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Original research article

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

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ABSTRACT

Children experience distinct impacts on their mental and physical health as well as their educational attainment as a result of living in energy poverty, according to multiple sources. International guidelines, such as the UN Convention on the Rights of the Child, underline the right of every child to an adequate standard of living and the need for all policies to consider the specific needs of children. This paper aims to understand the extent to which energy policies take explicit account of children in energy poverty and endeavour to address their distinct needs and the impacts they experience. The investigation is based on an analysis of EU-SILC data and policy documents across the 28 countries that (at the end of 2019) formed the European Union. The analysis reveals that children are mostly only considered within the wider family context, with larger families tending to receive greater support, despite evidence that single-parent families are at higher risk of energy poverty. Children are characterised as passive subjects in energy policy; their perspectives and needs are not considered in policy development.

1. Introduction

Energy poverty is a complex and multidimensional problem, defined as the inability to realise essential capabilities as a direct or indirect result of insufficient access to affordable, reliable, and safe energy services [1]. Brenda Boardman, in her seminal research, triggered a consensus about its main drivers being energy prices, energy-inefficient housing, and low household incomes [2]. This framework then extended to six energy vulnerability factors identified by Bouzarovski and Petrova [3], including access, affordability, flexibility, energy efficiency, needs, and practices. Other contributions claim that prevailing conceptual frames of energy poverty are too technical and at risk of overlooking lived experiences [4] 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 interventions [5]. Recent studies also point out at the increasing link between energy poverty and different public policies and debates, enabling a more comprehensive and integrative policy framework [6]. There has been a

shift away from viewing energy poor households as homogenous, 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 households, and disabled people [7–16], recognising differential impacts and experiences of energy poverty between different social groups and members of a household.

Overlooking the distinct experiences of children in energy poverty prevents policymakers from responding to their differential needs and overcoming discrimination against a specific group that, due to their dependence on adults, faces greater difficulties in exercising their rights [17]. 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) [18] or the European Strategy for the Rights of the Child (2021) have all 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

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energy poverty among children (2013), and on the requirement for all policy to take account of children, especially children in a vulnerable situation or environment [18]. Yet, a comprehensive children's rights-based approach is still lacking in public policy [19] more generally, and in energy policy in particular.

This paper intends to contribute to a growing research area on energy poverty policy and its responsiveness to the needs of vulnerable demographic groups. Our analysis reveals how, even when the specific impacts of energy poverty on children are understood, there is still a lack of recognition of their differential needs concerning energy, climate, and social policies relevant to energy poverty alleviation. Energy policies explicitly targeting children are rare, and where they do 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 [7–10,13,14] 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 descriptive quantitative analysis from European Union (EU) Statistics on Income and Living Conditions (SILC) data, and qualitative analysis of the National Energy Climate Plans (NECPs) and national and regional policy documents from European countries with a long tradition of policy responses to energy poverty (UK)-, where recent efforts to recognise energy poverty as a significant societal issue have been observed [6] –(Spain), and where significant energy poverty policies regarding children have been identified (Spain and Ireland).

The range of methods used contributes to meeting the key objectives of the research, which are: first, to reveal the extent of public policies specifically aimed at alleviating energy poverty during childhood; second, how these policies conceptualise children, e.g., as right-holding citizens or as members of a family or household unit; and third, to establish the extent to which children have been involved in the elaboration of such policies.

2. Growing up in energy poverty: a brief literature review

The first step in our analysis is a review of existing literature to highlight published evidence on the specific impacts of childhood energy poverty, both physical and mental, on educational development, and children's behaviours towards energy consumption, and to point out the gaps in relation to energy policy analysis specifically considering children's needs. While the focus of the paper is primarily on Europe -acknowledging the diversity of the geographical, social, and policy context across member states- this literature review takes into account a global body of knowledge on energy poverty and children to be able to state the impacts and further narrow the policy discussion to Europe.

