

MEASURING SOCIAL VULNERABILITY AMONG LOW-INCOME HOUSEHOLDS IN THE REPUBLIC OF MOLDOVA: A METHODOLOGICAL PERSPECTIVE²

The article proposes a methodological approach to assessing the social vulnerability of low-income households in the Republic of Moldova, grounded in the statutory subsistence minimum. In the context of persistent inflation, demographic ageing, migration and social instability, the need for accurate tools to identify and support vulnerable groups has become critical. The study aims to develop and test the Income-Based Vulnerability Index (IBVI), an adapted model that integrates three components: the ratio of disposable income to median national income, the share of social transfers and a contextual indicator related to access to basic services. By combining these dimensions, the IBVI captures both monetary poverty and broader risks of social exclusion, especially among households with elderly members and children. The model is compared with international methodologies, such as the Social Vulnerability Index (United States) and the AROPE indicator (European Union), highlighting its simplicity and stronger suitability for Moldova's socioeconomic realities. The illustrative results confirm the IBVI as a practical and flexible tool for monitoring living conditions and guiding more equitable social policies, while also indicating directions for refinement through expanded indicators and empirical validation.

Keywords: social vulnerability; subsistence minimum; low-income households; income-based vulnerability index; social policies

JEL: I32; I38; C43

1. Introduction

Social vulnerability is a complex phenomenon that reflects the extent to which individuals or groups are exposed to risks of poverty, social exclusion and marginalisation due to structural socioeconomic constraints. According to Mercadal (2021), social vulnerability encompasses a wider set of risks, including natural disasters, social phenomena such as unemployment and violence and economic instability, as well as intangible consequences such as insecurity and lack of support. This broader perspective highlights that vulnerability is shaped not only by

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material deprivation but also by systemic and historical conditions affecting resilience and adaptation. The concept has been developed in different disciplines, ranging from sociology and anthropology to environmental science, economics and public policy. International literature underlines its multidimensional character, which combines material risks with structural and cultural inequalities (Cutter, 2003; UNDP, 2016). In this paper, social vulnerability is operationalized as exposure to three risks: (i) monetary poverty (income below the statutory subsistence minimum and/or below 60% of the national median), (ii) social exclusion due to limited access to essential services (healthcare, education, utilities/adequate housing) and (iii) dependency risk associated with a high reliance on social transfers). It emphasises that certain social groups of households, such as women, youth or the elderly, may experience heightened vulnerability due to intersecting socioeconomic factors, including household structure, labour market instability and access to resources.

In the Republic of Moldova, interest in this topic has increased in recent years against the backdrop of persistent income inequality and rising poverty risks (World Bank), demographic ageing (UNFPA), large-scale emigration (IOM) and constraints in the effectiveness of social protection identified in assessments of the COVID-19 shock (UNDP). Low-income households are particularly at risk, facing unstable incomes, high dependence on social transfers and unequal access to essential services such as health care, education and adequate housing. These risks have been amplified by recent crises, like the regional instability caused by the war in Ukraine. Despite the growing relevance of this topic, existing methods for assessing vulnerability in the Republic of Moldova are predominantly based on income-based thresholds, in particular the statutory subsistence minimum.

Although international organisations (UNDP and Eurostat) have developed multidimensional tools (the Multidimensional Poverty Index (MPI) and the At Risk of Poverty or Social Exclusion indicator (AROPE)), they have not been fully adapted to the Moldovan context. Moreover, existing tools do not provide sufficient detail to design targeted interventions for low-income households. This paper proposes a contextualised methodological model based on income vulnerability, tailored to the specific risks faced by the low-income households in the Republic of Moldova. The aim of the study is to develop and test this model, which allows for the rapid and accurate identification of high-risk groups and supports the design of targeted and fair social policies. To achieve this aim, the article analyses the dynamics of the statutory subsistence minimum and poverty indicators, operationalises and computes the IBVI by integrating income positioning, dependence on social transfers and access to basic services, and compares the IBVI with international methodologies, identifying its strengths, limitations and relevance for the Moldovan context.

2. Literature Review

In the current literature, social vulnerability is considered from a multidimensional perspective, including economic, demographic, educational and institutional aspects (Davino et al., 2021; Tuccillo, Spielman, 2022). One of the most widely used instruments in the European context is the AROPE indicator developed by Eurostat, which combines three indicators: the at-risk-of-poverty rate (defined as income below 60% of the national median),

severe material deprivation and very low work intensity in the household (Eurostat 2025). Although AROPE is a valuable tool for international comparisons, it does not fully capture the specific features of household structures or labour market realities in non-EU countries such as the Republic of Moldova, including large household sizes, multigenerational living arrangements, high levels of informal employment and rural-urban disparities.

In parallel, the Multidimensional Poverty Index developed by the United Nations Development Programme (2024) offers a broader assessment framework based on simultaneous deprivation in key areas such as health, education and standard of living. Although MPI goes beyond monetary measures, its effective application requires access to large amounts of disaggregated data, which are often unavailable in countries with limited statistical capacity in monitoring income distribution, access to services and regional socioeconomic differences.

