiences into future research and policy responses addressing climate-related energy deprivation. These findings further develop the critique outlined in Chapter 3 regarding the limitations of conventional indicators by showing how children embodied and relational experiences remain insufficiently captured within existing measurement approaches.

6.2 Policy gaps, and children's recognition

A second major theme emerging from the joint analysis of the three papers is the persistent failure to recognise children within energy poverty policies, and the implications of these gaps for how energy poverty during childhood is addressed in practice. While the empirical findings presented in Papers 1 and 3 demonstrate that children are directly affected by energy poverty in both physical and emotional terms, the policy analysis in Paper 2 reveals a disconnection between evidence and institutional frame. This gap is not merely technical, but reflects deeper assumptions embedded in how energy poverty is framed, measured and governed. Previous research has highlighted that children are often rendered invisible within energy poverty debates, typically subsumed within household-level categories rather than recognised as subjects with distinct needs and experiences (O’Sullivan et al., 2016; Middlemiss et al., 2019). This section builds on these insights by examining how such patterns are reflected and reproduced within policy frameworks.

From an energy justice perspective, this incoherence can be understood as a problem of recognition injustice. Paper 2 shows that European energy poverty policies rarely address children explicitly, instead subsuming them within household categories such as “families,” “vulnerable consumers,” or “low-income households.” While such categories may implicitly include children, they fail to recognise children as subjects with distinct needs, vulnerabilities and rights. As a result, policies tend to focus on household-level affordability, energy efficiency or consumer protection, without attending to how energy poverty is experienced differently by children within those households. This reflects broader critiques within energy justice scholarship, which highlight the challenges of translating recognition

as a normative principle into concrete policy practices (Walker & Day, 2012; Sovacool et al., 2016).

This lack of explicit recognition has important consequences. When children are treated as passive members of households rather than as social actors affected in specific ways by energy deprivation, their experiences are unlikely to inform policy design, targeting or evaluation. The synthesis of Papers 1 and 2 highlights that the marginalisation of children within energy poverty policy cannot be explained by the absence of evidence regarding their vulnerability, but from dominant policy framings that prioritise adults and household units as the primary scale of intervention. This finding aligns with existing research showing that energy poverty governance is shaped by particular conceptualisations of vulnerability that prioritise households and adult consumers, often overlooking differentiated experiences within households (Bouzarovski & Thomson, 2021; Middlemiss et al., 2019).

A further incoherence emerging from the synthesis concerns the way vulnerability is constructed in policy through specific family typologies, for example, the prioritisation of large families over single-parent households. In several European countries, energy poverty policies explicitly identify large families as a priority group, based on assumptions about higher energy needs and greater household consumption. While household size is undoubtedly relevant for energy demand, this policy focus often overlooks the fact that single-parent families -most frequently headed by women- are consistently overrepresented among households experiencing energy poverty. Analyses of energy vulnerability in the Global North highlight that certain household types, including single-parent families, are disproportionately exposed to energy poverty due to the intersection of financial constraints, housing conditions and care responsibilities (Middlemiss, 2022; Sunnika-Blank & Galvin, 2021). This pattern is reinforced by broader EU-wide research showing that the “energy poverty penalty” is particularly visible among single-parent households across multiple countries, where these families report higher incidences of arrears on utility payments and increased vulnerability compared with other household types (Sunnika-Blank & Galvin, 2021). However, this is not always reflected in policy targeting.

This mismatch between empirical evidence and policy prioritisation has important implications for children. In single-mother households, limited income, constrained housing options, and the concentration of caregiving responsibilities in one adult can intensify children’s exposure to energy poverty. The synthesis of Papers 1 and 2 suggests that policies relying on household size may fail to identify children at risk in family forms that do not fit dominant normative models of “family”. From an energy justice perspective, this represents a form of recognition injustice, whereby certain family structures are implicitly valued or rendered more visible than others. From a care perspective, it also reflects a failure to account for the unequal distribution of caregiving labour and the ways in which care

responsibilities intersect with gender, income and housing constraints. By prioritising large families while under-recognising single-parent households, energy poverty policies risk misaligning interventions with actual patterns of vulnerability, leaving many children in precarious situations insufficiently supported.

Another aspect of childhood energy poverty that remains under-recognised in both research and policy is the fact that children exhibit distinct patterns of energy use and consumption behaviour; patterns that are shaped not only by household infrastructures but also by children's routines, activities and autonomy. A growing body of research suggests that children's energy behaviours differ from those of adults because they incorporate additional needs and practices, such as the use of lighting and appliances for studying, charging electronic devices, and other forms of engagement with modern energy services related to education, play and social interaction. For example, studies in low-income contexts have found that children engage in household energy activities ranging from lighting and device use to independent contributions to chores that involve energy-dependent tasks, demonstrating autonomy in energy behaviour that is shaped by social and economic factors (O'Sullivan, 2017).

This distinction has important implications for how material outcomes of energy poverty are measured and interpreted. Conventional energy poverty indicators tend to treat energy use as a homogeneous household attribute, obscuring how specific members -including children- engage with energy services in ways that reflect their developmental needs and daily schedules. Recognising that children may consume energy for activities that differ in timing, purpose and intensity from adult patterns challenges the assumption that households with similar consumption share similar lived experiences. It also underscores the argument that policies based only on aggregate household metrics may fail to capture energy demands and constraints that matter for children's well-being, such as adequate lighting for homework, cooling for sleep, device charging for participation in social and educational life, or independence during adolescence. Incorporating insights about children's distinct consumption patterns into energy poverty research and policy could therefore enhance the precision of measurement and the responsiveness of interventions to children's material realities.

Procedural dimensions of justice further reinforce this invisibility. Paper 2 indicates that children are almost entirely excluded from participatory processes related to energy poverty governance, including consultation, stakeholder engagement and policy evaluation. Even in contexts where participation is framed as a core principle, it is often assumed that adults—whether policymakers, experts or civil society representatives—can adequately speak on behalf of children. This reflects broader challenges identified in childhood studies, where formal recognition of participation rights does not necessarily translate into meaningful influence in practice (Lundy, 2007; McMellon & Tisdall, 2020;

Gallagher, 2019). When considered alongside the findings of Paper 3, which demonstrate that children are capable of articulating advanced understandings of energy poverty, this exclusion appears less a matter of feasibility and more a reflection of institutional norms regarding whose voices are considered legitimate in energy policy.

The analysis also reveals a seasonal dimension to these recognition gaps. While several countries are still based in winter and cold-related energy poverty policies, the evidence gathered showed otherwise, at least for Mediterranean countries.

This seasonal blind spot can have particular implications for children. As the findings of Paper 3 illustrate, children experience summer energy poverty through disrupted sleep, difficulty concentrating, reduced comfort and altered daily routines. These impacts are not easily addressed through policies designed primarily to improve winter heating efficiency or reduce energy bills. From a care perspective, the absence of summer considerations in policy places additional stress on families, who are left to manage heat-related risks without adequate institutional support.

An additional insight emerging from the dialogue between the three papers concerns the way policy framings shape what is measured, and therefore what becomes visible as evidence. Paper 2 shows that European energy poverty policies are largely constructed around household-level concepts such as affordability, arrears and dwelling efficiency, with adult consumers positioned as the primary subjects of concern. These framings are not confined to policy texts but extend into the design of large-scale surveys and monitoring tools, which typically rely on adult respondents and household-level indicators. As a result, the quantitative evidence base available to policymakers tends to reflect the same assumptions that underpin policy definitions.

This helps to contextualise the findings of Paper 1. While the quantitative analysis demonstrates clear associations between energy poverty and children's health and well-being, it does so use data reported by caregivers and indicators not specifically designed to capture children's experiences. The synthesis therefore suggests that the limited visibility of children in quantitative datasets is not accidental, but structurally produced through policy-driven measurement practices. In this sense, Paper 2 provides an important interpretive proposal for understanding why childhood energy poverty has remained under-documented in large datasets, even as Paper 1 shows that its impacts are measurable. Together, these findings highlight a circular dynamic in which policy framings influence measurement, measurement constrains evidence, and limited evidence is then used to justify policy priorities that continue to marginalise children.

The policy gaps identified in Paper 2 also stand in contrast to the empirical evidence generated in Paper 3, which demonstrates that children are capable of articulating

meaningful accounts of energy poverty. Through surveys and participatory workshops, children and adolescents describe thermal discomfort, disrupted routines, emotional impacts and seasonal challenges in ways that directly relate to core policy concerns such as health, well-being and social inclusion. This contrast suggests that children's exclusion from energy poverty policy processes cannot be explained by a lack of capacity or relevance, but by institutional assumptions about which knowledge is considered and rendered legitimate.

These findings extend existing literature by demonstrating that the limited recognition and participation of children in energy poverty policy is not only a matter of insufficient evidence, but is structurally embedded in how energy poverty is conceptualised, measured and governed. This directly addresses the gap identified in Chapter 3 regarding the marginalisation of children in both research and policy, and highlights the need to reframe energy-poverty governance to include children as legitimate subjects and stakeholders.

6.3 Lived experience, care and relational aspects of energy poverty

A third key theme emerging from the analysis concerns the relational and care-based dynamics through which energy poverty is experienced in childhood and mediated in everyday life. Previous research has increasingly highlighted the importance of lived experience and everyday practices in understanding energy poverty, pointing to the limitations of approaches focused solely on structural indicators or household-level measures (Middlemiss et al., 2019; Petrova & Simcock, 2019; Groves et al., 2021). While the quantitative and policy analyses presented in Papers 1 and 2 reveal important patterns of inequality and institutional invisibility, it is the participatory research in Paper 3 that brings into focus how energy poverty is lived, negotiated and managed within families, and from the child perspective. Taken together, the findings suggest that childhood energy poverty cannot be fully understood without attending to the relationships of care, dependence and responsibility that shape children's daily experiences.

Across the participatory materials analysed in Paper 3, children rarely described energy poverty as an isolated technical problem. Instead, their accounts situate energy deprivation within the context of family life, household routines and emotional relationships. Children speak about cold or overheated homes not only in terms of physical discomfort, but also in relation to disrupted sleep, altered routines, limitations on play or study, and changes in how family members interact with one another. These accounts are consistent with practice-oriented research showing that energy use and deprivation are embedded in everyday life and social relations rather than experienced as isolated conditions (Gram-Hanssen, 2024; Middlemiss & Gillard, 2015). While a small number of studies have begun to incorporate children's perspectives into energy poverty research, most notably O'Sullivan et al. (2016), this remains a relatively underdeveloped area of inquiry. This thesis builds on and extends this emerging strand of research by providing a more detailed and

context-specific account of how children experience, interpret and respond to energy poverty in their everyday lives.

From an ethics of care perspective, these findings are particularly revealing. Care frameworks emphasise interdependence and vulnerability, drawing attention to the fact that children's well-being is inseparable from the capacities, resources and constraints of those who care for them (Tronto, 1993; Held, 2006). The synthesis across the papers shows that caregivers often engage in significant emotional and practical labour to manage energy scarcity, attempting to protect children from discomfort or worry. Similar dynamics have been identified in previous studies, which highlight how households absorb the impacts of energy poverty through strategies of sacrifice, prioritisation and emotional labour (Middlemiss & Gillard, 2015; Petrova & Simcock, 2019). However, the findings of Paper 1 indicate that such strategies are not always sufficient to prevent adverse impacts on children's health and well-being. This tension highlights a central insight of care-informed analysis: responsibility for care does not equate to capacity to provide it under conditions of structural constraint.

The dialogue between Papers 1 and 3 highlights the importance of recognising these relational dynamics alongside measurable health outcomes. While Paper 1 identifies statistical associations between energy poverty and poorer mental health among children, Paper 3 provides insight into how such outcomes may emerge through everyday experiences of discomfort, disrupted routines and emotional stress within the household. Rather than treating health impacts as isolated endpoints, the analysis points towards a more processual understanding of how energy poverty unfolds over time in children's lives. In doing so, it contributes to existing literature by linking quantitative evidence of health impacts with qualitative insights into lived experience, an integration that remains relatively limited in current research.

This relational lens also helps to interpret the findings of Paper 2 in new ways. The policy analysis shows that energy poverty governance largely overlooks caregiving dynamics, implicitly assuming that households can manage energy poverty internally. By contrast, the participatory findings demonstrate that families often engage in complex practices of prioritisation, sacrifice and negotiation in order to meet children's needs. When policy frameworks fail to recognise these care practices, they effectively externalise responsibility onto families without addressing the structural conditions that constrain care (Henwood et al., 2017; Groves et al., 2021). This misalignment reinforces the invisibility of children's experiences and the emotional labour involved in protecting them.

An important aspect of the relational approach to energy poverty concerns children's agency. The participatory research shows that children are not passive recipients of care, but active participants in managing energy behaviour. Research in childhood studies has

consistently emphasised that children are social actors whose agency is exercised within relational and material constraints (James & Prout, 1997; Christensen & Prout, 2002; Gallagher, 2019). The findings of this thesis support this perspective, showing that children adjust their behaviour to reduce energy use, comply with household rules, and support parents emotionally. Adolescents, in particular, articulated awareness of financial constraints and demonstrated strategies for adapting to limited thermal comfort. While these forms of agency can be understood as resilience, they should not be interpreted as evidence that impacts are minimal. From a care perspective, children's adaptation to deprivation reflects their embeddedness within constrained care relations rather than an absence of harm.

The analysis also introduces generational differences in how energy poverty is experienced within households. Children's daily routines, time spent at home and physiological sensitivity to temperature mean that they may experience energy deprivation differently from adults, even within the same dwelling. This reinforces the argument, developed earlier in the chapter and in Chapter 3, that household-level approaches risk obscuring intra-household inequalities. By centring children's lived experiences, the thesis makes visible how energy poverty is unevenly distributed within families and mediated through age-specific needs and relationships of dependence. In doing so, it contributes to ongoing debates by demonstrating the importance of moving beyond household-level framings towards more relational and child-sensitive approaches to energy poverty analysis.

6.4. Theoretical Integration: Energy Justice and Care Ethics

Across the three papers, a coherent theoretical framework emerges that integrates energy justice with an ethics of care. Energy justice provides a critical foundation by identifying the structural dimensions of inequality through its focus on distribution, recognition and procedure. The findings of this thesis illustrate how each of these dimensions operates in the context of childhood energy poverty. Paper 1 highlights a distributive injustice, showing that children experience measurable health and well-being impacts associated with energy deprivation. Paper 2 reveals forms of recognition and procedural injustice, demonstrating that children remain largely absent from policy frameworks and excluded from decision-making processes. Paper 3, in turn, shows that children are capable of articulating their experiences and perspectives, thereby challenging assumptions that justify their exclusion from participation.

However, as identified in Chapter 3, energy justice frameworks alone are limited in their ability to capture the relational and lived dimensions of energy poverty (Middlemiss et al., 2019; Groves et al., 2021). While they are effective in identifying inequalities and institutional gaps, they tend to operate at a level of abstraction that does not fully account for how deprivation is experienced, negotiated and managed within everyday life. The findings of this thesis reinforce this limitation, showing that children's experiences of energy

poverty are deeply embedded in family relationships, caregiving practices and emotional dynamics that are not easily visible within justice-based frameworks.

This is where an ethics of care provides a necessary extension. Rather than focusing solely on fairness or rights, care ethics foregrounds interdependence, responsibility and the relational conditions through which well-being is sustained (Tronto, 1993; Held, 2006). Applied to the context of childhood energy poverty, this perspective shifts attention towards how care is organised, who is responsible for providing it, and under what conditions it is made possible or constrained. The findings of this thesis demonstrate that energy poverty can be understood not only as a distributional or recognition failure, but also as a failure of care: a situation in which the capacity of families to meet children's needs is undermined by structural constraints related to income, housing and energy systems.

This care perspective does not replace energy justice but deepens its analytical reach. While energy justice identifies where inequalities occur, care ethics helps to explain how these inequalities are lived and mediated in everyday contexts. For example, the analysis shows how caregivers engage in practices of prioritisation, sacrifice and emotional labour to protect children from the impacts of energy poverty, yet also reveals the limits of these strategies under conditions of constraint. In this sense, care makes visible the relational processes through which structural inequalities are translated into lived experiences.

Bringing these perspectives together also allows for a more nuanced understanding of children's position within energy poverty. Children emerge as both dependent and agentic subjects: their well-being relies on care provided by others, yet they are also capable of interpreting, adapting to and articulating their experiences. This challenges the implicit assumptions within policy frameworks that either overlook children entirely or treat them as passive members of households. The integration of care and justice, therefore, supports a more relational conception of children as subjects whose needs, rights and voices must be recognised within both policy and practice. The findings also point to a form of epistemic marginalisation, whereby children's understandings of energy poverty are rarely recognised as valid knowledge within broader social and policy frameworks. Even if children demonstrate clear awareness of their living conditions and their impacts, these perspectives remain largely absent from dominant narratives, reinforcing their invisibility not only as subjects of policy but as knowers of their own experiences.

This combined framework also has important implications for how energy poverty is addressed. It suggests that responses cannot be limited to technical fixes or market-based solutions, but must engage with both structural inequalities and the relational conditions through which well-being is sustained. Addressing childhood energy poverty requires not only improving access to adequate energy services, but also recognising and supporting the

care relations that underpin children's everyday lives, while ensuring that children's perspectives are meaningfully included in decision-making processes.

In this way, the thesis contributes to existing literature by advancing an integrated conceptual framework that brings together energy justice and ethics of care to better account for the multidimensional nature of childhood energy poverty. It shows that understanding and addressing energy poverty in relation to children requires moving beyond household-level and purely distributive approaches, towards a more relational, child-centred and care-informed perspective.

Chapter 7. Contributions to the identified knowledge gaps

As described at the end of Chapter 3, this thesis contributes to knowledge by addressing some of the gaps identified, in three aspects: empirical evidence, methodological approaches and conceptual understandings of energy poverty in childhood. By placing children at the centre of analysis, the research responds to long-standing gaps in energy poverty scholarship, which has predominantly focused on households or adult populations and has relied heavily on proxy reporting and household-level indicators (Thomson et al., 2016; Bouzarovski & Thomson, 2021). In doing so, the thesis contributes to emerging efforts to reconceptualise energy poverty as a phenomenon that intersects with childhood, care and well-being, rather than being confined to questions of affordability or household deprivation alone.

7.1. Empirical contributions

Empirically, the thesis contributes new and robust evidence on the impacts of energy poverty on children's health and well-being. This area remains underdeveloped within both energy poverty and public health research. While existing studies have documented associations between inadequate housing, material hardship and adverse health outcomes, relatively few have examined energy poverty specifically in relation to children as distinct subjects of analysis (Cook et al., 2008; Thomson et al., 2016; O'Sullivan, 2016; Teariki et al., 2020; Zhang et al., 2021). Through quantitative analysis of population-based data, this thesis demonstrates that childhood energy poverty is associated with measurable inequalities in physical and mental health and health-related quality of life.

These findings extend existing knowledge by showing that energy poverty is not only correlated with broader socioeconomic disadvantage but also constitutes an additional and specific source of risk for children's well-being. By identifying associations that persist after accounting for socioeconomic position, the thesis challenges implicit assumptions that children are effectively protected from the impacts of energy deprivation within households. In this sense, the empirical findings contribute to reframing childhood energy poverty as a public health concern in its own right, rather than a secondary effect of income poverty or poor housing.

The thesis also makes a significant empirical contribution by generating and analysing evidence reported directly by children. Energy poverty research has rarely incorporated children's own perspectives, relying instead on adult proxy reporting to infer impacts on younger household members (Bouzarovski & Thomson, 2021). By analysing a large-scale survey completed by children and complementing this with participatory research, the thesis documents children's own accounts of thermal discomfort, energy-related constraints and their effects on everyday routines, emotional well-being and social

participation. This child-reported evidence brings into view aspects of energy poverty that are often normalised or rendered invisible within household-level analyses.

In addition, the policy analysis contributes empirical insight into how children are positioned within energy poverty governance. Building on existing critiques of recognition gaps within energy poverty policy (Walker & Day, 2012; Gillard et al., 2017), the thesis demonstrates that children are typically addressed implicitly, rather than explicitly, within European policy frameworks. By systematically examining policy documents, the research shows that the limited visibility of children cannot be attributed to a lack of evidence, but instead reflects dominant framings of energy poverty that prioritise households and adult consumers. This finding contributes to improving the empirical understanding of energy poverty as an institutional and governance issue, in which recognition plays a central role.

7.2. Methodological contributions

Methodologically, the thesis contributes to energy poverty research by demonstrating the value of a mixed-methods and child-centred approach. While the field has increasingly recognised the importance of qualitative and relational perspectives, research continues to be dominated by household-level surveys and technical indicators (Middlemiss et al., 2019). By combining quantitative health analysis, policy analysis and participatory research with children, the thesis illustrates how different forms of evidence can be integrated to capture the material, institutional and lived dimensions of energy poverty.

A key methodological contribution lies in the use and analysis of data generated directly by children. Research in childhood studies has long highlighted discrepancies between caregiver reporting and children's own accounts of well-being (Ben-Arieh, 2008; Rees et al., 2010), yet this insight has rarely been applied in energy poverty research. The thesis demonstrates that children are capable of engaging meaningfully with questions related to energy poverty when age-appropriate tools and methods are used, and that their responses provide analytically valuable insights that cannot be derived from adult reports alone. Also, their insights can offer different conceptualisations and yet influence policy in other directions, if taken into account.

The participatory and arts-based methods developed and adapted in the thesis further contribute to methodological debates by offering practical examples of how research with children can be conducted in ethical, inclusive and reflexive ways. Also, how this research can be adapted to different age groups, realities and languages, making it suitable for all children to engage in a problem that largely affects them and risks impairing their future. These methods allowed children to express experiences that might be difficult to articulate through conventional survey instruments and created space for reflection on emotional and relational dimensions of energy poverty. By embedding these approaches within a broader

mixed-methods design, the thesis contributes with methodological knowledge that is transferable to other areas of energy, housing and social policy research involving children.

7.3. Theoretical contributions

Conceptually, the thesis contributes to debates on how energy poverty is framed and understood by bringing together energy justice and the ethics of care in the analysis of energy poverty in childhood. This specific contribution, more than addressing a previously identified knowledge gap, emerged during the research and alongside with recent publications on ethics, care and energy (Bartiaux et al., 2021; Damgaard et al., 2022; Wågström & Michael, 2023; Gram-Hanssen, 2024).

Energy justice frameworks have played a key role in highlighting distributive, procedural and recognitional inequalities within energy systems and in challenging narrow technical definitions of deprivation (Walker & Day, 2012; Sovacool et al., 2016). However, recent scholarship has questioned whether justice-based approaches alone are sufficient to capture the relational and everyday dimensions of energy poverty, particularly in contexts of dependence and care (Middlemiss et al., 2019).

By incorporating an ethics of care perspective, the thesis advances a child-sensitive conceptual framework that foregrounds interdependence, vulnerability and responsibility. Care-informed approaches draw attention to how energy poverty is mediated through caregiving relationships and to the moral and emotional labour involved in maintaining children's well-being under conditions of constraint (Middlemiss & Gillard, 2015; Petrova & Simcock, 2019). This thesis extends these insights by explicitly centring children, showing how care both shapes children's experiences of energy poverty and contributes to their partial invisibility within policy and research.

More broadly, the thesis contributes to a re-framing of energy poverty as an issue that intersects with childhood, care and well-being, rather than being confined to households or adult populations. By positioning children as central subjects of analysis and combining justice and care frameworks, the research challenges dominant assumptions within the field and opens new avenues for theorising vulnerability, responsibility and recognition in energy systems.

7.4 Extreme energy exclusion and the limits of existing frameworks: reflections from Cañada Real

In addition to the three empirical studies that form the core of this thesis, I collaborated with a series of focus group sessions with adolescents living in Cañada Real, a large informal settlement on the outskirts of Madrid that has experienced prolonged and systemic energy exclusion. While the material generated through these sessions is not included as an empirical paper in the thesis, it played an important role in shaping my understanding of

the limits of existing energy poverty frameworks and the diversity of children's experiences under conditions of extreme deprivation.

Cañada Real represents a context that differs markedly from those examined in the three published papers. Energy exclusion in this setting is not episodic or primarily related to affordability, but structural, long-term and entangled with broader processes of housing insecurity, legal precarity and institutional abandonment. Including this material within the same analytical frame as the other studies would have risked obscuring these differences. For this reason, the focus group findings are presented here as exploratory and reflexive insights, rather than as a fourth empirical contribution.