Being fundamentally an applied research subfield on a pressing social need, the energy poverty literature has engaged with the policy side of the issue since its early days – see, for instance, Boardman's (1993) 'Opportunities and constraints posed by fuel poverty on policies to reduce the greenhouse effect in Britain' [20]. Energy poverty scholarship purposefully strives to provide actionable knowledge and influence decision-making arenas with openly policy-oriented pieces that critically reflect on state-led responses to energy poverty and their links with related policy frameworks such as social welfare and climate change [21–24]. A strand of this literature has specifically focussed on comparative studies of policy tools and approaches, especially across EU member States [25–28], and has also provided insightful country analysis centred on energy poverty policy [29,30] instruments as national strategies, social tariffs or discounts or energy efficiency measures, among others. These efforts on energy policy are also being complemented by a growing interest in the socio-demographic analysis of energy poverty and the lived experience and inequalities within households [31–33], providing policymakers with a more comprehensive awareness of who is vulnerable to energy poverty, and how this

vulnerability intersects with factors such as gender, age, ethnicity, origin or social class, which in turn helps improve the targeting of interventions.

A growing body of research from the UK, Ireland, North America, Spain, and New Zealand [34–49] evidences the distinct impacts of energy poverty on children, focussing primarily on physical health impacts [12,37,40,43,49–51]. Young children are known to spend more time at home than adults [35,47], so housing conditions are likely to affect them more. Findings point to low-income families reducing their expenditure on food in response to cold weather [52–54], a correlation between living in cold houses and increased likelihood of hospital visits [36] and poor respiratory health [36,37,40].

Mental health impacts have also been identified by the literature in association with children in energy poverty. Financial stress [34] and increased likelihood of depression in parents [38] are also likely to affect children's wellbeing [55]. 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 [36,51]. 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 or it is not possible to heat or cool the whole home), and difficulties accessing social technologies and forging good relationships between peers [36]. O'Sullivan (2017) [48] 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.

Impacts are also likely to extend beyond health, as indicated by research [56] showing that energy poverty can be associated with poorer educational attainment, days off school, bullying, stigma, and social isolation. Indeed, reduced academic performance is a key pathway through which energy poverty affects children's wellbeing [39,41].

The presence of children in the household also influences energy consumption behaviour. Specifically, 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 routines and coping strategies [4]. Understanding this distinct behaviour and taking account of it represents an important element of sensitising energy policy to the distinct needs of children [57]. Much of the apparent lack of knowledge about the reality of children's energy consumption and their subjective wellbeing in relation to energy poverty is due to an absence of active involvement of children in research and policy-making processes.

Overall, there exists a strong body of evidence 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

This paper intends to bring together two different frameworks: the understanding of energy poverty within policy development and the conceptualization of children in policy elaboration and deployment. In order to establish a detailed picture of how childhood energy poverty is treated within policy, we adopted a multilayer methodology which is comprised of the following sequential strands: first, a prior literature review to establish the extent of existing knowledge regarding the specific impacts of energy poverty on children. Second, a descriptive analysis of EU-SILC data was carried out to identify trends and patterns (e.g., incidence of energy poverty among households with and without children) provided by consensual energy poverty indicators [58], from a childhood perspective. Next, a qualitative analysis of energy policy instruments was carried out at various levels, starting with a content analysis of NECPs of all EU countries (delivered by 31 December 2019),

which helped to identify how children were conceptualised in national energy policies. Then, a more in-depth analysis of relevant energy poverty policies with a certain focus on children identified at the national and sub-national level allowed us to capture potentialities and shortcomings when it comes to placing children at the centre of these policies.

3.1. Quantitative analysis of EU SILC indicators

The data analysis conducted to inform this paper 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 on utility bills. These two EU-SILC items belong to the ‘consensual’ family of energy poverty indicators based on households’ self-assessments of their material living conditions. Despite criticisms regarding the subjective character of the responses provided by households [58,59], this data is widely accepted in the energy poverty scientific and policy literature as valid metrics for quantifying the incidence of energy poverty at national and subnational levels in the EU. The latter point is confirmed by the fact that both EU-SILC items (inability to keep the house warm and arrears in utility bills) have been endorsed as ‘headline’ energy poverty indicators by the EU-sponsored EU Energy Poverty Observatory (EPOV) and its successor, the Energy Poverty Advisory Hub (EPAH).

