

HOUSING DEPRIVATION AMONG POLISH HOUSEHOLDS: PREVALENCE AND ASSOCIATED FACTORS

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ARTICLE INFO	ABSTRACT
Keywords: housing market, households, severe housing deprivation, overcrowding, multinomial logit model	Housing deprivation is a multidimensional concept that can be measured using various indicators. This study focuses on severe housing deprivation and its components – overcrowding and housing conditions problems. Severe housing deprivation means the failure to meet basic housing needs. Eurostat defines it as the simultaneous occurrence of overcrowding and housing conditions problems. All analyzed indicators of housing deprivation are based on European Union Statistics on Income and Living Conditions (EU-SILC) 2019 survey data. The study covers households in Poland – a country facing serious problems of housing deprivation. In fact, three dimensions of housing deprivation are examined: experiencing only housing conditions problems, experiencing only overcrowding, and being severely housing deprived. The study aims to investigate the prevalence of three-dimensional housing deprivation and reveal which socioeconomic features of the household are associated with the analyzed phenomenon. To achieve these purposes, the multinomial logit model was used to assess the average marginal effects for explanatory variables. It was found that the significant factors associated with housing deprivation are tenure status, dwelling type, household income, average age of household members, their level of educational achievement, presence of disabled and unemployed people, and household type.
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1. Introduction

Access to an independent dwelling of an appropriate standard is one of the basic needs of a household. Based on Malsow's pyramid of needs, it can be concluded that housing, apart from being classified as a basic need (located at the bottom of the pyramid), also enables the higher-level needs to be met (Kozera & Kozera, 2014), such as the need for security, belonging, recognition or self-fulfillment. In addition to providing the basis for meeting living needs, housing is one of the basic material elements (Dziechciarz-Duda, 2017) enabling the enjoyment of other human rights, such as education and health (Tyrell & Tuppet, 2017; Carmona-Derqui, 2023). Housing conditions, including the physical and structural characteristics of housing, are important

components of the broadly understood concept of quality of life (Marsch et al., 2000; Braubach & Fairburn, 2010; Rasnaca, 2017; Tyrell & Tuppet, 2017; Sikora-Fernandez, 2018; Ibrahim, 2020; Zumaya & Motlak, 2021; Matel & Marcinkiewicz, 2021; Ulman & Ćwiek, 2021).

A situation when an individual person or household is unable to meet their housing needs at an appropriate level is referred to as housing deprivation (Navarro & Alaya, 2008; Kozera et al., 2017; Sikora-Fernandez, 2018; Winston & Kennedy, 2019; Ulman & Ćwiek, 2020; Ulman & Ćwiek, 2021; Hick et al., 2022). In the literature, housing deprivation is also referred to as housing poverty. This concept is used in the literature in relation to the lack of access to housing, i.e. the problem of homelessness (Hick et al., 2022) and also applies to households that, despite having a

flat, suffer from deficiencies in basic housing conditions. Housing deprivation means the accumulation of deficiencies in basic housing conditions (Ayala & Navarro, 2007). Moreover, it should be emphasized that housing deprivation is a multidimensional concept. It may concern primarily the construction of a building/apartment that is inappropriate for human life, insufficient provision of elements of technical infrastructure and insufficient space in relation to the number of users (Sikora-Fernandez, 2018). The issue of housing deprivation is the subject of consideration by many researchers who use various measures relating to the examined dimension of housing deprivation (Ayala & Navarro, 2007), allowing for capturing the essence of housing deprivation in a given region or country. Research reveals that the level of satisfaction with housing needs varies spatially (Norris & Domański, 2009), which depends on many factors, including the level of economic development of a given area, the type of area where it occurs - e.g. urban and rural context (Wong & Chan, 2019; Ulman & Ćwiek, 2020; Dewilde, 2022), the implemented fiscal, financial and real estate policy, as well as household income and the support provided for families (Filandri & Olagnero, 2014; Tsenkova & Lowe, 2017; Winston & Kennedy, 2019).

Diverse research approaches depend on cultural and institutional contexts (Matel & Marcinkiewicz, 2021) and often result from data availability. When analyzing housing deprivation, researchers frequently use the approach proposed by Eurostat (Eurostat, 2023b). The indicators describing the poor condition of apartments include a leaking roof, damp walls/floors/foundations or rotting window frames or floors; no bath or shower; no indoor flushing toilet for domestic use only; apartment considered too dark (Borg, 2015; Ulman & Ćwiek, 2020; Matel & Marcinkiewicz, 2021; Hick et al., 2022; Wojewódzka-Wiewiórska & Dudek, 2023). To describe the housing situation as fully as possible, the authors use objective (e.g. overcrowding index) and subjective measures that inform how people perceive their housing situation (Tomaszewski & Perales, 2014; Sunega & Lux, 2016).