Another influential model is the Social Vulnerability Index (SVI), developed by the US Centres for Disease Control and Prevention (CDC) and used for emergency planning. The index aggregates variables such as household composition, socioeconomic status, ethnicity, language barriers, access to transportation and housing conditions (Agency for Toxic Substances and Disease Registry, n.d.). While SVI provides a detailed picture of vulnerability to natural disasters, its lack of a direct income component limits its relevance for the design of social policies based on economic criteria.

In the Republic of Moldova, poverty and vulnerability studies have traditionally been based on the subsistence minimum defined in Law No. 152/2012. This indicator sets the minimum monetary threshold required to meet basic consumption needs and is used to determine the right to social assistance (Parliament of the Republic of Moldova, 2012). However, an approach based solely on income misses important aspects such as social transfers dependency, access to basic services and individual economic resilience. This limits the ability to identify levels of vulnerability among the poor. Nevertheless, a recent paper by Ungur and Pahomii (2024) highlights the need to broaden the analytical framework to include aspects such as financial inclusion, income security among the elderly and exposure to social risks.

In this regard, the development of an Income-Based Vulnerability Index (IBVI) is proposed as a practical and analytically sound alternative. The model presented in this paper combines the ratio of available income to the national median, the level of social transfer dependency and a contextual indicator related to access to basic services. This framework is intended to allow for a more nuanced and context-sensitive assessment of social vulnerability, adapted to the socioeconomic realities of the Republic of Moldova and, as will be demonstrated in the empirical section, supporting evidence-based targeted policy measures.

Moldova's vulnerability profile is shaped by rising statutory subsistence requirements (2019-2024), age-graded poverty patterns (youth vs. 60+), and heterogeneous access to services across household types. These realities are directly embedded in IBVI via the income-to-median component, the transfer-dependence share, and the contextual service-access indicator (all measured from official statistics cited).

3. Data and Methodology

The empirical foundation of the analysis is based on official statistics published by the National Bureau of Statistics of the Republic of Moldova (NBS). The study covers the period 2019-2024, which makes it possible to trace both pre-crisis and post-crisis dynamics. The central indicator used is the subsistence minimum, representing the monetary value of a minimum consumption basket differentiated by socio-demographic groups (working-age population, pensioners and children). In addition, the analysis employs data on disposable household incomes disaggregated by sources of income (wages, social transfers, remittances and self-employment), as well as absolute poverty rates by age groups. To ensure comparability, national values expressed in Moldovan leu were converted into euros at the official exchange rate of the National Bank of Moldova as of 27 September 2025.

The IBVI is particularly appropriate for Moldova for three evidence-based reasons. First, the subsistence minimum is statutory and regularly published (Law No.152/2012; NBS), which ensures a legally grounded and timely benchmark for income adequacy. Second, 2019–2024 data show a ~46% increase in the subsistence minimum and persistently high poverty among 60+ (43.4% in 2024), evidencing income-linked vulnerability concentrated in specific groups (NBS tables cited in the paper). Third, official statistics allow direct measurement of household reliance on social transfers and compilation of simple service-access proxies, enabling the IBVI to combine feasibility (data availability) and policy relevance (targeting by income adequacy, transfer dependence, and service constraints). High informality and emigration-linked remittances also shape income composition in Moldova, making the explicit treatment of transfer dependency integral to precise targeting.

To operationalise the concept of social vulnerability, the study applies the subsistence minimum as the statutory threshold for assessing the adequacy of household incomes. Vulnerability is computed using the ratio between disposable income and the subsistence minimum, complemented by additional parameters such as dependency on social transfers and access to basic services. These elements are further integrated into the proposed Income-Based Vulnerability Index (IBVI), which assigns weights to each component (α , β , γ) based on their theoretical relevance. The computation of the IBVI allows for the systematic identification and classification of vulnerable groups, ranging from households with no vulnerability to those facing extreme vulnerability.

In order to substantiate the methodological approach, the dynamics of the subsistence minimum were examined as the statutory benchmark officially calculated and published by the NBS. This indicator provides the empirical basis for subsequent methodological calculations of the proposed index (Table 1).

The analysis of this data reveals a difference, reveals a general increase in the subsistence minimum in the Republic of Moldova. The subsistence minimum for the total population increased from 103.39 euros in 2019 to 150.85 euros in 2024, representing an increase of approximately 46%. The rise in the subsistence minimum since 2020 reflects the combined effects of inflation, wage adjustments and external shocks, including the COVID-19 crisis and the regional instability triggered by the war in Ukraine.

