
# Study on optimisation of energy poverty indicators collected at EU and national level

## Final Report

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*July 2024*

**EUROPEAN COMMISSION**

Directorate-General for Energy
Directorate B — Just Transition, Consumers, Energy Security, Efficiency and Innovation
Unit B.1 — Consumers, Local Initiatives, Just Transition

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Manuscript completed in July 2024

1st edition



Luxembourg: Publications Office of the European Union, 2024



PDF ISBN 978-92-68-20765-9 doi:10.2833/6627986 MJ-01-24-002-EN-N

# Contents

# Glossary

| Acronym | Full title |
|---|---|
| 2M | Proportion of households whose share of energy expenditure in income is more than twice the national median |
| AROP / ilc_li02 | At-risk-of-poverty rate |
| AUB / ilc_mdes07 | Arrears on utility bills |
| CINEA | European Climate, Infrastructure and Environment Executive Agency |
| CV | Coefficient of Variation |
| DG EMPL | Directorate-General of Employment, Social Affairs & Inclusion |
| DG ENER | Directorate-General of Energy |
| DPAs | Data Protection Authorities |
| EC | European Commission |
| ECHP | European community household panel |
| EE | Energy efficiency |
| EED | Energy Efficiency Directive |
| EHIS | European Health Interview Survey |
| EHPA | European Heat Pumps Association |
| ELPPE | Portugal National Energy Poverty Strategy |
| EP | Energy Poverty |
| EPAH | Energy Poverty Advisory Hub |
| EPBD | Energy Performance of Buildings Directive |
| EPC | Energy performance certificates |
| EPOV | EU Energy Poverty Observatory |
| EQLS | European Quality of Life Survey |
| ESS | European Social Survey |
| EU | European Union |
| EU-SILC | EU statistics on income and living conditions |
| GDPR | General Data Protection Regulation |
| H2020 | Horizon 2020 |
| HBS | Household Budget Survey |
| H&C | Heating and cooling |
| IKW / ilc_mdes01 | Inability to keep the home adequately warm |
| ISG | Indicator Subgroup |
| LDR / ilc_mdho01 | Total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor |
| LIHC | Low income, high-cost indicator |
| LTRS | Long-term renovation strategy |
| M/2 | Share of the population whose absolute energy expenditure is less than half the national median |
| M/4 | Share of population whose absolute energy expenditure is below a quarter of the national median |
| MS | Member State |
| NECP | National Energy and Climate Plan |
| NECPR | National Energy and Climate Progress Reports |

| Acronym | Full title |
|---|---|
| NUTS | Nomenclature of territorial units for statistics |
| OIPE | Italian Energy Poverty Observatory |
| ORSE | Romanian Energy Poverty Observatory |
| PRS | Private Rental Sector |
| RES | Renewable energy sources |
| RPEP | Ireland Research Programme on Energy Poverty |
| RRP | Recovery and Resilience Plan |
| SPC | Social Protection Committee |
| UN | United Nations |

**European Union Member States**

| | |
|---|---|
| AT | Austria |
| BE | Belgium |
| BG | Bulgaria |
| CZ | Czechia |
| CY | Cyprus |
| DE | Germany |
| DK | Denmark |
| EE | Estonia |
| EL | Greece |
| ES | Spain |
| FI | Finland |
| FR | France |
| HR | Croatia |
| HU | Hungary |
| IE | Ireland |
| IT | Italy |
| LT | Lithuania |
| LU | Luxembourg |
| LV | Latvia |
| MT | Malta |
| NL | Netherlands |
| PL | Poland |
| PT | Portugal |
| RO | Romania |
| SE | Sweden |
| SI | Slovenia |
| SK | Slovakia |

# Abstract


## English

This study provides an in-depth understanding of the landscape of energy poverty and subsequent indicators used at the European Union (EU) and Member State (MS) level. The aim of this study is to inform and improve how energy poverty policies are designed and implemented across the EU and at all levels of governance.

First, we identified and mapped relevant data for energy poverty monitoring and measuring, analysed and evaluated the datasets and indicators against a number of criteria (availability, robustness, frequency, accuracy, policy relevance) and developed a prioritisation the data/indicators considered to be more useful. Second, the team examined the national context of every MS and how energy poverty is defined and reported, as well as if and how MS policies tackling the issue are informed by indicators and whether these are consistent with each other. Third, we assessed each MS's ability to capture energy poverty based on the aforementioned analyses, to develop recommendations tailored to national specificities. Last, we conclude with recommendations in an effort to assist the European Commission to improve data collection and reporting of energy poverty at both EU and national level.

## Français

Cette étude permet de mieux comprendre le paysage de la précarité énergétique et les indicateurs utilisés au sein de l'Union européenne (UE) et des États membres. L'objectif de cette étude est d'informer et d'améliorer la manière dont les politiques de précarité énergétique sont conçues et mises en œuvre dans l'UE et à tous les niveaux de gouvernance.

Tout d'abord, nous avons identifié et cartographié les données pertinentes pour le suivi et la mesure de la précarité énergétique, analysé et évalué les ensembles de données et les indicateurs en fonction d'un certain nombre de critères (disponibilité, robustesse, fréquence, précision, pertinence politique) et élaboré une hiérarchisation des données/indicateurs considérés comme les plus utiles. Ensuite, l'équipe a examiné le contexte national de chaque État membre et la manière dont la précarité énergétique y est définie et rapportée, ainsi que si et comment les politiques abordant la précarité énergétique sont basées sur des indicateurs et si ceux-ci sont cohérents les uns avec les autres. Troisièmement, nous avons évalué la capacité de chaque État membre à appréhender la précarité énergétique sur base des analyses susmentionnées, afin d'élaborer des recommandations adaptées aux spécificités nationales. Enfin, nous concluons par des recommandations dans le but d'aider la Commission européenne à améliorer la collecte de données et la communication liée à la précarité énergétique au niveau de l'UE et au niveau national.

# Executive Summary

In 2022, 9.3% of the European Union (EU) population were unable to keep their home warm, according to Eurostat and the Energy Poverty Advisory Hub (EPAH).[1] Still, the actual number of people affected could be significantly higher. Energy poverty is a complex and longstanding challenge broadly defined as a situation in which households suffer from a "lack of access to essential energy services that underpin a decent standard of living and health, including adequate warmth, cooling lighting, and energy to power appliances, in the relevant national context."[2] In the absence of a standard EU definition of energy poverty up to June 2022, each Member State (MS) developed their own criteria for identifying, measuring and addressing (or not) the problem, according to their national context. Despite the diverging approaches, a mix of contextual and personal factors can offer a more informed understanding of the drivers. Overall, three main causes of energy poverty have been identified as structural. These are: low-income, high-energy bills, and inefficient buildings.

This study aims at shedding light on the landscape of energy poverty and subsequent indicators used at EU and MS levels. Through a thorough identification of relevant data sources and datasets and an exhaustive analysis of datasets and indicators based on a number of evaluation criteria – including the accuracy, frequency, robustness, availability and use in policy – the assignment evaluated how these have been applied in the national context so far, whether they have contributed to alleviating the burden off the shoulders of energy-poor households and what changes are needed to allow moving towards a new, comprehensive EU energy poverty reporting and measuring landscape by 2025.

The work establishes a holistic understanding of energy poverty, its definition and reporting, by also analysing in depth the currently submitted and forthcoming national energy and climate plan (NECP) documents but also other reporting relevant to energy poverty (both, reporting to the Commission and national reporting) such as the Territorial Just Transition Plans, the Long-term renovation strategies (LTRSs) and more. This study covers all EU27 Member States and captures how existing indicators are used in reporting on energy poverty. The analysis covers existing energy poverty indicators and datasets but also new ones, as well as local sources of information to assess energy poverty.

In order to achieve this and provide policy makers and readers with a comprehensive view of the state of energy poverty reporting and measuring, our work covers the following streams.

[1] European Commission (n.d.). Energy poverty. Available at: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-consumer-rights/energy-poverty_en

[2] Definition included in the proposed EED recast (Article 2(49)) and in the Council recommendation on ensuring a fair transition towards climate neutrality (Point 3(f)).

First the study identifies, maps and presents collected data that are relevant to the energy poverty monitoring and measuring, including also new types of data, available at a national and EU-level and performs exhaustive data analysis and evaluation of examined datasets and indicators to allow for a consistent data evaluation in terms of availability, robustness, frequency, accuracy, policy relevance and more. Then, the data/indicators are prioritized in terms of their usefulness, while considering national and local characteristics.

As a second workstream, the study provides a comprehensive view of how Member States define and report energy poverty by analysing submitted and forthcoming NECP and other public documents, and their consistency thereof, and further assesses the extent to which indicators have informed the development of measures and policies to tackle energy poverty

Further, the results from the previous two workstreams are consolidated and compiled for each country in the form of country fiches in order to provide a comprehensive overview of the country's ability to capture energy poverty and provide relevant recommendations and best practices relating to how EU and national indicators can be combined in different ways according to national specificities.

Finally, the study provides a set of recommendations aimed at improving data collection, data quality and data use to address energy poverty at both EU and national level. Recommendations took the form of methodological fiches including key information relevant for their implementation.

Overall, this study concludes that there are actions to be implemented, either by central authorities, governments or local/regional authorities to improve the assessment and monitoring of energy poverty in the European Union. These, relate to three main areas:

1. How and via which datasets and indicators we are measuring energy poverty,
2. Using of common indicators and templates for the monitoring and reporting of energy poverty to the European Commission and,
3. Linking of energy poverty data and monitoring to policy actions in order to alleviate the phenomenon.

# Résumé Exécutif (FR)

En 2022, selon Eurostat et l'Energy Poverty Advisory Hub (EPAH), 9,3 % de la population de l'Union européenne (UE) n'était pas en mesure de chauffer son logement[3]. Le nombre réel de personnes touchées pourrait cependant être nettement plus élevé. La précarité énergétique est un problème complexe et de longue date, défini de manière générale comme une situation dans laquelle les ménages souffrent d'un « manque d'accès aux services énergétiques essentiels au maintien d'un niveau décent de vie et de santé, notamment des systèmes adéquats de chauffage, de refroidissement, d'éclairage et d'alimentation des appareils en énergie, compte tenu du contexte national pertinent ».[4] En l'absence d'une définition européenne standard de la précarité énergétique jusqu'en juin 2022, chaque État membre a élaboré ses propres critères afin d'identifier, de mesurer et de résoudre (ou non) le problème, en tenant compte de son contexte national. Malgré les approches divergentes, une combinaison de différents facteurs contextuels et personnels peut offrir une meilleure compréhension des causes de la précarité énergétique. Globalement, trois causes principales ont été identifiées comme étant structurelles. Il s'agit des faibles revenus, des factures d'énergie élevées et des bâtiments inefficaces.

Cette étude vise à clarifier le paysage de la précarité énergétique et les indicateurs utilisés au sein de l'UE et de ses États membres. Grâce à une identification approfondie des sources et des ensembles de données pertinents ainsi qu'à une analyse exhaustive des données et des indicateurs sur base d'un certain nombre de critères d'évaluation - y compris la précision, la fréquence, la robustesse, la disponibilité et l'utilisation dans les politiques -, cette mission a permis d'évaluer la manière dont ces différentes informations ont été utilisées dans les contextes nationaux jusqu'à présent, si elles ont contribué à atténuer le fardeau qui pèse sur les épaules des ménages touchés par la précarité énergétique et quels changements sont nécessaires afin de développer un paysage européen plus complet en matière de rapportage et de suivi de la précarité énergétique d'ici 2025.

Le travail fournit une compréhension holistique de la précarité énergétique, de sa définition et de son rapportage, en analysant en profondeur les documents des plans nationaux pour l'énergie et le climat (PNEC) soumis actuellement par les Etats membres et ceux à venir, mais aussi d'autres rapports relatifs à la précarité énergétique (à la fois les rapports pour la Commission et les rapports nationaux) tels que les plans territoriaux pour une transition juste, les stratégies de rénovation à long terme (LTRS) et plus encore. Cette étude couvre tous les États membres de l'UE27 et montre comment les indicateurs existants sont utilisés dans le rapportage sur la précarité énergétique. L'analyse couvre les indicateurs et les ensembles de

[3] Commission européenne (s.d.). Energy poverty. Disponible à: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-consumer-rights/energy-poverty_en

[4] Définition incluse dans la proposition de refonte de la DEE (article 2(49)) et dans la recommandation du Conseil visant à assurer une transition équitable vers la neutralité climatique (point 3(f)).

données existants (mais également les nouveaux) sur la précarité énergétique ainsi que les sources locales d'information utilisées pour évaluer la précarité énergétique.

Afin d'atteindre cet objectif et de fournir aux décideurs politiques et aux lecteurs une vue d'ensemble de l'état des rapports et des mesures de la précarité énergétique, notre travail s'articule autour des axes suivants.

Tout d'abord, l'étude identifie, cartographie et présente les données collectées pertinentes pour le suivi et la mesure de la précarité énergétique, y compris les nouveaux types de données, disponibles au niveau national et européen, et effectue une analyse et une évaluation exhaustives des ensembles de données et des indicateurs examinés afin de permettre une évaluation cohérente des données en termes de disponibilité, de robustesse, de fréquence, d'exactitude, de pertinence politique, etc. Les données/indicateurs sont ensuite classés par ordre de priorité en fonction de leur utilité, tout en tenant compte des caractéristiques nationales et locales.

Dans un second temps, l'étude fournit une vue d'ensemble de la manière dont les États membres définissent et rapportent sur la précarité énergétique en analysant les PNEC soumis et à venir ainsi que d'autres documents publics ainsi que la cohérence de ces processus. En outre, l'étude évalue la mesure dans laquelle les indicateurs ont contribué à l'élaboration de mesures et de politiques de lutte contre la précarité énergétique.

Par ailleurs, les résultats des deux volets précédents ont été consolidés et compilés pour chaque pays sous la forme de fiches nationales afin de fournir une vue d'ensemble de la capacité du pays à appréhender la précarité énergétique et de fournir des recommandations pertinentes et des bonnes pratiques sur la façon dont les indicateurs européens et nationaux peuvent être combinés de différentes manières en fonction des spécificités nationales.

Enfin, l'étude fournit une série de recommandations visant à améliorer la collecte, la qualité et l'utilisation des données afin de lutter contre la précarité énergétique au niveau européen et national. Les recommandations prennent la forme de fiches méthodologiques contenant des informations clés pour leur mise en œuvre.

Globalement, cette étude conclut que des actions peuvent être mises en œuvre, soit par les autorités centrales, soit par les gouvernements ou les autorités locales/régionales, afin d'améliorer l'évaluation et le suivi de la précarité énergétique dans l'Union européenne. Ces actions concernent trois domaines principaux :

1. Comment et à l'aide de quels ensembles de données et d'indicateurs nous mesurons la précarité énergétique,
2. L'utilisation d'indicateurs et de modèles communs pour le suivi et le rapportage de la précarité énergétique à la Commission européenne et,
3. L'établissement d'un lien entre les données et le suivi de la précarité énergétique et les actions politiques visant à atténuer le phénomène.

# 1. Introduction

At least 9.3% of the European Union (EU) population was unable to keep their home adequately warm in 2022 and 10.6% in 2023 according to Eurostat, which makes it a major challenge for the EU.[5] This figure does not factor in the severe socio-economic implications of the COVID-19 pandemic and the energy crisis sparked by the Russian invasion of Ukraine. In 2022, 9.3% of the EU population were unable to keep their home warm, according to Eurostat and the Energy Poverty Advisory Hub (EPAH).[6]

Still, the actual number of people affected could be significantly higher. Energy poverty is a complex and longstanding challenge broadly defined as a situation in which households suffer from a "lack of access to essential energy services that underpin a decent standard of living and health, including adequate warmth, cooling lighting, and energy to power appliances, in the relevant national context."[7] In the absence of a standard EU definition of energy poverty up to June 2022, each Member State (MS) developed their own criteria for identifying, measuring and addressing (or not) the problem, according to their national context. Despite the diverging approaches, a mix of contextual and personal factors can offer a more informed understanding of the drivers. Overall, three main causes of energy poverty have been identified as structural. These are: low-income, high-energy bills, and inefficient buildings.

In recent years, energy poverty has moved higher up the political agenda in Europe, with the European Commission (EC) referring to energy poverty in its policy strategies and legislative frameworks as a serious problem that needs to be addressed with utmost urgency. This is because, according to research, scaling back on energy use to afford other costs such as housing and living costs, has a huge effect on mental and physical health, contributing to early deaths, higher levels of morbidity, psychological distress and the inability to live a life of security and dignity.

Indeed, tackling energy poverty is gaining traction and is spotted across different policy priorities. One may argue that in fact, energy poverty sits at the intersection of a multitude of crises: the economic, energy, social, health, climate, and housing crisis. Soaring energy prices, extreme temperatures caused by climate change, housing unaffordability due to fast increasing rent and house prices and roughly 75% buildings in the EU being energy inefficient,[8] all together create very challenging, almost hostile conditions for society's most vulnerable households, which need to withstand multiple and unprecedented crises happening simultaneously. For this, a

[5] EPOV Annual Report: Addressing Energy Poverty in the European Union: State of Play and Action, 2019

[6] European Commission (n.d.). Energy poverty. Available at: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-consumer-rights/energy-poverty_en

[7] Definition included in the proposed EED recast (Article 2(49)) and in the Council recommendation on ensuring a fair transition towards climate neutrality (Point 3(f)).

[8] European Commission (2020). In focus: Energy efficiency in buildings. Available at: https://commission.europa.eu/news/focus-energy-efficiency-buildings-2020-02-17_en

holistic approach is needed to handle the causes and consequences of energy poverty in an appropriate manner.

Meanwhile, such an approach can bring multiple benefits, including lower spending on health, reduced air pollution, improved comfort and wellbeing, and improved household budgets. Taken together, these benefits would increase social inclusion and directly boost economic growth and prosperity in the EU.

In an effort to bounce forward following the COVID-19 pandemic, Europe is delivering the Next Generation EU Recovery Package, meant to ‘guide and build a more sustainable, resilient and fairer Europe for the next generation’. The package confirms the role of the Renovation Wave as the main facilitator of the green recovery in Europe. The Renovation Wave seeks to tackle energy poverty, boost the structural renovation of worst-performing private and public buildings, and decarbonise heating and cooling

Furthermore, the Clean Energy for all Europeans (2018) policy package sheds light on the possible causes and consequences of energy poverty and brings forward measures to tackle the problem, especially through the National Energy and Climate Plans (NECPs). The novelty here was that all Member States were now asked to report on energy poverty and related policy measures in their NECPs (dedicated sections in the mandatory NECP template). Part of the package, the recast Electricity Directive stresses MSs’ obligation to assess the number of households in energy poverty, establish and publish the criteria underpinning this assessment, and in the event of significant numbers of such households, to include in their NECPs an indicative objective for the reduction of energy poverty, provide a timeframe, and outline relevant policies. Following this policy package, the European Commission has published the recommendation on energy poverty in 2020 (EU/2020/1563), and in the Fit-for-55 policy package, proposed in 2021, the EC again identified specific measures to determine the drivers of energy poverty risks that were also further developed in the recast of the Energy Performance of Buildings Directive (EPBD) and the revised Energy Efficiency Directive (EED) (EU/2023/1791). Further, in 23 October 2023, the Commission published the new Recommendation on energy poverty (C/2023/4080), together with a guidance document (SWD(2023) 647). The legislative documents also acknowledge the role of energy communities in helping fight energy poverty through reduced consumption and lower supply tariffs. The revised EPBD (EU/2024/1275), also includes specific provisions related to energy poor, and foresees, that EU countries include specific plans for the reduction of the number of people affected by energy poverty in their National Building Renovation Plans. Yet, submitted NECPs have showed that most MSs still lack both a clear definition of and an approach on how to assess energy poverty.

Despite the ever-increasing policy attention, there are important challenges in overcoming energy poverty. A very common one is its complexity. Poorly designed and constructed buildings that use more energy, combined with a broad mix of socioeconomic factors related with general poverty as well as complex housing

tenure systems (e.g., split incentives between owners and tenants) leave very little room for straightforward solutions. Moreover, the quantification of energy poverty at national level in a consistent and comprehensive manner is missing, while relevant datasets are not harmonised across the MS statistical offices. Nonetheless, significant progress has been made towards understanding the drivers and consequences of energy poverty, as well as the challenges associated with tackling the problem. So far, multiple EU-funded projects have developed a strong knowledge base and produced tangible results, for example, the EU Energy Poverty Observatory (EPOV) and the newest EPAH, aimed at fostering transformational change in knowledge about the extent of energy poverty monitoring and reporting in Europe, as well as the analysis of relevant policies and local initiatives.

A new aspect worth exploring are the emerging challenges and opportunities brought forward by the transition to climate neutrality and their interplay with energy poverty. Considering both climate neutrality and energy poverty in a unified manner is key. Synergies emerge as energy efficient buildings and appliances are key priorities for mitigating both climate and energy poverty. The energy transition is expected to give energy-poor households access to more affordable energy both due to more energy efficient buildings, products and services but also due to higher availability of energy carriers with lower and less fluctuating prices in the longer-term.  . At the same time, tackling energy poverty can itself be a driver of achieving energy efficiency objectives, and making the transition to climate neutrality a just one. Nevertheless, as a result of the energy transition, at least in the short to medium term, energy-related expenses per household are expected to increase in absolute terms: e.g., increased costs associated with investments in energy efficiency products and services; rising price of certain energy carriers. Other structural effects of the transition, such as the decline of carbon intensive sectors, may also temporarily expose households to energy poverty. On the other hand, the transition can reduce the vulnerability of the regions and households as demand for low-carbon goods emerges. The above, along with rising climate financing requirements, reveal new challenges and opportunities for EU livelihoods.

The overarching objective of this assignment is to provide an in-depth overview of the state-of-play of energy poverty indicators at both EU and MS levels in order to improve policies tackling energy poverty across the EU and at all levels of governance. Through a thorough identification of relevant data sources and datasets and an exhaustive analysis of datasets and indicators based on a number of evaluation criteria, including the accuracy, frequency, robustness, availability and use in policy, the assignment will evaluate how these have been applied in the national context so far, whether they have contributed to alleviating the burden off the shoulders of energy-poor households and what changes are needed to allow moving towards a new, comprehensive EU energy poverty reporting and measuring landscape by 2025. The work aims at establishing a holistic understanding of energy poverty, its definition and reporting, by also analysing in depth the currently submitted and forthcoming NECP documents but also other reporting relevant to energy poverty (both, reporting to the Commission and national reporting) such as

the Territorial Just Transition Plans, the LTRSs and more. The review of MS reporting will also identify a selection of strategies and policy measures meant to alleviate energy poverty and analyse how these would make use of energy poverty indicators. To this end, the objective is to cover both traditional, as per the indicators reported in Eurostat and alternative types of datasets and indicators, as identified in the literature, and explore how energy poverty is reported in official documents and policies. In addition, the objective is to develop consistent and informative country fiches for each of the 27 EU MSs and provide input for concrete recommendations. In particular, the analysis will table recommendations for improving data collection and indicator evaluation, the aim being to best characterise energy poverty at both EU and national level. Recommendations will seek to improve the current framework, governance and policy action related with energy policy indicators and its reporting requirements and will address the following topics related to energy poverty (national) statistical processes, including indicators and datasets.

The objectives will be accomplished by:

- Performing state-of-the-art desk research to analyse current EU and national databases and indicators for measuring energy poverty; evaluating the frequency, accuracy, transparency, accessibility, and availability of data; and assessing new types of datasets, relevant to energy efficiency, building stock condition and energy expenditure;
- Consulting national observatories, policy databases and public reporting documents for understanding the coverage of energy poverty reporting on a MS or even local level
- Acquiring an in-depth understanding of energy poverty at MS level through an analysis of how it is reported while exploring forward-looking issues, specifically the emerging synergies between tackling energy poverty and attaining climate neutrality.
- Providing detailed information on the capacity of each MS to capture energy poverty levels and make easily available information on national datasets and indicators, as well as current practices to measure energy poverty and monitor trends and results with recommendations on best practise for combining EU and national level indicators.
- Compiling recommendations on how to improve data collection at both EU and national level, the datasets used for reporting on energy poverty (including their strengths and shortcomings) and possible alternative datasets that MSs could use to inform on energy poverty.

This report starts with the analysis of the reporting practices and content, as well as the use of indicators to describe energy poverty by the EU27 MSs in **section 2**. The aim of the section is to provide a comprehensive overview of the ways MSs define and report on energy poverty after analysing several official reporting documents. ,and their consistency thereof. Moreover, we further assessed the extent to which indicators have informed the development of measures and policies to tackle energy poverty.

In continuity, **Section 3** focuses on the indicators – existing and new – that are used and could potentially be used by Member States to describe and further examine energy poverty. In this section, we identify, map and provide an overview of data that are relevant to the energy poverty monitoring and measuring, including also new types of data, available at a national and EU-level and performed exhaustive data analysis and evaluation of identified datasets and indicators to allow for a consistent evaluation in terms of availability, robustness, frequency, accuracy, policy relevance and more, and will prioritize the data/indicators in terms of their usefulness.

Further, **Section 4** consolidates and compiles the results from the previous two workstreams - described in Sections 2 and 3 - for each Member State in the form of a country assessment in order to provide a comprehensive overview of the country's ability to capture energy poverty and provide relevant recommendations and best practices relating to how EU and national indicators can be combined in different ways according to national specificities.

Lastly, **Section 5 and 6** consider the results from the three previous sections in order to elaborate a set of recommendations and conclusions aimed at improving data collection, data quality and use to address energy poverty at both EU and national level.

# 2. Analysis of the reporting on energy poverty and the use of indicators by the EU27 Member States

The aim of this line of work of the study is to provide a comprehensive view on how MSs define and report energy poverty (EP), by analysing submitted and forthcoming draft NECPs, Long-term Renovation Strategies (LTRSs), Recovery and Resilience Plans (RRPs) and other public documents, and their consistency in reporting. The study also focused on the governance of energy poverty reporting by addressing the legal basis of reporting, as well as potential improvements to existing policies.

To deliver on the analysis of reporting of energy poverty by MSs the project team developed a methodology for assessing the documents (section 2.1). We applied this methodology to the 27 MSs.

To perform the analysis of the documents, we focused on qualitative information relating to EP, such as definitions, the indicators (or datasets) included in the texts and how these are used (e.g., for setting targets, if values are available and the methodology of the indicators is clear), and policy measures relevant to EP looking out for and recording any limitations in the excel templates accompanying the analysis. The primary source of information were the draft 2023 updates of NECPs, complemented by LTRSs, NRRPs, and, if available, Action Plans on Energy Poverty, as well as MS assessments carried out in the framework of the EU EPOV and included some Amended RRPs. In addition, this section describes explicitly the reporting obligations deriving by national legislation of the Member States. (see subsection 2.2*)*. Furthermore, to provide an initial assessment of the available measures implemented by the MSs in light of the EED in the ODYSSEEMURE database, the study offers an overview of national measures under the topic of Energy Efficiency also addressing vulnerabilities linked to Energy Poverty. As such, the research offers insights in identified priority groups and general trends and approaches across MSs (see subsection 2.2.1).

To enhance the analysis and assessment of reporting structures we also investigated CORDIS for specific projects related to energy poverty as well as the EU calls databases based on keywords search (i.e. energy poverty, energy poverty indicators and definitions). This yielded favourable results in observing tentative steps forwards in conceptualising, defining, and addressing EP in different countries, by considering diverse types of innovative indicators and providing specific informative and legislative support.

Relevant projects we reviewed for innovative information on EP include the following:

- Connecting Obligated Parties to Adopt Innovative Schemes towards Energy Poverty Alleviation – SocialWatt
- Community Tailored Actions for Energy Poverty Mitigation – ComAct
- Empowering women to take action against energy poverty in the Mediterranean – Empowermed

- Empowering Energy Poor Citizens through Joint Energy Initiatives – PowerPoor
- Actions to Mitigate Energy Poverty in the Private Rented Sector – Enpor

The steps of the applied methodology are outlined below and should be read together with the annexed excel file “new_reporting_finaldraft”. The excel file contains detailed information about the NECPs, LTRSs, RRPs and other relevant documents reviewed and assessed.

## 2.1. Review of reporting processes regarding energy poverty

### Methodology for assessing energy poverty reporting

**Document overview**: first, the team went through each document under assessment, in this case the NECP draft update to understand the current reporting for energy poverty, including definitions, indicators, their relevant values and targets, and lastly legal measures and actions.

**Cross-reference with related documents**: the team compared and aligned the NECP draft update information with other relevant documents such as LTRSs, RRPs, and when available, the strategic action plans on energy poverty - in case MS have prepared one- were read.

**Fill in the relevant tables for NECPS, LTRSs, RRPs and Operational Programmes in the accompanying excel file (new_reporting_finaldraft.xlsx)**: this can be found in the excel file, with the same structure of country-based template. As the template is filled for NECPs, so it is done for LTRSs and RRPs when information is relevant and available. To navigate the file, we have included an introductory README tab where one can consult to be able to find all relevant information. The excel file contains 27 country tabs where the following information is present:

- Columns A to B: Documents (yellow coloured) show the relevant documents assessed and their publishing date
- Columns C to J: Energy Poverty Data (orange coloured) show the assessment on the energy poverty definition, the use of Eurostat indicators with their respective values and possible targets for reducing energy poverty along with their reference year. In addition, we also show the assessment on the use of non-Eurostat indicators, their respective values and targets.
- Columns K to O: Indicator Relevance (blue coloured) show the analysis based on all documents and for each indicator assessed the data source, reporting authority, the respective policy measure and/or scope, the measure conditionality and its possible impacts.

**Searching for Energy Poverty information**: after going through the documents with a key word search, the team aligned specific sections and data points from the NECP draft and the other documents with the corresponding columns in the country tabs on the “new_reporting_finaldraft” excel file.

**Identification of indicators and datasets**[9]: the team located the indicators used to measure aspects of energy poverty and related targets within the three different documents. In the excel template accompanying this report, when available, and per document assessed, one should be able to track if the indicators are present in the current draft, or whether MS are expected to add them in the final document, whether they are only national or Eurostat indicators and more. Beside the name of the indicator, we filled in year, values, and targets: the team introduced the baseline year, current value, and target figures for each indicator as provided in the available documents. Definitions of energy poverty are reported, along with the indicators used out of the four ones mentioned in the recast Energy Efficiency Directive (EED) (Directive EU 2023/1791), i.e.:

a. the inability to keep the home adequately warm (Eurostat, EU statistics on income and living conditions (EU SILC) [**ilc_mdes01**]);
b. the arrears on utility bills (Eurostat, EU SILC [**ilc_mdes07**]);
c. the total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor (Eurostat, SILC [**ilc_mdho01**]);
d. at-risk-of-poverty rate (Eurostat, SILC and ECHP surveys [**ilc_li02**]) (cutoff point: 60 % of median equivalised income after social transfers).

If other indicators – named in the accompanying excel file as non-Eurostat indicators– are identified, these are added in the second part of the table in the same manner. These non-Eurostat indicators are further assessed and analysed in Section 4.3.

**Determine data status and availability**: the team recorded the availability and status of each indicator included in the NECP draft update, noting whether data is present, under development, or not included.

**Reporting Frequency**: for NECPs, reporting should take place every two years. Recording the sources of data and the authorities responsible for reporting this information follows suite. Each country must submit a progress report every 2 years, according to the structure, format, technical details and process set out in the Implementing Regulation. The Commission will, as part of the state of the energy union report, monitor the EU's progress as a whole towards achieving these targets[10].

[9] The ad-hoc EU-SILC module 2023 on “energy efficiency” has the variables “Inability to keep the dwelling comfortably warm during winter” and “Inability to keep the dwelling comfortably cool during summer” that captures the phenomenon from the point of view of the characteristics of the dwelling (building condition). Related indicators will be available on Eurobase in 2024. In addition, the ad-hoc EU-SILC module 2025 on “Energy and the environment ”, will include, among others, variables related to the energy efficiency of the dwelling, such as “Energy efficiency renovation (thermal insulation, windows or heating system)’’ ; “Obstacles in improving energy efficiency’’ and “Damage to house/apartment due to environmental/weather causes’’.

[10] European Commission (n.d.). National energy and climate plans. Available at: https://commission.europa.eu/energy-climate-change-environment/implementation-eu-countries/energy-and-climate-governance-and-reporting/national-energy-and-climate-plans_en

**Acknowledging limitations**: the team went on noting limitations/gaps in the data or reporting mechanisms mentioned in the NECP draft. Most gaps and limitations are self-evident when filling in the table, marked by "No" or blank spaces under these categories.

**Policy relevance**: generally, it is important to take note of any policies that have been influenced by, or introduced, based on the EP indicators and also country-specific circumstances that may affect reporting on these indicators or energy poverty strategies. Other policies not based on available indicators have also been reported, as the provide quantitative information and support in defining situations of vulnerability and energy poverty, potentially leading to further definitions or options to identify EP.

**Country-specific information**[11]: The methodology included added any relevant information specific to MS that may impact their reporting or energy poverty strategies. This includes relevant specific tenders – as it was the case for Bulgaria, or country Specific Action Plans/Strategies or material available from EP observatories to tackle EP. Countries with relevant action Plans/EP Observatories: Austria, France, Greece, Italy, Portugal, Spain, Romania. It should be mentioned that a number of countries are in the process of forming national EP observatories. In fact, in Czechia, the Ministry of Industry and Trade has formed an expert group, tasked with creating a tailored definition of energy poverty. Similarly, in Denmark, the creation of a "Nordic" energy poverty observatory has been suggested by the Nordic Energy Research[12]. Lastly, in Ireland, a research network has been established with the goal of providing insights that enhance policy design to protect vulnerable households through coordinated efforts of different institutions[13].

**Consistency check**: information available in the accompanying excel file have been reported for and verified as they were transposed in a previous step of this study. Making sure that the data and objectives across the NECP draft update and other policy documents are aligned and accurately reflected in the document was key. Also, we strived to look for consistency across documents provided by the same country when possible.

**Address information gaps**: when information is insufficient or unclear, it was necessary to seek additional details from national documents, roadmaps on energy poverty, or directly from national authorities. In acknowledging these gaps, we can provide better tailored recommendations to specifically target issues in reporting.

[11] Disclaimer: there is a concrete possibility that some countries have more research and data compared to what reported in this study. Task 2 focused on information available in the official reporting mentioned above.

[12] Nordic Energy Research (2024). Energy poverty in the Nordic Countries. Available at: https://pub.norden.org/nordicenergyresearch2024-02/index.html

[13] ESRI (n.d.). Research Programme on Energy Poverty. Available at: https://www.esri.ie/current-research/research-programme-on-energy-poverty-rpep

**Document sources and justifications**: maintain a record of all sources of information, including dates and details of consultations or correspondence with national authorities or experts.

**Final verification**: the last step involved a final, thorough review of the table to confirm accuracy and completeness, with peer oversight.

## 2.2. Assessment of energy poverty indicators by MS and consistency checks

The legislative context in which energy poverty is addressed in European Regulations is both extensive and differentiated in its scopes: relevant articles and measures pertaining to the study hereby conducted are reported below.

First, the **Energy Performance of Buildings Directive (EPBD) 2010/31/EU** states that EP has to be mentioned accordingly to Art 2a (d) in regard to LTRSs. Secondly, the **Governance of the Energy Union and Climate Action Regulation (EU) 2018/1999** in Art. 3.3 (d) requires MSs to have a section in their NECP assessing the number of households in energy poverty while describing relevant policies, and, in case the MS finds it has a significant number of households in EP, then, it shall include national objectives to reduce such phenomenon, along with quantitative information on the number of households in EP, with information on policies and measures, based on Art. 24. In the following Commission Implementing Regulation (EU) 2022/2299, templates are provided in case MSs fall under the description of Art. 3.3(d) and need to report on EP. In the final **recast of the EED Directive (EU) 2023/1791**, not only it officially defines EP as per Art. 2 (52), according to Art. 8.3, MSs shall establish and achieve a share of the requited amount of cumulative energy savings among people affected by EP and other vulnerable groups, asking to consider the following indicators:

(i) the inability to keep the home adequately warm (Eurostat, SILC [ilc_mdes01]);
(ii) the arrears on utility bills (Eurostat, SILC [ilc_mdes07]);
(iii) the total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor (Eurostat, SILC [ilc_mdho01]);
(iv) at-risk-of-poverty rate (Eurostat, SILC and European community household panel (ECHP) surveys [ilc_li02]) (cutoff point: 60 % of median equivalised income after social transfers). This EED also officially defines EP as per Art. 2 (52).

In practice, thanks to the converging structure of EU legislation, MSs are aware and clearly guided on what to report under Art. 3.3(d) of the Governance regulation and other relevant policy packages. More consistent and coherent strides forward in the reporting effort are then to be expected after newly implemented regulations take place. For now, the assessment that MSs are allowed to offer doesn't require any strict, unified or homogenised methodology. As a result, many countries are indeed

respecting the requirements set out by the aforementioned article by describing wide arrays of social welfare measures, as well as more targeted ones towards EP alleviation, whereas some countries have not yet reported specifically structured approaches to the issue.

### 2.2.1. Member States national legislative approaches to energy poverty in energy efficiency

In the MURE database, national energy efficiency policies aimed at alleviating energy poverty are split into two main types: the ones designed primarily or exclusively to address energy poverty and those that include significant components aimed at mitigating energy poverty as part of broader initiatives. Measures identified within the first category are specifically targeted to directly alleviate the conditions and causes of energy poverty. These can include, for example, dedicated energy assistance programs, which may provide subsidies for target groups to acquire energy-efficient appliances, and other support mechanisms focused on vulnerable groups. By contrast, measures in the second category have broader objectives but still incorporate significant elements addressing energy poverty; for instance, these might involve higher grant rates for low-income households participating in general renovation programs, or promoting energy efficiency in social housing, as well as providing free energy advice services to vulnerable households. This dual approach makes it so that some policies are essentially on energy poverty while others integrate solutions within wider energy efficiency and social welfare frameworks, broadening their impact and reach.

By studying such measures included in wider policy initiatives not framed as “energy poverty specific”, as their focus is on vulnerable groups, so as that support reaches those who need it most, it emerges that the identified target groups typically include low-income households, people with disabilities, individuals receiving social benefits, families with children, and pregnant individuals. By reaching out to specific groups, policies can more effectively alleviate energy poverty and its associated hardships. For instance, programs that offer higher grant rates or specific subsidies for low-income families help ensure that the financial burden of energy costs does not disproportionately impact these vulnerable populations. This targeted approach not only addresses immediate needs but also contributes to long-term solutions. Indeed, by improving energy efficiency and reducing overall energy demand, as well as improving living conditions and quality of the dwelling itself, they bring communities closer to the Just Transition. By prioritizing these groups, national policies can make a substantial difference in mitigating energy poverty and promoting social equity.

Several national initiatives illustrate the practical application of these policies. For instance, the Warmer Home Scheme in Ireland specifically targets low-income households receiving certain social welfare payments. Its eligibility criteria include home ownership, the age of the home (built and occupied before 2006), and a low energy rating (C, D, E, F or G). This scheme directly targets energy poverty by

improving the energy efficiency of homes for those most in need. Similarly, the Individual Housing Assistance Scheme in Luxembourg, amongst other support options, offers financial aid for housing improvements based on income, ensuring that low-income families can afford necessary renovations. In Greece, the Saving at Home II Programme provides interest-free loans and subsidies for enhancing the energy performance of residential buildings, again reducing energy costs for households but also promoting the adoption of renewable energy sources, thus addressing energy poverty and environmental sustainability simultaneously.

Many other EU member states provide direct financial assistance or subsidies to low-income households to help cover energy costs or to fund energy efficiency improvements, as France's Energy Cheque Scheme and Spain's Social Bonus for Electricity. Moreover, other countries have established dedicated funds to support energy efficiency projects, particularly targeting low-income households as in the prominent example of Germany's Energy Efficiency Fund.

### A summary of Common Measures Across EU Countries:

- **Energy Bill Discounts**: financial discounts or social tariffs on energy bills for vulnerable households.
- **Energy Efficiency Grants and Loans**: provision of grants or low-interest loans for energy efficiency improvements in homes.
- **Tax Rebates**: tax incentives for investments in energy-saving measures.
- **Regulatory Measures**: implementation of regulations to ensure minimum energy efficiency standards in buildings.
- **Public Campaigns**: educational campaigns to promote energy-saving practices and inform about available support schemes

### Other relevant actions taken by MSs

Bulgaria's new regulation, approved in November 2023, defines criteria for vulnerable electricity customers. It considers disposable income, energy consumption, and specific needs like medical devices reliant on electricity. This regulation is part of a broader strategy to address energy poverty through targeted financial support and assistance programs. In Finland’s new report on energy poverty, they highlight the country's comprehensive social security system as an essential factor in addressing this issue. Through the General Housing Allowance, tailored allowances for pensioners, and social assistance, Finland provides support in covering housing and energy costs for vulnerable groups. Additional measures include temporary assistance with electricity costs, study grants for students, and social lending programs. Finland also employs various instruments like the ARA system, energy renovation subsidies, and energy guidance to further prevent energy poverty. Additionally, the report discusses trends in the energy market, making sure consumer protection and energy efficiency in buildings can be tackled simultaneously. Also, Slovenia's action plan aims to reduce energy poverty by improving energy efficiency in residential buildings, offering financial aid for energy-efficient appliances, and ensuring affordable energy supply. The plan targets vulnerable groups with tailored support programs, with EUR 33.8 million allocated for the period 2024-2026, the plan focuses on energy efficiency (EE) and renewable

energy sources (RES), social integration into energy communities, and awareness-raising activities. Key funding sources include the Climate Change Fund, European Regional Development Fund, and future allocations from the EU Social Climate Fund.

Lastly, Portugal's approval of the National Long-term Energy Poverty Mitigation Strategy 2023-2050 recognises that energy poverty affects not only economically disadvantaged households but also broader aspects of quality of life, health, and productivity. The strategy aims to achieve complete eradication of this issue by 2050. Key components of the strategy include enhancing the sustainability of housing in terms of energy and environment, ensuring equitable access to essential energy services for all citizens, promoting integrated local initiatives, and fostering informed public engagement. Central to its implementation is the establishment of a National Energy Poverty Observatory to monitor progress and propose evidence-based policies. Additionally, the strategy outlines decadal action plans for 2030, 2040, and 2050, for continuous adaptation and improvement in tackling energy poverty throughout the transition to sustainable energy practices.

### 2.2.2. Member State definitions of energy poverty

Bearing in mind such a legislative context, this study reports varying definitions of energy poverty across the 27 assessed MSs (all available also in the new_reporting_finaldraft.xlsx Excel document), reflecting the complex interplay of socio-economic factors within different national contexts and varied approaches in terms of strategies, measures, actions, and plans. For instance, Austria's definition includes households with incomes below the at-risk-of-poverty threshold, coupled with above-average energy costs, illustrating a clear link between financial vulnerability and energy affordability. Similarly, Ireland's definition stressed the inability to adequately heat or power a home as fundamental to social inclusion. In contrast, countries like Greece and Spain adopt differently holistic approaches, considering factors such as income, expenditure on energy products, and housing energy efficiency to identify energy-poor households. Reflections on the situation reveal the urgent need for coordinated efforts at the national and EU levels to address the underlying drivers of energy poverty and ensure equitable access to essential energy services for all citizens. Table 2-1 provides an overview of the status energy poverty definitions across the EU.