Recently, there has been an increasing interest in the housing conditions of the population (Hick et al., 2022). Access to a properly equipped apartment has become very important in connection with the COVID-19 (Ayala et al., 2022) pandemic and the resulting mandatory isolation of people in apartments. The apartment has become a place of work, education and

rest (Stachura et al., 2023). In this context, new measures of housing deprivation are considered, such as access to technology, environmental issues, economic stress and living space (Ayala et al., 2021; Ayala et al., 2022). On the other hand, employment instability related to the COVID-19 pandemic and high mortgage interest rates (Hromada et al., 2023) may have worsened the affordability and availability of high-quality housing for some social groups, i.e. young people entering adulthood (Kajta et al., 2022). Research shows that many countries have problems with housing deprivation in various dimensions (Navarro & Lyala, 2008; Eurofound, 2016; Ayala et al., 2021; Matel & Marcinkiewicz, 2021; Hick et al., 2022; Ayala et al., 2022).

Our research focuses on severe housing deprivation and its components – overcrowding and housing problems following Hick et al.'s (2022) approach. However, unlike Hick et al. (2022), we do not research all European Union (EU) countries but focus on Poland. A single-country study captures the specificity of housing deprivation in Poland, which is an example of a post-communist country where there are still problems with housing availability (Salamon & Muzioł-Węclawowicz, 2015) and overpopulation (Eurostat, 2023a). Our study provides new knowledge, including identifying correlates of housing deprivation at the household level. Thus, it fits into the trend of research conducted by other authors (Borg, 2015; Navarro & Lyala, 2008; Nolan & Winston, 2011).

Poland is an interesting area for researching housing deprivation in various dimensions. When explaining the current situation in terms of housing conditions, the great importance of historical conditions should be emphasized (Matel & Marcinkiewicz, 2021). In Poland, as a result of World War II, the housing infrastructure was destroyed (Kucharska-Stasiak, 2016), significantly increasing housing shortage. The period of the centrally planned economy (1945-1989) also seriously influenced the housing situation. It was a period of reconstruction and expansion of housing resources, which, however, due to limited financial resources and the implemented policy, did not bring sufficient results (Ulman, 2011; Hanusik & Łangowska-Szcześniak, 2018), and Polish households continued to struggle with a chronic lack of housing. The situation in the housing market changed with the political transformation and Poland's accession to the EU in 2004. Parts of the housing stock were privatized, and there was a stratification of housing quality standards

(Ulman & Ćwiek, 2021). On the other hand, analyzing statistical data on housing conditions in Poland, it can be concluded that the situation is improving year by year (Ministry of Development, 2020; Statistics Poland, 2023), although there are still deficiencies in some dimensions, which concerns various social groups (Ulman, 2011; Matel, 2017; Hanusik & Łangowska-Szcześniak, 2018; Matel & Marcinkiewicz, 2021). A particularly significant problem is the overcrowding of apartments. In 2021, 35.7% of the Polish population lived in overcrowded dwellings, which is one of the highest rates in EU countries (Eurostat, 2023a).

Our study fills the gap in the literature in terms of presenting a broad picture of housing deprivation in Poland at the household level. It also examines the accumulation of indicators of housing deprivation, an approach underrepresented in the literature (Nolan & Winston, 2011; Matel & Marcinkiewicz, 2021). Moreover, unlike existing research, we do not only identify the problem of housing deprivation, but we consider the socioeconomic characteristics of households influencing the risk of experiencing various dimensions of housing deprivation. It is also worth emphasizing that we use indicators proposed by Eurostat (Eurostat, 2023b) to describe the housing situation and not arbitrarily selected by ourselves.

In our study, we apply the multinomial logit model to identify correlates of all dimensions of household housing deprivation. This model has been used to analyze various forms of deprivation, for example, income poverty, severe material deprivation (Verbunt & Guio, 2019), and food insecurity (Dudek et al., 2021). Such a model was applied by Fiori et al. (2019), Maroto and Severson (2020), and Matel and Marcinkiewicz (2021) in their housing studies.

We use the Eurostat definition (Eurostat, 2023b; Borg & Guio, 2021), according to which a household is defined as experiencing severe housing deprivation if living in a dwelling that is simultaneously overcrowded and experiences housing conditions problems, i.e. exhibits at least one of the following problems in its dwelling:

- 1) a leaking roof, damp walls, floors or foundation, or rot in window frames or floor,
- 2) no bath/no shower, nor indoor toilet,
- 3) darkness.

A detailed explanation of the terms used in the measurement of housing deprivation is provided in the next part of the study in "The material and methods" section.

