

BABEŞ-BOLYAI UNIVERSITY IN CLUJ-NAPOCA
FACULTY OF GEOGRAPHY
GEOGRAPHY DOCTORAL SCHOOL

DOCTORAL THESIS
(ABSTRACT)

**GEODEMOGRAPHIC ANALYSIS AND ASSESSMENT
OF POPULATION QUALITY IN THE MOUNTAIN AND
MARGINAL CONTACT AREA OF MUREŞ COUNTY**

PhD supervisor,

Prof. univ. dr. habil. DEZSI ŞTEFAN

Doctoral student,

POP FLORIN

Cluj-Napoca
2026

TABLE OF CONTENTS

INTRODUCTION.....	4
1. THE SCIENTIFIC CONTEXT AND THE STATE OF RESEARCH AT THE NATIONAL AND INTERNATIONAL LEVEL.....	5
1.1. The General Scientific Context of the Proposed Topic	5
1.2. The History of Research in the Study Area	6
1.3. Geographical Location, Territorial Delimitation, and Configuration of the Study Area	7
2. THEORETICAL FOUNDATION AND DELIMITATIONS OF THE CONCEPT OF POPULATION QUALITY IN GEOGRAPHICAL ANALYSIS	9
2.1. Epistemological Considerations Regarding the Concept of Population Quality	9
2.2. Conceptual Delimitations in Relation to Complementary Terms	10
2.2.1. Conceptual Delimitation between Population Quality and Quality of Life	10
2.2.2. Population Quality vs. Human Capital.....	10
2.2.3. Population Quality vs. Human Development Index (HDI).....	11
2.2.4. Population Quality vs. Social Reproduction Capacity	11
2.2.5. Population Quality vs. Social Cohesion.....	11
2.2.6. Population Quality vs. Demographic Sustainability	11
2.3. Definition of the Concept “Population Quality” within Human Geography	12
3. DATA AND MATERIALS USED. RESEARCH METHODOLOGY	13
4. RESULTS AND DISCUSSION	14
4.1. Analysis and Dynamic Evaluation of Population Quality Indicators in the Mountain and Marginal Contact Area of Mureş County	14
4.1.1. Analysis and Evaluation of the Demographic Component of Population Quality.	14
4.1.2. Analysis and Evaluation of Health Indicators - a Fundamental Component of Population Quality.....	17
4.1.3. Education – a key factor in improving population quality.....	18
4.1.4. Culture as an Essential Component of Population Quality	21
4.1.5. The Population Quality Index: Evolution and Measurable Trends	23
4.2. Analysis and Evaluation of Population Quality in the Mountain and Marginal Contact Area of Mureş County, from a Territorial Perspective	24
4.2.1. Analysis and Evaluation of the Demographic Quality of the Population	25
4.2.2. Analysis and Evaluation of Population Health Quality.....	27
4.2.3. Analysis and Evaluation of Population Education Quality	28

4.2.4. Analysis and Evaluation of Population Cultural Index	30
4.2.5. Analysis and Evaluation of the Population Quality Index	32
4.3. Public Policy Proposals and Measures for Improving Population Quality	34
Conclusions	35
SELECTIVE BIBLIOGRAPHY	37

INTRODUCTION

The introductory chapter of the thesis highlights the importance of analyzing population quality in the context of the demographic, economic, and territorial transformations that occurred in Romania after 1990. The transition to a market economy, globalization, and technological progress have generated major changes in the labor market and in the structure of the population, emphasizing the role of human capital as an essential factor of sustainable development. At the same time, declining birth rates, population aging, migration, and territorial disparities have created significant socio-economic vulnerabilities, which require a complex assessment of population quality beyond its numerical dimension.

The paper aims to clarify and substantiate the concept of “population quality” as a multidimensional geodemographic notion situated at the intersection of human geography, demography, and economics. The research integrates four fundamental dimensions of population quality—demographic, health-related, educational, and cultural—considered defining elements in the evaluation of human resources. The study is applied to the mountainous and marginal contact area of Mureș County, analyzing 19 administrative-territorial units, with the purpose of highlighting territorial disparities and the level of development of local communities.

The scientific approach is based on five hypotheses and corresponding objectives, which aim to: define the theoretical and methodological framework of population quality; analyze the evolution of its components during the period 1992–2024; assess territorial disparities among administrative-territorial units; identify territorial typologies through a synthetic population quality index; and formulate public policy measures adapted to local specificities.

The originality of the research lies in the simultaneous integration of the four dimensions of population quality and in the development of a synthetic index capable of objectively expressing its overall level at the local scale. The methodology involves the evolutionary and comparative-territorial analysis of statistical indicators derived from official sources (National Institute of Statistics, Mureș County Directorate of Statistics, National Institute of Public Health), as well as their standardization and aggregation into a model applicable to other regions.

The research results aim to demonstrate that sustainable territorial development depends directly on investment in population quality, which represents the main strategic resource of local communities and of the socio-economic system as a whole.

1. THE SCIENTIFIC CONTEXT AND THE STATE OF RESEARCH AT THE NATIONAL AND INTERNATIONAL LEVEL

1.1. The General Scientific Context of the Proposed Topic

The subchapter “The General Scientific Context of the Proposed Topic” examines the evolution of the concept of “population quality” in the specialized literature, highlighting its transformation from a predominantly biological and quantitative approach into a multidimensional and interdisciplinary one. In the early stages of its development (19th century), the concept was influenced by eugenic theories and biological determinism promoted by authors such as Galton, Pearson, and Fairchild, who associated population quality with hereditary traits such as health, intelligence, and productive capacity. Subsequently, these perspectives were criticized on both ethical and methodological grounds, especially after the ideological compromise of eugenics in the context of the totalitarian regimes of the 20th century.

Beginning with the second half of the 20th century, the specialized literature underwent a paradigm shift, with emphasis moving from biological determinism toward the analysis of human capital and social development. Economists and sociologists such as Schultz, Berelson, Peccei, and Mosk highlighted the importance of education, health, vocational training, and social policies in defining population quality, considering that sustainable development depends directly on the qualitative level of human resources. At the same time, research conducted in the Soviet and Eastern European space analyzed the concept through the lens of the relationships between population, labor, and the socio-economic system, gradually integrating cultural, educational, and health-related dimensions as well.

The subchapter also highlights the close relationship between the notion of “population quality” and the concept of “quality of life,” defined by the World Health Organization as a multidimensional perception of individual and collective well-being. In this context, population quality is interpreted as an expression of a society’s capacity to support economic development, social equity, and community cohesion through the valorization of human capital and social living conditions.

In Romanian literature, the concept is approached in relation to demographic structure, educational level, health status, professional employment, and access to public services. The contributions of Romanian sociologists and demographers such as Zamfir, Vlăsceanu, Rotariu, and Trebici are highlighted, as well as the role of the Research Institute for Quality of Life (ICCV) in the development of studies on quality of life and population quality after 1990.

Based on the critical analysis of both national and international literature, the subchapter formulates an original definition of the concept of “population quality,” understood as “the set of individual and collective characteristics that determine the adaptive, productive, innovative, and reproductive potential of a population and its capacity to contribute sustainably to the development of society.” Thus, the concept is grounded as a multidimensional geodemographic category situated at the intersection of human geography, demography, sociology, economics, and public health.

1.2. The History of Research in the Study Area

This subchapter highlights the main scientific directions and contributions regarding the mountainous and marginal contact area of Mureș County through the critical analysis of geographical and interdisciplinary works developed over time. The consulted studies demonstrate that the analyzed area has been approached predominantly within broader regional or national research frameworks, while relatively few works have been dedicated exclusively to this area at the local or administrative-territorial scale. Most contributions originate from the fields of physical geography, human geography, history, sociology, historical demography, economics, and tourism.

Early research focused mainly on the natural framework of the region, emphasizing the geological structure, relief, climate, hydrography, vegetation, and soils of the contact area between the Transylvanian Depression and the Eastern Carpathians. The works of authors such as Stache, Herbich, David, Mac, Tufescu, and Schreiber contributed to defining the geomorphological and geological characteristics of the Gurghiu and Călimani Mountains, providing the basis for understanding the subsequent social and economic development of the region. Likewise, climatological, hydrological, and biogeographical studies highlighted the particularities of the natural environment and its role in the organization of geographical space.

In the field of human geography and demography, studies analyzed population dynamics, ethnic structure, migratory processes, and the evolution of human settlements in Transylvania and the Eastern Carpathians. The contributions of researchers such as Sabin Manuilă, Ungureanu, Giurcăneanu, Surd, and Ianoș are emphasized, as they addressed issues related to population, urbanization, and the organization of geographical space at both regional and national levels. At the same time, research on rural and urban settlements focused on the

typology, functionality, and evolution of settlement systems, underlining the influence of natural and socio-economic conditions on territorial structure.

The subchapter also highlights the development of research concerning regional economy, agriculture, industry, transportation, and tourism, especially after the Second World War. In recent decades, studies dedicated to tourism, sustainable development, and natural hazards have contributed to a better understanding of the economic potential and vulnerabilities of the mountainous and marginal contact area of Mureș County. In this regard, recent works developed within doctoral theses and research projects concerning tourism valorization, social mobility, demographic dynamics, and natural hazards are mentioned.

However, the analysis of the research history demonstrates the existence of a significant deficit of studies directly dedicated to population quality and its geodemographic components in the analyzed area. In this context, the present research justifies its relevance and originality through the integrated approach of the demographic, educational, health-related, and cultural dimensions of the population, contributing to the completion of a field insufficiently explored in both Romanian and international geographical literature.

1.3. Geographical Location, Territorial Delimitation, and Configuration of the Study Area

The geographical characteristics of the study area are determined by its location in the central-northern part of Romania, in the north-eastern extremity of Mureș County. The study area covers a surface of 1,932 km², representing approximately 28.8% of the total area of Mureș County, and largely overlaps with the upper basin of the Mureș River.

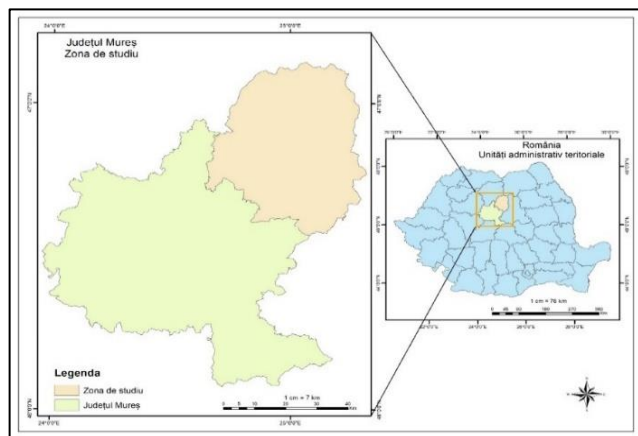


Figure 1. Geographical location of the study area

From a geological and geomorphological perspective, the investigated territory belongs to the morpho-structural units of the eastern Transylvanian Basin and includes both Neogene sedimentary formations and halophilic structures specific to the Transylvanian Subcarpathians, as well as the southern sector of the Călimani Mountains and the western part

of the Gurghiu Mountains, which are components of the volcanic chain of the Eastern Carpathians.

The relief configuration highlights three major sectors: the northern mountainous sector associated with the Călimani Mountains, the eastern sector represented by the Gurghiu Mountains, and the hilly-depressionary Subcarpathian sector in the west and south-west. Within this area, the piedmonts of the Călimani and Gurghiu Mountains, as well as the intracolinar depressions of Vălenii de Mureș, Gurghiu, and Sovata, stand out, being delimited by the Șieu–Sânioara–Sovata diapiric anticlinal axis.

The territorial delimitation of the study area was carried out by correlating administrative-territorial criteria with physical-geographical ones. The northern and north-western boundaries coincide with the administrative borders of Mureș County in relation to Suceava and Bistrița-Năsăud counties, while the eastern boundary follows the line of the highest altitudes bordering Harghita County. The analyzed area includes 19 administrative-territorial units, of which 17 are rural and 2 urban (Reghin and Sovata), totaling 77 villages.

The subchapter emphasizes that the population develops within a well-individualized geographical space characterized by functional and systemic relationships among local communities. These interdependencies contribute to the organization of the territory as a coherent whole, in which demographic dynamics and the level of population quality are influenced both by natural conditions and by the economic and social particularities of the region.