Table 1. Dynamics of the Subsistence Minimum in the Republic of Moldova (average per capita, euro (lei) per month)

Year	Total population	Including by socio-demographic groups of the population		
		Population of working age	Pensioners	Children-total
2019	103.39 (2,031.2)	111.67 (2,194.0)	86.90 (1,707.4)	98.08 (1,927.0)
2020	106.30 (2,088.4)	114.40 (2,247.6)	89.57 (1,759.8)	101.54 (1,995.0)
2021	109.64 (2,154.0)	117.60 (2,310.5)	92.21 (1,811.7)	105.59 (2,074.6)
2022	133.78 (2,628.4)	143.45 (2,818.3)	111.64 (2,193.3)	130.21 (2,558.3)
2023	146.44 (2,877.1)	156.70 (3,078.7)	122.36 (2,403.9)	143.64 (2,822.1)
2024	150.85 (2,963.8)	161.48 (3,172.6)	125.97 (2,475.0)	150.03 (2,947.7)
% to 2019	145.9	144.6	145.0	153.0

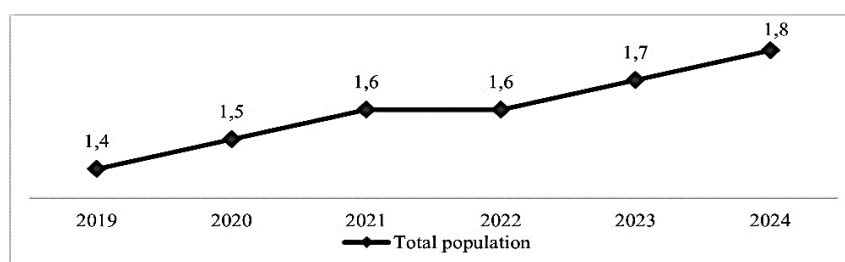
Note: Converted into euros at the exchange rate of the National Bank of Moldova on September 27, 2025.

Source: National Bureau of Statistics of the Republic of Moldova. Subsistence level by categories of population, semesters and area, 2019-2024.

The analysis by socio-demographic groups shows an increase in the working-age population by 44.6% (from 111.67 euros in 2019 to 161.48 euros in 2024). This is the category with the highest subsistence minimum, explained by increased consumption needs and restrictions in the economic sphere. For pensioners, the increase is about 45% (from 86.90 euros in 2019 to 125.97 euros in 2024). The lower subsistence minimum for pensioners reflects their reduced consumption compared to other categories. For children, the subsistence minimum increased by about 53% (from 98.08 euros in 2019 to 150.03 euros in 2024), which is the highest growth among all categories. This can be explained by high household expenditures related to childcare and education.

Figure 1 presents data on the ratio between disposable income and the subsistence minimum in the Republic of Moldova for the period 2019-2024. The ratio gradually increases from 1.4 in 2019 to 1.8 in 2024, which indicates an improvement in household income relative to the statutory minimum. However, the growth is modest and gradual, meaning that the increase in income was only slightly above the increase in the cost of the subsistence minimum. The stagnation between 2021 and 2022 (the ratio remaining unchanged at 1.6) suggests that income growth during this period was fully offset by higher living costs. The ratio reaching 1.8 in 2024 may indicate both a short-term improvement in household purchasing power and a better alignment between income and the statutory subsistence minimum.

Figure 1. Ratio between the population's disposable income and the subsistence minimum, 2019-2024 (ratio, dimensionless)



Source: Calculated based on data from the National Bureau of Statistics of the Republic of Moldova. Disposable incomes of population by sources of income and area, 2019-2024. Subsistence level by categories of population, semesters and area, 2019-2024.

Elderly people are in the most severe situation: in 2024, the poverty rate among individuals aged 60 and over (43.4%) is 1.3 times higher than the national average (33.6%) and 1.8 times higher than the poverty rate among those aged 18-29 (23.8%). At the same time, there is a clear age trend in the poverty level: among young and middle-aged groups, the poverty level decreases from 33.6% in the 0-17 age group to 24.5% in the 18-29 age group. Over a period of 30, 40 and 50 years, the poverty level shows a consistent increase. At age 60 and older, the poverty level increases sharply. Compared to 2019, there is an accelerated growth in all age groups, as well as on average in the country (an increase of 8.4 percentage points).

Table 2. Absolute poverty rate of the population by age (2019-2024), %

Age	2019	2020	2021	2022	2023	2024
Up to 18 years old	24,0	26,0	24,4	28,4	30,2	33,6
18-29 years	21,6	21,6	18,1	23,6	23,2	24,5
30-39 years	19,2	21,2	19,6	23,1	23,8	27,4
40-49 years	23,8	23,1	21,3	29,3	28,0	28,6
50-59 years	20,7	24,8	19,3	28,5	29,2	32,1
60 years and over	36,8	37,2	35,9	43,9	43,7	43,4
Total per country	25,2	26,8	24,5	31,1	31,6	33,6

Source: National Bureau of Statistics of the Republic of Moldova. Absolute poverty measures by areas, 2014-2024.