The 2019 EU Statistics on Income and Living

Conditions (EU-SILC) data was used, i.e., the most up-to-date data available for Poland to fully describe the phenomenon of severe housing deprivation. In our study, we consider three dimensions of household housing deprivation: (1) experiencing only housing conditions problems, (2) experiencing only overcrowding, and (3) being severely housing deprived.

This study aims to answer the following research questions (RQ):

RQ1: What is the prevalence of overcrowding, housing condition problems, and severe housing deprivation among Polish households?

RQ2: What household factors are associated with the risk of severe housing deprivation and its components?

The following sections contain the research methodology, including a description of the data and research methods used; then, the research results are presented; finally, there is a discussion and conclusions.

2. Material and methods

The study explores housing deprivation at the household level using the 2019 cross-sectional survey data from the EU-SILC. The analyzed sample includes 19,874 Polish households. The study considers data on overcrowding, housing conditions problems, severe housing deprivation, and socioeconomic characteristics of households.

By the Eurostat definition, it was assumed that a household is overcrowded if it has fewer rooms than the sum of one room per couple in the household, one room for each single person aged 18 or more, one room per pair of single people of the same gender aged 12-17 years, one room for each single person aged 12-17 years (and not included in the previous category) or one room per pair of children under 12 years of age (Eurostat, 2023a; Borg & Guio, 2021). A household experiences housing conditions problems if it is deprived concerning at least one of the following three housing conditions:

- 1) having a leaking roof, damp walls/floors/foundation, or rot in window frame/floor,
- 2) having neither a bath nor a shower in their dwelling and not having an indoor flushing toilet in their household,
- 3) living in dark dwellings.

More specifically, the first indicator identifies households where the household reports any of the

following issues in the dwelling: a leaking roof and/or damp ceilings, dampness in the walls, floors or foundation and/or rot in window frames and doors. Following Hick et al. (2022), it is worth noting that the bath & shower and toilet indicators are measured separately but counted as one item for the severe housing deprivation measure. Thus, a household is classified as deprived under this indicator only if it lacks both items. The third indicator identifies households reporting that their dwelling is too dark, meaning there is not enough daylight through the windows during the day. Furthermore, a household is defined as experiencing severe housing deprivation if it is living in a dwelling considered overcrowded while also exhibiting housing conditions problems. We consider various household features as explanatory variables in the models, which are presented in Table 1.

Table 1

Household features as explanatory variables in the model	
Variable	Description
Education	The highest education level of household members, with the following categories: – lower than upper secondary, – upper secondary, – tertiary.
Tenure status	Categories: – outright owner, – owner paying the mortgage, – tenant or subtenant paying rent at prevailing or market rate, – accommodation is rented at a reduced rate (lower price than the market price), – accommodation is provided free.
Dwelling type	Categories: – detached house, – semi-detached or terraced house, – apartment or flat in a building with less than ten dwellings, – apartment or flat in a building with ten or more dwellings.
Household type	Categories: – single-person, – two adults (both adults under 65 years), – two adults 65+ (at least one adult ≥ 65 years), – two adults with one dependent child, – two adults with two dependent children, – two adults with at least three dependent children, – single-parent, – other with dependent children, – other without dependent children.
Income	Annual equivalized household disposable income in thousands of euros from the previous year.

Unemployed	The presence of unemployed people in the household, a binary variable.
Disabled	Presence of disabled people in the household, a binary variable.
Age	Mean age of the household members.

Source: own study.

The multinomial logit model was used to analyze the probabilities of the different possible outcomes of a categorically distributed dependent variable. This model is shown in the equation below:

$$P(y = j|x) = \frac{\exp(x\beta_{j|b})}{\sum_{r=1}^m \exp(x\beta_{r|b})} \quad (1)$$

where:

- $P(y = j)$ - is the probability of an outcome being in category j , $j = 1, 2, \dots, m$,
 x - is the row vector of observed values of the explanatory variables (regressors),
 $\beta_{j|b}$ - is the coefficient vector for outcome j , $j = 1, 2, \dots, m$,
 m - is the number of categories of the outcome variable,
 b - is the base (reference) category.

In our study, the analyzed outcome variable has four categories:

- 1 – denotes being not housing deprived at all (without any housing deprivation whatsoever),
2 – means experiencing only housing conditions problems,
3 – denotes experiencing only overcrowding,
4 – means being severely housing deprived.