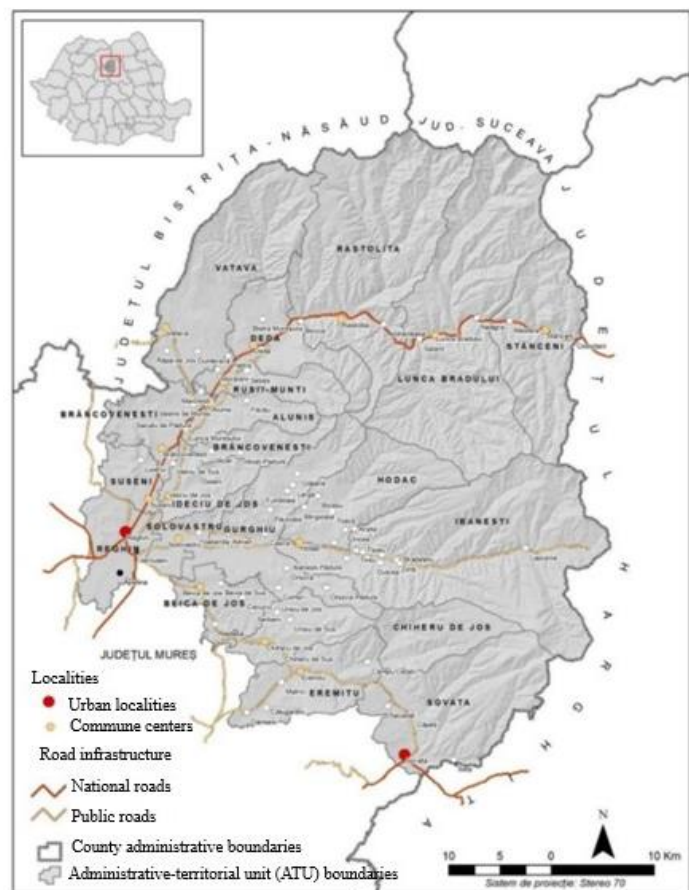


Figure 2. Territorial delimitation and configuration of the study area

2. THEORETICAL FOUNDATION AND DELIMITATIONS OF THE CONCEPT OF POPULATION QUALITY IN GEOGRAPHICAL ANALYSIS

2.1. Epistemological Considerations Regarding the Concept of Population Quality

The analysis, evolution, and conceptual delimitation of the notion of „population quality” highlight its multidimensional and interdisciplinary character, situated at the intersection of human geography, demography, sociology, and economics. The historical origins of the concept are presented, initially marked by deterministic and eugenic approaches that associated the value of a population with genetic heredity, differential fertility, and biological selection. In this context, the research conducted by Francis Galton and Karl Pearson laid the foundation for the idea of the existence of a “superior genetic capital,” later used in demographic control policies and social selection practices.

The paper emphasizes the conceptual transformation that occurred after the Second World War, when the discourse on population quality shifted from biological determinism toward perspectives centered on human rights, reproductive health, education, and human capital. The development of human capital theory, formulated by Theodore Schultz and Gary Becker, contributed to redefining the concept by emphasizing the role of investments in education and health in societal development. Within the contemporary paradigm, population quality is interpreted as the result of the interaction between demographic structures, educational level, health status, professional skills, and the capacity for social and cultural adaptation.

The subchapter also examines the relationship between the concept of population quality and a series of complementary terms grouped into demographic, genetic, medical, ethical-social, and political dimensions. Concepts such as differential fertility, demographic selection, genetic screening, reproductive autonomy, biopolitics, and neo-eugenics are analyzed, highlighting the ethical and social implications generated by new genetic technologies and by the possibility of “optimizing” the population through biomedical interventions.

2.2. Conceptual Delimitations in Relation to Complementary Terms

Furthermore, a conceptual delimitation is made between “population quality” and other terms frequently used in the specialized literature, such as quality of life, human development, human capital, social cohesion, the capacity for social reproduction, and demographic sustainability. It is emphasized that these terms form an interdependent conceptual system in which population quality represents the central core for evaluating human resources and territorial development potential.

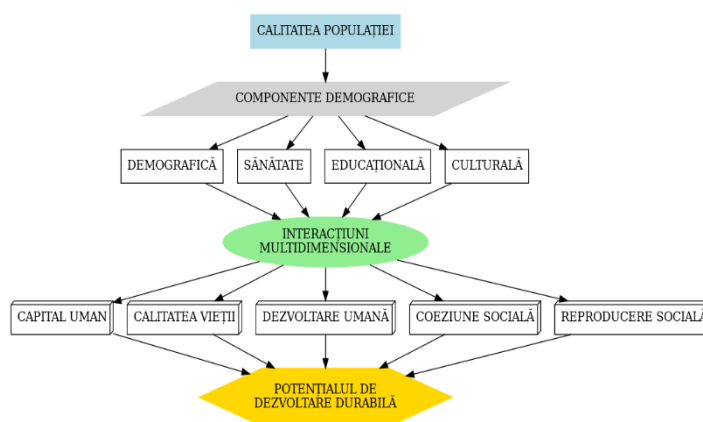


Figure 3. The conceptual structure of population quality and its relationship with complementary terms

2.2.1. Conceptual Delimitation between Population Quality and Quality of Life

Special attention is given to the relationship between population quality and quality of life. Although the two concepts are complementary, they express different dimensions: population quality refers to the intrinsic characteristics of human resources-education, health, demographic structure, skills, and adaptive capacity-whereas quality of life reflects living conditions and the level of individual well-being and satisfaction. At the same time, the study highlights the bidirectional relationship between the two concepts: a well-educated and healthy population contributes to increased social welfare, while a high level of quality of life creates favorable conditions for the development of human capital.

2.2.2. Population Quality vs. Human Capital

Human capital is an economic concept focused on skills, education, and abilities used in the production of economic value. In contrast, population quality has a much broader character, including biological, demographic, cultural, moral, and health dimensions. Human capital represents only one component of population quality, being strictly oriented toward economic efficiency, whereas population quality concerns the overall potential of society. The two concepts are complementary but not equivalent.

2.2.3. Population Quality vs. Human Development Index (HDI)

The Human Development Index (HDI) is a standardized synthetic indicator (life expectancy, education, GDP per capita) used for international comparisons. It reflects only part of the complex reality of population quality. The latter also includes dimensions not captured by the HDI, such as creativity, social cohesion, moral values, or demographic sustainability. Thus, the HDI is a partial measurement tool, while population quality is a much more complex and comprehensive concept.

2.2.4. Population Quality vs. Social Reproduction Capacity

Social reproduction capacity refers to a society's ability to maintain itself over time through biological reproduction, the transmission of human capital, and the functioning of institutions. Population quality represents a necessary but not sufficient condition for this process. The relationship is interdependent: a high-quality population supports social reproduction, while its failure may lead to demographic and social decline.

2.2.5. Population Quality vs. Social Cohesion

Social cohesion expresses the level of solidarity, trust, and integration among members of society. Unlike population quality, which describes individual characteristics, cohesion refers to the relationships between individuals. There is a bidirectional relationship: a high-quality population fosters social cohesion, while a cohesive society supports the development of population quality.

2.2.6. Population Quality vs. Demographic Sustainability

Demographic sustainability reflects a population's ability to maintain itself over the long term through a balance between fertility, mortality, migration, and age structure. Population quality influences this sustainability through demographic behaviors and levels of human development. In turn, demographic sustainability provides the necessary framework for maintaining a high-quality population. The relationship is reciprocal and essential for long-term sustainability.

In conclusion, the subchapter conceptually establishes population quality as an essential analytical tool in population geography and territorial development studies, arguing for its distinct treatment in contemporary research and in the formulation of public policies oriented toward sustainable development.

2.3. Definition of the Concept “Population Quality” within Human Geography

In the context of globalization and current demographic, economic, and technological transformations, the concept of “population quality” acquires strategic importance within human geography, being used to assess the adaptive, productive, innovative, and reproductive potential of human resources. It reflects an integrative and multidimensional approach to population, moving beyond a strictly quantitative analysis and focusing instead on the structures, capacities, and territorial disparities of human resources.

From an epistemological perspective, population quality is situated within the field of population geography, as part of human geography, contributing to the understanding of spatial distribution and territorial variations of human and social capital. Contemporary demographic changes, such as population aging, declining fertility, and increasing mobility, require a shift from quantitative population analysis toward qualitative assessment, as an indicator of territorial sustainability.

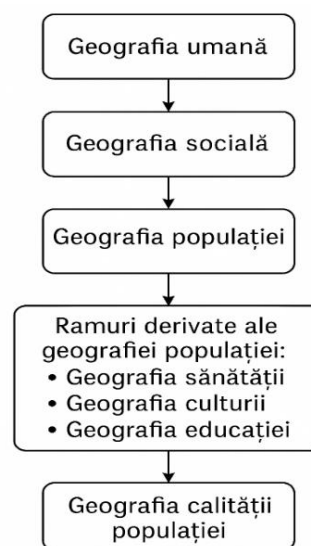


Figure 4. Conceptual and methodological structure (after Suvac, 2020)

In this research, population quality is defined as the set of individual and collective characteristics that determine a population’s capacity to respond to the requirements of modern society and to contribute sustainably to its development. The concept is operationalized through four main components: demographic, health-related, educational-professional, and cultural. The demographic component reflects the structural and reproductive balance of the population, the health component expresses health status and functional capacity, the educational component refers to the level of training and cognitive capital, and the cultural component highlights integration and participation in the social-symbolic sphere.

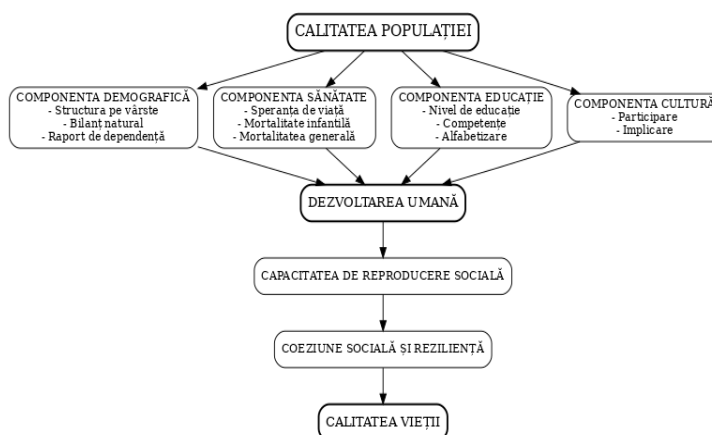


Figure 5. Conceptual model of the structuring of population quality components.

The analysis of these dimensions, through specific indicators, allows for the construction of a complex profile of population quality, relevant for assessing territorial development and supporting public policy formulation. In this sense, population quality becomes an essential analytical tool for understanding social and demographic dynamics, particularly in the current context of demographic imbalances and socio-economic crises.

In conclusion, population quality represents a dynamic and integrative concept situated at the intersection of human geography, demography, and social sciences, marking the transition from quantitative population analysis to the assessment of its functional human potential. It constitutes both a variable dependent on systemic conditions and an active variable in shaping regional development and social sustainability.

3. DATA AND MATERIALS USED. RESEARCH METHODOLOGY

The analysis and assessment of population quality represent a complex interdisciplinary approach situated at the intersection of human geography, demography, sociology, economics, and medical sciences, aiming to identify and interpret human resources in a multidimensional framework. In the present study, population quality is conceptualized as an integrative construct that goes beyond the strictly quantitative dimension of population, including both structural demographic indicators (size, age structure, dependency ratio) and essential qualitative characteristics (health status, level of education, professional capacity, cultural participation, and social integration).

The methodological foundation of the study is based on a quantitative-analytical and spatial-integrative approach, specific to population geography, combining statistical analysis, geographical interpretation, and socio-demographic modelling. The database used consists of official national and international sources (National Institute of Statistics, Ministry of Health, Ministry of Education and Research, Mureş County Directorate of Statistics, Organisation for Economic Co-operation and Development, Eurostat, United Nations Development Programme), complemented by derived datasets and constructed indicators for the period 1992–2024. These were standardized and aggregated into structural indices corresponding to the main components of population quality: demographic, health, educational, and cultural.

The research methodology included successive stages of data collection and validation, statistical processing, evolutionary analysis, indicator correlation, and predictive modelling. The analysis was further supported by the use of Geographic Information Systems (GIS), comparative and longitudinal methods, as well as multivariate analysis techniques

(including PCA and cluster analysis), with the aim of highlighting spatial disparities and territorial typologies of population quality.

For quantification purposes, indicators were normalized on a 0-1 scale using the min-max method and subsequently aggregated into composite indices for each analyzed dimension. The general Population Quality Index (I_{pc}) was calculated as the arithmetic mean of the partial indices (demographic, health, educational, and cultural), enabling inter-territorial comparability and temporal evolution analysis. Dynamic relationships between variables were investigated using simple linear regression models (Ordinary Least Squares - OLS), as well as demographic projections supported by alternative evolutionary scenarios, applying the ARIMA (Auto-Regressive Integrated Moving Average) time series model.