Operationalisation and computation. Unit of analysis: the household composition, converted to equivalent size (by using OECD-modified scale). Income position is measured as I_i/I_{median} , where I_{median} is the national median equivalized disposable income. Transfer dependency is T_i , the share of social transfers in total equivalized disposable income (Eurostat, Glossary: Equivalized income). The context indicator G_i is a simple 0-1 composite of basic-service constraints: (a) healthcare access (e.g., self-reported difficulty accessing primary care or distance $> X$ km), (b) education access (e.g., children missing compulsory schooling or travel time $> Y$ minutes), and (c) utilities/adequate housing (e.g., absence of safe water/heating or overcrowding above the national standard). Each binary (or thresholded) component is normalised to $\{0,1\}$ and averaged; hence $G_i \in [0,1]$ and $G_{\text{max}}=1$ by construction.

The index is computed as

$$\text{IBVI} = \alpha (I_i/I_{\text{median}}) + \beta T_i + \gamma G_i,$$

with baseline weights ($\alpha=0.5$, $\beta=0.3$, $\gamma=0.2$) reflecting the primacy of income for meeting basic needs, the structural role of transfer dependence, and the moderating effect of service constraints. Coefficients are not politically set; they may indirectly reflect policy priorities, but are empirically adjusted and validated against observed poverty/exclusion outcomes to minimise classification error. We report three interpretative bands: high vulnerability ($\text{IBVI} < 0.6$), moderate ($0.6 \leq \text{IBVI} < 0.8$), and relative stability ($\text{IBVI} \geq 0.8$); thresholds can be tuned in sensitivity checks.

4.1. Results (descriptive evidence for Moldova)

After describing the evolution of the subsistence minimum, we first present the IBVI computation and illustrative classification; we then compare the approach with international

methodologies. There are various methodologies used to determine social vulnerability, including:

The Social Vulnerability Index (SVI) is a quantitative tool developed by the US Centres for Disease Control and Prevention and the Agency for Toxic Substances and Disease Registry that uses census data to identify communities vulnerable to various hazards, including natural disasters and epidemics. The SVI takes into account factors such as poverty, lack of access to transportation, overcrowded housing, minority status and language barrier. The index includes four main categories: housing type and transportation, socioeconomic status, household composition and disability, as well as minority status and language. These categories are combined to create a single overall social vulnerability indicator (Agency for Toxic Substances and Disease Registry).

The SVI is used by emergency planners to determine the number of personnel needed in an emergency, to plan the optimal evacuation routes and to account for vulnerable populations. It is also used by public health officials to identify areas in need of emergency shelters and to estimate the number of supplies and/or staff (Agency for Toxic Substances and Disease Registry). For example, the SVI was used to identify vulnerable communities during Hurricane Katrina and the COVID-19 pandemic.

A Social Vulnerability Profile involves collecting qualitative and quantitative data about a specific community to identify factors that contribute to social vulnerability. The profile may include information on demographic characteristics, socioeconomic conditions, access to resources and the ability to cope with risks.

Quantitative Models use statistical data to estimate social vulnerability at the individual or community level (Tuccillo & Spielman, 2022). They may include indicators such as income, education level, health status and access to social services.

Quantile regression as a statistical method is used to analyse the impact of stress factors on different segments of the population, taking into account social heterogeneity (Davino et al. 2021).

A number of factors and indicators commonly used to assess social vulnerability are presented in Table 3.

These factors are interconnected and can reinforce each other. For example, poverty can limit access to education and healthcare, which can lead to poor health and increased vulnerability to various risks (Agency for Toxic Substances and Disease Registry).

Determining the social vulnerability of low-income households to poverty and social exclusion is a complex but important process for developing effective public policies. Identifying vulnerable groups involves a detailed analysis of available income relative to the subsistence minimum, as well as taking into account additional factors that increase the risk of vulnerability.

This methodology provides a systematic basis for analysing social vulnerability, contributes to the development of more effective public policies and improves financial inclusion.

Table 3. Social Vulnerability Factors and Indicators

Factor/Indicator	Description
Age	Elderly people and children may be more vulnerable to certain risks.
Gender	Women may be more vulnerable due to wage gaps, risk of domestic violence, or disproportionate family responsibilities.
Race and Ethnicity	Ethnic minorities may be more vulnerable to discrimination and social exclusion.
Immigration Status	Immigrants may face language barriers, difficulty finding employment, or limited access to social services.
Poverty	Lack of financial resources limits access to basic necessities and opportunities.
Unemployment	Unemployment reduces income and can affect self-esteem and mental health.
Education Level	Low education limits employment opportunities and access to information.
Housing	Inadequate housing affects health and safety.
Health Status	People with chronic illnesses or disabilities are more vulnerable to various risks.
Access to Healthcare	Limited access to healthcare threatens not only poor health, but also economic losses due to the inability to work or high healthcare costs.
Social Capital	Social networks, community cohesion and interpersonal trust can provide support and reduce social isolation.
Access to Information and Technology	Lack of access to information and technology limits access to opportunities and services.

Source: Developed by the author based on the specialised literature (WHO, UNDP, etc.).