Even though EU-SILC data takes the household as the main sampling and assessment unit (and does not focus on specific individuals within the household, and consequently does not directly reflect children’s experiences), the data can be disaggregated according to household composition to observe the proportion of households with children in energy poverty relative to other household types. The categories selected for analysis were (1) single parents with dependent children, (2) two adults with three or more dependent children, (3) three or more adults with dependent children, (4) households with children, and (5) households without children. The first three categories were chosen because they showed worse outcomes, in terms of being at higher risk of energy poverty. The category ‘households with children’, which includes the three previously mentioned categories and other household types with children, has also been selected for visualization to show more general trends.

To avoid focusing the analysis on a single year, 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 within the appendix.

We then used Recalde et al. [60] cluster distribution for their Structural Energy Poverty Vulnerability (SEPV) Index across the EU-27 (the countries studied were those constituting the EU as of January 2013, so Croatia is not included) to assess differences across ‘energy poverty regions’ in the EU. 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 SEPV Index was validated by studying the association between the country typologies obtained and the energy poverty prevalence of each country.

This cluster distribution provided by Recalde et al. [60] 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. It represents a classification of regions according to their degree of structural vulnerability to energy poverty, crossed with the data available in the EU-SILC, and allows us to better identify trends concerning the different household typologies. Unfortunately, it does not specifically cover childhood-related indicators, which should be rectified as a priority in the future.

We then grouped the 27 EU countries into Recalde et al. clusters and calculated the average incidence of energy poverty (given by the EU-

SILC indicators) for all the Member States in each cluster weighted by population in 2019. The results thus obtained (i.e., the annual average of energy poverty incidence in each cluster) were disaggregated by household type, and we then 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 quantitatively assess the difference in energy poverty incidence across different household typologies (with a focus on the presence/absence of children in the household) and provides a necessary basis for the subsequent policy analysis.

3.2. Policy analysis

Building on existing knowledge, the policy analysis conducted for this article provides an assessment of the final versions of the 28 NECPs submitted to the European Commission by EU member states and the UK, undertaken using a keyword search system based on the words: child, infant, minor, parent, family, young, youth. This search allowed us to identify where children were mentioned and then perform a justice [61–65] focused analysis of the relevant content. For example, whether 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 for deeper analysis, we opted for two complementary 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 EU 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 aimed to understand if they were aware of experiences in literature, public policy, or activism that referred to fuel or energy poverty and children. We then undertook in-depth interviews specifically related to energy policies targeting children among policymakers, practitioners, and academics from France, Portugal, the Netherlands, the UK (England and Scotland), Hungary, and Spain; these countries were selected based on the prior survey.

Based on the survey and interview findings, Spain (with a focus on Catalonia), and the UK (England and Scotland) were identified as warranting further exploration as policy case studies. It is necessary to emphasize the fact that this policy analysis does not attempt to comprehensively capture a country’s performance, but rather to understand policy approaches and development processes.

Once policy case studies had been selected, they were analysed to find direct mentions of children, but also to understand in detail how children were taken into account. To do so, we used Daly’s (2020) framework on ‘three social policy approaches to children’ [66], specifically the aspects related to family-centred and children-centred policy.

Analysing the way children are understood in energy poverty and the approach of energy policies to this from different points of view, both qualitative and quantitative, has reached the aim of detecting shortcomings and proposing recommendations in relation to policy development.

Throughout the study, ‘children’ refers to all persons under the age of 18, but we are aware that the impacts of energy poverty on children vary by age during childhood. Likewise, although the available data does not allow for this, it would be highly desirable to incorporate an intersectionality perspective to show how different axes of discrimination aggravate the impacts of energy poverty on children.

4. Children in energy poverty: secondary data analysis

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 types, allowing us to understand how children might be affected by energy poverty according to their household composition.

As explained in the Methodology section, and to ensure better visualization of data, we applied the cluster distribution developed by Recalde et al. (2019) [60] in their SEPV Index. The clusters introduced in Fig. 1 serve as a basis for showing the temporal evolution of the two main energy poverty indicators mentioned above in Figs. 2 and 3. These graphs illustrate how the four clusters of EU countries performed between 2011 and 2019 by showing the weighted average value for each household type in each cluster.

This analysis yields several relevant considerations. First, relevant 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, 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.