The focus groups were conducted with young people aged approximately 12 to 17 years and were designed as discussion-based sessions in which participants were invited to reflect on their everyday experiences, priorities and concerns related to energy, housing and daily life. The sessions were deliberately framed to position young people as experts on their own lives, rather than as respondents to predefined indicators. This approach was consistent with the participatory orientation of the thesis, while recognising the specificities of the context.

One of the most striking insights from these discussions was the normalisation of energy exclusion within young people's narratives. Unlike children in other contexts studied in this programme of research, who often described energy poverty as a constraint or disruption, participants in Cañada Real frequently spoke about the absence of reliable electricity as an expected and enduring feature of daily life. Energy deprivation was not framed as a temporary hardship, but as part of a broader condition of marginalisation that shaped routines, aspirations and relationships with institutions. This challenges dominant energy poverty frameworks, which often assume a baseline of connection and focus on deviations from adequacy.

The discussions also highlighted how energy exclusion intersected with stigma and social exclusion, particularly in relation to schooling and peer relationships. Young people described difficulties studying at home, charging devices, or participating in digital activities that were taken for granted by peers elsewhere. These constraints were not only material, but symbolic, reinforcing feelings of difference and exclusion. While similar themes of embarrassment and constraint emerged in the participatory research presented in Paper 3, the intensity and pervasiveness of these experiences in Cañada Real pointed to a qualitatively different form of deprivation.

A further insight concerned young people's relationship with institutions and policy. Participants frequently expressed scepticism or distrust towards public authorities, shaped by long-standing experiences of neglect and unfulfilled promises regarding housing and

basic services. In this context, energy exclusion was understood not simply as a technical or economic issue, but as a manifestation of political abandonment. This perspective complicates policy-oriented approaches to energy poverty that focus on targeted interventions or technical fixes, and underscores the importance of trust, recognition and structural change.

From a care perspective, the focus group discussions also revealed the heavy burden placed on families to manage extreme scarcity. Young people spoke about parents and caregivers improvising solutions, rationing limited resources and attempting to protect children from the worst consequences of exclusion. However, unlike in other contexts examined in the thesis, these caregiving strategies operated under conditions where institutional support was minimal or absent. This reinforced the insight, developed elsewhere in the thesis, that policies which externalise responsibility onto families without addressing structural constraints place unrealistic demands on caregiving practices, demands that become particularly visible in situations of extreme energy exclusion.

Importantly, the Cañada Real focus groups also confirmed a key finding of Paper 3: children and young people are able to articulate sophisticated and contextually grounded understandings of energy-related deprivation. Participants demonstrated a clear awareness of how energy exclusion intersected with housing, education, health and social stigma, and were able to reflect critically on their situation. This reinforces the argument that children's exclusion from energy poverty research and policy processes cannot be justified based on capacity, but rather reflects institutional assumptions about whose knowledge is valued.

Reflecting on this material alongside the three core papers helped clarify both the scope and limits of the findings. On the one hand, the experiences of young people in Cañada Real resonate with broader themes identified elsewhere, including the relational mediation of deprivation, the emotional impacts of scarcity, and the invisibility of children in policy frameworks. On the other hand, the extremity of energy exclusion in this context highlights the need for analytical and policy frameworks that can account for situations where basic services are systematically denied, rather than inadequately provided.

For these reasons, the Cañada Real focus groups point towards important avenues for future research. They suggest the need for dedicated studies of extreme and prolonged energy exclusion that integrate perspectives from energy poverty, housing rights and child well-being. They also underline the importance of participatory approaches that recognise young people as knowledgeable actors, particularly in contexts where conventional indicators and policy tools are insufficient.

In sum, while the Cañada Real material is not part of the formal empirical core of the thesis, it played a significant role in shaping my understanding of childhood energy poverty and in

testing the boundaries of existing conceptual frameworks. Including these reflections in the synthesis chapter allows the thesis to acknowledge complexity and variation in children's experiences, without overextending the claims made on the basis of the three published papers.

Chapter 8: Conclusions

This research set out to examine how energy poverty affects children, and to explore the extent to which children are recognised within energy poverty research and policy. While energy poverty has been widely studied as a household-level condition, children have largely remained implicit within dominant analytical frameworks, assumed to be protected within families and rarely considered as subjects of analysis in their own right. Complementary to this approach, and to emerging intersectional debates, the thesis sought to bring children to the centre of energy poverty debates by combining quantitative analysis, policy analysis and participatory research.

Three interrelated objectives guided the research. First, to assess whether energy poverty in childhood is associated with measurable inequalities in health and well-being. Second, to examine how children are recognised, or overlooked, within European energy poverty policy frameworks. Third, to explore how children themselves experience and understand energy poverty in their everyday lives. By addressing these objectives through a mixed-methods approach, the thesis aimed to capture the material, institutional, and lived dimensions of childhood energy poverty and to generate evidence to inform more child-sensitive research and policy responses.

8.1 Main research conclusions

As discussed in Chapters 6 and 7, this thesis leads to three main conclusions regarding the material impacts of childhood energy poverty, how it is addressed in policy, and how it is experienced in everyday life. These conclusions draw on the combined analysis of quantitative data, policy frameworks and participatory research with children.

First, the findings show that energy poverty in childhood is linked to clear disadvantages in terms of health and well-being. Children living in energy-poor households report poorer general and mental health, as well as lower quality of life. These differences remain even when taking into account broader socioeconomic factors, suggesting that energy poverty is not simply an expression of general poverty, but a specific dimension of inequality that affects children's lives and should be understood as a public health issue.

Second, children remain largely absent from energy poverty policy frameworks. The analysis shows that policies tend to treat the household as the main unit of concern, with little explicit attention to children. This is not due to a lack of evidence, but rather to the way energy poverty is framed, often as a technical or economic issue. As a result, important aspects of children's experiences and vulnerabilities are overlooked.

Third, childhood energy poverty emerges as something that is lived through everyday routines, relationships and constraints within the home. The participatory work shows how children experience it through discomfort, changes in daily practices and emotional

responses, while also pointing to the efforts made by caregivers to manage limited resources.

The participatory findings also suggest that children are able to reflect on and describe their experiences in meaningful ways when appropriate methods are used. Their accounts connect material conditions with feelings, routines and family dynamics, offering perspectives that are not captured through standard indicators or adult reporting. This challenges the idea that children cannot engage with these issues and shows the value of including them directly in research.

The research also points to the importance of looking beyond winter conditions. Experiences of overheating and thermal discomfort during warmer periods suggest that energy poverty is not limited to heating, and that seasonal dimensions remain insufficiently addressed in current policy discussions.

Overall, these findings show that childhood energy poverty is not a marginal issue, but one that cuts across health, policy and everyday life. Bringing children's experiences into the analysis challenges household-based approaches and suggests the need for ways of understanding and addressing energy poverty that take children into account more directly.

8.2 Knowledge Translation and Policy Impact

This section should be read in close connection with the positionality statement presented at the beginning of this document. As discussed there, my engagement with energy poverty in childhood is shaped by a longstanding professional and activist involvement in the field, including direct work with families affected by energy deprivation and participation in collective action against energy poverty. I did not treat this background as separate from the research process, but as situated knowledge that informed the questions I asked, the methods I used, and the forms of knowledge I sought to produce.

Within this context, my commitment to knowledge translation and policy engagement is not an add-on to the academic work, but an extension of the same ethical and epistemological approach. Researching a topic with clear and ongoing social harms raised questions for me not only about how knowledge is produced, but also about how it circulates and to whom it is made accessible. Engaging with policymakers, practitioners and civil society actors was therefore part of a reflexive effort to ensure that the research remained accountable to the communities and issues it examines, while still meeting the standards of academic rigour required of a doctoral thesis.

The emphasis on policy outreach and knowledge translation in this thesis is also consistent with a relevant body of research literature that highlights the importance of connecting academic knowledge with decision-making processes, particularly in fields concerned with

social inequalities and public well-being. Scholars have argued that research addressing complex social problems risks limited relevance if it remains confined to academic audiences, and that engagement with policy and practice can enhance both the quality and the impact of research (Nutley, Walter, & Davies, 2007; Cairney & Oliver, 2017). From this perspective, knowledge translation is not understood as a one-directional transfer of findings, but as an iterative process involving dialogue, adaptation and mutual learning between researchers and non-academic actors.

In areas such as public health, social policy and environmental justice, policy engagement has been framed as a key dimension of responsible and reflexive research practice, particularly when research findings have implications for vulnerable or marginalised groups (Greenhalgh et al., 2016). In the context of this thesis, which documents the impacts of energy poverty on children's health, well-being and everyday lives, engaging with policy and practice audiences was therefore both a methodological choice and an ethical one. It reflects an understanding that evidence alone is insufficient to generate change unless it is communicated in accessible ways and connected to the institutional contexts in which decisions are made.

Certainly, I undertook this doctoral research with a clear intention that it should contribute not only to academic knowledge but also to social and policy change. I began the PhD with an established professional and activist trajectory in the field of energy poverty, and with limited familiarity with academic research environments. Throughout the doctoral process, I therefore made a conscious effort to ensure that the thesis met rigorous scholarly standards while remaining closely connected to the social relevance and policy implications of the topic. Given the impacts of energy poverty on children's health, well-being and rights, I considered it important that the research did not become detached from the contexts in which it could be used.

Prior to starting the PhD, I had carried out a study commissioned by a non-governmental organisation on energy poverty and childhood. That work was a key motivation for applying for doctoral research, as it revealed both the lack of robust, child-focused evidence and the persistent invisibility of children within energy poverty detection systems, professional protocols and policy responses. It also highlighted the need for deeper and more systematic research that could support improved identification, prevention and intervention. The thesis has sought to respond to this gap by generating empirical evidence across health, policy and lived experience dimensions, while remaining attentive to how such evidence could be translated into practice.

The research has taken place during a period in which energy poverty has become progressively more visible within European policy debates, particularly in the context of rising energy prices and climate change. This evolving landscape has created a window of

opportunity to inform policies and programmes at local, national and European levels. I have therefore approached knowledge translation not as an activity that follows the completion of the thesis, but as an integral part of the research process itself.

I have actively engaged with a range of actors working on energy poverty and childhood, including social movements, civil society organisations, public institutions and research bodies. These include collaborations and exchanges with organisations such as the Institut de la Infància de Barcelona, the Barcelona Public Health Agency, and the Catalan Government working group on childhood poverty, as well as engagement with grassroots initiatives such as the Plataforma Cívica Cañada Real o Aliança contra la Pobresa Energètica. These relationships have helped ensure that the research remained grounded in practical concerns and that findings could be shared and discussed beyond academic audiences.

In terms of concrete outputs, the research has informed several forms of documentation and knowledge exchange. These include reports produced for civil society organisations on the impacts of energy exclusion on children, methodological guides on the design and use of participatory workshops to address childhood energy poverty, and contributions to policy-oriented knowledge exchange initiatives such as those led by the UK Department for Energy Security and Net Zero. I have also participated in public seminars and debates, including those organised by the Fundació Bofill in the context of the State of Education in Catalonia, and have contributed to more creative dissemination outputs, such as the development and editing of a children's book aimed at communicating energy rights in an accessible and age-appropriate way.

Taken together, these activities reflect an approach to knowledge translation that recognises children not only as subjects of research, but also as audiences and potential participants in broader discussions about energy, climate and social justice. This approach is consistent with the participatory orientation of the thesis and with the empirical finding that children are able to engage meaningfully with issues of energy poverty when appropriate methods and formats are used.

8.2.1 Policy recommendations

Drawing on the findings of the three papers included in this thesis, several policy-relevant recommendations can be identified. First, I argue that child-specific indicators should be integrated into energy poverty measurement tools at national and European levels. The evidence presented in the thesis shows that household-level indicators alone are insufficient to capture how energy poverty affects children's health, well-being and everyday lives. Including child-focused measures would improve detection, monitoring and evaluation of policies aimed at reducing energy poverty.

Second, national energy and climate strategies should explicitly recognise children as a group affected by energy poverty, rather than addressing them only implicitly within household-based categories. This includes acknowledging children's particular vulnerability to thermal discomfort, overheating and housing-related stress, as well as the longer-term implications for health and development identified in this research. Explicit recognition is a necessary step towards more child-sensitive policy responses.

Third, the findings support the development of participatory processes that include children in policy design and decision-making, particularly at local and municipal levels. The participatory research conducted for this thesis demonstrates that children are able to articulate relevant and insightful perspectives on energy poverty, and that their systematic exclusion from policy processes represents a missed opportunity to improve policy relevance and effectiveness.

Fourth, I conclude that addressing childhood energy poverty requires stronger cross-sectoral collaboration between energy, housing, health, education and social services. The impacts documented in the thesis cut across these domains, and fragmented policy responses risk addressing symptoms rather than underlying causes. Integrated approaches are particularly important for identifying and supporting families with children facing multiple and intersecting forms of vulnerability.

Finally, the research highlights the importance of public investment in energy-efficient and climate-adaptive housing for low-income families with children. Improving housing conditions has the potential to reduce both winter and summer energy poverty, alleviate pressure on caregiving practices, and contribute to better health and well-being outcomes for children. Complementary education and awareness initiatives on energy rights and sustainability, tailored to children and young people, can further support long-term change by fostering informed and empowered future citizens.

8.3 Limitations of the research and directions of future study

As with any research, this thesis is subject to a number of limitations that should be taken into account when interpreting its findings. Reflecting on these limitations is important not only to clarify the scope of the conclusions drawn, but also to identify priorities for future research on childhood energy poverty.

A first limitation relates to the scope and scale of the participatory research with children. Although the thesis includes original data generated directly with children through surveys, workshops and focus groups, the number of participating groups and contexts was necessarily limited. Participatory research with children is time-intensive and requires sustained engagement, trust-building and careful ethical consideration (Christensen &

James, 2008; Punch, 2002). Expanding the number and diversity of participating children, including across different geographical, social and cultural contexts, would strengthen the robustness and transferability of findings. Future research would benefit from replicating and extending the participatory approaches used in this thesis with larger samples and in comparative settings, while retaining the depth and child-centred orientation that proved essential to capturing children's experiences.

A second limitation concerns the constraints imposed by the COVID-19 pandemic, which affected both the timing and the format of data collection. Restrictions on in-person contact limited opportunities for prolonged engagement with children and constrained the use of certain arts-based and group-based methods. While alternative strategies were adopted where possible, the pandemic inevitably shaped the depth, continuity and rhythm of some research activities. Similar challenges have been widely documented in social research conducted during this period (Vindrola-Padros et al., 2020). Future studies conducted under less restrictive conditions would be better positioned to develop longer-term participatory processes and to explore changes in children's experiences over time.

Language and communication barriers also constituted an important limitation, particularly in research conducted with children from migrant or multilingual backgrounds. In some cases, linguistic differences may have constrained children's ability to fully express their experiences or required the use of simplified language and additional support. Although care was taken to design accessible and child-friendly methods, these challenges highlight the importance of future research designs that incorporate multilingual facilitation, culturally adapted tools and extended engagement periods, in line with recommendations from research on inclusion and participation with diverse child populations (Spyrou, Rosen, & Cook, 2019).

Methodologically, the thesis combines caregiver-reported quantitative data with child-reported participatory evidence. While this mixed-methods approach is a central strength of the research, it also introduces limitations. Caregiver-reported surveys may frame children's experiences through adult perceptions, while participatory methods prioritise depth over breadth and do not aim for statistical representativeness. Future research could build on this work by developing and validating large-scale surveys designed specifically for direct completion by children and adolescents, allowing for systematic comparison between adult proxy reporting and child self-reporting across contexts (Ben-Arieh, 2005).

The policy analysis presented in the thesis is also subject to important limitations related to the dynamic and evolving nature of policy environments. Energy poverty policies, particularly at European and national levels, are subject to frequent revision in response to political change, economic shocks and external crises such as energy price volatility. As a result, there is an inherent temporal mismatch between the pace of academic research and

the speed at which policy frameworks can evolve (Cairney & Oliver, 2017). Some policy instruments or strategies analysed in this thesis may have been amended or replaced during the course of the research. However, the core findings regarding the limited recognition of children within energy poverty frameworks and the dominance of household-centric approaches remain relevant, as they reflect structural patterns rather than specific policy instruments. This limitation underscores the need for ongoing policy monitoring and iterative research that can track how recognition, participation and child-specific considerations evolve.

The exploratory focus group work conducted in Cañada Real represents a further limitation in terms of scope rather than relevance. While this material was not included as a formal empirical paper due to its focus on extreme and prolonged energy exclusion, it highlighted contexts that challenge conventional energy poverty frameworks and merit dedicated investigation. Future research should examine childhood energy exclusion in informal settlements and highly marginalised contexts, drawing on interdisciplinary approaches that integrate energy poverty, housing rights, migration and child well-being.

These limitations point also towards several key directions for future research. There is a clear need for expanded, child-centred and participatory studies on energy poverty, including longitudinal designs that follow children's experiences over time. Comparative research across countries and policy regimes would further illuminate how institutional contexts shape children's exposure to energy deprivation. Greater attention should also be paid to seasonal dynamics, particularly summer overheating, and to the intersections between energy poverty, migration, disability and language barriers.

Despite these limitations, the thesis provides a solid foundation for further research that places children at the centre of energy poverty analysis. By acknowledging both the constraints encountered and the insights gained, this section reinforces the contribution of the research while highlighting the ongoing need for evidence that is attentive to children's voices, lived realities and rights.

Building on this work, my next steps will focus on extending the empirical and methodological approaches developed in this thesis. In particular, I aim to further develop child-centred research tools that can be applied in larger and more diverse contexts, including the design of survey instruments that allow children and adolescents to report directly on their experiences. There is also scope to deepen engagement with policy actors, with the aim of translating child-centred evidence into policy-relevant frameworks that better reflect children's needs and perspectives.

More broadly, this research has positioned me within an emerging field that seeks to bring children into energy poverty research not only as subjects of concern, but as participants in

knowledge production. This requires continuing to work across disciplines, combining public health, social policy and energy research, and maintaining a commitment to participatory and ethically grounded approaches.

For researchers and practitioners working on energy poverty, the findings of this thesis point to the need to move beyond household-level and adult-centred approaches. This includes recognising children as directly affected by energy poverty, developing tools that capture their experiences, and creating spaces for their perspectives to inform both research and policy. It also requires engaging more closely with the relational and everyday dimensions of energy deprivation, rather than relying only on indicators and technical definitions.

Ultimately, the contribution of this thesis lies not only in the findings it presents, but in the perspective it adopts. Taking children seriously as subjects of energy poverty opens up new questions, challenges existing assumptions and suggests different ways of designing research and policy. Future work in this area should continue to build on this shift, ensuring that children's experiences are not treated as secondary, but as central to how energy poverty is understood and addressed.

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Appendix A : Article 1



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Article

The Association of Energy Poverty with Health and Wellbeing in Children in a Mediterranean City

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Abstract: Children have been identified as being particularly vulnerable to energy poverty (EP), but little empirical research has addressed the effect of EP on children’s health and well-being, especially in southern Europe. In this work we aimed to provide an in-depth description of the distribution of EP by sociodemographic, socioeconomic and housing characteristics, as well as to analyse the association between EP and health and well-being in children in Barcelona. We performed a cross-sectional study using data from the Barcelona Health Survey for 2016 ($n = 481$ children under 15 years). We analysed the association between EP and health outcomes through prevalence differences and prevalence ratios (PR) and their 95% confidence interval (CI), using Poisson regression models with robust variance. In Barcelona, 10.6% of children were living in EP and large inequalities were found by sociodemographic, socioeconomic and housing characteristics. EP was strongly associated with poor health in children (PR (95% CI): 7.70 (2.86, 20.72)). Living in EP was also associated with poor mental health (PR (95% CI): 2.46 (1.21, 4.99)) and with more cases of asthma (PR (95% CI): 4.19 (1.47, 11.90)) and overweight (PR (95% CI): 1.50 (1.05, 2.15)) in children. It is urgent to develop specific measures to avoid such serious and unfair health effects on children.

Keywords: energy poverty; fuel poverty; health; health inequalities; social determinants of health; children; southern Europe; urban

1. Introduction

Housing is a key social determinant of health [1]. Children are especially vulnerable to the effects of inadequate housing, because they spend more time at home and because a safe and adequate home is essential for their favourable development and physical and emotional well-being [2]. Adequate housing is not just four walls. It involves, among many other factors, basic supplies to carry out reproductive and caregiving activities, such as cooking or cleaning, and to achieve thermal comfort and the use of appliances and other electronic devices enabling effective participation in society [3]. If a household cannot secure a materially and socially required level of energy services, there is a situation of energy poverty (EP) [4].

EP is a major public health problem in the European Union (EU), affecting 9% of the population in 2016 [5]. EP is gaining increasing academic and policy attention in southern European countries because its rates are above the EU average (32.6% in Greece, 24.8% in Portugal or 13.4% in Spain in 2016) [5] and because of the emerging need for space cooling to adapt to climate change and increasingly high temperatures [6]. In Barcelona, for example, 12.4% of the population cannot afford to maintain their dwellings at an adequate temperature during the cold and/or warm months. This average value, however, hides much higher percentages in specific social groups, such as women born in low- and middle-income countries, where the percentage of EP is as high as 24% [7]. Like other social determinants of health, EP follows the classic lines of social stratification and is rarely an isolated problem. It tends to coexist with financial difficulties, unemployment and other material hardship [8,9]. Therefore, specific sociodemographic, socioeconomic and housing characteristics may be related to a disproportionate burden of EP [10]. For example, higher EP rates have been found in single-parent families, families living in market-price rented accommodation and those with food or housing insecurity [8,10–12].

Several studies have shown that EP negatively affects people's health and well-being [5,13–17]. Although children have been identified as a particularly vulnerable population group, little empirical research has addressed how, specifically, they are affected by EP, especially in southern Europe. According to the scarce existing literature, the main negative effects of EP on infants and young children concern physical health. In this age range, some studies suggest that EP is associated with a higher risk of health problems, mainly respiratory problems, greater health services use and worse disease course, with more recurrences [18–20]. Children living in EP are also at higher risk of under-nutrition or being overweight due to poor nutrition resulting from austerity in expenditure control, purchase of obesogenic products that are usually cheaper or, in more extreme cases, the inability to cook or preserve food [21,22]. Moreover, irregular connection of supplies or the use of alternative heating sources may increase the risk of domestic accidents such as burns or carbon monoxide inhalation [23,24]. EP and its effects on physical health can in turn affect

children's well-being and school performance [2,25]. In contrast, among adolescents, EP appears to primarily affect mental health. Difficulties in finding the needed privacy and personal space at home, feeling unhappy with their families and poorly cared for, being afraid of bullying and spending more time in public spaces such as parks or shopping precincts are some of the described effects of EP that can affect the mental health of adolescents and can also increase risk behaviours (e.g., early alcohol and tobacco abuse) [13,15,26]. Recently, a study in China showed that EP had a negative impact on subjective well-being in adolescents aged 10–15 years and suggested that academic performance might be one of the most important mediating mechanisms [27]. Finally, families' difficulties in paying their utility bills and the accumulation of debt can also affect the mental health of children and adolescents through the influence of economic stress on parental mental health [28], couple interaction and parenting [29].

This study was motivated by the lack of empirical data on how EP affects families differently and its effects on the health and well-being of children in southern Europe. Therefore, the aim of this study was to provide an in-depth description of the distribution of EP by sociodemographic, socioeconomic and housing characteristics, as well as to analyse the association between EP and health and well-being in children in Barcelona in 2016.

2. Materials and Methods

2.1. Design, Information Source and Study Population

We performed a cross-sectional study using data from the Barcelona Health Survey for 2016. This survey covers a representative sample of the non-institutionalised population in the city and includes a specific questionnaire for people under the age of 15 years. This under-15s population includes infants through adolescents, and will henceforth be referred to as children. This study includes all the children who participated in the survey, which represents a sample size of 481 children, sufficient to obtain representative population estimates of percentages with a precision of $\pm 4.5\%$ [30]. The questionnaire was completed by the child's usual caregiver.