The subsistence minimum represents the minimum amount required to cover basic expenses to ensure survival, including adequate nutrition (in accordance with nutritional standards set by authorities); housing (including utility costs such as water, electricity, and heating), as well as basic healthcare and compulsory education costs as defined in Law No. 152/2012.

Regular updating of the subsistence minimum is crucial to reflect the economic situation and inflation.

The ratio of disposable income to the subsistence minimum constitutes the basis for determining social vulnerability. This method is widely used in the analysis of living standards and the development of social policies.

Formula for determining social vulnerability:

$$R = \frac{\text{Disposable Income}}{\text{Subsistence Minimum}} \quad (1)$$

Where:

Disposable income represents the total amount of net income per household or per capita, after taxes and mandatory contributions.

Disposable income refers to the equivalized disposable income, consistent with the operationalisation described in Section 3.

The results of the ratio can therefore be interpreted as follows:

$R < 1$ – a person/household is considered vulnerable, whose income is insufficient to cover basic needs;

$R = 1$ – a person/household is on the threshold of the subsistence minimum;

$R > 1$ – a person/household has sufficient income, exceeding the subsistence minimum.

Calculating this ratio allows for the rapid identification of population groups at highest risk of social vulnerability.

In the Republic of Moldova, the National Bureau of Statistics uses this ratio to assess the standard of living of the population. This type of analysis is also used in other countries to measure the degree of economic vulnerability and to develop effective social protection measures. Regular use of this coefficient helps identify population groups exposed to increased economic and social risks, which helps develop targeted and effective support strategies.

In addition to disposable income, there are other factors that contribute to social vulnerability that need to be taken into account. Among them:

1. *Economic dependency ratio* – the number of dependents in the household (children, elderly people) in relation to the economically active population.
2. *Expenditures* – the share of income spent on food and utilities. A high share indicates a low level of disposable income allocated for other needs.
3. *Access to services* – the availability and accessibility of healthcare, financial services, education, etc. Lack of access to these services can increase the vulnerability of social groups.
4. *Education level* – people with a low level of education are more susceptible to the risk of low income and limited employment opportunities.

Segmentation of vulnerable groups based on the R coefficient and additional factors is carried out as follows:

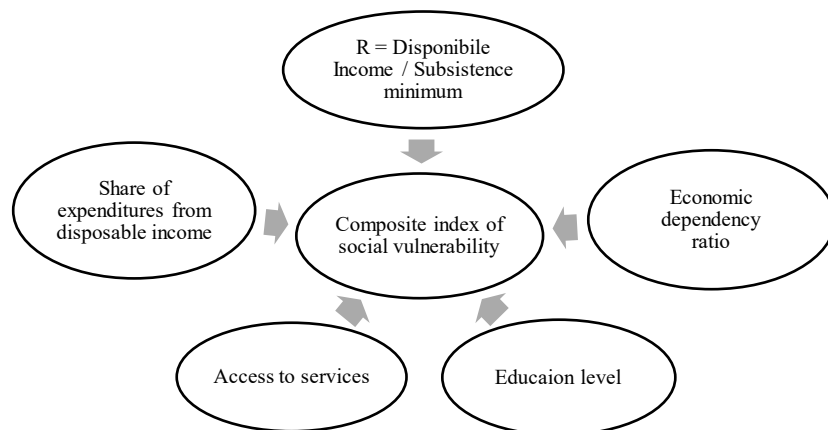
- *age categories*: children and youth (under 18); working age people (18-64years); elderly people (65+);
- *habitat*: urban or rural. Rural groups of the population tend to be more vulnerable due to limited access to services and economic opportunities;
- *professional status*: self-employed, unemployed, pensioners, low-income workers;
- *education level*: primary education or no formal education = high risk; secondary education = moderate risk; higher education = low risk.

Effective analysis of the dynamics of social vulnerability of individuals/households requires periodic monitoring of the ratio of disposable income and the subsistence minimum. Regular monitoring helps identify trends in increasing or decreasing social vulnerability and assess the impact of implemented public policies on vulnerable groups.

Such dynamic analysis allows for faster and more effective interventions in the situation, adapting to changes in the social and economic context.

A comprehensive assessment of social vulnerability requires a model that takes into account many factors. Thus, the index may include the following factors:

Figure 2. Social Vulnerability Model



Source: Developed by the author based on specialised literature on social vulnerability assessment (WHO, UNDP, Eurostat, etc.).

This index can provide an overview of the social situation of the population and allows comparisons to be made between regions or population categories.

Defining social vulnerability is a complex process with a number of limitations and challenges. Social vulnerability is a multidimensional concept and can be difficult to define and measure. The choice of indicators and methodologies used significantly affects the assessment results. Access to reliable and disaggregated data on social vulnerability can be limited, especially in developing countries. Social groups are heterogeneous, and vulnerability levels can vary significantly within groups. Assessments need to take this diversity into account (United Nations Development Programme, 2017).