A key finding of this secondary data analysis is that the incidence of energy poverty is higher among household categories with dependent children across all clusters. Specifically, the categories 'single adult with dependent children' and 'two adults with three or more dependent children' report energy poverty rates that often double the 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 reporting inability to keep their homes warm (Fig. 3) appear to be lower. Although further study of this behaviour is needed, this analysis supports prior studies on coping strategies which point to a tendency among families with children to prioritise reaching a comfortable temperature even if debts are incurred or other sacrifices made, such as reducing food intake [53,67], 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. 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 (Figs. 1 and 2). The 'energy poverty penalty' experienced by single-parent households is also very visible even in EU countries with the lowest incidence (Cluster 4: Sweden, Denmark, and The Netherlands), where these households report energy poverty rates well above the average for the cluster. This higher risk among single-parent households is confirmed by recent literature on intersectionality in energy poverty, with studies having found a strong association between single-parent households and being in arrears on utility bills [8]. This pattern highlights energy poverty as a gendered form of material deprivation as previously noted by several authors [7,10,14] who confirmed that a majority of single-parent households are headed by women (78,6 % in 2019) [68].

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 the supplementary information), 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 among this household category.

It is necessary to acknowledge that households might take more forms than the ones highlighted by EU-SILC statistics and that family structure may, among 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. It is relevant to understand in which family structures, among the data available, we find a mismatch between the performance shown according to energy poverty indicators and how they are targeted with energy poverty policies.

5. Policy analysis

Considering the emerging evidence on the distinct nature of childhood energy poverty, a third strand of 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 policymaking occurs at different levels (national, regional, or local). Our analysis therefore attempts to cover the different levels, starting with an overview of the national energy policy commitments that the various EU member states have set out in their NECPs, which provide the overarching policy context in which energy poverty regarding children (if it exists at all) is situated.

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 [27,69]. 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

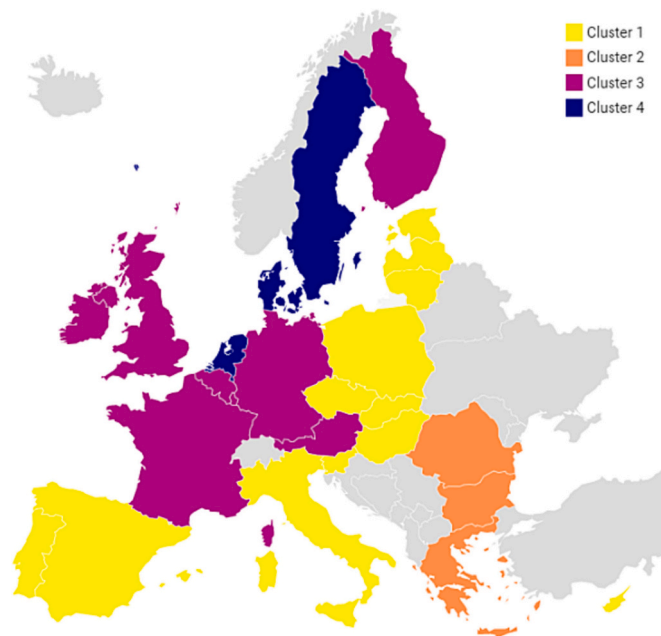


Fig. 1. SPEV Index 4-Cluster distribution across EU-27 based on Recalde et al. (2019), indicating four different levels of structural vulnerability to energy poverty in European regions [60].