2.2. Study Variables

2.2.1. Health and Well-being

To assess general health, we used caregiver-reported child health and we dichotomised it into two categories: good health (excellent, very good or good) and poor health (fair or poor) [31]. Mental health was measured using the Strengths and Difficulties Questionnaire (SDQ) for ages 4–17 years. We analysed the total difficulties score, as well as the individual scales of conduct problems, hyperactivity, emotional problems and peer problems. We dichotomised the five scales using the borderline cut-points [32]. We also studied health-

related quality of life (HRQoL) for ages 6–14 years through the Kidscreen-10. This is a 10-item questionnaire that provides a Rasch-scaled single score where higher scores indicate better HRQoL [33,34]. Finally, we also analysed two health outcomes that, according to the literature, can be significantly affected by EP, namely asthma and overweight [19,35]. Asthma was assessed through a chronic morbidity checklist, where the caregivers were asked, among others things, if the children suffered from asthma. Overweight was calculated from the height and weight provided by the caregiver. Overweight was defined as a BMI-for-age greater than 1 standard deviation above the WHO Growth Reference median [36,37].

2.2.2. Energy Poverty

The main EP variable used in this study was constructed from the following two questions: Can the household afford to keep the home at an adequate temperature during the cold months? Can the household afford to keep the home at an adequate temperature during the warm months? EP was considered when the caregiver reported that the household could not afford to keep the home at an adequate temperature during the cold and/or warm months. However, to assess the overlap between different dimensions of EP, the socioeconomic and household conditions variables (described below) also included other primary and secondary EP indicators [38].

2.2.3. Sociodemographics

We included sex, age, the parents' country of birth and household composition and we categorized the variables as defined hereafter. The parents' country of birth was classified into high-income (HI) and low- and middle-income (LMI) countries according to the 2018 World Bank classification [39]. We then classified children into three groups: both parents from HI countries; one from HI and the other from LMI countries; and both from LMI countries. Households were categorised into four groups, single-parent, extended single-parent when the parent and children lived with more people, two-parent and extended two-parent households.

2.2.4. Socioeconomics

We included social class, the ability of the household to afford an unforeseen expenditure of €750 with their own resources (based on one of the primary indicators to measure material deprivation used by the European Commission (European Statistics on Income and Living Conditions [40,41]), arrears on utility bills in the last 12 months (primary EP indicator), food insecurity and housing tenure. We categorized the variables as defined hereafter. Children were assigned the most privileged social class among the parents, based on their current or last occupation. Social class was dichotomised into non-manual and manual class [42]. To measure food insecurity, we used an adaptation of the 6-item US Household Food

Security Survey Module, which has been validated for the Hispanic population [43]. Housing tenure was categorised into five categories: paid property, property paying mortgage, rent at market price, social renting and other (re-renting of part of the dwelling, squatting and cession by family members, social services or non-governmental organisations).

2.2.5. Housing Conditions Related to EP

We included three dichotomous variables, which are also secondary EP indicators: dwelling with a leaking roof, damp walls, floors or foundations, or rot in window frames or floors; dwelling without means of heating or with central heating or room-heating appliances, but not used when necessary; and dwelling without an air conditioner or with an air conditioner, but not used when necessary.

For more information on the variables used, as well as to check the specific questions, please consult the Barcelona Health Survey manual, which also includes the complete questionnaire [30].

2.3. Data Analysis

First, we categorized the different sociodemographic, socioeconomic and housing conditions variables as detailed in the previous section and we described the sample according to these variables. Then, we calculated the percentage of EP and its 95% confidence interval (CI) for the total population, as well as by sociodemographic, socioeconomic and housing condition variables and we used the Pearson chi-square test with the second-order Rao-Scott correction to assess differences in EP percentage within categories of each variable [44]. Subsequently, we obtained the prevalence of health indicators among children with and without EP. Finally, we used Poisson regression models with robust variance to assess absolute and relative differences of the prevalence of health indicators among children with and without EP [45]. To do this, we calculated prevalence differences (PD) and prevalence ratios (PR) and their 95%CI, respectively. In the case of the Kidscreen, the only continuous health outcome, we calculated means and their 95%CI for both groups and their association with EP was studied using linear models. EP often occurs in a wider context of material hardship and disadvantaged economic situation, which can also affect health and well-being during childhood. For this reason, we calculated raw PD and PR and also adjusted by social class, as a proxy of the family's socioeconomic position. Adjusted PD were calculated with the adjusted prevalence obtained from the same Poisson regression model through the marginal standardisation method [46]. In all the analyses we took into consideration the complex sample design. We used the R software (version 3.6.3, R Foundation for Statistical Computing, Vienna, Austria).

3. Results

3.1. EP by Sociodemographic and Socioeconomic Characteristics and Housing Conditions

Table 1 describes the sociodemographic and socioeconomic characteristics and housing conditions of the sample, as well as the percentage of EP according to these characteristics and conditions. In Barcelona, 10.6% of children lived in EP. The most affected age group was 4–11 year-olds, in which the percentage of children living in EP was 13%. There was a clear gradient in the percentage of children living in EP according to the parents' country of birth, being 6.6% in children with both parents born in HI countries, 18.2% in those with one parent born in an HI country and another in an LMI country and 20.7% in those with both parents born in a LMI country. Point estimates also suggested a gradient in the percentage of EP in relation to household composition. Single-parent families were worst affected, and especially if they were extended single-parent families.

Table 1. Description of the sample and percentages of energy poverty by sociodemographic and socioeconomic characteristics and housing conditions. Barcelona 2016.

	Total		Energy Poverty *			
	<i>n</i>	%	Cases	%	95%CI	<i>p</i> -Value †
Total	481	100	48	10.6	(7.7, 13.4)	
Sociodemographic characteristics						
Sex						
Girl	240	48.7	21	9.2	(5.4, 12.9)	0.367
Boy	241	51.3	27	11.9	(7.5, 16.2)	
Age (years)						
0–3	89	17.9	5	6.3	(1.1, 11.4)	0.091
4–11	284	61.7	35	13.0	(8.8, 17.1)	
12–14	108	20.3	8	7.0	(2.3, 11.8)	
Parents country of birth						
Both HI	339	70.6	21	6.6	(3.7, 9.6)	<0.001
One HI, one LMI	38	7.6	6	18.2	(5.0, 31.4)	
Both LMI	103	21.7	21	20.7	(12.7, 28.7)	
Household composition						
Single-parent	43	8.6	5	11.4	(1.8, 20.9)	0.553
Extended single-parent	39	7.9	6	16.4	(4.3, 28.5)	
Two-parents	350	72.8	31	9.4	(6.2, 12.7)	
Extended two-parents	49	10.7	6	13.2	(3.1, 23.3)	
Socioeconomic characteristics						
Social class						
Non-manual laborer	341	71.2	13	4.5	(1.9, 7.1)	<0.001
Manual laborer	134	28.8	34	25.2	(17.7, 32.7)	
Can afford unforeseen expenditure of 750€						
Yes	336	70.7	6	2.3	(0.3, 4.4)	<0.001
No	137	29.3	42	30.8	(22.9, 38.6)	
Arrears on utility bills in the last 12 months **						
No	337	82.7	23	7.3	(4.2, 10.3)	<0.001
Yes	70	17.3	22	32.7	(21.5, 43.9)	
Food insecurity						
No	432	89.9	22	5.7	(3.3, 8.2)	<0.001
Yes	49	10.1	26	53.4	(39.1, 67.6)	
Tenure status						
Paid property	100	20.7	1	1.0	(−1.0, 3.0)	<0.001
Property paying mortgage	169	36.2	12	6.9	(3.0, 10.7)	
Rent at market price	184	39.1	30	17.6	(11.7, 23.5)	
Social renting	5	1.1	0	0.0	(0.0, 0.0)	
Other	13	2.9	5	40.7	(14.0, 67.5)	
Housing conditions						
Leaks, dampness in walls, floors, ceilings or foundations, or rot in floors, window frames or doors						
No	432	89.7	37	9.1	(6.2, 11.9)	0.003
Yes	49	10.3	11	23.5	(11.3, 35.7)	
No means of heating or central heating or room-heating appliances, but not used when necessary						
No	444	92.5	35	8.3	(5.6, 11.0)	<0.001
Yes	35	7.5	13	38.5	(22.1, 54.9)	
No air conditioner or air conditioner, but not used when necessary						
No	251	52.2	2	0.9	(−0.4, 2.1)	<0.001
Yes	228	47.8	46	21.2	(15.6, 26.7)	

* Three missing values; ** 74 missing values; *n* = sample size; cases: number of children with EP; 95%CI: 95% confidence interval; HI: high-income; LMI: low- and middle-income; †: Pearson chi-square test with the second-order Rao-Scott correction, differences are considered statistically significant if *p*-value is less than 0.05 (marked in bold).

The most significant differences in the percentage of EP were related to the socio-economic situation. For example, the percentage of EP in households unable to afford an unforeseen expenditure of €750 with their own resources was 30.8%, compared with 2.3% in those that could. The percentage of EP in families with food insecurity was 53.4%. We also found differences according to tenure, where the EP percentage was 1% in paid-ownership households and 17.6% in market-rate renting households. Finally, there was a strong overlap between different dimensions of EP: 32.7% of households with arrears on utility bills in the last 12 months also lived in dwellings with inadequate temperatures.

3.2. EP and Children's Health and Well-being

Table 2 shows the prevalence of health and well-being outcomes among children with and without EP, as well as the respective absolute (PD) and relative (PR) differences. Children living in EP had 7.70 (95%CI: 2.86, 20.72) times more poor health than those without EP and the respective PD was 12.2%. EP was also associated with poor mental health (PD: 11.6% and PR [95%CI]: 2.46 [1.21, 4.99]) and the most affected dimensions were peer (PD: 8.9% and PR [95%CI]: 2.48 [1.09, 5.63]) and emotional (PD: 8% and PR [95%CI]: 1.70 [0.86, 3.34]) problems. Children living in EP also had lower HRQoL, with an average of 2.57 points less in the Kidscreen. The prevalence of asthma (10.3% vs. 2.5%) and overweight (44.4% vs. 29.6%) was also higher in children living in EP, specifically, it was

4.19 (95%CI: 1.47, 11.90) and 1.50 (95%CI: 1.05, 2.15) times more frequent than in children without EP, respectively. After adjustment of the models by social class, the association between EP and poor health was consistent and, for the rest of the outcomes examined, children living in EP were still more likely to have poorer results, although the differences were not statistically significant (at the 5% level).

Table 2. Health measures prevalence among children with and without energy poverty and crude and adjusted absolute (prevalence difference—PD) and relative (prevalence ratio—PR) differences. Barcelona 2016.

	Energy Poverty (n = 48)		No Energy Poverty (n = 430)		PD	PR (95%CI)	aPD	aPR (95%CI)
	Cases	% (95%CI)	Cases	% (95%CI)				
Poor health	7	14.0 (4.1, 23.9)	8	1.8 (0.6, 3.1)	12.2	7.70 (2.86, 20.72)	10.3	6.51 (2.45, 17.29)
Mental health: SDQ for age 4 to 14								
Poor mental health (Total difficulties score)	9	19.6 (7.7, 31.4)	28	8.0 (5.1, 10.8)	11.6	2.46 (1.21, 4.99)	6.5	1.78 (0.91, 3.51)
Conduct problems	9	19.7 (7.8, 31.6)	49	14.2 (10.5, 17.9)	5.5	1.39 (0.72, 2.69)	1.1	1.08 (0.56, 2.08)
Hyperactivity	7	16.6 (5.1, 28.0)	42	12.2 (8.7, 15.7)	4.4	1.36 (0.64, 2.88)	1.2	1.09 (0.53, 2.26)
Emotional problems	9	19.6 (7.8, 31.4)	40	11.5 (8.1, 15.0)	8.0	1.70 (0.86, 3.34)	3.6	1.30 (0.68, 2.51)
Peer problems	7	14.9 (4.4, 25.3)	21	6.0 (3.5, 8.5)	8.9	2.48 (1.09, 5.63)	5.6	1.89 (0.81, 4.40)
Health-related quality of life: Kidscreen for age 6 to 14 *		59.7 (54.5, 64.9)		62.3 (60.8, 63.7)		-2.57 (-8.03, 2.89)		-2.61 (-8.94, 3.72)
Asthma	5	10.3 (1.5, 19.2)	11	2.5 (1.0, 3.9)	7.9	4.19 (1.47, 11.90)	4.8	2.84 (0.91, 8.80)
Overweight	22	44.4 (29.9, 59.0)	127	29.6 (25.3, 34.0)	14.8	1.50 (1.05, 2.15)	6.4	1.21 (0.84, 1.74)

SDQ: Strengths and Difficulties Questionnaire; n = sample size; cases: number of children with the health outcome; 95%CI: 95% confidence interval; PD: crude Prevalence Difference; PR: crude Prevalence Ratio; aPD: social class-adjusted Prevalence Difference; aPR: social class-adjusted Prevalence Ratio; * Kidscreen is the only continuous variable and therefore the values shown are means and their 95%CI among children with and without EP and mean differences and their 95%CI calculated through linear models; in bold statistically significant PR

4. Discussion

4.1. Main Findings

This study shows a high percentage of EP in families with children in the city of Barcelona, as well as inequalities by sociodemographic and socioeconomic characteristics and housing conditions. We found a strong association between EP and poor health in children. The

findings also suggest that EP is associated with poorer mental health, lower HRQoL and with more cases of asthma and overweight in children.

4.2. Interpretation of Results

In this study, 10.6% of children in Barcelona were living in EP. A value well above the EU average according to the most up-to-date data from the EU Energy Poverty Observatory, which indicate that in 2018, 7.3% of the EU population was not able to keep their home adequately warm. This result is consistent with the percentages found in a previous study in adults, reporting that 13.3% of women and 11.3% of men in the city of Barcelona lived in EP [7]. Robustly, both studies show how the axes of inequality that place our society in a hierarchy lead to greater exposure to EP in more vulnerable groups such as people born in LMI countries, those from more disadvantaged social classes and women. In this study, we found no differences between sexes. This may be because women are more affected by EP in adulthood due to gender roles that make them more responsible for reproductive and caregiving activities [47] and to the lesser economic, political and social power that women have in patriarchal societies, which hinders their access to commoditized goods such as energy. These aspects do not yet manifest at such early ages. However, gender differences can be observed related to household composition. As in other studies [18,24], in our study the prevalence of EP was higher in single-parent households, which are generally headed by women (in 85.4% of those in the study population).

We found slightly lower percentages of EP in households with children aged 0–3 years. This may be because infants and toddlers are more vulnerable to extreme variations in ambient temperatures due to their immature physiologic capacity for thermoregulation [21] and parents may choose strategies to cope with EP other than self-rationing of energy consumption. Not being able to keep the house at an adequate temperature is only one of the many expressions of EP. Families who decide to go into debt or reduce other basic needs to pay for energy services and those who are forced to connect irregularly to the distribution network also suffer from EP [11]. These situations often coexist in the same household, as found in this study where families with arrears on utility bills also had greater difficulty in keeping their homes at an adequate temperature. This can place a double burden on health, due to the specific direct effects of each dimension of EP.

Because the current energy model turns basic supplies into a commodity accessible only to those able to pay for them, EP usually occurs in disadvantaged socioeconomic contexts. For this reason and as also shown in this study, EP generally coexists with other economic and material hardship, such as job, food or housing insecurity [8,10,21,22,48]. This interaction of difficulties increasingly results in deteriorating health and makes it more difficult to break out of the circle of precariousness.

The most striking result in this study was the strong association between EP and poor child health. After adjustment for social class, children living in EP had 6.51 times more poor health than children without EP. Very few studies have quantified the magnitude of the association between EP and children's health. A United States study that also examined the association between EP and poor health in children younger than 36 months found that children in households with moderate or severe EP had an adjusted odds of poor health 30% higher than those in households without EP. The authors suggest that there is a low "threshold effect" of EP on children's health, affecting both moderate and severe cases of EP [21].

EP has been found to predominantly affect physical health in children and mental health in adolescents, but there have been few systematic assessments of the mental health effects on children [13]. In this study, we assessed the effects of EP on mental health in 435 young people, 319 children aged between 4 and 11 years and 116 young adolescents aged between 12 and 14 years. The results suggest worse mental health in young people living in EP. The most affected scales were emotional and peer problems, which are those composing the SDQ internalising score. Internalising behaviours include anxiety, withdrawal and dysphoria [49]. Although measured with another scale, a recent study found that 9-year-old children experiencing dual food and energy hardship had a greater odds of coexisting internalising and externalising behaviours [48]. Mental health in children living in EP may be affected by different mechanisms; for example, by the effects of EP on physical health, since children's mental health is more adversely affected by illness than adults health [13]. Stress and other mental health problems experienced by parents living in EP can be transferred to children, and can also negatively affect parental relationships and parenting behaviour [50]. In addition, children with EP may find their play space and opportunities for leisure and socialisation reduced [24].

So far, asthma has been the most widely studied health effect of EP in children. Previous studies have shown that asthma is associated with cold homes and damp and mouldy conditions, and that interventions to reduce EP improve asthma symptoms in children and reduce school absence [19,51–53]. The present study found a much higher percentage of children with asthma in households with EP. Although this result was not statistically significant after adjustment for social class, point estimation revealed that, in more temperate climates, there is also a strong association between EP and asthma, with children with EP having almost 3 times more asthma than those without EP.

Finally, the relationship between EP and poor nutrition in children is also a major concern. Families with EP have greater difficulty in buying healthy, quality food and in preserving and cooking it properly. Poor nutrition in children can lead to underweight and overweight, with significant long-term consequences for their health and well-being. One study showed that infants up to the age of 3 living in EP were 29% more likely to be underweight, but the

effects of EP on child overweight have not yet been studied. In this study we found a much greater prevalence of overweight in children with EP, suggesting that children living in EP were 50% more likely to be overweight.

4.3. Limitations and Strengths

The main limitation of this study is the sample size. The low statistical power did not allow us to show many statistically significant associations after adjustment of the models for social class, and the low number of observations limited us to stratifying the analyses by possible effect modifiers. Another limitation is that the survey was completed by caregivers. Children and adolescents have valid opinions that should be collected. The lived experience of children living in EP is essential to better understand and scale how EP affects their health and well-being and build meaningful policy and practice to address EP [53]. Moreover, there are successful experiences of studies of EP with the participation of adolescents [26]. It should also be noted that this study was conducted in the city of Barcelona and may not be generalizable to other contexts. Finally, data are from 2016. Although these are the latest data available, they may be outdated, especially due to the exceptional circumstances caused by the Covid-19 this past year. This study, however, is the first to analyse and quantify the magnitude of the effects of EP on various child health and well-being outcomes in southern Europe and its relevant findings should draw the attention of practitioners, researchers and policy-makers to further advance this much-needed field.

5. Conclusions and Recommendations

EP is an important public health problem in the city of Barcelona, with a highly uneven distribution among families and that negatively affects children's health and well-being. The poorer physical and mental health experienced by children living in EP has an immediate effect on their quality of life, but may also have important long-term health implications and may hamper children's learning and socialising. Long-term health problems and a lower educational achievement can, in turn, affect employment opportunities and economic well-being in adulthood, increasing health inequalities and perpetuating cycles of precariousness, which may even affect future generations.

These serious consequences in the short- and long-term should prompt policy-makers to develop specific measures that prioritise children and adolescents and guarantee basic supplies for their favourable development and well-being. This is especially important in the context of the COVID-19 pandemic, when we are on the verge of a possible new economic crisis, which could drag many families into EP and aggravate its effects on health.

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Appendix B: Article 2

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Original research article

Empowering whose future? A European policy analysis of children in energy poverty

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Abstract

It is proven that children experience specific impacts on their mental and physical health as well as their educational attainment as a result of living in energy poverty. International guidelines and requirements underline the right of every child to an adequate standard of living and the need for all policy to take children into account. This paper aims to understand the extent to which energy policies target children in energy poverty and acknowledge their differential needs and impacts. The paper is based on a study of EU-SILC data and the analysis of policy documents across the 28 countries that by the end of 2019 formed the European Union. The analysis reveals how energy policies mostly consider children only within the context of their families, tending to provide greater support to larger families, while data suggests single parent families are at higher risk of energy poverty. Generally, children tend to be seen as passive subjects in energy policy, are not involved in its development, and their own perspectives and needs are often neglected.

Keywords: children in energy poverty, energy poverty policy, families in energy poverty, children-centred policies.

1. Introduction

Energy poverty is a complex and multidimensional problem, defined as the inability of a household to secure a socially and materially required level of energy services in the home¹. Brenda Boardman, in her seminal research, triggered a consensus about its main drivers being energy prices, energy-inefficient housing, and low household incomes². This framework then extended to six energy vulnerability factors identified by Bouzarovski and Petrova (2015)³, including access, affordability, flexibility, energy efficiency, needs and practices. Other contributions claim that the conceptual frame of energy poverty is too technical and at risk of overlooking lived experiences⁴ capable of providing insights into the everyday lives of the energy poor and enabling more comprehensive analysis of policy impacts and development of more viable interventions⁵. There has been a shift away from viewing energy poor households as homogenous towards recognising the distinct ways in which different households – and different people within a household – are affected. For instance, research has been conducted on gender, the elderly, single parent households and disabled people^{6–15}, recognising differential impacts and experiences of energy poverty between different members of households.

Overlooking the distinct experiences of children in energy poverty prevents policymakers from responding to differential needs and overcoming discrimination of a specific group that, due to their dependence on adults, face greater difficulties in exercising their rights¹⁶. Different international guidelines and requirements, such as the UN convention on the Rights of the Child (1989), the Recommendation on Investing in Children (2013), a WHO-UNICEF-Lancet Commission (2020)¹⁷ or the European Strategy for the Rights of the Child (2021) have underlined the right of every child to an adequate standard of living (1989, 2021), the need to guarantee children's participation, the role of States to provide assistance and support, to address situations of energy poverty among children (2013), and on the requirement for all policy to take account of children, especially children in a vulnerable situation or environment¹⁷. Yet, there is no nation state which has a comprehensive approach to considering children's interests in multisectoral public policies.

This paper reveals how, even when specific impacts of energy poverty on children have been acknowledged, there is still a lack of recognition of their differential needs in relation to energy, climate and social policies relevant to energy poverty alleviation. Energy policies targeting children are rare, and when they exist, they tend to place children under the broader category of their family or household unit, even when prior research on energy poverty related to age, gender or disability^{6–9,12,13} demonstrates how every member of a household will be impacted differently.

We begin this paper with a literature review presenting the existing evidence on the differential and distinct impacts that energy poverty has on children. We then use various data sources including EU Statistics on Income and Living Conditions (SILC) data, National Energy Climate Plans (NECPs) and public policy reviews, to investigate, in the context of EU and UK nations: first, whether there are public policies specifically aimed at alleviating energy poverty during childhood; second, how these policies conceptualise children, e.g., as citizens or as members of a family or household unit; and third, the extent to which children have been involved in the elaboration of such policies.

2. Growing up in energy poverty: a literature review

Recent research conducted in the UK, Ireland, Northern America, Spain and New Zealand^{18–33} evidences the distinct impacts of energy poverty on children, focussing primarily on physical health impacts^{11,18,25,27,30,33,34}. Young children are known to spend more time at home than adults^{19,23}, so housing conditions are likely to affect them more. Findings point to poor families reducing their expenditures on food in response to cold weather^{35–37}, an association between living in cold houses and hospital visits²⁶ and poorer respiratory health^{26,27,30}.

Mental health impacts have also been identified by the literature in association with children in energy poverty. Financial stress¹⁸ and increased likelihood of depression in parents²⁸ are also likely to affect children's well-being³⁸. In particular, teenagers living in energy poverty report psychological stress and seem to be at a higher risk of mental health problems and engaging in risky behaviours such as alcohol abuse, drug abuse and

violence^{26,34}. Other causes of mental health issues include the need for intimacy that accompanies the adolescent period (more complex when the housing conditions are not adequate), and difficulties accessing social technologies and forging good relationships between peers²⁶.

Impacts are also likely to extend beyond health, as hinted by a smaller number of studies. Early research³⁹ has shown that energy poverty can be associated with poorer educational attainment, days off school, bullying and stigma and social isolation. Indeed, academic performance can be an important channel through which energy poverty affects children's well-being^{29,31}.

The presence of children in the household also influences the energy consumption behaviour and is key to the development of child-oriented energy policies. We know that households with children have different patterns of energy use (quantity and times of use) and that energy use is deeply entwined with daily routine and coping strategies⁴. Understanding this distinct behaviour and taking account of it represents an important element of sensitising energy policy to the distinct needs of children⁴⁰.