**Table 2-1 Assessment of Member State definitions of energy poverty**

| Member State | Status of Definition | Definition |
|---|---|---|
| Austria | Mentioned in NECP (2019) | A household is considered energy poor if its income is below the at-risk-of-poverty threshold and, at the same time, it has to cover above-average energy costs (not official). |
| Belgium | | n/a |
| Bulgaria | Defined in State Gazette issue № 103/12.12.2023 | A household in a situation of energy poverty" is a household which, at the current prices of energy carriers, has a disposable average monthly income of a member of the household for the previous year up to the official poverty line, after it has been reduced by its expenditure on the determined relative to the energy characteristics of the dwelling typical energy consumption and which therefore does not have access to basic energy services for adequate heating, cooling, lighting and providing energy for household appliances. |
| Cyprus | Defined in NECP (2023) | Energy poverty pertains to customers facing financial hardship due to low income, professional status, family status, house energy efficiency, and reliance on electrical equipment for health reasons. Vulnerable consumers are specifically categorized in the 2025 Decree on the Determination of Energy Poverty and Categories of Vulnerable Consumers and Measures to Combat Energy Poverty and the Protection of Vulnerable Consumers. |
| Czechia | Mentioned EED definition (NECP 2023) | Mentioned EED definition in the NECP with intention of adopting it: lack of access for households to essential energy services that provide basic standards and a decent standard of living and health, including adequate heating, hot water, cooling, lighting and energy to power appliances, in the relevant national context, existing social policy and other relevant policies, due to a combination of factors including unavailability, lack of disposable income, high energy expenditure and low household energy efficiency;" a vulnerable customer (defined in the amendment of the Energy Act) may, in particular, represent a situation in which the customer:<br>• is significantly less able than a typical consumer to protect or represent his interests in the energy market (for example, because of age or health);<br>• in the event of a negative energy supply situation, his personal status will be more damaged by the event than another customer in the same situation. |
| Germany | | n/a |
| Denmark | | n/a |
| Estonia | Adopted EED definition (NECP 2023) | A person affected by energy poverty was linked to maintenance support, which means that the number of beneficiaries of subsistence support is equal to the number of persons affected by energy poverty. A person affected by energy poverty is a person or family living alone within the meaning of the Social Welfare Act who has received at least one subsistence allowance in the last six months and whose income per family member in the previous month does not exceed the minimum wage. |

| Member State | Status of Definition | Definition |
|---|---|---|
| Greece | Defined in NECP (2023) | The identification of households affected by the phenomenon of energy poverty should be carried out through the calculation of a combined index, which will take into account as many factors as possible related to the issue under consideration. This index incorporates the dimensions, which are described by Directive 2019/944/EU and relate to income, expenditure on the purchase of energy products and the energy efficiency of households' residential buildings. |
| Spain | Defined in LTRS (2020) | Energy poverty is the situation in which a household in which basic needs for energy supplies cannot be met as a result of insufficient income and, where appropriate, may be aggravated by energy inefficient housing; Vulnerable consumer is the consumer of electricity or thermal uses who is in energy poverty and may benefit from the support measures put in place by the authorities |
| Finland | | n/a |
| France | Defined in NECP and national law (2023) | A person experiencing particular difficulties in obtaining the energy supply necessary to meet his basic needs in his house owing to the inadequacy of his resources or housing conditions is in a situation of energy poverty |
| Croatia | | n/a |
| Hungary | | n/a |
| Ireland | Defined in Ireland Energy Poverty Action Plan (2022) | Energy poverty is defined as an inability to heat or power a home adequately. core principles that defined the previous Strategy to Combat Energy Poverty still stand:<br>• Adequate supplies of light, heat and power are fundamental to being able to participate in society and essential for social inclusion<br>• Energy poverty is a function of 3 elements: a household's income, the cost of energy and the level of energy efficiency of the home<br>• Energy poverty is strongly correlated with basic deprivation i.e. that it is a symptom of inadequate resources to cover living costs rather than an energy only problem<br>• Energy poverty has long term debilitating effects for individuals and society with growing evidence that it contributes to higher levels of respiratory and cardiovascular disease, excess winter mortality and overall states of mental health and wellbeing. |
| Italy | Defined in National Energy Strategy (2017) | The difficulty of purchasing a minimum basket of energy goods and services or, alternatively, access to energy services that involves a distraction of resources, in terms of expenditure or income, exceeding a "normal value" |
| Lithuania | | n/a |

| Member State | Status of Definition | Definition |
|---|---|---|
| Luxembourg | | n/a |
| Latvia | Defined in NECP (2023) | The EC's Energy Poverty Observatory defines energy poverty is a special type of poverty related to a number of adverse effects on human health and well-being, e.g. respiratory and heart disease and mental health influenced by low temperatures and stress related to gas, heating, and electricity bills that people cannot pay. |
| Malta | Defined in NECP (2019) | Energy poverty is defined as "whether a household can afford the necessary energy services to meet its basic daily living requirements" |
| Netherlands | | n/a |
| Poland | Defined in Energy Law Article 5gb | Energy poverty means a situation in which a domestic household headed by a single person or by several people sharing a common household in a self-contained dwelling or a single-family dwelling in which no economic activity is carried out, cannot provide itself with sufficient heat, cooling and electricity to supply appliances and<br>for lighting, where the household collectively meets the following conditions:<br>1) it has a low income;<br>2) has high energy expenses;<br>3) resides in a dwelling or building with low energy efficiency |
| Portugal | | n/a |
| Romania | Defined in LTRS (2020) | Energy poverty can be defined as 'a situation where a household or an individual is unable to afford basic energy services (heating, cooling, lighting, mobility and power) to guarantee a decent standard of living due to a combination of low-income, high-energy expenditure and low energy efficiency of their houses'. |
| Sweden | | n/a |
| Slovenia | Defined in LTRS (2020) | According to the Official Journal of the EU, we speak of energy poverty when a household is unable or difficult to provide adequate heating at an affordable price and has no access to affordable energy-related services |
| Slovakia | Defined in NECP (2023) | 'energy poverty' means a household's lack of access to essential energy services that provide basic levels and decent standards of life and health, including adequate heating, hot water, cooling, lighting and electricity for appliances in the relevant national context, existing national social policy and other relevant national policies, due to a combination of factors such as at least financial unavailability, insufficient disposable income, high energy expenditure and low energy efficiency in houses. |

Available | EED definition | In progress | Unavailable

Even as a great stride forward has been observed in many MSs, it is important to note that definitions might (and might have to) differ across countries, based on regional climate, socio-economic specificities and local capacity to deal with social issues. Alas, not all countries have official or formally recognised definitions of energy poverty, which hinders comparability and coordination efforts: this leads to unclear and inconsistent reporting both on a national and European level.

Among the definitions reported, Greece's approach appears to be one of the most comprehensive, as it integrates various dimensions of energy poverty, aligning with Directive 2019/944/EU, which stresses income, expenditure on energy products, and the energy efficiency of residential buildings. By incorporating these multiple factors into a combined index, it considers both financial vulnerability and the quality of housing conditions. Hence, this holistic approach can be an example of acknowledging the intricate on-ground reality between socio-economic factors and energy access.

Another noteworthy example is Ireland, focusing on the fundamental importance of energy access for social inclusion and overall well-being as it considers energy poverty as not merely an issue of affordability but as a broader challenge encompassing income levels, energy costs, and the energy efficiency of homes. By recognising the three core elements of income, energy costs, and home energy efficiency, Ireland's definition reflects a similar approach to the Greek one.

Similarities in definitions:

1. **Financial Hardship**: or low income are identified as many as a core component of energy poverty. This includes countries like Austria, Cyprus, Spain, France, Ireland, Italy, Hungary, Poland, Romania, Slovakia, and Slovenia.
2. **Inability to Meet Basic Energy Needs**: mentioned in every definition.
3. **Combination of Factors**: EP not solely determined by low income but influenced by many factors, including housing conditions, energy efficiency, and household expenditure on energy.

Differences in Definitions pertain to:

1. **Specific Criteria Used**: each country employs specific criteria or indicators to define energy poverty. For example, Austria uses income below the at-risk-of-poverty threshold combined with above-average energy costs, while Greece employs a combined index that considers factors related to income, energy expenditure, and energy efficiency.
2. **Focus on Vulnerable Consumers**: some countries, like Cyprus, Spain, Hungary, and Romania, specifically categorize vulnerable consumers and outline measures to combat energy poverty and protect these groups.
3. **Incorporation of Health Factors**: countries like Ireland highlight the long-term health effects of energy poverty, such as respiratory and cardiovascular diseases, excess winter mortality, and mental health issues.
4. **Emphasis on Access to Services**: countries like Slovakia and Slovenia stress the lack of access to essential energy services necessary for decent standards of life and health.

Despite the increasingly widespread action taken by MSs, some are still missing an official definition: this list includes countries such as Austria, Croatia, Germany, Hungary, Lithuania, Latvia,  The Netherlands, and Sweden. Other countries, such as Belgium, Denmark, Finland, Luxembourg and Portugal have specified that they are in the process of providing a definition or they have proposed one Lastly, Estonia implemented the definition provided by the EED, while Denmark report that it takes note of this definition and Czechia states the intention of adopting such definition in its NECP.

### 2.2.3. Use of Eurostat indicators

Countries across the European Union can use the set of suggested Eurostat indicators to assess energy poverty comprehensively. Table 2-2 shows which ones are used by MSs in their reporting (also available in the new_reporting_finaldraft.xlsx Excel document). Their use of such indicators is varied, but it is usually more pronounced for countries actively tackling EP.

**Table 2-2 Use of Eurostat harmonized indicators in official national reporting per Member State**

| Member State | Inability to keep home adequately warm | Arrears on utility bills | Total population living in dwellings in bad condition | At risk poverty rate | High share of energy expenditure in income | Low absolute energy expenditure |
|---|---|---|---|---|---|---|
| | ilc_mdes01 | ilc_mdes07 | ilc_mdho01 | ilc_li02 | 2M | M/2 |
| Austria | ■ | | | ■ | | |
| Belgium | | ■ | | | | ■ |
| Bulgaria | ■ | ■ | | | | |
| Cyprus | ■ | ■ | ■ | ■ | | |
| Czechia | ■ | ■ | | ■ | ■ | |
| Germany | | | | | | |
| Denmark | | | | | | |
| Estonia | ■ | ■ | | | | |
| Greece | ■ | ■ | | | | |
| Spain | ■ | ■ | | | ■ | ■ |
| Finland | | | | | | |
| France | | | | | | |
| Croatia | ■ | ■ | | | | |
| Hungary | | | | | | |
| Ireland | | ■ | | | | |
| Italy | ■ | ■ | | | | |
| Lithuania | ■ | | | | ■ | |
| Luxembourg | ■ | ■ | | ■ | | |
| Latvia | ■ | | ■ | | | |

| Member State | Inability to keep home adequately warm | Arrears on utility bills | Total population living in dwellings in bad condition | At risk poverty rate | High share of energy expenditure in income | Low absolute energy expenditure |
|---|---|---|---|---|---|---|
| Malta | | | | | | |
| Netherlands | | | | | | |
| Poland | | | | | | |
| Portugal | | | | | | |
| Romania | | | | | | |
| Sweden | | | | | | |
| Slovenia | | | | | | |
| Slovakia | | | | | | |

Note: This analysis of use of harmonised indicators is based on a review of official national reporting (e.g. LTRS, NECP, RRP, national energy poverty strategies)

## 2.3. Forward-looking assessment of new types of energy poverty indicators

### 2.3.1. Other employed indicators

The additional indicators employed by different countries consider various socio-economic factors and household circumstances. In this perspective, additional indicators are those for which official reporting is not expected, but they still emerge from national reporting and national research to provide more contextual and granular information about this social phenomenon.

One common theme among these additional indicators is the focus on the affordability and adequacy of energy services within households: components as the share of energy expenditure in income and the weight of energy bills in the household budget shed light on the financial strain experienced by vulnerable households. This indicates that households struggle to meet basic energy needs without compromising other essential expenses. For example, in Spain, the high share of energy expenditure in income (2M) identifies households where energy costs disproportionately burden already limited financial resources, while in Lithuania, the share of households with significant energy expenditure underscores the extent to which energy costs impact overall household budgets.

Moreover, several indicators assess the hidden dimensions of energy poverty, which may not be readily apparent through conventional measures. For instance, in Belgium, the concept of hidden energy poverty reflects households' efforts to minimise energy consumption to cope with financial constraints, showing the sacrifices households make to afford basic energy services. Similarly, in France,

indicators like the energy effort rate and the feeling of cold provide insights into the lived experiences of energy-poor households, offering a more holistic understanding of their challenges beyond economic indicators alone.

Additionally, these other indicators reflect the diverse contexts and policy priorities across countries. In Ireland, metrics related to customer arrears and annual bills underline the intersection of energy poverty with broader issues of financial vulnerability and social welfare provision, informing targeted interventions to support struggling households. Similarly, in Poland, the inability to keep dwellings cool in summer underscores the importance of addressing seasonal variations in energy poverty and safeguarding access to affordable cooling solutions.

Overall, the adoption of these additional indicators represents a significant step towards advancing the measurement and analysis of energy poverty, facilitating more targeted and effective policy responses.

Additional indicators used by various countries to assess energy poverty include (also available in the Excel file):

- **Belgium**, in its Baromètre de la précarité énergétique, observes:
  - Measured energy poverty: households with energy bills that exceed their income.
  - Hidden energy poverty: households that minimize energy consumption to meet financial constraints.
  - Subjective energy poverty: households that self-report inadequate heating.
- **Czech Republic**:
  - Households spending more than twice the median on energy.
  - Households spending so little on energy that they likely live in hidden energy poverty.
- **Greece**: Index I-II: households meeting specific criteria related to energy consumption costs and income levels.
- **Spain**:
  - High share of energy expenditure in income (2M).
  - Low absolute energy expenditure (M/2).
- **France**:
  - Energy effort rate: households where energy expenditure exceeds a certain percentage of income.
  - Indicator on the feeling of cold: quantifies self-restriction phenomena not captured by economic indicators.
  - weather corrected indicator: neutralises the effect of weather on heating consumption
- **Croatia:** Risk indicators including household income, building energy rating, and total energy costs relative to income.
- **Ireland**:
  - Households spending more than 10% of income on energy.
  - Metrics related to electricity and gas customer arrears and annual bills.
- **Italy**:
  - Energy expenditure relative to heating needs.

    - Indicators related to low income combined with high energy costs and arrears on utility bills.
- **Lithuania**:
    - Share of households with significant energy expenditure.
    - Metrics related to heating affordability and household maintenance costs.
- **Luxembourg**: Combined indicators TEE & BRDE to address energy waste and household poverty levels.
- **Netherlands**: Metrics assessing the combination of low income with high energy bills or low-quality housing.
- **Poland**:
    - Weight of energy bills in household budget.
    - Number of beneficiaries of the Social Energy Tariff.
    - Inability to keep dwellings cool in summer.

### 2.3.2. Indicators from EU programmes

Various EU levels projects and initiatives offer additional indicators to provide a more comprehensive understanding of the challenges faced by energy-poor households. For instance, the ComAct project reports that the Austrian Social Ministry introduced a complex indicator that considers both housing conditions and financial burdens related to energy costs. According to this indicator, a household is classified as energy poor if it experiences inadequate heating, high energy costs relative to income, or arrears on utility bills. Similarly, projects like SocialWatt and STEP propose indicators like hidden energy poverty and inability to pay energy bills, which aim to identify vulnerable households that may not meet traditional income thresholds but still experience significant energy-related hardships. The SocialWatt indicator, for example, classifies households as energy poor if their actual energy consumption is lower than the theoretically required level for maintaining thermal comfort, or if the ratio between energy cost and income exceeds certain thresholds.

Furthermore, some projects introduce complex indicators that consider multiple factors simultaneously to identify energy-poor households. Again, as part of ComAct, the Hungarian NGO Energiaklub developed a complex indicator that combines income levels, energy cost-to-income ratios, building energy efficiency, and dwelling conditions. This indicator identifies households at risk of poverty based on income thresholds and assesses their energy poverty status based on energy cost burdens and building energy efficiency ratings. Similarly, the REPI indicator combines standard measures of energy poverty with an indicator of the size of the private rental sector (PRS) in a given area. Countries with higher levels of energy poverty in the PRS and significant PRS sizes yield elevated REPI scores, providing insights into the spatial distribution of energy poverty and its relationship with housing tenure.

# 3. Mapping of the current landscape and identification of shortcomings for datasets of indicators for energy poverty

In this section, all activities undertaken in the line of work on Datasets and Indicators used to inform on energy poverty are described and explained how the data are identified, mapped, collected and analysed, which are relevant to energy poverty monitoring and measuring. This also includes additional data (i.e. data sets that have not so far been used for reporting on energy poverty and its dimensions) available at a national and EU-level. The team conducted exhaustive data analysis and evaluation of both currently used and (to the extent possible) newly identified datasets and indicators to allow for consistent data evaluation with view to a set of criteria comprising: data **availability**, **robustness** of indicators, indicator **uniqueness**, **completeness** of data sets, **frequency** of data collection, **accuracy** of indicators, **policy relevance compatibility** of indicators across Member States, **spatial granularity** of data sets and options for disaggregated analyses of energy poverty e.g., with view to developments, outcomes and group specific affectedness. Based on the multi-criteria assessment, indicators and their corresponding datasets were ranked to reflect their ability to reliably capture energy poverty and localize affected households taking into consideration the specific characteristics of each country.

## 3.1. Identification of databases at EU, national, and local level

To identify additional indicators and data sets for monitoring aspects of energy poverty, the team has pursued a tripartite strategy.

First, a list of potentially relevant data sets comprising information on energy poverty indicators and drivers compiled in the preparatory stage of the study was amended with the results of a desktop research with view to a list of factors influencing energy poverty vulnerability clustered in three dimensions (i.e., heating/cooling burden, socioeconomic condition and building condition (c.f. Table 3-1). . Secondly, the team performed a review of the pertinent scientific literature, which, thirdly, was then complemented with the findings of the official reporting documents screening in Section 2.

The purpose of the review was threefold: 1) to identify alternative indicators currently not applied by public authorities in the EU, 2) to identify new data sets used for the construction of said indicators or to be linked for differentiated analyses of energy poverty e.g., across regions, building types or socioeconomic groups and 3) to draw on performed analyses of specific indicator (types) to support their qualitative or quantitative assessment on different parameters.

To find relevant literature concerning the topic of capturing or analysing energy/fuel poverty within the EU Member States, the team employed the scientific search engines ScienceDirect, Google Scholar and Web of Science. The following search terms were used to find thematically appropriate literature in general as well as focusing on the EU or specific Member States: 'energy poverty' + 'indicators' (+country name), 'fuel poverty' + 'indicators' (+country name) and 'energy justice' + 'indicators' (+country name). Additionally, the search results were filtered for publications that were published during the last 10 years, covering publications from 2013 till 2023.

Building on the well-designed and systematic literature review on energy poverty indicators performed by Siksnelyte-Butkiene et al. 2021, who have reviewed more than 500 pertinent publications, the team focused its research efforts on the identification of new scientific literature since 2020. The identified literature was then reviewed in terms of novel indicators or data being presented to amend existing analyses on energy poverty and findings included in the respective template.

In total, 129 scientific publications were reviewed, of which 40 comprised relevant information for this study (i.e., comprising indicators currently not used by public authorities for monitoring energy poverty or a further developed/refined version thereof). In a first step, the indicators found in the reviewed sources were collected in a table and clustered into four categories:

- Household expenditure-based indicators
- Household self-reported indicators
- Multidimensional indicators
- Indirect indicators (comprising prices, incomes etc. – where energy poverty is not measured directly).

In addition, a short description of the indicator, the geographical focus of analysis, as well as the used data sources were extracted to inform the further analysis and possible assignment to the respective country sheets (please see in accompanying excel file '*Datasets_Assessment_num.xlsx*' in tab EU). The review revealed a range of alternative indicators, the majority of which are multidimensional or employ alternative methods or data to define threshold values for the analysed region or group.

Next, based on the criteria provided below, the additional indicators, along with their underlying datasets, were shortlisted in communication with the EC, with the aim to analyse them further. The employed criteria comprised:

- *complementarity* between alternative and currently used datasets aiming to fill existing gaps with regards to drivers or manifestations of energy poverty
- *accessibility* that allows a public or easy access of alternative datasets
- *transparency* with regards to the data collection practices
- *frequency* of data collection
- *continuity* of data collection and

- *availability* of data for a number of Member States.

As a result, a consolidated list of indicators suitable to enhance current monitoring and reporting practices of EU Member States has been developed.

The team conducted a review of the proposed additional alternative datasets shown below in Table 3-1 and concluded that the majority of datasets are available at the EU level and much less at a national or regional level. Further, the majority of these datasets are not connected to any specific population groups or spatial disaggregation levels. Our findings are summarized in the excel files accompanying this report.

### Accompanying documents

The excel files accompanying this section of the report are the following:

- *Datasets_Assessment_num.xlsm:* Excel file identifying energy poverty indicators and underlying drivers and variables therein; This excel file contains both the detailed dataset/indicator analysis per MSs, including 27 MS tabs with listed datasets and indicators along with the criteria assessment and upfront we have created an Overview tab where one can get a summed up picture of the use of indicators per MS. In the Overview tab, the depicted rating values reflect the average rating over all (relevant) assessment criteria and years (where applicable). Ratings are rounded to integer values with the colour strength indicating whether a rating is closer or further away from the respective integer value. The colour range is defined as red for a rating of 0 (i.e., no rating possible), dark orange for 1 (i.e., a low rating), light orange for 2 (i.e., a medium rating) and green for 3 (i.e., a high rating). Values in between 2 and 3 take on either a yellow or light green colour depending on their proximity to either integer value.
- *Short list datasets & indicators.xlsx*: Short list of indicators based on scientific literature. This excel file lists and analyses relevant literature on indicators to inform on energy poverty. It contains two tabs, a Long List tab where all 129 publications are present and a Short List with the results of the assessment as described above.

**Table 3-1 List of alternative datasets relevant to the assessment of energy poverty**

| Dimension | Factors | Datasets |
|---|---|---|
| Heating/cooling burden | • Climatic conditions<br>• Energy prices (per fuel)<br>• Fuel type<br>• Efficiency of household equipment<br>• Access to infrastructure<br>• Energy/Income support schemes | • SHARES tool (Fuel type, RES H&C and Heat Pumps capacity)<br>• Eur'Observer – RES (Fuel type)<br>• Heating and Cooling days (Climatic conditions) Eurostat<br>• Heat waves and Cold spells from Copernicus Institute<br>• National Statistical Services (Household energy prices)<br>• Multiple Eurostat data sets (i.e. nrg_pc_202)<br>• EPAH policy database/Atlas (Energy/Income support schemes<br>• Bruegel data set on national fiscal responses to the energy crisis (Energy/Income support schemes)<br>• EHPA (European Heat Pumps Association) |
| Socio-economic condition | • Age<br>• Gender<br>• Household composition and size<br>• Health<br>• Employment status<br>• Education level<br>• Income<br>• Household (energy) expenses | • European Quality of Life Survey (EQLS)<br>• European Health Interview Survey (EHIS)<br>• Eurobarometer surveys<br>• UN Generations and Gender Programme Survey<br>• National Household Budget Surveys (income, energy expenditure)<br>• Household surveys conducted within EU-funded Research Projects (e.g., ENABLE13)<br>• National Statistical Services (Census data; thematic surveys)<br>• National Household Panels (e.g., SOEP (DE), DHS (NL), PSELL (LU))<br>• European Social Survey (ESS) (income, health, wellbeing) |
| Building condition | • Heating/cooling demand<br>• Renovation status<br>• Dwelling maintenance costs<br>• Building type<br>• Location (both of dwellings in a building and the building itself)<br>• Tenure status<br>• Building age | • National Energy Performance Certificate (EPC) data bases (Renovation Status)<br>• EU-funded research projects such as EPISCOPE H2020 project (Split of Buildings by category), TABULA H2020 project (Heating and Cooling by categories) and Hotmaps (tenure status)<br>• ODYSSEE-MURE (Energy consumption by end-use in the residential sector)<br>• Multiple Eurostat datasets |

## 3.2. Development of robustness indicators and structured data analysis

To implement the in-depth analysis of currently used, harmonised indicators and data sets at EU level (Table 3-2), the qualitative and quantitative evaluation parameters listed in Section 3.1 were further specified in consideration of the respective data analysed. These are described in detail in Table 3-3. Considering its relevance for assessing an indicator's reliability to identify and monitor energy poverty, the robustness criterion was dissembled in three sub-criteria to capture different aspects. The operationalisation of these and the other criteria are further described in Table 3-3 and the following paragraphs presenting the results of their application to the data. The analysis was conducted for specific energy poverty indicators that are directly collected within the EU SILC & HBS surveys or can be calculated based on the comprised data respectively (Table 3-2). The indicators assessed are those listed in the Commission Recommendation 2020/1563[14], as well as additional EPAH indicators including those recently added to the dashboard[15] as far as accessible to the team[16]. In addition, the low income, high-cost indicator (LIHC) derived from the HBS data was assessed, though not as extensively as the recommended expenditure-based indicators

**Table 3-2 Overview of analysed indicators in the SILC and HBS data sets**

| | Indicators | |
|---|---|---|
| **Database** | **COM recommended indicators** | **EPAH indicators and others** |
| **SILC** | • Inability to keep home adequately warm (IKW)<br>• Inability to keep home adequately warm and at risk of poverty (IKW_AROP)<br>• Arrears on utility bills (AUB)<br>• Arrears on utility bills and at risk of poverty (AUB_AROP)<br>• Presence of leak, damp or rot (LDR)<br>• Presence of leak, damp or rot and at risk of poverty (LDR_AROP)<br>• At risk of poverty (AROP) | • Equivalised disposable income (EPAH)<br>• Total housing costs (EPAH)<br>• Housing cost overburden (EPAH)<br>• Dwelling too dark (EPAH)<br>• No regular use of public transport (for financial reasons) (EPAH)<br>• Dwelling comfortably warm in winter (Cool) (EPAH)<br>• Dwelling comfortably cool in summer (Warm) (EPAH) |
| **HBS** | • 2M (share of energy expenditure in income is twice the national median)<br>• M/2 (absolute energy expenditure is below half the national median) | • LIHC - Low income, high cost (income after energy expenditure is below the poverty line (60% of median income)) (other) |

14 https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020H1563
15https://energy-poverty.ec.europa.eu/document/download/b00326ad-da4b-43cd-a99e-574eb587fce7_en?filename=EPAH2023_2nd%20Indicators%20Report_Final_0.pdf
16 For some of the new EPAH indicators such as "Causes of death" or "Population reporting a chronic disease", access to the microdata was either restricted or could not be gained within the timeline of the study.

### Table 3-3 Overview of operationalisations for the assessment criteria

| Parameter | | Operationalisation for main indicators | | |
|---|---|---|---|---|
| | Specification | Main SILC indicators (IKW, AUB, LDR) | 2M | M/2 |
| Robustness | I) sensitivity to changing configurations and definition of indicator (e.g., energy poverty thresholds) | Coefficient of variation for EP results between original indicator and restricted to the at risk of poverty population | Coefficient of variation for EP results between 2M, 10% and 2M Exp | Coefficient of variation for EP results between M/2, M/2 low, M/4 and M/4 low |
| | II) assessment of distribution of indicator across income deciles | Share of high-income households (8-10$^{th}$ income decile) identified as energy poor per country and year | | |
| | III) spike or outlier analysis within MS | N/A | Share of outliers in the expenditure and income data (+/- 3 standard deviations from the mean) | |
| Uniqueness | Qualitative assessment whether an indicator is uniquely available in a specific data set | Availability of indicators in other data sets | Common availability of data to build indicators in other data sets | |
| Completeness | Analysis of completeness of datasets | Share of missing data points in the data per country, year and subgroup | | |
| Frequency | Frequency with which the data is collected | Categorisation by level of frequency (multi-yearly, yearly, sub-yearly) | | |
| Compatibility across MS | Extent to which the indicator can be sensibly applied across MS | Qualitative assessment based on properties of an indicator (e.g., its robustness to differing configurations), its availability and with view to differing context conditions and energy poverty drivers (e.g., climate, income distribution etc.) | | |
| Spatial granularity | Extent to which the data enables the spatial localisation of energy poor households | Availability of data to assign observations to geographical units of varying granularity (NUTS0, NUTS1, NUTS2[17]) per country and year | | |
| Options for disaggregation | Extent to which the underlying dataset enables the disaggregation of the indicator by variables of interest | Assessment whether data set comprises additional information to enable the analysis of EP drivers related to one, two or all three vulnerability dimensions | | |
| Accuracy | Extent to which the data/indicator is an accurate/valid measure of energy poverty | Qualitative assessment with view to the formulation of survey questions and share of high-income households identified as energy poor | Share of high-income households identified as energy poor by the indicator | |

17 The nomenclature of territorial units for statistics (NUTS) is a geographical system, according to which the territory of the European Union is divided into hierarchical levels. The three hierarchical levels are known as NUTS1, NUTS2 and NUTS3, with higher numbers reflecting smaller geographical units. This classification enables cross-border statistical comparisons at various regional levels within the EU. In many cases the classification ties in with the administrative structure of the Member States. In most – but not all – countries each NUTS level corresponds to a certain administrative level or an aggregation of administrative units. In this analysis NUTS0 is assigned to data, where no information to assign observations to a subnational level has been collected.

For the assessment of the indicators/data sets on the criteria, we applied a three-point scale, indicating differing performance levels (low, medium or high). The following table shows the operationalisation with view to the results of the qualitative or statistical assessment.

**Table 3-4 Overview of rating definitions for the different assessment criteria**

| Parameter | Rating | | | | |
|---|---|---|---|---|---|
| | 0 | 1 = low rating | 2 = medium rating | 3 = high rating | 4 |
| **Robustness I** | No data | Coefficient of variation > 75 | Coefficient of Variation 50-75 | Coefficient of Variation <50 | |
| **Robustness II** | No data | Share > 15% | Share 5-15% | Share 0-5% | N/A |
| **Robustness III** | No data | Share > 15% | Share 5-15% | Share 0-5% | N/A |
| **Uniqueness** | No data | Available in multiple other data sets | Available in one other data set | Only available in the analysed data set | - |
| **Completeness** | No data | Share > 15% | Share 5-15% | Share 0-5% | - |
| **Frequency** | Once | Twice | Multi-yearly | Yearly | Sub-yearly |
| **Compatibility across MS** | No data | Can only be sensibly applied in one MS | Can only be sensibly applied in a few MS | Can be sensibly applied in all MS | - |
| **Spatial granularity** | - | NUTS0 | NUTS1 | NUTS2 | - |
| **Options for disaggregation** | No additional information on factors affecting EP | Additional information on factors affecting EP in one dimension | Additional information on factors affecting EP in two dimensions | Additional information on factors affecting EP in all three dimensions | - |
| **Accuracy** | No data | Qualitative assessment with view to the formulation of survey questions and share of high-income households identified as energy poor | | | Indicator does not directly capture EP |

With view to the **first robustness criterion**, we examined the variability of energy poverty measurement results when changing the configuration of the main indicators comprised in the Commission Recommendation 2020/1563 and validated in the more recent Commission Recommendation 2023/2407. To this end, we calculated the Coefficient of Variation (CV) as a common dispersion measure. A higher variability indicates that energy poverty incidences are susceptible to changing definitions, which bears the risk of excluding vulnerable groups in the monitoring, in the worst case leading to the design of ineffective energy poverty policies.

*Application to the SILC indicators*

For the SILC indicators “Inability to keep home adequately warm” (IKW), “Arrears on utility bills” (AUB) and “Presence of leak, damp or rot” (LDR), the energy poverty rates were compared with those resulting when restricting the indicator to the at-risk-of-poverty population. Generally, medium or high variation reflects that a substantial

share of the energy poor population according to the indicator is not at risk of poverty. On the other hand, where variation is low there is a higher congruency between overall energy poor population and the at-risk-of-poverty subgroup.

With view to the IKW indicator, there is a mixed picture with most countries showing either medium or high variation (the latter for most years in DK, FI, NL and SE), except for EE, HR, LV and PL, which for several or even most years show a low variation.

Regarding the AUB indicator, the results are similar, with most countries for most years showing medium or in some years high variation. The exception here are again DK, FI and SI with relatively consistent high variations over the years and on the other end of the spectrum ES, with low variation indicating higher congruency of the overall energy poor population and the at-risk-of-poverty subgroup.

For the LDR indicator, results show a relatively consistent high variation across countries and years, with exception of several easter and southern European countries (BG, EE, EL, HR, LT, LV, PL, RO, SK), for which variation was medium in some years or even low (HR, LV, RO).

*Application to the HBS based indicators*

For the expenditure-based indicators based on the HBS data, we calculated energy poverty rates for different variants drawing to some extent on the presentation comprised in Trinomics 2016 (p.36-37). Specifically, for the assessment of the 2M indicator, we additionally calculated energy poverty rates for other high expenditure indicators, namely the 2M Exp indicator (Expenses in energy are more than twice as large as the national median in the current year) and the 10% indicator (Share of energy expenses relative to its disposable income (income minus taxes) is higher than 10%).

Results show a mixed picture with low variation in some countries (AT, BE, DK, EL, ES, FR, IE, PT, RO) and high (CZ, SK) or mixed variation in other. With view to the first group, this reflects an interesting consistency of EP results over different indicator configurations.

For the M/2 indicator, we calculated the CV using results from variations of this indicator with view to the included population and/or the energy poverty threshold applied. Specifically, we calculated energy poverty rates for M/2 low (M/2 restricted to the lower five income deciles), M/4 (absolute energy expenditure is below a quarter of the national median) and M/4 low (M/4 restricted to the lower five income deciles).

Results showed that variation between the energy poverty rates in the different years are rather high, with medium variation only observed for FI, FR, PL and RO. This indicates that EP rates will differ quite substantially depending on the respective setting of thresholds or exclusion of higher income groups.

The **second robustness criterion** relates to the share of high-income households identified as energy poor by an indicator. To this end, we calculated the share of households belonging to the upper three income deciles in the overall energy poor population as captured by the different indicators.

*Application to the SILC indicators*

For the main SILC indicators IKW and AUB, in most countries and years, a share of at least 5-15% of high-income households is captured, indicating that they are not fully accurate to identify materially deprived households. In LT and SE, the IKW indicator even consistently identifies more than 15% of high-income households as energy poor. Similarly, the AUB indicator in most years identifies a high share of high-income households in BG, FI and RO. There are only a few countries in which the share is low for some years (AT, BE, IE, NL, SE). Clearly, for higher income households, alternative explanations besides lacking funds could apply for the emergence of arrears such as poor organisation or mental or physical health issues. The LDR indicator identifies the highest shares of high-income households, which is in almost all countries >15%, except for BG, EE, HR, HU, PL and RO. This is somewhat less surprising given that there is no differentiation between the presence of leak, damp or rot, which arguably reflect different levels or stages of housing defects. For instance, while dampness can originate from insufficient heating due to financial reasons or building defects it can also be a result of insufficient ventilation in well insulated buildings albeit in fewer cases.

Regarding the additional EPAH indicators in the SILC data, an interesting result is the consistent high share of high-income households in the “Dwelling not comfortably cool in summer” indicator in all countries, indicating that overheating risks are currently not yet well addressed in the European building stock. Similarly, also for the “Dwelling not comfortably warm” indicator, the share is mostly high, which in some instances stands in contradiction with the results for the IKW indicator in the respective year. For the other ad-hoc module indicator “No regular use of public transport”, the share is high only in a few mostly high-income countries (DE, DK, FI, LU, MT and SI). With view to the Housing cost overburden indicator, the share is moderate too low for most countries and years, except for PL, which exhibited a consistently high share of high-income households being affected in all years. Lastly, for the “Dwelling too dark” indicator in many countries a high share of high-income households is affected, which is less surprising given that this does not necessarily reflect a lack of income but may also be due to a lack of bright dwelling supply, national building design patterns or building density in urban areas.

*Application to the HBS based indicators*

For the HBS indicators, particularly for the 2M indicator in many countries (AT, BE, CZ, DE, DK, EE, FI, HR, IE, LU, MT, NL, PT, SE, SI) consistently a high share of high-income households (>15%) is captured. This could point to limited robustness of the indicator with view to the identification of those in actual need of cost relief and instead also capture well-off households with lavish consumption habits. In lower-

income countries with high energy prices and low energy performance of the building stock this still might bring some more plausible results, which however cannot be assessed without further in-depth analysis of national circumstances. Regarding the M/2 indicator, results show a more robust indicator in the majority of countries, apart from FI and SE, in which consistently a high share of high-income households is captured, likely due to the generally higher energy efficiency of the building stock. On the other hand,  in EE, EL, HR, LV, NL and SK robustness in this sense is consistently high. For the LIHC, with view to its definition robustness is non-surprisingly high throughout most Member States. Only in PL and RO, there is a medium share of high-income households.

As a **third robustness criterion**, we applied the outlier analysis to the continuous variables in the data sets, which represent measures of material deprivation themselves (equivalised disposable income and housing cost in the SILC data) or serve as a basis to calculate expenditure-based energy poverty indicators (equivalised energy expenditure and equivalised net income in the HBS data). Outliers were defined as those observations whose values deviated more than three standard deviations from the mean.

The share of outliers in the SILC data is overall low, with a maximum of 2.9% for equivalised disposable income in the 2020 EE sample and 2.7% for housing costs in the 2021 MT sample. Likewise, also in the HBS data we found only a few outliers, with a maximum of 3.7% for energy expenditure in the 2010 DE sample and 3.7% for income in the 2010 PT sample. Accordingly, data robustness in this respect has been assessed as high.

Regarding the data set **completeness**, first we calculated the share of missing data points in the indicators and their components in the overall sample and then specifically for different subgroups (income deciles, tenure status, household type, NUTS region, degree of urbanisation and dwelling type). To keep it manageable for this study, we based our overall completeness assessment for the indicators and components on the findings for the overall sample.

*Application to the SILC indicators*

In the SILC data, the share of missing data points in the indicators is for most countries and years below 5% with very few exceptions: for the LDR indicator, the 2020 DE sample comprises almost 50 % of missing data points. For the AUB indicator the 2005 SK sample exhibited a share of 15.3%. Furthermore, in some countries the share of responses for the optional indicators in the ad-hoc modules were particularly low such as for the “Dwelling not comfortably cool in summer” indicator in the 2007 BG sample (93.3% missing) or for the “No regular use of public transport” indicator in the 2014 DK sample (50.6%) and in some instances data is completely missing. There is no data for the “Dwelling not comfortably cool in summer” indicator in the 2007 BG data and for the “Dwelling not comfortably warm in winter” indicator, no data has been collected in the 2007 IE sample. Furthermore, in 2013 no data on the “No regular use of transport” indicator was collected for CY, CZ,

DE, DK, EE, FI, FR, HU, IE, LU, LV, MT, NL, PL, SE and SI. For the “Housing cost overburden” and “Dwelling too dark” indicators, outliers in terms of data completeness were the 2004 AT sample (26.8%) and the 2020 PL sample respectively, where no data at all was collected. Likewise, no data was collected for housing cost in the 2004 DK, the 2004 EE and the 2021 FR samples.

*Application to the HBS based indicators*

In the HBS data, the share of missing data points is equally low as in the SILC data. Nevertheless, for some countries relevant data is completely missing, such as income data for IT in all years and for LU in 2010 and CZ in 2020. Furthermore, in the 2020 RO sample data on energy expenditure is missing. Accordingly, for these countries the expenditure-based indicators building on these variables cannot be calculated and are thus also missing (i.e., 2M and LIHC for IT, CZ 2020 and LU 2010; M/2 for RO in 2020). Beyond this, for SE the indicators could not be calculated for 13.6% of households due to a corresponding share of zero values on the energy expenditure variable, likely reflecting the widespread warm rent models, in which heat provision is included in the rent.

For the **uniqueness** criterion, most indicators in the SILC data were given a high rating except for the IKW indicator and the income and its derived variables (i.e. poverty risk), which may be obtained from other data sets as well (e.g., HBS). In the HBS data, likewise all indicators were assigned a high rating except for the net income variable for the same reason.

Regarding the **frequency** of data collection, due to its regulated nature, the SILC data and its indicators are collected annually, except for the ad-hoc module-based indicators “Dwelling not comfortably warm in winter”, “Dwelling not comfortably cool in summer” (both 2007 & 2012) and “No regular use of public transport” (2013 & 2014). Accordingly, a low rating was assigned for the latter (in two instances also a 0 when collection was implemented only once (cf. Completeness assessment)) and a high rating for the remainder. With view to the harmonised HBS data, due to its multi-annual compilation frequency a medium rating was assigned. It should be noted here, that HBS data is collected in many Member States in higher frequency and thus the derived indicators can be calculated and used for energy poverty monitoring in shorter intervals. Obtaining and conducting an in-depth analysis of all these national data sets was however not possible within the scope of this study.

With view to the **compatibility** criterion**,** due to the regulated nature of the SILC data and its consequently comprehensive availability and comparability, we assigned a uniformly high rating to the comprised indicators. While some indicators such as the IKW may be more relevant in colder climates to capture energy related deprivation, there still is a high value in applying it also in southern European countries, in which buildings often lack heating facilities. We assigned the same high rating to the HBS indicators, despite the lack of data quality safeguards.

Concerning the **accuracy** criterion, we employed a differentiated assessment that considered both the precision of the item (i.e., question) in the survey and the

robustness of the indicator with view to the share of high-income households identified as energy poor. Specifically, for the SILC indicators the following assessment was implemented: for the IKW, AUB, the “Dwelling not comfortably warm in winter” and “Dwelling not comfortably cool in summer” indicators, an average rating was calculated based on a qualitative rating of medium accuracy for the precision of the question and the rating of the respective indicator on the robustness II criterion (i.e., related to the share of high-income households identified as energy poor). The rationale for the qualitative medium rating related to the binary nature of the indicators which does not allow to differentiate with view to the frequency or severity of the experienced energy deprivation. Furthermore, the AUB indicator does not differentiate between energy and other utilities, which complicates targeted responses to the identified issue. For the LDR indicator, we applied the same averaging approach over the qualitative rating and the robustness II rating, however assigned a qualitative high rating (also for LDR_AROP), as the indicator captures housing defects accurately thus providing evidence for housing related deprivation. For the IKW_AROP, AUB_AROP, AROP, equivalised disposable income and housing cost overburden indicators we assigned a medium qualitative rating due to their binary form or their only indirect relation to energy poverty. Lastly, for total housing cost and the “Dwelling too dark” indicator we assigned a low rating, as these indicators do not capture energy poverty in a differentiated manner. For the HBS indicators, we mirrored the rating of the robustness II criterion as this best reflects the accuracy of the indicators to identify energy poor households.

Based on the described operationalisation of the criteria, we examined the selected indicators in the Household Budget Survey and the EU SILC Data by means of qualitative and statistical analysis and assigned the corresponding ratings per criterion, indicator, country and year. Subsequently, we first calculated an average of the criterion rating over the years for which data for a country and indicator was available and then used the average rating per indicator to calculate the overall final rating over all criteria, excluding those criteria for which an application to the respective indicator did not make sense (e.g., the share of high-income households in the AROP indicator).

Overall, for all countries and indicators we established at least a medium rating except for the expenditure-based indicators in IT, for which income data is required and is consistently lacking in the HBS data. Only for few countries and indicators a “fully” high rating (i.e., a numerical value of 3) was calculated/assigned, indicating the relevance of a multi-indicator approach for energy poverty assessment and potential for improvements in the data collection and/or indicator definition.

### Additional datasets and indicators

Regarding the work performed on additional datasets and indicators, , we have identified a consolidated list of additional indicators that can improve Member States’ assessment of energy poverty.

We have conducted a detailed review and assessment of identified alternative datasets, following the list of criteria that were used for the EU SILC & HBS surveys.

Sources of indicators include Eurostat, the European Quality of Life Survey and the United Nations Generations and Gender Programme Survey, among others. Additionally, we have explored a number of household surveys at national level that are conducted by the statistical offices of the Member States.

The first set of indicators we propose are from the Eurostat database (see Table 3-5). These indicators are almost exclusively expenditure-based and numerical, rather than consensual. Data includes energy prices for various energy products and households' electricity consumption in a disaggregated form. They exist for every Member State and their frequency and data completeness are very high for almost all Member States. Temporal coverage for most indicators is above ten consecutive years and they are measured at an annual frequency. These may not be directly connected to the energy poverty concept given their nature, nevertheless, they are a useful tool in analysing differences on an aggregate level between Member States. Exception to this, and the only non-expenditure-based indicator in the datasets is the "Population unable to keep home adequately warm by poverty status" which is a self-reported indicator. In contrast to the rest of the indicators from Eurostat, it also includes an inequality dimension, dividing households according to the median equivalised income.

**Table 3-5 Eurostat new indicators**

| Database | New datasets/indicators |
|---|---|
| **Eurostat** | • Gas prices for household consumers - bi-annual data (from 2007 onwards) (nrg_pc_202)<br>• Household consumption volumes of electricity by consumption bands (nrg_pc_204_v)<br>• Gas prices components for household consumers - annual data (nrg_pc_202_c)<br>• Electricity prices by type of user (ten00117)<br>• Gas prices by type of user (ten00118)<br>• Final energy consumption in households by type of fuel (ten00125)<br>• Population unable to keep home adequately warm by poverty status (sdg_07_60)<br>• Disaggregated final energy consumption in households - quantities (nrg_d_hhq)<br>• Supply, transformation and consumption - commodity balances (nrg_cb)<br>• Supply, transformation and consumption of gas (nrg_cb_gas)<br>• Energy Statistics - quantities, monthly data (nrg_cb_m) solid products<br>• Energy Statistics - quantities, monthly data (nrg_cb_m) oil and petroleum products<br>• Supply, transformation and consumption of gas - monthly data (nrg_cb_gasm)<br>• Supply, transformation and consumption of electricity - monthly data (nrg_cb_em)<br>• Net electricity generation by type of fuel - monthly data (nrg_cb_pem)<br>• Supply of gas - monthly data (nrg_103m)<br>• Electricity prices for domestic consumers - bi-annual data (until 2007) (nrg_pc_204_h)<br>• Electricity prices components for household consumers - annual data (from 2007 onwards) (nrg_pc_204_c) |

The European Quality of Life Survey (EQLS) dataset can be of great use to policy makers as it assesses, among other things, energy poverty. It is a survey-based dataset and includes three relevant questions which can be directly linked to energy poverty. These include the lack of facilities to keep a comfortable temperature, the number of rooms in accommodation and finally and the households' ability to keep home adequately warm. It exists and is almost fully complete for all EU member states, nevertheless its temporal coverage is only for one year, 2016. Exceptions to its completeness are Denmark and Romania where only one of the three indicators is available namely the indicator ability to keep home adequately warm, and Croatia, where the question on the availability of keeping house warm is missing.

UN Generations and Gender Programme Survey includes one question that is directly connected to the energy poverty issue: the ability to keep home adequately warm. It exists for a number of member states and its temporal coverage is only two years between 2004 and 2011 (the time of the survey is different between different countries, and it was conducted in two waves). EU member states that are not part of the dataset are: Cyprus, Denmark, Greece, Spain, Finland, Croatia, Ireland, Luxembourg, Latvia, Malta, Portugal, Slovenia and Slovakia.

We have also identified a number of datasets that are specific to the countries of reference, conducted by the countries' statistical authorities. While this was a more common practice in the past, EU-SILC has replaced most of the national household surveys. We have identified such datasets for Germany, Spain, France, Ireland, Luxembourg and the Netherlands.

SOEP survey in Germany is one of the most comprehensive national survey datasets. It includes three questions directly related to energy poverty: the total size of household's dwelling, ability to keep home adequately warm and finally, a question on heating costs. It is an annual survey, and it was conducted from 1990 to 2021.

Spain also conducts an important survey: Intituto Nacional de Estadistica - Quality Indicators. In this dataset there is a question on "population living in homes with certain housing deficiencies" which can be of interest in the country's energy poverty assessment. Importantly, this survey is conducted at a NUTS2 level of disaggregation while it spans the 2008-2022 period.

France, in the past, was carrying out the permanent living conditions survey - EPCV scheme. This includes several questions on topics within the field of living conditions in great detail and is available for the years 1996-2006.

Ireland has also a nationally conducted survey the "Living in Ireland Survey". It includes questions related to the topic such as whether the dwelling has adequate heating and whether the household can afford its heating expenses. It has an annualised frequency and is available for the years 1994-2001.

PSELL3, organised by Luxembourg for the years 2003-2014, is a national survey and includes two questions related to energy poverty: a question on the heating costs and the ability to keep home adequately warm.

Finally, DHS from the statistical authorities of Netherlands, has a temporal coverage for 1993-2022 and includes a question on the households' heating costs.

Except for the aforementioned datasets and indicators, we have also assessed a number of building conditions and energy efficiency datasets/indicators. We have performed a search and analysis of Energy Performance Certificates (EPCs) Registries and assessed them based on the criteria listed. For the majority of MSs these registries are either not public, do not span temporally for many years or are maintained at a NUTS0 level. Still, EPCs Registries are a valuable source of information for the buildings stock conditions that can either be used in composite indicators or coupled with surveys performed at national or local level.

Another important factor both for the phenomenon of energy poverty but also to the efficiency levels of dwellings are the climatic conditions. To that end, we have gathered and analysed Heating & Cooling Degree Day data from Eurostat. This is a very valuable set that MSs can use, especially in composite indicators, in light of its completeness, presence of data since 1980 to 2022 for all MSs at NUTS0 and high accuracy. On top of that we have also assessed data from the Copernicus Institute on heat waves and cold spells – information that can be of great value in future extreme climate phenomena.