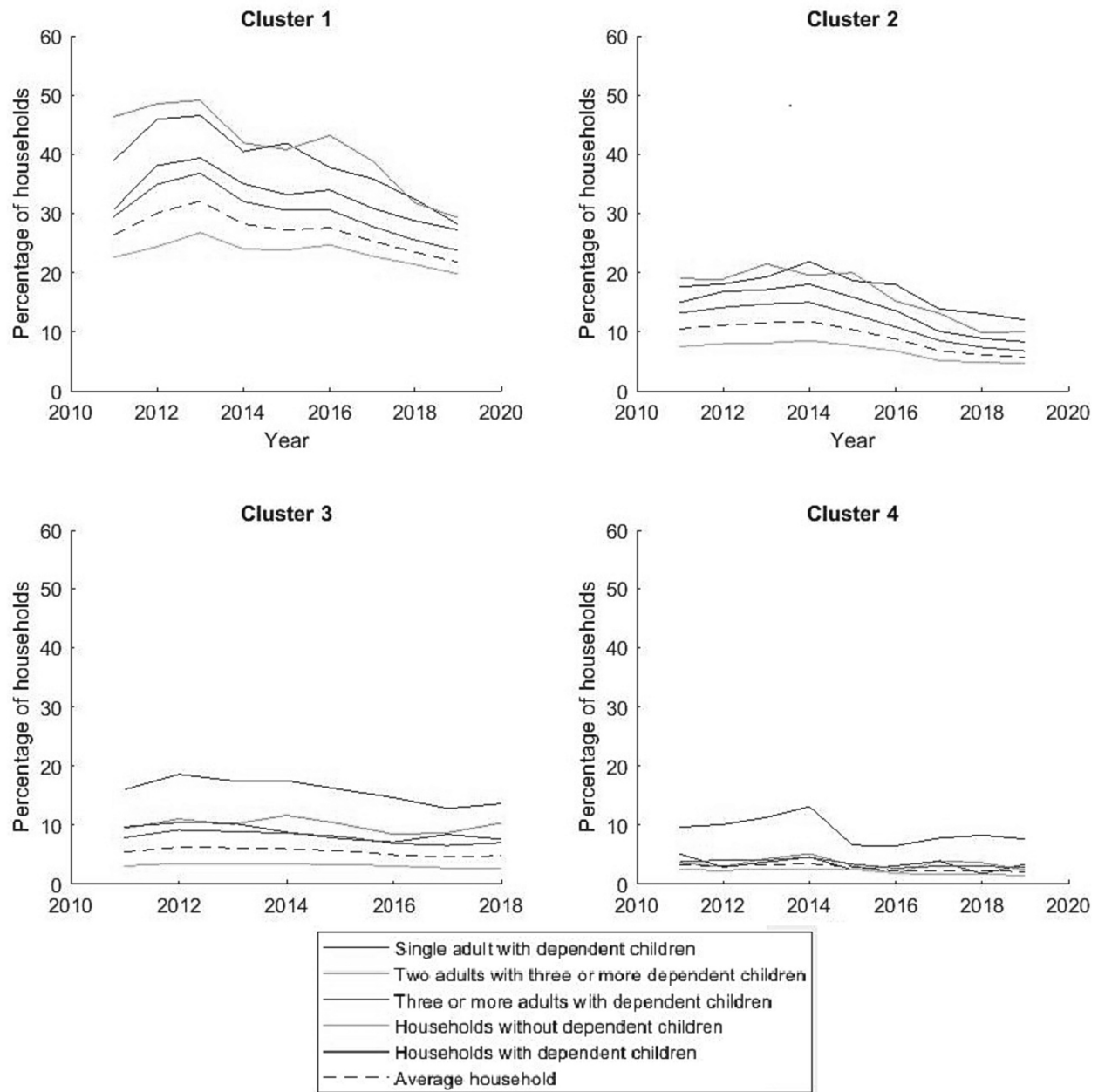


Fig. 2. Arrears in utility bills for different household types, in the four energy poverty cluster areas defined by Recalde et al. [60] between 2011 and 2019.

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 Methodology section, to find out how often and in which way they refer to children. We differentiate three assessment criteria here, associated with the energy justice framework [61,70]: 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). Our results are shown in Table 1.

Of the 28 reviewed NECPs, eight do not mention ‘children’ or ‘families’ in their energy poverty assessments or current public policies. Only nine recognise to any extent the specific impact of energy poverty 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 explicitly acknowledges any household with a child under 16 as a vulnerable family.

Regarding support measures targeting families, even if the majority of EU 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 specifically refers to child poverty in its energy poverty section, while at the same time, it points out that energy poverty is an issue that