In fact, much of the apparent lack of knowledge about the reality of children's energy consumption and their subjective well-being in relation to energy poverty is due to an absence of active involvement of children in research and policy making. O'Sullivan (2017)²⁴ provides a rare example of an energy poverty study involving teenagers. It found that cold housing has significant effects on their day-to-day lives outside and inside the home and revealed awareness on the part of teenagers of the financial stress their families were under.

Overall, there exists a strong body of evidence to suggest that the impacts of energy poverty experienced by children and their specific energy behaviours related to care and family routines are distinct from those of other household members and therefore warrant explicit research and policy attention directly involving children.

3. Methodology

The article intends to bring together two different frameworks: the understanding of energy poverty within policy development and the conceptualization of children in policy elaboration. Also, it seeks to approach the research problem – children in energy poverty and policy - from different angles, which require different methods.

A first step in our analysis has been a review of existing literature to highlight published evidence on the specific impacts of childhood energy poverty, both physical and mental, and on educational development. While the focus of the paper is primarily on Europe - acknowledging the diversity of the geographical, social and policy context across member states- the literature review takes into account of a global body of knowledge on energy poverty and children to be able to state the impacts and further on narrow the policy discussion to Europe.

From this foundation, the following activities were undertaken:

Quantitative analysis of EU SILC indicators

The data analysis is based on the two widely reported and accepted energy poverty indicators contained in the EU-SILC European survey to measure energy poverty: inability to keep the house warm and arrears in utility bills. Although the data refers to households and not specifically to children, it can be disaggregated according to household composition. The categories selected for analysis were single parents with dependent children, two adults with three or more dependent children, three or more adults with dependent children, households with children and households without children. The first three categories were chosen because they showed worse outcomes, so higher risk to be in energy poverty.

In order to avoid focusing the analysis on a single year and thus be able to visualize trends, we chose to study the period from 2011 to 2019 in the 28 countries that by the end of 2019 formed the European Union including the UK. Results from the 28 countries can be visualized as supplementary information.

We then used Recalde et al.⁴¹ cluster distribution for their Structural Energy Poverty Vulnerability Index across the EU-27 (the countries studied were those constituting the EU as of January 2013, so Croatia is not included). 13 different indicators were used by Recalde et al. to construct the index, and then a hierarchical cluster analysis (HCA) was conducted on the index variable. The index was validated studying the association between the country typologies obtained and the energy poverty prevalence of each country.

This cluster distribution provided by Recalde et al.⁴¹ was chosen because it has been validated, it allows a better comprehension of data, and it deepens the analysis by taking into account a diverse range of indicators constituting what they called the three structural dimensions of energy poverty: labour market and welfare state, housing market and policies and energy market and policies. Its classification of countries according to their degree of structural vulnerability to energy poverty, crossed with the data available in the EU-SILC, allowed us to identify trends with respect to the different household typologies. Unfortunately, it does not specifically cover childhood-related indicators, which could be an essential idea for further work concerning children in energy poverty.

Once the index had been chosen as a visualisation and trend indication tool, we then grouped the 27 countries into Recalde's et al. clusters, calculated the average, weighted by population in 2019, within countries for each household type and generated two sets of graphics (one for each indicator: inability to keep the house warm and arrears in utility bills). We believe that this data visualization is useful to establish the impacts of energy poverty on different household typologies and provides a necessary basis for subsequent policy analysis.

Policy analysis

The policy analysis was conducted as an assessment of the final versions of the 28 National Energy Climate Plans (NECPs) submitted to the European Commission by EU member states and the UK was undertaken using a keyword search system, looking for the following words: child, infant, minor, parent, family, young, youth. This search allowed us to identify where children were mentioned through the documents and then propose a classification related to the energy justice framework: if NECPs acknowledge specific impacts on children

(recognition justice), whether specific measures for families with children are detailed (distributional justice), and in which ways (if any) children or young people have been consulted, informed or involved during the elaboration of the NECP (procedural justice).

Next, in order to select relevant case studies on energy poverty policies targeting children to help deepen the analysis, we opted for two approaches: a survey and in-depth interviews of energy poverty researchers and practitioners. It should be noted that the analysis of the NECPs had already provided us with indications of the degree of maturity of energy poverty policies in the different countries. However, as energy poverty policy occurs also at a regional or local level, which is not usually captured by NECPs, we found it was appropriate to look more deeply into the analysis of various countries.

The survey was completed by 20 energy poverty academics and practitioners and it aimed to know if they were aware of experiences in literature, public policy or activism that made reference to fuel or energy poverty and children. We then undertook in-depth interviews specifically related to energy policies targeting children among policy makers, practitioners and academics from France, Portugal, the Netherlands, the UK (England and Scotland), Hungary and Spain. Both the survey and the interviews provided information to look into national and regional policies more deeply and based on this guidance we selected case studies from Spain (with a focus on Catalonia) and the UK (England and Scotland).

Once policy case studies had been selected, it was necessary to analyse them not only in terms of the possible direct mention of children, but also to understand in more depth how children were taken into account. In order to do so, we used Daly's 'three social policy approaches to children'⁵⁰, specifically the aspects related to family-centred and children-centred policy.

Analysing the problem of children in energy poverty and the approach of energy policies to it from different points of view, qualitative and quantitative, has undoubtedly been relevant in order to detect shortcomings and propose adequate recommendations.

Throughout the study, children are referred to as all persons under the age of 18. We are aware that the impacts of energy poverty on children vary by age during childhood as well.

Likewise, although the available data does not allow for this, it would be necessary to incorporate an intersectionality perspective to show how different axes of discrimination aggravate the impacts of energy poverty on children. This study aims to highlight the lack of consideration of children in public policies on energy poverty, which we expect that will also allow for the generation of data necessary for further studies to cover the issues so necessary for the development of appropriate policies.

4. Children in energy poverty: a secondary data study

As stated previously, there are no specific EU indicators on children in energy poverty. However, the two main indicators commonly used to quantify the phenomenon are found within the EU SILC statistics. These two main indicators: inability to keep home adequately warm and arrears on utility bills, can be disaggregated by household typology, allowing to understand the ways in which children might be affected by energy poverty according to their household composition.

As explained in the methods section, and to ensure a better visualization of data, we use the cluster distribution developed by Recalde et al. (2019)⁴¹ in their structural energy poverty vulnerability (SEPV) index, which comprised 13 indicators and allowed a cluster analysis according to structural determinants of EP in 27 European countries. The clusters introduced in Figure 1 serve as a basis for showing the temporal evolution of the two main energy poverty indicators mentioned above in Figures 2 and 3. These graphs illustrate how each of the four clusters of EU countries have performed between 2011 and 2019 by showing the weighted average value for each household type in each cluster.

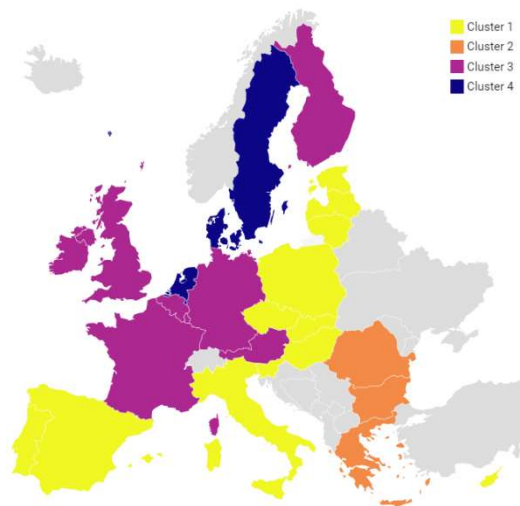


Figure 1. SPEV Index 4-Cluster distribution across EU-27 based on Recalde et al. (2019)⁴¹

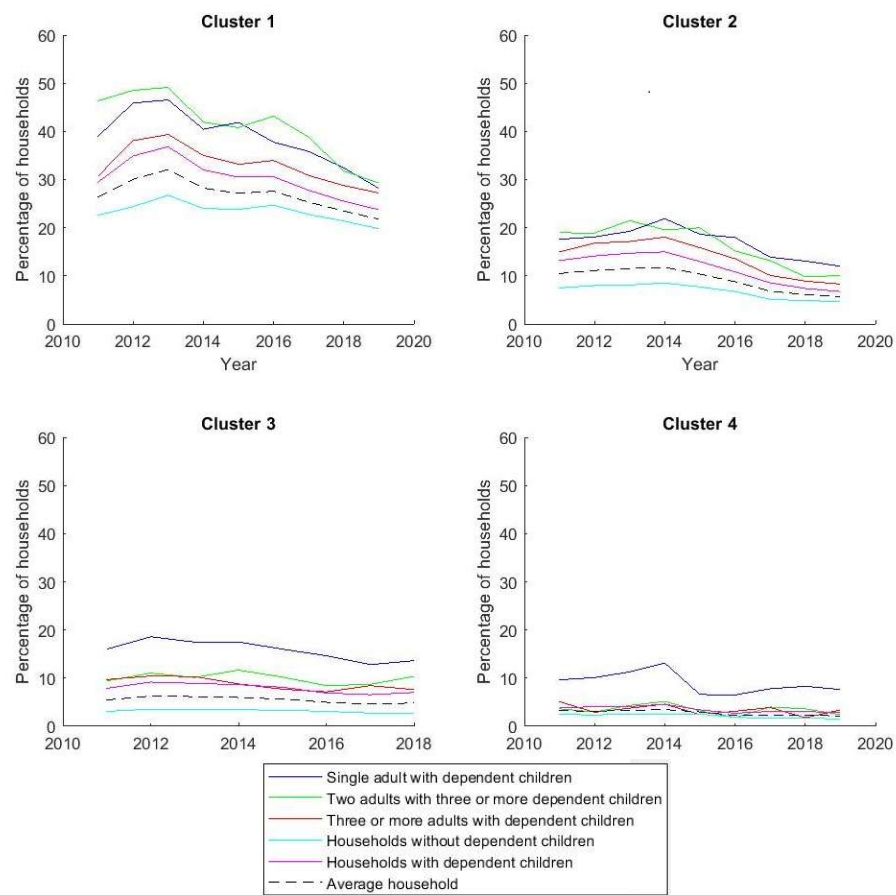


Figure 2. Arrears in utility bills for different household types, in the four energy poverty cluster areas defined by Recalde et al.⁴¹ between 2011 and 2019

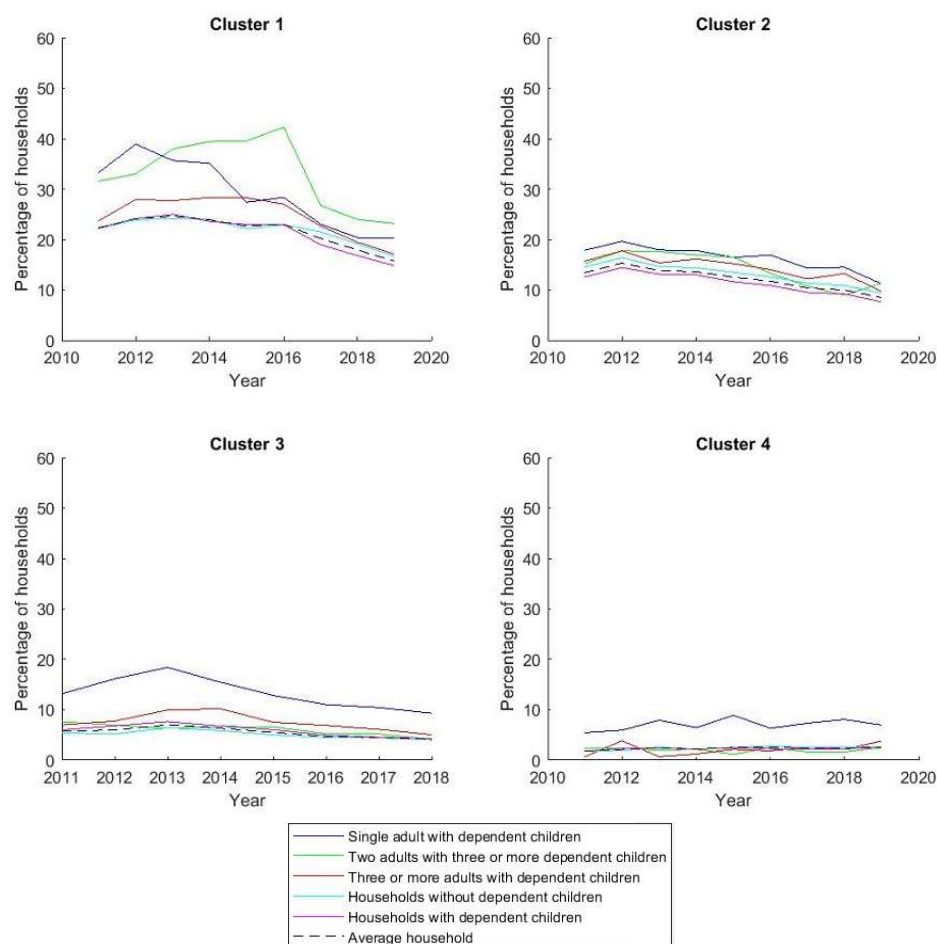


Figure 3. Inability to keep home adequately warm for different household types, in the four energy poverty cluster areas defined by Recalde et al.⁴¹ between 2011 and 2019

This analysis yields a number of relevant considerations. First, significant differences exist in the incidence of energy poverty across the four different clusters, with the Nordic countries of Cluster 4 showing energy poverty rates below 5% and the Southern and Central Eastern Europe countries of Cluster 1 reporting incidence often above 20% of the population. It can also be observed how clusters 1 to 3 show a decreasing trend in both indicators between 2011 and 2019, while cluster 4 shows some small fluctuations from a constant base. Such trends are consistent with declining energy poverty rates in most parts of Europe, especially in the periphery member states of Southern and Central and Eastern Europe (Clusters 1 and 2). It can be said that, in general, instead of converging, the lines

representing the different family typologies evolve in parallel, which can be explained by the lack of specific policies addressing the specificities of each group.

All clusters indicate that the incidence of energy poverty is higher among some household categories with dependent children. Specifically, categories 'single adult with dependent children' and 'two adults with three or more dependent children' report energy poverty rates that often double average scores for each cluster. Households with dependent children seem to have a higher tendency to declare arrears on utility bills (Fig. 2), while the percentages of families reporting inability to keep their homes warm (Fig. 3) appears to be lower. Although further study of this behaviour is needed, this analysis supports prior studies on coping strategies which point to a tendency amongst families with children to prioritise reaching a comfortable temperature even if debts are incurred or other sacrifices made, such as reducing food intake^{36,42}, leisure expenditure or extreme food cost management.

Furthermore, according to the data, one of the factors influencing the risk of being in energy poverty during childhood is household composition. As a matter of fact, the percentage of single-parent households with arrears on utility bills and inability to keep the house warm is higher than that of average households in almost all EU countries (Fig.1). This higher risk among single-parent households has been also confirmed by recent literature on intersectionality in energy poverty data. These studies found a strong association between single-parent households and being in arrears on utility bills⁷, which also highlights energy poverty as a gendered form of material deprivation as previously noted by several authors^{6,9,13}, since a majority of single parent households are headed by women (78,6% in 2019)⁴³.

Disaggregated data also point to a higher risk of energy poverty among larger families (i.e., children in households with three or more siblings) especially in Romania, Bulgaria and Greece. Also, in at least 16 countries (as detailed in supplementary information), a risk can be identified concerning intergenerational households (three or more adults with dependent children). Countries like Croatia, Bulgaria, Malta or Slovakia, where intergenerational households are more common, show concerning outcomes regarding arrears on utility bills.

It is necessary to acknowledge that households take more forms than the ones highlighted by EU-SILC statistics and that family structure may -amongst other factors- aggravate experiences and vulnerability to energy poverty. In this sense, more research is needed to identify associations between household composition and the different impacts experienced. Even if this analysis is outside the scope of the paper, it is relevant to understand in which family structures, among the data available, we find a mismatch between household typologies showing a worse performance according to energy poverty indicators and household typologies effectively targeted with energy poverty policies.

5. Public policy outcomes

Considering the emerging evidence on the distinct nature of childhood energy poverty, a third strand to our analysis is necessary to assess the extent to which public policies acknowledge these groups as being at higher risk of energy poverty and propose measures to alleviate it. Energy poverty policy making occurs at different levels (national, regional or local). Our analysis therefore attempts to cover the different levels, starting with an overview of the energy policy commitments that the various European states have set out in their NECPs. Therefore, we will provide the context in which they situate -if they do so at all- energy poverty regarding children.

5.1 National Energy and Climate Plans (NECPs)

NECPs were introduced by the Regulation on the governance of the energy union and climate action (EU)2018/1999, agreed as part of the EU's 'Clean energy for all Europeans' policy package adopted in 2019. Even if energy poverty is covered to some extent in most of the plans, they demonstrate multiple and diverging interpretations of the problem^{44,45}. In fact, although NECPs are required to address energy poverty mitigation, a significant number of them fail to do so or only commit to designing future strategies. For the most part, they still do not provide an assessment of the number or type of households affected by energy poverty, and many lack specific targets and objectives.

For the purpose of this article, we have analysed the final versions of 28 NECPs submitted to the European Commission at the end of 2019 using a keyword search system, as explained in the methods section, to find out how often and in which way they refer to children. We differentiate three approaches here, associated with the energy justice framework 46,47: if they acknowledge specific impacts on children (recognition justice), whether specific measures for families with children are detailed (distributional justice) and in which ways children or young people have been consulted or informed during the elaboration of the document (procedural justice). Results are shown in table 1.

	Acknowledgment of specific impacts on children / families with children	Support measures or programs targeting families (highlight when mentioning children is specified)	Children or young people consulted or informed
Austria		<i>Support instruments for families. Not children specific.</i>	
Belgium	Pollution impacts on children Single-parent family is a risk factor for EP	<i>Energy loan to save energy. Not children specific.</i>	Opinion from Flemish Youth Council gathered
Bulgaria		<i>Targeted Heating allowance during cold months. Not children specific.</i>	
Cyprus	Large families with low income as vulnerable customers of electricity.	Benefits for large families with low incomes	Workshops and bilateral meetings with youth organisations
Czech Republic	Pollution impacts on children's health	<i>Housing allowance. Not children specific.</i>	
Denmark		Special supplementary housing benefit. Large families mentioned.	
Germany		Infants as special circumstance against supply disconnection due to payment arrears	
Hungary	Large families living in single-family houses in small municipalities as a vulnerable consumer group	Subscription based electricity connection scheme for at least one room in families with small children.	Establishing an energy and climate literate society focusing on younger generations

Ireland	A study from C.Liddell cites on the impacts of energy poverty on children	Energy efficiency retrofits improve health, particularly prevalent among children. Programs targeting lone parents with young children .	
Italy		Electricity and gas social bonus favouring larger families (more than three dependent children)	
Latvia	Pollution impacts on children's health	Electricity for a reduced rate for families taking care from a child with disability and large families .	
Lithuania	Energy poverty affects children, single parents.	<i>Reimbursement of domestic heating and water costs. Not children specific.</i>	
Luxembourg		<i>Energy benefits: Allocation de vie chère et première énergie. Not children specific.</i>	Students actively involved in the consultation
Malta		<i>Energy benefits Not children specific.</i>	
Portugal	Energy poverty impact school performance and social isolation of young people	<i>Automatic recognition system to assign social tariff. Not children specific.</i>	Make young people aware of climate change / air quality.
Romania		<i>Home heating grant. Not children specific.</i>	
Slovakia			Raising energy efficiency awareness among children and young people .
Slovenia			Open call to young people to be involved in the NECP process.
Spain		Social energy bonus. Particular attention to households with children .	
United Kingdom	Wales vulnerable household when there is a child or young person under 16	<i>Different regional approaches Not children specific.</i>	

Table 1. Analysis of 28 final NECPS delivered by EU countries + UK for evidence of its references to children. Bold fonts refer to children being specifically mentioned and italic fonts represent the existence of support measures or programs targeting families without children being specifically mentioned.

Of the 28 reviewed NECPs, there are eight which do not mention children or families in their energy poverty assessments or current public policies. In fact, only nine recognise to some extent the specific impact of energy poverty -or pollution- on children, or emphasize the vulnerability of certain family typologies such as larger families (Cyprus, Hungary) or single parent families (Belgium and Lithuania). Only Wales in the UK acknowledges any household with a child under 16 as a vulnerable family.

Regarding support measures targeting families, even if the majority of the countries mention policy support instruments for households in energy poverty, only eight of them identify children - always in the context of their household - as beneficiaries. Support for large families is specified in five of these countries, while lone parents are only mentioned in one (Ireland).

Concerning children's involvement in policy development, only four countries refer to gathering young people's views in the elaboration of the document, while three allude to the future involvement of children or young people in energy and climate subjects.

Special mention should be made of the NECP for the Netherlands, which refers to child poverty, while stating that energy poverty is only one aspect of this, and pointing out that this needs to be addressed by broader social policy. Following previous research outcomes^{44,48}, this approach is another manifestation of mis-recognition overlooking the fact that energy poverty can affect different households to those in poverty more broadly and has distinct drivers that are also different from those associated with poverty, although there is some overlap. This lack of recognition risks ignoring children in energy poverty because of a bias in its definition.

5.2 Policy case studies

Considering that the NECPS mostly provide a state-wide overview of energy poverty definitions, measurements and policies, it is necessary to deepen our assessment to include a more detailed analysis of other national and regional approaches involving energy policy and children. In order to do so, we will look at three different policy instruments -national or regional strategies, financial and support schemes, energy supply protection- in Spain

(and Catalonia), Ireland and the United Kingdom (specifically Scotland and England). These regions and countries have been identified as those having advanced energy poverty policy developments which contain child-specific measures.

5.2.1 National and regional strategies mentioning children

European countries work at different speeds in terms of progress towards official strategies to alleviate energy poverty. The UK, which has a long history of recognising energy poverty as a distinct policy issue, published the first Fuel Poverty strategy in 2001 that recognised the specific impacts of cold homes on children. However, the 2001 strategy indicator based on Boardman's 10% expenditure vs. income rule didn't use equivalised incomes, so it underestimated the risk of families with children suffering energy poverty. The succeeding 2010 strategy introduced equivalised incomes and mentioned children as a specifically vulnerable group to the effects of energy poverty; however, children's references still appeared to be rather symbolic⁴⁹ and not accompanied by specific policies.

England's 2021 fuel poverty strategy, *Sustainable warmth: protecting vulnerable households in England*, reinforces the association between vulnerability and being younger than school age, which only targets a specific group of children. The prior 2015 strategy, *Cutting the cost of keeping warm*, committed to monitor children under 16 in energy poverty as a key indicator, mainly based on energy efficiency of their home, neglecting a range of other drivers of energy poverty proven to affect children. It is significant that progress on recognition of and distinct impacts on children has been non-linear, as the 2015 strategy makes a stronger commitment to monitor the impacts on children than the 2021 strategy does.

The Scottish Fuel Poverty Act, supported unanimously by the Scottish Parliament in 2019, explicitly mentions household childcare costs in its definition and has gone through a Child Rights and Well-being Impact Assessment. This Assessment looks at how the Fuel Poverty Act takes into account children's interests and how it may affect children, providing an estimate of the number of children -and children with long term illnesses or disabilities- affected by energy poverty. Nonetheless, no children or young adults directly responded to

the online consultation process and the Assessment was conducted by organisations that work with or represent children.

As for Spain, its 2019-2024 *National Strategy against Energy Poverty* recognises the special vulnerability of children to energy poverty and provides data disaggregated by family composition in its four headline indicators based on the European Energy Poverty Observatory's (EPOV) recommendations.

None of the strategies examined provide data focused on the percentage of children in energy poverty nor outlines specific policies or strategies targeting this group, despite defining them as vulnerable. As far as children being involved in policy making or even being consulted, there is no evidence of this whatsoever in the energy poverty policy development process.

5.2.2 Policy instruments targeting children

Here we consider how children are targeted in energy poverty policy. We are interested in the extent to which energy poverty policy making involves or even considers child participation, as well as when it recognizes children themselves (children-oriented) rather than locating them within their familial context (family-oriented). For this purpose, we adapt the conceptual framework proposed by Daly (2020)⁵⁰ in her studies of EU policy developments and children rights and entitlements, summarized in table 2. We start from her description of the general categories children-oriented and family-oriented to classify the public policies studied, as shown in table 3.