We also performed analyses and assessments on databases relevant to the technical building stock equipment – both heating and cooling – with a focus point on the use on heat pumps and the renewable share in heating and cooling (in terms of final energy consumption). For this purpose, we have analysed the SHARES tool Eurostat dataset, the European Heat Pump Association (EHPA) sales reports and EurObserv'ER energy efficiency dataset.

Last, in an effort to identify and assess databases and datasets relevant to the typology of buildings stocks which in turn contains information about the buildings' age and thus its energy efficiency status we have analyses two major projects which unfortunately have only gathered information once in 2016. Those are the EU funded H2020 EPISCOPE/TABULA project and Hotmaps projects. They provide valuable information, not always present for all MSs, and should be updated and used by MSs in policy design.

## 3.3. Visualisation of results

Table 3-6 and Table 3-7 provide the overall ratings per Member State for EU harmonised indicators and new indicators respectively. The depicted rating values reflect the average rating over all (relevant) assessment criteria and years (where applicable). Ratings are rounded to integer values with the colour strength indicating whether a rating is closer or further away from the respective integer value. The colour range is defined as red for a rating of 0 (i.e., no rating possible), dark orange for 1 (i.e., a low rating), light orange for 2 (i.e., a medium rating) and green for 3 (i.e., a high rating). Values in between 2 and 3 take on either a yellow or light green colour depending on their proximity to either integer value. Further visualisations of results informing the robustness criteria ratings as well as an overview of missing data points in the SILC data are in the Annex I. These overview Tables derive from the analysis presented above and is, in detail, documented in the accompanying *Datasets_Assessment_num.xlsx* excel file. There, one can find the 27 country tabs where all indicators are assessed based on the criteria referred to in subsection 3.2. In addition, the tab Input contains all information deriving from the extended literature review on the use of indicators to study energy poverty. The Overview tab, which is presented in two parts in Table 3-6**.** and Table 3-7 is the consolidated information per MS as described in the paragraph above.

### Table 3-6 EU SILC & HBS indicators overall rating per MS

| Data source | Indicator | AT | BE | BG | CZ | CY | DE | DK | EE | EL | ES | FI | FR | HR | HU | IE | IT | LT | LU | LV | MT | NL | PL | PT | RO | SE | SI | SK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EU-SILC | Inability to keep home adequately warm | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 2 |
| | Inability to keep home adequately warm + at risk of poverty | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Arrears on utility bills | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 2 |
| | Arrears on utility bills + at risk of poverty | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Presence of leak, damp or rot | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 |
| | Presence of leak, damp or rot + at risk of poverty | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Dwelling comfortably warm in winter time | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Dwelling comfortably cool in summer time | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Poverty Risk | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Equivalised disposable income | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Total housing cost | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Housing cost overburden | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Dwelling too dark | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Regular use of public transport | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| HBS | 2M | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 0 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| | M/2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 |
| | LIHC | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 0 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 |
| | Energy expenditure | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| | Net income | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

### Table 3-7 New indicators overall rating per MS

| Data source | Indicator | AT | BE | BG | CZ | CY | DE | DK | EE | EL | ES | FI | FR | HR | HU | IE | IT | LT | LU | LV | MT | NL | PL | PT | RO | SE | SI | SK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUROSTAT | Gas prices for household consumers - bi-annual data (from 2007 onwards) (nrg_pc_202) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Household consumption volumes of electricity by consumption bands (nrg_pc_204_v) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Gas prices components for household consumers - annual data (nrg_pc_202_c) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Electricity prices by type of user (ten00117) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Gas prices by type of user (ten00118) | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Final energy consumption in households by type of fuel (ten00125) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Population unable to keep home adequately warm by poverty status (sdg_07_60) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Disaggregated final energy consumption in households - quantities (nrg_d_hhq) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Supply, transformation and consumption - commodity balances (nrg_cb) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Supply, transformation and consumption of gas (nrg_cb_gas) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Energy Statistics - quantities, monthly data (nrg_cb_m) solid products | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Energy Statistics - quantities, monthly data (nrg_cb_m) oil and petroleum products | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Supply, transformation and consumption of gas - monthly data (nrg_cb_gasm) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Supply, transformation and consumption of electricity - monthly data (nrg_cb_em) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Net electricity generation by type of fuel - monthly data (nrg_cb_pem) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| Data source | Indicator | AT | BE | BG | CZ | CY | DE | DK | EE | EL | ES | FI | FR | HR | HU | IE | IT | LT | LU | LV | MT | NL | PL | PT | RO | SE | SI | SK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| EUROSTAT | Supply of gas - monthly data (nrg_103m) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Electricity prices for domestic consumers - bi-annual data (until 2007) (nrg_pc_204_h) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Electricity prices components for household consumers - annual data (from 2007 onwards) (nrg_pc_204_c) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| European Quality of Life Survey (EQLS) | Lack of facilities (heating or cooling) to keep a comfortable temperature | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Number of rooms in accommodation | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Ability to keep home adequately warm | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| UN Generations and Gender Programme Survey | Ability to keep home adequately warm (GGS wave 1) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Ability to keep home adequately warm (GGS wave 2) | 2 | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| | Ability to keep home adequately warm (GGS wave 3) | - | - | - | - | - | 2 | - | - | - | - | - | 2 | - | 2 | - | - | - | - | - | - | 2 | - | - | 2 | - | - | - |
| National EPC Registry | Energy Performance Certificates | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 2 |
| EUROSTAT | Heating degree days | 2 | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | Cooling degree days | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| COPERNICUS | Heat waves | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| COPERNICUS | Cold spell | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EUROSTAT | SHARES tool (RES H&C Heat pump capacity) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| European Heat Pump Association (EHPA) | EHPA (share of Heat pumps market perspective) | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EurObserv'ER | EurObserv'ER | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | - | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| EpiscopeEu | TABULA buildings condition | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |
| GitLab | Hotmaps | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 |

# 4. Overview of Member States ability to capture energy poverty

The ability to capture energy poverty in the 27 EU Member States varies considerably, where some countries are more advanced than others. Based on the analysis of this study, an assessment has been made for each Member State, including:

- An overview of the ability for MSs to capture energy poverty;
- Assessment of datasets and indicators relating to energy poverty; and
- Limitations, gaps and best practices.

## 4.1. Overview of ability for Member States to capture energy poverty

The overall assessment of ability to capture energy poverty for each Member State is based on several parameters, including whether the Member State:

- Has a definition for energy poverty;
- Uses indicators in official EU reporting;
- Has a national energy poverty observatory (or equivalent);
- Has an (above) average rating for EU harmonised indicators (based on mapping in this study);
- Has an (above) average rating for alternative indicators (based on mapping in this study).

Based on these parameters, each Member States is assessed as having limited/ basic, intermediate or advanced ability of capturing energy poverty. Overall, 6 MSs are identified to have limited/basic ability, 14 with intermediate ability and 7 with advanced ability. The table below provides an overview of these assessments.

**Table 4-1 Overall assessment of the ability for Member States to capture energy poverty**

| Member State | Overall assessment | Energy poverty definition | Use of indicators in reporting | Has energy poverty targets | National EP observatory (or equivalent) | Rating of EU harmonised indicators | Rating of Alternative indicators |
|---|---|---|---|---|---|---|---|
| AT | Advanced | + | + | - | + | + | + |
| BE | Intermediate | - | + | - | + | + | + |
| BG | Intermediate | + | - | - | - | + | + |
| HR | Limited/basic | - | - | - | - | + | + |
| CY | Intermediate | + | + | - | - | + | + |
| CZ | Intermediate | - | + | - | + | + | + |
| DK | Limited/basic | - | - | - | - | + | + |
| EE | Intermediate | + | + | - | - | + | + |
| FI | Limited/basic | - | - | - | - | - | + |
| FR | Advanced | + | + | - | + | + | + |

| Member State | Overall assessment | Energy poverty definition | Use of indicators in reporting | Has energy poverty targets | National EP observatory (or equivalent) | Rating of EU harmonised indicators | Rating of Alternative indicators |
|---|---|---|---|---|---|---|---|
| DE | Limited/basic | - | - | - | - | + | - |
| EL | Advanced | + | + | + | + | + | + |
| HU | Limited/basic | - | - | - | - | + | + |
| IE | Advanced | + | + | - | + | + | + |
| IT | Advanced | + | + | + | + | - | + |
| LV | Intermediate | - | + | + | - | + | + |
| LT | Intermediate | - | + | + | - | + | + |
| LU | Intermediate | + | + | - | + | + | - |
| MT | Intermediate | + | + | - | - | + | + |
| NL | Intermediate | - | + | - | - | + | + |
| PL | Intermediate | + | + | - | - | + | + |
| PT | Advanced | + | + | - | + | + | + |
| RO | Intermediate | + | - | - | + | + | + |
| SL | Intermediate | + | - | - | - | + | + |
| SK | Intermediate | + | - | - | - | + | + |
| ES | Advanced | + | + | + | - | + | + |
| SE | Limited/basic | - | - | - | - | - | - |

## 4.2. Assessment of datasets and indicators relating to energy poverty

For each Member State the dataset assessment is divided into two:

1. Main data/indicators reported to Eurostat/needed for the indicators included in the EU guidance on energy poverty (SWD(2020) 960 final); and
2. Additional alternative indicators/datasets to assess energy poverty

For each indicator/dataset, there are several parameters used for evaluation to determine a rating per dataset (See Section 3.2 for assessment criteria). The country fiches provide a summary of this assessment, listing the rating, compiling agency, frequency of data collection, options for disaggregation, spatial granularity and compatibility across MS. Table 4-2 provides an overview of the EU level datasets; where possible, MS level datasets are also assessed.

There are three main datasets:

- The **EU SILC** is considered a main dataset, as it includes several indicators included in the EU's guidance on energy poverty, including inability to keep home warm, arrears on utility bills, presence of leak, damp or rot, dwelling comfortably warm/cool in winter/summer and at poverty risk rate. The EU SILC also include alternative indicators such as housing cost overburden rate. Data from the EU SILC is typically collected on an annual basis, where some modules of the EU SILC are collected less frequently – this varies per MS.
- The **HBS** is also considered a main dataset, where this data is used for the 2M, LIHC and M/2 indicators. The HBS is collected every five years.

- **Energy price statistics** (for electricity and gas) from Eurostat are also included in the EU's guidance on energy poverty; these statistics are collected very frequently on an (bi-)annual basis.

The options for disaggregation and spatial granularity vary per Member State but tend to have a high/medium rating. Compatibility of indicators in these datasets tend to be high.

Of the alternative datasets, indicators from the Copernicus dataset, energy performance certificate (EPC) databases and energy statistics (quantities) have the highest ratings (>2 out of 3). Whereas indicators from the EHPA on share of heat pumps, TABULA on building conditions, Hotmaps and UN Generations and Gender Programme Survey have the lowest ratings (<2 out of 3).

**Table 4-2 Overview of assessment of energy poverty datasets and indicators**

| Dataset | Average rating | Compiling agency | Frequency of data collection | Options for disaggregation | Spatial granularity | Compatibility across MS |
|---|---|---|---|---|---|---|
| **Main data reported to Eurostat/needed for the indicators included in the EU guidance on energy poverty [SWD(2020) 960 final]** | | | | | | |
| EU SILC | 2.5 | EUROSTAT | Mostly annual | Varies per MS, typically high | Varies per MS | High |
| HBS | 2.4 | EUROSTAT | Every five years | Varies per MS, typically medium | Varies per MS | High |
| Energy Statistics - prices | 2.1 | Varies per MS | (Bi-)annual | Varies per MS, typically medium | NUTS0 | High |
| **Additional alternative datasets to assess energy poverty** | | | | | | |
| Energy Statistics - quantities | 2.1 | Varies per MS | Mostly annual | Varies per MS, typically medium | NUTS0 | High |
| European Quality of Life Survey (EQLS) | 2.0 | Eurofound | Lower than biennial | Varies per MS, typically medium | Varies per MS | High |
| National EPC data bases (Renovation Status) | 2.2 | Varies per MS | Varies per MS | Varies per MS, typically medium | NUTS0 | High |
| Heating and Cooling days (climatic conditions) | 2.0 | Joint Research Centre (AGRI4CAST Resources Portal) | Annual | Varies per MS, typically medium | NUTS0 | High |
| Heat waves and cold spells (COPERNICUS) | 2.3 | COPERNICUS | Annual | Varies per MS, typically medium | NUTS2 | Medium |
| SHARES tool (RES H&C Heat pump capacity) | 2.0 | EUROSTAT | Annual | Varies per MS, typically medium | NUTS0 | High |
| EHPA (share of Heat pumps market perspective) | 1.6 | European Heat Pump Association | Varies per MS | Varies per MS, typically medium | NUTS0 | Low |
| EurObserv'ER | 2.0 | EurObserv'ER | Varies per MS | Varies per MS, typically medium | Varies per MS | High |
| TABULA buildings condition | 1.3 | EpiscopeEu | Lower than biennial | Varies per MS, typically medium | Varies per MS | Medium |
| Hotmaps | 1.5 | GitLab | Lower than biennial | Varies per MS, typically medium | Varies per MS | Medium |
| UN Generations and Gender Programme Survey | 1.7 | UN | Lower than biennial | Varies per MS, typically medium | NUTS0 | Medium |

## 4.3. Limitations, gaps and good practices

Based on the analysis of datasets/indicators and national reporting, limitations, gaps and best practices are compiled for each Member State. In this analysis, there are four main themes for limitations/gaps considered:

1. **Lack of definition of energy poverty:** Member State either lacks an official definition (either defined in NECP, and in national action plans or implemented in legislation) or the current definition is not adequate for various reasons (e.g. definition is too vague, does not take energy efficiency into account, lack of consistent definition across official reporting).
2. **Lack of strategy:** Member State does not have any official strategy to tackling energy poverty and/or energy poverty is not mentioned or has limited reporting in some EU official reporting.
3. **Limited/no use of indicators/targets:** Member State either does not report any indicators or there are limitations to indicator reporting (no/few EU harmonised indicators are reported, no targets are reported, lack of updated values in reporting, lack of consistent reporting on indicators)
4. **Low data quality/access:** Member State does not report certain indicators to Eurostat and/or lacks public access to some relevant data.

On the other hand, there are several Member States which have developed well in certain aspects of assessing energy poverty. We have identified five main types of good practices:

1. **Energy poverty is well defined in official EU reporting:** MS clearly defines energy poverty in their NECP, LTRS and/or national actions, plans and strategies to alleviate energy poverty. As example:
    - **Ireland**'s definition emphasises the fundamental importance of energy access for social inclusion. It considers income levels, energy costs and home energy efficiency.
    - **Austria**'s definition from their NECP includes households below poverty threshold coupled with above-average energy costs. It clearly links between financial vulnerability and energy affordability. Though, the definition is not yet official – it is currently in the draft law, Energy Poverty Definition Act.
    - **Greece**'s definition includes index incorporating income, energy expenditure, and housing conditions. This reflects a holistic understanding of energy poverty drivers.
    - There are several other Member States which also have a definition of energy poverty which are listed in Table 4-1.
2. **Clear strategy to address energy poverty:** Along with having a clear definition, also having a clear strategy to tackle energy poverty is important to provide a well-established, consistent understanding and targets. Such a

strategy provides direction of how and what should be the focus for monitoring and assessing energy poverty in the country. Some examples of countries with a clear strategy to address energy poverty are:

- **Greece:** The National Action Plan for Alleviation of Energy Poverty was adopted in 2021. Further, in Greece's 2019 NECP, targets were introduced to reduce energy poverty by 50% by 2025 and by 75% in 2030 compared to 2016.
- **Spain:** The Ministry of the Ecological Transition published the National Strategy against energy poverty 2019-2024 in 2019 to provide a comprehensive response to energy poverty and raise awareness for the need to improve energy efficiency.
- **Ireland** published their Energy Poverty Action Plan in 2022, including actions against energy poverty (income support, targeted social protection and consumer protection)
- **Italy** has an Energy Poverty Action Plan and have reported targets and values for used indicators.
- **Portugal** has several measures, strategies and actions to combat energy poverty in their LTRS and RRP. Further, Portugal published their own National Energy Poverty Strategy (ELPPE) in 2024, with the aim to eliminate energy poverty by 2050.
- **Slovenia:** In 2023, Slovenia's government adopted an action plan for 2024-2026 to fight energy poverty. The plan includes measures adding up to 34 million EUR, including incentives for thermal insulation and efficient heating.

3. **Established national energy poverty observatory or equivalent:** A national energy poverty observatory can play a critical role in improving a country's ability to assess energy poverty. These observatories support national/regional decisions makers on the current levels and evolution of energy poverty in their country. There are several countries with an established energy poverty observatory (or equivalent), namely: **Belgium** (Platform against energy poverty, managed by the King Baudouin Foundation), **Ireland** (Research Programme on Energy Poverty (RPEP)), **France** (National energy poverty observatory (ONPE)), **Austria** (Coordination Office for Energy Poverty), **Romania** (Romanian Energy Poverty Observatory (ORSE)), **Italy** (Italian energy poverty observatory (OIPE)), **Greece** (Greek Energy Poverty Observatory) and **Czechia** (the Ministry of Industry and Trade has formed an expert group, tasked to create a tailored definition for energy poverty).
4. **Extensive use of EU harmonised indicators in official reporting:** The use of common indicators facilitates cross-country comparison, allowing for more effective cross-country analysis and policy coordination. Namely, Cyprus and Spain use several common indicators in their national reporting.
    - **Cyprus** uses four EU harmonised indicators in their NECP (inability to keep home adequately warm, arrears on utility bills, population living in

dwellings with bad conditions and at risk of poverty rate). Additionally, they also use inability to keep home warm and arrears on utility bills in their reporting in their LTRS.
    - **Spain** uses for EU harmonised indicators in their NECP (inability to keep home adequately warm, arrears on utility bills as well as 2M and M/2).
5. **Innovative indicators:** MS reports using specialised indicators tailored to their country's needs.
    - **France** uses indicators which focus on health and well-being factors. They use metrics like energy effort rate and feeling of cold which provide insights beyond economic factors. Additionally, they highlight long-term health effect of energy poverty.
    - **Portugal** addresses season variation in energy poverty by using indicators on inability to keep dwellings cool in the summer in their NECP as well as focussing on safeguarding access to affordable cooling solutions.
    - **Spain** focuses on affordability and adequacy of energy services by using metrics like high share of energy expenditure in income (2M) and low absolute energy expenditure (M/2) are used in their official reporting (NECP/LTRS) to identify vulnerable households. These indicators highlight the disproportionate burden of energy costs on households with limited financial resources.
    - **Lithuania** uses indicators to assess hidden energy poverty, namely focusing on significant energy expenditure and heating affordability. This captures the impact of energy costs on overall household budgets.
    - **Greece** uses a combined index, incorporating income, energy expenditure, and housing conditions. This index reflects a holistic understanding of energy poverty drivers

# 5. Practical Recommendations

This chapter, provides a list of practical recommendations that may be implemented at either the EU or the Member State level, based on the key conclusions that were drawn on:

- The adequacy and robustness of currently available datasets in the EU – see Section 3; and
- The reporting on energy poverty and use of indicators by Member States – see Section 2..

These recommendations are geared towards the improvement of data collection and indicator evaluation at both EU and national level, where the focus areas are:

A. Measuring energy poverty: improving the data collection of existing indicators and use of alternative datasets to better inform on energy poverty.
B. Monitoring and reporting energy poverty: improving how energy poverty is defined and how indicators are used/prioritised; and
C. Linking energy poverty data to policy actions.

## 5.1. A. Measuring energy poverty

### 5.1.1. Recommendation A.1 – Expansion of data collection for EU databases

#### Description

There is need for EU data collection to align with the MS data requirements for their NECP updates and other Fit-for-55 legislation (e.g. Energy Efficiency Directive 2023 and Governance Regulation), as also indicated by EPAH in their report on national indicators. In this context, it is recommended that there is a particular expansion of databases such as the HBS and EU SILC[18] to address this issue.

For tracking fluctuations in energy poverty over time, it is important to have more frequent updates of relevant EU surveys. Currently, EU level data on household (energy) expenditure is collected in different intervals in the MS through the national household budget surveys and only harmonised in an EU data set every five years The EU SILC on the other hand is conducted annually. Ideally, EU survey data on energy poverty should align with Member State progress reporting on energy poverty, such as the National Energy and Climate Progress Reports (NECPRs), which are conducted every two years. Therefore, to ensure that EU data collection is

[18] EU Statistics on income and living conditions

useful for MS reporting, data collection of energy poverty information should occur at least every two years.

In this sense, the EU SILC dataset is a good starting point, as it is already conducted annually. However, it does not include all relevant information (such as energy or transport expenditure data collected by the HBS) and additionally, there are some modules in the EU SILC which are collected less frequently, such as for 'labour and housing conditions', which is a 3-yearly rolling module starting in 2023.[19] Further, a module for 'energy efficiency/poverty' is expected to be disseminated in September 2024. However, some of these variables are options, where many countries opt out of collecting data on these variables. Therefore, it would be beneficial if the **EU SILC included a dedicated, annual section relating specifically to energy poverty**.

In this study, more than 120 scientific publications were reviewed for indicators which are currently not used by public authorities for monitoring energy poverty, where a short-list of indicators. This short-list is a good starting point to identify which indicators are best suited to include and possibly complement current data collection practices.

Beyond this, a more targeted data collection should include further information on the ability of households to make use of energy services other than space heating. This could enable the identification of cases in which households restrict their consumption in other areas to deal with energy related financial hardship.

Furthermore, considering increasingly frequent heat waves even in the northern European countries, the survey should include one or several additional items on exposure to and equipment to prevent overheating. Examples could be the 2007 and 2012 ad-hoc module on housing conditions items MH060 (dwelling equipped with air-conditioning facilities) and MH070 (dwelling comfortably cool in summer).

Another area in which data gaps in current collection practice has been identified relates to the outcomes of financial difficulties with view to energy bills in terms of disconnections from heat and power. Here, both the collection of such information from households within the SILC as well as from utility companies (or their associations) could provide valuable insights regarding the severity of energy poverty.

To further improve the information base with view to the severity of energy poverty experiences and allow for more differentiated analyses, it would be beneficial to expand response options for the currently binary indicators "Inability to keep home adequately warm" and a potentially new summer energy poverty indicator to include frequencies (e.g., "always", "often", "sometimes", "rarely" and "never").

[19] Eurostat. (n.d.). Income and Living Conditions: Modules. Available at: https://ec.europa.eu/eurostat/web/income-and-living-conditions/database/modules

### Potential considerations/implications / drawbacks

- ✓ Expanding existing EU datasets with a dedicated section on energy poverty is relatively less resource intensive for EU and national agencies compared to developing a new dedicated household survey on energy poverty.
- ✓ Careful attention will need to be paid to ensure that new questions will not increase the complexity of the survey such that it leads to respondent fatigue, thus reduced data quality.
- ✓ A dedicated section should already consider the utilisation of the data to inform policy decisions, therefore there is a need to ensure that the dedicated section aligns well with data requirements provided in EU regulations.

### Main stakeholders and roles

Any changes to the EU surveys will either be decided by the European Parliament, Council and Commission or by an agreement between the national statistical institutions and the Commission (Eurostat)[20]. In this sense, these parties will need to agree upon any additional data collection.

- ✓ **The European Commission (Eurostat)** would be responsible for the design, implementation and management of EU surveys such as HBS and EU SILC, and therefore will have a crucial role in expanding EU databases.
- ✓ **National statistical institutions** in MSs will be responsible for conduction the updated EU surveys and reporting to Eurostat and national stakeholders (e.g. government, observatories, etc.).
- ✓ Other stakeholders to consult include **research institutions, building related market parties, organisations such as EPAH as well as policy makers and existing national observatories or similar working groups**, where they can provide further insights on prioritisation of indicators to include.

## 5.1.2. Recommendation A.2 – Development of an energy poverty EU data repository

### Description

Currently, data on energy poverty in the EU is scattered across various sources, making it challenging for decisionmakers to easily access relevant information on energy poverty. Currently, data on energy poverty in the EU can be found in several sources, namely Eurostat, Energy Poverty Advisory Hub and Member State data repositories. Therefore, a **comprehensive EU repository of energy poverty data** should be developed, which provides a full picture of energy poverty in the EU and allows for efficient monitoring across the Member States.

[20] Eurostat (n.d.). Programmes and activities. Available at: https://ec.europa.eu/eurostat/web/european-statistical-system/programmes-and-activities

First, this repository should compile all EU harmonised indicators, including those recommended by the EC, but also alternative indicators which are available at EU level. In the long-term, the repository should be updated as new indicators become available.

This repository should include both quantitative data, such as indicators relating to energy consumption, household income and housing conditions, and qualitative data, such as policy database, best practices and pilot case studies on energy poverty measures. This should provide a holistic understanding of the issue.

#### Potential considerations/implications / drawbacks

- ✓ Developing and maintaining a data repository will be resource intensive in terms of required time required for data collection and maintenance. Close cooperation with Eurostat and other statistical institutions as well as national observatories or similar working groups to facilitate efficient data integration and updating. Additionally, if unofficial (national level) statistics are used, there will be a need for quality assurance measures.

#### Main stakeholders and roles

- ✓ **European institutions, particularly Eurostat, Directorate-General of Energy (DG ENER) (including the EPAH)** will be the main responsible agencies in developing this repository and will require close coordination to set up and maintain the repository. Coordination with Member States as well as other European institutions such as EEA (for data on energy poverty reported in Reportnet for the NECPR) and CINEA (to discuss integration of data from European projects, i.e. good practices, case studies) will also be required for data collection, particularly qualitative data.
- ✓ The repository will be a useful tool for many stakeholders, including **EU and MS policy makers as well as national observatories or similar network of experts, energy ombudsmen, energy agencies, national energy regulatory bodies, local authorities, researchers** as well as advocacy groups.

### 5.1.3. Recommendation A.3 – Improved (public) access/availability of national databases

#### Description

As identified in this study, there are several alternative indicators that can potentially improve the conceptualisation of energy poverty in Member states, however, for some Member States, there are limitations in the **public accessibility and availability of data**, caused by several reasons such as lack of data collection, decentralised data storage, data protection laws (e.g. General Data Protection

Regulation (GDPR)) and/or lack of publicly accessible platforms/tools. Lack of public access/availability renders some indicators unusable as the barriers for use are too high even though it may be highly relevant to the national context.

This is particularly the case for **Energy Performance Certificate (EPC) data**, where currently each Member State has their own approach to how EPC data is gathered. Although there is great potential to use energy performance certificate data to supplement existing energy poverty indicators, for some Member States, this data is not easily accessible. This makes it difficult for researchers and decision makers to use this data. However, EPC data accessibility should improve with the EPBD 2023 recast (Article 19), where Member States will be required to set up a national database for EPCs, where aggregated and anonymised data will be made publicly available. In an aggregated form, this data provides the overall distribution of the housing stock according to their energy class and thus provides some indicator of the level of performance of building. However, access to disaggregated data, at the building or neighbourhood level, could also be potentially useful, particularly for local authorities and researchers (such as done in France[21]), in terms of identifying vulnerable communities living in the worst performing buildings. However, providing access to this data requires balancing protection of private data and allowing access where relevant. It is also important to note that EPC datasets are not representative of the entire building stock, as there can be an overrepresentation of new buildings. Although, this issue should subside over time as an increasing share of the building stock is subject to sale or rent (and therefore an EPC).

Additionally, there can be limitations in the availability of other important indicators at MS level. For instance, some EU income-related indicators (e.g. 2M) are not available in Italy due to a lack of income data in the national Household Budget Survey. Member States should also improve the availability of these indicators where possible.

### Potential considerations/implications / drawbacks

- ✓ The resources required to improved data accessibility/availability will depend on the Member State, as the barriers for access/availability very (e.g. lack of data collection, regulatory barriers, administrative barriers, etc.).

### Main stakeholders and roles

- ✓ The **national government and parliament (and energy poverty observatory, or similar national networks of experts, as required by Article 24(4) EED)** will oversee where data availability needs to improve. This will require an analysis of the existing databases and assessment of which databases need to be improved/set up. The government, including national Data Protection Authorities (DPAs) will also play a role in modifying regulation

[21] In France, local authorities can access EPC data of buildings in their area.

if necessary to ensure that measures are in place which protect the privacy and confidentiality of data while also improving data accessibility where appropriate.

- ✓ The responsible **implementation agencies** will depend per country in terms of who is responsible for certain data (e.g. EPCs, survey data collection).
- ✓ The national observatories or network of experts, as required by Article 24(4) EED, should be consulted to discuss what databases are most useful to improve accessibility and specifically which data is needed. These decisions will also be informed by what indicators are deemed most useful (see recommendations in Section B).

### 5.1.4. Recommendation A.4 – Improve quality of data collection

#### Description

Not only is it important to increase the volume of data collected on energy poverty, but ensure that the data collected is of *quality*, lending itself to provide useful insights to decision makers. This pertains to ensuring that data collection methods are robust and accurately capture the broad picture of energy poverty. In particular, the following elements are emphasized which would improve quality of data collection at MS and EU level:

- **Enhance the spatial and temporal granularity of data:** Data availability for every municipality, every year, although insightful, is very resource intensive. Alternatively, greater regional disaggregation of data, in terms of providing representative data of the various types of municipalities (based on size, income distribution and climate), could provide similar insights to decisionmakers and allow for greater tailoring of interventions particularly to local contexts. Additionally, increasing the temporal granularity of data (e.g. summer vs. winter) can provide greater context of the variation in the situation over the course of the year.
- **Sustained local-level data collection**: In order to improve the quality of data being collected at the local level, municipalities require support, such as through long-term funding commitment and standardised annual procedures for municipal data collection, which can also be a requirement for annual funding programmes. These actions are intended to ensure the continuity and reliability of data collection.
- **Greater disaggregation of data:** greater disaggregation of data on relevant demographics can support decision-making by helping identify vulnerable groups and thus tailor interventions to their needs. Categorisations, such as age, income and gender, are already recorded, though not fully available. On the other hand, other demographics, such as disability and ethnicity, are not well recorded; in these cases, specific surveys may be more relevant.

#### Potential considerations/implications / drawbacks

- ✓ Implementing high-quality data collection methods can be resource-intensive, especially at more local levels. This can also become more challenging in terms of ensuring long-term funding uniformly across local levels. There will need to be a balance between increasing the granularity of data and setting up a sustainable data collection method given limited resources (continuous vs. ad-hoc data collection).

#### Main stakeholders and roles

If greater disaggregation requires changes to the EU surveys this will either be decided by the European Parliament, Council and Commission or by an agreement between the national statistical institutions and the Commission (Eurostat)[22]. In this sense, these parties will need to agree upon any additional data collection.

- ✓ The **European Commission**, particularly Eurostat, in coordination with national statistical offices, could play a role in adjusting current data collected can be more disaggregated.
- ✓ **National statistical offices** are responsible for overseeing data collection efforts and thus will be the main implementation agency. Other government agencies, such as those involved in energy poverty mitigation strategies as well as local government authorities, should be involved in deciding which data should be improved and to what level of granularity is appropriate.
- ✓ **Local government authorities, research institutes, or polling companies/consultancies** will be responsible for data collection at regional and municipal levels.

## 5.2. B. Monitoring and reporting energy poverty

### 5.2.1. Recommendation B.1 – Implementation of common indicators

#### Description

The revised EED contains certain obligations for Member States regarding their policy towards addressing Energy Poverty. Namely, Article 8(3) mentions that Member States shall make use of the following indicators, in their assessment of the share of energy poverty in their NECPs:

a) Inability to keep the home adequately warm;
b) Arrears on utility bills;

[22] Eurostat (n.d.). Programmes and activities. Available at: https://ec.europa.eu/eurostat/web/european-statistical-system/programmes-and-activities

c) The total population living in a dwelling with a leaking roof, damp walls, floors or foundation, or rot in window frames or floor; and
d) At-risk-of-poverty rate.

This is aligned with the obligations set out in the Governance Regulation[23], and shall include a national indicative objective to reduce energy poverty.

However, as identified in this study, not all Member States report these indicators in their most recent NECPs. Further, for those that do report these indicators, values and targets are sometimes missing. Therefore, it should be **ensured that these common indicators are used across Member States** when updating their NECPs and in future EU official reporting. This will facilitate comparability of data and enable more effective cross-country analysis and policy coordination. If not possible, there should be a clarification of conditionality measures based on national policies and defining who is eligible to access support measures and what criteria they must meet and require member states to report on these measures.

### Potential considerations/implications / drawbacks

- ✓ While common indicators enable comparability and coordination across the Member States, they may oversimplify the complexities and potentially overlook contextual differences between Member States. Therefore, it is important that each Member State determines which common indicators are most applicable to their situation and supplement with their own national indicators. This should be considered by the 'network of experts' (e.g. national energy poverty observatory) as stipulated in the EED 2023 Article 24(4).
- ✓ Implementing common indicators could increase administrative burden on Member States in terms of data collection required. Therefore, it should be ensured that common indicators are developed based on data which is already collected at EU level. Therefore, this recommendation should be also taken into account in the case of implementation of Recommendation A.1 (expansion of data collection of EU databases).

### Main stakeholders and roles

- ✓ The **European Commission** would play the role of overseeing the implementation of common indicators, ensuring consistency and comparability of data across Member States. The EC should also support Member States in implementing these common indicators in terms of technical assistance (e.g. guidelines for next NECPs, implementing regulations for the NECPRs) and facilitating sharing of best practices between Member States. This responsibility is highly connected developing a national energy poverty observatory

[23] The Governance Regulation 2018/1999 EU on the Energy Union and Climate Action, article 3(3) (d)

(recommendation B.2) as the observatory will play a key role in offering advice on common indicators.

- ✓ At Member State level, the **national agency or authority** responsible for reporting on energy poverty policy will play a role in implementing and reporting on common indicators.
- ✓ A **national energy poverty observatory** or equivalent networks of experts (cf. Art.24(4) EED) should support the assessment of the effectiveness of the common indicators in addressing energy poverty in their national context.

### 5.2.2. Recommendation B.2 – Development of clear energy poverty strategy through country-specific definition, indicators, and targets as well as consistent reporting

#### Description

Having a definition for energy poverty provides a common understanding that lays the foundation for stakeholders to effectively identify, monitor, and alleviate energy poverty. Since 2009, the European Commission has used the concept of energy poverty, mostly in the context of vulnerable consumer protection, but later the concept has been broadened in the scope of a just and fair energy transition for all Europeans.[24] The European Commission defines energy poverty in the revised Energy Efficiency Directive in Article 2(52) as: *a household's lack of access to essential energy services, where such services provide basic levels and decent standards of living and health, including adequate heating, hot water, cooling, lighting, and energy to power appliances, in the relevant national context, existing national social policy and other relevant national policies, caused by a combination of factors, including at least non-affordability, insufficient disposable income, high energy expenditure and poor energy efficiency of homes.* This definition points to the needs of a household's health and necessary living standards and remains open to the relevant national context and existing national policies.

Therefore, **Member States should define energy poverty, if not already, to align with this EU definition, while also further specifying the national specificities.** Having a national definition is an important initial step to developing a clear strategy to assess and ultimately address energy poverty through policy, as it creates a common understanding among relevant stakeholders and allow for more effective monitoring and more accurate identification of vulnerable communities.

Additionally, MSs should **ensure that definitions, indicators and targets are consistent** across all official national reporting to comply also with the Governance

[24] European Commission (n.d.). Energy poverty. Available at: https://energy.ec.europa.eu/topics/markets-and-consumers/energy-consumers-and-prosumers/energy-poverty_en

regulation. Inconsistent reporting can reduce the ability for policymakers to coordinate actions at different levels of government and with other relevant stakeholders as differences in how energy poverty is evaluated can lead to misalignment of goals and ultimately resource allocation. Further, inconsistent reporting can also lead to sending mixed signals to stakeholders on the long-term strategy. It can also hamper the evaluation process of the policies hence leading to ambiguities about reaching the goals. Therefore, developing a consistent strategy can facilitate coordinated monitoring and policy action.

### Potential considerations/implications / drawbacks

- ✓ Obliging all Member States to monitor and report on energy poverty may impose additional administrative burden.
- ✓ Defining energy poverty based on national context can lead to inconsistency across Member State strategies. While it is important for MSs to tailor their strategy to their national context, it can risk misalignment of national strategies with EU-level objectives as well as hamper cross-country comparison. Therefore, it is important to create a balance between tailoring (of definitions) and uniformity (of common indicators), while aligning to the new provisions of the EED, namely Article 8 and 24.

### Main stakeholders and roles

- ✓ The **European Commission** is responsible for overseeing consistency of national definitions with EED provisions as well as providing guidance and technical assistance to develop a definition. This responsibility is highly connected developing a national energy poverty observatory (recommendation B.2) as the observatory or equivalent will play a key role in offering advice on defining energy poverty.
- ✓ **National governments** play a leading role in developing and implementing the national reporting on energy poverty, including defining energy poverty and identifying indicators and setting targets. The additional effort required will vary per MS, as some MSs already have a national definition and a clear consistent/strategy. Alternatively, this role may be assigned to a national energy poverty observatory or equivalent, with support from research institutions.
- ✓ It is also important to involve **other stakeholders, such as organisations advocating for vulnerable communities, the energy sector as well as local authorities and municipalities**, to provide insights on how energy poverty should be defined to incorporate all dimensions of energy poverty in the country.

### 5.2.3. Recommendation B.3 – Further development/use of new, alternative indicators

#### Description

MSs should be encouraged to also **use a variety of indicators to assess energy poverty** through continued technical support and funding for research and development of additional indicators and data sources but also facilitating knowledge sharing and dissemination of best practices, which is already done to an extent by the Energy Poverty Advisory Hub (EPAH) and the Energy poverty and Vulnerable Consumers Coordination Group. In some Member States, new, innovative indicators are already used to assess energy poverty, therefore the level of assistance needed per MS will vary.

While it is important to have comparability of data across countries through common indicators, it is also important for indicators to capture variations (e.g. climatic, social, regional) specific to the country but also regional and municipal differences. This entails complementing common EU indicators/data sources with national indicators/data sources.

The relatively easiest indicators to implement are those already in the Eurostat database, e.g. **indicators on energy prices and household energy consumption**, as this data is readily available, complete and most indicators are updated (sub)-yearly. Further, **climatic conditions**, such as heating and cooling days from Eurostat, are a relevant indicator to consider when comparing energy poverty across Member States, but also over time. Additionally, climatic data from the Copernicus Institute on heat waves and cold spells could be a valuable source for indicators. Although these indicators may not directly link to energy poverty, they remain useful, particularly in combination with other indicators, to analyse energy poverty.

Additionally, indicators based on **building condition, particularly based on Energy Performance Certificate**, are valuable addition in terms of providing context of the building stock. Namely, there is potential to use EPC data in composite indicators or couple with surveys performed at national/regional level. However, as mentioned in Recommendation A.3, public accessibility of EPC varies per Member State, therefore whether EPC-based building condition indicators can be easily implemented depends on the national context. Additionally, this study also investigated other databases on building stock typologies (EU-funded H2020 EPISCOPE/TABULA project and Hotmaps project), although, this data was only collected once in 2016 and not present in all MSs.

Further, an alternative approach to using multiple single indicators is rather to use **composite indicators**, which provide a comparable and comprehensive assessment of energy poverty by compiling many indicators into one index. Utilising composite indicators can be particularly useful when monitoring energy poverty

across MSs as well as regional comparisons within a country, where ultimately, composite indicators can help policymakers with targeting interventions where it is needed most by identifying regions and communities with the highest levels of energy poverty. Several methodologies for developing composite indicators have been developed for energy poverty, such as the Rented Private Housing Energy Poverty Indicator (REPI) (EU – Energy Poverty Dashboard), the Index of Vulnerable Homes (IVH) (England), Building Fuel Poverty Index (BFP) (Italy), Structural Energy Poverty Vulnerability (SEPV) (EU), Energy Poverty Vulnerability Index (EPVI) (Portugal) and Composite Energy Poverty Index (CEPI) (EU) as well as the Domestic Energy Poverty Index (EDEPI) by OpenExp.[25]

### Potential considerations/implications / drawbacks

- ✓ Implementing new indicators can be resource intensive in terms of capacity needed to assess which new indicators are most valuable for a MS and depending on required data to compile new indicators, there could be significant efforts required to improve the quality and accessibility of data.
- ✓ Additionally, depending on the complexity of the indicators, more effort may be required to increase understanding amongst stakeholders of how to interpret the new indicators. Despite simplifying information, composite indicators can still be complex, where there is high risk for misinterpretation and oversimplification. Additionally, how the weighting/normalisation of the different components of composite indicators is undertaken can strongly influence the final outcome. Therefore, it is recommended that composite indicators are not used stand-alone, but rather complement other indicators used.
- ✓ An EU level composite indicator may not be able to capture contextual factors in different regions, leading to a risk of misidentification of energy poverty. Attention needs to be given for how an EU level composite indicator takes into account the uniqueness of varying regions.

### Main stakeholders and roles

- ✓ The **European Commission** can support MSs through technical assistance, funding and guidance for developing and implementing new alternative indicators. This facilitation and knowledge sharing among MSs would mostly occur through platforms like the Energy Poverty Advisory Hub.
- ✓ **National government** will play a leading role in evaluating which new indicators are most suitable for their specific context as well as assessing the needs to improving quality and accessibility of data. Further, national agencies will play a role in collaborating with the European Commission to share best practices and lessons learned. Alternatively, this role may be assigned to a national energy poverty observatory or equivalent.

[25] Kashour, M. & Jaber, M. (2024). Revisiting energy poverty measurement for the European Union. Available at: https://doi.org/10.1016/j.erss.2024103420

- ✓ It is also important to involve **other stakeholders, such as research institutions, organisations advocating for vulnerable communities, the energy sector as well as local authorities and municipalities**, to better understand what indicators are best suited to evaluate energy poverty at national and local levels.

### 5.2.4. Recommendation B.4 – Support Member States with the development of national energy poverty observatories (if not yet established)

#### Description

As established in Article 24(4) of the EED, Member States are required to establish a '*network of experts from various sectors…to develop strategies to support local and national decisions makers in implementing…[measures]…to alleviate energy poverty*'. Namely, this network of experts should support Member States by offering advice on national definitions, indicators as well as developing and improving relevant indicators and datasets.

In this context, Member States should be supported to develop a national energy poverty observatory, such as already established in Austria, Belgium, Czechia, France, Greece, Ireland, Italy, Luxembourg, Portugal and Romania. An observatory can play a critical role in improving a country's ability to assess energy poverty. Such an observatory helps to ultimately inform decision makers on the current levels and evolution of energy poverty in the country. When setting up an observatory, it is important to have a clear plan in terms of having clear objectives for the observatory, a common understanding of energy poverty and how data will be acquired. Additionally, involving a variety of different stakeholders is a key success factor, as done in France, which facilitates retrieving input and support from many sources.

#### Potential considerations/implications / drawbacks

- ✓ Setting up and maintaining an observatory is resource intensive, requiring investment in financial and human resources , including funding for data collection, analysis and stakeholder engagement.
- ✓ Acquisition of data from various stakeholders requires careful coordination as well as setting up a common understanding of energy poverty and standardised methodologies for data collection

#### Main stakeholders and roles

- ✓ The **European Commission** can support Member States with technical assistance and guidance for setting up the observatory. Technical assistance/guidance may include efforts such as providing advice on defining objectives for the observatory, offering capacity building resources and supporting the development of working groups to involve a variety of stakeholders. Support can also be provided in terms of allocating financial

resources and facilitating knowledge exchange and best practices (via EPAH for instance).

- ✓ **National agencies** would be responsible for setting up the observatory as well as providing funding and policy support to maintain the observatory.
- ✓ **National statistical offices and research institutions** are critical collaborative participants in terms of contributing their expertise on data collection and analysis.
- ✓ **Energy suppliers and grid operators** can provide the observatory relevant data and expertise relating to energy access and affordability.
- ✓ **Representatives of vulnerable communities** are an important stakeholder to involve, offering knowledge and perspective of energy-poor communities

## 5.3. C. Linking energy poverty data to policy actions

### 5.3.1. Recommendation C.1 – Integration with Social Climate Fund

#### Description

The establishment of the Social Climate Fund presents an opportunity to integrate energy poverty measures into the broader climate and social policy frameworks. In this context, **Member States should be required to report on measures taken to address energy poverty** and **clear guidelines on reporting requirements** related to energy poverty should be established, which can ensure that energy poverty measures are adequately reported and monitored. In this sense, performance metrics (indicators and targets) to track progress and outcomes for financed measures addressing energy poverty should be standardised. To facilitate reporting for MSs, metrics should be based on EU harmonised indicators and the European Commission should provide MSs with templates and reporting frameworks.

As the EC will be assessing such plans under Art. 16 of **the Social Climate Fund (SCF) Regulation (2023/955)**, particularly considering situations of energy (and transport) poverty, MSs are allowed to request for support under the Technical Support Instrument established by Regulation (EU) 2021/240. Specific guidelines

should be provided in order to fulfil the requirements set by Art. 6 (d, f, g)[26], Art. 7.2 (e)[27], and Art. 8.1 (c)[28]

Ensuring that energy poverty measures are coherently reported for the Social Climate Fund will create transparency in how these EU funds are used to address energy poverty as well as facilitate the monitoring and evaluation of the measures by allowing for cross-country analysis. In this sense, requiring a harmonised approach to reporting in this framework can help identify which measures are most effective/efficient.

### Potential considerations/implications / drawbacks

- ✓ Establishing clear reporting guidelines and standardised metrics can on the one hand alleviate administrative burden by providing clear guidance on how energy poverty measures should be monitored, whereas on the other hand, standardisation can also impose an administrative burden in terms of additional time needed to ensure compliance to requirements as well as additional resources needed for data collection if necessary. In this sense, using harmonised EU indicators should alleviate this burden by reducing the need for additional efforts.
- ✓ Having a standardised framework for reporting may not adequately capture the nuances of energy poverty dynamics, which very per Member State. Therefore, guidelines for reporting should allow for a range of indicators, where Member States are allows to decide which indicators are most appropriate for their measures.