The research results were translated into cartographic representations and spatial analyses, highlighting significant territorial disparities and differentiated structures of population quality at the level of the analyzed administrative-territorial units. Methodological limitations related to data availability and comparability, the multidimensional complexity of the phenomenon, and the difficulty of integrating heterogeneous indicators were also identified and addressed through methodological triangulation and cross-source validation.

Overall, the study confirms that the analysis of population quality requires an integrated approach capable of correlating demographic, social, educational, and cultural dimensions within a coherent spatial and temporal interpretative framework. Population quality thus emerges as a synthetic indicator of territorial human potential and as a relevant operational tool for public policy formulation, regional development planning, and demographic sustainability assessment.

4. RESULTS AND DISCUSSION

4.1. Analysis and Dynamic Evaluation of Population Quality Indicators in the Mountain and Marginal Contact Area of Mureș County

4.1.1. Analysis and Evaluation of the Demographic Component of Population Quality

The analysis of the demographic component of population quality shows that it represents the functional foundation of demographic assessment, integrating indicators such as birth rate, mortality rate, natural increase, age structure, demographic dependency ratio,

and ageing index, whose evolution allows for the assessment of long-term population sustainability.

The results indicate a progressive structural deterioration of demographic dynamics in the study area during the period 1992-2024, characterized by a sharp decline in birth rates and relatively stable mortality levels, which led to a persistent negative natural balance, significantly accentuated after

2010 and reaching a minimum during the COVID-19 pandemic. The evolution of this indicator confirms the transition from a balanced demographic dynamic to a regressive one, with direct implications for population renewal.

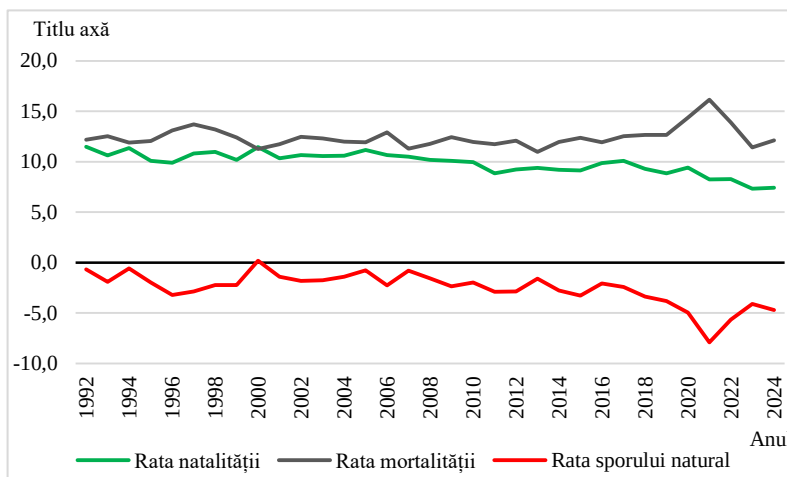
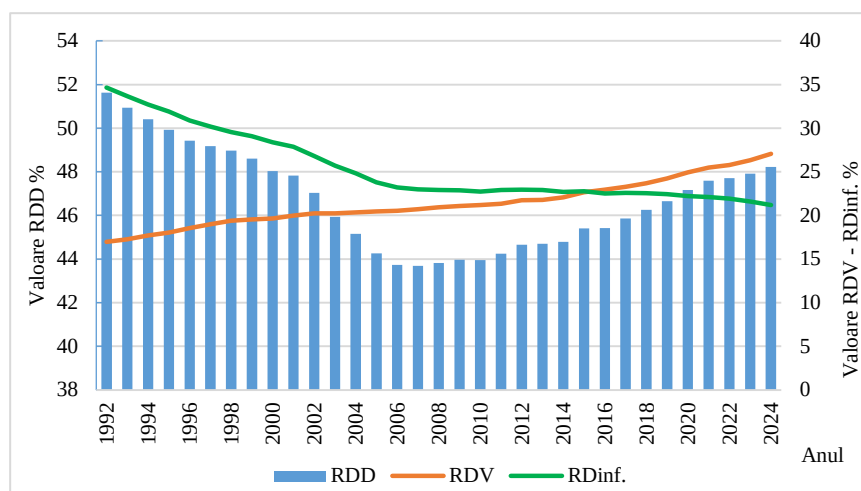


Figure 6. Evolution of birth rate, mortality rate, and natural increase in the study area, in relative values, during the period 1992-2024

The age structure reveals an advanced process of demographic ageing, manifested through a significant decrease in the share of the young population (0-14 years) and a continuous increase in the elderly segment (65+ years). These changes reflect declining fertility, selective external migration of young people, and increasing life expectancy. Consequently, the demographic ageing index has increased considerably, exceeding thresholds specific to an aged population, confirming that the study area has entered an advanced stage of the demographic transition.

The demographic dependency ratio indicates a reversal of the favorable trend observed in the early decades of the analysis, from a reduction in pressure on the working-age population (1992-2007) to a constant increase after 2008, mainly driven by the growing share of the elderly population and the shrinking young population. As a result, pressure on pension systems, healthcare, and social assistance services is increasing, while the base of the working-age population is contracting.

Figure 7. Evolution of demographic dependency ratios in the study area, 1992-2024



The regression analysis of the demographic ageing index confirms the existence of a moderate structural inertia ($R^2 = 0.2785$), suggesting that demographic imbalances have a persistent component over time, but are also significantly influenced by recent factors such as migration, socio-economic development disparities, and changes in reproductive behavior.

The demographic development index shows an overall downward trend, indicating a reduced capacity for demographic regeneration and an increasing instability of the population system. The low values of this index confirm a deficit of young and active population, which negatively affects the demographic and socio-economic sustainability of the study area (Figure 8).

In conclusion, the demographic component of population quality reveals an accelerated ageing process and relative depopulation, driven by declining fertility, external migration, and increasing life expectancy. These transformations generate increased pressure on social and economic systems and require the implementation of integrated policies aimed at stimulating fertility, reducing external migration, and adapting socio-economic structures to new demographic realities.



Figure 8. Evolution of the demographic development index in the study area, 1992-2024

4.1.2. Analysis and Evaluation of Health Indicators - a Fundamental Component of Population Quality

The analysis of objective health indicators in the study area highlights the essential role of health as a fundamental dimension of population quality and human capital. The research focused on the main demographic health indicators-general mortality, infant mortality, and life expectancy at birth-analyzed for the period 1992-2024 based on official data provided by the National Institute of Statistics, the National Institute of Public Health, and the Ministry of Health. The results confirm the existence of persistent territorial disparities between urban and rural areas, as well as between mountainous and marginal contact zones, generated by demographic, socio-economic, and healthcare accessibility factors.

General mortality reveals a structural gap to the disadvantage of rural areas and mountainous zones, where values have remained consistently higher than in urban areas. This situation reflects pronounced demographic ageing, difficult access to specialized medical services, insufficient healthcare infrastructure, and socio-economic vulnerabilities specific to peripheral areas. The COVID-19 pandemic amplified these differences, generating significant excess mortality during 2020-2022 and highlighting the fragility of the healthcare system in the face of external shocks.

Infant mortality, considered one of the most sensitive indicators of socio-economic development and healthcare system efficiency, recorded a significant decline over the entire analyzed period. The reduction of this indicator reflects the modernization of medical infrastructure, the expansion of vaccination programs, and the improvement of maternal and child healthcare services. Nevertheless, rural areas continue to present higher values than urban areas, indicating the persistence of structural vulnerabilities related to access to healthcare services and local socio-economic conditions.

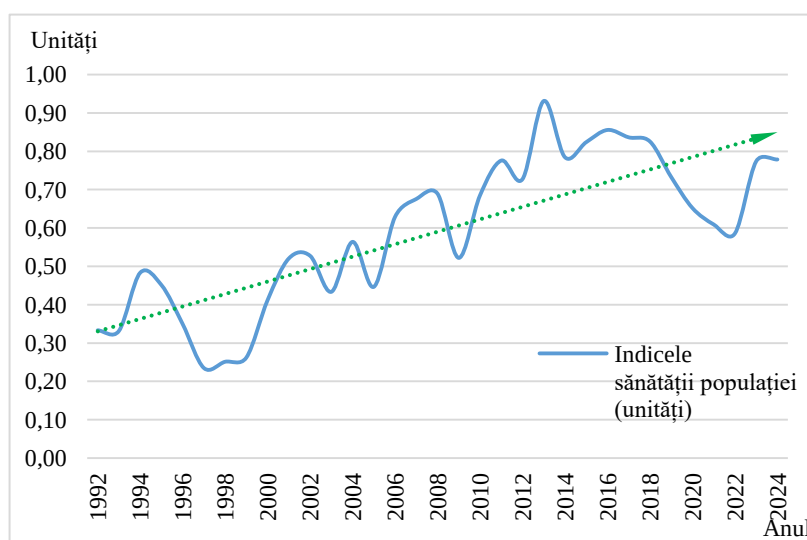
Life expectancy at birth showed an overall upward trend, increasing from approximately 69-70 years in the early 1990s to over 76 years in 2024. This growth reflects reduced mortality, improved treatment of chronic diseases, and a general increase in living standards. At the same time, the analysis reveals a persistent gender gap, with female life expectancy consistently higher than that of males, a difference explained by biological and behavioral factors, as well as a higher prevalence of risk behaviors among men.

The analysis of causes of death confirms the epidemiological transition in the study area, characterized by a decline in infectious diseases and an increasing share of non-communicable chronic diseases, especially tumors and neurodegenerative conditions. While

in 1992 cardiovascular diseases represented the leading cause of death, in 2024 there is a marked increase in mortality associated with tumors and nervous system disorders, a phenomenon linked to population ageing and lifestyle changes.

For a synthetic assessment of population health status, a population health index was constructed as the arithmetic mean of structural indices for general mortality, infant mortality, and life expectancy. The evolution of this index highlights four distinct stages: a period of decline and instability in the 1990s, a phase of recovery and modernization after 2000, a stage of consolidation and convergence toward European standards between 2010 and 2020, and a crisis period followed by recovery after 2022. The overall trend is positive, with the health index increasing significantly by 2024; however, the fluctuations caused by the COVID-19 pandemic demonstrate the vulnerability of the healthcare system and the need to strengthen its resilience.

Figure 9. Evolution of the population health index in the study area, 1992–2024



In conclusion, the analysis of objective health indicators confirms a gradual improvement in the health-related quality of the population in the study area over the last three decades, but also the persistence of significant territorial and social inequalities. The results highlight the need for public policies aimed at reducing urban–rural disparities, strengthening healthcare infrastructure, increasing access to preventive services, and improving the resilience of the healthcare system, in order to support sustainable development and enhance population quality.

4.1.3. Education – a key factor in improving population quality

Education represents one of the fundamental dimensions of population quality and human capital development, directly influencing health, economic productivity, social cohesion, and demographic behavior. The specialized literature highlights that the effects of

education go beyond the simple accumulation of years of schooling, emphasizing instead the importance of acquired competencies, the reduction of inequalities, and the adaptability of the education system to contemporary economic and technological transformations. In this context, education contributes both to individual development and to increasing societal competitiveness and sustainability, constituting a decisive factor of human development and population quality.

The analysis conducted for the mountainous and marginal contact area of Mureș County highlights the profound impact of demographic decline and educational reforms on the school network and school-age population during the period 1992-2024. Statistical data indicate a drastic reduction in the number of legally established educational units, from 179 units in 1992 to 32 in 2024 (-82.12%), a phenomenon driven by declining birth rates, external and internal migration, population ageing, and the administrative reorganization of the education system. The process of school consolidation and centralization, intensified after 2000 through the introduction of per-student financing and new legislative regulations, has particularly affected rural areas, where numerous schools were transformed into subordinate structures or closed entirely.