		Children-oriented	
	Family-oriented	Children-centred	Children-focused
	Primary focus	Adults	Children and adults Children and adults
	Direct or indirect engagement with children	Indirect	Direct recognition of children as a direct group with needs Direct recognition of children as capable of defining their own needs
	The entitlement	Income support for family	Resources- income and services Resources (income and services) and participation
	The desired outcome	Sufficiency of family income	Recognition and resourcing of children Children's empowerment

Table 2. Adaptation from Daly's three social policy approaches to children⁵⁰

	<i>Financial /Support schemes</i>	<i>Supply protection</i>
<i>Children focused</i>	Child Winter Allowance (Scotland) Warmth and Well-being Scheme (Ireland)	Disconnection forbidden in families with social bonus and children under 16 (Spain) Energy dependent status (Catalonia)
<i>Family oriented</i>	Social Bonus (Spain) Cold Weather Payment, Warm homes discount (UK)	Priority services register (UK)

Table 3. Classification of energy poverty policies on the basis of the adaptation of Daly's three social policy approaches to children

Concerning policy instruments, there is significant emphasis within the case study countries on providing financial assistance to households in energy poverty in the form of cheques or discounts on bills. For instance, the social bonus in Spain offers a direct discount on the electricity consumption part of the bill. The income thresholds to access the social bonus increase according to the number of children living in a household, but families with three or more children have direct access to it without any income restriction. This calls into question the principle of universality, suggesting that some children are more deserving than others, depending on their family composition. It also ignores the evidence⁷ that single parent households are disproportionately affected by energy poverty.

Regarding the UK, financial instruments include; the Winter Fuel Payment, oriented mainly towards older people; the Cold Weather Payment, active when temperatures under 0° C are reached for seven consecutive days and targeting - among others - disabled children and children under five; and the Warm Homes Discount, which again prioritises older people in its core groups but low-income families may be eligible in a limited broader group budget.

Scotland has also a financial scheme to support disabled children in energy poverty, the Child Winter Heating Assistance, introduced in 2020. To qualify for the assistance, children should also qualify for the highest rate of the care component of Child Disability Payment, the highest rate of the care component of Disability Living Allowance for children or the enhanced daily living rate of personal Independence Payment and be under 19 years old. This policy targeting disabled children is consistent with recent research findings stating the need for more energy policy acknowledging disabled people's specific needs⁸ and it is formulated based on the child as a subject rather than the family.

A remarkable approach tested in Ireland is the Warmth and Well-being Scheme in Dublin, which prioritises financial support to improve energy efficiency in households with children under 12 years with a respiratory condition and where their guardian is in receipt of fuel allowance or a single parent benefit. This programme highlights the situation of single

parent families, is addressed to the children as subject of the benefits, and is consistent with research findings that cold home negatively impact the respiratory health of childrens⁵¹.

There are also public policies in the above-mentioned countries that aim to protect access to electricity for vulnerable children in energy poverty. Spanish legislation, for instance, bans disconnections from the electricity supply in homes benefitting from the social bonus with children under 16 years of age. While it is true that in order to obtain this protection the family must be in receipt of the social bonus - which is advantageous for large families - the need to protect the supply for all children under 16 years of age is a noteworthy addition.

Specifically, in Catalonia the law 24/2015 (art. 52) forbids disconnection of families below a certain income threshold, which increases according to the number of children living in the house. Also, the public health care system can provide an energy dependent status to any child (or adult) with disabilities or illnesses requiring continued energy services; this status prevents them from being disconnected.

Regarding the UK, energy suppliers and network operators provide families with children under five with access to the priority services register, which ensures support to families in case of planned cuts and priority support in emergencies, among other benefits. However, access this register is not automatised, so it is up to the families to be aware of its existence and to proactively request it.

It is essential to highlight that no public energy policies were identified which could be classified under Daly's category of children-centred, as none include the perspective that children are capable of deciding on their own needs, none involve children in the definition of the policy and none consider children's empowerment. Ultimately, the analysis corroborates that public energy policies mostly take a family-centred approach and when they do take a children-centred perspective, they fail to design policy from children's own perspective and needs.

6. Conclusion and policy implications

A major difficulty in analysing the interactions between energy poverty and childhood, especially how it is addressed (or not) by public policy, is the lack of sufficient data to identify children actually living in energy poverty which represents a failure in itself. Notwithstanding this, a growing body of research warns us about how domestic energy deprivation can have specific impacts on children's physical health, mental health and educational development^{11,18,25,27,30,33,34}. More effort is therefore needed to generate specific data on children that reflects their particular situation and not only in relation to their family composition. For example, coordinate with education and health services to broaden the detection of child energy poverty and deepen the study of its impacts or increase efforts to develop indicators that draw on children's own views and experiences rather than through their main breadwinner. Specific data on children would also allow an intersectionality perspective in its analysis, essential to the generation of appropriate public policy.

In fact, the majority of references to children in public policies are family-oriented, in the sense that they aim to improve the well-being of a specific type of family, namely large families in many countries. In relation to this, we detect inconsistencies between energy poverty data disaggregated by family type - which tend to show a higher risk among single-parent families - and public policies on energy poverty targeting larger families. In this case, public policies should take more account of the association between fuel poverty and single-parent families and generate specific policies in this regard.

In addition, financial assistance aimed at alleviating energy poverty in families often relies on households being eligible and claiming for it. Children are dependent on adult caregivers to improve their situations and suffer where families are ineligible or do not claim what they are entitled to. Initiatives such as the automatic social bonus in Portugal may be an option to remove this barrier to accessing subsidies.

Probably the most salient conclusion of this study is that despite the long-term impacts of energy poverty on children now being recognised, as well as the need for child-centred policies and investment¹⁷, such policies are still lacking in practice. Children tend to be mostly seen as passive subjects in energy public policy, and are not involved in its

development. Future policy should target them directly, as active citizens able to be involved in policy generation related to issues affecting them. That is to say, as the UN convention on the Rights of the Child (1989) foundational principles implied, that children of all ages must be recognised in energy poverty policy making as valid agents with right to speak and to be heard, and ultimately it is the responsibility of adults to provide adequate spaces and overcome possible barriers of language, expression or thinking patterns throughout the different stages of childhood⁵².

Data availability statement

The EU-SILC indicators that have been used for the analysis are publicly available at Eurostat webpage

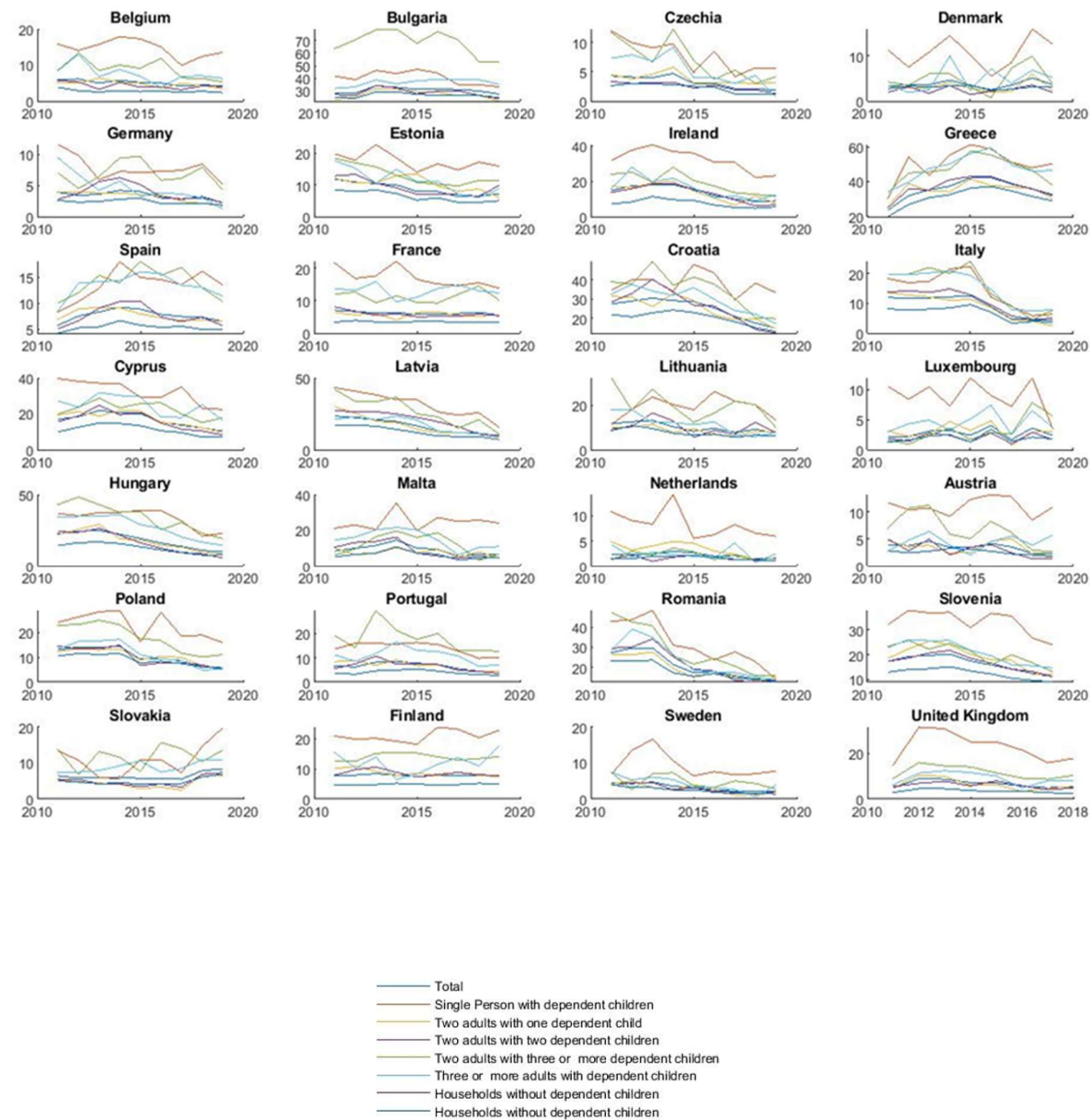
(https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdes01&lang=en and https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdes07&lang=en).

The policy documents consulted are also publicly available at https://ec.europa.eu/info/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en.

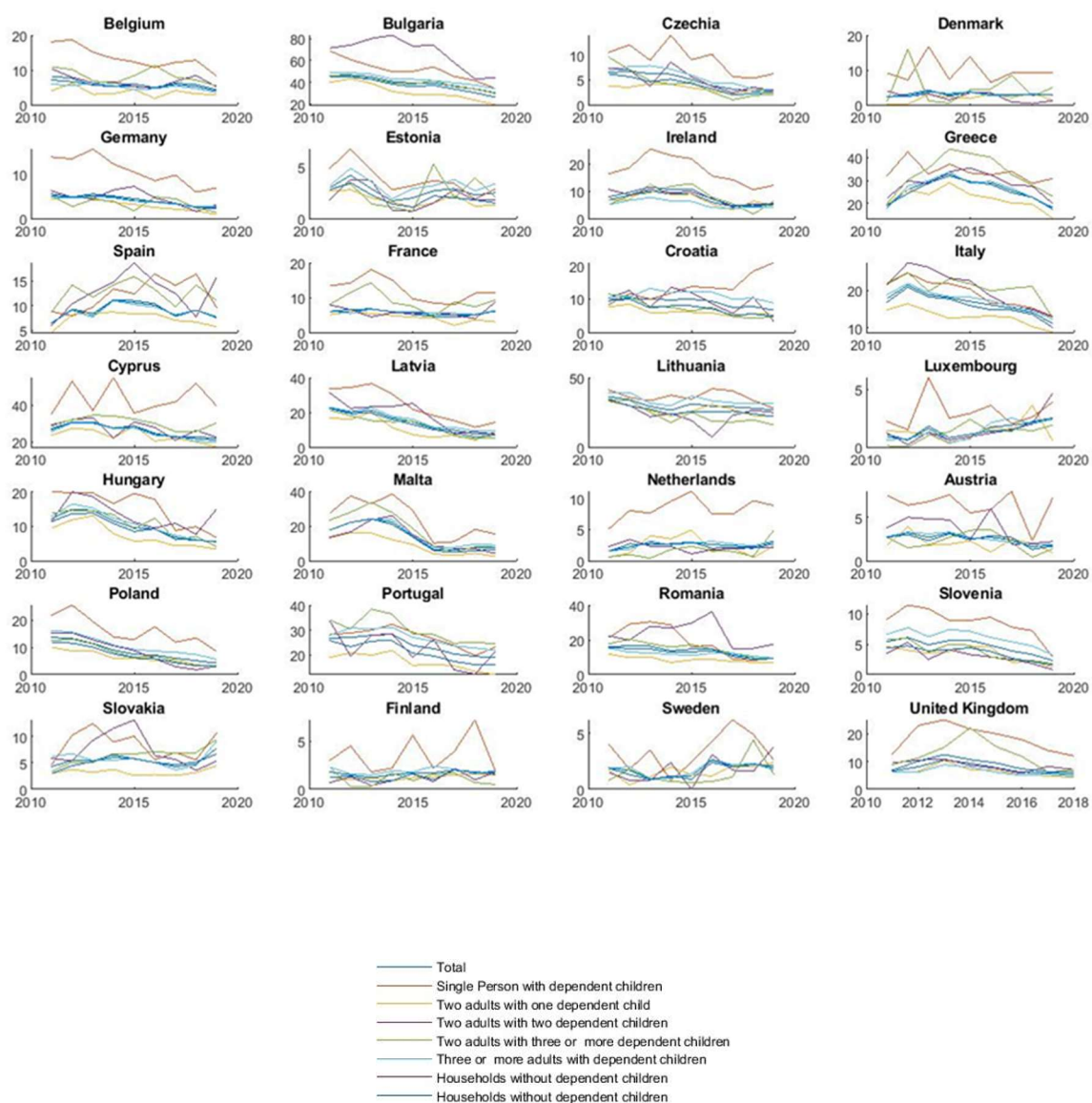
Ethical compliance

We have complied with all relevant ethical regulations and we have also gone through an Ethical Application procedure at Sheffield Hallam University, which has received approval on 27/07/2021. We have also obtained informed consent from all the participants.

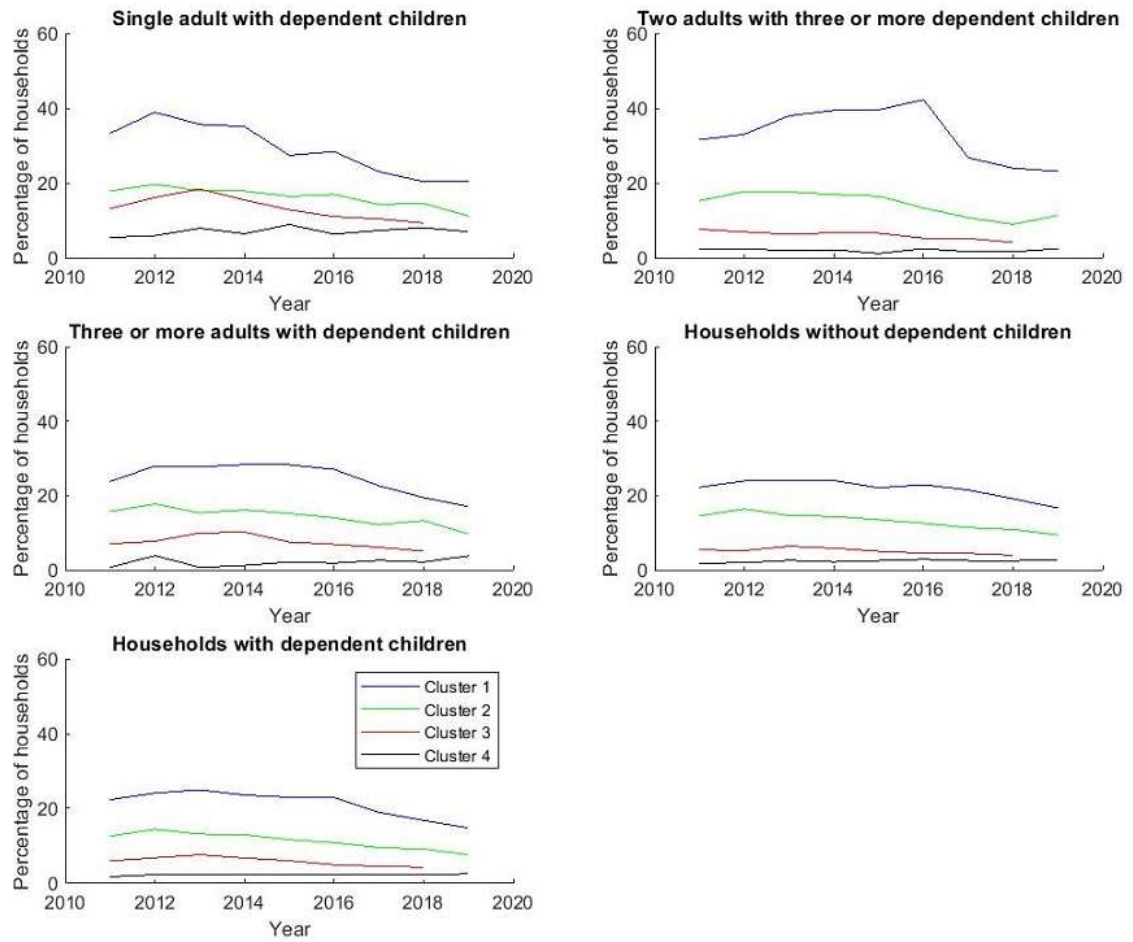
Appendix



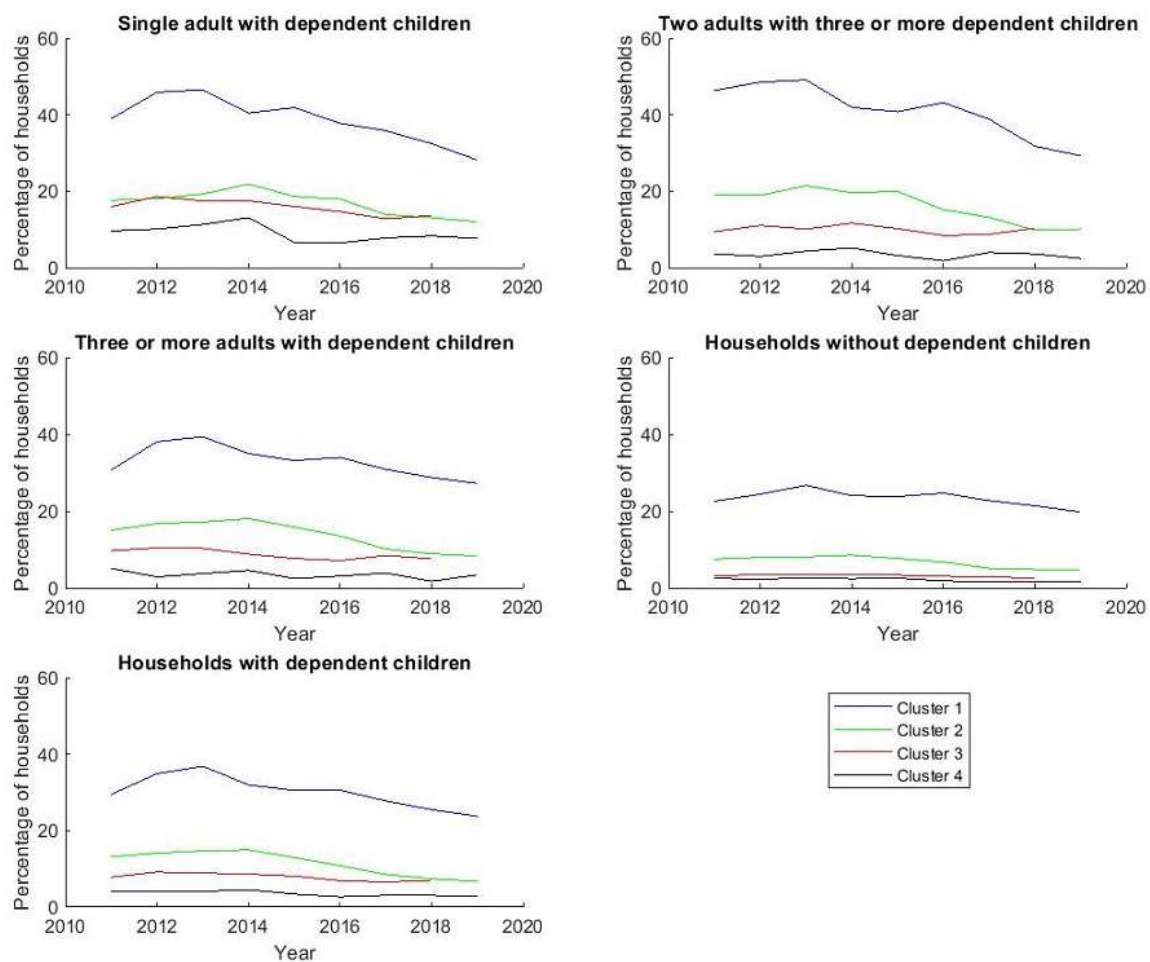
Arrears in utility bills for different household types, in the 28 countries that by the end of 2019 formed the European Union. Data between 2011 and 2019



Inability to keep warm for different household types, in the 28 countries that by the end of 2019 formed the European Union. Data between 2011 and 2019



Inability to keep home adequately warm for different household types, in the four energy poverty cluster areas defined by Recalde et al.⁴¹ between 2011 and 2019



Arrears in utility bills for different household types, in the four energy poverty cluster areas defined by Recalde et al.⁴¹ between 2011 and 2019

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Appendix C: Article 3

Children's Voice: exploring children's perceptions of energy poverty in Barcelona

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Abstract:

Energy poverty remains a critical barrier to achieving sustainable and equitable energy transitions in Europe, yet the voices of those most affected—particularly children—are rarely included in research or policy. This study investigates how children perceive and experience energy poverty in Barcelona, a Mediterranean city facing rising social and climatic vulnerabilities. Adopting a mixed-methods design, the research combines quantitative data from the Survey of Children's Subjective Well-being in Barcelona (n = 3,742; ages 10–11) with qualitative insights from participatory, arts-based workshops involving children aged 6–12. Guided by frameworks of energy justice and care ethics, the analysis explores how children articulate energy deprivation, its emotional and social impacts, and their visions for change. Findings reveal that 4.4% of children report feeling cold at home and 12% report overheating, associated with lower life satisfaction, health, and material well-being. Qualitative evidence shows that children conceptualize energy poverty as an absence—of light, safety, and comfort—rather than simply as financial hardship, linking it to care, fairness, and collective responsibility. Their proposed solutions, including community energy infrastructures and fair pricing policies, reflect a relational and justice-oriented understanding of energy as a shared public good. The study demonstrates the importance of recognising children as knowledgeable social actors in the energy transition and calls for care-informed, participatory policies that integrate children's perspectives to ensure that sustainable energy systems are also socially just and inclusive.

Keywords

1. Energy poverty
2. Children's perspectives
3. Energy justice
4. Care ethics
5. Sustainable energy transition

Introduction

Energy poverty has been widely studied in recent years, particularly as it has become a crucial issue in both the social crises following the pandemic and the energy crisis triggered by the Ukraine war ¹. In Europe, energy poverty is a significant concern, affecting 47 million people who struggle to keep their homes warm and afford basic energy needs (Eurostat, 2022). This challenge is increasingly tied to the broader issue of climate change, as rising global temperatures and environmental shifts drive higher energy demand and supply disruptions ². Therefore, addressing energy poverty is not only a matter of health, economic fairness, and social inclusion for current and future generations but also a critical component of tackling the climate crisis and promoting social equity for generations to come ³. Additionally, we are in the midst of an energy transition process that aims to leave no one behind while facing the major challenge of including those currently excluded from energy services.

Besides, we are aware that energy poverty has a greater impact on certain population groups, such as older people, women, single-parent families, unemployed people, and children ³⁻⁵. Specifically, children will not necessarily be aware of the exogenous factors influencing energy poverty dynamics. Still, they may experience shifts in how they access energy services as a result of financial or climate struggles, among other things ⁵⁻⁷. Children are also a particularly distinct population group, their lives being dependent upon caregivers and their future shaped by the care they receive. The ability to care is undoubtedly impacted by access to energy services and the duty of care assumed by those who mediate access to energy services, including governments and private companies. Access to adequate care enabled by energy services is a crucial determinant of health, well-being and social inclusion.