[26] Article 6 of SCF regulation 2023/955 defines the content of the Social Climate Plan and sets out: (d) the particulars of national effects of inclusion of GHG-emissions of buildings and road transport within the scope of Dir 2003/87/EC on energy poverty and transport poverty on households and micro-enterprises. within MSs. (f) how MSs should use the energy poverty and transport poverty definitions (g) the criteria that MSs shall apply to art. 4(3) and how they positively impact Energy poverty and Transport Poverty. an estimate of the likely effects of the increase in prices resulting from the inclusion of greenhouse gas emissions from buildings and road transport within the scope of Directive 2003/87/EC on households, in particular on incidence of energy poverty and transport poverty, and on micro-enterprises; those effects are to be analysed at the appropriate territorial level as defined by each Member State, taking into account national specificities and elements, such as access to public transport and basic services, and identifying the areas mostly affected; (f) an explanation of how the definitions of energy poverty and transport poverty are to be applied at national level; (g) where the Plan provides for measures as referred to in Article 4(3), the criteria for the identification of eligible final recipients, the envisaged time limit for the measures in question and their justification on the basis of a quantitative estimate and a qualitative explanation of how those measures are expected to reduce energy poverty, transport poverty and the vulnerability of households to an increase in the price of road transport and heating fuel;

[27] Payment of financial support to Member State shall be given only if that Member State achieves reductions of number of households in energy poverty, vulnerable micro-enterprises and vulnerable transport users. This is in accordance with Article 8 of this Regulation and with EU Climate Law (Regulation (EU) 2021/1119 Article 7: Payment of financial support pursuant to paragraph 1 of this Article to each MS shall be conditional upon that Member State achieving the milestones and targets for the measures and investments in accordance with Article 8 of this Regulation. Those milestones and targets shall be compatible with the Union's climate targets and the objective set out in Regulation (EU) 2021/1119 and shall cover in particular: reductions in the number of vulnerable households, in particular households in energy poverty, of vulnerable micro-enterprises and of vulnerable transport users.

[28] MSs may include in the costs of the Social Climate Plans targeted to vulnerable households, micro-enterprises and transport users measures that contribute to decarbonisation, energy savings or reducing energy poverty. (article 8(1)(c)).

- ✓ Having an emphasis on quantitative reporting of measures can lead to overlooking qualitative aspects, such as social and cultural factors which influence energy poverty. Therefore, guidelines should also advocate for qualitative indicators, though maybe not standardised, to also be considered alongside quantitative indicators.

#### Main stakeholders and roles

- ✓ The **European Commission** would be responsible for setting up clear guidelines and reporting requirements for Member States in order to access financing from the Social Climate Fund. This includes also providing templates and reporting frameworks to standardised reporting. The EC will also be responsible for ensuring compliance to requirements.
- ✓ **National governments** would be responsible for implementing the reporting requirements for measures as well as allocating resources for monitoring and evaluating progress of measures.

### 5.3.2. Recommendation C.2 – Integration of Conditionalities

#### Description

Governments not only identify energy poverty through its definition and indicators used but also indirectly (or not so much, as for the case of Cyprus) through its measures in terms of existing conditionalities in various policies and initiatives relating to energy poverty. Conditionalities in this context pertain to the requirements/eligibility criteria used for policies in terms of who can access certain benefits/subsidies/services. In this sense, where possible, it should be **encouraged for Member States to integrate these conditionalities in their national reporting (e.g. NECP) on energy poverty**. Identifying these conditionalities can help evaluate whether measures to address energy poverty align with broader policy objectives and how energy poverty is currently assessed. Examples from reported policies include number of recipients of gas/electricity subsidies, no. of recipients of social housing/other welfare subsidies, unemployment, renovation bonuses, etc.

#### Potential implications / drawbacks

- ✓ Additional reporting on conditionalities will increase administrative burden to some extent.

#### Main stakeholders and roles

- ✓ The **European Commission** would support Member States in terms of providing guidelines on how conditionalities should be reported.
- ✓ The **national government** would be responsible for reporting on conditionalities. **Local authorities** may also support in reporting conditionalities for local level initiatives.

# 6. Concluding discussion

The table below presents an overview of the practical recommendations that have been discussed in the previous section.

The implementation timeframe is categorised as follows:

- ✓ **Short term:** Actions are to be implemented within 2 years;
- ✓ **Medium term:** Actions are to be implemented within 5 years;
- ✓ **Long term:** Actions are to be implemented beyond 5 years

The level of costs, categorised as high, medium, and low, are based on the recommendations potential implications/drawbacks and are considered as follows:

- **High costs:** requires significant financial resources (e.g. due to long-term implementation, large-scale investment in technology or specialised skills-training)
- **Medium costs:** requires moderate level of financial resources (e.g. due to medium-term implementation, investment required in technology or administrative resources)
- **Low costs:** minimal financial resources required (e.g. short-term implementation, small-scale implementation such as pilot projects, limited investment required in technology or administrative resources)

The level of complexity, categorised as high, medium and low, are also based on the recommendations potential implications/drawbacks and are considered as follows:

- **High complexity:** can involve several factors, such as: need for deployment of complex systems requiring highly specialised expertise for implementation; requirement of collaboration of multiple and diverse stakeholders; need for significant change to existing regulation.
- **Medium complexity:** can involve several factors, such as: implementation of new systems/measures which require some specialised expertise, some required need to coordinate efforts of different stakeholders, some adaptation of existing regulation required.
- **Low complexity:** can involve several factors, such as: easy implementation with minimal technical expertise required, streamlining existing processes and improving efficiencies without requiring significant changes.

**Table 6-1 Summary table of key recommendations**

| A. Measuring energy poverty | Implementation timeframe | Costs | Complexity | Implementation level |
|---|---|---|---|---|
| A.1 Expansion of data collection for EU databases | Long term | Medium | Medium | EU |
| A.2 Development of energy poverty EU data repository | Medium/Long-term | High | Medium/High | EU |
| A.3 Improve public access to national databases | Long term | High | High | MS |
| A.4 Improve quality of data collection | Medium-term | High | High | MS/EU |
| **B. Monitoring and reporting energy poverty** | **Implementation timeframe** | **Costs** | **Complexity** | **Implementation level** |
| B.1 Implementation of Common Indicators | Short-term | Medium | Low/Medium | EU/MS |
| B.2 Develop clear energy poverty strategy | Short-term | Medium | Medium | EU/MS |
| B.3 Use of new, alternative indicators | Medium-term | Medium | Medium/High | EU/MS |
| B.4 National energy poverty observatories | Medium-term | High | Medium | EU/MS |
| **C. Linking energy poverty to policy action** | **Implementation timeframe** | **Costs** | **Complexity** | **Implementation level** |
| C.1 Integration with Social Climate Fund | Medium/Long-term | Medium | Medium | EU |
| C.2 Integration of Conditionalities | Medium/Long-term | Low | Low | EU |

Overall, the main stakeholder roles for these actions are:

- **European institutions** (i.e. European Commission, particularly Eurostat, DG ENER (including the Energy Poverty Advisory Hub), DG EMPL (including the Social Protection Committee (SPC) and the Indicator Subgroup (ISG))) would be responsible for overseeing EU level initiatives and supporting Member States with national level actions by providing guidance and technical assistance.
- **National governments/institutions** would be responsible for overseeing all MS level recommendations.
- **National energy poverty observatories or equivalent** are an integral part of all of all MS level recommendations as they play an advisory role for the

government for all actions relating to measuring and reporting on energy poverty.

- **Other stakeholders**, mainly for consultation for several actions, such as local/municipal authorities, research institutions, building-related market parties, organisations advocating for vulnerable communities, the energy sector, and policy makers.

# Acknowledgement

We thank the national experts whose contributions supported the validation of the Member State assessments. We particularly wish to acknowledge the following experts for their contributions:

- Altan Sahin, Kerstin Schilcher, Angela Holzmann (Austrian Energy Agency) (Austria)
- Sarah Wildiers, Roel Vermeiren, Lisa D'haens (Belgium)
- Jurica Brajković (Energy Institute Hrvoje Požar, Zagreb) (Croatia)
- Manuel Llorca (Denmark)
- Antje Kahlheber (Germany)
- Christos Tourkolias (Greece)
- Nora Feldmar (Hungary)
- Experts from the Italian Energy Poverty Observatory (OIPE) (Italy)
- Anna Mutule (Latvia)
- Voilaine Giaux, Denis Sijaric, Dr. Olivier Thunus (Luxembourg)
- Manuel Casquiço, Luís Silva, Rui Fragoso (Portugal)
- Dr. Anca Sinea and Dr. George Jiglau (Romanian Energy Poverty Observatory) (Romania)
- dr. Matevž Pušnik (Slovenia)
- Pilar de Arriba Segurado, Patricia Isabel Bañón Serrano, Carlos Alberto Fernández López (Spain)

We thank the following experts of the DG ENER B1 Energy poverty team for the collaboration and insightful contributions:

- Liviu Ion Stochita
- Veronique Marx
- Sara Lapenna,
- Tadhg O'Brian,
- Alejandro Ulzurrun de asanza y munoz,
- Mathilde  Leyge

We also extend our thanks to those experts who have chosen to remain anonymous.

# Annex I – Dataset properties and visualised results of the dataset assessment by country as of Section 3

## Austria

### Robustness I (sensitivity to differing configurations)

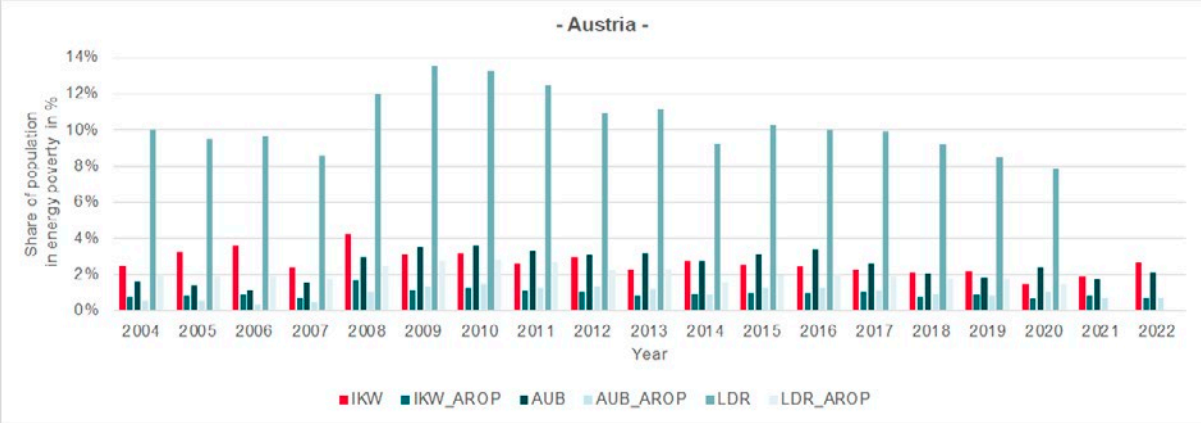



**Figure 0.1 Comparison of energy poverty rates for different configurations of consensual indicators in Austria**

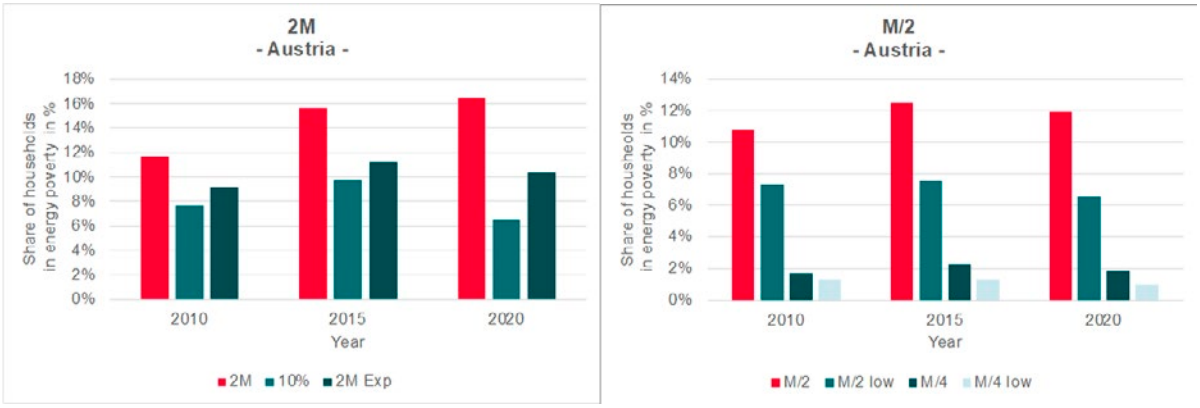



**Figure 0.2 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Austria**

## Robustness II (share of high-income households identified as energy poor)


**Figure 0.3 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Austria**

## Robustness III (share of outliers)

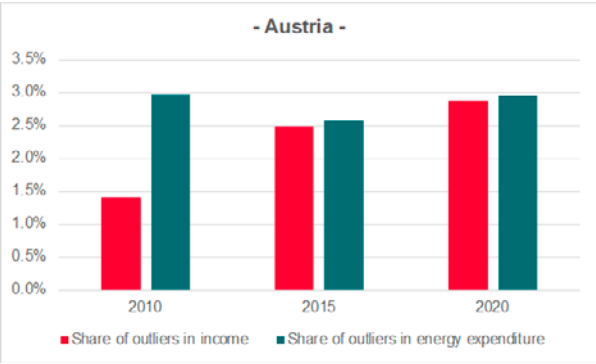



**Figure 0.4 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Austria by wave**

## Completeness

### Table 0-1 Share of missing data points per indicator and year in the Austrian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0.2 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0.1 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 1.3 | 0.2 | 0 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 0.2 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0.1 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 1.3 | 0.2 | 0 | 0 | 0 |
| Presence of leak, damp or rot | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.2 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 26.8 | 0 | 5.3 | 4.7 | 4.6 | 5.9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0.3 | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Belgium

## Robustness I (sensitivity to differing configurations)

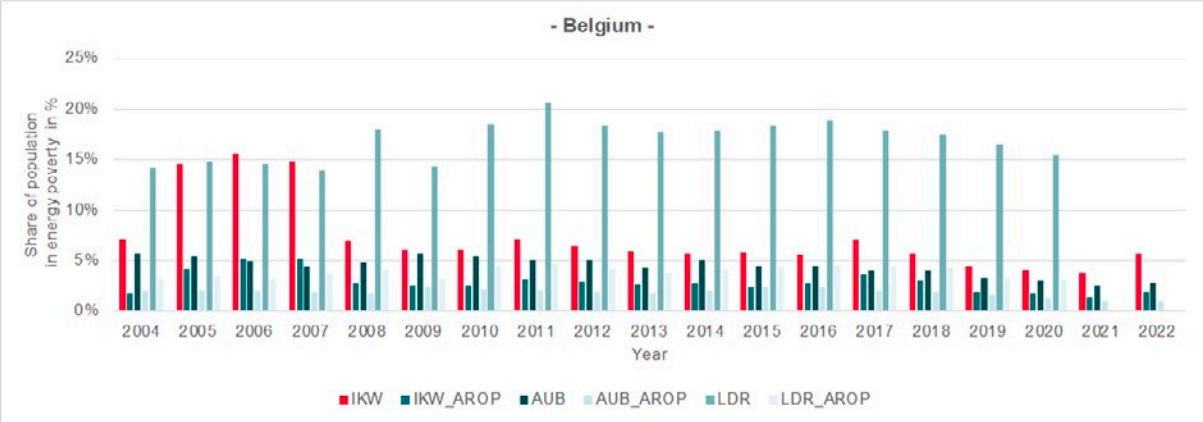



**Figure 0.5 Comparison of energy poverty rates for different configurations of consensual indicators in Belgium**

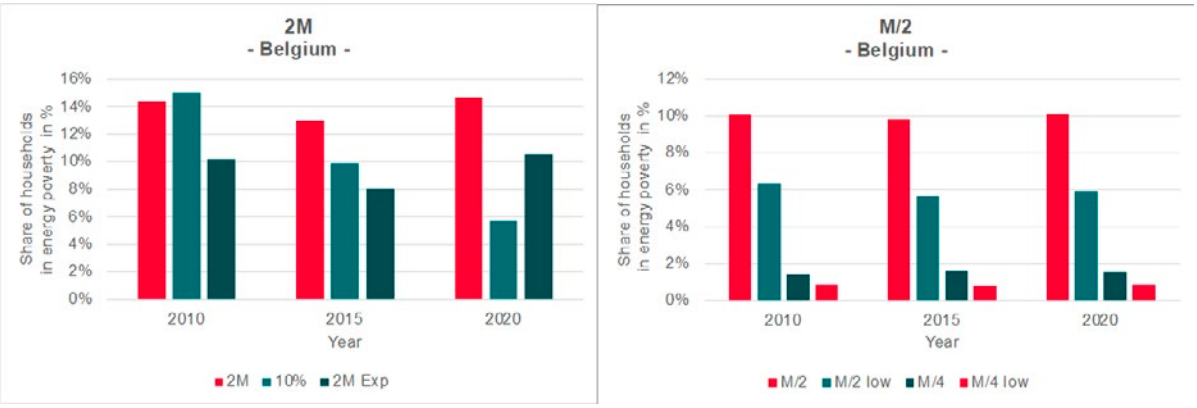



**Figure 0.6 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Belgium**

## Robustness II (share of high-income households identified as energy poor)

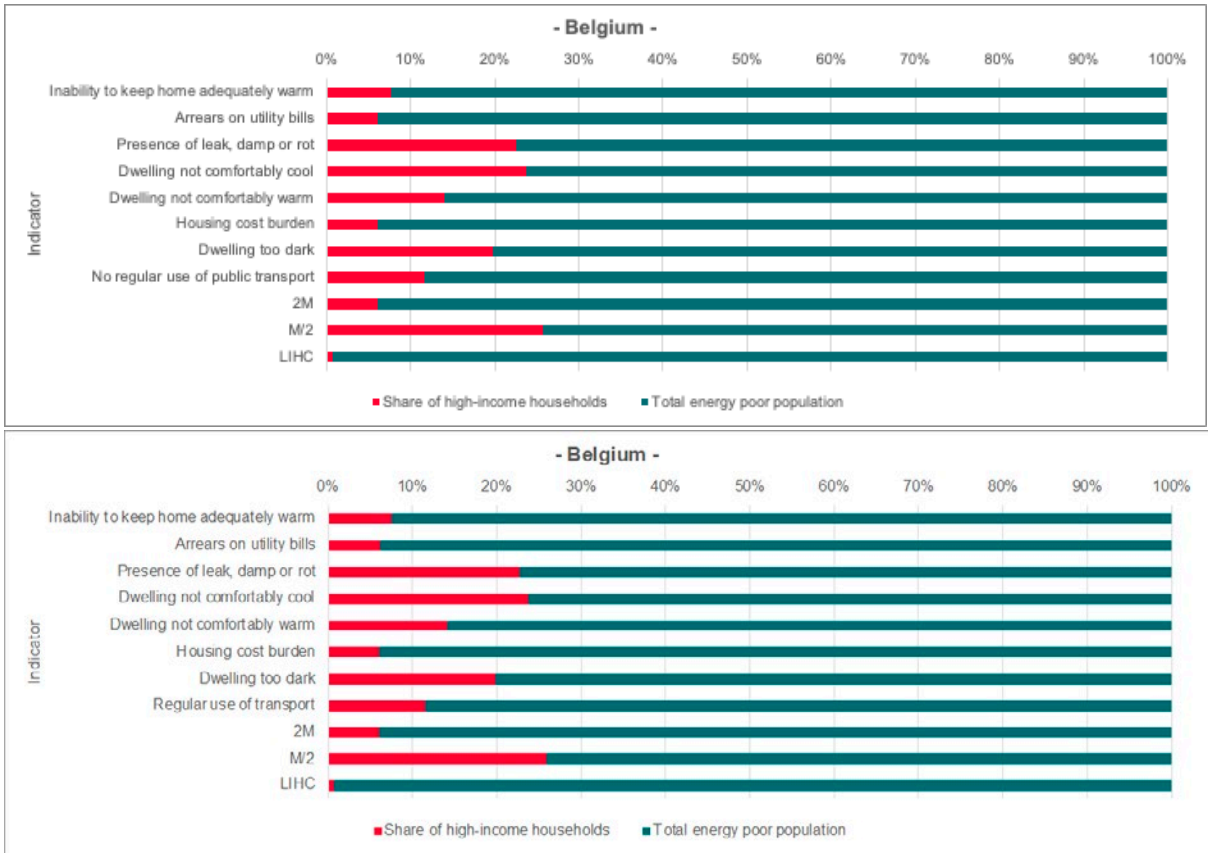



**Figure 0.7 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Belgium**

## Robustness III (share of outliers)

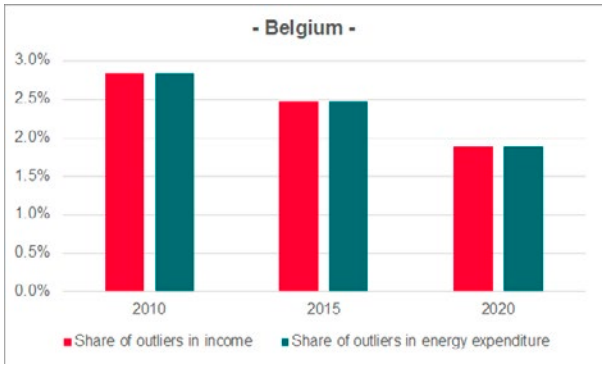



**Figure 0.8 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Belgium by wave**

## Completeness

### Table 0-2 Share of missing data points per indicator and year in the Belgian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 2.2 | 1.0 | 2.3 | 2.2 | 2.1 | 2.5 | 2.4 | 1.9 | 1.9 | 1.6 | 1.7 | 2.1 | 2.3 | 2.1 | 1.9 | 1.0 | 0.6 | 0.8 | 0.4 |
| Arrears on utility bills + at risk of poverty | 2.2 | 1.0 | 2.3 | 2.2 | 2.1 | 2.5 | 2.4 | 1.9 | 1.9 | 1.6 | 1.7 | 2.1 | 2.3 | 2.1 | 1.9 | 1.0 | 0.6 | 0.8 | 0.4 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 3.3 | 0 | 0 | 0 | 0.4 | 0.9 | 0.6 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 3.3 | 0 | 0 | 0 | 0.4 | 0.9 | 0.6 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.2 | No data | No data | No data | No data | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0.1 | No data | No data | No data | No data | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 2.5 | 7.2 | 6.6 | 4.6 | 0 | 0.3 | 0.4 | 0.2 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | 0.1 | 0.1 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 1.0 | 1.0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Bulgaria

## Robustness I (sensitivity to differing configurations)

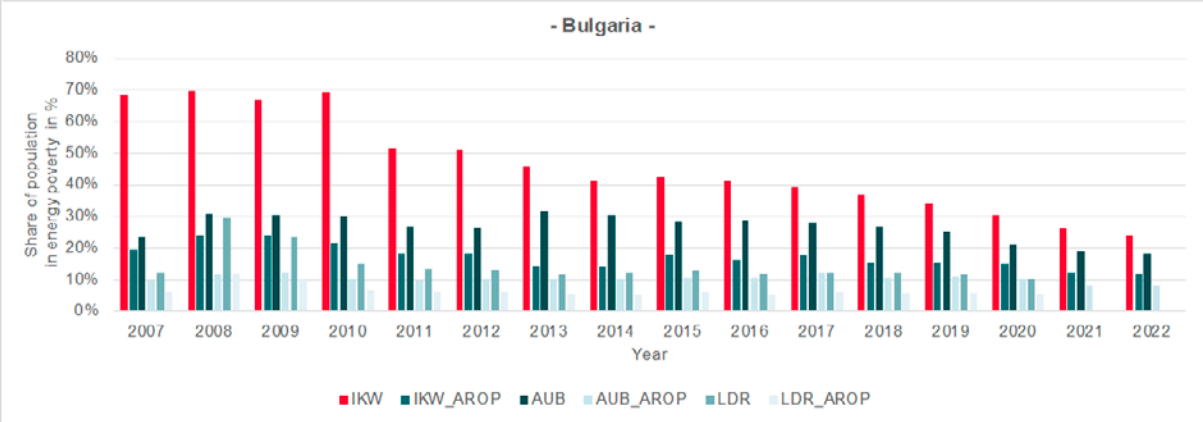



**Figure 0.9 Comparison of energy poverty rates for different configurations of consensual indicators in Bulgaria**

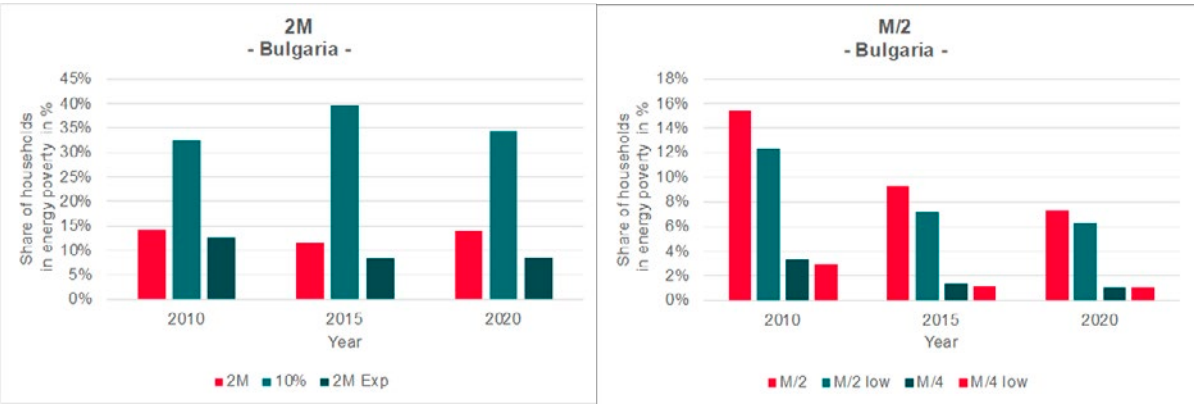



**Figure 0.10 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Bulgaria**

## Robustness II (share of high-income households identified as energy poor)

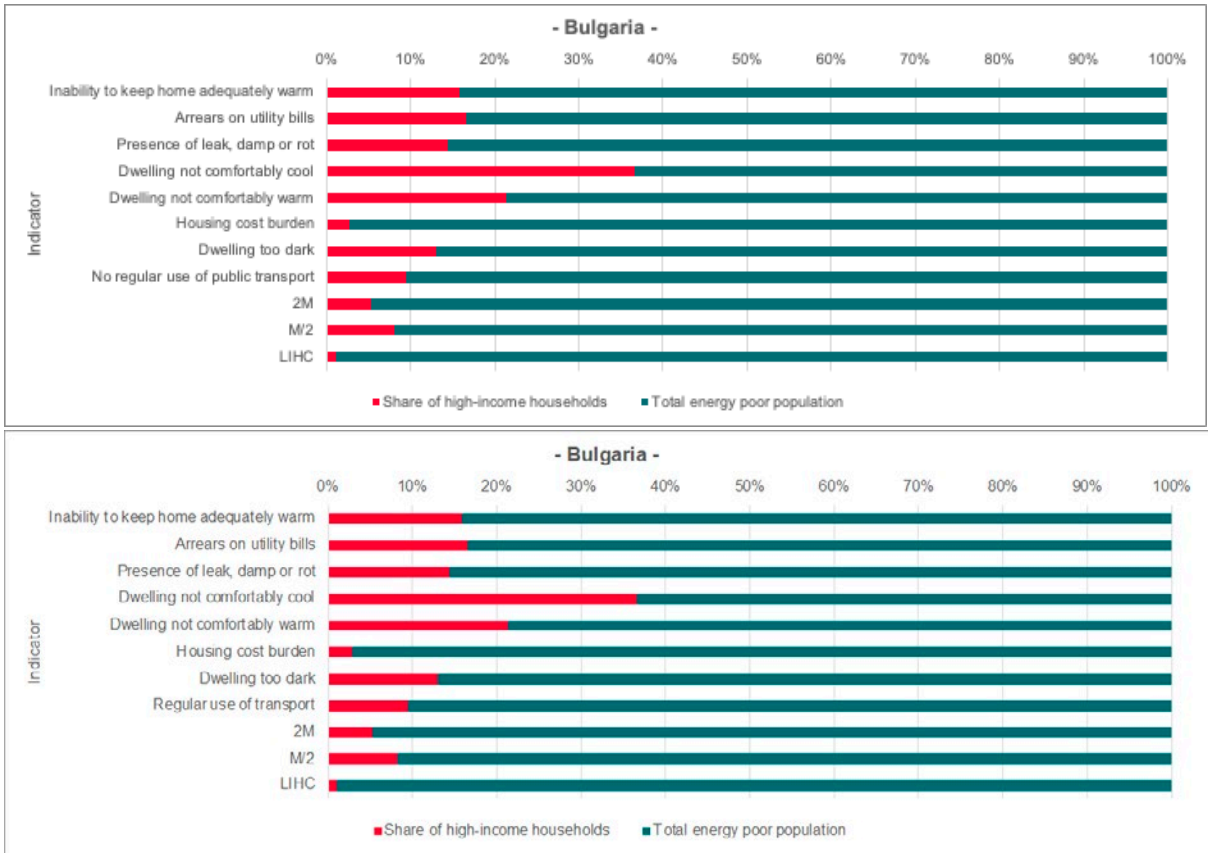



**Figure 0.11 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Bulgaria**

## Robustness III (share of outliers)

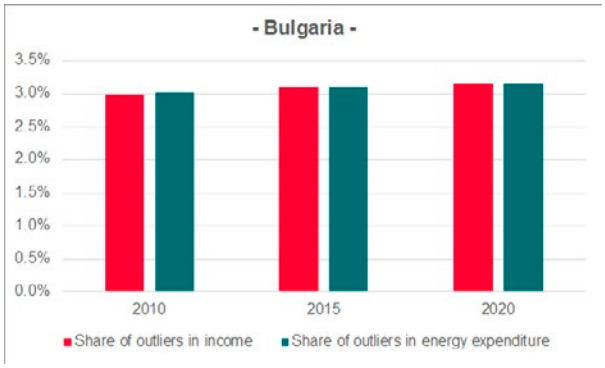



**Figure 0.12 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Bulgaria by wave**

## Completeness

### Table 0-3 Share of missing data points per indicator and year in the Bulgarian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.7 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 3.2 | 0.3 | 0.4 | 0.1 | 0.1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.2 | 0.6 | 0.3 | 0.3 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 3.7 | 0.8 | 0.6 | 0.4 | 0.6 | 0.9 | 0.5 | 0.5 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 |
| Presence of leak, damp or rot | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 2.7 | 0.1 | 0.4 | 0.1 | 0.1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 2.5 | 0.1 | 0.4 | 0.1 | 0.1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 2.5 | 0.1 | 0.4 | 0.1 | 0.1 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | 93.3 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | 1.6 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | 0 | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Cyprus

## Robustness I (sensitivity to differing configurations)

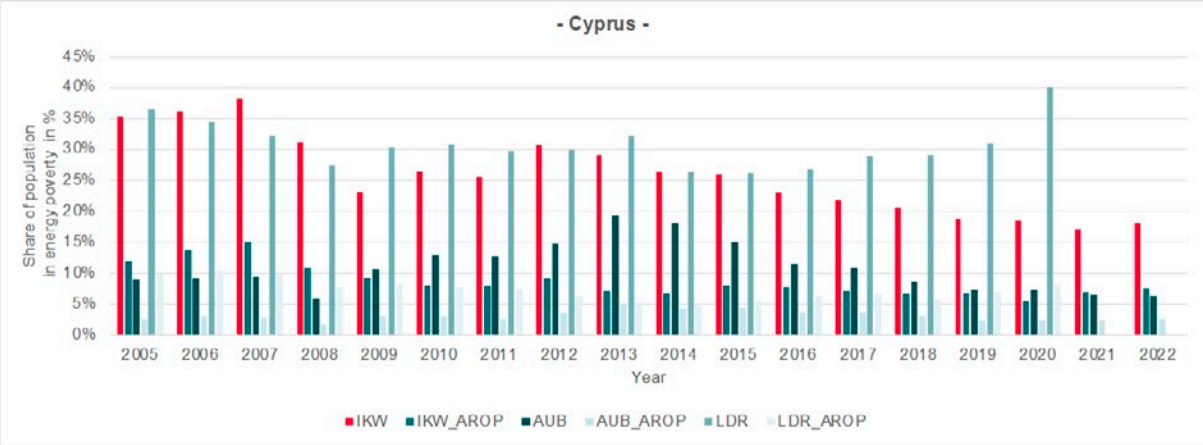



**Figure 0.13 Comparison of energy poverty rates for different configurations of consensual indicators in Cyprus**

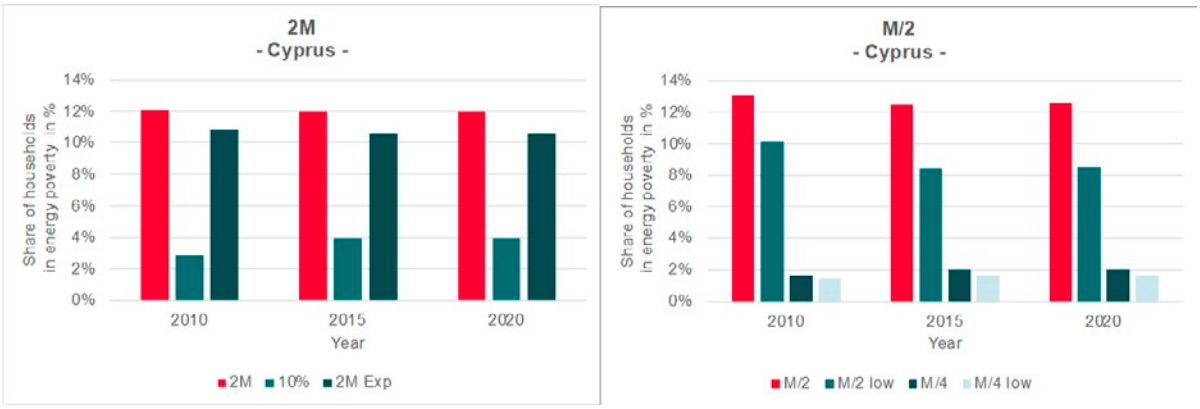



**Figure 0.14 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Cyprus**

## Robustness II (share of high-income households identified as energy poor)

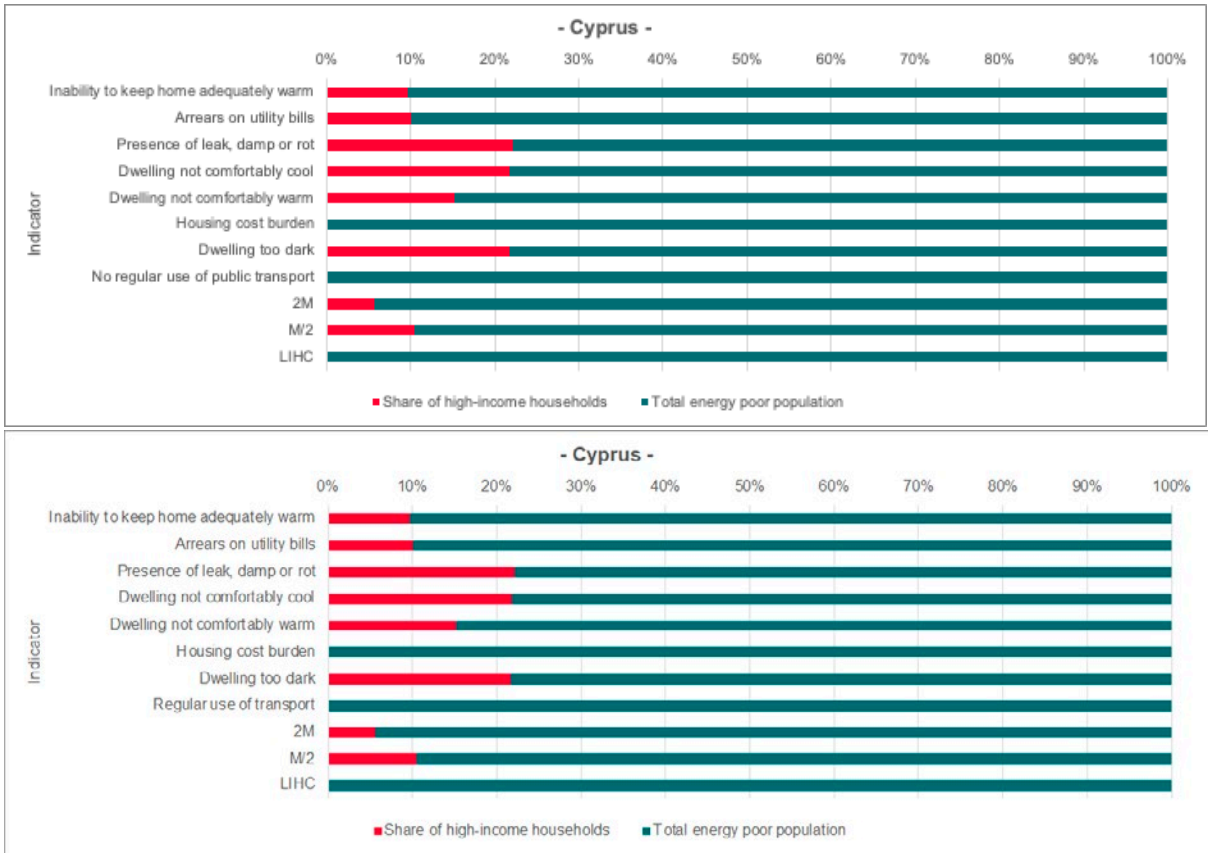



**Figure 0.15 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Cyprus**

## Robustness III (share of outliers)

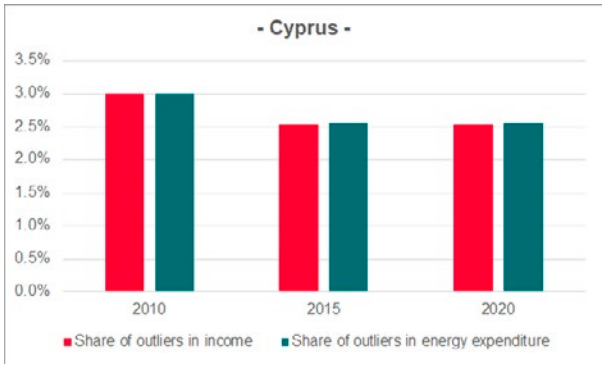



**Figure 0.16 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Cyprus by wave**

## Completeness

### Table 0-4 Share of missing data points per indicator and year in the Cyprian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.7 | 1.7 | 1.4 | 1.2 | 1.0 | 1.3 | 1.6 | 2.4 | 1.4 | 1.4 | 1.7 | 1.7 | 1.5 | 0.6 | 0.8 | 0.7 | 0.3 | 0.3 |
| Arrears on utility bills + at risk of poverty | 1.7 | 1.7 | 1.4 | 1.2 | 1.0 | 1.3 | 1.6 | 2.4 | 1.4 | 1.4 | 1.7 | 1.7 | 1.5 | 0.6 | 0.8 | 0.7 | 0.3 | 0.3 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Czech Republic

## Robustness I (sensitivity to differing configurations)

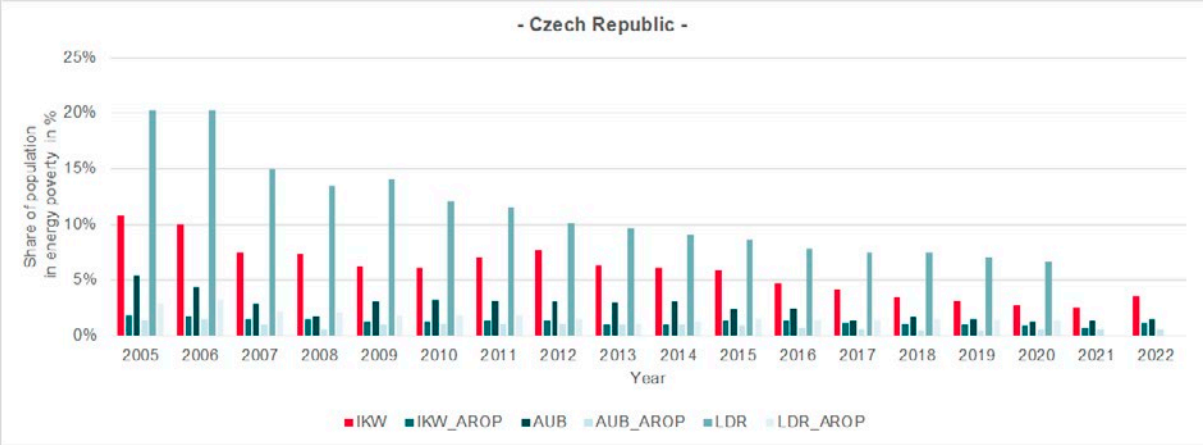



**Figure 0.17 Comparison of energy poverty rates for different configurations of consensual indicators in Czech Republic**

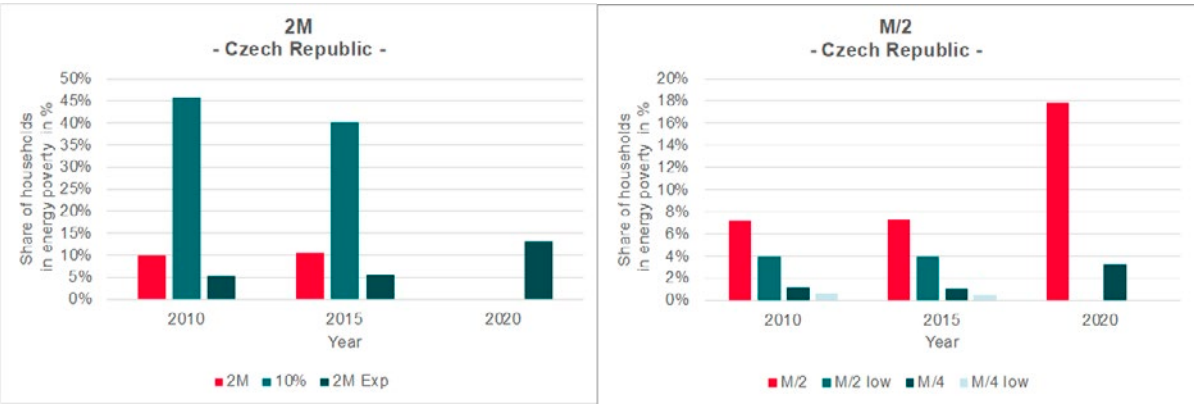



**Figure 0.18 Comparison of energy poverty rates for different configurations of expenditure-based indicators in the Czech Republic**

## Robustness II (share of high-income households identified as energy poor)

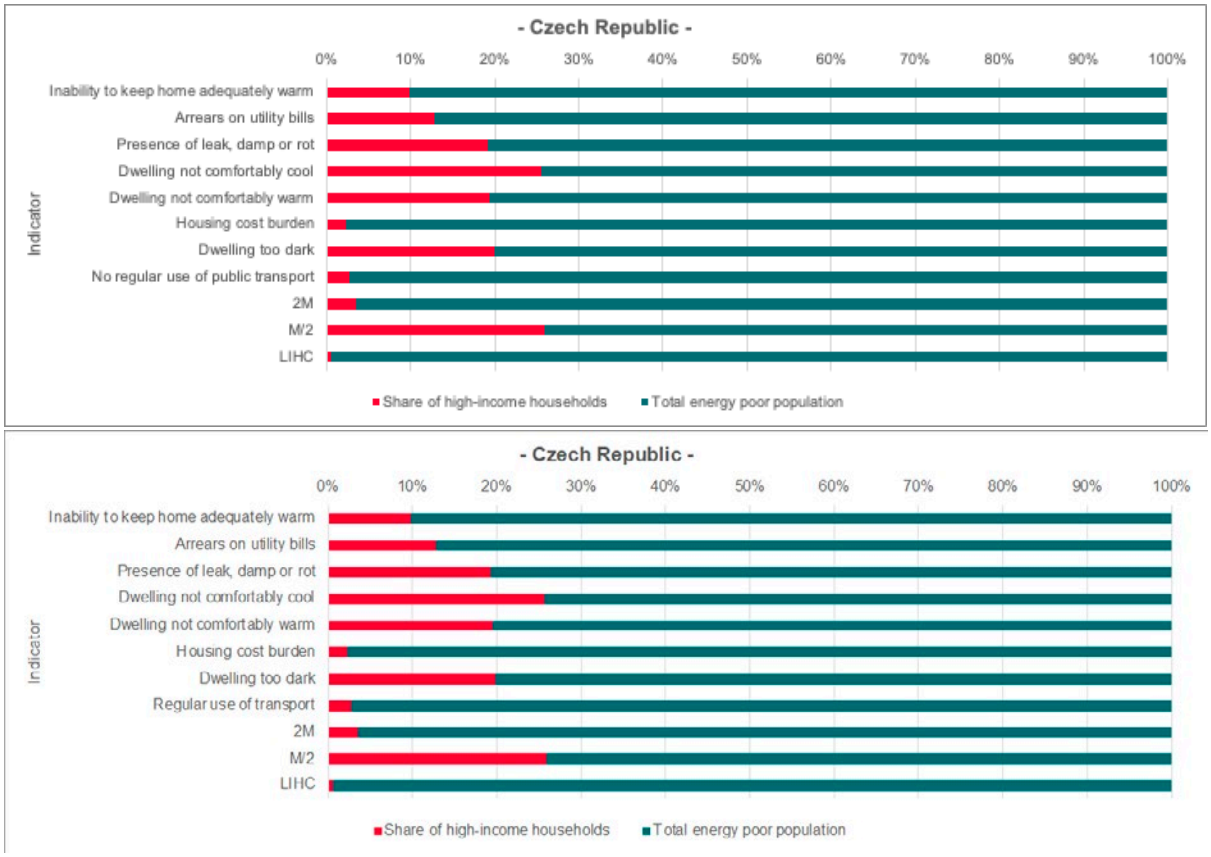



**Figure 0.19 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in the Czech Republic**

## Robustness III (share of outliers)

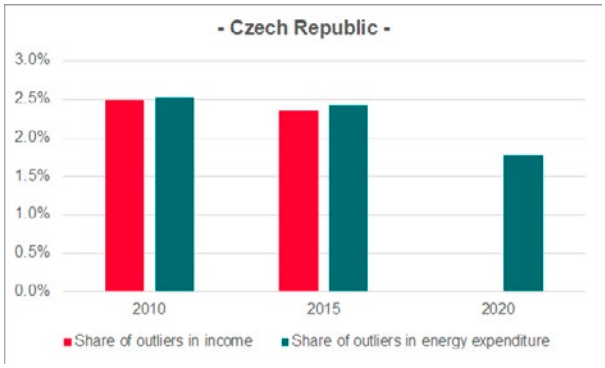



**Figure 0.20 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in the Czech Republic by wave**

## Completeness

### Table 0-5 Share of missing data points per indicator and year in the Czech SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.3 | 1.1 | 0.9 | 0.6 | 1.0 | 0.7 | 0.4 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Arrears on utility bills + at risk of poverty | 1.3 | 1.1 | 0.9 | 0.6 | 1.0 | 0.7 | 0.4 | 0.6 | 0.5 | 0.4 | 0.4 | 0.3 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.4 | 0.2 | 0.2 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Germany