Therefore, assuming the outcome of one as the base category, the predicted probabilities are calculated as (Hardin & Hilbe, 2018):

$$P(y = j|x) = \begin{cases} \frac{1}{1 + \sum_{r=2}^4 \exp(x\beta_{r|1})} & \text{for } j = 1 \\ \frac{\exp(x\beta_{j|1})}{1 + \sum_{r=2}^4 \exp(x\beta_{r|1})} & \text{for } j = 2, 3 \text{ or } 4 \end{cases} \quad (2)$$

The unknown parameters in each vector β_j are typically jointly estimated using the maximum likelihood method (Cameron & Trivedi, 2010; Long & Freese, 2006). However, their interpretation is challenging due to nonlinearity in the formula expressing probabilities in the multinomial logit model. Therefore, as in Fiori et al. (2019), Maroto and Severson (2020), and Matel and Marcinkiewicz (2021), average marginal effects (AMEs) were used.

Marginal effects are popular means by which the effects of variables in nonlinear models can be made more intuitively meaningful (Williams, 2012). In the multinomial logit model, they show the changes in

probability when the predictor or independent variable increases by one unit. In particular, given the categorical variable X_r , they indicate how $P(Y = j)$ changes as X_r changes from 0 to 1 after controlling for the other variables in the model. However, the marginal effects depend on the value of X_r and the values of all other covariates. To determine the average marginal effect (AME), one must first calculate the marginal effect for each observation by using the actual values of each observation and then compute the average of those marginal effects. There are as many marginal effects as observations in the analysis for a given explanatory variable. AME then calculates the average of those marginal effects. Thus, AME refers to the average marginal effect, which can be interpreted as a change in the probability of the outcome category associated with a unit change in the explanatory variable.

In all computations, we use the cross-sectional household weights provided by the EU-SILC. Our statistical analyses were performed in the Stata program.

3. Results

The prevalence of four analyzed categories of housing deprivation among Polish households in 2019 is presented in Figure 1. It turned out that there is a lack of full compliance between the considered indicators. Based on Figure 1, it can be concluded that 24% of households experienced only overcrowding, 8% of households experienced only problems with housing

conditions, and 7% of households experienced both symptoms simultaneously, i.e. severe housing deprivation.

To get a deeper insight into the probabilities of various dimensions of housing deprivation, the parameters of the multinomial logit model are estimated. The estimated AMEs are shown in Table 2. (Results for estimated parameters are in the appendix).

The AMEs presented in Table 2 reveal interesting findings. Firstly, it can be noticed that some AMEs are statistically significant in one dimension but not another. For example, in the case of income and mean age, AMEs are significant in all dimensions except the "Only housing conditions problems" dimension. However, for such characteristics as the presence of disabled people in the household and education, all AMEs are statistically significant. The detailed interpretation of the AMES results is as follows.

Compared to households without disabled persons, in households with a disabled person, the probability of being not housing deprived at all is on average 0.068 lower; however, the probability of having only housing condition problems is, on average 0.020 higher, the probability of experiencing only overcrowding is on average 0.017 higher, and probability of facing severe housing deprivation is on average 0.031 higher. This means a worse situation for households with disabled people.

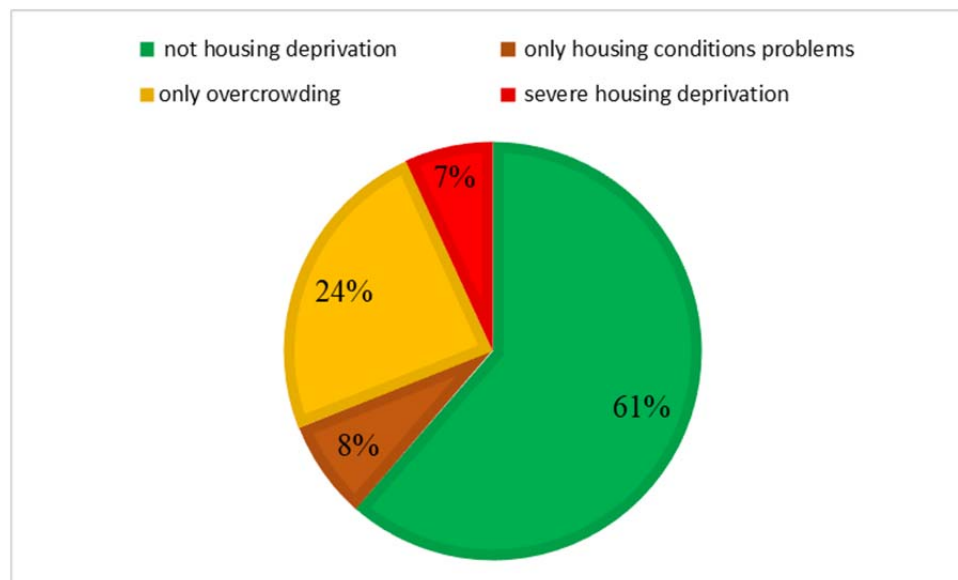


Fig. 1. Prevalence of housing deprivation dimensions in Polish households in 2019 [%]. *Source:* own study.