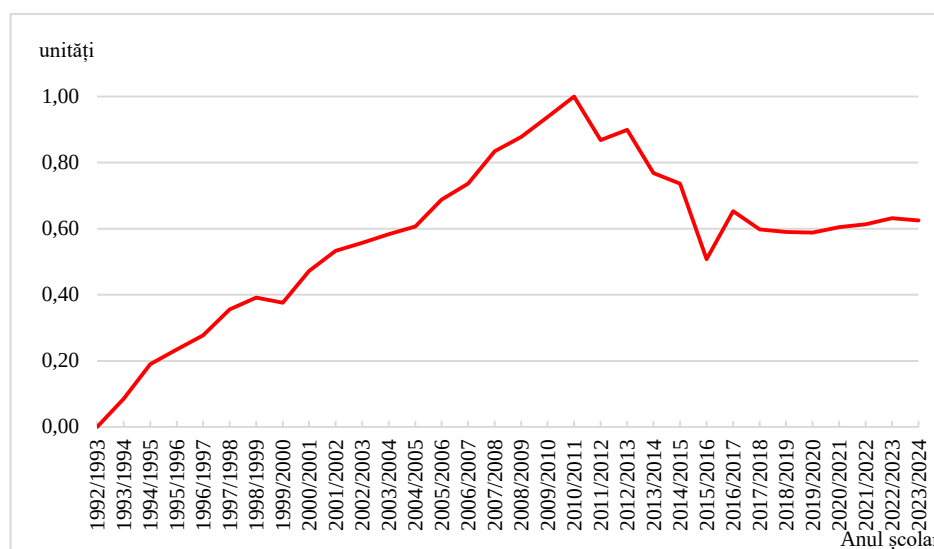
In parallel, the school-age population recorded a more moderate decline, from 19,327 students in 1992 to 13,883 in 2024 (-28.17%), highlighting a major discrepancy between the rate of reduction of the student population and that of the school network. This difference demonstrates that institutional restructuring was not determined exclusively by demographic dynamics, but also by administrative and financial criteria aimed at efficiency. The analysis by residence environment reveals an increased vulnerability of rural areas, where the reduction of educational infrastructure has led to longer commuting distances, dependence on school transport, and the emergence of “educational deserts,” characterized by limited access to quality education and the widening of territorial inequalities.

Statistical modelling using linear and polynomial regression confirms the existence of a structural demographic decline in the school-age population, with an average loss of approximately 207 students per year, with a more severe relative impact in rural areas. At the same time, the analysis of the student-per-school ratio highlights the institutional consolidation of the education network: the average number of students per unit increased from approximately 110 in the 1990s to over 430 after 2018, as a result of school mergers and the concentration of students in urban educational centers.

Regarding educational indicators of population quality, analysis of gross enrollment rates reveals high participation at compulsory levels (primary and lower secondary

education), but also a marked decline in participation at upper secondary, vocational, and post-secondary levels. While early childhood and compulsory education benefit from relatively high coverage, the transition to higher levels is marked by increasing school dropout rates and structural vulnerabilities, particularly in rural areas. The very low participation rate in pre-primary education and the modest enrollment in vocational and post-secondary education reflect the persistence of significant territorial and social disparities.

Figure 10. Evolution of the education quality index in the study area, 1992-2024



Evolution of gross enrollment rates in upper secondary, vocational, and post-secondary education shows an expansion phase up to around 2010-2012, followed by a decline and then a relative stabilization, influenced by demographic, socio-economic, and institutional factors. The reduction of the school-age population, external migration, restructuring of the educational network, and limited accessibility of school infrastructure in rural areas have all contributed to decreasing school participation, especially at upper secondary and vocational levels.

Territorial disparities are accentuated by the concentration of educational infrastructure in urban centers, while rural and mountainous localities have a limited and insufficiently diversified educational offer. These differences are reflected both in low enrollment rates in vocational and post-secondary education and in lower values of school life expectancy for certain vulnerable population groups. At the same time, the reintroduction of dual vocational education and dropout reduction programs have had moderate positive effects, without managing to recover the levels reached during the peak period of educational expansion.

The analysis of school life expectancy confirms the existence of an educational cycle characterized by expansion (1992-2010), decline (2011-2016), and stabilization (after 2017),

an evolution reflecting the cumulative impact of educational reforms, the economic crisis, and demographic transformations. The increase in school life expectancy and the education index up to around 2010 suggests a strengthening of human capital and expanded access to education, while the subsequent decline highlights the vulnerability of the rural and mountainous education system to socio-economic changes and reduced institutional resources.

The education index reveals a non-linear trajectory influenced by European integration processes, regional development policies, and the adaptive capacity of local communities. The relative stabilization of the indicator after 2016 demonstrates a certain degree of local educational resilience; however, territorial disparities and limited access to higher levels of education continue to affect the competitiveness and social cohesion of the region.

Overall, the research results confirm that the restructuring of the school network, the decline in the school-age population, and the educational level of the population are the cumulative expression of demographic, economic, and institutional transformations in post-1990 Romania and represent one of the key factors of territorial development and population quality in the mountainous and marginal contact area. Although reorganization policies aimed at improving efficiency and educational quality, they have produced significant side effects on accessibility and educational equity, particularly in rural and marginal communities.

The strengthening of human capital requires integrated policies aimed at reducing urban–rural disparities, modernizing educational infrastructure, diversifying vocational and post-secondary training, and encouraging school participation in vulnerable communities. In the absence of coherent and sustainable interventions, negative demographic trends and persistent educational inequalities may intensify processes of marginalization and depopulation in the Mureș mountainous area.

Consequently, education remains a strategic factor for improving population quality, and the development of differentiated public policies focused on reducing territorial disparities, supporting early education, combating school dropout, and strengthening educational infrastructure is essential for sustainable development and socio-territorial cohesion of the analyzed communities.

4.1.4. Culture as an Essential Component of Population Quality

This subchapter analyzes culture as a fundamental dimension of population quality, arguing that it must be assessed alongside demographic, educational, and health indicators. Culture is conceptualized as an expression of cultural and social capital, influencing health

behaviors, civic participation, social cohesion, and sustainable development. Based on theoretical and empirical perspectives, the study highlights that cultural participation contributes to the development of cognitive competencies, the strengthening of cultural identity, and the enhancement of community resilience.

For the assessment of the cultural dimension of the population in the study area, two main indicators were used: the number of library users per capita and the number of museum visitors relative to population, for the period 2005-2024. The analysis reveals a pronounced decline in library usage, both in urban and especially in rural areas, a phenomenon explained by accelerated digitalization, migration, population ageing, underfunding of cultural infrastructure, and changing patterns of cultural consumption. Rural libraries face chronic underuse, reflecting the cultural marginalization of rural space and the widening of territorial disparities.

In contrast, participation in museum activities increased until the 2016-2019 period, supported by the development of cultural tourism and interest in local heritage, followed by a sharp decline in the context of the COVID-19 pandemic. Museums are considered indicators of institutionalized cultural capital and active cultural participation, but their predominantly urban distribution limits access for rural populations to such activities.

Based on the two indicators, a composite cultural index was constructed, used to assess the “cultural quality” of the population. Its evolution highlights four main stages: a period of cultural consolidation and high participation (2005-2011), a phase of adjustment and moderate cultural transformation (2012-2016), a pronounced decline and cultural crisis associated with the pandemic (2017-2021), and a slow but incomplete recovery after 2021.

The overall trend is a downward one, with the cultural index decreasing significantly by 2024, reflecting a reduction in institutionalized cultural participation and a redefinition of the population’s cultural behavior.

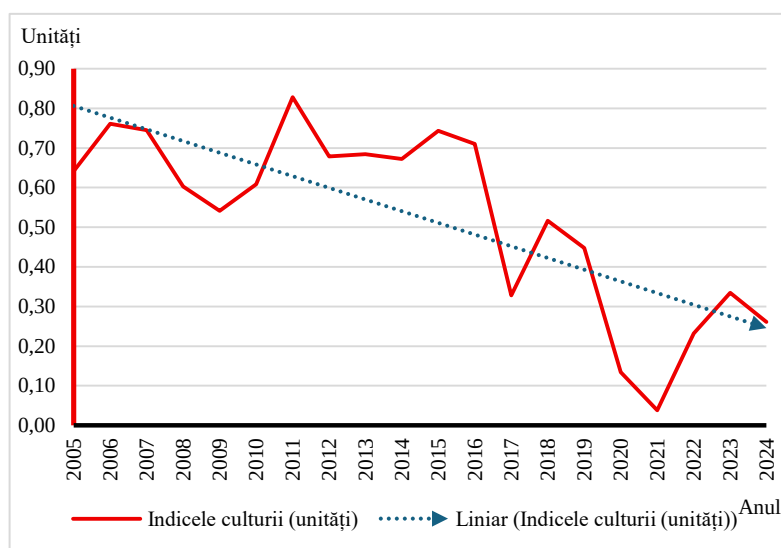


Figure 11. Evolution of the cultural index in the study area, 2005-2024

The conclusions emphasize that the cultural level of the population is influenced by demographic, economic, social, and technological factors, while cultural infrastructure plays a key role in the development of cultural capital and social cohesion. In this context, strategic directions are proposed, such as the modernization of libraries and museums, the expansion of digital access, the promotion of cultural participation among young people, and the integration of cultural policies into sustainable development strategies. Thus, culture is defined as a complex indicator of socio-cultural resilience and of the community's capacity to preserve and valorize its identity resources within a continuously changing social context.

4.1.5. The Population Quality Index: Evolution and Measurable Trends

The Population Quality Index was constructed as a composite index resulting from the integration of four fundamental dimensions of human development: demographic development, health, education, and culture. It was calculated for the period 2005–2024 using the arithmetic mean of the composite indices corresponding to each dimension, given that the availability of statistical data on the cultural component allowed analysis only starting from 2005. Thus, the index provides a synthetic assessment of the qualitative level of the population in the study area, reflecting the interdependence between demographic, social, educational, and cultural components of human capital.

The analysis of its evolution reveals values ranging from a minimum of 0.37 in 2021 to a maximum of 0.72 in 2011, with an average of 0.586 over the period, indicating a medium level of population quality. Its dynamics show distinct stages of evolution, marked by periods of consolidation, decline, and partial recovery.

During the 2005-2011 interval, an upward trend is observed, associated with post-transition socio-economic stabilization processes, expanded access to education and healthcare services, reduced infant mortality, and increased life expectancy. This period represents the phase of maximum consolidation of population quality, although fluctuations recorded between 2007 and 2009 highlight persistent vulnerabilities driven by external migration, economic instability, and declining fertility.

The 2012-2019 period is characterized by a moderate decline, driven by the intensification of demographic ageing, declining birth rates, the emigration of young active population, and reduced cultural and civic participation. These processes contributed to the weakening of human capital and the widening of disparities between urban and rural areas, reflecting increasingly visible socio-demographic tensions within the study area.

Between 2020 and 2024, the evolution of the index is significantly influenced by the impact of the COVID-19 pandemic, which generated the lowest level of population quality in the entire analyzed series. Health restrictions, limited access to educational and medical services, deterioration of health status, and the amplification of socio-territorial disparities led to a sharp contraction of the index in 2021. Subsequently, a slow recovery is observed, supported by investments in health, education, and digital infrastructure; however, values remain below pre-pandemic levels.

Overall, the evolution of the Population Quality Index highlights a generally downward trajectory after 2011, suggesting the existence of a structural imbalance among the demographic, social, and cultural components of the population. Based on the recorded values, three main levels of “quality status” can be identified: a period of medium to high and consolidated quality (2005-2011), a phase of medium quality in decline (2012-2019), and a period of low quality, but with recovery potential (2020-2024).

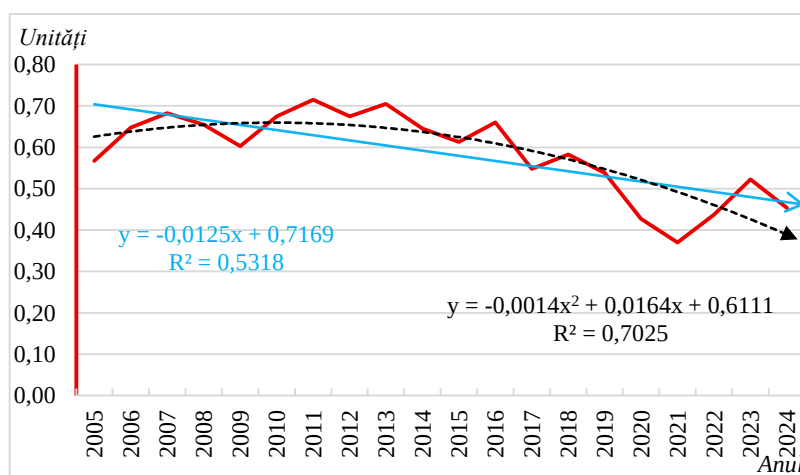


Figure 12. Evolution of the Population Quality Index in the study area, 2005-2024

The results confirm the integrative nature of the Population Quality Index, which cumulatively reflects the level of education, health, cultural participation, and demographic stability. At the same time, the analysis demonstrates that economic transformations, external migration, and socio-territorial vulnerabilities directly influence the quality of human resources, especially in mountainous and marginal contact regions. In this context, the strengthening of human and social capital through integrated public policies becomes an essential condition for supporting sustainable development and reducing territorial disparities.

4.2. Analysis and Evaluation of Population Quality in the Mountain and Marginal Contact Area of Mureș County, from a Territorial Perspective

The territorial analysis and evaluation of population quality in the mountain and marginal contact area of Mureș County was carried out with the aim of understanding socio-demographic differences and the mechanisms generating them. In the context of major

structural transformations-population ageing, rural-urban and external migration, economic restructuring, and functional changes in space-population quality becomes an essential indicator for substantiating local and regional sustainable development strategies.