## Robustness I (sensitivity to differing configurations)

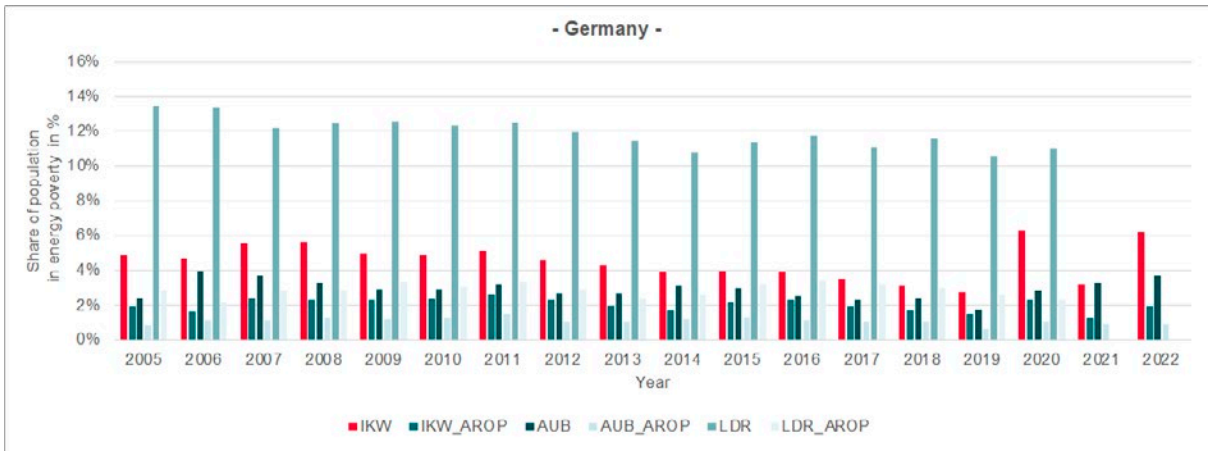



**Figure 0.21 Comparison of energy poverty rates for different configurations of consensual indicators in Germany**

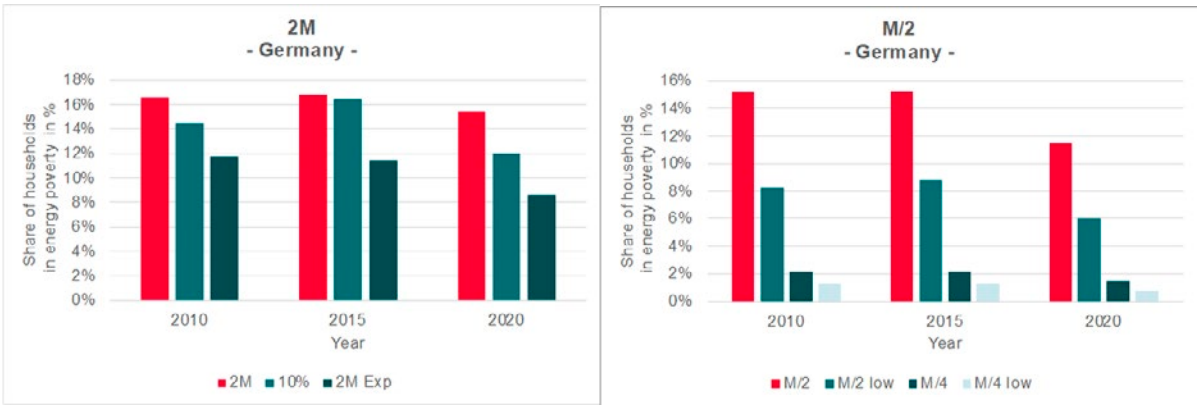



**Figure 0.22 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Germany**

## Robustness II (share of high-income households identified as energy poor)

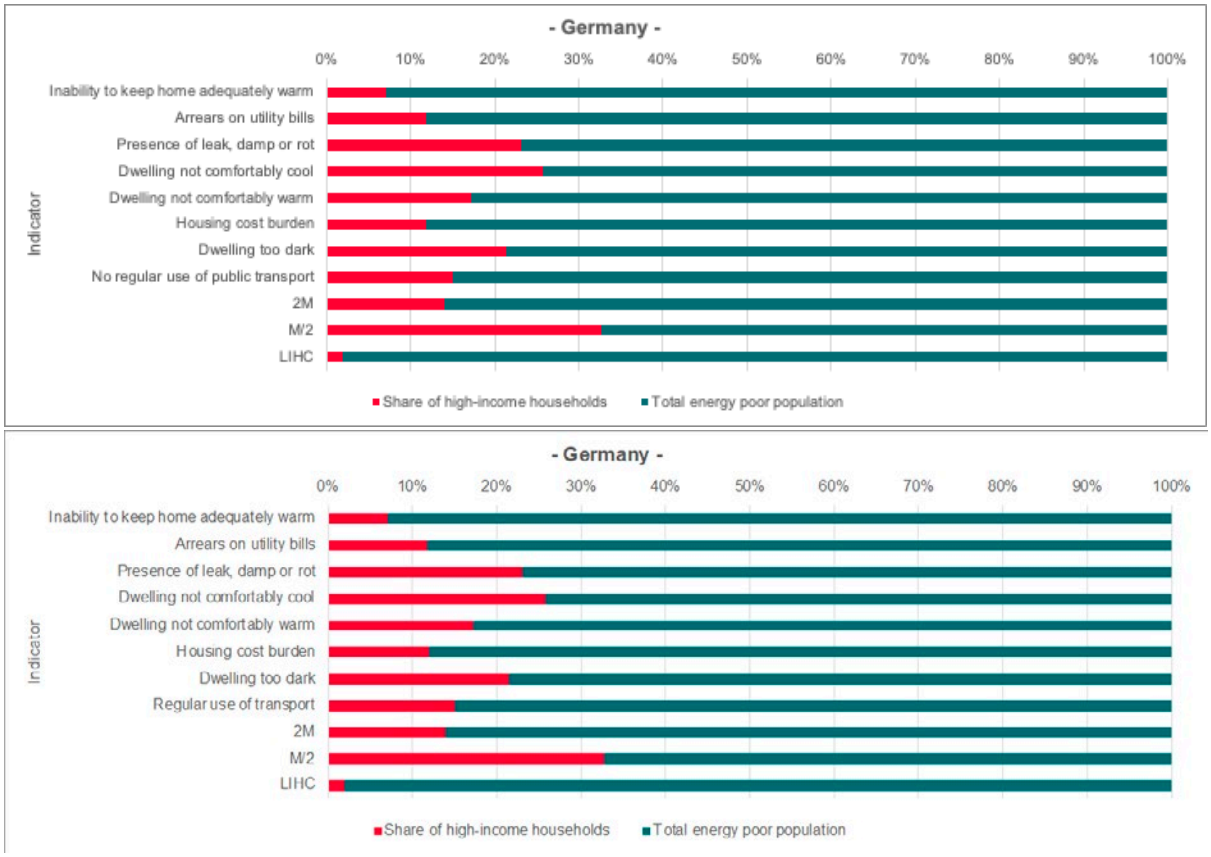



**Figure 0.23 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Germany**

## Robustness III (share of outliers)

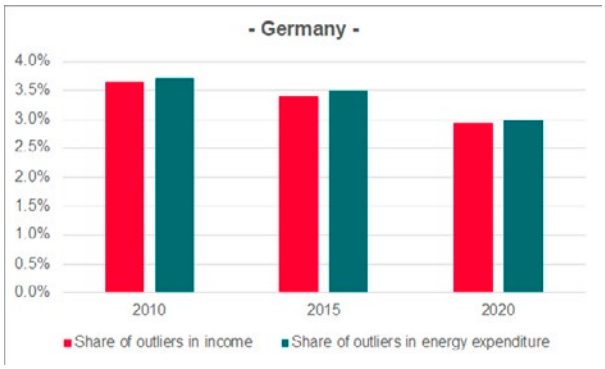



**Figure 0.24 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Germany by wave**

## Completeness

### Table 0-6 Share of missing data points per indicator and year in the German SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.3 | 0.1 | 0.3 | 0.2 | 0.3 | 0.4 | 0.3 | 0.4 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0.2 | 0.3 | 0.1 | 0.1 | 0.1 | 0.3 | 0.3 | 0.1 | 0.3 | 0.2 | 0.3 | 0.4 | 0.3 | 0.4 | 0 | 0 | 0 |
| Arrears on utility bills | 1.1 | 5.5 | 2.7 | 2.5 | 2.7 | 1.8 | 1.9 | 2.4 | 2.1 | 2.7 | 3.2 | 2.7 | 3.0 | 1.1 | 1.9 | 2.8 | 2.4 | 2.6 |
| Arrears on utility bills + at risk of poverty | 1.1 | 5.5 | 2.7 | 2.5 | 2.7 | 1.8 | 1.9 | 2.4 | 2.1 | 2.7 | 3.2 | 2.7 | 3.0 | 1.1 | 1.9 | 2.8 | 2.4 | 2.6 |
| Presence of leak, damp or rot | 3.5 | 0.9 | 0.9 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48.7 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 3.5 | 0.9 | 0.9 | 0.4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 48.7 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0.5 | No data | No data | No data | No data | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0.7 | No data | No data | No data | No data | 0.7 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.2 | 10.2 | 3.4 | 2.5 | 1.0 | 0.9 | 0.4 | 0.1 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0 | 0.2 | 3.8 | 2.6 | 0.5 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.1 | 1.1 | 0.9 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50.5 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 3.5 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Denmark

## Robustness I (sensitivity to differing configurations)

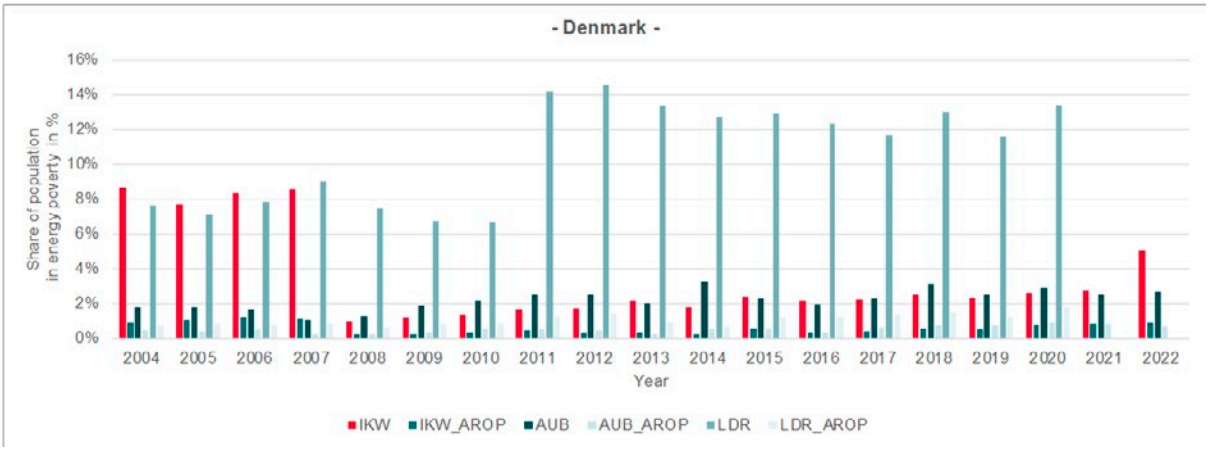



**Figure 0.25 Comparison of energy poverty rates for different configurations of consensual indicators in Denmark**

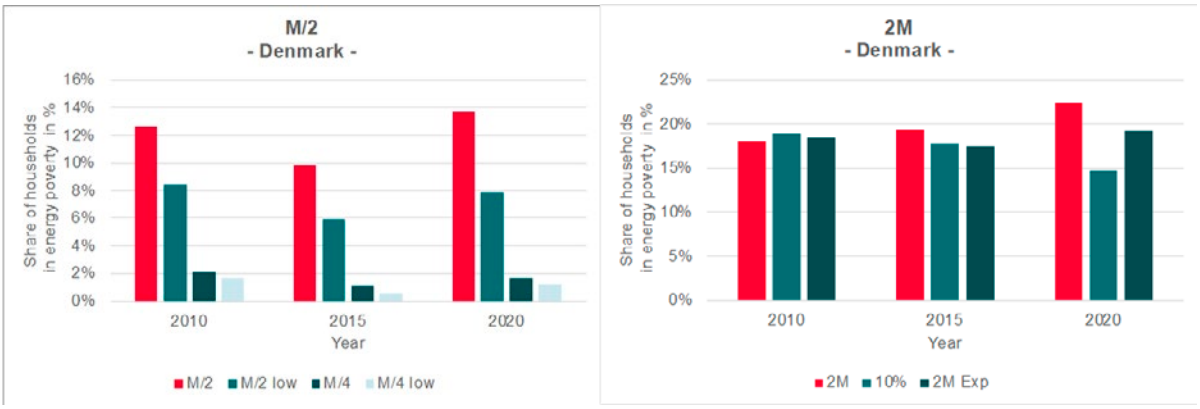



**Figure 0.26 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Denmark**

## Robustness II (share of high-income households identified as energy poor)

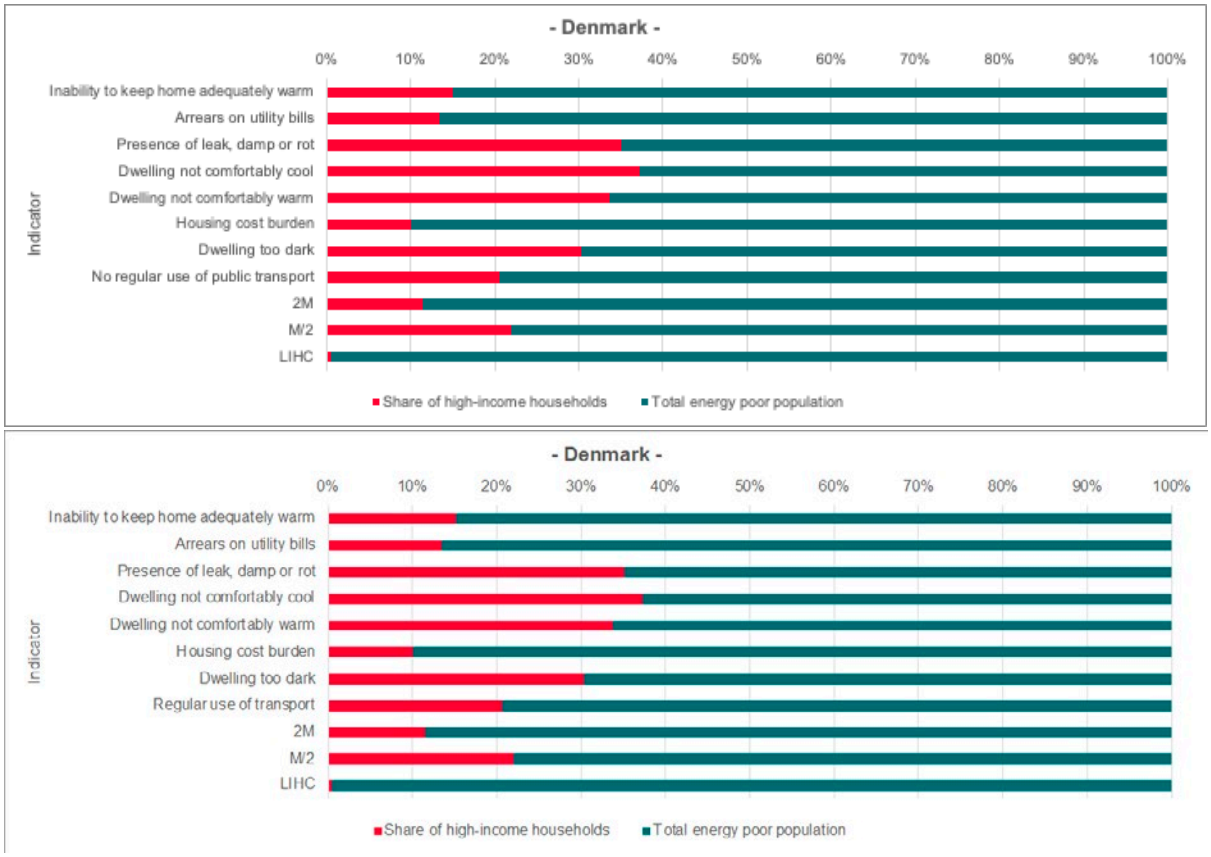



**Figure 0.27 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Denmark**

## Robustness III (share of outliers)

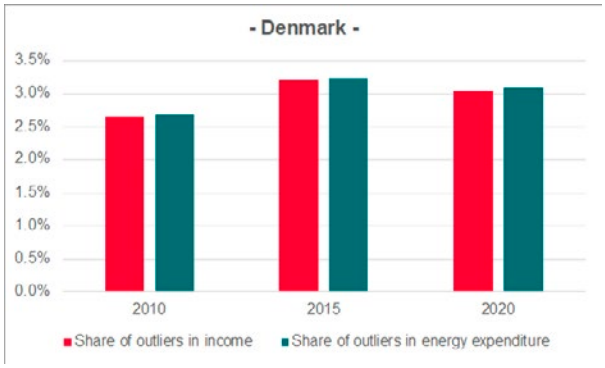



**Figure 0.28 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Denmark by wave**

## Completeness

### Table 0-7 Share of missing data points per indicator and year in the Danish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.3 | 0.7 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0.3 | 0.7 | 0.8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 |
| Arrears on utility bills | 0 | 0 | 0 | 0 | 0.2 | 0.2 | 0.4 | 0.2 | 0.7 | 0.9 | 0.8 | 1.5 | 1.3 | 0.9 | 0.9 | 1.1 | 1.7 | 2.6 | 2.6 |
| Arrears on utility bills + at risk of poverty | 0 | 0 | 0 | 0 | 0.2 | 0.2 | 0.4 | 0.2 | 0.7 | 0.9 | 0.8 | 1.5 | 1.3 | 0.9 | 0.9 | 1.1 | 1.7 | 2.6 | 2.6 |
| Presence of leak, damp or rot | 0.1 | 0.3 | 0.7 | 0.5 | 0.4 | 0.7 | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0.3 | 0.7 | 0.5 | 0.4 | 0.7 | 0.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 1.3 | No data | No data | No data | No data | 0.5 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0.8 | No data | No data | No data | No data | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | No data | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0 | 0.9 | 0.1 | 0.1 | 0.2 | 0.1 | 0.7 | 1.0 | 0.7 | 0.8 | 0.2 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.1 | 0.4 | 0.8 | 0.6 | 0.5 | 0.7 | 0.7 | 0.2 | 0.1 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 50.6 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Estonia

## Robustness I (sensitivity to differing configurations)

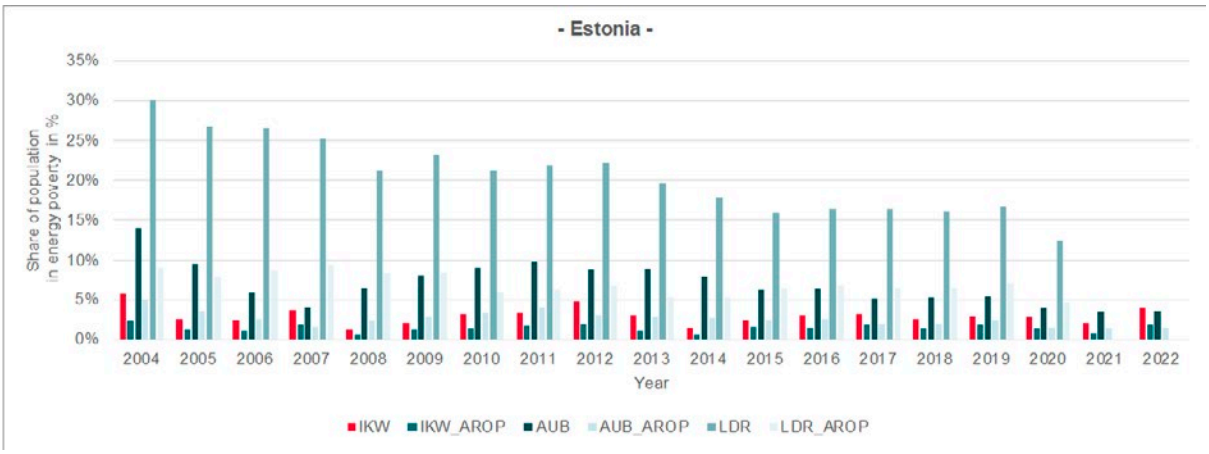



**Figure 0.29 Comparison of energy poverty rates for different configurations of consensual indicators in Estonia**

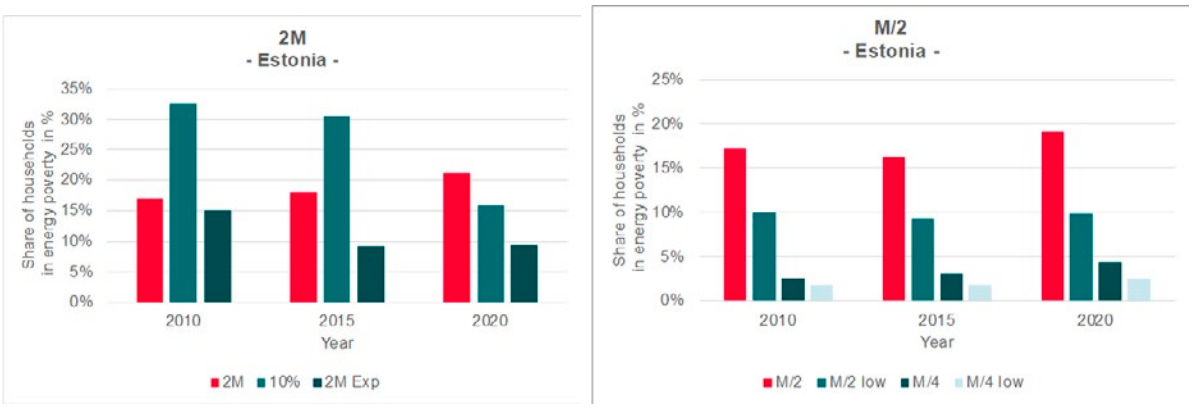



**Figure 0.30 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Estonia**

## Robustness II (share of high-income households identified as energy poor)

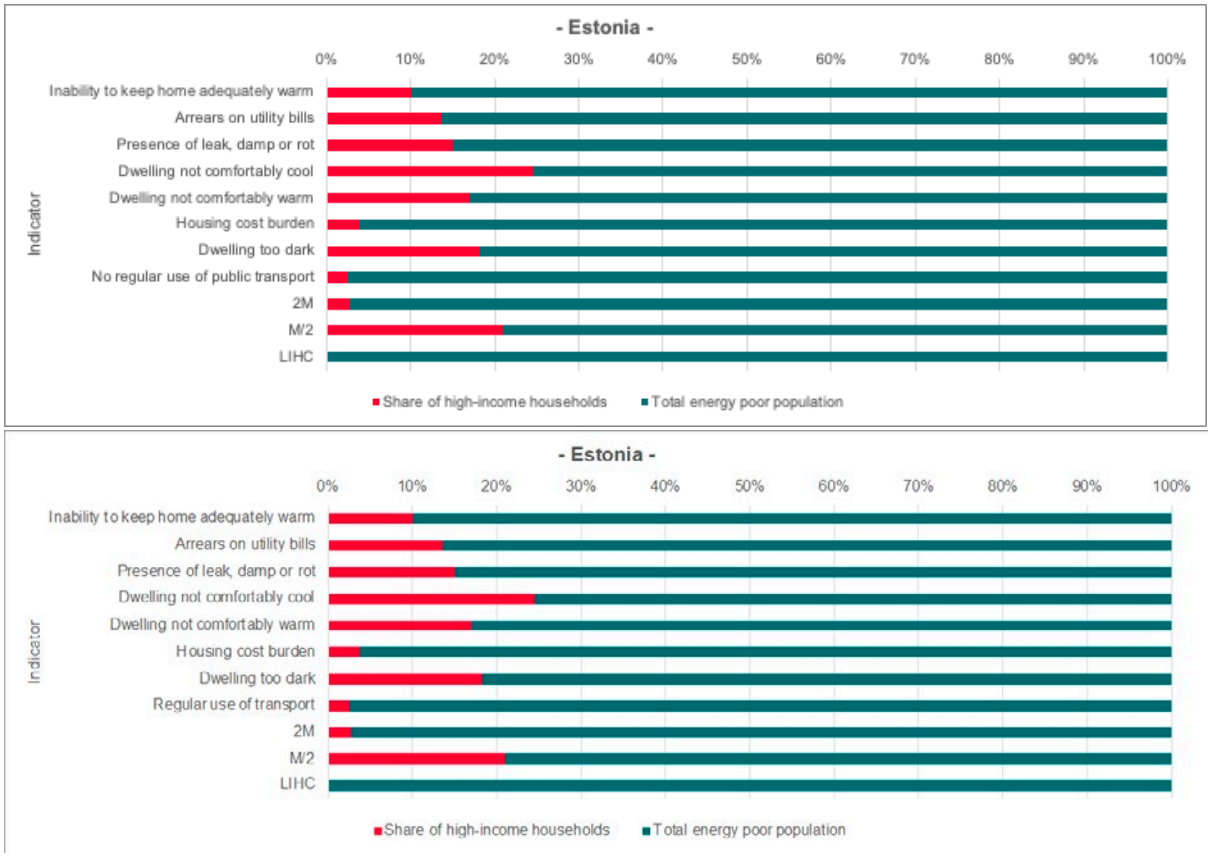



**Figure 0.31 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Estonia**

## Robustness III (share of outliers)

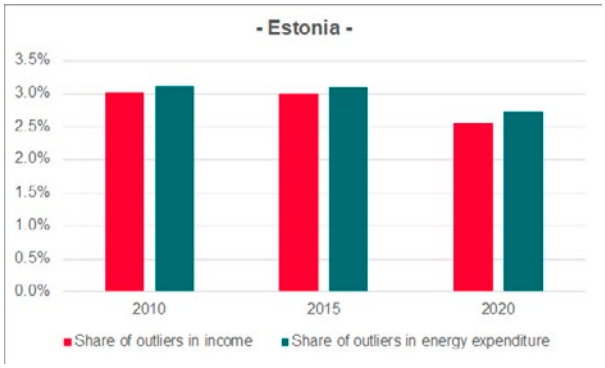



**Figure 0.32 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Estonia by wave**

## Completeness

### Table 0-8 Share of missing data points per indicator and year in the Estonian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.7 | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.7 | 4.5 | 0.1 | 0.1 | 0.6 | 1.1 | 0.8 | 1.1 | 1.3 | 0.7 | 0.6 | 1.0 | 0.8 | 1.2 | 0.9 | 0.7 | 1.0 | 1.1 | 1.1 |
| Arrears on utility bills + at risk of poverty | 2.4 | 4.9 | 0.3 | 0.1 | 0.6 | 1.1 | 0.8 | 1.1 | 1.3 | 0.7 | 0.6 | 1.0 | 0.8 | 1.2 | 0.9 | 0.7 | 1.0 | 1.1 | 1.1 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.7 | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0.7 | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0.7 | 0.4 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0 | No data | No data | No data | No data | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0 | No data | No data | No data | No data | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | No data | 0.5 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Greece

## Robustness I (sensitivity to differing configurations)

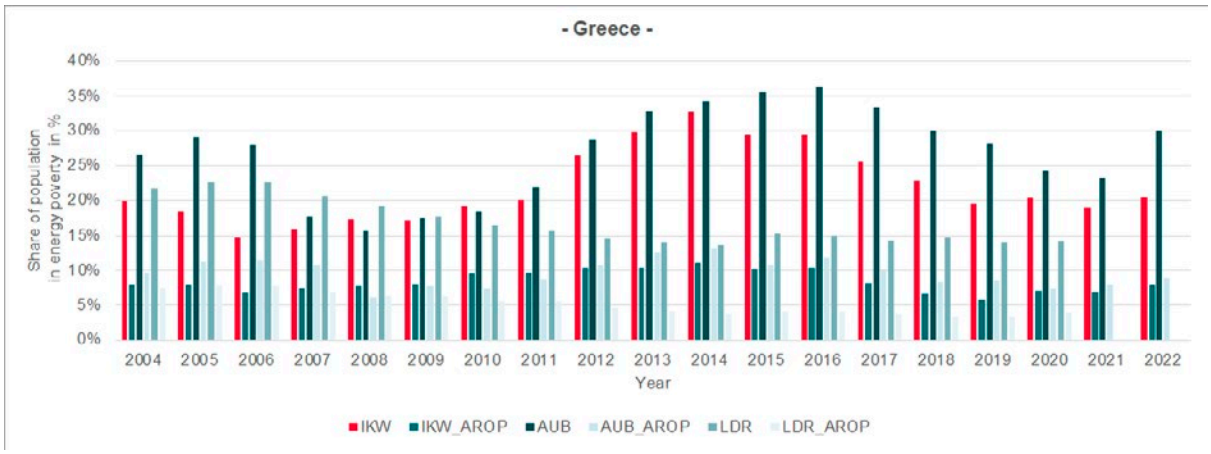



**Figure 0.33 Comparison of energy poverty rates for different configurations of consensual indicators in Greece**

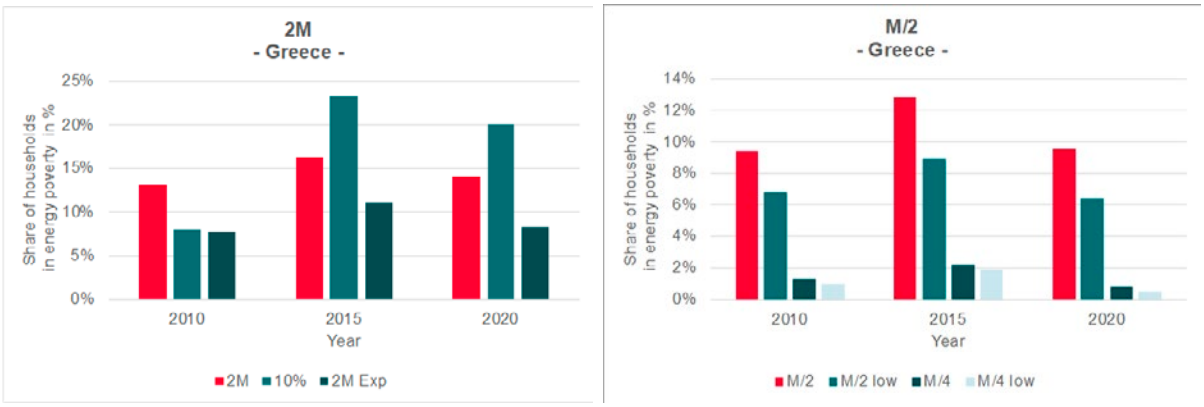



**Figure 0.34 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Greece**

## Robustness II (share of high-income households identified as energy poor)

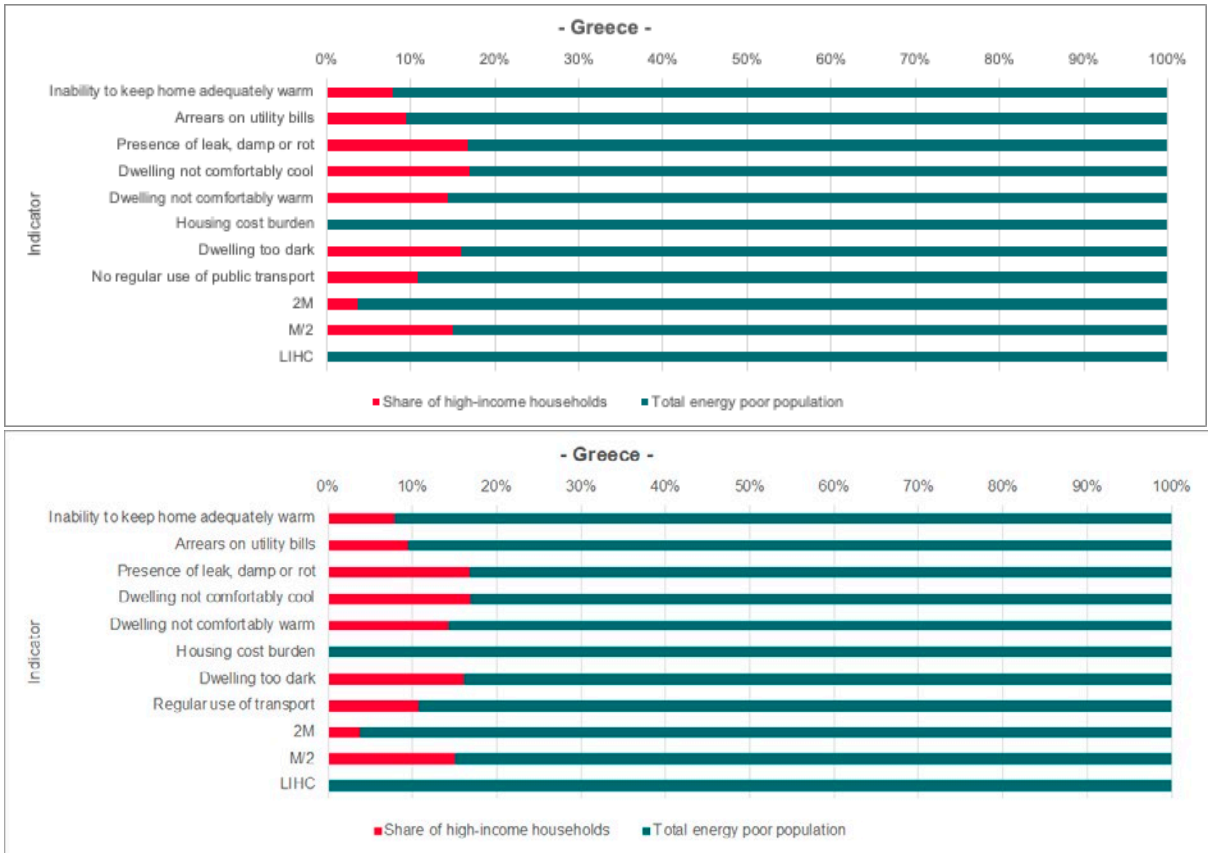



**Figure 0.35 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Greece**

## Robustness III (share of outliers)

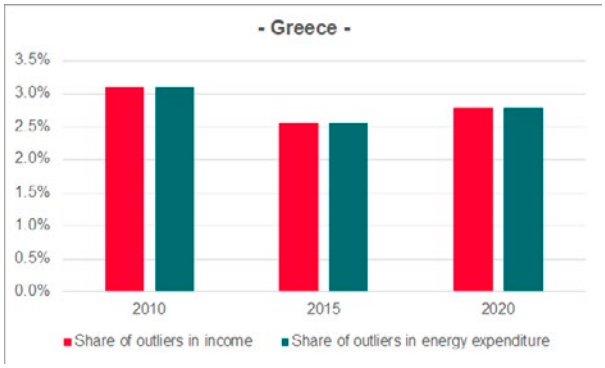



**Figure 0.36 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Greece by wave**

## Completeness

### Table 0-9 Share of missing data points per indicator and year in the Greek SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.2 | 1.3 | 1.3 | 1.1 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0.2 | 0.7 | 1.4 | 0.1 | 0.3 | 0.1 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 1.2 | 1.3 | 1.3 | 1.1 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0.2 | 0.7 | 1.4 | 0.1 | 0.3 | 0.1 | 0 | 0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Spain

## Robustness I (sensitivity to differing configurations)

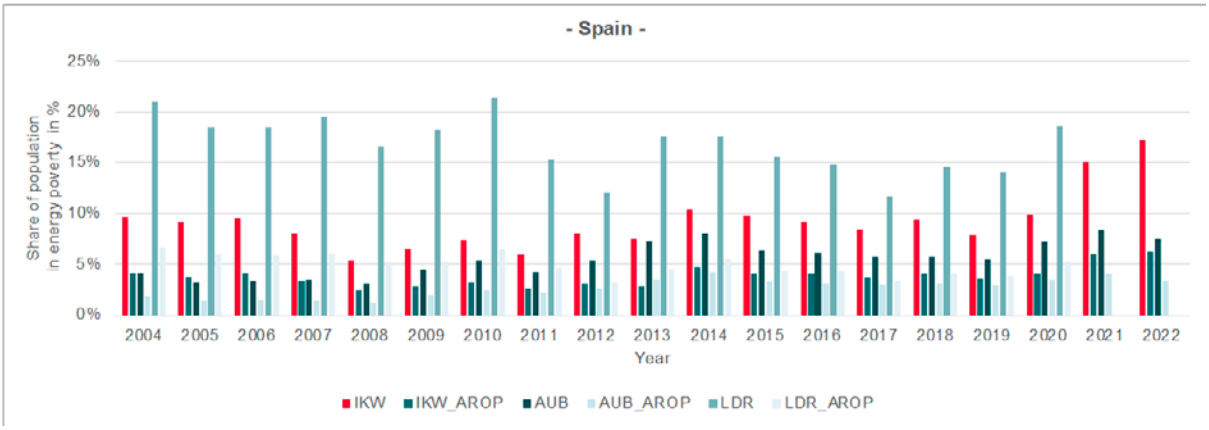



**Figure 0.37 Comparison of energy poverty rates for different configurations of consensual indicators in Spain**

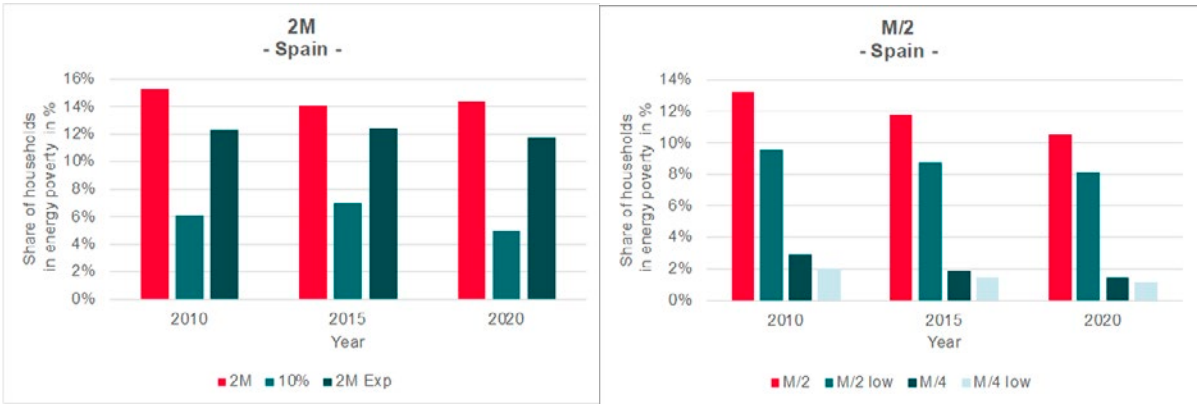



**Figure 0.38 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Spain**

## Robustness II (share of high-income households identified as energy poor)

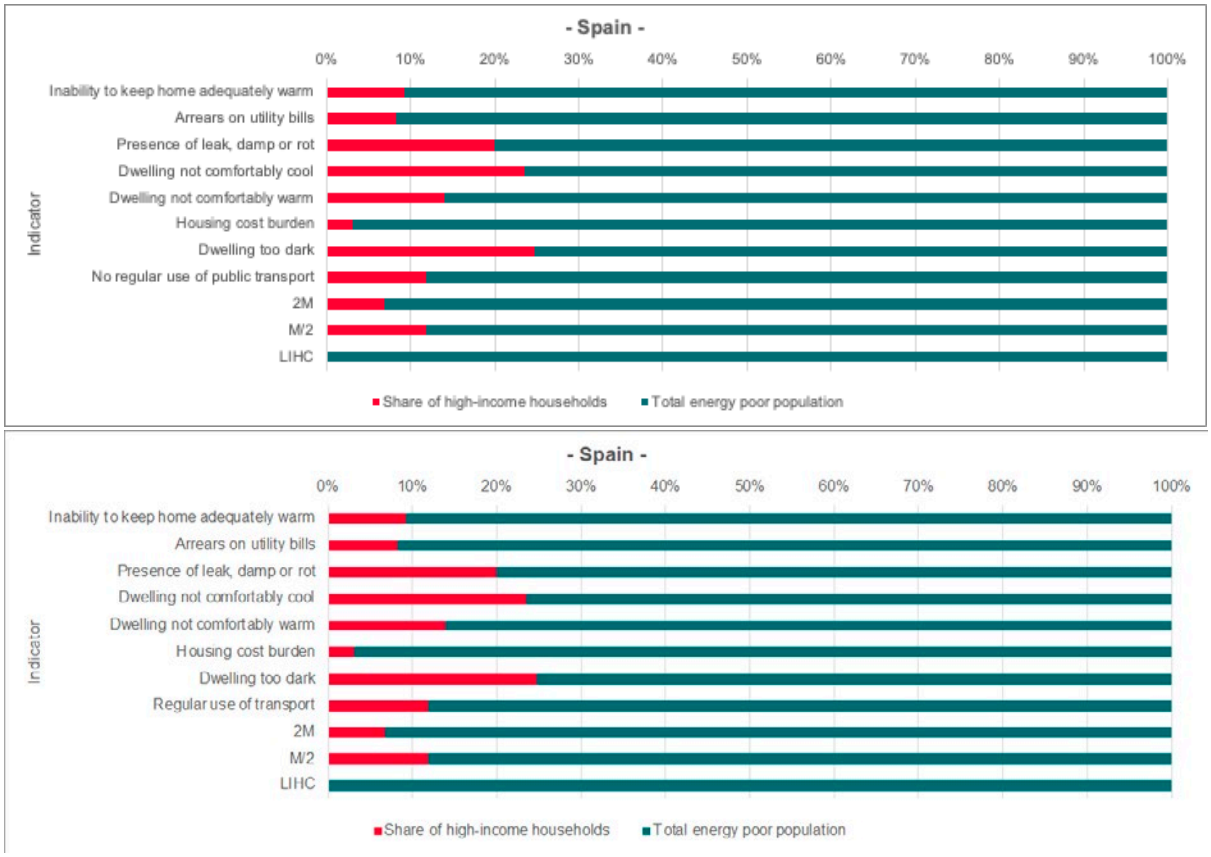



**Figure 0.39 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Spain**

## Robustness III (share of outliers)

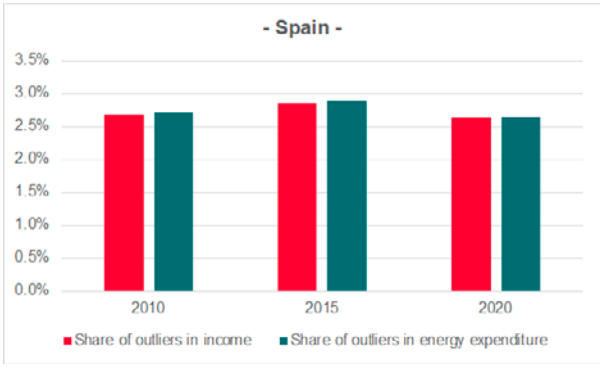



**Figure 0.40 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Spain by wave**

## Completeness

### Table 0-10 Share of missing data points per indicator and year in the Spanish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0.1 |
| Inability to keep home adequately warm + at risk of poverty | 4.7 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0.1 |
| Arrears on utility bills | 0.8 | 0.6 | 0.4 | 0.5 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.7 | 0.6 | 0.5 | 0.6 | 0.5 | 0.5 | 0.6 | 0.7 |
| Arrears on utility bills + at risk of poverty | 5.4 | 1.1 | 0.9 | 0.6 | 0.4 | 0.5 | 0.5 | 0.4 | 0.4 | 0.5 | 0.5 | 0.7 | 0.6 | 0.5 | 0.6 | 0.5 | 0.5 | 0.6 | 0.7 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 4.7 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | No data | No data |
| Poverty risk | 4.7 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 4.7 | 0.5 | 0.5 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.2 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 1.6 | 1.9 | 0.2 | 0.4 | 0.2 | 0.1 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0.1 | 0.1 | 0.1 | 0.2 | 0.3 | 0.4 | 0.3 | 0.4 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 2.7 | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Finland