Children's distinctive positioning within energy poverty dynamics means they will have unique insights on the matter, and yet, scant academic research engages directly with children to understand their perspectives and experiences of living in energy poverty ⁸. Therefore, this study aims to address this gap by achieving the following aims:

- 1) to share novel insights into children's lived experience of energy poverty and impacts on subjective well-being through a case study (quantitative and qualitative data) of Barcelona.
- 2) to use these experiences to explore how care is impacted by energy poverty and explore the hypothesis that an apparent absence of care inherent in energy systems may lie at the root of this.
- 3) to demonstrate the value of exploring children's experiences of energy poverty and what new insight is gained by analysing them using the concept of care.

This paper consists of five sections, in addition to this one. A literature review contextualises the research within the relevant literature; a section outlining the methods applied and the data used; a characterisation of energy poverty in Barcelona and its impacts on children; a findings section and discussion of the results; and finally, conclusions and policy implications.

2. Literature review

2.1 Care as a holistic framework

Academic approaches to energy poverty have evolved in recent decades. From a mostly technical grounding, limited to considering household income, energy efficiency and energy prices, scholars from different disciplines have introduced health outcomes^{9–12}, the concept of vulnerability¹³, the importance of life experiences^{4,14,15}, the perspective of dignity¹⁶, and energy justice^{13,17–20}. These approaches have all contributed to the understanding of the multidimensional complexity of energy poverty²¹, highlighting the diverse causes and impacts.

There has also been a shift away from viewing energy-poor households as homogeneous, with increasing recognition of the distinct ways in which different households – and different people within a household – are affected. For instance, research has been conducted on gender, the elderly, single-parent families, and disabled people^{4,22–27}, recognising differential impacts and experiences of energy poverty between different social groups and members of a household.

From an energy justice perspective, recent studies have demonstrated that energy consumption patterns mirror social and economic inequities^{28,29}. Data from diverse contexts reveal that low-income households and disadvantaged communities often face insufficient energy access and related hardships such as anxiety, exclusion, and limited agency. Equally, excessive energy consumption by affluent households contributes to broader distributive injustices. Authors describe this gap using frameworks of energy justice that include elements of redistributive, recognition, and need-based interventions^{30–32}, and moving forward towards broader frameworks as energy equality³³ as *"providing all individuals with equal opportunities to use energy services, energy technologies, and consuming energy and embodied energy to satisfy personal needs and holding capabilities"*³⁴.

Some recent studies also build on the importance of social relations³⁵ and complex analysis of energy poverty to provide a framework that goes beyond the scope of individuals, engages with rights and introduces the importance of unequal vulnerabilities, distributions of power and responsibilities³⁶. This might be understood by care ethics, for instance, as caregivers being dependent on energy systems to meet caring needs of others, *"their ability to care is also contingent upon their access to public institutions, social infrastructure like health, basic energy access etc., filtered through gender, ethnicity, and bodily abilities among others"*³⁷.

We argue that this framing is complementary with distributional perspectives when focusing on energy poor children because of its capacity to highlight relationships within households, revealing how people can exercise care for themselves and their dependents, and how they are often dependent in turn on public institutions and infrastructures (for income, healthcare, energy provision, and so on)³⁷, in ways that are refracted also through age. So, not placing the burden of responsibility on the household (with all the implications of energy-related caregiving in the home)

but referring instead to structural, system-level inequalities in energy and housing provision. Moreover, this perspective addresses the need to recognise the caring responsibilities of organisations, authorities and consumers³⁸.

A care perspective also recognises the role of children in the energy system, their dependence on caregivers, but also how energy is embedded in their daily lives and future expectations and outcomes, their specific energy needs and their reliance on public and energy providers and the extent to which they act based on care³⁸.

2.2 The impact of energy poverty on children

A strong body of research has been developed regarding the specific effects of energy poverty on children, highlighting concerns related to physical health^{10,11,39–48}, mental health^{5,10,49–53}, educational outcomes, and safety^{5,42,53,54}. Energy poverty during childhood can have lifelong consequences⁵⁵, impacting children's future opportunities.

In addition, the impacts of climate emergencies, such as extreme temperatures and droughts, contribute to aggravating both energy availability and energy poverty. Climate uncertainty has a particular impact on children, both because of their vulnerability and their increased likelihood of future exposure. Energy poverty in summer, or the difficulties of cooling the home in the face of increasingly persistent high temperatures, is a growing problem in many regions of the globe^{56–59}. Children are known to be more likely to be affected by respiratory disease, renal disease, electrolyte imbalance and fever during persistent hot episodes⁶⁰.

Moreover, it is not only the impacts that need to be taken into account; children also have specific energy needs, which change as they grow, and must also be considered when designing energy policies. These can be specific needs in their environment (e.g., for education, play, and social inclusion), or also in connection with children-specific energy vulnerabilities in domestic space (e.g., thermal comfort needs for children of different ages)⁶¹.

However, childhood also plays another role in energy services that is often overlooked. Studies^{62,63} have shown that they can contribute to promoting more efficient energy consumption habits in households and thus contribute to the reduction of consumption and the energy transition process.

Thereupon, despite a growing interest in research on the multiple aspects of childhood energy poverty, children's active participation in such research is still scarce, and their role is largely confined to that of objects of study, overlooking their subjective perception of the issue and lived experience.

2.3 Children have their say: child participation.

Children in energy poverty are misrepresented in research and as potential participants in social and political life concerning energy decisions²⁰. However, Article 12 of the Convention on the Rights of the Child by the UN General Assembly (1989) states their right to be heard in all matters affecting

them and to be taken seriously when expressing their views. Also, it has been recognised that children's participation promotes their development, better protects them and produces improved outcomes ⁶⁴, contributing in terms of rigour, ethics and quality to the research⁶⁵.

However, a recent policy brief issued by the European Fundamental Rights Agency still points at the limited implementation of children's right to be heard and the general lack of meaningful mechanisms allowing children to have a say in matters affecting them ⁶⁶. Children are experts in their own experiences and, therefore, any research that affects children but does not include children's voices is incomplete and overlooks a significant dimension of the phenomenon ⁶⁷.

From an energy justice perspective, including children as active actors in research contributes to addressing misrecognition, yet asking children about their views implies assuming them as competent actors ^{8,68}. Indeed, this study adopts the view that children are competent beings and key informants who can offer unique insights into their own perspectives and experiences ^{65,69}. This stance entails the adoption of research methods that enhance children's meaningful participation in research⁷⁰.

The researchers acknowledge that the notion of 'children's voice' is messy, situated in complex power relations between the child-participant and the adult-researcher ⁷¹. In addition, children express their concerns in different ways from adults, and this is complicated further by the myriad of factors that could influence children's participation, such as gender, age or origin. To address these concerns, multimodal, participatory research methods recognise how visual, gestural and kinaesthetic modes of communication play a key role in children's self-expression ⁷².

In sum, we argue that to advance the alleviation of energy poverty among children, it is essential to adopt a relational and care-oriented perspective that considers the relations and responsibilities of the various actors involved. This approach should also account for children's specific impacts and needs, and, above all, focus on their own experiences and subjectivities to addressing the issue with them, rather than for them.

3. Children, housing and energy services in the city of Barcelona

This section aims to understand the situation of children regarding energy poverty in the city of Barcelona, providing existing data and studies, as well as some guidelines on specific policy and resources regarding this issue.

According to the Municipal Data Office⁴, 14.4% (236,675) of the total population of Barcelona are children and adolescents aged 0 to 17 (OMD, 2022). However, the impact of childhood and

⁴ <https://portaldades.ajuntament.barcelona.cat/ca>

adolescence extends more broadly: four out of ten people in the city experience it directly, considering that 14.4% are minors and 23.4% are adults (18+) who live with them.

Energy poverty is a multidimensional phenomenon. The risk that a household faces inadequate access to energy services stems from multiple factors: characteristics of the immediate environment (dwelling, neighbourhood, city); the presence or absence of mitigating policies (e.g., social transfers, bans on disconnections, energy allowances); energy market conditions (prices); and household-level variables such as income and family composition.

Specifically, according to the Barcelona Children's Institute, children and families with children are greater risk of poverty than other households; 32,3% of the population aged 0-17 is at risk of poverty following the AROPE tax. Households with children are also three times more likely to face eviction and lose their homes. Moreover, public social policies are less effective for the 0–17 age group than for other groups: they reduce moderate poverty by only 7.8 percentage points (from 35.8% to 28%) and severe poverty by 8.2 points (from 21.1% to 12.9%)⁵.

Housing-related vulnerabilities are widespread. Among children and adolescents in Barcelona, 21.5% live in households overburdened by housing costs, 21.9% in households with arrears on housing-related payments, and 20% in homes that cannot be maintained at an adequate temperature (EMCV, 2021–2022). Strong territorial inequalities also exist ⁶ : children in neighbourhoods of Ciutat Vella, Sants-Montjuïc, Horta Guinardó, Nou Barris, Sant Andreu, and Sant Martí face the greatest vulnerability. The child poverty rate rises sharply when housing costs are considered, increasing by 16.5 percentage points (from 28% to 45.5%), with migrant and single-parent households most affected.

Low energy efficiency further exacerbates the problem. In Barcelona, 80% of buildings have an energy certificate of E or lower (Observatori Metropolità de l'Habitatge, 2022), reflecting the structural challenge of poorly insulated housing.

Children's and adolescents' perceptions confirm these structural trends. Preliminary results from the *Secondary School Risk Factors* survey (2021), which included 3,370 students (50.9% girls) from 2nd and 4th ESO, 2nd Bacallaureate, and CFGM levels, highlight the extent of energy poverty in their everyday lives⁷³.

⁵ https://institutinfancia.cat/wp-content/uploads/2023/07/20230701_DadesClau2022

⁶ <https://www.institutmetropoli.cat/wp-content/uploads/2023/01/Anuari-IERM-WEB2019.pdf>

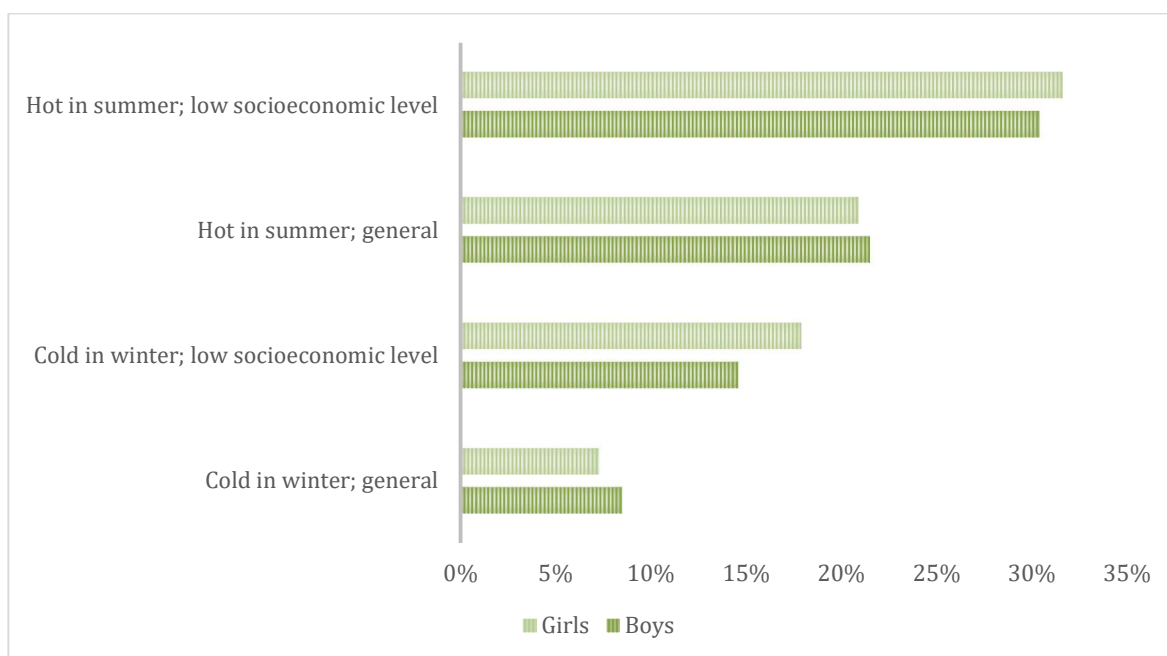


Figure 1: Percentage of Girls/Boys feeling always cold in winter or hot in summer, in relation to their socioeconomic level (2021)

As shown in Figure 1, 8.5% of girls and 7.3% of boys reported their home was always cold in winter, while 20.9% of girls and 21.5% of boys said it was always hot in summer. Inequalities by socioeconomic status were stark: in low-income households, 17.9% of girls and 14.6% of boys reported being constantly cold in winter, while 31.6% of girls and 30.4% of boys reported constant heat in summer.

Administrative data further confirms this pattern. In 2021, 43.3% of households assisted by the city's Energy Poverty Assessment Points were families with children.

Briefly, the majority of children in Barcelona live in energy inefficient houses, with high poverty rates, particularly in single-parent or migrant families. There are significant geographical and socioeconomic inequalities. Given teenagers' subjective data and Energy Poverty assistance rates amongst families with children, we can state that families with minors are at a disproportionate risk of energy poverty, amplified by the housing crisis and the increasing energy poverty challenges.

4. Methodology and Data



Figure 2. Workshops at the Casal del Raval, February 2021

This study is based on a mixed-methods approach, integrating quantitative survey data and qualitative insights from arts-based and collaborative workshops. This design aims to offer both the situation of children regarding the lack of energy services and a comprehensive understanding of their subjective well-being and their experiences with energy poverty in Barcelona.

4.1 Quantitative data collection

The quantitative data were drawn from the *Survey of Children's Subjective Well-being in Barcelona 2021*, conducted between September 27, 2021, and December 6, 2021, by the Barcelona Children's Institute (Institut de la Infància).

The survey collected direct responses from 3,742 children aged 10-11, 5th and 6th grade, in Barcelona. The schools were selected following a two-stage procedure. In the first stage, they were selected randomly respecting the proportion of children enrolled, residents in the city of Barcelona and the context of social vulnerability (variables provided by the Barcelona Education Consortium within the sampling frame). Each centre had two substitutes of the same typology (also randomly selected). The final units were class groups, in which all children in the group were surveyed. The gender distribution is self-represented because the sampled schools do not segregate by gender.

The questions included in the survey were previously validated through other known surveys, such as Children's Worlds, the Family Affluence Scale, and the Risk Factors in Secondary Schools Survey

Specific questions related to energy poverty in the survey include:

- Do you feel cold at home because you cannot afford heating?
- Do you feel hot at home because you cannot afford cooling?

4.2 Qualitative data collection

The qualitative data were collected through a range of multimodal, participatory research activities during arts-based workshops. In doing so, the researchers recognise that children's voices are not always verbal, and indeed seeking children's perspectives through a variety of activities is underpinned by the recognition that children express themselves in complex, multimodal ways ⁷⁴. The workshops were conducted with a group of 10 to 12 children, aged 6 to 8, from the El Raval neighbourhood, an area with a high prevalence of energy poverty. These workshops were conducted in collaboration with the Casal d'Infants del Raval charity from January to February 2021 and consisted of six sessions:

- Icebreaker games to establish a bond between the children and the workshop leaders
- Storytelling: "And Then There Was Light"⁷, a children's booklet on emotions and energy poverty
- Playmobil workshop with a house to understand the role of energy services in our daily life
- Arts and crafts activities
- Role-playing exercises
- Drawing and evaluation activities

During the workshops' implementation, several challenges were decisive, such as the difficulty of expression for most of the children, coming from migrant families, and, in some cases, particular difficulties of expression or comprehension. Also, the children's attendance at the workshop was inconsistent, so only 8 were able to participate in all the sessions. The workshops were recorded, and notes were also made during the execution. The children produced drawings in the final session, constituting also relevant data.

Additionally, two qualitative workshops were conducted with two groups of 25 students, each aged 11 to 12, from a public school in the Sants-Montjuïc district in Barcelona. These 90-minute collaborative workshops were organized in groups of four, with no prior explanation of energy poverty or the results of the prior related surveys. The discussions in these workshops focused on the following questions:

- What do you understand about the term "energy poverty"?
- How do you think you would feel if you were living in energy poverty?
- What suggestions would you offer to reduce energy poverty?

⁷ <https://www.fuelpovertyresearch.net/wp-content/uploads/2022/04/And-then-there-was-light-Irene-Gonzalez.pdf>

By combining these diverse methodological approaches, the research aims to capture both the subjective experiences and the broader social contexts surrounding energy poverty among children in Barcelona.

4.4 Ethics

Due to the specific characteristics of this research, which includes children from vulnerable backgrounds, ethical considerations have been an essential part of the methodology design. Regarding formal procedures, an Ethical Application procedure was approved by Sheffield Hallam University on 27/07/2021.

Based on this procedure, relevant aspects of ethics-in-practice have been taken into account. Specifically, in creating participatory spaces where children feel safe and have the option to participate actively or not according to their needs, taking into account the power hierarchy that can exist between adult researchers and children. Efforts have also been made to obtain informed consent from the participating children, as well as to inform their families and primary carers. The research is based on the premise that children are experts in their own experiences.

4.3 Data analysis

The data have been analysed through an integrated mixed-methods approach, combining descriptive statistical analysis of survey results with qualitative thematic analysis of children's contributions in workshops and drawings.

As for the quantitative survey data, descriptive statistics were used to calculate the prevalence of children reporting experiences of energy deprivation (e.g., feeling cold or hot at home) and their associations with indicators of subjective well-being, such as child material deprivation, life satisfaction, and perceived health.

Regarding qualitative data, a thematic analysis⁷⁵ approach has been followed, based on field notes during the workshops and children's creative inputs. Children's expressions were grouped into categories such as absence/presence of energy, emotional responses (fear, sadness, frustration), relational impacts (family life, community participation), and normative framings (fairness, collective solutions).

The integration of both datasets was carried out in two stages. First, survey results provided a broad quantitative picture of the prevalence and distribution of energy poverty among children in Barcelona. Second, the qualitative material enriched this understanding by offering children's subjective perspectives on how energy deprivation is experienced and what it means in their everyday lives. This combination allowed us to capture both the measurable impacts of energy poverty and the social, emotional, and ethical dimensions articulated by children.

5. Findings: Children’s Subjective Well-being in Barcelona concerning Energy Poverty

The following section aims to describe the findings from both quantitative and qualitative data, followed by a general discussion integrating both sets of findings.

5.1 Children’s Well-being Survey Analysis

Regarding the Children’s Well-being Survey analysis, we can state that 4,4% of children in Barcelona are always or often cold in their homes, while 12% feel always or often hot.

These figures mask significant disparities when examined alongside indicators of well-being and deprivation. The data suggest that energy poverty functions as both a material and psychosocial determinant of children’s welfare, influencing their comfort, security, and daily life.

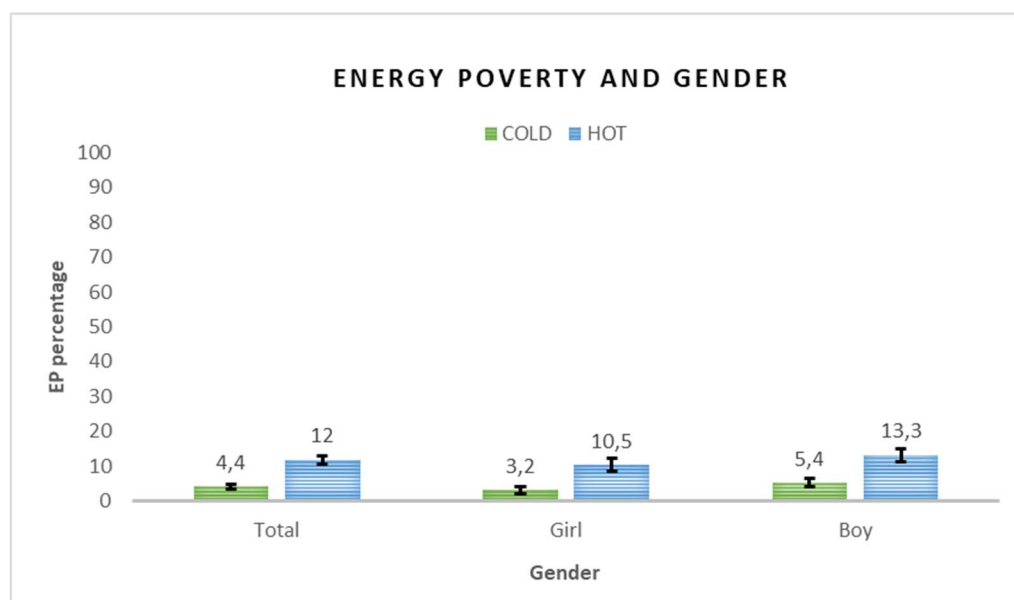


Figure 3. Children in energy poverty in Barcelona, 2021

These findings are different from the ones obtained by the Secondary School Survey, where 8.5 % of girls and 7.3% of boys report that their home is always cold in winter, and 20.9% of the girls and 21.5% of boys report that their home is always hot in summer.

In both age groups, the higher proportion of children affected by overheating compared with those feeling cold highlights a shifting seasonal pattern of vulnerability in Mediterranean cities. This suggests that summer energy poverty—linked to insufficient cooling, poor insulation, and rising temperatures—may be an emerging public health issue, consistent with recent evidence from southern European contexts^{56,57}.

As we can see in figures 3 to 5, energy poverty is related to children's material deprivation, low life satisfaction, and perceived poor physical and emotional health. These findings are consistent with the data obtained from caregivers and in the literature ³⁹.

More specifically, children reporting inadequate thermal comfort also exhibit substantially lower levels of life satisfaction and poorer self-rated health. This confirms that energy deprivation affects not only physical well-being but also emotional security and social participation. Such multidimensional effects have been documented in prior studies across Europe linking cold or overheated homes to stress, fatigue, and social isolation^{39,43,51}. The present results reinforce the understanding that energy poverty is both a symptom and a driver of wider inequality.

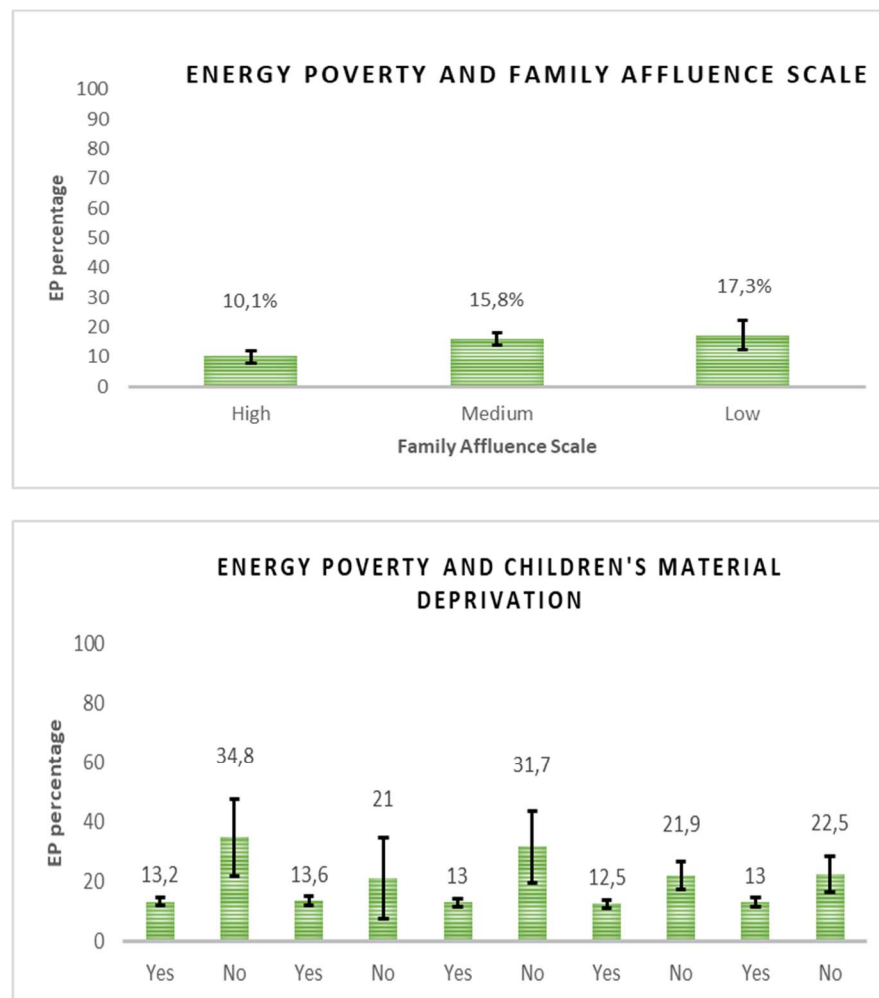


Figure 4. Energy poverty and material deprivation in children from Barcelona, 2021

Regarding socioeconomic conditions, we chose to prioritise children's material deprivation over the family affluence scale because it relates to the immediate children's environment, and is claimed to provide a more direct measure of poverty, allowing analysis at the individual level and not just at

the household level ⁷⁶. Yet, both indicators show a correlation between energy poverty and worsening conditions.