The territorial study proposes a multidimensional approach to population quality at the level of administrative-territorial units (ATUs), integrating demographic, educational, health, and cultural dimensions, correlated with determining factors such as infrastructure, accessibility, and public policies. The analyzed space is characterized by significant territorial disparities, generated by geographical, historical, and socio-economic particularities that influence the distribution of human capital and the overall level of development.

4.2.1. Analysis and Evaluation of the Demographic Quality of the Population

The analysis and evaluation of the demographic quality of the population in the mountain and marginal contact area of Mureș County is based on a set of fundamental indicators-the natural increase rate, the total demographic dependency ratio, and the elderly-to-young dependency ratio-subsequently integrated into a composite demographic development index. Methodologically, these indicators were standardized and transformed into structural indices referenced to a benchmark value of 1, calculated for all administrative-territorial units (ATUs) and mapped for the reference years 1992 and 2024, allowing for a comparative evolutionary and spatial analysis over more than three decades.

The results highlight significant territorial differences, confirming the existence of an accentuated demographic polarization within the studied area. Most ATUs recorded substantial declines in the demographic development index in 2024 compared to 1992, reflecting processes of depopulation, demographic ageing, and net negative migration. The most affected units are Stânceni, Brâncovenеști, and Rușii-Munți, where the decline exceeds 70–80%, indicating a severe deterioration of population structure, correlated with the loss of traditional economic functions, reduced accessibility, and the out-migration of young people toward urban centers or abroad.

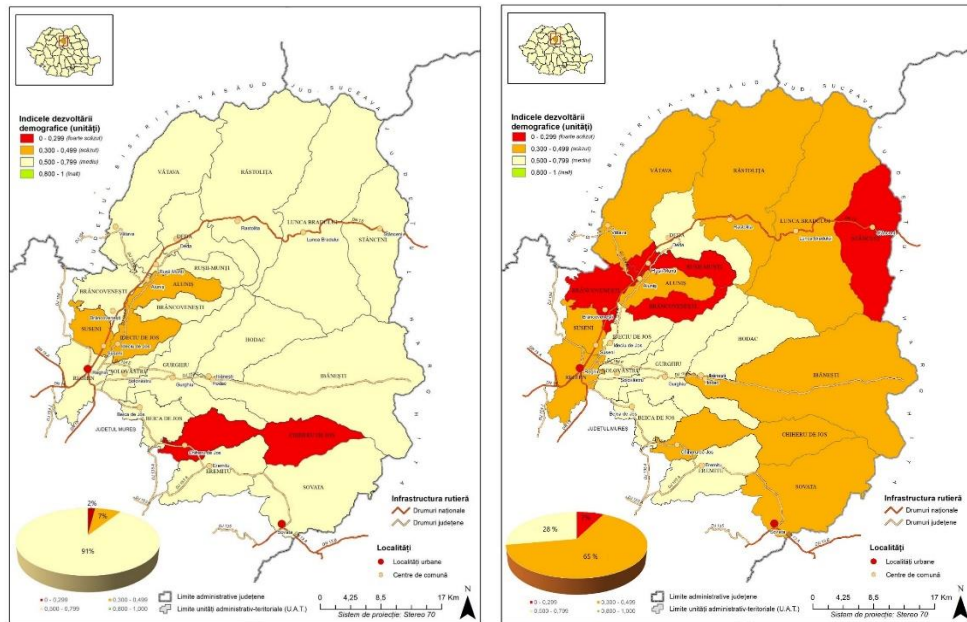


Figure 13. Typology of administrative-territorial units in the study area according to the demographic development index, 1992 and 2024

In contrast, a limited number of administrative-territorial units-such as Chiheru de Jos, Ideciu de Jos, Beica de Jos, Solovăstru, Eremitu, and Deda-record positive or relatively stable dynamics, suggesting the existence of local demographic resilience nuclei. These are associated with a set of favorable factors such as the diversification of economic activities, proximity to transport corridors, agricultural or tourism potential, and in some cases, stronger community cohesion and a more favorable initial demographic structure. In urban areas (Reghin and Sovata), although a downward trend persists, the decline is more moderate compared to rural areas, due to economic diversification and better access to public services.

The comparative analysis between 1992 and 2024 highlights a profound restructuring of the demographic system, characterized by a break in continuity and a weak dependence between initial and current index values. Regression results ($R^2 \approx 0.02$) confirm that the demographic structure in 1992 explains only a negligible proportion of subsequent evolution, indicating a deep territorial reorganization of the population driven by post-socialist transition, external migration, deindustrialization, and accelerated demographic ageing.

From a spatial perspective, a clear polarization is observed between ATUs located near transport corridors and urban centers, which show relative demographic stability, and peripheral mountainous ATUs, characterized by severe demographic decline. This distribution confirms the decisive role of accessibility, functional connectivity, and economic diversification in maintaining demographic balance.

Overall, the mountain and marginal contact area of Mureș County fits the pattern of European regions experiencing demographic decline, characterized by loss of working-age population, accelerated ageing, and reduced regenerative capacity. However, the existence of local exceptions indicates the potential for resilience models based on local economic development, resource valorization, and improved territorial integration.

In conclusion, the demographic quality of the population reflects a general trend of structural regression with direct implications for regional development sustainability. The results highlight the need for territorially differentiated public policies aimed at revitalizing demographic capital, stimulating the local economy, improving accessibility, and strengthening public services. Only through integrated and locally adapted interventions can demographic degradation be counteracted and a sustainable development trajectory ensured for the analyzed mountainous and marginal area.

4.2.2. Analysis and Evaluation of Population Health Quality

The analysis of the population health index in the mountain and marginal contact area of Mureș County highlights significant transformations during the period 1992-2024, reflecting the combined influence of demographic, socio-economic, and accessibility factors on the population's health status. The index, constructed based on indicators such as life expectancy and mortality rates, reveals important territorial differences among administrative-territorial units, with values ranging from high levels (close to 1) to vulnerable situations (below 0.5).

From an evolutionary perspective, four main patterns can be identified: relative stability (e.g., Reghin, Gurghiu, Solovăstru), moderate increases (e.g., Sovata, Deda, Eremitu, Ibănești), strong increases in specific cases (e.g., Rușii-Munți, starting from a very low baseline), and a decline in certain ATUs (e.g., Aluniș, Răstolița, Suseni, Stânceni), associated with depopulation, demographic ageing, shortage of medical personnel, and limited access to healthcare services. Overall, a sanitary polarization is observed between urban and touristic areas with more developed medical infrastructure and isolated rural mountainous areas characterized by persistent vulnerabilities.

Comparative cartographic analysis between 1992 and 2024 indicates a partial sanitary convergence trend, expressed through the reduction of areas with very low index values and the expansion of medium and high classes, as a result of healthcare infrastructure modernization, improved accessibility, and the implementation of public health programs.

Nevertheless, territorial disparities remain significant, highlighting the persistence of structural gaps between center and periphery.

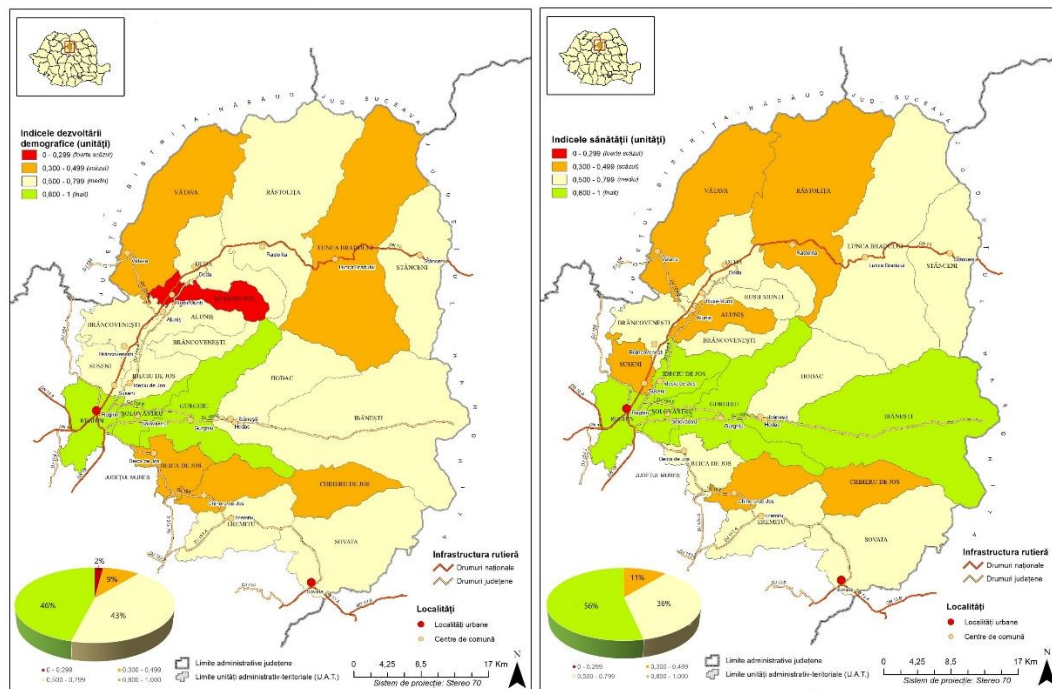


Figure 14. Typology of administrative-territorial units in the study area according to the health index, 1992 and 2024

The linear regression model indicates a moderate relationship between the 1992 and 2024 values ($R^2 = 0.375$), suggesting partial convergence but also the significant influence of exogenous factors such as local investments, healthcare infrastructure, and differentiated public policies. The results confirm that the evolution of the health index is determined not only by structural legacy, but mainly by the recent dynamics of territorial development.

In conclusion, the evolution of the health index highlights a mixed pattern of convergence and polarization: on the one hand, significant improvements in some administrative-territorial units, and on the other hand, the persistence of areas with high vulnerability. The mountain and marginal contact area of Mureș County remains characterized by territorial health inequalities, which calls for integrated policies aimed at developing medical services, improving accessibility, and aligning health interventions with regional sustainable development strategies.

4.2.3. Analysis and Evaluation of Population Education Quality

The analysis of population education quality in the mountain and marginal contact area of Mureș County highlights significant structural transformations during the period 1992-

2024, reflecting a strongly differentiated territorial dynamic between urban and rural environments. The study uses a composite education index based on school enrollment rates and expected years of schooling, with the evaluation conducted through temporal comparisons, simple linear regression models, and GIS-based cartographic analysis.

The results indicate a pronounced educational polarization at the level of administrative-territorial units. The municipality of Reghin emerges as the main regional educational pole, recording a significant increase in the education index and reaching the maximum value in 2024, supported by diversified educational infrastructure and the concentration of educational functions. Moderate but positive developments are observed in Sovata and Deda, while most rural ATUs show significant declines in the education index, with some communes affected by severe educational decline (e.g., Ideciu de Jos, Stânceni, Solovăstru, Suseni).

Educational decline in rural areas is correlated with negative demographic processes such as depopulation, youth outmigration, and population ageing, as well as with the restructuring of the school network and reduced accessibility to educational services. At the same time, some ATUs show partial resilience or stagnation, but without significant recovery dynamics.

The linear regression model highlights a positive relationship between the educational level in 1992 and that in 2024, confirming the hypothesis of path dependence. However, the moderate coefficient of determination indicates that a significant portion of variation is driven by post-1990 structural factors such as migration, educational policies, and socio-economic transformations. Residual analysis reveals significant differences between ATU performance, with overperformance in urban centers and underperformance in peripheral rural areas.

Overall, the study highlights the consolidation of an educational polarization model in which urban centers strengthen their role as educational poles, while the rural, mountainous, and marginal areas experience an erosion of educational capital. This dynamic contributes to the deepening of territorial disparities and the weakening of regional socio-economic cohesion.

The main conclusion emphasizes the need for differentiated public policies aimed at reducing educational gaps through the strengthening of rural school infrastructure, the support of human resources in education, and the adaptation of educational services to territorial specificities, in order to support the sustainable development of vulnerable areas.