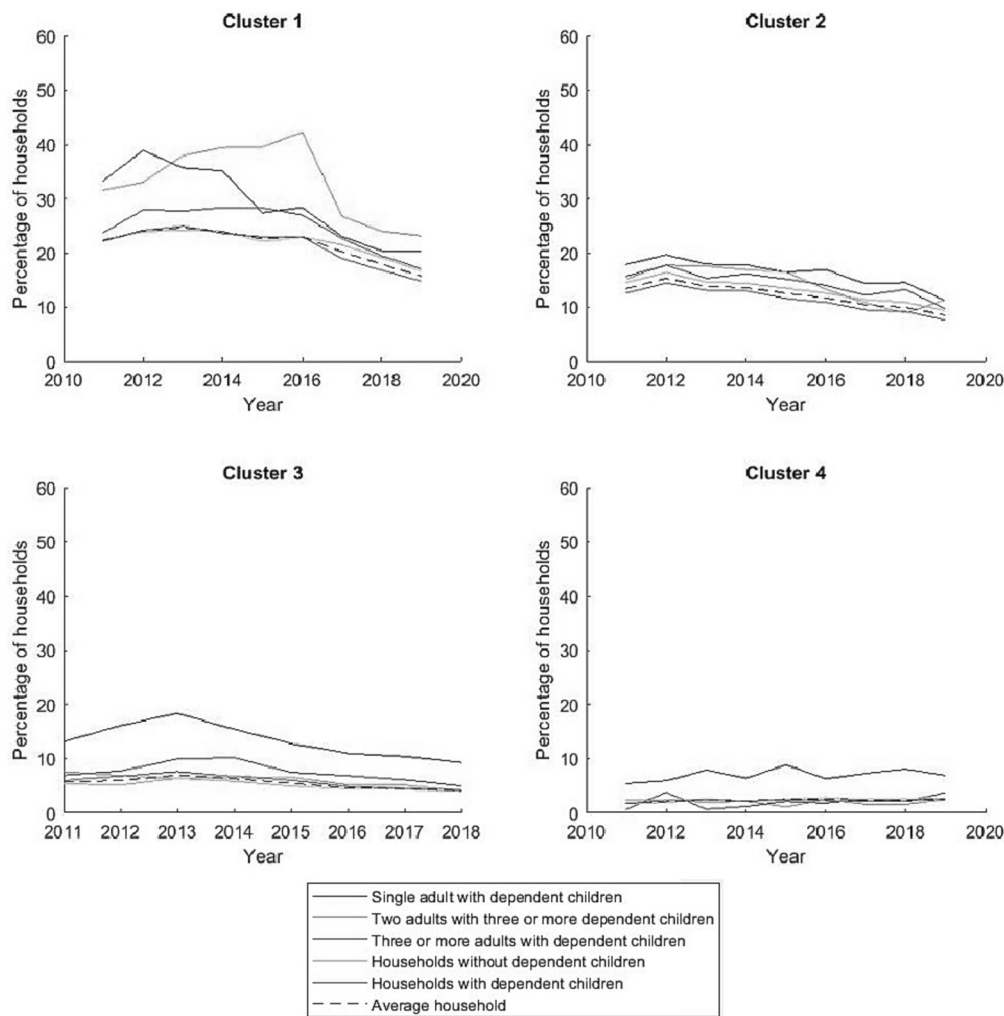


Fig. 3. Inability to keep home adequately warm for different household types, in the four energy poverty cluster areas defined by Recalde et al. [60] between 2011 and 2019.

needs to be addressed by broader social policy. Following previous research [27,29], this approach is another manifestation of mis-recognition because it overlooks the fact that energy poverty affects households beyond those with low incomes, and has distinct drivers that are also different from those affected by poverty more broadly, even if there is a significant overlap between domestic energy deprivation and monetary poverty. This narrow understanding of the issue risks ignoring children in energy poverty because of the conflation of energy poverty with poverty more broadly.

5.2. Policy case studies

Considering that the NECPS mostly provide a state-wide overview of energy poverty definitions, metrics, and policies, it is necessary to deepen our assessment to include a more detailed analysis of specific national and regional approaches to energy poverty policy-making involving children. To do so, we look at three different policy instruments -national or regional strategies, financial and support schemes, and 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 that 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 from energy poverty. The succeeding 2010 strategy introduced equivalised incomes and mentioned children as a group specifically vulnerable to the effects of energy poverty; however, references to children still appeared to be symbolic [30] and not accompanied by specific policies.

England's 2021 fuel poverty strategy, *Sustainable warmth: protecting vulnerable households in England*, considers low-income households to be vulnerable to fuel poverty if at least one member is younger than school age, which only targets a specific group of children. The prior 2015 strategy, *Cutting the cost of keeping warm*, committed to monitoring 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. Significantly, progress in recognition of the 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

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 households without children being specifically mentioned.