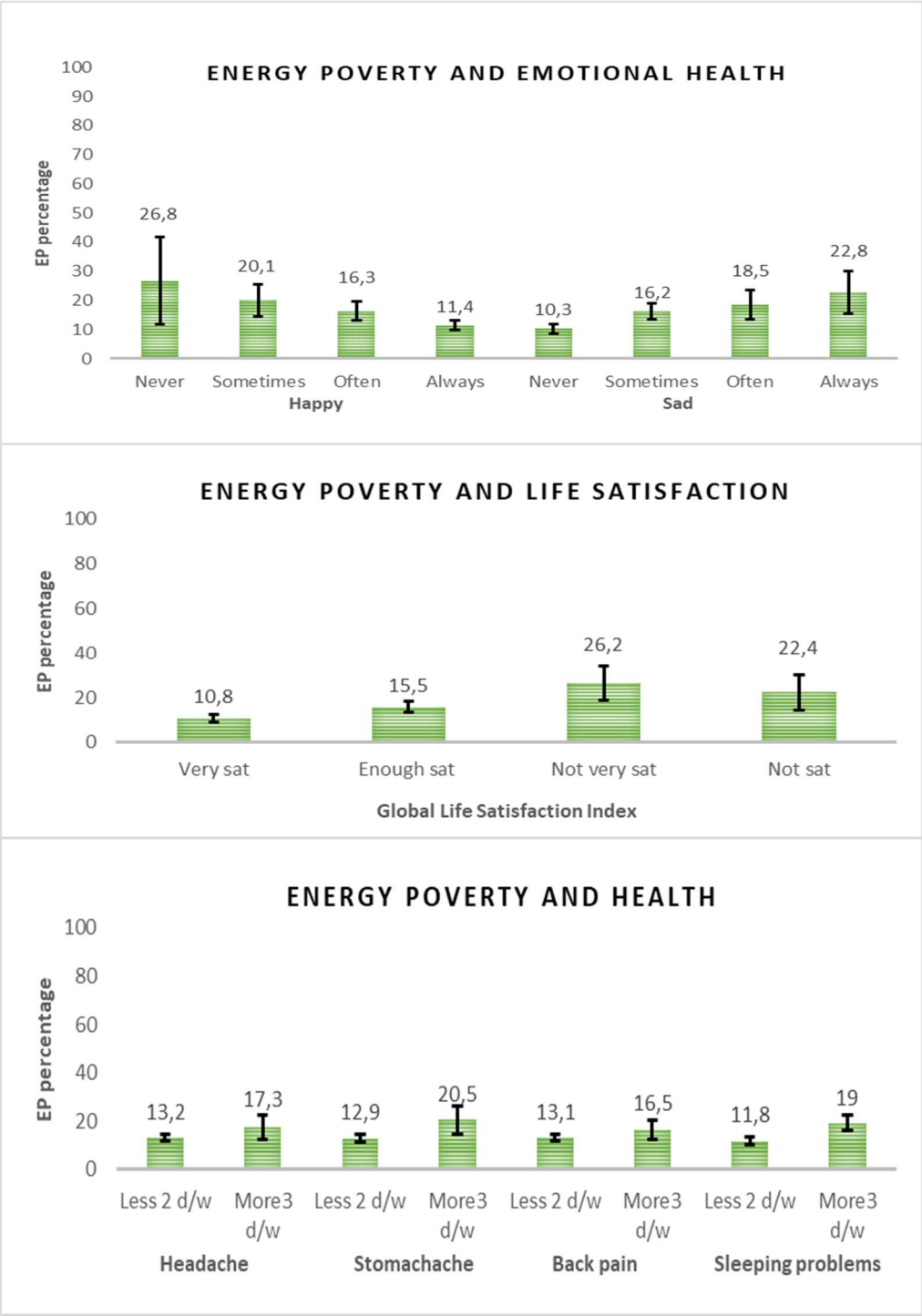


Figure 5. Energy poverty, health and life satisfaction in children in Barcelona, 2021

This methodological decision also contributes to a child-centred perspective by recognising that resources are not always equally distributed within households. The material-deprivation index

captures children's own experiences of lacking warmth, light, and comfort, which may diverge from adult perceptions. This approach aligns with emerging child-poverty research⁷⁷ and strengthens the argument for treating access to energy as a key dimension of children's rights and social inclusion.

In sum, the quantitative evidence from the survey reveals that energy poverty among children in Barcelona is not only an outcome of economic hardship but also a determinant of multidimensional disadvantage. Its effects intersect with health, emotional well-being, and the capacity to participate fully in social life. These findings provide a solid foundation for the qualitative insights discussed in Section 5.2, where children further articulate how energy deprivation affects their sense of care, dignity, and belonging.

5.2 Children's Workshops and Drawings Regarding qualitative methods, Table 1 shows the responses that each of the 12 groups of 4 or 5 children, aged 11 and 12, provided to answer the various questions:

- What is energy poverty for you?
- How would you feel in a situation of energy poverty?
- What proposals would you make to reduce energy poverty?

It is important to highlight that only one group associated energy poverty with people's resources for accessing energy, while the vast majority used phrases like "*small amount of energy*," "*poor quality energy*," or "*lack of renewable energy*." Additionally, one group noted the connection between energy and "*the ability to carry out daily tasks*."

This link between energy and daily life is reflected throughout the questionnaire in statements such as "*energy is necessary for life*", "*energy is like a shelter*", or "*light is everything*". This also translates into an expression of the negative impacts of supposedly being in energy poverty, which include expressions of anger, frustration, sadness, fear, insecurity, or more practical issues such as dirt, hunger, heat, cold or discomfort.

With regard to the proposals made to help alleviate energy poverty, several issues are revealing. On the one hand, eight groups mentioned the need to lower the price of energy, which suggests a majority idea that there is an imbalance between the necessity of energy and the economic price paid for it. From the statements of up to 7 working groups, the idea that everyone should have access to the necessary energy can be deduced, and it is linked to public or community issues, such as the local government and having infrastructures for community use (renewables, bicycles, community housing or shelters with energy).

There is also talk of very interesting concepts, such as good living conditions, access to 'minimums', the ability to 'live well' or 'it shouldn't be so difficult to live in good conditions. There is also a link with the idea of redistribution or equality, referring to balancing out those who consume the most, those consumptions that have no 'utility'. Two groups also mention the link with school, which is revealing since it is a space where they spend a minimum of 6 hours a day and which often does not meet the necessary thermal comfort requirements.

	What is energy poverty for you?	How would you feel in a situation of energy poverty?	What proposals would you make to reduce energy poverty?
1	Small amount of energy	Normal (I would look for other solutions) Electricity is necessary for life Concerned (would seek a solution)	The City Council to pay part of the bill The Generalitat should buy ceiling fans for schools.
2	Lack of renewable energy Energy with little force	I would feel sad, and it would complicate my life.	Providing better living conditions. Lower the price of electricity by 5%.
3	People without access to energy because they have few resources	Bad, seeing that others have too much and we don't reach the minimum. Limited, overwhelmed Powerless because of not being able to change the situation.	Charge a minimum so that everyone can live well. Everyone should have a home, and it should be easy to find. The municipality provides minimums (housing with services, jobs).
4	Small amount of energy	Unable to carry out daily tasks It would be very difficult to live without electricity Bad, useless in everyday life	Lowering prices across the board Giving away battery-powered fans for schools That electricity should not be so expensive Create community cases where electricity, heating or water are available. Energy improvements.
5	There is a low amount of energy to carry out daily tasks.	Dirty, without resources Hot/cold, hunger Fear (no night light) No money	Build a renewable energy source for the people who need it. Part of the money people earn should be used to pay for energy.
6	Small amount of energy	Sad, sorry, angry, different, poor, bored, insecure, as if something was missing.	Law to lower energy prices Cheaper energy Putting energy-generating bicycles on the street and in the schools.
7	Lack of energy Energy that is not of good quality	It would limit me to many things in everyday life.	Lower the prices of electric cars so that people can buy them.
8	Lack of energy Energy does not have electrons We are running out of energy	I would feel bad and poor; energy is like a shelter, and I would feel tired without having access to electricity	Stop wasting energy Lower energy price Have a more stable energy service Everybody should have access to light and good living conditions The city council should pay more attention It shouldn't be so hard to have good living conditions
9	There is a lack of energy	Poor, insecure, nervous, "light is everything", man from the caves	Make the electricity cheaper
10	Lack of energy Poverty created by energy	Bad	Make energy costs cheaper Create more energy jobs and build more energy infrastructure Spend less on useless things Have fewer household appliances with high energy demand Have energy limits, restrictions, as we do with droughts Make the richest pay more Invest more in energy and less in politics
11	Lack of energy	Not good, we would not have electricity services, and our lives would be more difficult. We wouldn't feel comfortable without electricity.	The Christmas tree in front of the City Council should keep the lights off during daylight. Using cheaper and renewable energy
12	Not enough energy	Poor, sad, angry	Energy should be cheaper and everybody should have access to it People consuming too much energy should consume less and everybody would have some

Table 1. Answers of 12 year old children regarding energy poverty in Barcelona, 2023

To complement the data collected in this research, it is also necessary to interpret the qualitative data obtained in the workshops with younger children from vulnerable socioeconomic backgrounds. As explained in the methodology section, in this case, and in order to adapt the proposal to the age of the children, a series of workshops were held on the issue of energy poverty, which sought to capture the different expressive abilities of children and their experiences in relation to it. They related their emotions and stories from their immediate life experiences.

Some of the outstanding contributions consider the relationship between energy and necessary daily activities such as caring for babies (*"we have a baby at home, babies need energy for everything"*), the functioning of the lift (*"it is very important to have energy because it is dark at night; also, a woman with a trolley cannot take the elevator and go home"*), internet access, etc.

Also, the relationship between fear and darkness is present, both in the contributions and in the final evaluation drawings in figure 6, in which darkness, sadness and fear are contrasted with luminosity, joy and strength. The relationship between light and social relations or leisure is interesting (*"I didn't have light at the house, nor my aunt, so we couldn't celebrate Christmas. We don't have internet access."*, *"Telephones are important, people are calling... Computers enable you to work, and you can see interesting stuff in the TV; with electricity, you can see, otherwise it is scary."*) as well as an early awareness of sufficiency (turning off the lights or not needing too many toys).



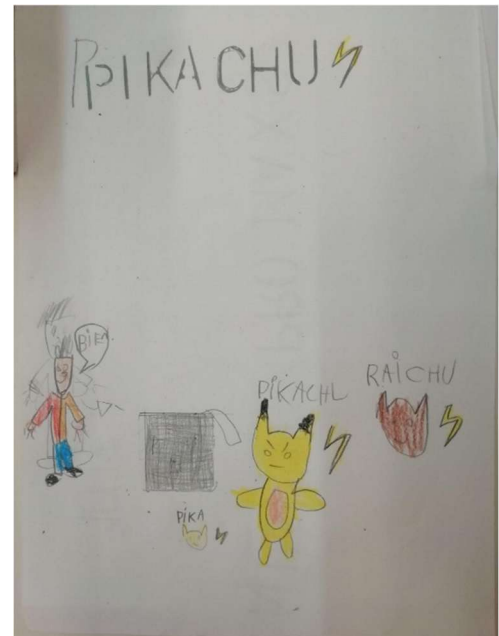
"House without light. Everything is dark."



"Light is shining; the person is happy"



"House without electricity and people crying because they don't have energy"



"The school is dark. They were afraid and Pikachu saved them."



"A woman is feeling bad because she doesn't have light"

Figure 6. Drawing made by 6/7 year 7-year-old children. Barcelona, 2021

5.3 Thematic analysis and discussion

This discussion subsection draws together the findings from both quantitative and qualitative data and frames them through three related themes. First, we explore how children articulate absence versus affordability in their understanding of energy poverty. Second, we examine the relational versus collective dimensions of children's experiences. Third, we highlight the significance of care and energy and care and justice, focusing on how children link energy to well-being, security, and everyday life.

5.3.1 Absence vs affordability

Children frequently described energy poverty not in terms of household finances, but as a state of absence—darkness, cold, or a lack of comfort. For instance, in workshops, some expressed: *“House without light. Everything is dark”* or *“light is everything.”* Such descriptions highlight that children conceptualize energy deprivation in more experiential and emotional terms than affordability alone.

Quantitative findings reinforce this interpretation: 4.4% of children reported feeling cold at home always or often, while 12% reported being hot. These data show a measurable prevalence of energy deprivation, but the children's voices provide depth, illustrating how absence is felt as fear, sadness, or exclusion. The perception of energy as a shelter or as necessary to “live well” suggests that affordability is only part of the story—what matters most to children is the experiential absence of essential conditions.

5.3.2 Relational vs collective

Children also framed energy in relational and collective terms. In workshops, they emphasised how energy affects family life and community participation: *“We couldn't celebrate Christmas”,* or *“a woman with a trolley cannot take the elevator and go home.”* These examples show that energy deprivation is not just an individual experience but disrupts relational practices of care, leisure, and social inclusion.

This relational framing extended to collective imaginaries. Children proposed solutions such as community infrastructures, renewable energy sources for shared use, or government support: *“The City Council to pay part of the bill,”* *“Create community cases where electricity, heating or water are available.”* These proposals underscore that children see energy as a collective good that should be guaranteed through shared responsibility rather than left to individual households alone.

5.3.3 Care and justice

The data also highlight the strong connection between care and energy. Younger children, in particular, emphasised daily practices of care: *“We have a baby at home, babies need energy for*

everything.” Others linked energy to security and emotional well-being: drawings contrasting *darkness, sadness and fear* with *light, joy and strength* show how children equate energy with safety and happiness.

From this perspective, energy is not merely a technical resource but a relational enabler of care. Children’s recognition of sufficiency—turning off lights, limiting unnecessary consumption—shows that they are attentive to how energy is used in ways that sustain, or undermine, practices of care.

Children’s perspectives also highlight the intersection between care and justice. Their responses show an emerging awareness of inequality and distributive injustice: *“Bad, seeing that others have too much and we don’t reach the minimum,”* or proposals such as *“Make the richest pay more.”* These voices position energy poverty not just as an issue of caregiving and vulnerability, but as a structural injustice shaped by unequal consumption and systemic exclusion.

By framing energy as both a matter of care (relational well-being) and justice (fair distribution and recognition), children’s insights bridge two often separated analytical frameworks. Their emphasis on *“minimums for everyone”* reflects a politics of sufficiency and solidarity, which contests dominant framings of energy as a private, commodified good.

5.3.4 Discussion

The findings of this study confirm and expand upon existing literature pointing to the multidimensional impacts of energy poverty on children, particularly in urban contexts such as Barcelona. The quantitative data from children aged 10–11 reveal direct correlations between energy deprivation and reduced subjective well-being, encompassing material deprivation, lower life satisfaction, and compromised emotional and physical health. These findings are consistent with prior studies linking cold or overheated housing conditions to poorer health outcomes and psychosocial stressors^{43,44,51,55,78,79}

One of the study’s most salient contributions is the insight into children’s conceptualizations of energy poverty. While adults often define energy poverty in terms of affordability and access, children tend to articulate it through the lens of *absence*—a lack of light, heat, security, and even joy or happiness.

Children’s perspective on energy is markedly relational. Rather than defining energy poverty solely as an economic inability to pay for services, children intuitively relate it to an absence that undermines dignity, care, and daily functioning. This view resists a commodified understanding of energy and reflects an ethics of sufficiency and shared responsibility.

Moreover, children’s narratives frequently refer to care-based perspectives. Their emphasis on collective rights and preference for structural solutions (e.g., municipal action, school-level improvements) suggests that they inherently think in systemic and ethical terms. This supports the argument that *care ethics*—with its attention to interdependence, responsibility, and vulnerability-

can offer a more fitting framework for analyzing and addressing energy poverty in childhood, combined with justice-oriented approaches.

Children's experiences also connect to energy justice theories. Traditional energy justice frameworks emphasize distribution (who gets what), recognition (who is heard and valued), and procedure (who participates in decision-making). This study contributes to all three pillars, especially *recognition*, by restoring children's place as subjects of knowledge, and *distribution*, by exposing how energy poverty maps onto and exacerbates existing social inequalities, such as those linked to housing, migration, gender, and single parenthood. Yet, the data also point to the limitations of individual or household-level framings that dominate public policy. Children are not just "dependent" on caregivers who may or may not afford energy; their well-being is shaped by a structural matrix of exclusion involving old and inefficient housing stock or unequal urban development.

Particularly striking is the elevated perception of summer-related energy poverty (inability to cool homes), which was more frequently recognized than winter-related discomfort. This aligns with projections of increasing heatwaves in Mediterranean cities and underscores the inadequacy of policy responses focused primarily on winter heating subsidies.

Also, and comparing with the results obtained in the survey of adolescents in the same city, we see how subjective perceptions differ with age even in the same environment. This suggests the need to approach interpretative techniques appropriately and to design the research in a flexible way that is focused on the target population. In this sense the combinations of methods used in this study has provided a comprehensive picture of the impacts and lived experiences at different ages and perspectives, which is very useful to further research.

Finally, the qualitative data reveal that even very young children internalize the effects of energy deprivation and associate it with fear, marginalization, and social exclusion. The emotional depth and practical insights of these contributions demonstrate that children are not merely passive victims but observant social actors whose perspectives enrich our understanding of energy poverty in profound ways.

6. Conclusions and Policy Recommendations

This study provides evidence that energy poverty must be redefined not only as a technical or economic problem but also as a structural, relational, and justice-oriented issue, in line with the way that children perceive the issue. In Barcelona, energy poverty is marked by severe inequalities in access to adequate energy services. These disparities disproportionately affect children in low-income, migrant, and single-parent households, as well as those living in overcrowded or poorly insulated dwellings.

This paper has strengthened the case for adopting the stance that children are competent experts in their own lives. The multimodal, participatory research methods with children enabled the research to uncover insights into children's perspectives and priorities. Children's experiences underscore that energy is essential for their physical security, emotional well-being, participation, and care, positioning energy poverty as a form of social exclusion.

To address these challenges, several key policy recommendations emerge. First, energy policy must integrate energy justice and care frameworks. This means moving beyond technocratic and efficiency-driven models to embrace relational, interdependent, and justice-based approaches. That means developing more qualitative and live experience-based research and understanding energy poverty beyond the household and in a community environment. Essential energy services should be recognized as a public good and guaranteed through universal access.

Structural, area-based interventions must be designed and implemented. Integrated urban policies should target high-risk neighbourhoods and include measures such as retrofitting housing stock, developing community cooling infrastructure, and upgrading energy systems in schools. These interventions require coordination across housing, energy, education, and health sectors.

There is a need to guarantee child-specific energy rights. This involves developing indicators to assess energy poverty from a child's perspective, including evaluations of thermal comfort in homes and schools, access to digital resources, and the emotional impact of energy deprivation. These indicators should guide eligibility for assistance and inform targeted interventions.

Seasonal vulnerability must be addressed with equal priority. In light of the climate emergency, it is essential to establish summer-focused energy poverty relief programs, such as cooling subsidies and the creation of community-based climate shelters, to support children's well-being during heat waves. Also, these proposals must fit in with children's specific needs and will preference, so that they are accessible, adequate and successfully used. Children must be recognized and included as stakeholders in energy planning. Participatory processes tailored to various age groups should be created, allowing children to express their needs and contribute meaningfully to both local or citywide energy strategies. Children are in fact not just passive recipients of care. In this study, they emerge as political agents, capable of critical reflection and civic imagination. Their proposals—public action, shared infrastructure, fair pricing, ecological awareness—speak to a politics of solidarity and sufficiency that contests the current framing of energy.

Energy should then be reframed as a tool for equity and inclusion. This requires challenging prevailing narratives of individual responsibility and embracing a vision of energy systems that promote social inclusion, ecological sustainability, and intergenerational equity. Measures such as progressive pricing schemes and social tariffs can help redistribute the burden from vulnerable households to high-consuming ones.

Lastly, energy poverty assistance must be expanded through public institutions. Schools, primary healthcare centres, and social services should become active agents in identifying and supporting

energy-vulnerable children and families. These institutions must be equipped with adequate resources and legal mandates to intervene early and effectively.

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Declarations

Ethics approval and consent to participate

An Ethical Application procedure involving human participants was approved by Sheffield Hallam University Ethics Committee on 27/07/2021.

Consent for publication

All participants have given consent to their participation in workshops and pictures, as well as the use of the drawings and other materials.

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests

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Authors' contributions

IG conducted the workshops, interpreted the data and lead the writing of the paper.

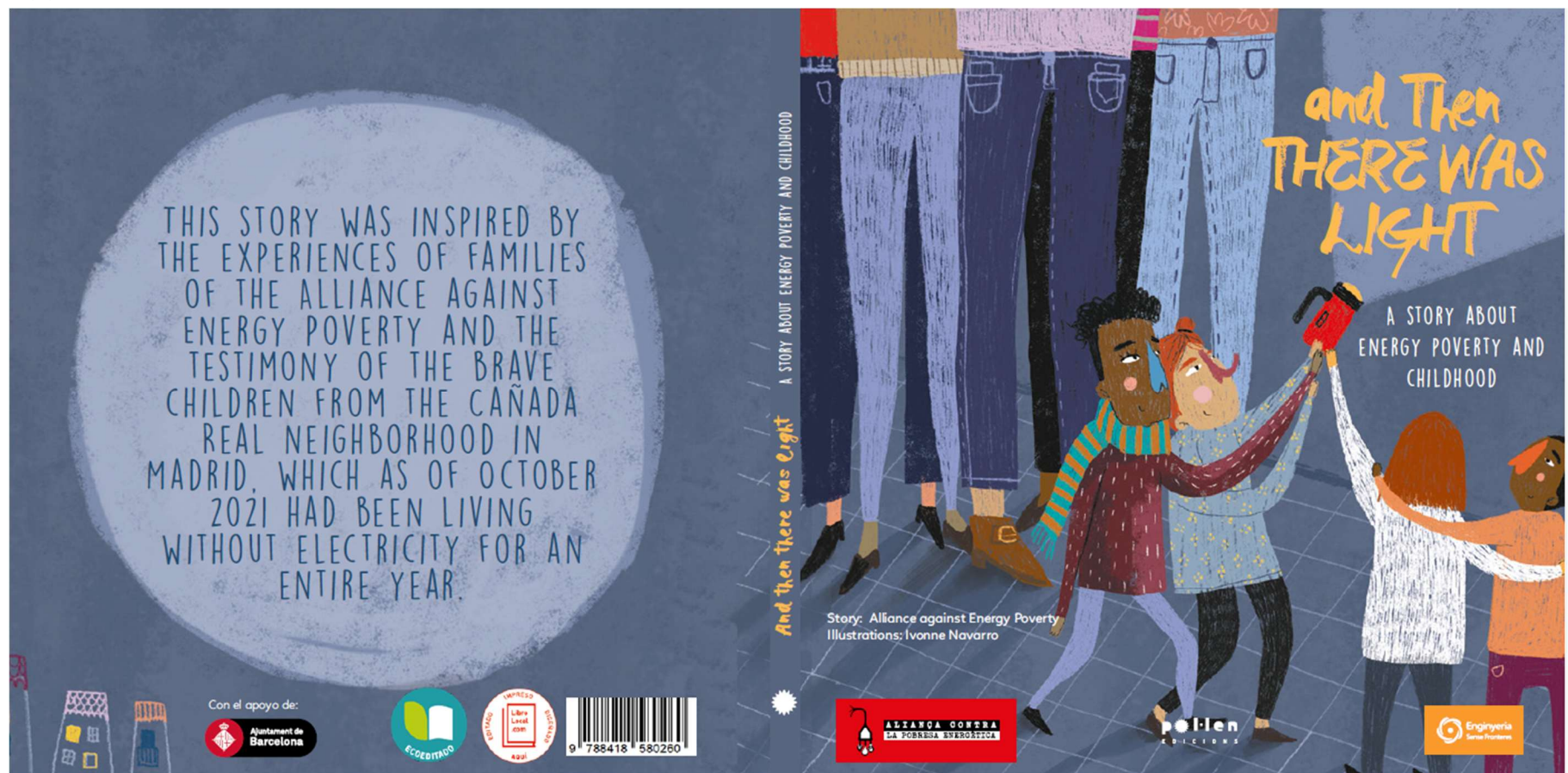
AA participated in the design of the workshops, interpretation of data and contributions to the written text.