## Robustness I (sensitivity to differing configurations)

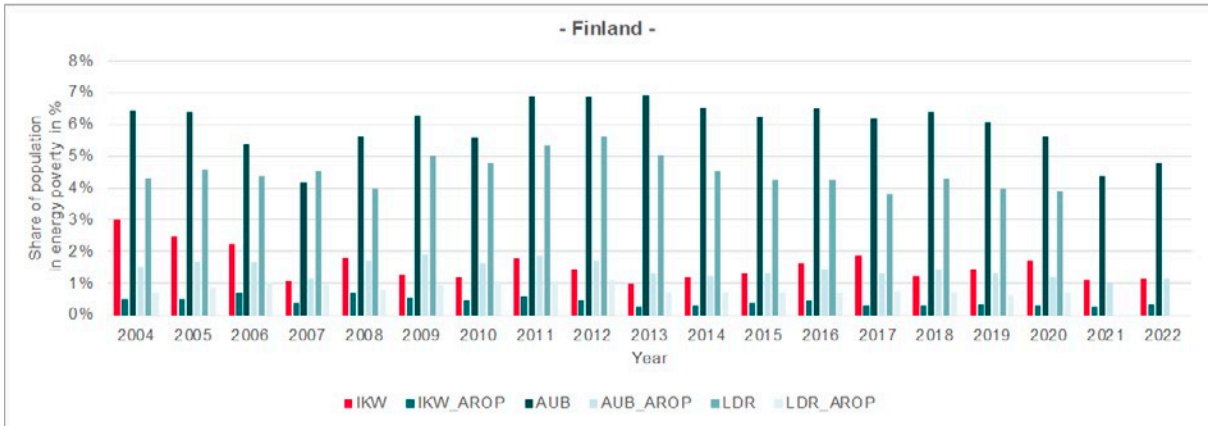



**Figure 0.41 Comparison of energy poverty rates for different configurations of consensual indicators in Finland**


**Figure 0.42 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Finland**

## Robustness II (share of high-income households identified as energy poor)

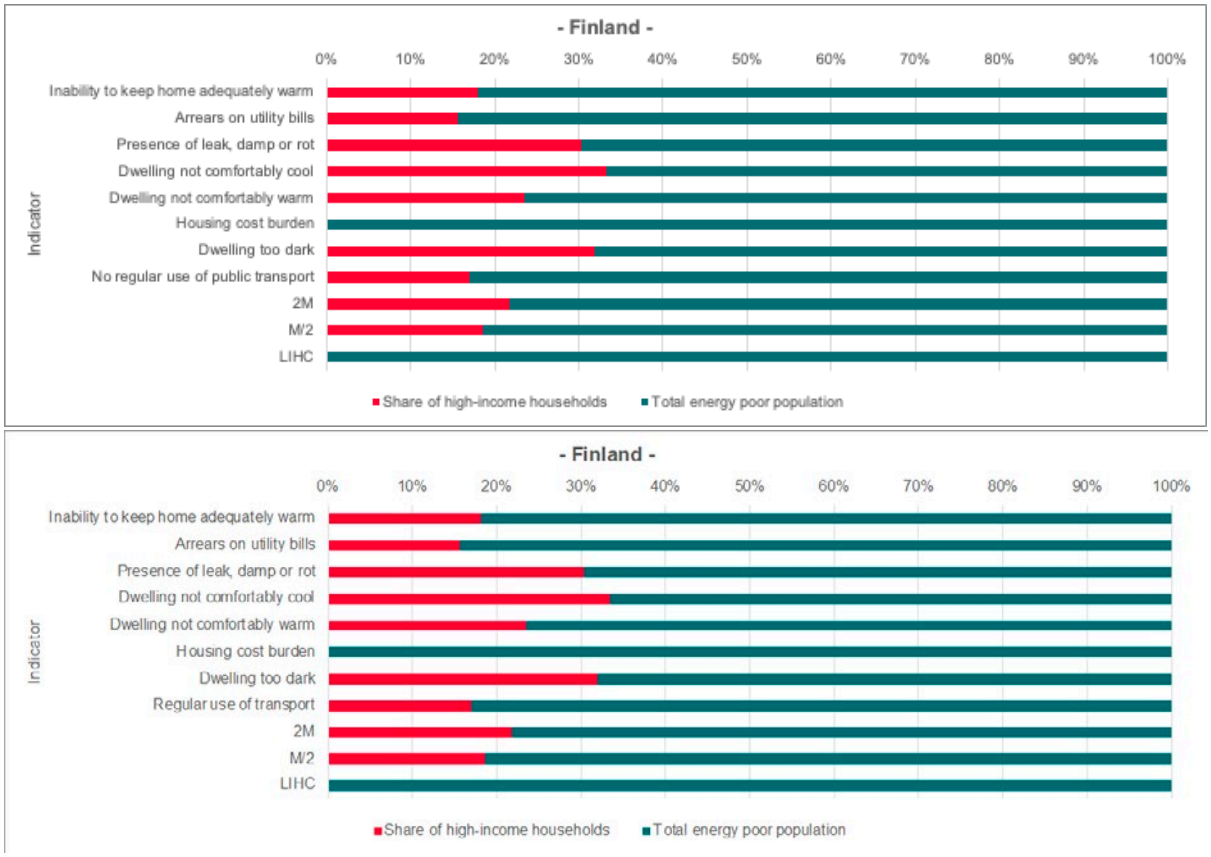



**Figure 0.43 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Finland**

## Robustness III (share of outliers)

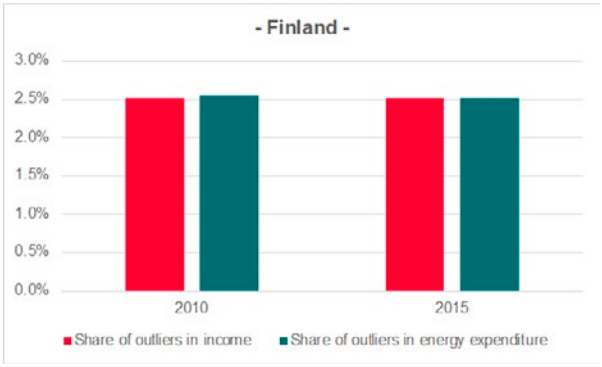



**Figure 0.44 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Finland by wave**

## Completeness

### Table 0-11 Share of missing data points per indicator and year in the Finish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.3 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |
| Inability to keep home adequately warm + at risk of poverty | 0.3 | 0.2 | 0.1 | 0.3 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.1 | 0.1 |
| Arrears on utility bills | 0.4 | 0.3 | 0.4 | 0.3 | 0.3 | 1.0 | 0.9 | 1.0 | 0.9 | 0.8 | 0.7 | 0.8 | 0.8 | 0.9 | 0.7 | 0.5 | 0.7 | 0.5 | 0.5 |
| Arrears on utility bills + at risk of poverty | 0.4 | 0.3 | 0.4 | 0.3 | 0.3 | 1.0 | 0.9 | 1.0 | 0.9 | 0.8 | 0.7 | 0.8 | 0.8 | 0.9 | 0.7 | 0.5 | 0.7 | 0.5 | 0.5 |
| Presence of leak, damp or rot | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.1 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.3 | 0.3 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.1 | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 1.9 | No data | No data | No data | No data | 2.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0.1 | No data | No data | No data | No data | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0 | 0.2 | 0.1 | 0.1 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 49.3 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# France

## Robustness I (sensitivity to differing configurations)

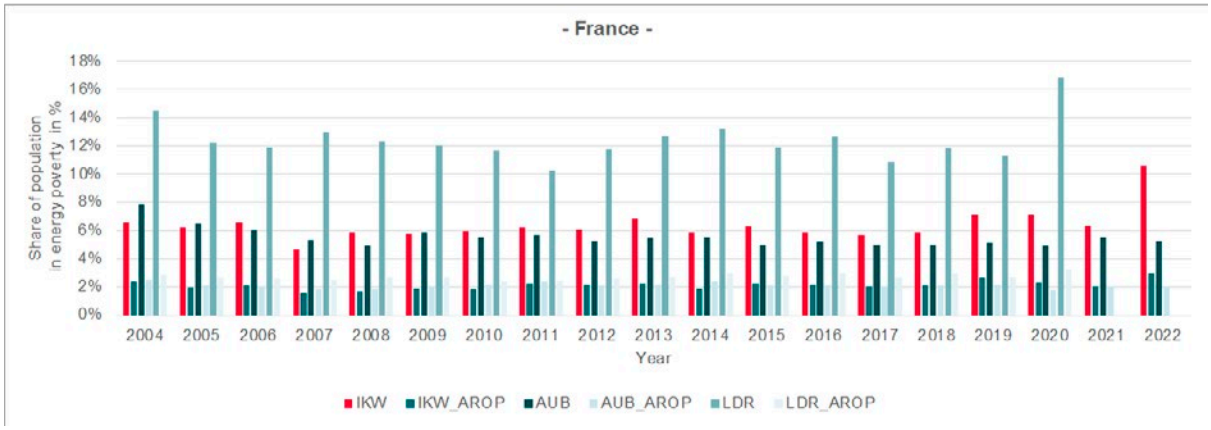



**Figure 0.45 Comparison of energy poverty rates for different configurations of consensual indicators in France**


**Figure 0.46 Comparison of energy poverty rates for different configurations of expenditure-based indicators in France**

## Robustness II (share of high-income households identified as energy poor)

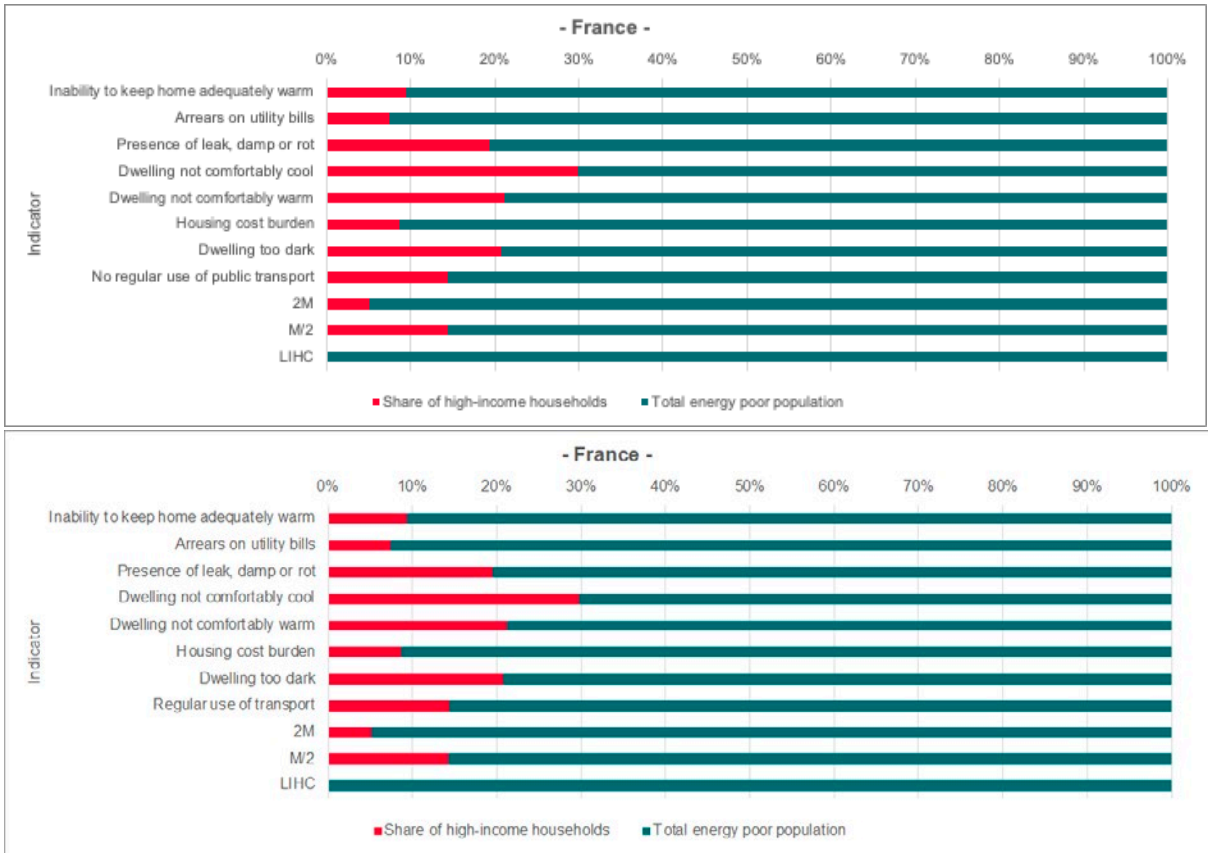



**Figure 0.47 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in France**

## Robustness III (share of outliers)

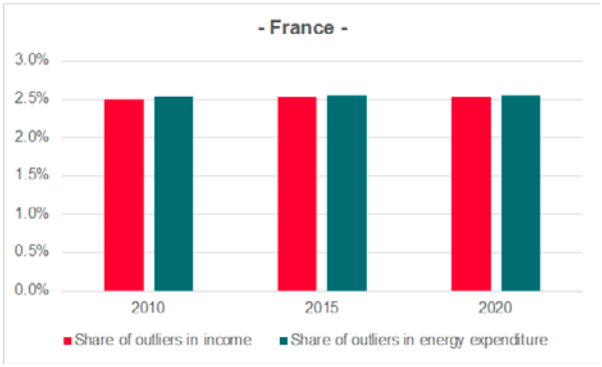



**Figure 0.48 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in France by wave**

## Completeness

### Table 0-12 Share of missing data points per indicator and year in the French SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 |
| Inability to keep home adequately warm + at risk of poverty | 0.3 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.2 | 0.1 | 0.2 | 0.3 | 0.2 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 |
| Arrears on utility bills | 0.1 | 0 | 0 | 0 | 1.3 | 1.8 | 1.4 | 1.4 | 1.7 | 1.3 | 1.0 | 1.3 | 1.3 | 1.6 | 1.2 | 1.3 | 1.5 | 0.9 | 1.3 |
| Arrears on utility bills + at risk of poverty | 0.1 | 0 | 0 | 0 | 1.3 | 1.8 | 1.4 | 1.4 | 1.7 | 1.3 | 1.0 | 1.3 | 1.3 | 1.6 | 1.2 | 1.3 | 1.5 | 0.9 | 1.3 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0.1 | 0.1 | 0.1 | 0 | 1.3 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0.1 | 0.1 | 0.1 | 0 | 1.3 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 2.1 | No data | No data | No data | No data | 2.0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 1.0 | No data | No data | No data | No data | 0.9 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.1 | 0 | 0 | 0 | 0.4 | 0.4 | 0 | 0.2 | 0.2 | 0.1 | 0 | 0.1 | 0.2 | 0.2 | 0.1 | 0.1 | 11.3 | No data | 7.6 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.2 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 1.5 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0 |

# Croatia

## Robustness I (sensitivity to differing configurations)

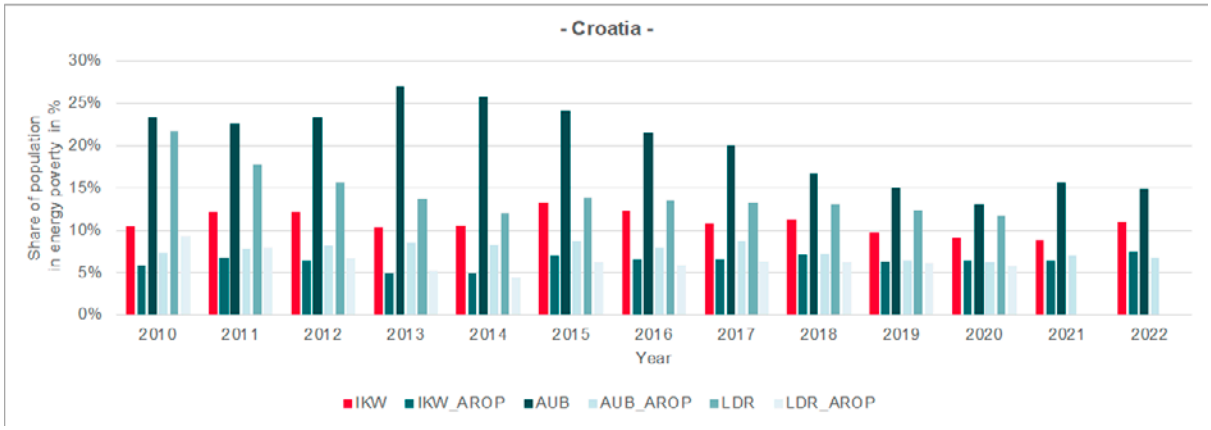



**Figure 0.49 Comparison of energy poverty rates for different configurations of consensual indicators in Croatia**

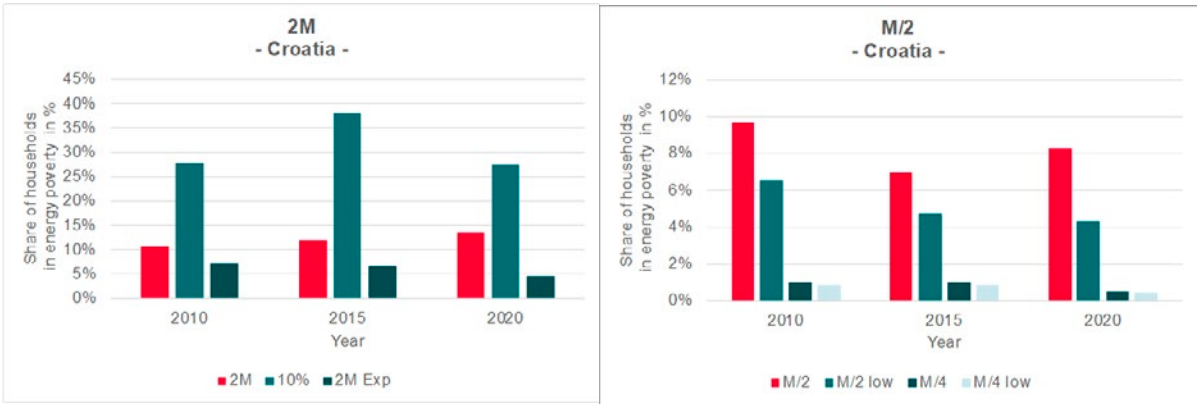



**Figure 0.50 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Croatia**

## Robustness II (share of high-income households identified as energy poor)

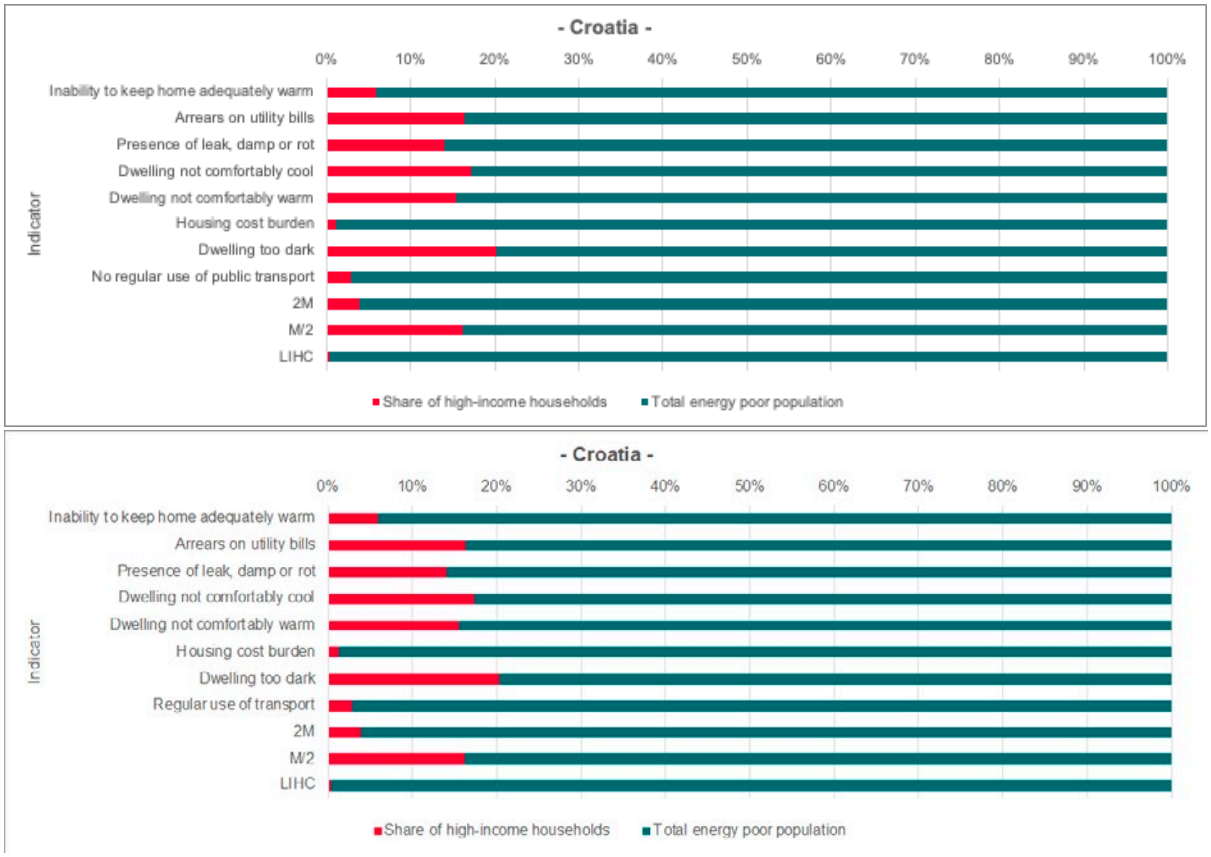



**Figure 0.51 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Croatia**

## Robustness III (share of outliers)

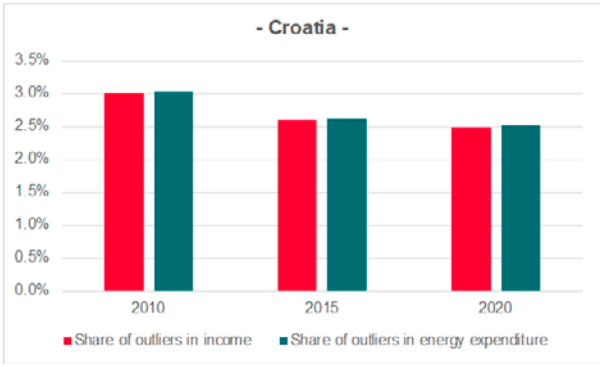



**Figure 0.52 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Croatia by wave**

## Completeness

### Table 0-13 Share of missing data points per indicator and year in the Croatian SILC data

| Indicator | Survey year | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0.5 | 1.2 | 1.1 | 1.1 | 0.6 | 1.0 | 1.5 | 1.5 | 1.6 | 1.8 | 1.7 | 1.4 | 1.4 |
| Arrears on utility bills + at risk of poverty | 0.5 | 1.2 | 1.1 | 1.1 | 0.6 | 1.0 | 1.5 | 1.5 | 1.6 | 1.8 | 1.7 | 1.4 | 1.4 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0.7 | 0.5 | 0.5 | 0.8 | 1.0 | 0.9 | 1.1 | 1.1 | 1.0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | 5.3 | 2.5 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Hungary

## Robustness I (sensitivity to differing configurations)

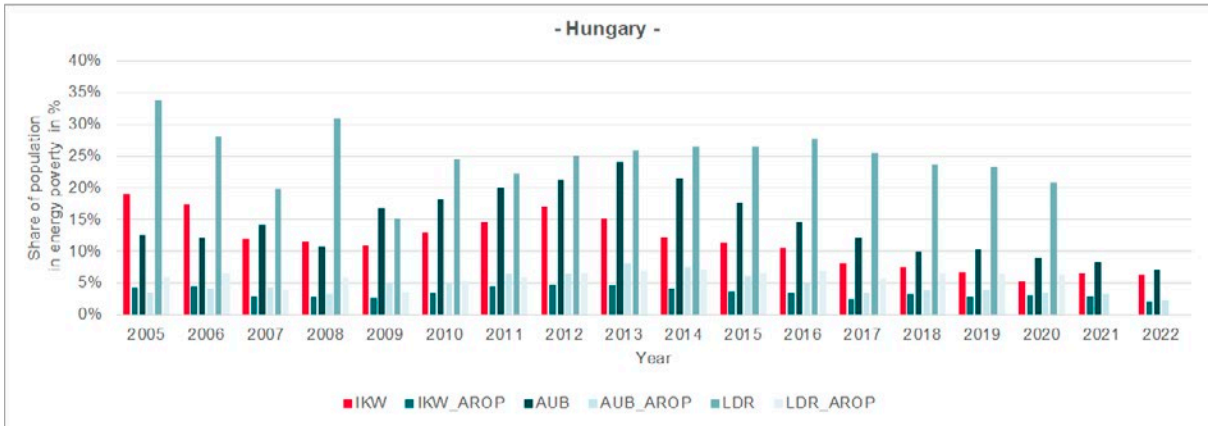



**Figure 0.53 Comparison of energy poverty rates for different configurations of consensual indicators in Hungary**

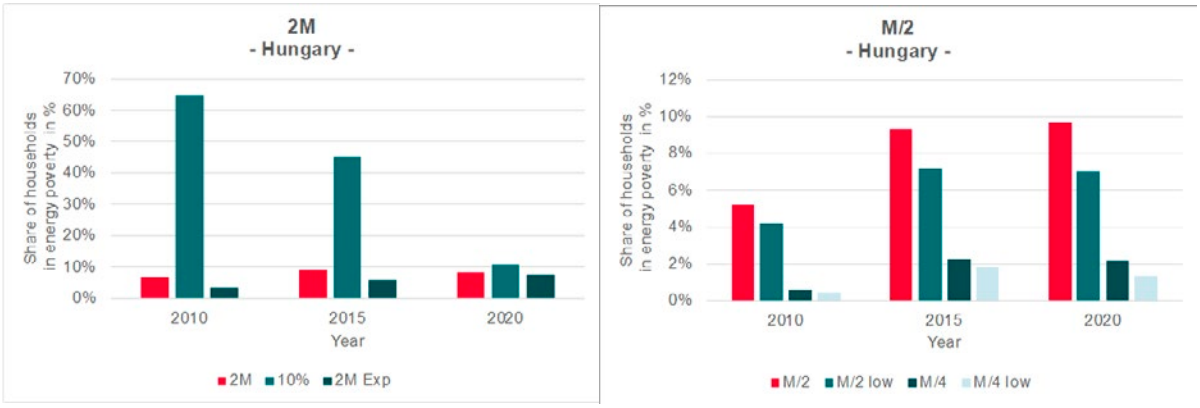



**Figure 0.54 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Hungary**

## Robustness II (share of high-income households identified as energy poor)

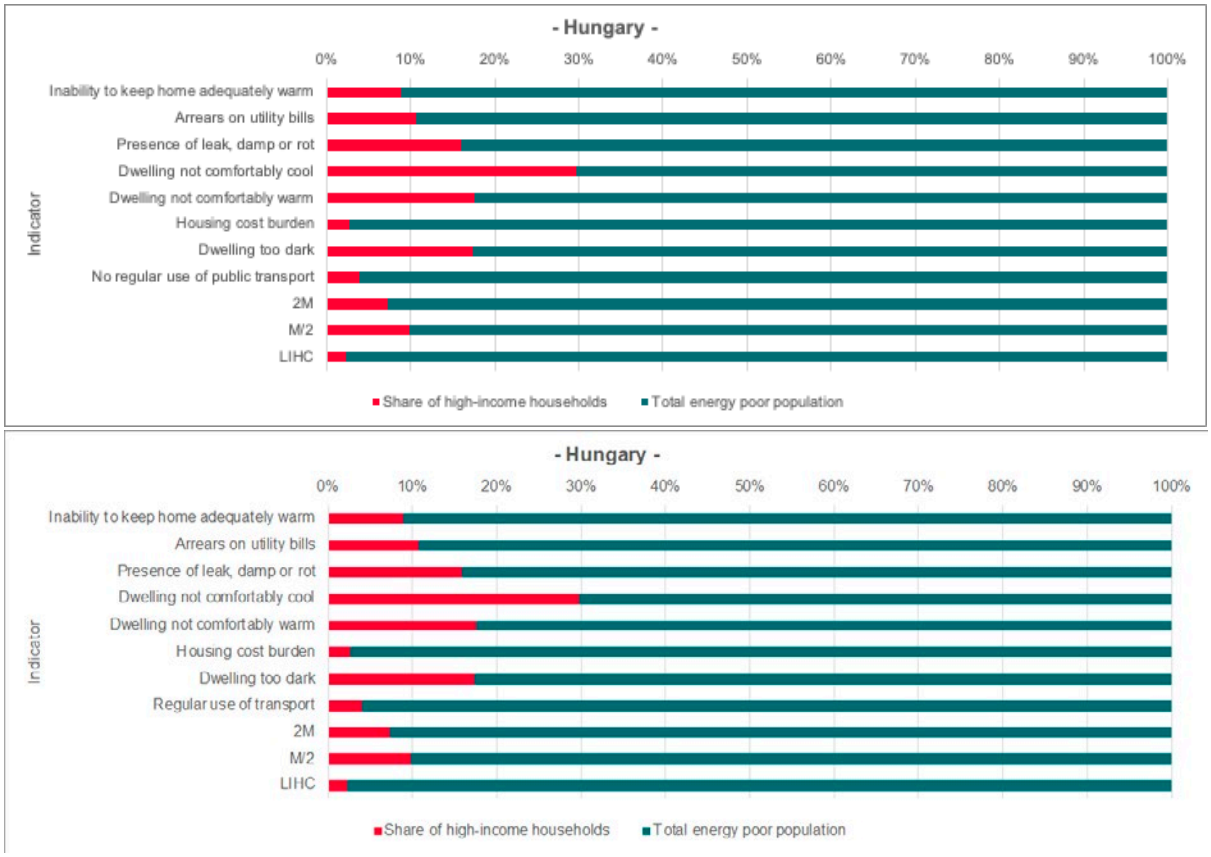



**Figure 0.55 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Hungary**

## Robustness III (share of outliers)

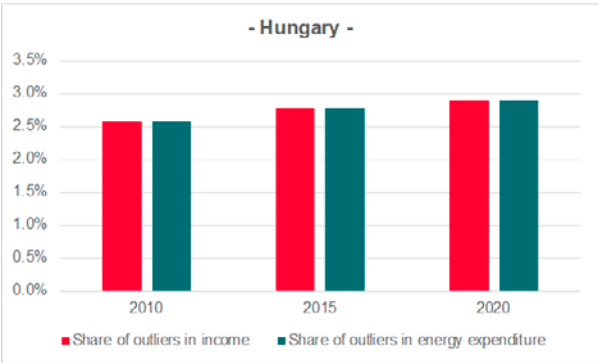



**Figure 0.56 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Hungary by wave**

## Completeness

### Table 0-14 Share of missing data points per indicator and year in the Hungarian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.2 | 0.9 | 1.3 | 0.9 | 0.8 | 0.4 | 0.7 | 0.8 | 2.2 | 0 | 0.6 | 0.9 | 1.9 | 1.8 | 2.2 | 2.0 | 1.8 | 0 |
| Arrears on utility bills + at risk of poverty | 1.2 | 0.9 | 1.3 | 0.9 | 0.8 | 0.4 | 0.7 | 0.8 | 2.2 | 0 | 0.6 | 0.9 | 1.9 | 1.8 | 2.2 | 2.0 | 1.8 | 0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0.1 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0.1 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0.6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9.4 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0.2 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Ireland

## Robustness I (sensitivity to differing configurations)


**Figure 0.57 Comparison of energy poverty rates for different configurations of consensual indicators in Ireland**

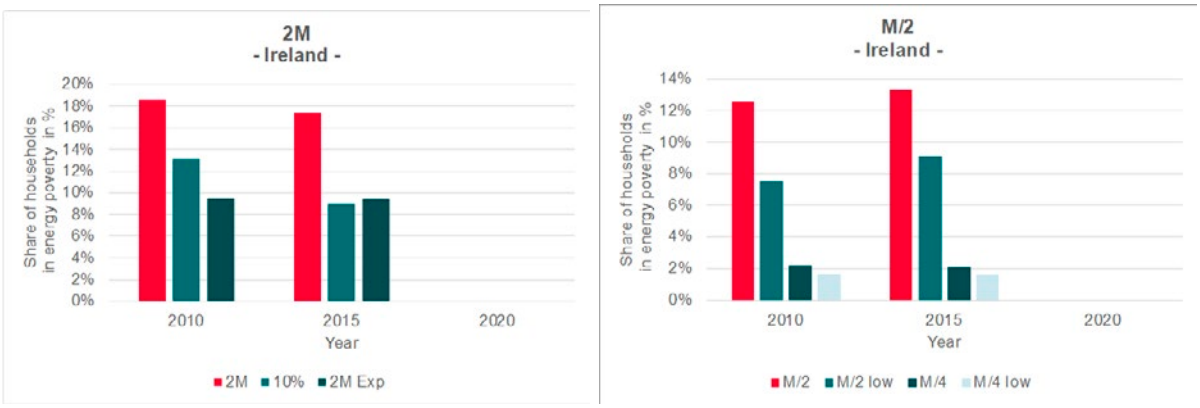



**Figure 0.58 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Ireland**

## Robustness II (share of high-income households identified as energy poor)

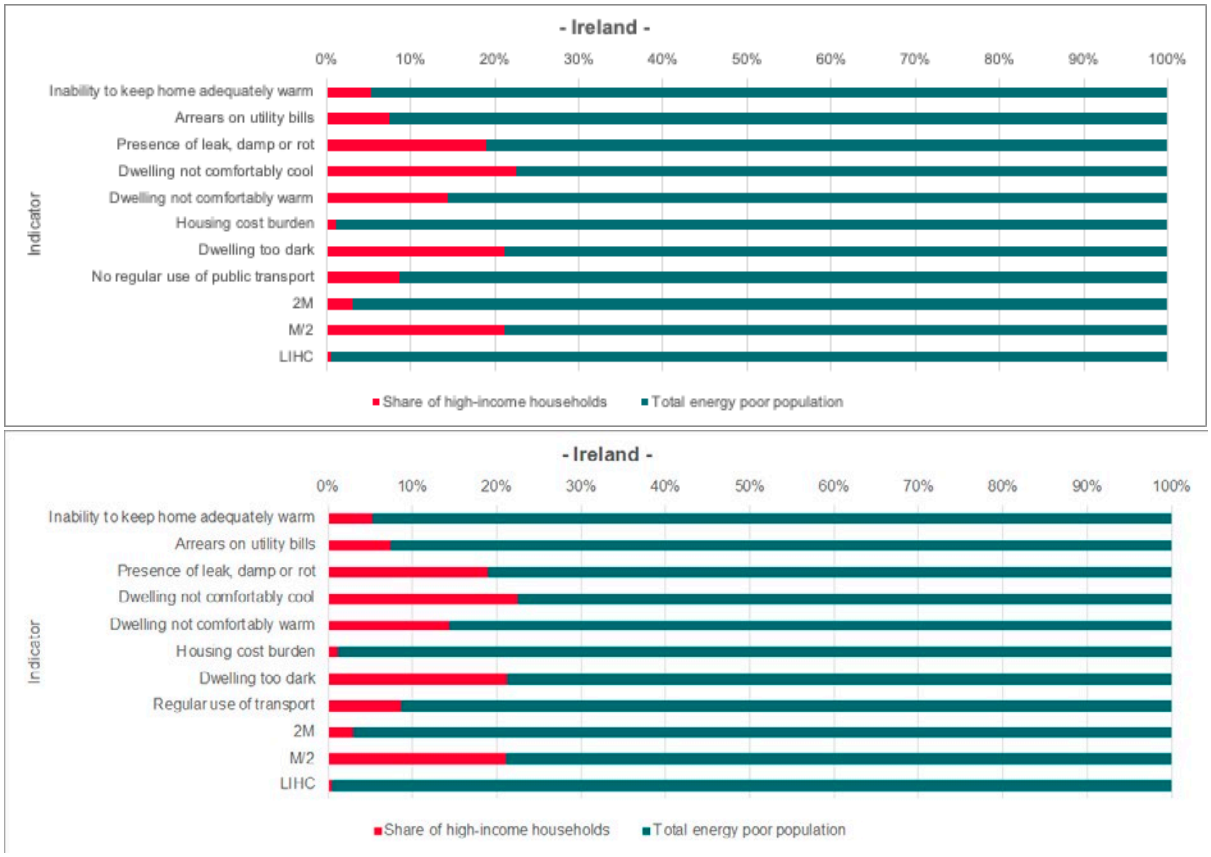



**Figure 0.59 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Ireland**

## Robustness III (share of outliers)

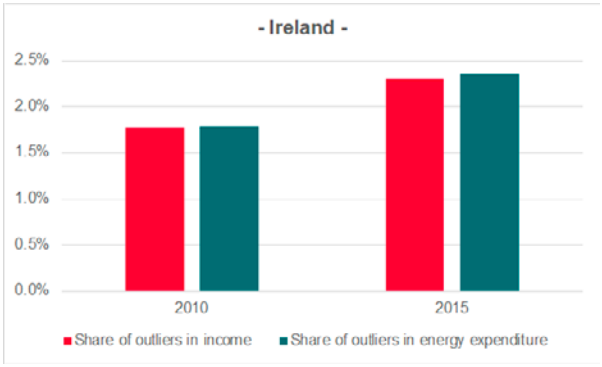



**Figure 0.60 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Ireland by wave**

## Completeness

### Table 0-15 Share of missing data points per indicator and year in the Irish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0.4 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0.4 | 0.2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 4.4 | 4.2 | 4.4 | 4.6 | 0 | 0.2 | 0.1 | 0.1 | 1.7 | 1.8 | 2.1 | 1.9 | 4.8 | 2.4 | 2.2 | 2.3 | 1.9 | 0.7 | 0.2 |
| Arrears on utility bills + at risk of poverty | 4.4 | 4.2 | 4.4 | 4.6 | 0 | 0.2 | 0.1 | 0.1 | 1.7 | 1.8 | 2.1 | 1.9 | 4.8 | 2.4 | 2.2 | 2.3 | 1.9 | 0.7 | 0.2 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0.2 | 0 | 0.1 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.2 | No data | No data | No data | No data | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | No data | No data | No data | No data | No data | 0.3 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0.8 | 0 | 0.1 | 0 | 0.1 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.4 | 0.2 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Italy

## Robustness I (sensitivity to differing configurations)

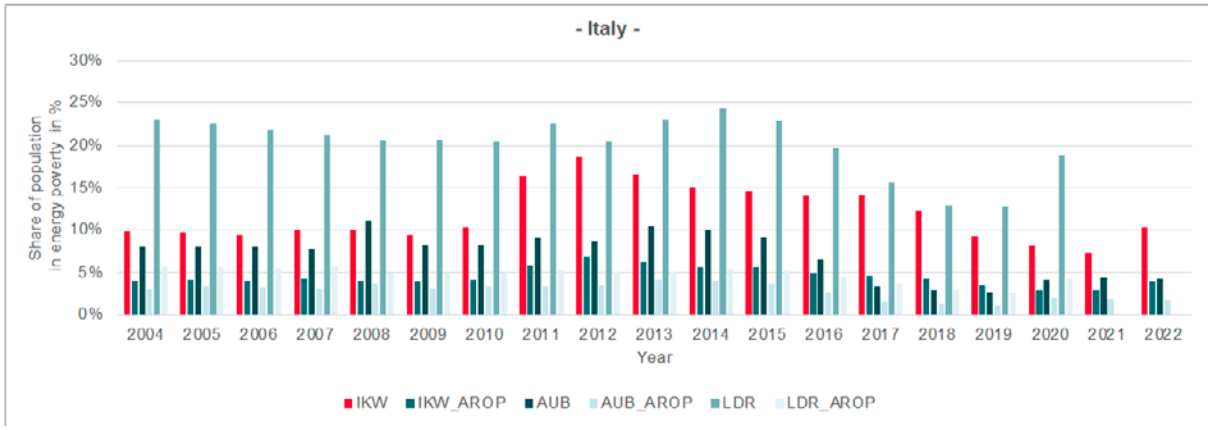



**Figure 0.61 Comparison of energy poverty rates for different configurations of consensual indicators in Italy**

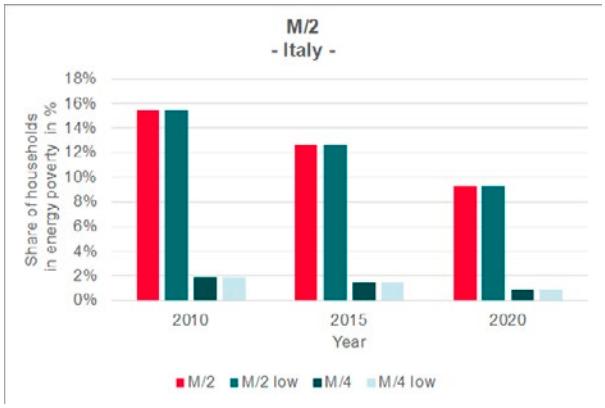



**Figure 0.62 Comparison of energy poverty rates for different configurations of the M/2 indicator in Italy**

## Robustness II (share of high-income households identified as energy poor)

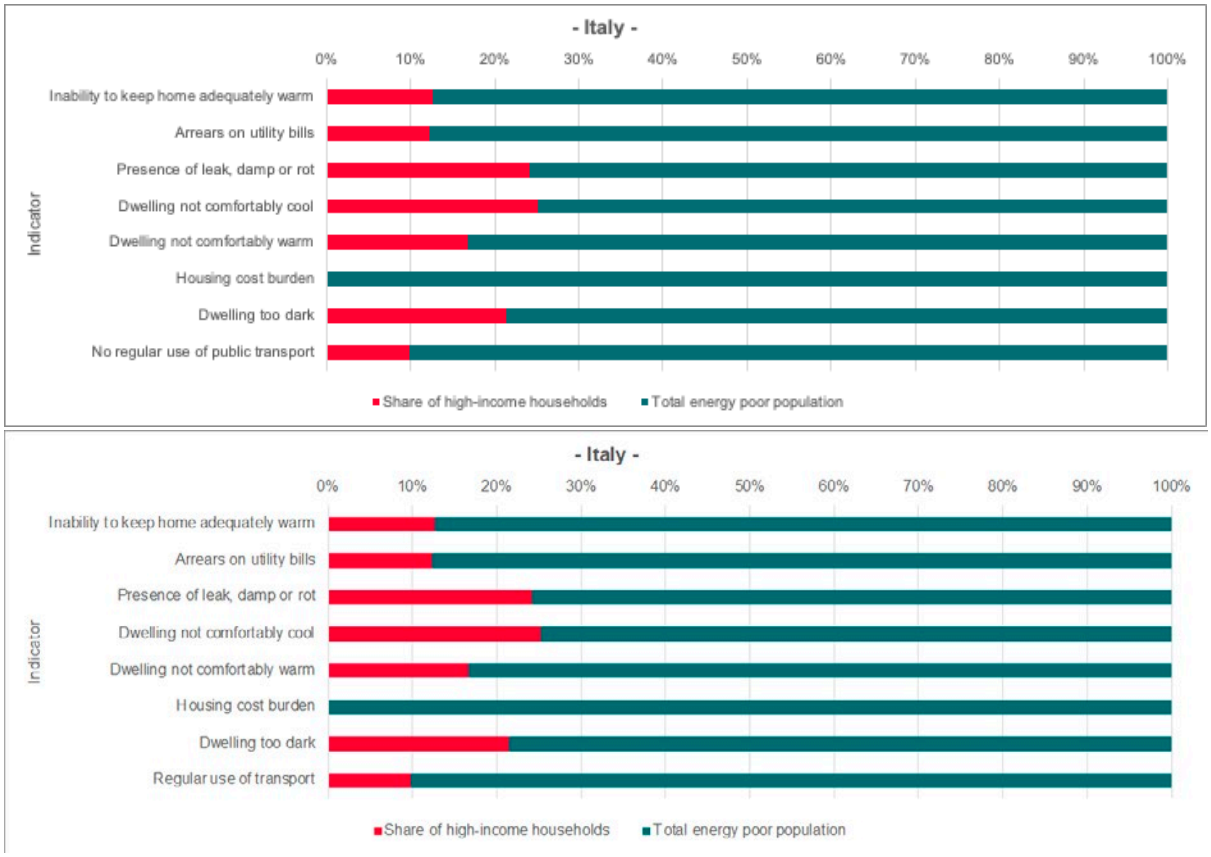



**Figure 0.63 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Italy**

## Robustness III (share of outliers)

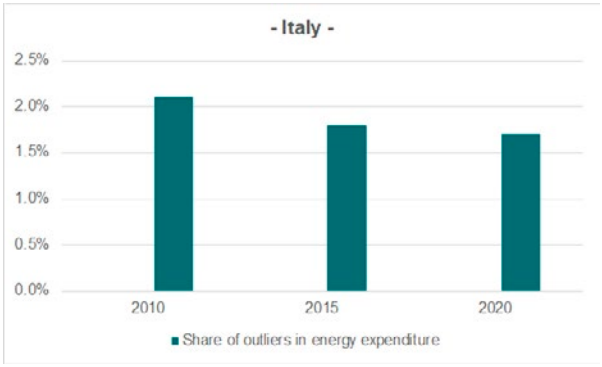



**Figure 0.64 Share of outliers in the energy expenditure variable of the harmonized HBS data in Italy by wave**

## Completeness

### Table 0-16 Share of missing data points per indicator and year in the Italian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Lithuania

## Robustness I (sensitivity to differing configurations)

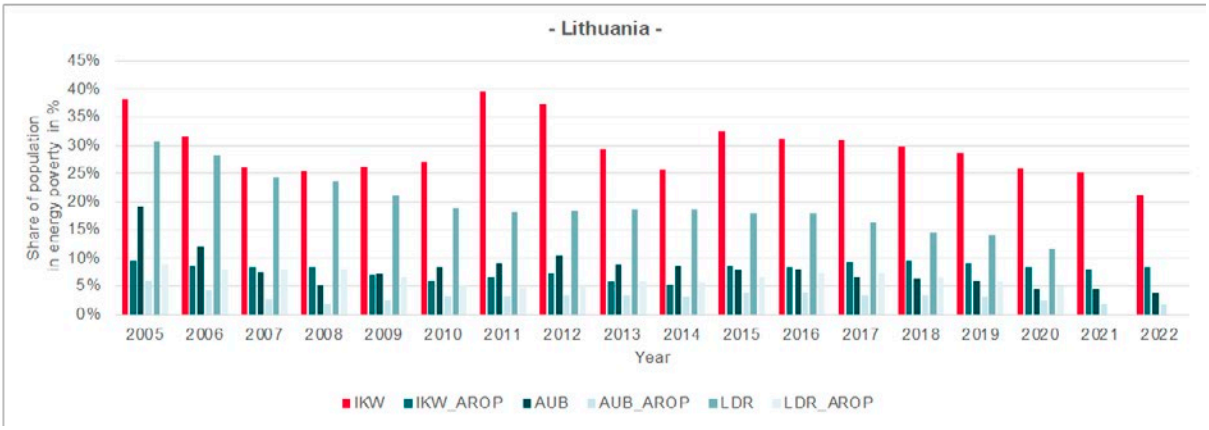
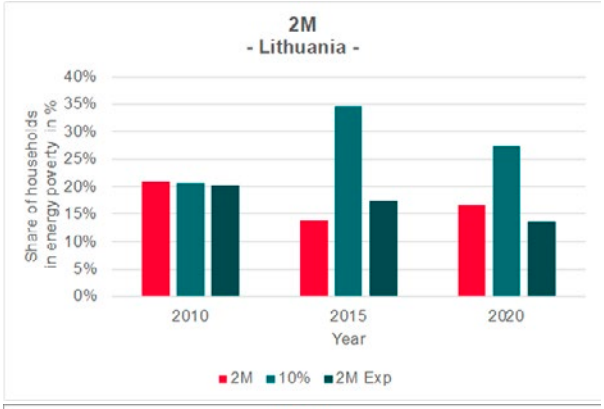