Table 2

The multinomial logit model results – average marginal effects								
Variables	Without any housing deprivation at all		Only housing conditions problems		Only overcrowding		Severe housing deprivation	
	AME	SE	AME	SE	AME	SE	AME	SE
Income	0.012	0.001	-0.0003	0.0006	-0.007	0.001	-0.005	0.001
Age	0.005	0.000	-0.0001	0.0002	-0.004	0.000	-0.001	0.0002
Disabled	-0.068	0.009	0.020	0.005	0.017	0.008	0.031	0.005
Unemployed	-0.089	0.016	0.039	0.011	0.007	0.013	0.043	0.009
Education: lower than upper secondary – ref.								
Upper secondary	0.137	0.013	-0.023	0.007	-0.072	0.013	-0.042	0.009
Tertiary	0.215	0.014	-0.022	0.008	-0.131	0.013	-0.062	0.007
Tenure status: outright owner – ref.								
Owner paying mortgage	0.055	0.015	0.007	0.011	-0.050	0.012	-0.012	0.006
Tenant or subtenant paying rent at prevailing or market rate	-0.213	0.023	0.004	0.014	0.135	0.020	0.074	0.015
Accommodation is rented at a reduced rate	-0.229	0.040	0.032	0.030	0.103	0.037	0.094	0.027
Accommodation is provided free	-0.197	0.013	0.032	0.008	0.053	0.013	0.112	0.010
Dwelling type: detached house – ref.								
Semi-detached or terraced house	-0.082	0.020	0.024	0.011	0.022	0.021	0.035	0.014
Apartment or flat in a building with less than ten dwellings	-0.240	0.014	-0.006	0.006	0.191	0.015	0.055	0.010
Apartment or flat in a building with ten or more dwellings	-0.174	0.009	-0.064	0.005	0.243	0.009	-0.005	0.005
Household type: single-person – ref.								
Two adults	0.107	0.014	-0.003	0.007	-0.092	0.012	-0.012	0.008
Two adults 65+	0.014	0.013	-0.023	0.005	0.008	0.013	0.000	0.008
Adults without children	-0.167	0.016	-0.047	0.006	0.175	0.017	0.039	0.011
Single-parent	-0.193	0.027	-0.026	0.012	0.150	0.027	0.069	0.018
2 adults with 1 child	-0.112	0.018	-0.048	0.006	0.123	0.019	0.037	0.013
2 adults with 2 children	-0.141	0.018	-0.051	0.006	0.158	0.019	0.034	0.013
2 adults with at least 3 children	-0.326	0.022	-0.064	0.007	0.305	0.028	0.085	0.023
Other with children	-0.285	0.016	-0.073	0.005	0.312	0.019	0.046	0.013

Note: AME are average marginal effects, SE – standard errors; the numbers in bold denote statistically significant results at a level of 0.05.

Source: own study based on EU-SILC 2019 data.

Similarly, when analyzing the results for education, we observe households in which no member has an upper secondary or higher level education to experience housing deprivation in all dimensions more frequently as compared to those households, where at least one member has higher education, in the case of which the probability of not being housing deprived at all is, on average, 0.215 higher. In contrast, the probability of having only housing condition problems is, on average, 0.022 lower, the probability of experiencing only overcrowding is, on average, 0.131 lower, and the probability of facing severe housing deprivation is, on average, 0.062 lower.

Considering tenure status, generally speaking, compared to households with outright ownership of houses, households of owners paying mortgage were better off, while households of tenants were worse off. Notably, the probability of being not housing deprived at all is, on average, 0.055 higher in

households of owners paying mortgage, 0.213 lower in households of tenants or subtenants paying rent at prevailing or market rate, 0.229 lower in households where accommodation was rented at a reduced rate, 0.197 lower in households where accommodation was provided free.

Taking into account dwelling type, it is observed that, compared to households living in detached houses, households living in semi-detached or terraced houses and apartments or flats in buildings, on the one hand, have a lower probability of being not housing deprived at all on average, but on the other hand, their probability of experiencing only overcrowding is on average higher. However, experiencing only housing condition problems was, on average, 0.024 higher for households living in semi-detached or terraced houses and 0.064 lower for households living in apartments or flats in buildings with ten or more dwellings.

Furthermore, considering household type, the statistically significant differences between single-person households and other types depend on the dimension of housing deprivation. Specifically, on average, the probability of having only housing conditions problems was higher for single-person households. However, except for households of two adults under 65, the probability of experiencing only overcrowding was, on average, lower for single-person households than for other households. In addition, it is interesting that the risk of overcrowding and severe housing deprivation for all household types with children was, on average, higher than in single-person households.