Social vulnerability is a dynamic process that changes over time in response to social, economic and environmental factors (Lundgren, Jonsson, 2012). Therefore, assessments need to be updated periodically. Some aspects of social vulnerability, such as risk perception and adaptive capacity, can be subjective and difficult to measure (Leary, Messimer, 2023). Poverty can limit access to resources needed for disaster preparedness and recovery, such as purchasing goods and services (Johnson, 2021).

Crisis management requires analysing the response capacity of the healthcare system. However, predicting resource allocation by hospitals and health centres during emergencies remains challenging, especially due to the heterogeneity in hospital capacity (Fallah-Aliabadi et al., 2022). Assessing social vulnerability should also take into account social capital. Social assets, such as human, financial, natural and social capital, can be mobilised to respond to hazards and build community resilience (Leary, Messimer, 2023).

While the ratio of disposable income to subsistence minimum provides an initial indication of social vulnerability, it does not fully capture the complexity of a household's economic situation. Therefore, the Income-Based Vulnerability Index (IBVI), a more detailed index

that also takes into account dependency on social transfers and relevant contextual factors, was developed. This index is a synthetic indicator used to assess the degree of social vulnerability of an individual or household, by taking into account a variety of relevant factors such as disposable income, dependence on social transfers and other contextual elements, which allows for a more comprehensive understanding of social vulnerability.

Similar methodologies for assessing socioeconomic vulnerability exist in scientific literature, focusing on disposable income and factors related to social inclusion. The most relevant international approaches include the Social Vulnerability Index (developed by the US Centers for Disease Control and Prevention and Agency for Toxic Substances and Disease Registry, which includes socioeconomic status, such as income, as one of the main factors of social vulnerability) and the Economic Vulnerability Index, which analyzes factors such as population size and economic structure, indirectly related to the income level and economic stability of a country.

The proposed formula for calculating the IBVI is:

$$IBVI = \alpha \times I_i / I_{median} + \beta \times T_i + \gamma \times (G_i / G_{max}) \quad (2)$$

Where:

I_i – individual/household income (adult equivalent);

I_{median} – national median income (adult equivalent);

T_i – share of social transfers in total income;

G_i – context indicator (e.g., household size, access to services, etc.);

α, β, γ – weights set according to research objectives or national policy;

G_{max} – maximum value of the context indicator (for normalisation).

The ratio between individual and median income (I_i / I_{median}) shows that the person's income is close to the national median value. A low ratio means that the person is in financial difficulty.

The share of social transfers (T_i) shows that the household is dependent on government support. A high level indicates greater economic vulnerability, as the income is not generated independently.

The context factor (G_i / G_{max}) normalises an additional indicator that can affect vulnerability (e.g., household size, access to basic services, etc.), providing a more representative picture of the social situation.

The weighting coefficients α, β and γ are needed to balance each factor when calculating the IBVI. They provide the basis for statistical analysis and social impact studies. For example, if income has the greatest impact on vulnerability, the α coefficient will have a higher weight. By adjusting this weight, it is possible to assign a value to the variables depending on the economic and social context of the country. For instance, if social policy emphasises reducing dependence on social transfers, then β may have a higher weight.

Thus, it can be concluded that the IBVI can be used for identifying economically and socially vulnerable groups. Using a composite formula allows for a more accurate assessment than simple income analysis, since it also takes into account the dependence on social assistance and contextual factors. This type of index can be used to develop more effective public policies by targeting resources to those who need them most.

Based on the IBVI value, a hierarchy of vulnerability levels can be established:

- *No vulnerability*: households/individuals with incomes well above the poverty threshold³ and high financial stability.
- *Low level of vulnerability*: households/individuals with incomes above the poverty threshold and relative financial stability.
- *Moderate level of vulnerability*: households/individuals near the threshold (income close to the threshold, partial dependence on social assistance, etc.).
- *High level of vulnerability*: households/individuals below the poverty threshold, with unstable incomes and a high dependence on social transfers.
- *Extremely vulnerable*: households/individuals well below the poverty threshold and facing multiple problems (inadequate housing, lack of basic resources, severe social exclusion).

The income-based social vulnerability assessment methodology supports decision-making on resource allocation and allows assessing the impact of public policies on social well-being. Regular adaptation of indicators and thresholds to the economic context ensures the relevance and continued usefulness of income-based vulnerability assessment.

The classification of households by the IBVI allows to determine the level of social and economic vulnerability. The following thresholds are set:

High vulnerability ($IBVI < 0.6$) – a household is in an unstable economic situation, with an income significantly below the national average and a high dependence on social transfers. Such households have limited access to basic services and financial resources, which makes them most at risk of social exclusion and extreme poverty.

Moderate vulnerability ($0.6 \leq IBVI < 0.8$) – a household with an income close to the national median, but still facing economic instability. Dependence on social transfers exists, but to a lesser extent than in the previous case.