LM participated in the design of the workshops, interpretation of data and contributions to the written text.

CF participated in the design of the workshops, interpretation of data and contributions to the written text, especially section 2.3 and 4.

ST participated in the design of the workshops, interpretation of data and contributions to the written text, especially section 5.

Appendix D: Children booklet



And then there was light...
First Edition: November 2021

© The story: Engineers without Borders (Catalonia) and the Alliance against Energy Poverty (Aliança contra la Pobresa Energètica)

© Illustrations: Ivonne Navarro

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And then there was light

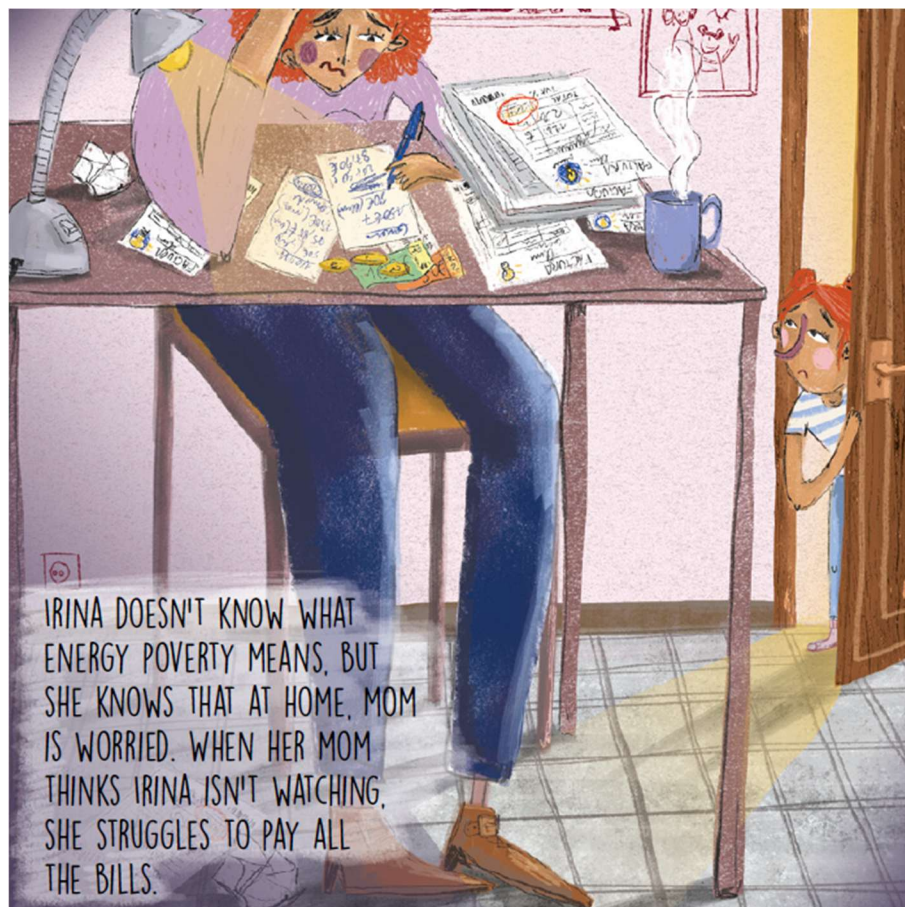
A STORY ABOUT ENERGY POVERTY AND CHILDHOOD



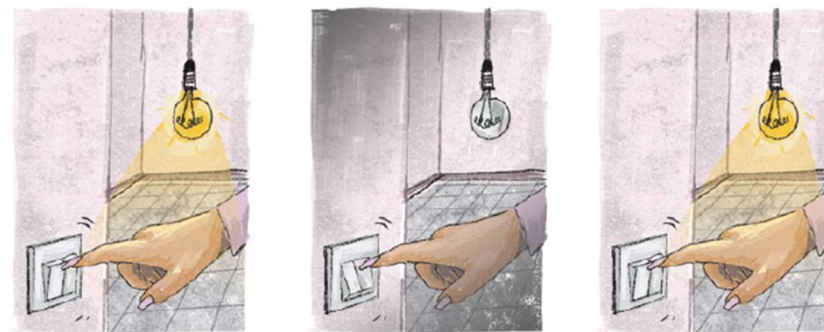
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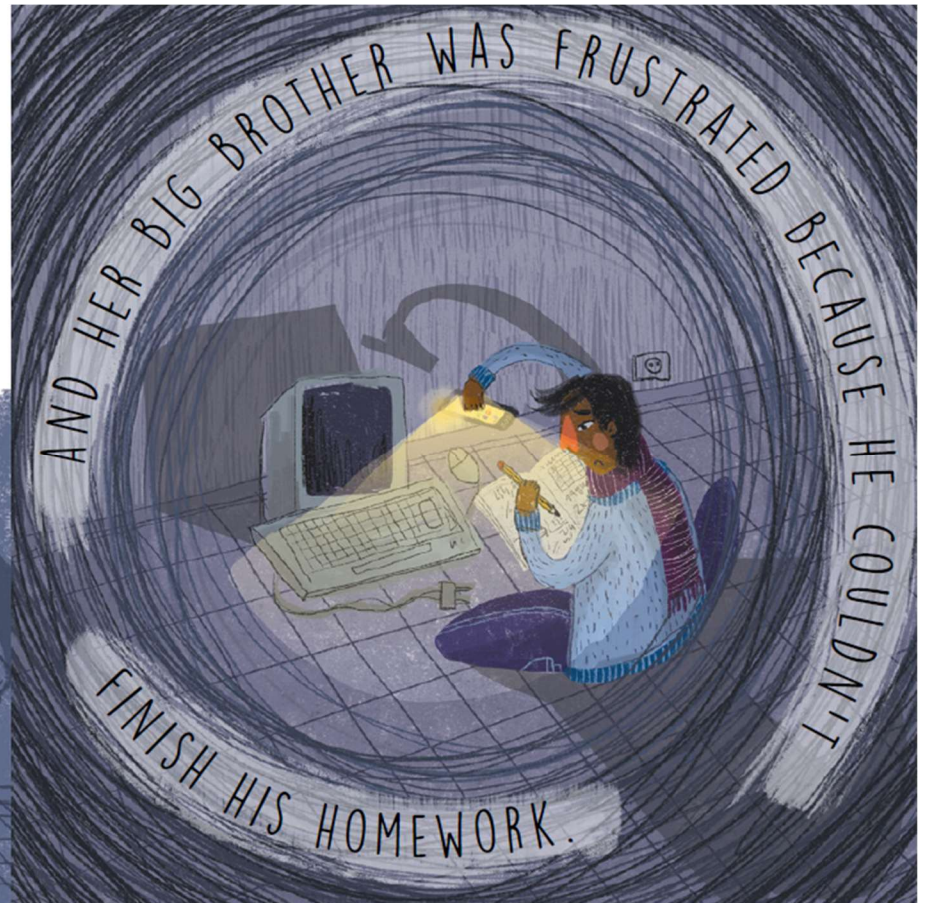
HER MOTHER IS SCARED THAT THE ELECTRICITY OR THE WATER WILL GET CUT OFF,



BECAUSE THEY OFTEN CAN'T PAY ALL THE BILLS.



ALL DAY SHE CHECKS TO MAKE SURE THEY STILL HAVE WATER AND ELECTRICITY.

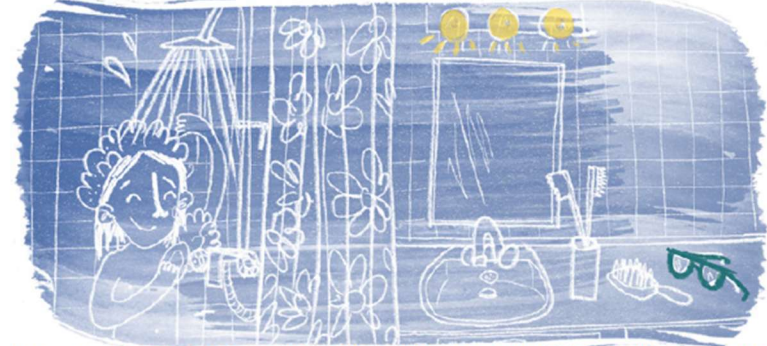




AINARA KNOWS THAT WHEN SHE GETS HOME,



SHE WILL HAVE A NICE HOT SHOWER



AND GO TO BED EARLY. SHE CAN'T IMAGINE WHAT IT WOULD BE LIKE



SHE WILL READ A LITTLE AND DO HER HOMEWORK.



IF SHE DIDN'T HAVE HER NIGHTLIGHT TO PROTECT HER IN THE DARK.





WHEN THE MEETING IS OVER, THEY GO OUT TO THE STREET AND SING AND RAISE THEIR VOICES TO DEMAND WATER AND ELECTRICITY FOR EVERY FAMILY. BEING TOGETHER GIVES THEM STRENGTH.

Appendix F: Right to energy in children's hands

The final appendix contains a methodological guide intended for social organisations working with children affected by energy poverty. The guide was originally written in Catalan and has been translated for the purposes of this appendix.



Energy rights in the hands of children

Methodological guide on workshops with children
to address energy poverty



Energy rights in the hands of children

Methodological guide on workshops with children
to address fuel poverty

Author: Irene González Pijuan

Workshop development team: Irene González Pijuan, Andrea Vides de Dios, Maria Camps Graupera,
Mar Clemente Gimerno, Karim Akidouch.

Design: Dani López Pérez

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and, above all, to the children who took part in the workshops and turned them into fantastic spaces
for collective learning.

Year: 2022



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1. Introduction

This document is intended as a brief methodological guide to the workshops that have been delivered to six- and seven-year-old children at the Raval Children's Centre as part of the "Energy Rights in the Hands of Childhood" project, supported by the Project Free from Inequality, Poverty and Social Exclusion.

This project arises from the joint work of Engineering without Borders and the Alliance against Energy Poverty in the fight against energy precarity from a rights-based and empowerment perspective, defending universal access for all people to quality basic services, which are essential for a dignified life. It also stems from the recognition that energy poverty does not affect us all equally, but rather has differential impacts on groups that face discrimination on the grounds of gender, age, disability, origin, administrative status and other intersectionalities.

One of these groups, children, is present in many households experiencing fuel poverty and suffers its impacts directly, often in a different way to adults. Even so, this kind of situation is not always discussed with children, who perceive the problem but may find it difficult to put it into words or to understand what is happening and why. Considering that one of the consequences of fuel poverty on the mental health of those who suffer from it is feelings of guilt, stigma or loneliness, it is very important to create spaces where it can be discussed, from a perspective of mutual support and empowerment, in order to overcome these feelings of isolation or difference. This should also include children.

It is for this reason that these workshops have been designed and carried out with children from the Raval neighbourhood of Barcelona, where in 2018 32% of children lived in households with inadequate temperatures and 27.3% in households experiencing difficulties in paying utility bills. [1].

The aim of this guide is to share the process undertaken during this project, as well as the methodology of the workshops, so that they can serve as a replicable and useful experience for discussing energy poverty with children.

2. The impacts of fuel poverty on children

Various studies carried out in the United Kingdom, Ireland, Spain, China and New Zealand show that fuel poverty disproportionately affects children's physical and mental health, as well as their social interactions. It is known that children spend more time at home than adults [2], so housing is likely to affect them more, directly or indirectly.

In the United Kingdom, the Marmot Review Team [3] was one of the first to address the association between childhood and fuel poverty in *"The health impacts of cold homes and fuel poverty"* (2011), where it identified some of the direct and indirect impacts of living in a cold home and highlighted the financial stress aspect of fuel poverty, which can cause mental health problems for families.

Among the consequences that energy poverty can have on childhood, the first that often comes to mind is the impact on physical health, particularly respiratory illnesses and malnutrition. Research carried out in the United States found that families reduce their food expenditure in response to cold in order to ensure adequate temperatures [4]. Specific research in Northern Ireland concluded that living in cold homes is linked to 30% of hospital visits [5]. Furthermore, the National Centre for Social Research (NatCen) in the United Kingdom conducted a five-year study of 14,000 children, which showed that respiratory problems were twice as common (15% vs. 7%) in children who had lived in cold homes for at least three years.

Recent research carried out in Ireland also examined the effect of fuel poverty on households during the growth and development of two cohorts of children. For those households that experienced difficulties in meeting the cost of household energy, the findings indicate negative consequences for

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the respiratory health of younger children and their overall health [6]. Data from the cohorts of the same children also showed how energy poverty increases the likelihood of depression in the primary caregivers, posing a risk to the children, since the well-being of these individuals directly affects theirs [7].

In fact, mental health is the aspect of the impacts of fuel poverty that is still the least understood and studied among children. A study carried out by the National Children's Bureau (UK) found that one in four adolescents living in fuel poverty is at risk of mental health problems (compared with one in twenty among other adolescents) and that they are also more likely to engage in risky behaviours (alcohol abuse, drug abuse, violence, etc.). In fact, an article based on data from the United States examined the link between parental debt and the well-being of children, concluding that insecure debt (such as that generated in situations of fuel poverty) is linked to poorer socio-emotional development in childhood [8].

Interviews conducted for a report on energy poverty among children in the city of Barcelona show [9] that children and adolescents experiencing energy poverty report high levels of psychological stress. Among the causes studied are the need for privacy that accompanies adolescence (more complex when housing conditions are inadequate), the natural tensions in relationships with adults, and the difficulties in forging good peer relationships or accessing social technologies.

Researcher Kimberly O'Sullivan also carried out a study in New Zealand, where once again the conclusion was that fuel poverty has significant negative effects on children and young people; With the aim of exploring the experiences and views of New Zealand youth living in, or at risk of, energy poverty, a series of surveys and questionnaires were developed. The importance of this study lies precisely in the fact that it is the first to collect the direct experiences of young people on fuel poverty (656 questionnaire responses) as part of a youth-led research project. They state that a cold home has significant effects on their daily lives both inside and outside the home and show awareness of the financial stress their families may suffer [10].

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Finally, with regard to the consequences for education, research by the Energy Poverty Observatory [11] has shown that energy poverty can be associated with impacts such as days off school, bullying and stigma, social isolation and poorer academic performance.

Energy insecurity undoubtedly affects the quality of life of children and puts some of their fundamental rights at risk, as enshrined in the Convention on the Rights of the Child (United Nations 1989). This has specific impacts on their mental and physical health, safety, emotional development and school performance. Therefore, specific public measures and policies must also be promoted to counteract these consequences and prevent them from persisting into the children's adult lives.



3. Children's participation: children at the centre of the

As for the role of children in relation to this issue, the Convention on the Rights of the Child (United Nations 1989) was undoubtedly a milestone in recognising childhood as a subject of rights and in the debate on the right to participate in matters that affect them. Article 12 of the Convention emphasises the importance of opportunities for children to influence decision-making, where their voices must be heard [12].

However, over the past 30 years, even though a coherent narrative on child participation has been developed, its implementation has been rather poor [13] and this participation, which regards children as individuals with agency and opinions, as experts in their own lives and as citizens entitled to have their say, for example on matters such as public services [14], has still not been achieved in general.

In fact, it is often assumed that children cannot understand or access the vast majority of issues that, by contrast, directly affect their lives, such as in this case sufficient access to energy. Participation structures are created that rely entirely on adult intermediation, and often no consideration is given to providing as many spaces and channels for direct participation as possible to make participation more meaningful. In this regard, it is also essential not to forget the need to provide children with feedback on the impacts of their participation to empower them in this process and to make them feel the importance of their voices.

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It should be highlighted the programme Children Speak, an initiative of the Barcelona Institute of Childhood, which seeks to place childhood at the centre of the public policies that affect them. The programme consists of three phases: a survey of 5,000 children aged 8 to 11, 60 participatory workshops to interpret the results, and the presentation of an agenda with demands and proposals for improvement to various municipal stakeholders.

The first phase of surveys has now been completed, which found, among other things, that experiencing material deprivation means children are less satisfied with their lives. It also found that 4 in 10 children get hot at home during the summer to varying degrees, and 3 in 10 get cold during the winter. It is also found that fuel poverty affects children's overall life satisfaction and their well-being. (Data from the Institute for Childhood, 2022).



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Nor can we overlook the importance of deepening the concept of child agency, which goes a step beyond participation and is based on a notion of proactivity in which children decide to raise their voices or make their opinions known and seek strategies to claim their rights. In this regard, the role of children and adolescents in the Cañada Real conflict is noteworthy, where 4,000 residents (including 1,800 children) have been deprived of access to the electricity grid by the distributor Naturgy since October 2020. Children have been a key actor in the demand for reconnection (which, at the time of writing this report, had not yet taken place) and in denouncing the impacts that the mass power cut has had on their lives. They have made their voices heard in the media and participated in demonstrations, and in this process, they have also shown their essential role to the public as children, not as adults in the making.

Finally, if focused public policies tailored to the needs of childhood and the impacts they endure are necessary, we must find and promote the means to incorporate their perspectives and proposals throughout the process. These channels must be adapted to the age of the children we are addressing, must be able to provide sufficient information for decision-making, and must recognise the irreplaceable role of children as experts in their own lives.

4. Tools for tackling energy poverty with children

In order to develop an effective and inclusive methodology that enables the creation of a space where children can receive sufficient and appropriate information on a specific topic and express their opinions freely, various factors must be taken into account. Firstly, we must be able to provide materials appropriate to the age of the group we are addressing; in this regard, experiences such as the adaptation of the Convention on the Rights of the Child carried out by the *Platform for Childhood* are very interesting.

It should also be borne in mind that children express themselves in diverse ways (verbal language, written language, artistic expression, etc.); for this reason, it may be useful to draw on perspectives such as the Mosaic approach (Clark and Moss, 2001), which has precisely been proposed as the general framework for workshop methodology. What this approach proposes is using different techniques to gather various children's perspectives on the same topic, so as to capture each child's different ways of expressing themselves and diverse viewpoints on the subject.

In this regard, and when working with children, it is necessary to allow a sufficiently broad margin to enable them to choose and prioritise activities, as well as to remain flexible to ensure full and voluntary participation (Gallacher and Gallagher, 2008). It is also necessary to allow for a period of working with or getting to know the group beforehand, in order to build the trust that will enable them to express themselves freely.

Based on these preliminary considerations, the following workshops have been designed for children aged 6 to 8:

Session 1

GET-TO-KNOW-YOU GAMES

The first session aims to introduce the person (or persons) running the workshops to the group of children and to build trust. The bonding stage may extend beyond one session; in fact, ideally it should, so that the children feel at ease contributing on topics that can be sensitive.

Session 2

DRAMATISED/SHARED READING OF THE STORY "AND THERE WAS LIGHT".

"And the Light Was Made" is a children's story, a tale about energy poverty during childhood. Illustrated by Ivonne Navarro, it is a collective creation of the families of the Alliance against Energy Poverty, who over several sessions shared the experiences of their homes when they were in a situation of energy precarity. These testimonies were used to create several stories in which children experience the emotional impacts of being without electricity or water: fear, shame, worry, etc.

The storytelling session aims to share the meaning of the concept "energy poverty", as well as to foster empathy or connection with the emotions that, as the shared stories recount, children in situations of energy poverty may experience. It also aims to highlight that the situation of energy poverty often leads to feelings of guilt, stigma or loneliness, and seeks to offer, by way of counterpoint, the collective dimension and the concept of the right to access energy and its link to life.

Session 3

THE PLAYMOBIL HOUSE

Following the premise that the workshops are designed around play or the arts to enable children to engage with complex issues such as energy poverty and the right to energy, this session offers a proposal centred on Playmobil.

It starts with a Playmobil house containing as many figures and details as possible related to everyday life: furniture, a television, a computer, a washing machine, a fridge, kitchen utensils, a bathroom, etc. Children are then asked to remove from the house everything that cannot function without energy and place it to one side.

The aim of the workshop is therefore to reflect on our day-to-day lives and consider how many of the things we do would be possible without energy and how this could impact our lives (playing, studying, everyday activities, etc.). At this point it is important to reflect on the link between hot water and energy, on not being able to cook hot food, on not being able to refrigerate (some medicines need a fridge), of how to wash clothes, of studying, of leisure time with electrical appliances or of the possible fear of the dark and the fact that it gets dark very early in winter, etc.

The aim of the session is to understand that access to energy is closely linked to well-being and that, therefore, for everyone to be able to access this well-being, energy should be a right (explain the concept of a right).

Session 4

ART OR CRAFT PROPOSAL

The arts and crafts session aims to provide a calm space in which to absorb the issues raised during previous sessions, while carrying out an artistic activity related to fuel poverty. In our case, for example, the children were invited to build houses out of milk cartons, make the windows and place battery-powered candles in the centre to simulate light in the home.

This more relaxed atmosphere allows some of the children to comment on or share issues that have come up in previous workshops, or to resolve any doubts or questions they may have, all while continuing to strengthen the bond with the workshop leaders.

Session 5

THEATRE OR ROLE-PLAY GAME

The drama or role-play session is designed to stage the issue (with different roles assigned to boys and girls) in order to address themes such as "who is to blame?", "what can I do if it happens to me?" or even to enact scenes of community support to reinforce this point.

Simple scenes are depicted, such as a family whose electricity is cut off and who want to protest and claim their right, a family whose bill is sharply increased and who complain because they won't be able to pay, or a community that mobilises because there are neighbours without power. The objective is to reinforce the notion of access to a right and community bonds, so as not to place the burden of guilt on the family that has no electricity or cannot meet its payment. It is perhaps the session that requires the most support due to its complexity.

Session 6

DRAWING/WRITING AND ASSESSMENT

The closing session is based on asking the children to make a drawing, or a written piece if they do not want to draw, or to explain verbally if they prefer, what they have understood or felt from the previous workshops. It can also be done in the form of a request, suggesting they draw or express what they would ask for to end fuel poverty.

At the end of the session, it is very important to carry out an evaluation of all the previous sessions adapted to the children's age, asking how they have felt, whether they believe they have learnt anything, whether they enjoyed it, and if they would have any suggestions or proposals for improvement for future sessions with other children.



During the workshops at the Casal dels Infants, all the planned sessions were carried out, and the children's evaluation was very positive. Likewise, areas for improvement were identified, such as the ability to respond to diversity within the group of children and the balance between leisure and recreation time and work. Overall, the workshops' objective was met: the group was introduced to the concept of energy poverty from a rights-based perspective, as well as what the right to energy entails and the impacts that being deprived of it could have on their lives.

6. Conclusions and recommendations

Having carried out a comprehensive process of research into the impacts of fuel poverty on childhood, both within the framework of this project and from the stories shared at the collective advisory sessions of the Alliance against Fuel Poverty, we can observe the serious impacts this situation has on children, specifically on their physical and mental health, educational development and safety (broadly understood).

Despite suffering the consequences, children are not always taken into account when the situation is explained to them and when discussing what is happening, what the causes are, and how they are experiencing or feeling it. This is why it is essential to develop tools and materials adapted to childhood and adolescence in order to include them in the debate and make their voices heard.

We have developed a series of workshops which, from different perspectives and based on the arts and play, aim to explain energy poverty to children, give them a space to share their views, and support them in their experience, where appropriate. The workshops have proven to be a positive and enriching experience from the children's perspective, and we believe it is worthwhile to replicate them in order to continue this work of empowering and supporting vulnerable children.

7. References

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