4. Discussion

The study provides new insight into severe housing deprivation and its two components – overcrowding and housing conditions problems. It was found that the factors associated with various dimensions of housing deprivation include tenure status and dwelling type. Moreover, such socioeconomic factors as household income, presence of disabled and unemployed people, type of households and age and education level of household members are associated with various housing deprivation dimensions. It should be noted that the degree of urbanization as an explanatory variable was omitted in our study due to its significant association with the dwelling type (Pearson $\chi^2(4) = 982.779$, Cramer's $V = 0.390$). In particular, it was found that most rural households in Poland (72%) lived in detached houses, while in cities, most households (71%) lived in apartments or flats in buildings with ten or more dwellings.

Our results cannot be fully comparable with those obtained in other research as they often use different indicators of housing deprivation. Hick et al. (2022) paper is one of the few studies analyzing severe housing deprivation and its components. In our study, we follow Hick et al.'s (2022) approach using EU-SILC data. However, we focus on one country – Poland, while they use 2016 data from 27 EU countries. Our results are, to a large extent, consistent with theirs. Specifically, in line with Hick et al. (2022), we found that households living in detached houses have a lower risk of overcrowding and severe housing deprivation than households living in apartments or flats in a building with less than ten dwellings; nevertheless, when it comes to housing conditions, the opposite relationship occurs. Moreover, Hick et al. (2022) noticed a lower risk of housing deprivation

across all dimensions in households owning their homes than in the case of tenants, which we confirmed in our research. Moreover, our results corroborate the problematic situation of households with children regarding overcrowding and severe housing deprivation. These results allow us to refer to researchers' discussions on the effectiveness of the policy used to support the housing economy in Poland so far (Kamiński, 2019; Cieślak et al., 2020) and the types of instruments used, including dilemmas whether to use demand-side interventions or those aimed at influencing the supply of housing. There is also the issue of the level at which intervention in the housing economy should take place (Ellen, 2017; Phillips, 2020; Kazis, 2022), where fiscal decentralization is taken into account in reaching the groups most in need of support.

It is worth mentioning that numerous researchers draw attention to the problem of measuring housing poverty (Ayala & Navarro, 2007). The authors use different housing deprivation measures in their research; no universal approach to this issue has been developed (Navarro & Alaya, 2008; Hick et al., 2022). In our study, in order to measure severe housing deprivation, we took into account its components – the problem of overcrowding and problems with housing conditions. Our research revealed that these two elements did not overlap, which confirms the validity of analyzing housing poverty by component. It is worth noting that some researchers (Kozera et al., 2017; Ulman & Ćwiek, 2021) construct a synthetic measure of housing poverty based on many diagnostic variables. The advantage of this approach to measuring housing deprivation is the inclusion of many quantitative and qualitative variables in the analysis, both objectively and subjectively (Ulman & Ćwiek, 2021). However, it should be noted that using a synthetic measure may blur the actual level of housing poverty, particularly by failing to capture it according to its components.

Moreover, the literature raises the issue of the accuracy of the selection of indicators describing housing deprivation (Matel & Marcinkiewicz, 2021; Hick et al., 2022). In our research, we selected measures that are consistently validated across the EU and used by researchers (Ayala et al., 2021; Matel & Marcinkiewicz, 2021) to measure severe housing deprivation. This approach allows for various comparative analyses in terms of time and space, including with other countries. However, it should be pointed out that, in the literature, some authors draw

attention to the need to seek an original selection of housing poverty indicators (Palvarini & Pavolini, 2010; Hick et al., 2022). They recommended considering the individual context of the country or region under study, which will, in turn, allow for capturing the degree of inability to meet adequate housing needs.

This study contributes to understanding the three-dimensional phenomenon of housing deprivation in Polish households. To the best of our knowledge, this is the first study conducted for Poland using EU-SILC data focusing on severe housing deprivation and its components. The selected research time frame must recognize the situation before the COVID-19 pandemic (Ayala et al., 2022), which, as research shows (Kocur-Bera, 2022; Stachura et al., 2023), was of great importance for improving housing conditions in Poland. The advantage of our work is the use of EU-SILC data, which consistently covers the validated measures throughout the UE. Unlike those chosen arbitrarily by the authors, these indicators are considered by Eurostat to monitor living conditions in terms of housing deprivation in the EU. This approach enables a comparative analysis of severe housing deprivation by component between all EU countries.