	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
<i>Austria</i>		<i>Support instruments for families. Not children specific.</i>	
<i>Belgium</i>	Pollution impacts on children Single-parent family is a risk factor for energy poverty	<i>Energy loan to save energy. Not children specific.</i>	Opinions from the Flemish Youth Council gathered
<i>Bulgaria</i>		<i>Targeted Heating allowance during cold months. Not children specific.</i>	
<i>Cyprus</i>	Large families with low income as vulnerable customers of electricity.	Benefits for large families with low incomes	Workshops and bilateral meetings with youth organisations
<i>Czech Republic</i>	Pollution impacts on children's health	<i>Housing allowance. Not children specific.</i> Special supplementary housing benefit. Large families mentioned. Infants as special circumstance against supply disconnection due to payment arrears	
<i>Denmark</i>		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
<i>Germany</i>	Large families living in single-family houses in small municipalities as a vulnerable consumer group	Energy efficiency retrofits improve health, particularly prevalent among children. Programs targeting lone parents with young children. Electricity and gas social bonus favouring larger families (more than three dependent children) Electricity for a reduced rate for families taking care of a child with a disability and large families.	
<i>Hungary</i>		<i>Reimbursement of domestic heating and water costs. Not children specific.</i> <i>Energy benefits:</i> <i>Allocation de vie chère et première énergie. Not children specific.</i>	
<i>Ireland</i>	A study from C. Liddell cites the impacts of energy poverty on children		
<i>Italy</i>			
<i>Latvia</i>	Pollution impacts on children's health		
<i>Lithuania</i>	Energy poverty affects children, single parents.		
<i>Luxembourg</i>			Students actively involved in the consultation

Table 1 (continued)

	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
<i>Malta</i>		<i>Energy benefits Not children specific.</i>	
<i>Portugal</i>	Energy poverty impacts 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.
<i>Romania</i>		<i>Home heating grant. Not children specific.</i>	
<i>Slovakia</i>			Raising energy efficiency awareness among children and young people. Open call to young people to be involved in the NECP process.
<i>Slovenia</i>		Social energy bonus. Particular attention to households with children.	
<i>Spain</i>			
<i>United Kingdom</i>	Wales vulnerable household when there is a child or young person under 16	<i>Different regional approaches Not children specific.</i>	

Scottish Parliament in 2019 and from which the 2021 *Tackling Fuel Poverty in Scotland* strategy is derived, explicitly mentions the role of household childcare costs in its definition of fuel poverty and has also gone through a Child Rights and Wellbeing 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.

The 2021 strategy in Scotland mentions explicit benefits for children as the Child Winter Heating Assistance or the Scottish Child Payment and includes families with children under 16 as one of the main targets for eligibility for the Warmer Homes Scotland national fuel poverty scheme. The consideration of impacts on families with children is sustained throughout the whole document, establishing clear connections with the broader *Tackling Child Poverty Delivery Plan 2018–2022* and other support measures targeting children as the Scottish Child Payment, free bus travel, improving access to childcare or providing free school meals as well as working in partnership with other actors as health institutions or Social Security Scotland.

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 energy/fuel poverty strategies examined provide data focused on the percentage of children in energy poverty and only the Scottish one 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 policymaking involves or even considers child participation, as well as when it recognises 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) [66] in her studies of EU policy developments and children's rights and entitlements, summarized in Table 2. We start from her description of the general categories of children-oriented and family-oriented to classify the public policies studied, as shown in Table 3.

Concerning policy instruments, there is a significant emphasis within the case study 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 – plus an annual lump sum payment for non-electric domestic energy services. 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 despite evidence indicating that households with three or more dependent children tend to be in the higher income strata in Spain [71]. This signals the regressive effects of certain large family-oriented policies and 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 evidence [8] 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.

Scotland also has 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 a more explicit focus within energy policy on disabled people's specific needs [9]. It is formulated based on the child as a subject rather than the family.