**Figure 0.65 Comparison of energy poverty rates for different configurations of consensual indicators in Lithuania**



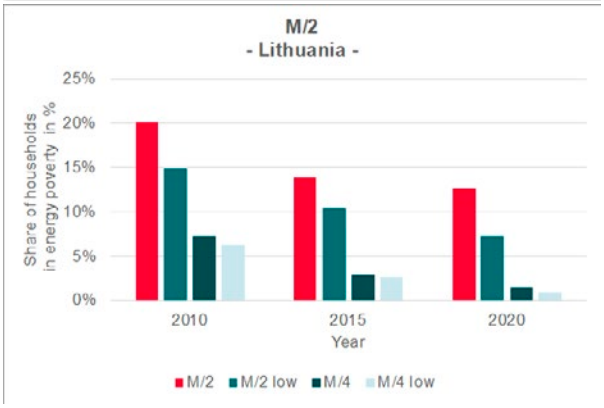




**Figure 0.66 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Lithuania**

## Robustness II (share of high-income households identified as energy poor)

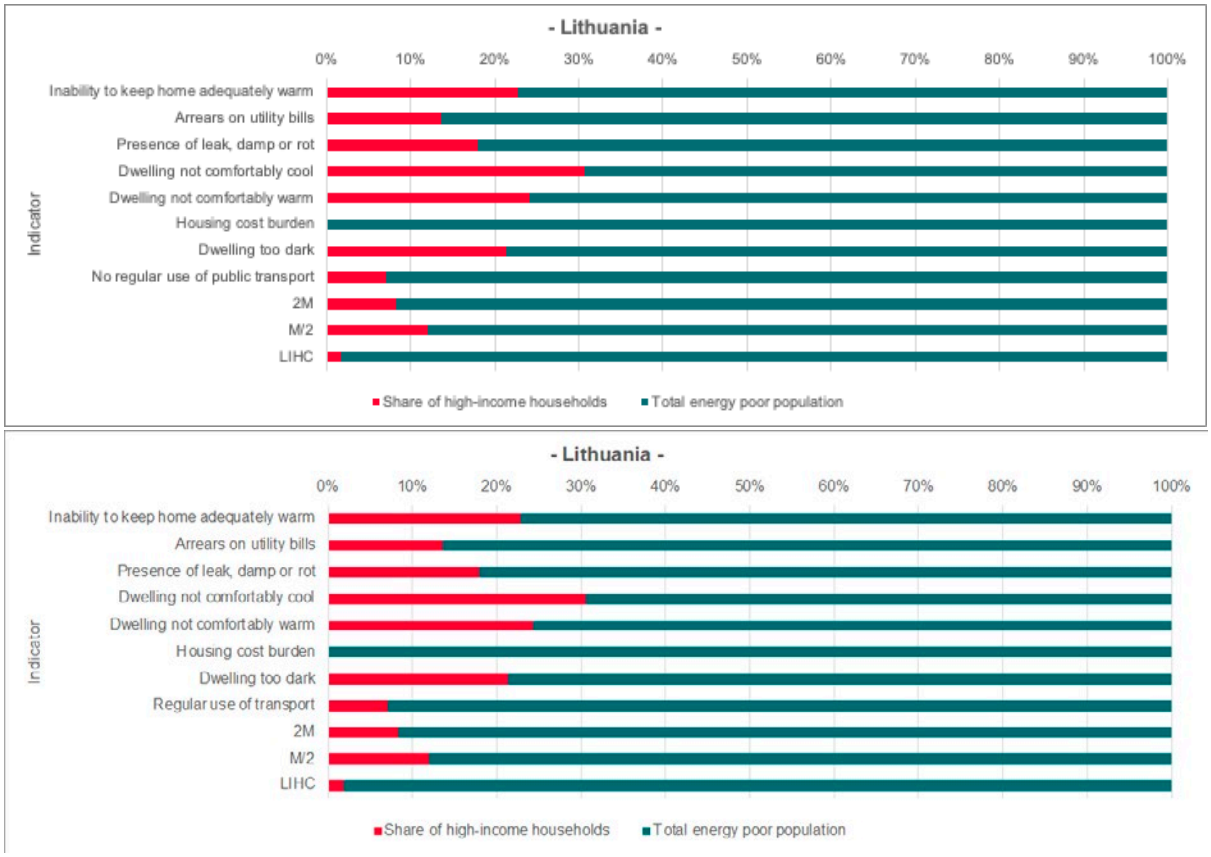



**Figure 0.67 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Lithuania**

## Robustness III (share of outliers)

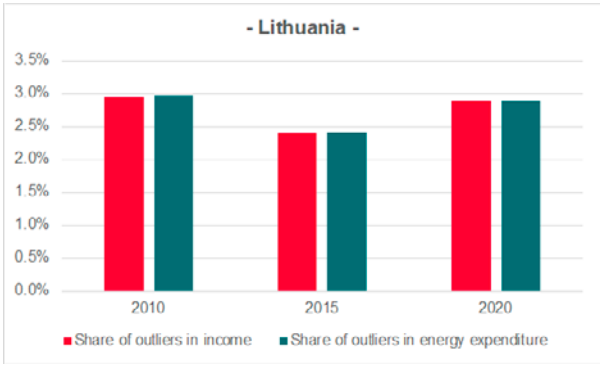



**Figure 0.68 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Lithuania by wave**

## Completeness

### Table 0-17 Share of missing data points per indicator and year in the Lithuanian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.4 | 0.2 | 0.1 | 0.1 | 2.7 | 2.3 | 2.9 | 1.4 | 0.2 | 0.4 | 0.9 | 0.8 | 1.1 | 1.2 | 1.3 | 1.3 | 1.3 | 1.6 |
| Arrears on utility bills + at risk of poverty | 1.5 | 0.2 | 0.1 | 0.1 | 2.7 | 2.3 | 2.9 | 1.4 | 0.2 | 0.4 | 0.9 | 0.8 | 1.1 | 1.2 | 1.3 | 1.3 | 1.3 | 1.6 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | 1.0 | 0.8 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Luxembourg

## Robustness I (sensitivity to differing configurations)

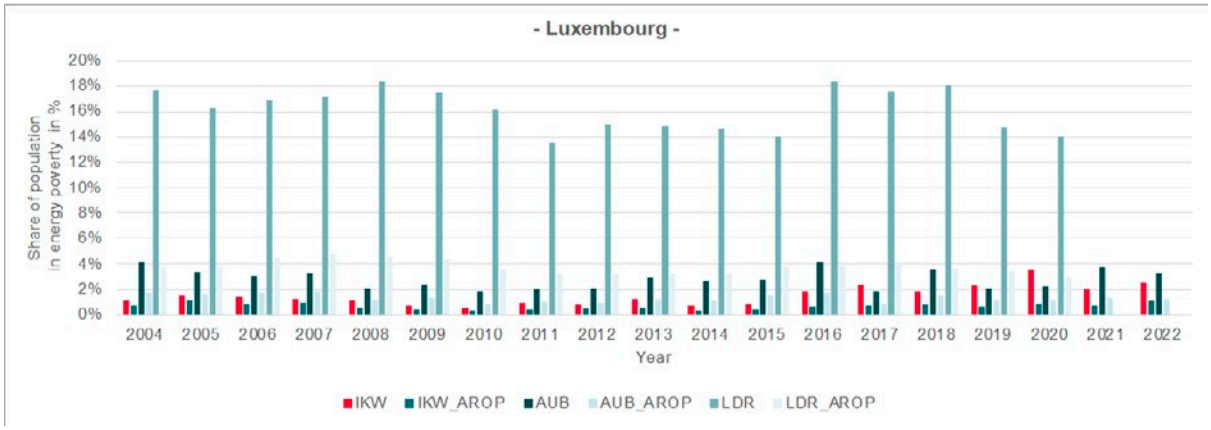



**Figure 0.69 Comparison of energy poverty rates for different configurations of consensual indicators in Luxembourg**

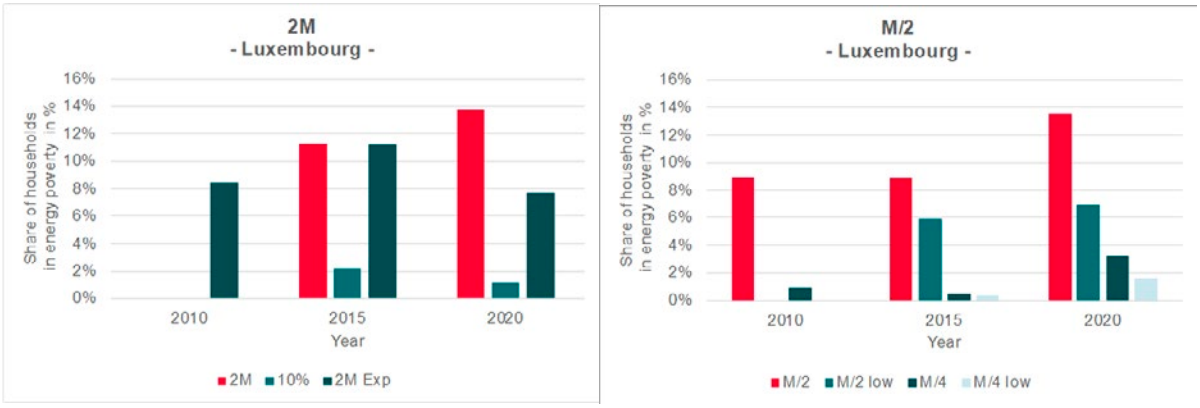



**Figure 0.70 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Luxembourg**

## Robustness II (share of high-income households identified as energy poor)

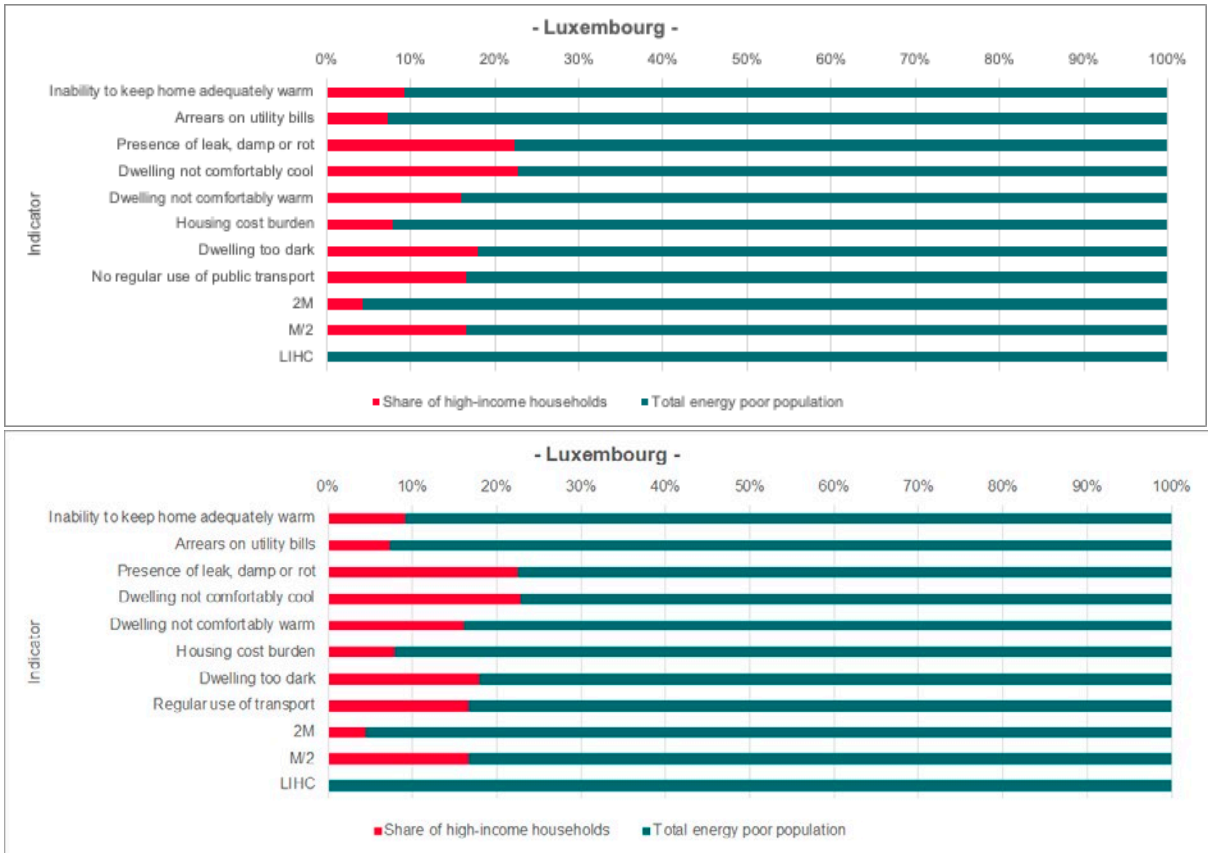



**Figure 0.71 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Luxembourg**

## Robustness III (share of outliers)

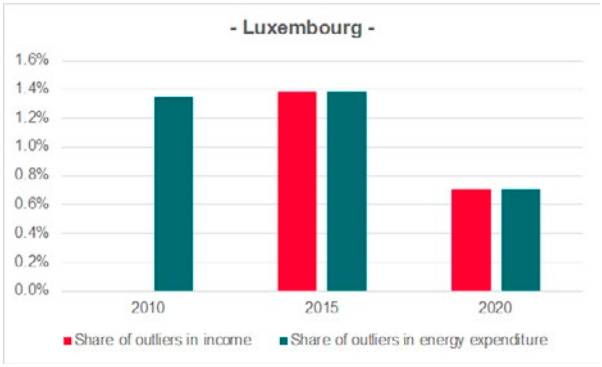



**Figure 0.72 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Luxembourg by wave**

## Completeness

### Table 0-18 Share of missing data points per indicator and year in the Luxembourgian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.2 | 0.3 | 0.1 | 1.4 | 1.9 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.2 | 0.3 | 0.1 | 1.4 | 1.9 |
| Arrears on utility bills | 2.6 | 3.9 | 3.5 | 3.5 | 0 | 0.2 | 0 | 0.1 | 0.2 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 1.5 | 1.0 |
| Arrears on utility bills + at risk of poverty | 2.6 | 3.9 | 3.5 | 3.5 | 0 | 0.2 | 0 | 0.1 | 0.2 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0 | 1.5 | 1.0 |
| Presence of leak, damp or rot | 0.3 | 0.4 | 0.2 | 0.1 | 0 | 0 | 0 | 0.3 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0.4 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.3 | 0.4 | 0.2 | 0.1 | 0 | 0 | 0 | 0.3 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0.3 | 0.4 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.8 | No data | No data | No data | No data | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0.1 | No data | No data | No data | No data | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5.9 | 4.7 | 5.1 | 3.0 | 3.2 | 0.1 | 8.7 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.4 | 0.4 | 0.1 | 0 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Latvia

## Robustness I (sensitivity to differing configurations)

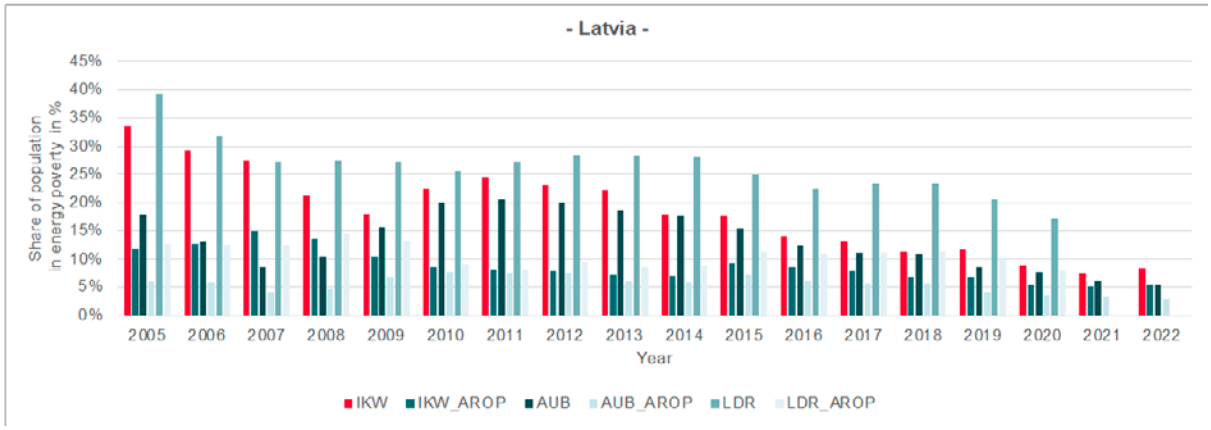



**Figure 0.73 Comparison of energy poverty rates for different configurations of consensual indicators in Latvia**


**Figure 0.74 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Latvia**

## Robustness II (share of high-income households identified as energy poor)

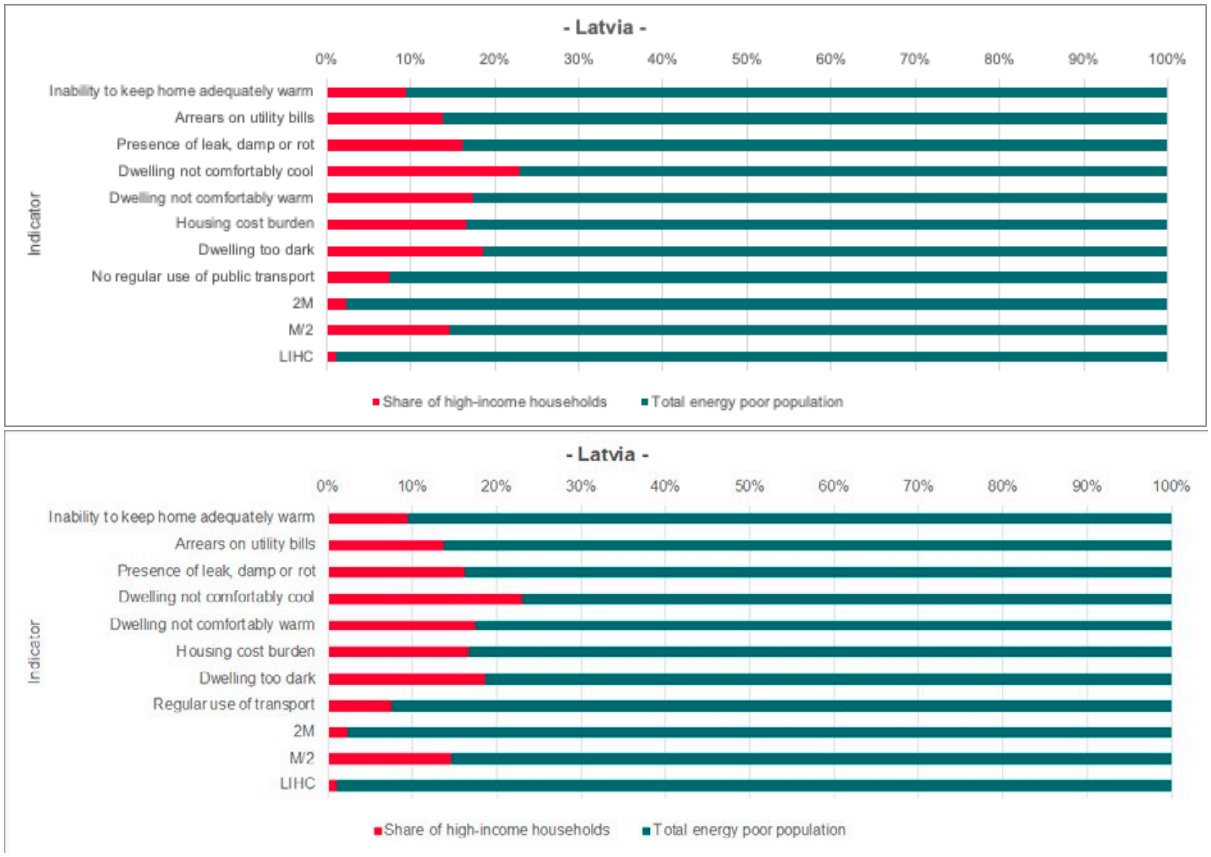



**Figure 0.75 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Latvia**

## Robustness III (share of outliers)

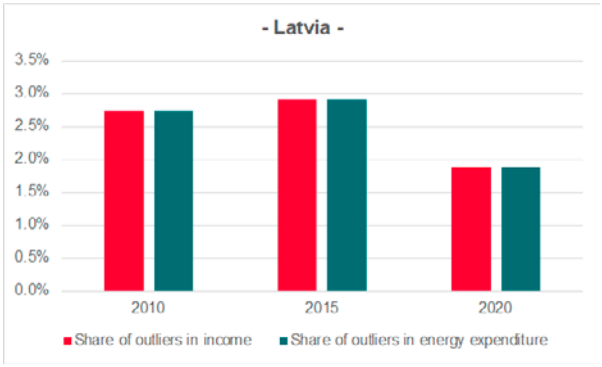



**Figure 0.76 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Latvia by wave**

## Completeness

### Table 0-19 Share of missing data points per indicator and year in the Latvian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 1.2 | 2.0 | 1.0 | 1.6 | 1.7 | 1.2 | 1.5 | 1.9 | 0.8 | 0.8 | 0 | 1.2 | 1.1 | 1.8 | 1.7 | 1.9 | 1.9 | 2.9 |
| Arrears on utility bills + at risk of poverty | 1.2 | 2.0 | 1.0 | 1.6 | 1.7 | 1.2 | 1.5 | 1.9 | 0.8 | 0.8 | 0 | 1.2 | 1.1 | 1.8 | 1.7 | 1.9 | 1.9 | 2.9 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 4.3 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 4.3 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 2.8 | 2.3 | 2.7 | 2.3 | 2.3 | 1.5 | 2.6 | 2.6 | 1.7 | 2.4 | 2.3 | 1.8 | 3.0 | 4.3 | 5.4 | 3.4 | 3.4 | 2.6 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 2.1 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Malta

## Robustness I (sensitivity to differing configurations)

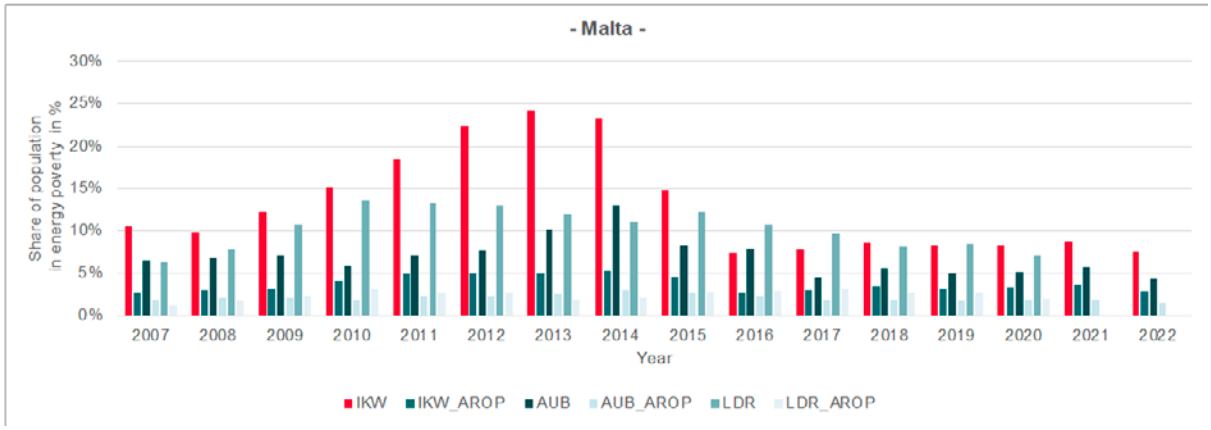



**Figure 0.77 Comparison of energy poverty rates for different configurations of consensual indicators in Malta**

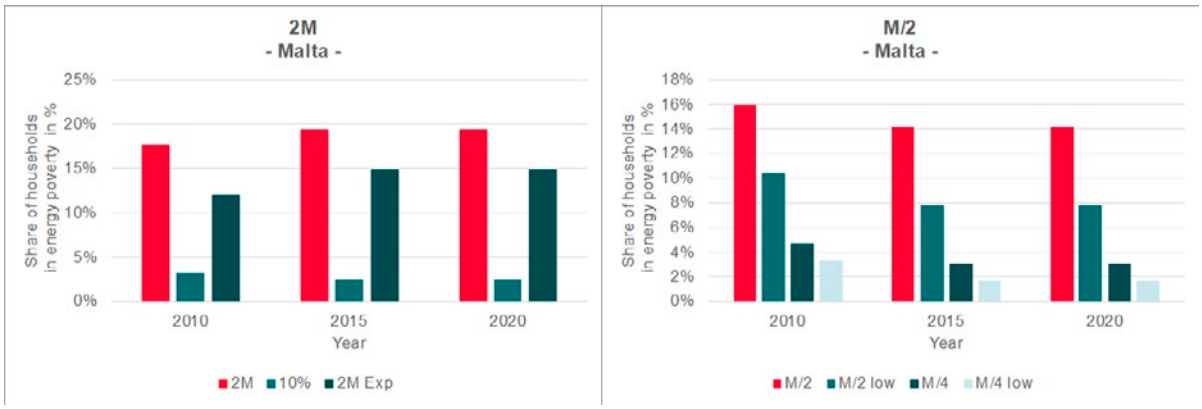



**Figure 0.78 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Malta**

## Robustness II (share of high-income households identified as energy poor)

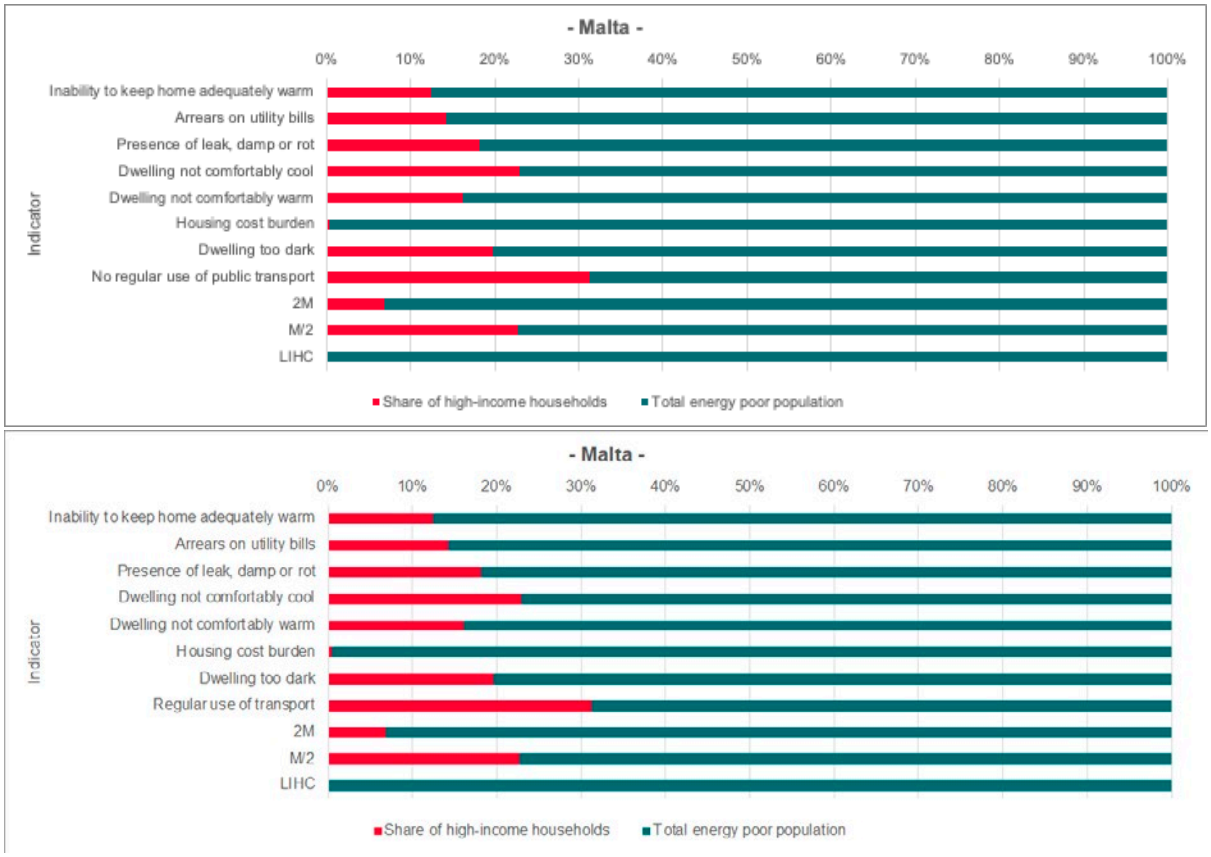



**Figure 0.79 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Malta**

## Robustness III (share of outliers)

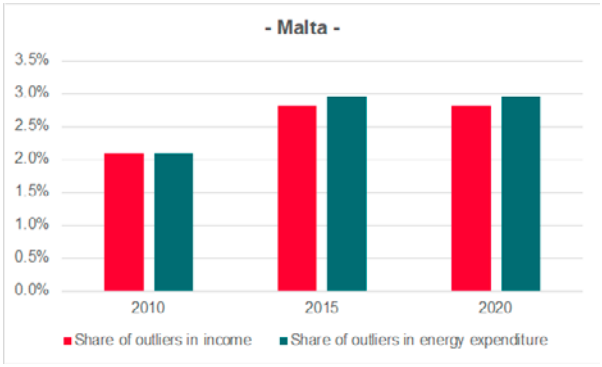



**Figure 0.80 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Malta by wave**

## Completeness

### Table 0-20 Share of missing data points per indicator and year in the Maltese SILC data

| indicator | Survey year | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.4 | 0.1 | 0.4 | 0.2 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0.4 | 0.1 | 0.4 | 0.2 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0.8 | 0.2 | 0.5 | 0.9 | 0.4 | 0.2 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 0.8 | 0.2 | 0.5 | 0.9 | 0.4 | 0.2 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0 | 0.1 | 0 | 0 | 0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | 0.2 | No data | No data | No data | No data | 1.4 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | 0 | No data | No data | No data | No data | 1.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | 1.0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# The Netherlands

## Robustness I (sensitivity to differing configurations)

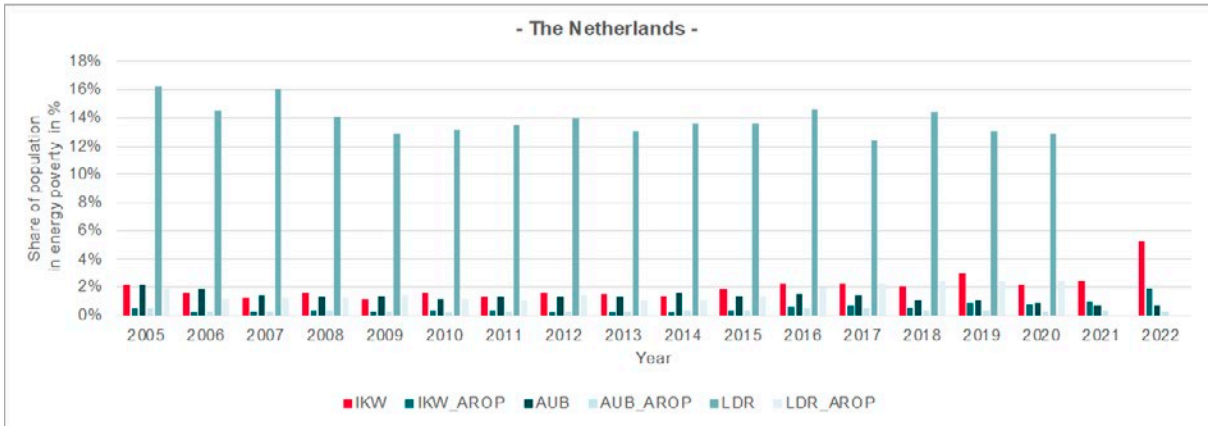



**Figure 0.81 Comparison of energy poverty rates for different configurations of consensual indicators in the Netherlands**

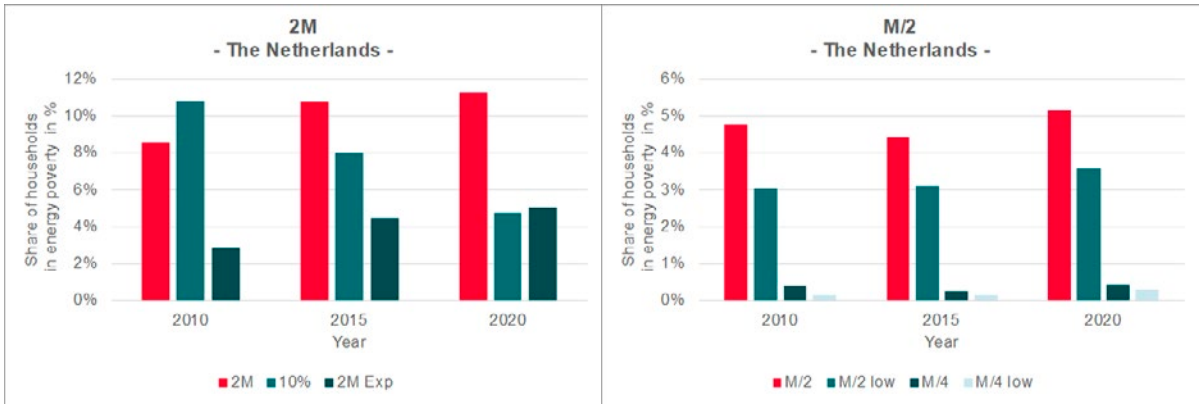



**Figure 0.82 Comparison of energy poverty rates for different configurations of expenditure-based indicators in The Netherlands**

## Robustness II (share of high-income households identified as energy poor)

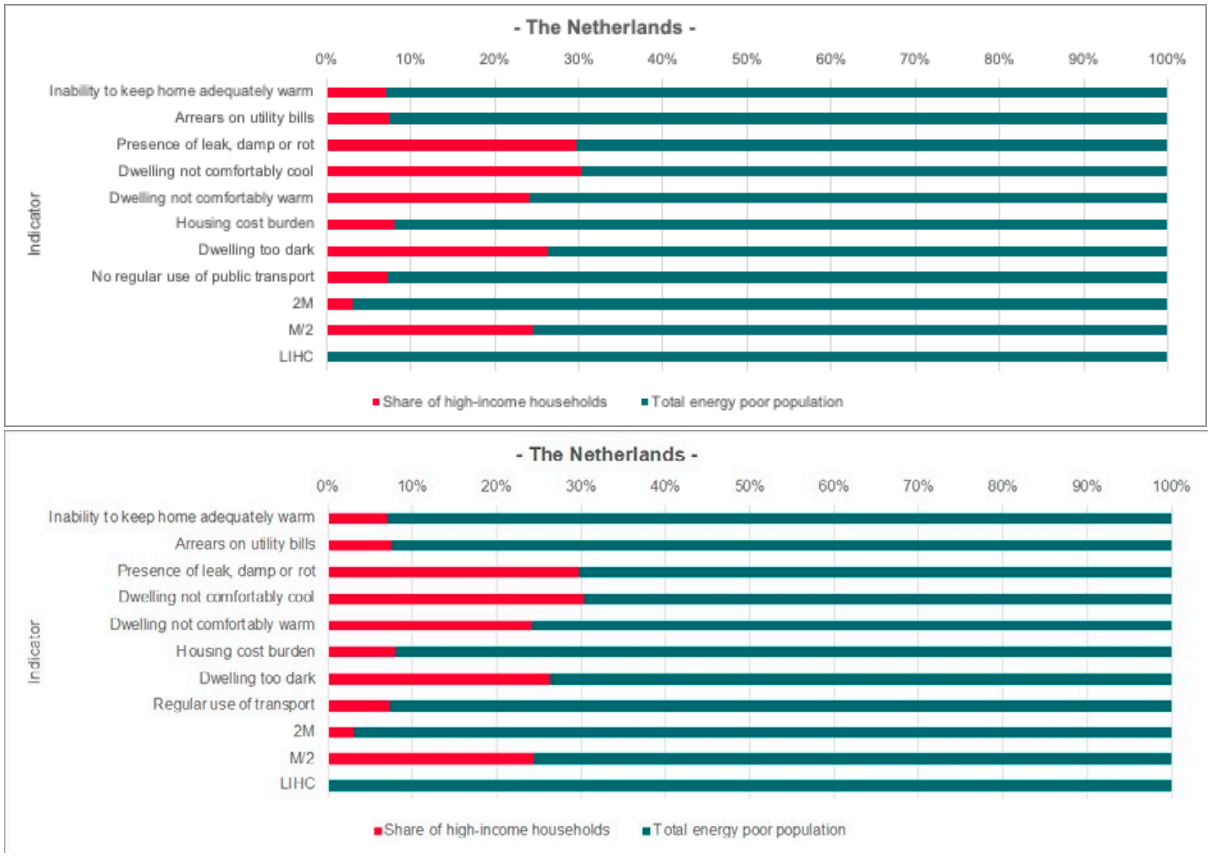



**Figure 0.83 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in The Netherlands**

## Robustness III (share of outliers)

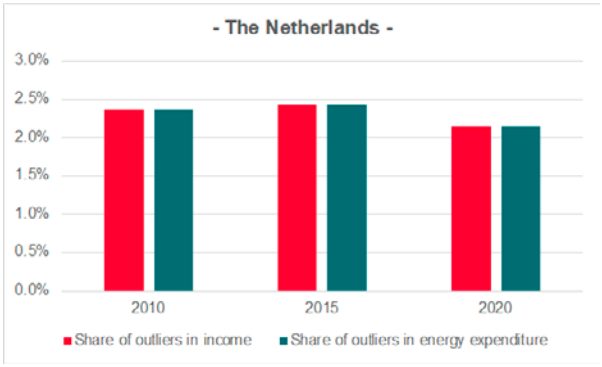



**Figure 0.84 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in The Netherlands by wave**

## Completeness

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | 0.6 | 0.7 | 1.0 | 0.8 | 0.7 | 1.4 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.5 | 0.6 | 0.7 | 1.0 | 0.8 | 0.7 | 1.4 |
| Arrears on utility bills | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.6 | 0.5 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 |
| Arrears on utility bills + at risk of poverty | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.6 | 0.5 | 0.7 | 0.8 | 0.7 | 0.7 | 0.8 |
| Presence of leak, damp or rot | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.4 | 0.3 | 0.3 | 0.5 | 0.6 | 0.7 | 0.7 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0.2 | 0.2 | 0.1 | 0.2 | 0.4 | 0.3 | 0.3 | 0.5 | 0.6 | 0.7 | 0.7 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0.6 | No data | No data | No data | No data | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 1.0 | No data | No data | No data | No data | 0.6 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.4 | 0.5 | 0.6 | 0.3 | 0.6 | 0.6 | 0.6 | 0.6 | 0.5 | 0.4 | 0.6 | 0.1 | 0 | 0.1 | 0.1 | 0 | 1.8 | 2.0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.2 | 0.2 | 0.2 | 0.4 | 0.3 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 47.6 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Poland

## Robustness I (sensitivity to differing configurations)

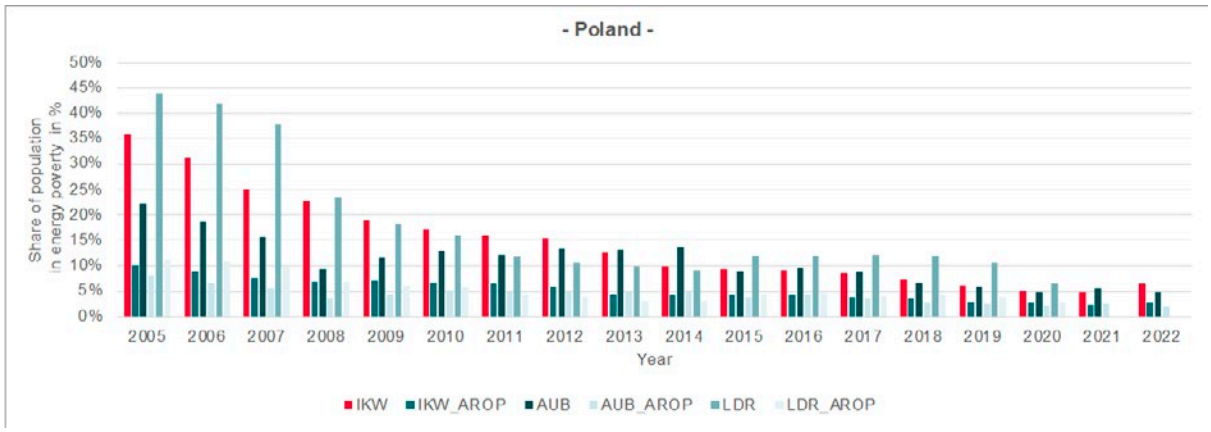



**Figure 0.85 Comparison of energy poverty rates for different configurations of consensual indicators in Poland**

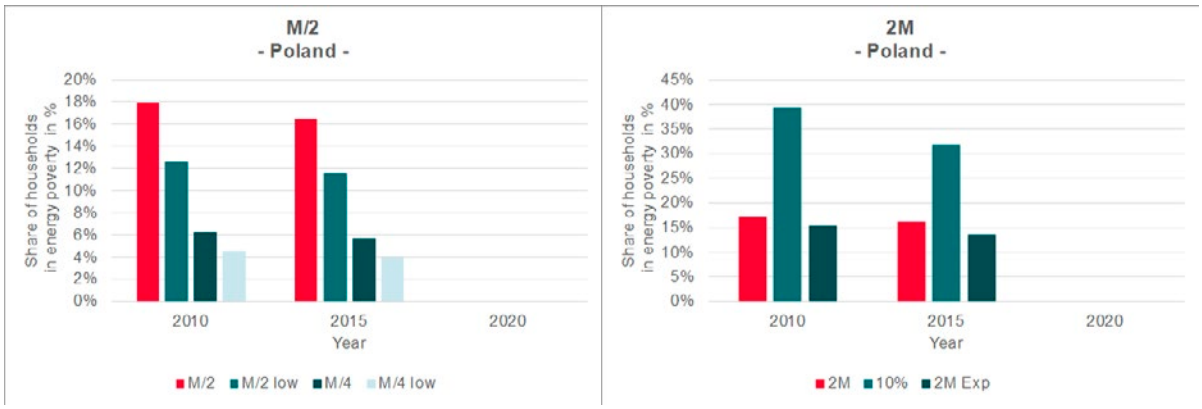



**Figure 0.86 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Poland**

## Robustness II (share of high-income households identified as energy poor)

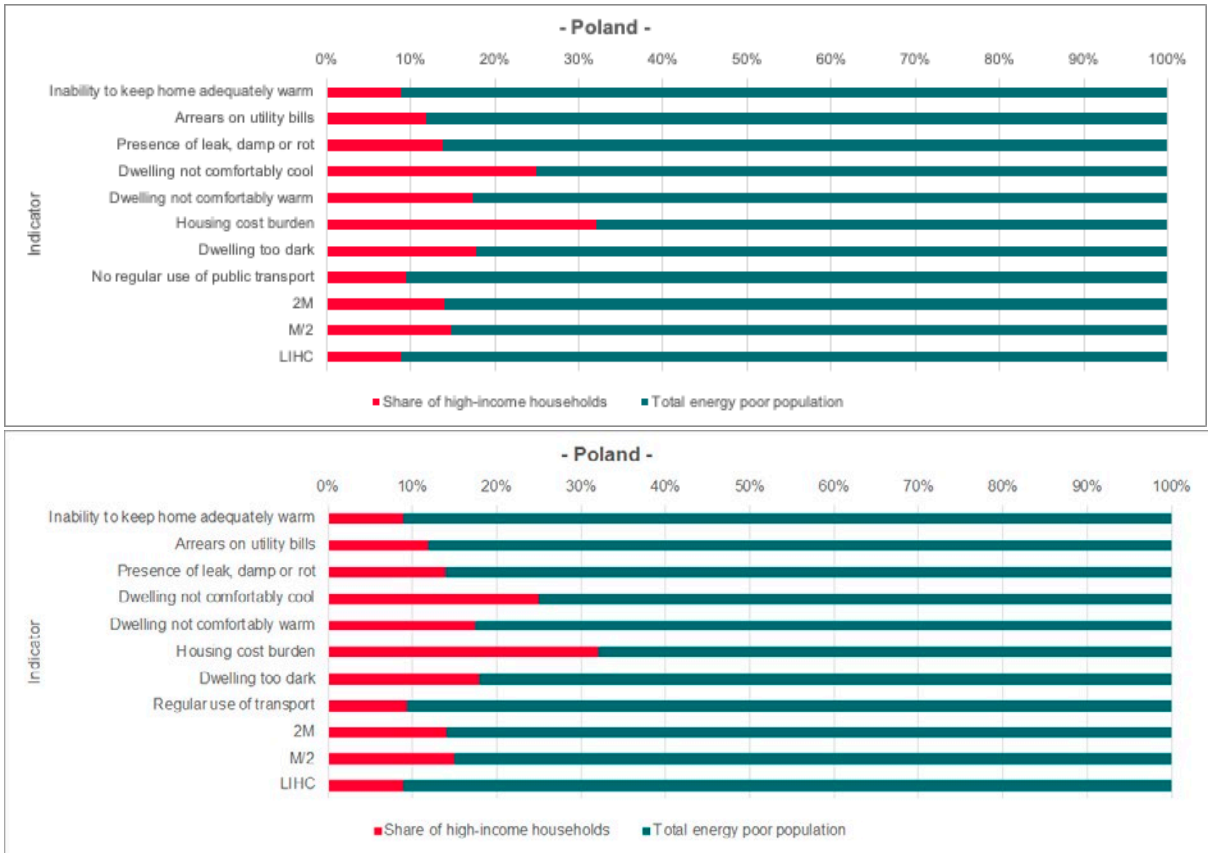



**Figure 0.87 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Poland**

## Robustness III (share of outliers)

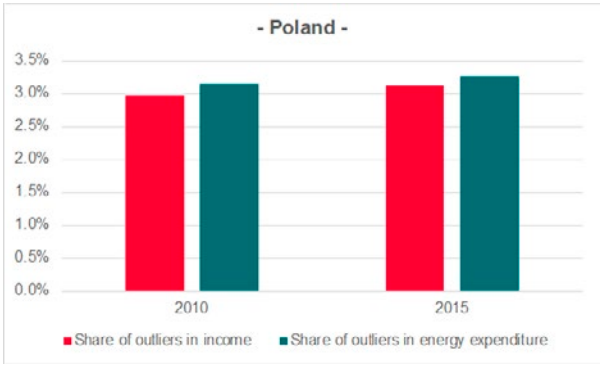



**Figure 0.88 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Poland by wave**

## Completeness

### Table 0-21 Share of missing data points per indicator and year in the Polish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 |
| Arrears on utility bills | 1.1 | 3.7 | 1.0 | 1.0 | 0.7 | 0.8 | 0.4 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills + at risk of poverty | 1.1 | 3.7 | 1.0 | 1.0 | 0.7 | 0.8 | 0.4 | 0.1 | 0.1 | 0.1 | 0.2 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 2.0 | 1.2 | 1.1 | 1.5 | 1.7 | 1.6 | 2.3 | 3.6 | 3.6 | 6.8 | 7.7 | 8.0 | 7.7 | 8.6 | 9.6 | 3.3 | 3.4 | 3.7 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 7.4 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Portugal