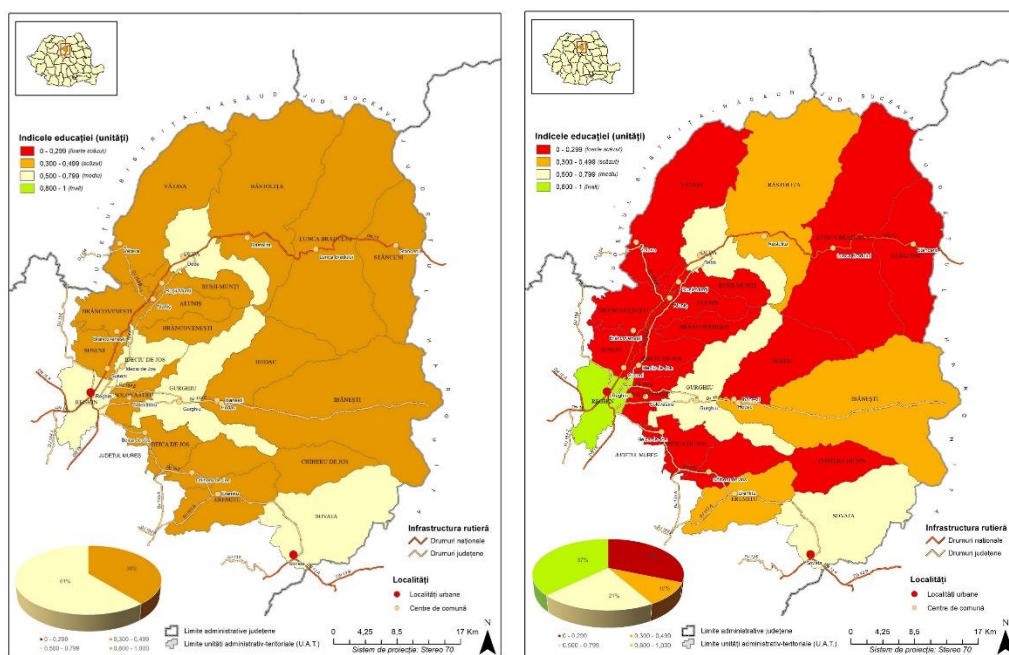


Figure 15. Typology of administrative-territorial units in the study area according to the education index, 1992 and 2024

4.2.4. Analysis and Evaluation of Population Cultural Index

The analysis of the population cultural index highlights the cultural capital dimension as an essential component of population quality and territorial development, particularly in the mountainous and marginal contact areas of Mureș County. It is conceptualized as a composite indicator of participation in cultural activities, access to cultural infrastructure, heritage preservation, and community cohesion, playing a decisive role in strengthening the cognitive and social capital of the population.

Methodologically, the evaluation is based on two main indicators-number of library users and number of museum visitors-for two time points (2005 and 2024), standardized on a unified scale. The comparative and cartographic analysis reveals strong territorial polarization, characterized by the concentration of high values in urban areas (especially the municipality of Reghin) and the predominance of low values in rural mountainous and marginal space.

The results show that Reghin maintains its dominant and stable position (index 1.000), reflecting the concentration of cultural infrastructure and qualified human capital. In contrast, most rural ATUs record significant declines in the cultural index, with some extreme cases (e.g., Brâncovenești, Hodac, Ideciu de Jos), a phenomenon associated with depopulation, youth outmigration, and reduced functionality of local cultural institutions. However, some

isolated cases of growth are also identified (e.g., Vătava, Stânceni, Suseni), explained by local cultural revitalization, community initiatives, and the valorization of intangible cultural heritage.

Cartographic analysis confirms the persistence of a strongly polarized spatial model, with a predominance of ATUs with very low cultural levels and a strong concentration of high values in urban centers, indicating a rigid territorial structure and limited cultural diffusion toward peripheral areas.

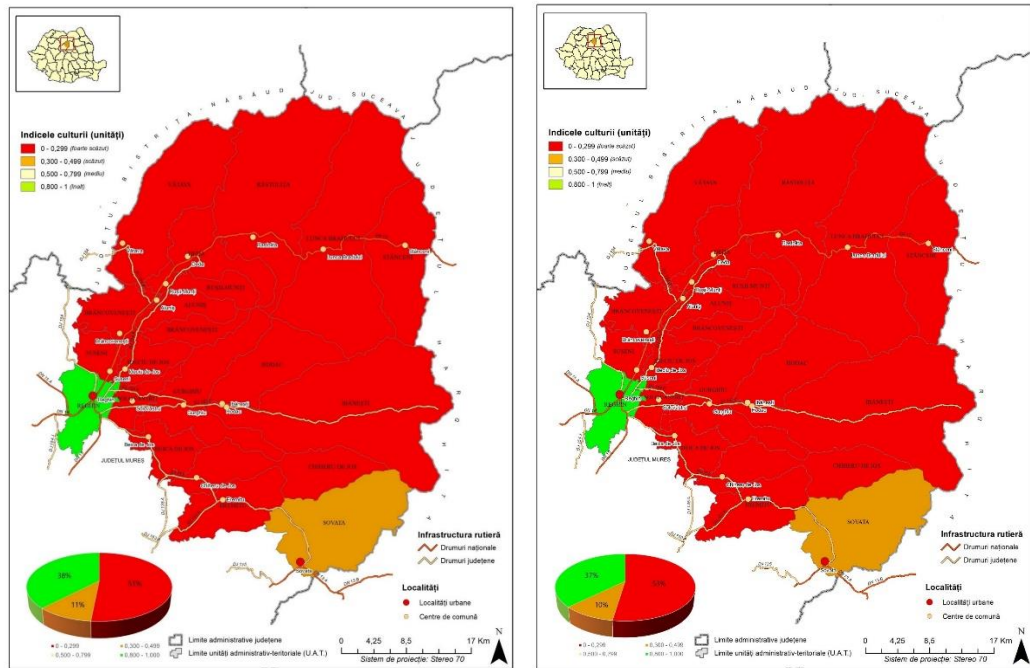


Figure 16. Typology of administrative-territorial units in the study area according to the cultural index, 2005 and 2024

The simple linear regression model (2005-2024) reveals a very strong statistical relationship between initial and current values of the cultural index ($\beta = 0.947$; $R^2 = 0.934$), confirming a high persistence of cultural hierarchies and the existence of path dependence. Thus, more than 93% of the current variation is explained by the initial structure, indicating strong structural stability and a limited capacity for inter-territorial convergence.

Residual analysis highlights both ATUs with above-expected performance (e.g., Chiheru de Jos, Stânceni, Vătava, Gurghiu) and underperforming ATUs, suggesting the influence of local factors and community initiatives in shaping cultural trajectories. Overall, the cumulative and unequal nature of cultural development is confirmed, dominated by urban–rural polarization processes.

In conclusion, the population cultural index reflects a deeply unequal territorial structure, with high persistence of disparities over time and a limited capacity for regional convergence. The results highlight the need for differentiated cultural policies aimed at reducing territorial imbalances through investment in rural cultural infrastructure, support for community initiatives, and the integration of local cultural heritage into sustainable development strategies. Methodological limitations of the study, stemming from the aggregated nature of the data, indicate the need for future analyses to incorporate qualitative tools and field research for a more accurate assessment of the population's actual cultural participation.

4.2.5. Analysis and Evaluation of the Population Quality Index

The analysis of the population quality index in the mountainous and marginal contact area of Mureș County highlights differentiated developments during the period 2005-2024, reflecting profound socio-demographic transformations driven by economic restructuring, population migration, and unequal accessibility to essential public services (education, health, and culture). The composite indicator, constructed as the average of the four dimensions of population quality, reveals a general model of territorial polarization between urban centers and peripheral rural areas.

The results show that the majority of ATUs (73.7%) record declines in the index, indicating a generalized deterioration of population quality, while only 26.3% show increases. Strong declines are concentrated mainly in isolated mountainous ATUs (e.g., Stânceni, Răstolița, Lunca Bradului), where processes of depopulation, demographic ageing, and reduced access to public infrastructure are most intense. Moderate declines characterize ATUs in functional transition, while relative stability is specific to the municipality of Reghin, which maintains its position as a regional urban pole.

Positive developments are isolated (e.g., Chiheru de Jos, Solovăstru, Eremitu, Vătava) and are associated with local adaptation processes, infrastructure investments, better access to urban centers, and the development of economic or tourism-related activities. However, these do not alter the overall trend of regression and polarization.

Cartographic analysis confirms the consolidation of an unbalanced spatial model, characterized by an increasing share of ATUs with very low index values and the continued concentration of high values exclusively in urban areas. Thus, population quality becomes a

major territorial differentiating factor, closely correlated with demographic structure, economic development level, and infrastructure accessibility.

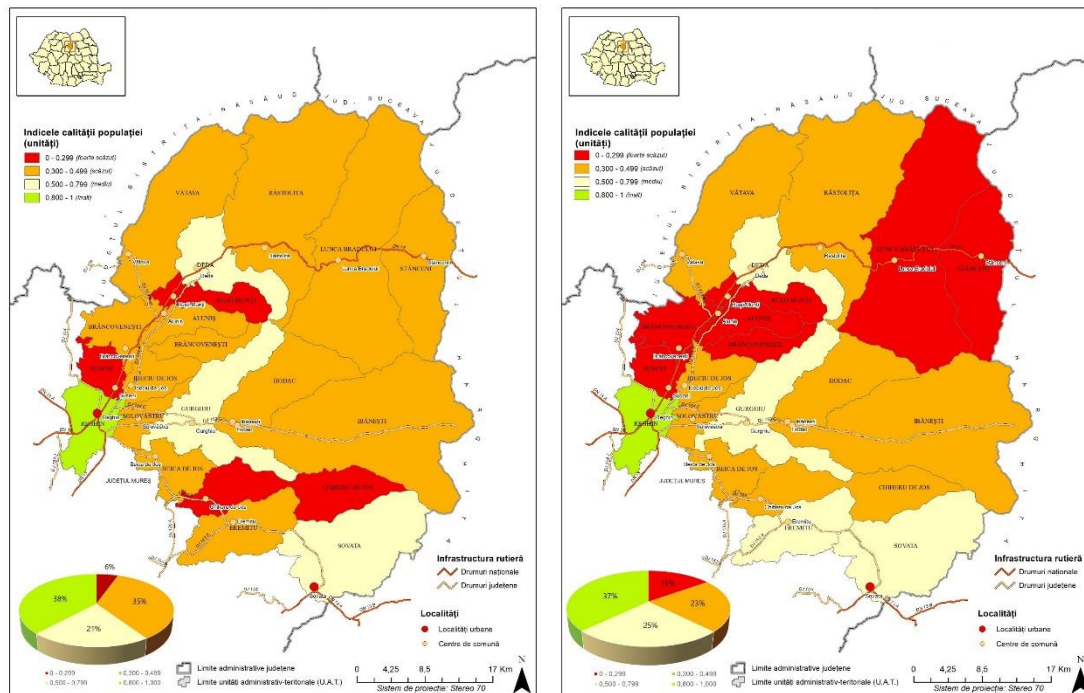


Figure 17. Typology of administrative-territorial units in the study area according to the population quality index, 1992 and 2024

The simple linear regression model indicates a positive and strong relationship between the 2005 and 2024 index values ($\beta = 0.8263$; $R^2 = 0.7158$), confirming the persistence of socio-territorial structures and the decisive role of initial conditions in long-term evolution. Approximately 71.6% of the current variation in the indicator is explained by the initial level, highlighting strong path dependence effects and limited convergence.

Overall, the results confirm the existence of an unequal territorial development pattern, in which urban advantages are consolidated while rural disadvantages accumulate. Population quality reflects both the current state of communities and the mechanisms through which disparities are reproduced. The study highlights the need for differentiated public policies aimed at reducing imbalances through investments in infrastructure, public services, retention of young population, and stimulation of endogenous development in marginal rural areas.

4.3. Public Policy Proposals and Measures for Improving Population Quality

The integrated analysis of the dynamics of the population quality index (1992-2024) reveals a strongly polarized territorial model in the mountainous and marginal contact area of Mureș County, characterized by the consolidation of urban centers and the progressive deterioration of human capital in rural areas. In this context, population quality is conceptualized as a multidimensional construct resulting from the interaction of human, social, and cultural capital, requiring integrated public interventions adapted to territorial specificities and oriented toward sustainable development.

Public policy proposals are structured along five main directions. The first targets the revitalization of demographic capital through fertility incentives, support for young families, facilitation of return migration, and promotion of active ageing, aiming to stabilize population structure and reduce demographic decline. The second focuses on strengthening educational infrastructure by maintaining rural school networks, implementing flexible education models, digitalizing learning processes, supporting teaching staff, and reducing school dropout through integrated support programs and vocational training adapted to the local economy. The third direction addresses the reduction of health inequalities through the strengthening of primary care, development of telemedicine, improved accessibility infrastructure, and integration of health policies with social and educational ones. The fourth aims at revitalizing cultural capital by reconfiguring cultural institutions as multifunctional community centers, digitizing access to cultural resources, developing itinerant programs, and valorizing local heritage as a resource for economic and identity development.

Finally, the integration of these measures into a coherent territorial strategy is proposed, based on participatory planning, GIS-based tools, and alignment of sectoral policies with regional development objectives. Monitoring the population quality index is considered an essential instrument for evaluating the impact of public policies and adjusting them over time.