Economic stability ($IBVI \geq 0.8$) – indicates a household with sufficient income for a decent standard of living, no significant dependence on social assistance, better access to services and a lower risk of social exclusion.

These thresholds are set based on theoretical analysis and can be adjusted according to the national socioeconomic context and social policy objectives.

³ In 2024, according to the data from the National Bureau of Statistics of the Republic of Moldova, the absolute poverty threshold amounted to 3493.3 MDL (177,81 euro). (Poverty lines)

This method allows for a more detailed assessment of social vulnerability than a simple income analysis.

To explain the use of the IBVI, an abstract numerical example is presented. Consider the following household:

Monthly income per adult equivalent = 4000 MDL (203.60 euro)

National median income = 5000 MDL (254.49 euro)

Share of social transfers = 25% of total income

Contextual indicator (e.g., access to services) = 0.7 out of 1.0

The weighting coefficients ($\alpha = 0.5$, $\beta = 0.3$, $\gamma = 0.2$) used in the example were not derived from a specific statistical analysis of data from the Republic of Moldova, but were chosen based on theoretical considerations about the relative influence of each factor on social vulnerability. Income level ($\alpha = 0.5$) was assigned the highest weight, as it directly determines the ability of households to meet basic needs and thus represents the most immediate determinant of vulnerability. The share of social transfers ($\beta = 0.3$) was attributed a lower but still substantial weight, reflecting households' dependency on external support and their exposure to potential changes in social protection systems. Finally, access to basic services ($\gamma = 0.2$) received the lowest weight, as its effect, while relevant, is often indirect and mediated by income availability and reliance on social transfers. This distribution of weights ensures that the index reflects the central role of income, while also capturing the structural importance of social protection and service accessibility in shaping social vulnerability. The coefficients are not directly determined by political decisions, although they may implicitly reflect national policy priorities, such as the emphasis placed on income security or the role of social transfers. To remain relevant, the coefficients should be periodically updated through empirical calibration, using statistical techniques (e.g., regression analysis, factor analysis) and expert consultations, in order to adapt the model to changes in the socioeconomic and policy context. Coefficients are not politically set; they may indirectly reflect policy priorities, but are periodically recalibrated empirically to minimise classification error against observed poverty/exclusion outcomes.

If statistical analysis shows that income has a significant impact on vulnerability, then α (the coefficient for relative income) can be higher, for example, 0.6 or 0.7. If dependence on social transfers is a key factor in maintaining a minimum standard of living, then β can be increased, for example, to 0.4. If access to services and other contextual factors have a smaller impact on vulnerability, then γ can be reduced, for example, to 0.1.

$$IBVI = 0.5 \times 4000/5000 + 0.3 \times 0.25 + 0.2 \times (0.7/1.0) = 0.615 \quad (3)$$

The resulting value of 0.615 places the household in the moderate vulnerability band. With income at 80% of the national median and partial reliance on transfers, the household shows elevated vulnerability, although not acute; living standards cannot be inferred from income alone, but the index signals heightened risk of short-term instability. Such a household remains vulnerable to changes in public services, although some limitations persist.

4.2. Comparison with international methodologies

Social vulnerability analysis is crucial for the development of effective public policies, especially in the context of the Republic of Moldova, where poverty and social exclusion remain serious problems. Below is a structured comparison of the main methodologies used at national and international levels to assess social vulnerability, with an emphasis on their relevance for the Republic of Moldova.

Table 4. Comparison of the Income-Based Vulnerability Index with Other International Methodologies

Index	Key Factors	Application Domains	Limitations	Relevance for the Republic of Moldova
Income-Based Vulnerability Index (IBVI)	Income, social transfers, contextual factors (e.g., access to essential services)	Social policies, aid allocation and poverty monitoring	May omit non-economic factors (e.g., social capital, mental health); depends on data accuracy regarding income and transfers	High, adapted to the local context, allows personalised assessment of vulnerability and targeted interventions
Social Vulnerability Index	Poverty, transportation, housing, language barriers, minority status, household composition and disability	Disaster planning, public health and identification of vulnerable communities	Does not account for individual income; difficult to adapt to Moldova's socio-economic context; may dilute the economic specificity of vulnerability	Limited, useful for macro-level planning but less relevant for income-based social policies
EU Poverty Index	Relative income, material deprivation and employment rate	Monitoring poverty and social exclusion at the EU level	Requires adaptation to national context; may not fully reflect labour market and household structure specifics	Useful for international comparison and reporting, but requires adjustments for application in Moldova

Source: compiled by the author based on information from the Social Vulnerability Index, the European Union's "At Risk of Poverty or Social Exclusion" indicator and academic literature on social vulnerability measurement.

Adapting the IBVI to Moldovan specifics does not preclude international comparability: the income component aligns with the AROPE 60%-of-median concept, while transfer dependency and service-access modules are reported separately and can be omitted when strict comparability is required.