## Robustness I (sensitivity to differing configurations)

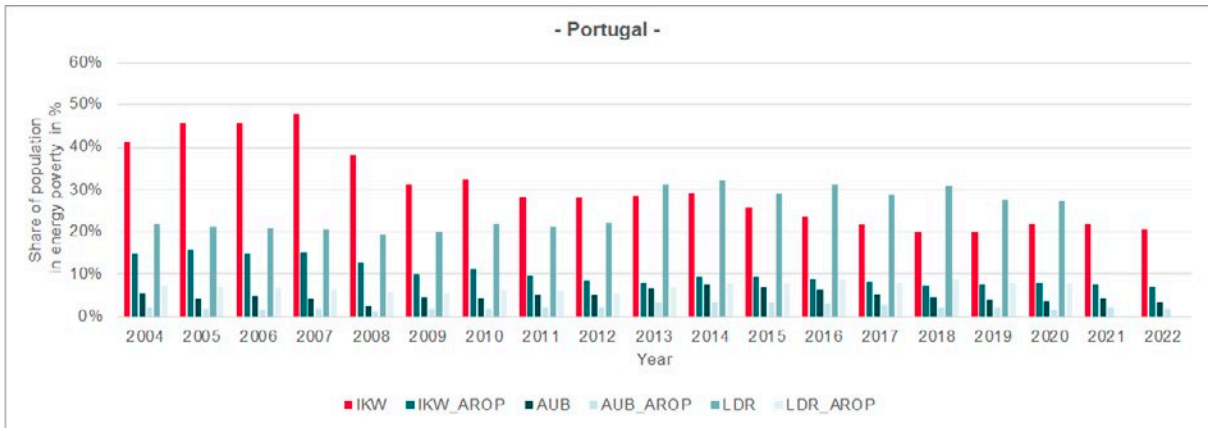



**Figure 0.89 Comparison of energy poverty rates for different configurations of consensual indicators in Portugal**

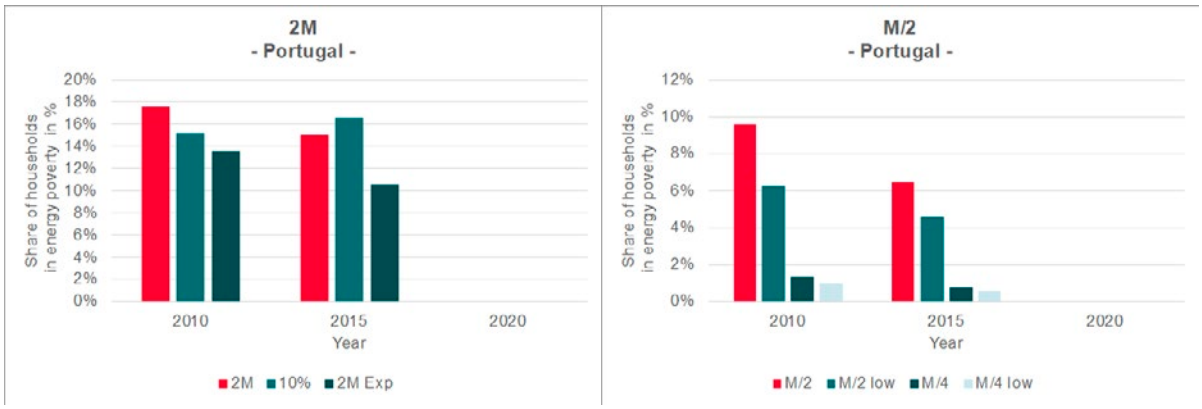



**Figure 0.90 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Portugal**

## Robustness II (share of high-income households identified as energy poor)

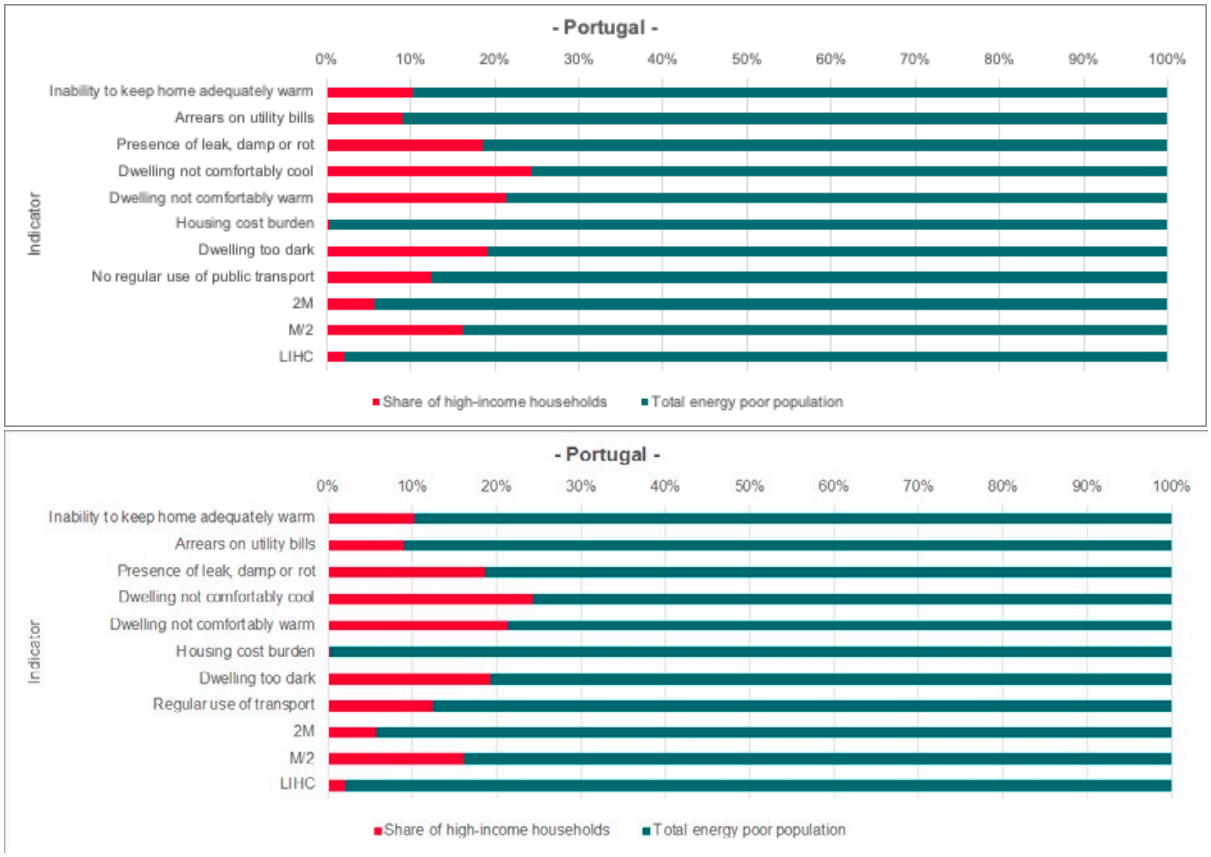



**Figure 0.91 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Portugal**

## Robustness III (share of outliers)

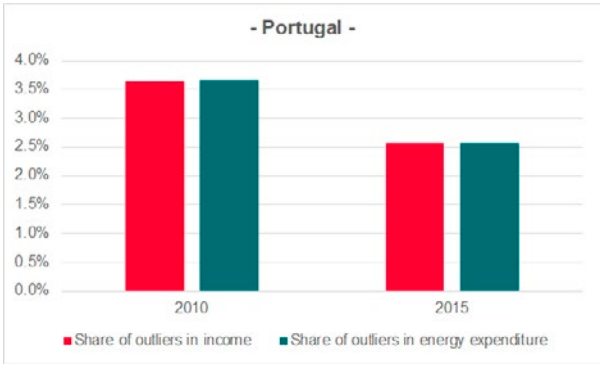



**Figure 0.92 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Portugal by wave**

## Completeness

### Table 0-22 Share of missing data points per indicator and year in the Portuguese SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0.1 | 0 | 0.5 | 1.1 | 1.0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.2 | 0.1 |
| Inability to keep home adequately warm + at risk of poverty | 0 | 0 | 0 | 0.1 | 0 | 0.5 | 1.1 | 1.0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.2 | 0.2 | 0.1 |
| Arrears on utility bills | 7.2 | 0.3 | 6.1 | 4.6 | 1.7 | 0.6 | 0.4 | 0.4 | 0.5 | 1.0 | 1.2 | 1.9 | 1.8 | 2.0 | 0.4 | 0.2 | 0.3 | 2.4 | 0.3 |
| Arrears on utility bills + at risk of poverty | 7.2 | 0.3 | 6.1 | 4.6 | 1.7 | 0.6 | 0.4 | 0.4 | 0.5 | 1.0 | 1.2 | 1.9 | 1.8 | 2.0 | 0.4 | 0.2 | 0.3 | 2.4 | 0.3 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 0.4 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 0.6 | No data | No data | No data | No data | 0.2 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0.3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Romania

## Robustness I (sensitivity to differing configurations)

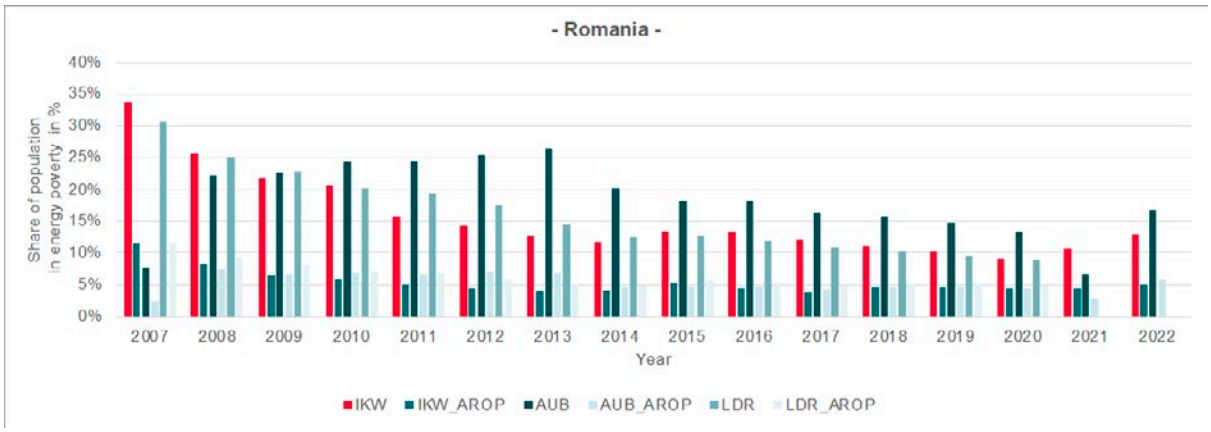



**Figure 0.93 Comparison of energy poverty rates for different configurations of consensual indicators in Romania**

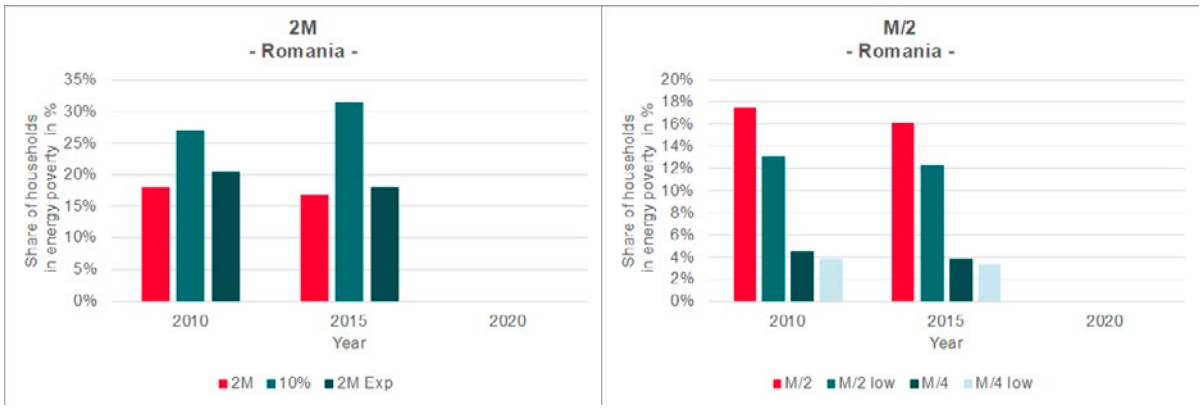



**Figure 0.94 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Romania**

## Robustness II (share of high-income households identified as energy poor)

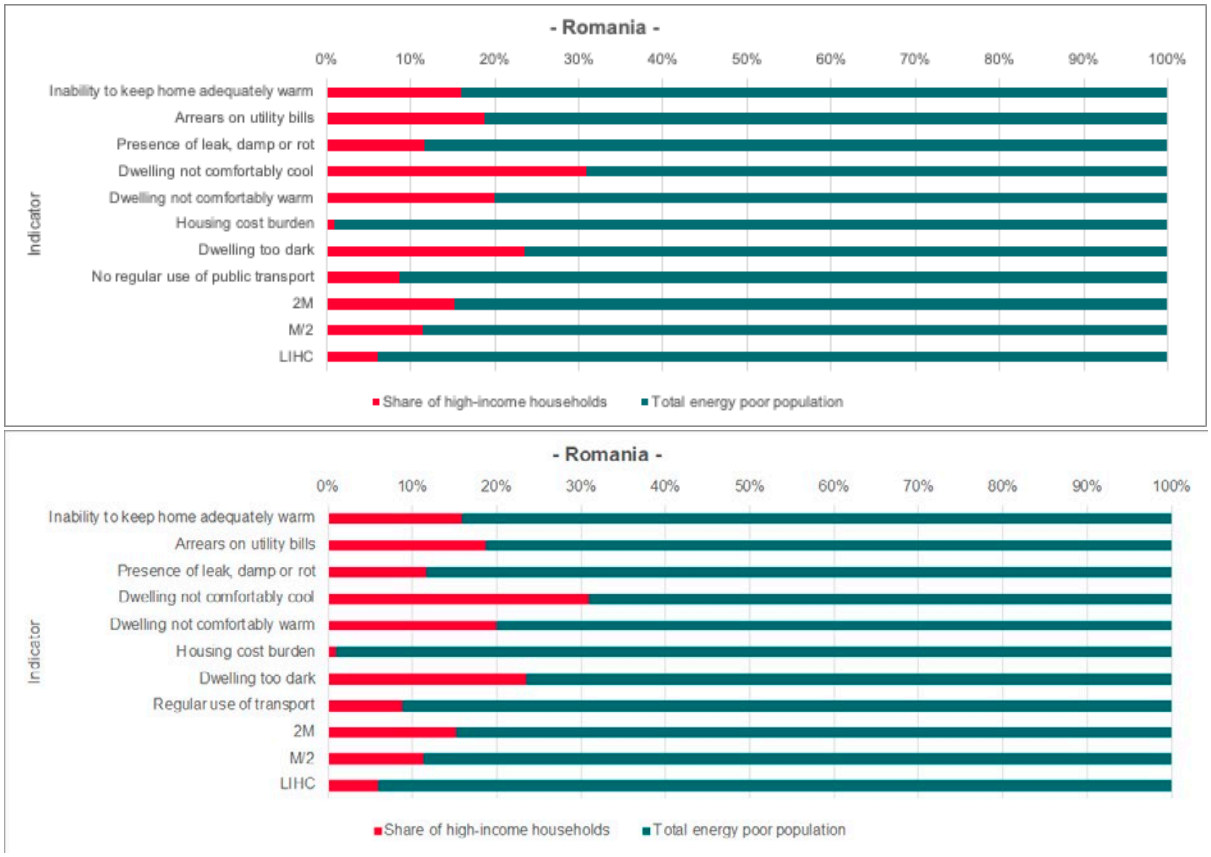



**Figure 0.95 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Romania**

## Robustness III (share of outliers)

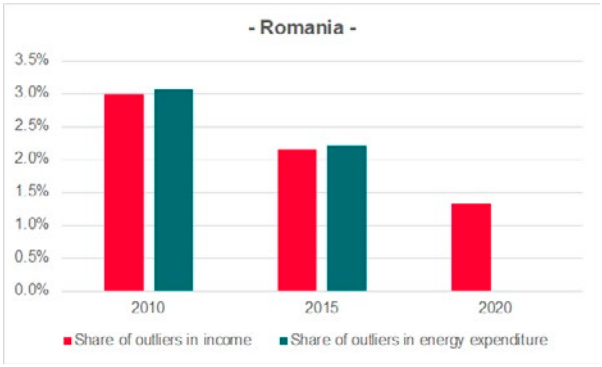



**Figure 0.96 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Romania by wave**

## Completeness

### Table 0-23 Share of missing data points per indicator and year in the Romanian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.3 | 0.6 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.5 | 0.4 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0 | 1.1 | 0.5 | 0.3 | 0.3 | 0.4 | 0.4 | 10.4 | 8.5 | 7.6 | 8.3 | 6.4 | 6.2 | 5.3 | 6.2 | 5.0 |
| Arrears on utility bills + at risk of poverty | 0.3 | 1.7 | 1.1 | 0.7 | 0.8 | 0.8 | 0.8 | 10.7 | 9.0 | 8.0 | 8.6 | 6.4 | 6.2 | 5.3 | 6.2 | 5.0 |
| Presence of leak, damp or rot | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.3 | 0.6 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.5 | 0.4 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0.3 | 0.6 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.5 | 0.4 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0.3 | 0.6 | 0.6 | 0.4 | 0.5 | 0.4 | 0.3 | 0.4 | 0.5 | 0.5 | 0.4 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1.7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | 0 | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Sweden

## Robustness I (sensitivity to differing configurations)

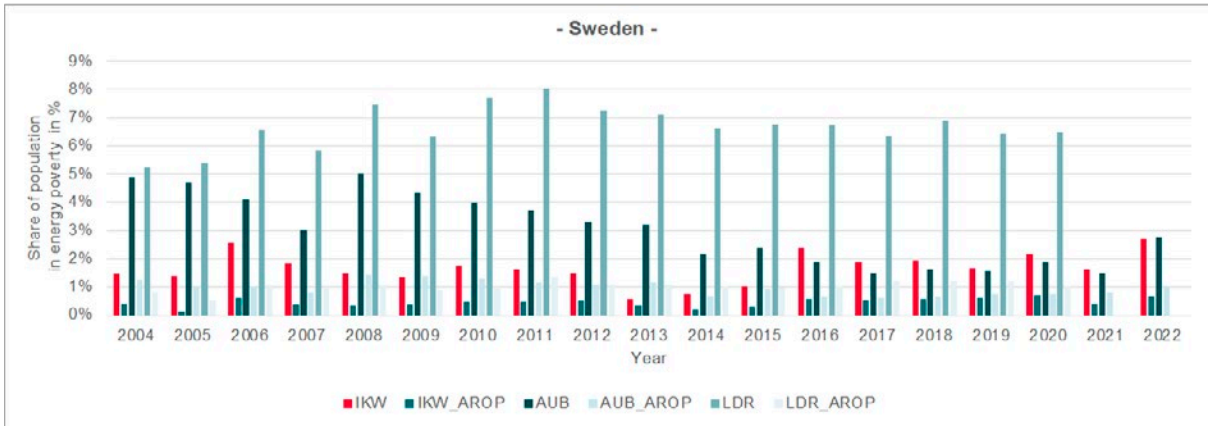



**Figure 0.97 Comparison of energy poverty rates for different configurations of consensual indicators in Sweden**

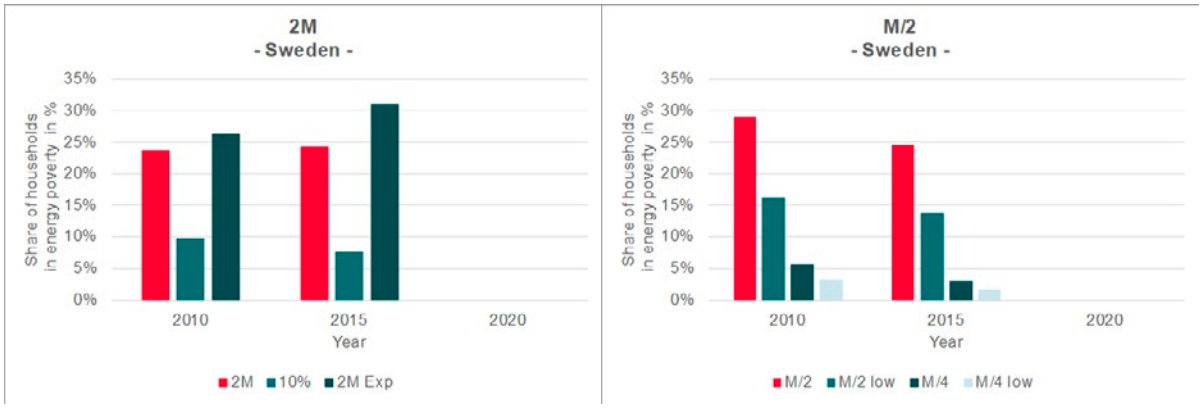



**Figure 0.98 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Sweden**

## Robustness II (share of high-income households identified as energy poor)

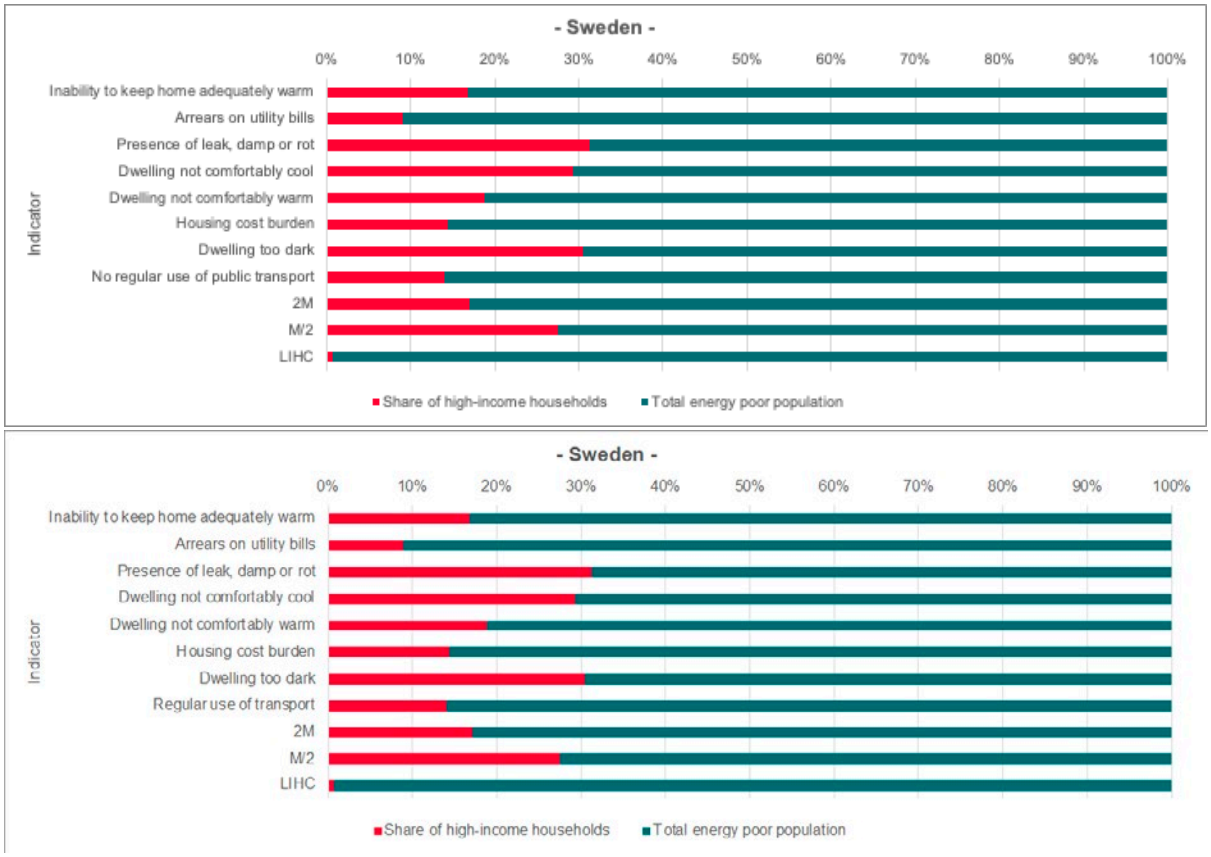



**Figure 0.99 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Sweden**

## Robustness III (share of outliers)

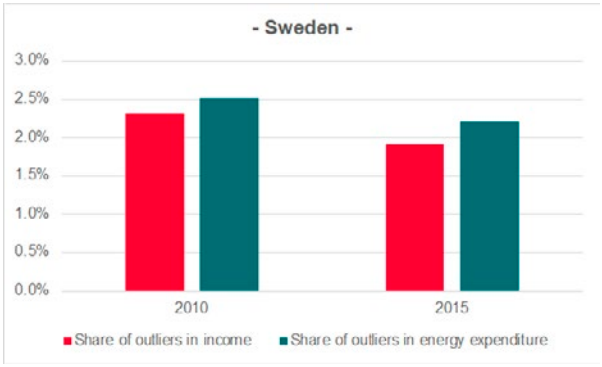



**Figure 0.100 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Sweden by wave**

## Completeness

### Table 0-24 Share of missing data points per indicator and year in the Swedish SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 2.2 | 1.9 | 0.5 | 0.6 | 0.6 | 0.4 | 0.7 | 0.4 | 0.6 | 0.5 | 0.3 | 0.3 | 0.6 | 0.5 | 0.7 | 0.4 | 0.6 | 0.4 | 1.3 |
| Inability to keep home adequately warm + at risk of poverty | 2.2 | 1.9 | 0.5 | 0.6 | 0.6 | 0.4 | 0.7 | 0.4 | 0.6 | 0.5 | 0.3 | 0.3 | 0.6 | 0.5 | 0.7 | 0.4 | 0.6 | 0.4 | 1.3 |
| Arrears on utility bills | 8.9 | 6.8 | 3.2 | 2.8 | 0.4 | 0.5 | 0.2 | 0.2 | 0.3 | 2.0 | 2.1 | 1.9 | 1.5 | 1.9 | 2.0 | 2.8 | 2.1 | 2.5 | 2.7 |
| Arrears on utility bills + at risk of poverty | 8.9 | 6.8 | 3.2 | 2.8 | 0.4 | 0.5 | 0.2 | 0.2 | 0.3 | 2.0 | 2.1 | 1.9 | 1.5 | 1.9 | 2.0 | 2.8 | 2.1 | 2.5 | 2.7 |
| Presence of leak, damp or rot | 1.0 | 0.8 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 1.0 | 0.8 | 0.2 | 0.3 | 0.3 | 0.2 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 | 0.3 | 0.3 | 0.3 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | No data | 1.8 | No data | No data | No data | No data | 2.0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | No data | 1.9 | No data | No data | No data | No data | 1.9 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0.7 | 0.4 | 0.4 | 0.7 | 0.4 | 0.3 | 0.5 | 0.3 | 0.6 | 0.5 | 0.5 | 0.5 | 0.9 | 1.5 | 1.9 | 1.4 | 1.5 | 1.8 | 2.3 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 2.0 | 1.6 | 0.1 | 0.1 | 0.4 | 0.2 | 0.5 | 0.3 | 0.2 | 0.4 | 0.5 | 0.6 | 0.3 | 0.3 | 0.4 | 0.4 | 0.3 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data | 48.8 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Slovenia

## Robustness I (sensitivity to differing configurations)

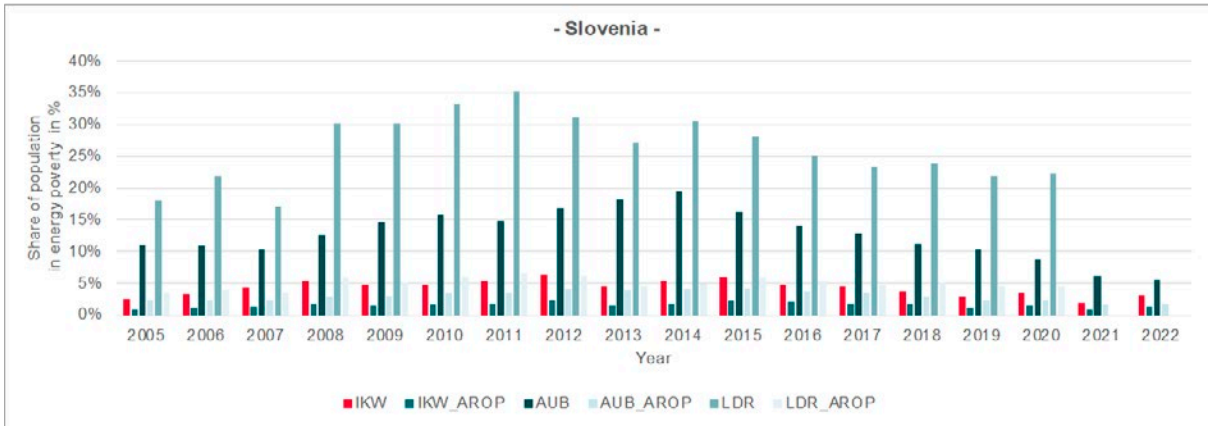



**Figure 0.101 Comparison of energy poverty rates for different configurations of consensual indicators in Slovenia**

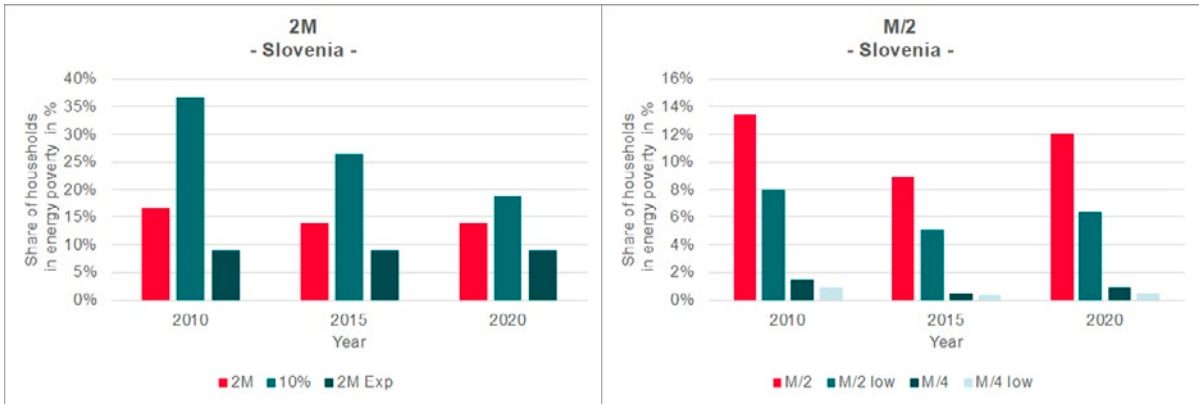



**Figure 0.102 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Slovenia**

## Robustness II (share of high-income households identified as energy poor)

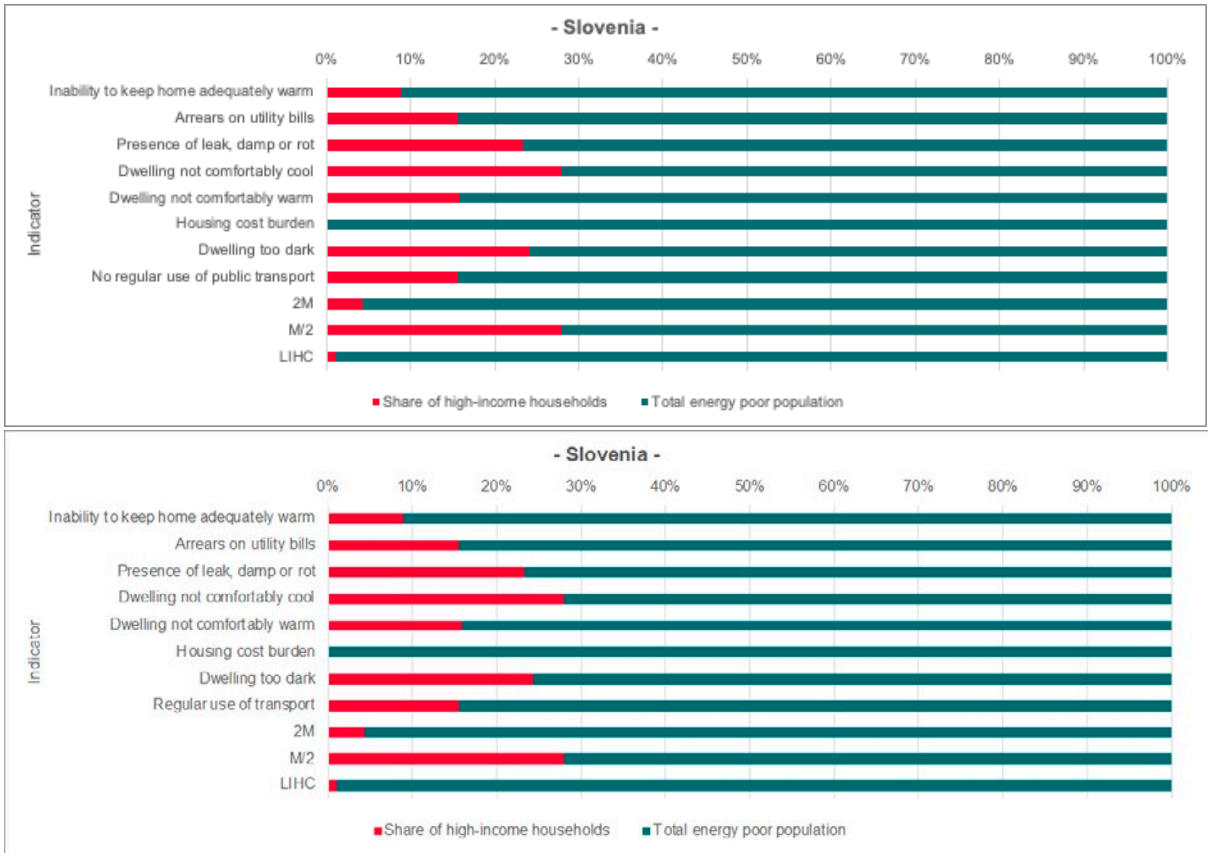



**Figure 0.103 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Slovenia**

## Robustness III (share of outliers)

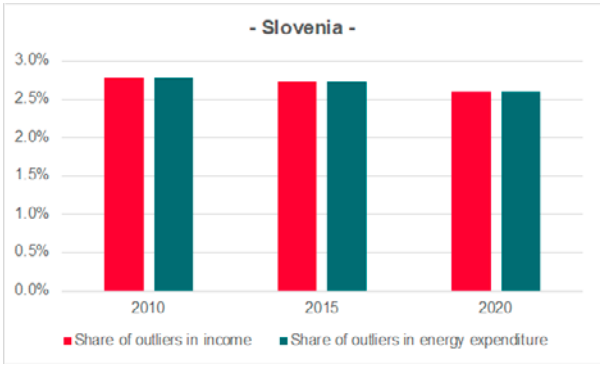



**Figure 0.104 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Slovenia by wave**

## Completeness

### Table 0-25 Share of missing data points per indicator and year in the Slovenian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 0.5 | 0.5 | 2.9 | 0.4 | 0.4 | 0.6 | 0.7 | 0.6 | 0.4 | 0.4 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.6 | 0.6 |
| Arrears on utility bills + at risk of poverty | 0.5 | 0.5 | 2.9 | 0.4 | 0.4 | 0.6 | 0.7 | 0.6 | 0.4 | 0.4 | 0.7 | 0.7 | 0.7 | 0.7 | 0.7 | 0.8 | 0.6 | 0.6 |
| Presence of leak, damp or rot | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

# Slovakia

## Robustness I (sensitivity to differing configurations)

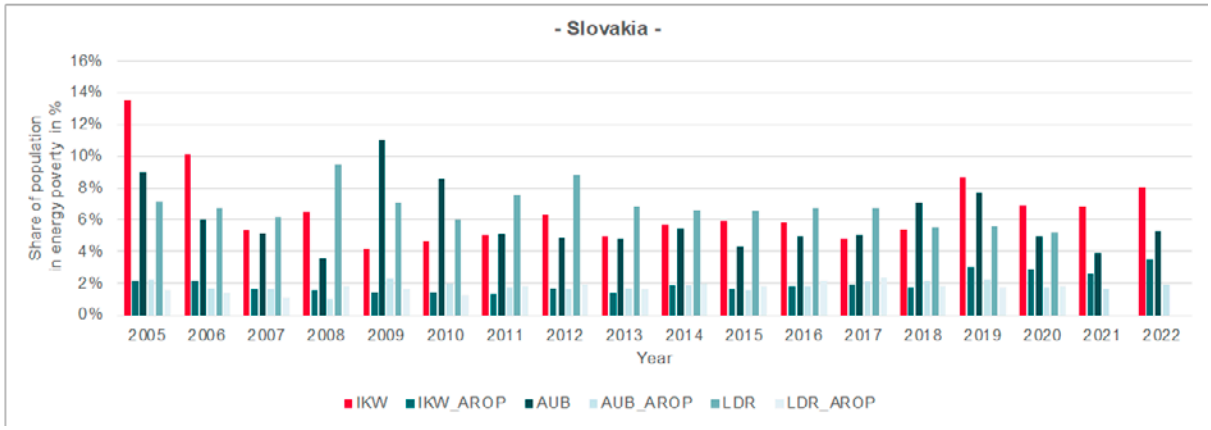



**Figure 0.105 Comparison of energy poverty rates for different configurations of consensual indicators in Slovakia**

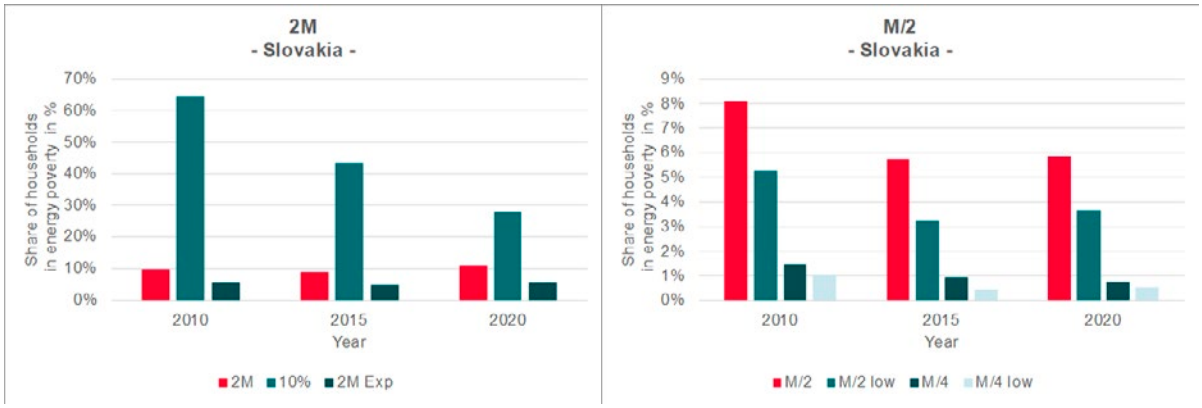



**Figure 0.106 Comparison of energy poverty rates for different configurations of expenditure-based indicators in Slovakia**

## Robustness II (share of high-income households identified as energy poor)

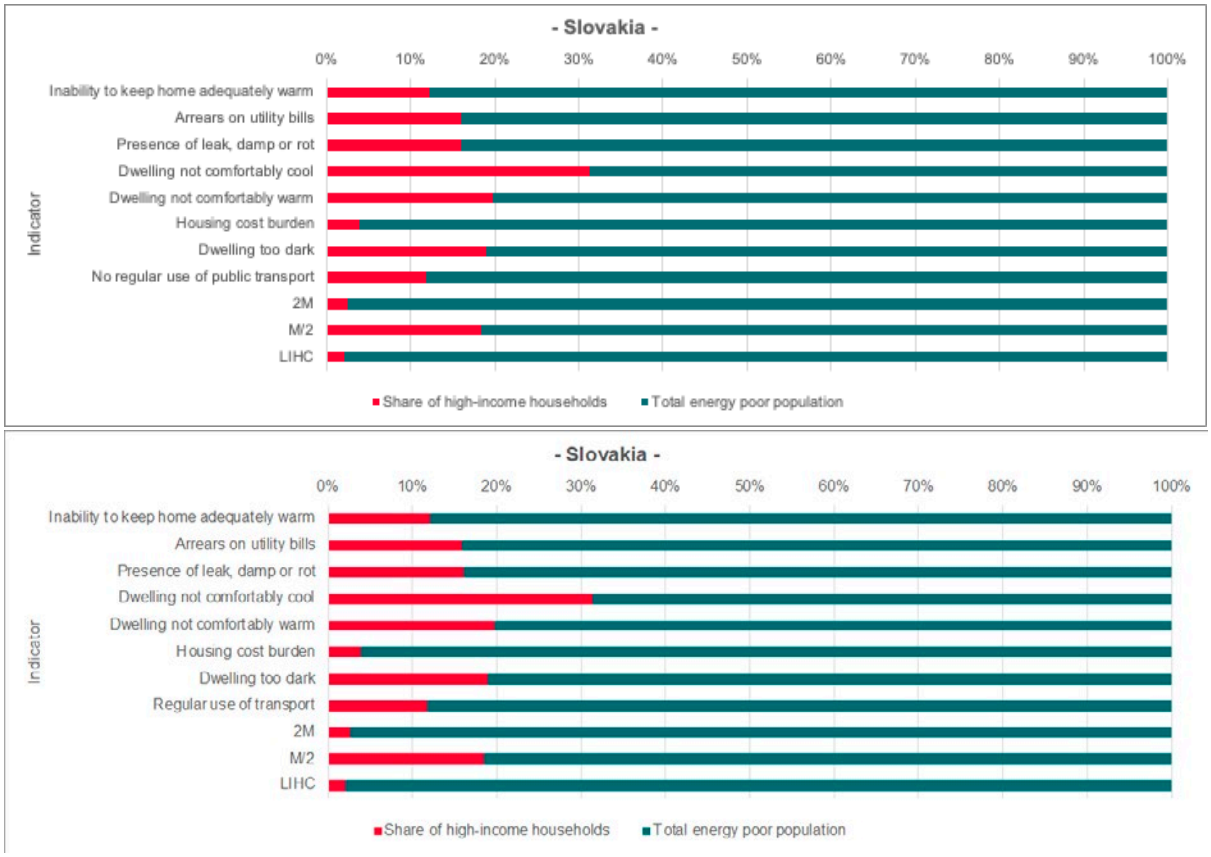



**Figure 0.107 Average share of high-income households identified as energy poor by different consensual and expenditure-based indicators in Slovakia**

## Robustness III (share of outliers)

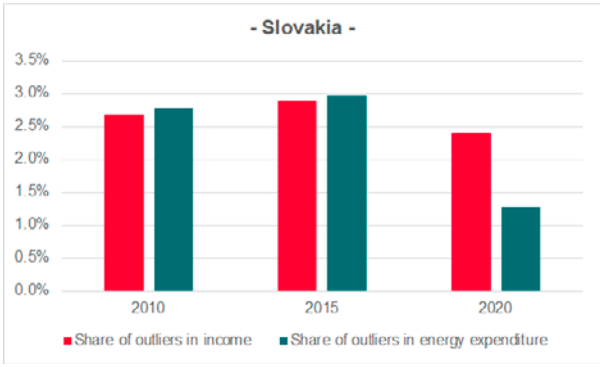



**Figure 0.108 Share of outliers in the income and energy expenditure variables of the harmonized HBS data in Slovakia by wave**

## Completeness

### Table 0-26 Share of missing data points per indicator and year in the Slovakian SILC data

| Indicator | Survey year | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
| Inability to keep home adequately warm | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Inability to keep home adequately warm + at risk of poverty | 0.2 | 0.1 | 0.1 | 0.2 | 0.1 | 0.1 | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Arrears on utility bills | 15.3 | 0.5 | 0.6 | 1.0 | 0.8 | 0.8 | 4.6 | 1.4 | 0.7 | 1.9 | 0.3 | 0.5 | 0.4 | 0.4 | 0.6 | 0.4 | 0.3 | 0.2 |
| Arrears on utility bills + at risk of poverty | 15.3 | 0.5 | 0.6 | 1.0 | 0.8 | 0.8 | 4.6 | 1.4 | 0.7 | 1.9 | 0.3 | 0.5 | 0.4 | 0.4 | 0.6 | 0.4 | 0.3 | 0.2 |
| Presence of leak, damp or rot | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Presence of leak, damp or rot + at risk of poverty | 0.1 | 0 | 0 | 0.1 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| Poverty risk | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Equivalised disposable income | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling not comfortably cool in summer | No data | No data | 0.1 | No data | No data | No data | No data | 0.1 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Dwelling not comfortably warm in winter | No data | No data | 0 | No data | No data | No data | No data | 0 | No data | No data | No data | No data | No data | No data | No data | No data | No data | No data |
| Total housing cost | 8.8 | 0.3 | 0 | 0.5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Housing cost overburden | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Dwelling too dark | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0.1 | 0.1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | No data | No data |
| No regular use of public transport | No data | No data | No data | No data | No data | No data | No data | No data | 0.5 | 0 | No data | No data | No data | No data | No data | No data | No data | No data |
| NUTS Region | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

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- via the following form: european-union.europa.eu/contact-eu/write-us_en.

## Finding information about the EU

### Online

Information about the European Union in all the official languages of the EU is available on the Europa website (european-union.europa.eu).

### EU publications

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### EU law and related documents

For access to legal information from the EU, including all EU law since 1951 in all the official language versions, go to EUR-Lex (eur-lex.europa.eu).

### EU open data

The portal data.europa.eu provides access to open datasets from the EU institutions, bodies and agencies. These can be downloaded and reused for free, for both commercial and non-commercial purposes. The portal also provides access to a wealth of datasets from European countries.

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