A remarkable approach tested in Ireland is the Warmth and

Table 3

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

	Financial/support schemes	Supply protection
Children focused	Child Winter Allowance (Scotland)	Electricity supply disconnection forbidden in families with social bonus and children under 16 (Spain)
	Warmth and Wellbeing Scheme (Ireland)	Energy dependent status (Catalonia)
Family oriented	Social Bonus (Spain) Cold Weather Payment, Warm Homes discount (UK)	Priority services register (UK)

Wellbeing 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 program recognises the plight of single-parent families, addresses children as the subject of the benefits, and is consistent with research findings that a cold home negatively impacts the respiratory health of children [37].

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 to obtain this protection the family must receive 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 power cuts and priority support in emergencies, among other benefits. However, access to this register is not automatic, so it is up to the families to be aware of its existence and to proactively request it.

It is essential to highlight that none of the policies assessed above could be classified under Daly's category of children-centred, as none adopt the principle that children are capable of deciding their own needs, none involve children in the definition of the policy and none consider children's empowerment. Ultimately, the analysis is clear in that energy poverty-relevant 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 living in energy poverty which represents a failure in itself. This said, EU- SILC data, widely accepted and used for quantifying energy poverty in member states, indicates that the incidence of energy poverty is higher among household categories with dependent children, showing worst outcomes regarding arrears in utility bills. Also, the analysis points to the influence of family composition on children's risk of being impacted by energy poverty, supporting the need for specific policies. The relevance of these statistics is highlighted by a growing body of research warning about the significant impacts of domestic energy deprivation on children's physical health, mental health, and educational development

Table 2

Adaptation from Daly's three social policy approaches to children [66].

	Family-oriented	Children-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
Entitlement provided	Income support for family	Resources- income and services	Resources (income and services) and participation
Desired outcome	Sufficiency of family income	Recognition and resourcing of children	Children's empowerment

[12,37,40,43,49–51]. More effort is therefore needed to generate specific data related to children that reflect their particular situation. Data could then, for example, be coordinated with education and health statistics to broaden the detection of childhood 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 parent(s). Specific data on children would also allow an intersectionality perspective in its analysis, essential to the generation of appropriate public policy.

Our analysis of EU policies indicates that 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, often large families in many countries. In relation to this, we detect inconsistencies between energy poverty data disaggregated by family type - which tends 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 energy 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 for and claiming 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 automatically allocated social bonus in Portugal, a discount on the electricity and natural gas bills that all eligible households receive without having to apply for it, may be an option to remove this barrier to accessing subsidies and will ensure better living conditions for children regardless of the household's ability to apply for support schemes.

Regarding the reviewed national and regional policy case studies, specific recommendations can be elaborated at different levels. First, policy should ensure that children are considered explicitly in all national strategies on energy poverty, defining explicit and targeted financial support for children living in cold homes, with special attention to single-parent households and large families. Also, inter-departmental and inter-institutional coordination should be promoted, to ensure energy poverty is detected among children, and that there is adequate social support.

Additionally, some remarkable aspects arise from the studied instruments, such as ensuring children are prevented from energy supply disconnections, following Spain's Social Bonus legislation, or developing energy retrofit interventions directly targeting children, especially single-parent households, as in Ireland's Warm and Wellbeing Scheme. These schemes act as international exemplars.

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 investment [18], 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, children of all ages must be recognised in energy poverty policy-making as valid agents with the 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 childhood [72].

Finally, we acknowledge several limitations in this study. First, the lack of specific data has prevented us from analysing intersectional inequalities concerning children's energy poverty experiences, such as those related to gender, ethnicity, or disabilities. We are also aware, as stated, of the limitations of the quantitative indicators chosen, and it is precisely because of this lack of data that we have sought to present a combination of methods that not only demonstrates a higher incidence of energy poverty among households with dependent children but also conducts a first-ever assessment of policies in the EU from an energy

poverty in childhood perspective. Finally, policy generation is a dynamic process and occurs at different levels; acknowledging the complexity and the risks of undertaking a comprehensive EU scale analysis, we have chosen to narrow the scope and identify specific policy instruments and analyse them in their context.

Ethical compliance

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

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

The EU-SILC indicators that have been used for the analysis are publicly available on the Eurostat webpage (https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdcs01&lang=en and https://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=ilc_mdcs07&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.

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Appendix A. Supplementary data

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