Apart from the strengths, some limitations of our study should be mentioned. Firstly, our analysis does not cover severe housing deprivation during the COVID-19 pandemic. However, as we mentioned before, we used the most up-to-date housing deprivation indicators available for Poland. For 2020, the indicator related to living in dark dwellings is missing. Moreover, the EU-SILC database for 2021 unfortunately does not include any indicators describing the "housing conditions problems" dimension. Thus, the lack of complete data made it impossible to compare the results obtained with those for the years of the COVID-19 pandemic. It should be taken into account that the housing market in Poland has been very dynamic recently (Kowalski et al., 2023), which may result in changes in housing deprivation. It is worth mentioning the inflow of a large number of refugees from Ukraine (Trojanek & Gluszak, 2022) and migrants from other countries, as well as the change in the domestic economy, including high inflation, which affects the prices and availability of apartments in Poland. As a result, many social groups may experience housing deprivation in various dimensions.

5. Conclusions

There has been a growing interest in housing poverty in Poland recently. Our research follows this trend by

providing new insight into severe housing deprivation and its two components – overcrowding and problems with housing conditions. We indicate that almost 40% of Polish households experienced deprivation in at least one of the dimensions considered, of which 24% experienced only overcrowding, 8% – only housing conditions problems and 7 % – severe housing deprivation.

The multinomial logit model approach investigates the impact of typical socioeconomic characteristics. It enables the analysis of the average marginal effect, a useful single-number summary interpreted as a change in the probability of experiencing a given housing deprivation dimension associated with a unit change in the explanatory variable.

The study finds that increasing income and better education cause a decrease in housing deprivation in households. Still, the presence of unemployed and disabled people is associated with increased housing deprivation. In addition, the experience of considered housing deprivation dimensions varies across dwelling type, tenure status and household type. Specifically, the appropriate average marginal effects for "only housing conditions problems" for most household types with children compared to single-person households are lower than zero. However, they are greater than zero for "only overcrowding" and "severe housing deprivation". On the one hand, this indicates better housing conditions; however, on the other hand, it means greater overcrowding and greater severe housing deprivation in households with children than in single-person households.

The results obtained are crucial both from a theoretical and practical point of view in the context of the COVID-19 pandemic. Therefore, apartments have gained new functions; in addition to being a place to live and rest, they also enable household members to work and study remotely. Monitoring the phenomenon of housing deprivation in various dimensions is a key issue in the coming years. The identification of the characteristics of households exposed to various dimensions of housing deprivation, i.e. overcrowding, poor housing conditions or severe housing deprivation, provides the basis for identifying the most vulnerable groups of households. This, in turn, gives opportunities to appropriately target decision-makers' actions and create instruments to counteract housing deprivation and help those experiencing it.

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Appendices

Table A1

Multinomial logit model estimates						
	b	SE	z	p	[95% Conf. Interval]	
1 (being not housing deprived at all) – base category						
2 (only housing conditions problems)						
Constant	-0.659	0.263	-2.505	0.012	-1.174	-0.143
Income	-0.026	0.010	-2.760	0.006	-0.045	-0.008
Age	-0.010	0.003	-2.910	0.004	-0.016	-0.003
Disabled	0.398	0.073	5.432	0.000	0.255	0.542
Unemployed	0.615	0.125	4.920	0.000	0.370	0.861
Education: lower than upper secondary – ref.						
Upper secondary	-0.584	0.100	-5.846	0.000	-0.780	-0.388
Tertiary	-0.692	0.127	-5.443	0.000	-0.941	-0.443
Tenure status: outright owner – ref.						
Owner paying mortgage	0.016	0.153	0.102	0.919	-0.284	0.316
Tenant or subtenant paying rent at prevailing or market rate	0.461	0.217	2.129	0.033	0.037	0.886
Accommodation is rented at a reduced rate	0.835	0.345	2.421	0.015	0.159	1.512
Accommodation is provided free	0.762	0.098	7.759	0.000	0.569	0.954
Dwelling type: detached house – ref.						
semi-detached or terraced house	0.455	0.134	3.384	0.001	0.191	0.719
apartment or flat in a building with less than ten dwellings	0.401	0.102	3.939	0.000	0.202	0.601
apartment or flat in a building with ten or more dwellings	-0.636	0.088	-7.263	0.000	-0.808	-0.465
Household type: single-person – ref.						
Two adults	-0.211	0.111	-1.900	0.057	-0.429	0.007
Two adults 65+	-0.367	0.096	-3.827	0.000	-0.555	-0.179
Adults without children	-0.483	0.143	-3.371	0.001	-0.763	-0.202
Single-parent	-0.022	0.258	-0.086	0.931	-0.528	0.484
2 adults with 1 child	-0.673	0.173	-3.885	0.000	-1.012	-0.333
2 adults with 2 children	-0.721	0.183	-3.934	0.000	-1.080	-0.362
2 adults with at least 3 children	-0.895	0.424	-2.114	0.035	-1.725	-0.065
Other with children	-1.015	0.212	-4.782	0.000	-1.432	-0.599
3 (only overcrowding)						
Constant	0.125	0.203	0.613	0.540	-0.274	0.523
Income	-0.066	0.007	-8.940	0.000	-0.080	-0.051
Mean age	-0.033	0.003	-12.570	0.000	-0.038	-0.028
Disabled	0.262	0.058	4.477	0.000	0.147	0.376
Unemployed	0.260	0.092	2.814	0.005	0.079	0.440
Education: lower than upper secondary – ref.						
Upper secondary	-0.741	0.095	-7.778	0.000	-0.928	-0.554
Tertiary	-1.264	0.110	-11.468	0.000	-1.480	-1.048
Tenure status: outright owner – ref.						
Owner paying mortgage	-0.419	0.095	-4.408	0.000	-0.605	-0.233
Tenant or subtenant paying rent at prevailing or market rate	1.130	0.120	9.454	0.000	0.896	1.364
Accommodation is rented at a reduced rate	1.055	0.227	4.638	0.000	0.609	1.500
Accommodation is provided free	0.769	0.081	9.469	0.000	0.610	0.928
Dwelling type: detached house – ref.						
Semi-detached or terraced house	0.324	0.140	2.322	0.020	0.051	0.598
apartment or flat in a building with less than ten dwellings	1.456	0.090	16.173	0.000	1.280	1.633
Apartment or flat in a building with ten or more dwellings	1.656	0.067	24.745	0.000	1.525	1.788
Household type: single-person – ref.						
Two adults	-0.792	0.111	-7.169	0.000	-1.009	-0.576
Two adults 65+	0.024	0.091	0.267	0.790	-0.154	0.202
Adults without children	1.248	0.101	12.347	0.000	1.050	1.446
Single-parent	1.188	0.158	7.535	0.000	0.879	1.497