Overall, the study highlights the need to move beyond fragmented sectoral approaches and adopt an integrated model of territorial governance, in which population quality becomes both an indicator and a driver of sustainable development in mountainous and marginal areas.

Conclusions

The research aimed to analyze the integrated quality of population in the mountainous and marginal contact area of Mureș County during the period 1992–2024, from demographic, educational, health, and cultural perspectives. The study is based on the hypothesis that population dynamics and structure represent a fundamental determinant of territorial development, especially in regions vulnerable to geographic, economic, and social constraints. Methodologically, the research used composite indicators, GIS spatial analysis, and regression models, allowing the capture of both long-term trends and territorial disparities.

A key result is the conceptual clarification of “population quality” as a distinct indicator from related concepts such as quality of life or human capital, defined by the internal potential of communities expressed through demographic structure, health status, educational level, and cultural capital.

The analysis highlights a persistent process of demographic decline in the studied area, characterized by ageing, declining birth rates, and selective migration, leading to depopulation and pronounced structural imbalances. The urban environment shows relatively higher resilience, while rural areas are affected by cumulative decline in human capital and socio-economic functions.

The health dimension shows overall improvements in health indicators but persistent territorial disparities and increased vulnerability in rural areas, exacerbated by limited access to medical services and population ageing. The COVID-19 pandemic highlighted the fragility of the healthcare system in peripheral areas and the need for digitalization and strengthening of primary care.

The educational component indicates a process of contraction and restructuring of the rural school network, correlated with demographic decline and youth migration, negatively affecting human capital accumulation. The cultural dimension reveals strong polarization, with cultural resources concentrated in urban areas and reduced participation in rural zones, where culture remains more traditional than institutionally supported.

Statistical and spatial analyses confirm the existence of stable territorial polarization and strong dependence on initial conditions, with no significant convergence processes between ATUs. Structural disadvantages tend to persist, while urban advantages are reinforced.

Overall, the mountainous and marginal contact area of Mureș County is characterized by interdependent processes of depopulation, ageing, and socio-cultural marginalization,

requiring integrated rather than sectoral public interventions. Population quality is highlighted as a central indicator of territorial development and an essential tool for public policy formulation.

The research provides a methodological framework applicable to similar regions, contributing to the understanding of uneven development mechanisms. Future research directions include expanding GIS analyses, developing prospective models, correlating demographic indicators with regional development processes, and strengthening interdisciplinary approaches for territorial cohesion policies.

SELECTIVE BIBLIOGRAPHY

- Aburto, J., M.** (2022). Quantifying impacts of the COVID-19 pandemic through life-expectancy losses: a population-level study of 29 countries. *International Journal of Epidemiology*, Volume 51, Issue 1, Pages 63–74, <https://doi.org/10.1093/ije/dyab207>
- Ares Abalde, M.** (2014), School Size Policies: A Literature Review, OECD Education Working Papers, No. 106, OECD Publishing. DOI: <http://dx.doi.org/10.1787/5jxt472ddkjl-en>
- Arthur, B. W.** (1989). Competing Technologies, Increasing Returns, and Lock-In by Historical Events. *The Economic Journal*, 99(394), 116–131. <https://doi.org/10.2307/2234208>
- Arthur, B.W.** (1994). Increasing Returns and Path Dependence in the Economy. Series: Economics, Cognition, And Society. University of Michigan Press. <https://doi.org/10.3998/mpub.10029>
- Banegas, M. et al.** (2019). The social and economic toll of cancer survivorship: a complex web of financial sacrifice. Published in final edited form as: *J Cancer Surviv.*; 13(3): 406–417. doi:10.1007/s11764-019-00761-1
- Barro, R.J.** (1991). Economic Growth in a Cross Section of Countries, Oxford Academic, *The Quarterly Journal of Economics*, Volume 106, Issue 2, May 1991, Pages 407–443, <https://doi.org/10.2307/2937943>
- Bean, C.** (2016). Independent Review of UK Economic Statistic [online]. 254 p. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/507081/2904936_Bean_Review_Web_Accessible.pdf
- Beck, U.** (1992). *Risk Society: Towards a New Modernity*. SAGE Publications London. Newbury Park. New Delhi. ISBN 0 8039 8346 8 (pbk)
- Becker, G. S.** (1964/1975/1993). *Human Capital: A Theoretical and Empirical Analysis, with Special Reference to Education*. University of Chicago. Published by National Bureau of Economic Research New York. Columbia University Press. <http://www.nber.org/chapters/c3730>
- Benedek, J., Veres, V.** (2023). Regional development differences and cultural value patterns: The Romanian case. *Regional Statistics* 13(6):1098-1123. DOI:10.15196/RS130604.
- Benedek, J., Moldovan, A.** (2015). Economic convergence and polarisation: towards a multi-dimensional approach. *Hungarian Geographical Bulletin*. DOI: <https://doi.org/10.15201/hungeobull.64.3.3>
- Bloom, D. E., Canning, D.** (2000). The Health and Wealth of Nations. *Science*, 287, 1207-1209. <http://dx.doi.org/10.1126/science.287.5456.1207>

- Bloom, D.E., Canning, D., Fink, G.** (2010). Implications of population ageing for economic growth. *Oxford Review of Economic Policy*, Volume 26, Issue 4, Pages 583–612, <https://doi.org/10.1093/oxrep/grq038>
- Bonea, G. V.** (2019), Abandonul școlar. *Revista Calitatea Vieții*, 4/2019, 387– 403. URL: <https://revistacalitateavietii.ro/journal/article/view/123/97>
- Bond, J.** (1999). Quality of life for people with dementia: approaches to the challenge of measurement. *Ageing and Society*, 19(1), 561–579. doi: [10.1017/S0144686X99007473](https://doi.org/10.1017/S0144686X99007473).
- Bray, F., Laversanne, M., Weiderpass, E., Soerjomataram, I.** (2021). The ever-increasing importance of cancer as a leading cause of premature death worldwide. *Journal of the American Cancer Society*. Volume127, Issue16. Pages 3029-3030 <https://doi.org/10.1002/cncr.33587>
- Brouwer, E.** (2019), The impact of school closures on rural villages in the Northern Netherlands. A precursor of demographic decline? Master thesis, University of Groningen, URL: <https://frw.studenttheses.ub.rug.nl/id/eprint/3146> . Accessed on 02.03.2026
- Brummet, Q.** (2014), The effect of school closings on student achievement. *Journal of Public Economics*, 119, 108–124. DOI: <https://doi.org/10.1016/j.jpubeco.2014.06.010>
- Buza, V.** (2024). Reziliența rețelei școlare în România – Dinamica structurilor spațiale ale școlilor primare rurale. *Sociologie Românească - Volumul 22(2)/2024* – p.108 – 132, <https://doi.org/10.33788/sr.22.2.5>
- Buza, V., Tușa, E.** (2024). Disparities in School Performance in Romania. A Geostatistical Analysis of Baccalaureate Results between 2015-2022, Vol. 16 No. 1, *Revista Românească pentru Educație Multidimensională*, <https://doi.org/10.18662/rrem/16.1/829>
- Coleman, J.S.** (1988). Social Capital in the Creation of Human Capital. *American Journal of Sociology*, Vol. 94, Supplement: Organizations and Institutions: Sociological and Economic Approaches to the Analysis of Social Structure, pp. S95-S120. The University of Chicago Press <http://www.jstor.org/stable/2780243>
- Crăciun, A.M., Dezs, Ș., Pop, F., Pintea, C.** (2022). Rural Tourism - Viable Alternatives for Preserving Local Specificity and Sustainable Socio-Economic Development: Case Study - “Valley of the Kings” (Gurghiului Valley, Mureș County, Romania). *Sustainability* 2022, 14, 16295. <https://doi.org/10.3390/su142316295>
- Cubilla-Montilla, M., Castillo, A., Torres-Cubilla, C. A.** (2026). Cross-national patterns of quality of life according to HDI levels: A multivariate approach using partial triadic analysis. *Regional Science, Environment and Economy*, 3(1), 2. <https://doi.org/10.3390/rsee3010002>

Dezsi, Șt., Rusu, R., Ilieș, M., Ilieș, G., Bădăraș, Al. S., Roșian, Gh. (2014). The Role of Rural Tourism in the Social and Economic Revitalisation of Lăpuș Land (Maramureș County, Romania), 14th International Multidisciplinary Scientific Geoconference SGEM on Ecology, Economics, Education and Legislation, Conference Proceedings, volume II: Ecology & Environmental Protection, STEF92 Technology, Sofia, pp. 783-790, ISBN 978-619-7105-18-6, ISSN 1314-2704. DOI: [10.5593/sgem2014B52](https://doi.org/10.5593/sgem2014B52)

Direcția Județeană de Statistică Mureș (DJS), <https://mures.insse.ro/>

Doboș, C. (2006). Dificultăți de acces la serviciile publice de sănătate în România, Revista Calitatea Vieții, Vol. XVII/2006, Nr. 1-2. Editura Academiei Române.

Drăgan, A., Crețan, R., Bulzan, R.D. (2024). The spatial development of peripheralisation: The case of smart city projects in Romania. DOI: [10.1111/area.12902](https://doi.org/10.1111/area.12902)

Dumitrache, L. (2004). Starea de sănătate a populației României – o abordare geografică, Editura Univers Enciclopedic, București, 380 p.

Duncombe, W., Yinger, J. (2007), Does school district consolidation cut costs? Education Finance and Policy, 2(4), 341–375. DOI: <https://doi.org/10.1162/edfp.2007.2.4.341>

Echazarra, A., Radinger, T. (2019), Learning in rural schools: Insights from PISA, TALIS and the literature. OECD Education Working Paper No. 196. URL: <https://dx.doi.org/10.1787/8b1a5cb9-en>

Eggerickx T., Tabutin, D. (2001). Le vieillissement démographique dans le monde. Historique, mécanismes et tendances, Université catholique de Louvain, Département des Sciences de la Population et du développement, Document de travail n° 14. Encyclopedia of Economics and Finance.

Engberg, J., Gill B., Zamarro G., Zimmer R. (2012), Closing schools in a shrinking district: Do student outcomes depend on which schools are closed? Journal of Urban Economics, 71(2), 189–203. DOI: <https://doi.org/10.1016/j.jue.2011.10.001>

Erdeli G., Dumitrache, L. (2014). Geografia populației mondiale. București: Editura Universitară.

European Commission (2022), Education and Training Monitor – Romania. European Commission. URL: <https://op.europa.eu/en/publication-detail/-/publication/6a29fe32-66f9-11ed-b14f01aa75ed71a1/language-en>. Accessed on 05.11.2025

European Commission (2023), Education and training monitor 2023: Romania. Publications Office of the European Union. DOI:10.2766/936303. URL: <https://cdn.edupedu.ro/wpcontent/uploads/2023/12/education-and-trainingmonitor-2023-NCAJ23001ENN-1.pdf>. Accessed on 05.11.2025

European Commission (2024), Study on funding for EU rural areas. DOI:10.2762/901111, URL: <https://op.europa.eu/en/publication-detail/-/publication/959487c4-38e5-11ef-b441-01aa75ed71a1/language-en>. Accessed on 05.11.2025

Eurostat (2022). <https://ec.europa.eu/eurostat>

Eurostat (2023). <https://ec.europa.eu/eurostat>

Eurostat (2022). Early school leaving statistics. Retrieved from <https://ec.europa.eu/eurostat>

Eurostat (2023a). Pupils and students – enrolments (UOE). https://ec.europa.eu/eurostat/databrowser/view/educ_uoe_enra01/default/table?lang=en

Eurostat (2023b). Early leavers from education and training. Retrieved from <https://ec.europa.eu/eurostat/> Accessed on 07.11.2025.

Eurostat (2024), Life expectancy at birth – demographic statistics. Luxembourg: European Commission – Eurostat.

Eurydice (2025), National reforms in general school education. European Commission/EACEA/Eurydice. URL: <https://eurydice.eacea.ec.europa.eu/eurypedia/romania/national-reforms-general-school-education>. Accessed on 17.12.2025

Fairchild, H., P. (1939). People. The quantity and quality of population. N. Y., 1939. 315 p.

Feinstein, L., Hammond, C. (2004). The contribution of adult learning to health and social capital. Oxford Review of Education, 30(2), 199–221. <https://doi.org/10.1080/0305498042000215520>

Foreign Investors Council (FIC). Investiții străine directe în România, ediția 2023, <https://fic.ro/publications/foreign-direct-investment-in-romania-2023-edition>

Frenk, J.J. L, Bobadilla, J. L., Stern, C., Frejka, T., Lozano, R. (1991). Elements for a theory of the health transition. Published By: National Center for Epidemiology and Population Health (NCEPH), The Australian National University 1991 Apr;1(1):21-38. <https://www.jstor.org/stable/40608615>

Galton, E. (1869). Hereditary Genius (Geniul ereditar), MacMillan and Co., London

Gherman, A. (2012). Valorificarea potențialului turistic al masivelor vulcanice: Călimani, Gurghiu. Editura Casa Cărții de Știință, Cluj-Napoca.