Strengths of the IBVI

- **Simplicity and adaptability.** The IBVI is easy to compute and flexible, as it relies on accessible statistical indicators, which makes it suitable for the socioeconomic conditions of the Republic of Moldova.
- **Policy relevance.** The index allows for the rapid identification of vulnerable groups, providing a practical tool for designing and targeting social policies.

- **Preliminary consistency check.** IBVI-based classifications were compared with observed age-specific poverty rates from the National Bureau of Statistics, showing consistency and supporting their potential for policy use.

Limitations of the IBVI

- **Narrow scope of indicators.** The IBVI does not fully capture multidimensional aspects of vulnerability such as health, housing quality or social capital.
- **Subjectivity in weighting.** The weighting coefficients ($\alpha = 0.5$, $\beta = 0.3$, $\gamma = 0.2$) are based on theoretical considerations rather than empirical calibration, introducing a degree of subjectivity.
- **Data challenges.** The robustness of the index depends on the quality of administrative and survey data, which may be subject to reporting errors and limited disaggregation.
- **Limited empirical validation.** While preliminary validation was performed, a full-scale empirical application across the Moldovan population has not yet been carried out.

Future refinement of the IBVI could also consider regional socioeconomic disparities, ensuring that policy responses are sensitive to local differences. In addition, weights should be empirically adjusted and validated on the basis of observed data to minimise subjectivity and strengthen the robustness of the index.

The Income-Based Vulnerability Index, based on the concept of the subsistence minimum, takes into account the ratio of individual or household income to the national median income, the share of social transfers and contextual factors such as access to basic services. This index allows for the rapid and accurate identification of population groups at highest risk of social vulnerability, providing a practical tool for designing social policies, allocating resources and continuously monitoring living conditions.

In comparison, the Social Vulnerability Index, widely used in the United States for emergency and public health planning, is based on a broad range of socio-demographic factors (Agency for Toxic Substances and Disease Registry), but does not explicitly include individual income, which limits its applicability to the context of the Republic of Moldova, where income remains the main determinant of vulnerability. The European Union's poverty index provides a useful framework for monitoring poverty and social exclusion at a comparative level (Eurostat); however, for the Republic of Moldova, the methodology needs to be adjusted to local specificities, especially household structure and the labour market.

The results confirm the relevance of the Income-Based Vulnerability Index as a tool adapted to the socioeconomic realities of the Republic of Moldova. Although the IBVI allows for the rapid identification of vulnerable groups based on economic criteria and offers a more targeted perspective than international indices, its applicability may be constrained by the quality of available administrative data. Further development of the index should therefore focus on the inclusion of additional indicators, such as access to education, housing conditions or mental health, while ensuring regular updates to reflect changes in income

structure and living costs. Compared to the Social Vulnerability Index, which is more suitable for macro-level planning, the IBVI has the advantage of focusing directly on household-level needs, but requires continuous refinement to maintain both accuracy and policy relevance.

4. Conclusions

The Income-Based Vulnerability Index (IBVI) represents a methodological tool particularly suitable for the Republic of Moldova, as it reflects the ability of households to meet their basic needs and captures structural risks that are often overlooked by international methodologies. By integrating three dimensions – income positioning relative to the national median, dependence on social transfers, and access to basic services – the IBVI allows for a more nuanced identification of households at risk of social exclusion and poverty.

Compared to the Social Vulnerability Index developed in the United States, which is valuable for macro-level planning in emergency management and public health, the IBVI is better aligned with the Moldovan socioeconomic context, where income and transfer dependency remain the primary determinants of vulnerability. Similarly, while the European Union poverty index (AROPE) provides a robust framework for international monitoring, it requires adjustment to local specificities such as household structure, labour market characteristics, and the role of informal transfers, which limit its direct applicability for policy targeting in Moldova.

The IBVI has the advantage of simplicity and adaptability, relying on accessible national statistics, which makes it a practical tool for policymakers. Preliminary validation has shown consistency between IBVI-based classifications and observed age-specific poverty rates, supporting its potential policy relevance. At the same time, the index faces limitations: the narrow scope of contextual indicators, the subjective nature of weighting coefficients, and the need for more extensive empirical validation.

Future refinement should include broadening the set of indicators to capture multidimensional aspects of vulnerability (e.g., education, housing quality, health, and social capital), recalibrating weights through empirical analysis, and testing the IBVI at regional levels to ensure robustness and comparability with international practices. Periodic updating of the index is essential to reflect rapid changes in income structure, cost of living, and external shocks, such as those experienced during the COVID-19 pandemic and the war in Ukraine.

In conclusion, the IBVI provides a context-sensitive framework that can support evidence-based social policies in Moldova, contributing to more accurate targeting of vulnerable groups and more effective allocation of resources. With further refinement and validation, it can evolve into a reliable national tool for monitoring social vulnerability and guiding inclusive policy development.

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During the preparation of this work the author used ChatGPT (OpenAI) to translate the manuscript from the native language into English and in to improve the language and the clarity of the text. After using this tool/service, the author reviewed and edited the content as needed and take full responsibility for the content of the publication.

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