2 adults with 1 child	0.873	0.110	7.930	0.000	0.657	1.089
2 adults with 2 children	1.080	0.110	9.773	0.000	0.863	1.296
2 adults with at least 3 children	2.139	0.146	14.603	0.000	1.852	2.426
Other with children	2.043	0.107	19.155	0.000	1.834	2.252
4 (severe housing deprivation)						
Constant	-0.705	0.311	-2.266	0.023	-1.315	-0.095
Income	-0.117	0.016	-7.550	0.000	-0.148	-0.087
Mean age	-0.030	0.004	-7.420	0.000	-0.038	-0.022
Disabled	0.697	0.096	7.296	0.000	0.510	0.885
Unemployed	0.845	0.124	6.843	0.000	0.603	1.087
Education: lower than upper secondary – ref.						
Upper secondary	-1.091	0.133	-8.175	0.000	-1.353	-0.830
Tertiary	-1.952	0.178	-10.979	0.000	-2.301	-1.604
Tenure status: outright owner – ref.						
Owner paying mortgage	-0.466	0.198	-2.355	0.019	-0.853	-0.078
Tenant or subtenant paying rent at prevailing or market rate	1.653	0.185	8.952	0.000	1.291	2.015
Accommodation is rented at a reduced rate	1.846	0.290	6.357	0.000	1.277	2.415
Accommodation is provided free	1.866	0.103	18.188	0.000	1.665	2.067
Dwelling type: detached house – ref.						
Semi-detached or terraced house	0.737	0.181	4.070	0.000	0.382	1.091
Apartment or flat in a building with less than ten dwellings	1.541	0.125	12.340	0.000	1.296	1.785
Apartment or flat in a building with ten or more dwellings	0.617	0.113	5.478	0.000	0.396	0.837
Household type: single-person – ref.						
Two adults	-0.560	0.175	-3.195	0.001	-0.903	-0.216
Two adults 65+	-0.022	0.146	-0.148	0.882	-0.308	0.265
Adults without children	1.180	0.162	7.290	0.000	0.862	1.497
Single-parent	1.487	0.208	7.157	0.000	1.080	1.894
2 adults with 1 child	0.932	0.186	5.017	0.000	0.568	1.295
2 adults with 2 children	1.000	0.183	5.467	0.000	0.641	1.358
2 adults with at least 3 children	2.202	0.229	9.623	0.000	1.754	2.651
Other with children	1.703	0.179	9.528	0.000	1.353	2.053
Wald $\chi^2(57) = 3185.95$, $p\text{-value} = 0.000$, Pseudo $R^2 = 0.169$						

Source: own calculations based on EU-SILC 2019 data. Note: b are estimates, SE – standard errors, P – p-values, the numbers in bold denote statistically significant results at a level of 0.05. All standard errors are heteroscedasticity-robust standard errors.