Ghețău, V. (2004). Declinul demografic al României: ce perspective? (The demographic decline of Romania: What perspectives?). Sociologie Românească (Romanian Sociology Review), 2(2), 5-14.

Ghețău, V. (2007). Declinul demografic și viitorul populației României: O perspectivă din anul 2007 asupra populației României în secolul 21 , Buzău: Alpha MDN.

- Goldstone, J.A.** (1991). Revolution and rebellion in the early modern world, Berkeley : University of California Press, ISMN 0-502-06758-4
- Gray, S. L., Scott, D. G., Mehisto, P.** (2018), Curriculum Reform in the European Schools. Publisher: Palgrave Macmillan Cham. eBook Packages: Education, Education (R0). DOI: <https://doi.org/10.1007/978-3-319-71464-6>
- Guvernul României** (2021a), Planul Național de Redresare și Reziliență (PNRR). URL: <https://mfe.gov.ro/pnrr/> . Accessed on 15.11.2025
- Guvernul României** (2021b), Planul Național de Redresare și Reziliență al României (PNRR). Componenta 15 – Educație. (National Recovery and Resilience Plan. URL: <https://www.edu.ro/PNRR>. Accessed on 16.11.2025
- Guțoiu, G.** (2019). Spatial and Temporal Patterns of Polarization and Population Decline in Romania's Demography: 1992-2018. Revista Universitară de Sociologie, Year XV, no. 2/2019.
- Hannum, E., Zhang, Y., Wang, M.** (2021), Estimating the Effects of Educational System Consolidation: The Case of China's Rural School Closure Initiative. DOI: 10.48550/arXiv.2203.17101
- Haase, A., Rink, D., Mikhnenko, V.** (2014). Conceptualizing Urban Shrinkage, July 2014, Sage Journals, *Environment and Planning A: Economy and Space*. Vol: 46(7), 1519-1534, DOI: [10.1068/a46269](https://doi.org/10.1068/a46269)
- Haartsen, T., van Wissen L.** (2012), Causes and consequences of regional population decline for primary schools. Tijdschrift Voor Economische En Sociale Geografie, 103(4), 487-496. DOI: <https://doi.org/10.1111/j.1467-9663.2012.00736.x>
- Harris, A., Jones, M.** (2015), Transforming education systems: comparative and critical perspectives on school leadership, Asia Pacific Journal of Education, 35(3), 311-318, DOI: <https://doi.org/10.1080/02188791.2015.1056590>
- Hărăguș, M., Földes, I.** (2020). The Demographic Profile of Rural Areas in Romania, Revista Calitatea Vieții, Vol. 31 No. 4, <https://doi.org/10.46841/RCV.2020.04.01>
- Heckman, J. J.** (2006). Skill formation and the economics of investing in disadvantaged children. Science, 312(5782), 1900–1902. <https://doi.org/10.1126/science.1128898>
- Howley, C., Johnson, J., Petrie, J.** (2011). Consolidation of schools and districts: What the research says and what it means. National Education Policy Center. <http://nepc.colorado.edu>

Ianoș, I. (2000). Sisteme teritoriale. O abordare geografică, Ed. Tehnică, București SBN: 973-31-1482-0

Ianoș, I., Heller, W. (2006). Spațiu, economie și sisteme de așezări. Editura Tehnică. București.

Institutul Național de Sănătate Publică (INSP), Raport de Activitate, https://insp.gov.ro/download/rapoarte_insp/

Institutul de Cercetare a Vieții (ICV). <https://www.iccv.ro/>

Institutul Național de Statistică (INS). Anuarul Statistic al României (Statistical Yearbook of Romania). <https://insse.ro/> . Accessed on 08.11.2025 .

Istrate, M., Șerban, R., H., Muntele, I. (2019). Young Romanians' Transition from School to Work in a Path Dependence Context. Sustainability2019, 11(5), 1254; <https://doi.org/10.3390/su11051254>

Jensen, A., R. (1969). How much can we boost IQ and scholastic achievement? (Cât de mult putem crește IQ-ul și performanța școlară?). Harvard Educational Review, 39 (1), 1–123. <https://doi.org/10.17763/haer.39.1.13u15956627424k7>

Jensen, A., R. (1972). Genetics and education. L., 380 p. Standard book no: 06-012192-0

Johnston, R., Gregory, D., Pratt, G., Watts, M. (2009). The Dictionary of Human Geography. Wiley-Blackwell. ISBN: 978-1-405-13288-6

Marx, K., Friedrich E. (1958). Opere alese. Vol. 3. Editura Politică. București.

Laslett, P., Paillat, P. (1999). Changements de structure: l'émergence du troisième âge, 255-283, in Bardet, Jean-Pierre et Dupâquier, Jacques (dir.), Histoire des populations de l'Europe, III, Les temps incertains, 1914-1998, Paris, Fayard.

Legea nr. 354/2004. Monitorul Oficial al României, nr. 687 din 30 iulie 2004. URL: https://www.cdep.ro/pls/legis/legis_pck.htm_act?ida=51100. Accessed on 16.11.2025

Legea educației naționale nr.1/2011. Monitorul Oficial al României, Partea I, nr. 18 din 10.01.2011. URL: https://www.edu.ro/sites/default/files/legeaeducatiei_actualizata%20august%202018.pdf.

Accessed on 15.11.2025

Legea învățământului preuniversitar nr. 198/2023. Monitorul Oficial al României Nr. 613 din 5 iulie 2023.

https://edu.ro/sites/default/files/_fi%C8%99iere/Minister/2023/Legi_educatie_Romania_educata/legi_mon_itor/Legea_invatamantului_preuniversitar_nr_198.pdf. Accessed on 16.11.2025

- Lehtonen, O.** (2021), Primary school closures and population development – is school vitality an investment in the attractiveness of the (rural) communities or not? *Journal of Rural Studies*, 82, 138– 147. DOI: <https://doi.org/10.1016/j.jrurstud.2021.01.011>
- Loginova, N., N., Julina, M.A.** (2002). Качество населения: опыт социально демографического – исследования// Регионология (Calitatea populației: un studiu socio-demografic), nr. 4, pp. 298–309, ISSN 2587-8549
- Lutz, W., Samir, K., C.** (2013). *Demography and Human Development: Education and Population Projections*, International Institute for Applied Systems Analysis (IIASA), UNDP Human Development Report Office, <http://hdr.undp.org/>
- McKee, M., Fister, K.** (2004). Post-communist transition and health in Europe, *BMJ* 329(7479):1355–1356. doi: [10.1136/bmj.329.7479.1355](https://doi.org/10.1136/bmj.329.7479.1355)
- Meyer H., Rowan B.** (2006), ONE Institutional Analysis and the Study of Education. URL: <https://www.semanticscholar.org/paper/ONEInstitutional-Analysis-and-the-Study-of-MeyerRowan/f8977f59c058926871b0238ec513c7146bd84401> . Accessed on 16.11.2025
- Manea, M.E.** (2021). *Demografia României*, Editura Academiei Române, București, 2018. Vasile Ghețău (coord.). *Romanian Sociology Review*. 19 (1), 252-256. <https://doi.org/10.33788/sr.19.1.17>
- Mărginean, I., Bălașa, A.** (coord.) (2005). *Calitatea vieții în România*. București, Editura Expert. ISBN 973-618-059-X
- Mărginean, I.** (2006). Condițiile de viață ale populației din mediul rural (Living conditions in rural areas). *Revista Calitatea Vieții*, XVII/2006, No: 1-2, Page Range: 153-170. Editura Academiei Române.
- Mărginean, I.** (2009), Școala în societatea românească de azi. *Revista Calitatea Vieții*, 20(3–4), 298–302. DOI: <https://revistacalitateavietii.ro/journal/article/view/440>
- Mărginean, I.** (2016). Mișcarea naturală a populației. România în contextul statelor membre ale Uniunii Europene.(Natural population movement. Romania in the context of the European Union member states) *Calitatea Vieții*, 27(2), 118–126.
- Mihailescu, M., Neiterman, E.,** (2019), A scoping review of the literature on the current mental health status of physicians and physicians-in-training in North America. *BMC Public Health*. ;19(1):1363. DOI: [10.1186/s12889-019-7661-9](https://doi.org/10.1186/s12889-019-7661-9)
- Mihalache, F.** (2020), *Mediul rural 1990 - 2020. Transformări și decalaje*. Cluj-Napoca. Editura Presa Universitară Clujeană, URL: <https://doi.org/10.46841/RCV.2021.01.08>. Accessed on 16.11.2025.

Ministerul Educației și Cercetării (MEC). Rapoarte privind starea învățământului preuniversitar 2021-2022, 2022-2023, 2023-2024. <https://www.edu.ro/> . Accessed on 06.11.2025.

Ministerul Educației și Cercetării. (MEC). Strategia Națională pentru Reducerea Părăsirii Timpurii a Școlii 2021-2027. <https://edu.ro/strategia-privind-reducerea-p%C4%83r%C4%83sirii-timpurii-%C8%99colii-%C3%AEn-rom%C3%A2nia>

Ministerul Educației și Cercetării. (MEC). Planul Național pentru Redresare și Reziliență - Componenta 15: Educație // PNRR, <https://www.edu.ro/PNRR>

Ministerul Sănătății (MS), Rapoarte de activitate, <https://ms.ro/ro/informatii-de-interes-public/rapoarte/rapoarte-de-activitate/>

Mosk, C. (1996). Making health work: Human Growth in Modern Japan. Berkeley, Calif: University of California Press, – 156 p. ISBN 0-520-08315-6. <https://books.google.ro/books?id=t8dL114NXaYC&lpg=PP1&hl=ro&pg=PR4#v=onepage&q&f=false>

Munteanu, I. D. (2022). Urban Education Versus Rural Education In Romania, Management Strategies Journal, Constantin Brancoveanu University, vol. 58(4), pages 118-123. Handle: RePEc:brc:journl:v:58:y:2022:i:4:p:118-123.

Muntele, I., Istrate, M., Bunduc, F. (2020). Educational disparities in Romania. A multilevel analysis of the National Assessment Examination succes rate, Rev. Roum. Géogr. Rom. Journ. Geogr, 64, 43-55

Muntele, I., Istrate, M., Horea-Șerban, R. I., Banica, A. (2021). Demographic resilience in the rural area of Romania. A statistical-territorial approach of the last hundred years. Sustainability, 13(19), 10902, <https://doi.org/10.3390/su131910902>

Mureșan, C. (2007). Family dynamics in pre and post transition Romania: A life table description. Demographic Research, 16(4), 118-152.

Mureșan, C. (2017). Effects of Education and of Union Type on Men's Lifetime Fertility in Two Different Societal Contexts. Romanian Journal of Population Studies. Volume: XI Issue: 2, Pages: 127-144, <https://doi.org/10.24193/RJPS.2017.2.06> , ISSN (online) 3061-225X "

Neagu, G. (2006), Polarizarea accesului la serviciile de educație. Rolul sistemului de învățământ. Revista Calitatea Vieții, 17(1-2), 1-13. URL: <https://www.revistacalitateavietii.ro/journal/article/vie w/606>. Accessed on 06.11.2025

Neagu, G. (2015). Tinerii, educație și ocupație în România. Calitatea Vieții, XXVI(1), 16-35. URL: <https://www.revistacalitateavietii.ro/journal/article/vie w/110>. Accessed on 06.11.2025

- Neagu, G.** (2009). Măsurarea șanselor de acces la educație, Paradigma calității vieții (pp.65-88), Chapter: 3, Publisher: Editura Academiei Române, DOI:10.13140/2.1.4642.0164
- Netedu, A.** (2016). Demografie și sociologia populațiilor. Elemente teoretice și practice, Editura Univ. Al. I. Cuza Iași. ISBN: 978-606-714-250-1
- Netuveli, G., & Blane, D.** (2008). Quality of life in older ages. British Medical Bulletin, 85(1), 113–126. <https://doi.org/10.1093/bmb/ldn003>
- OECD.** (2006). Annual Report, https://www.oecd.org/en/publications/2006/04/oecd-annual-report-2006_g1gh6767.html
- OECD** (2017), The Funding of School Education: Connecting Resources and Learning, OECD Reviews of School Resources, OECD Publishing, Paris, URL: <https://doi.org/10.1787/9789264276147-en>. Accessed on 06.11.2025
- OECD** (2018), Responsive School Systems: Connecting Facilities, Sectors and Programmes for Student Success, OECD Reviews of School Resources, OECD Publishing, Paris, <https://doi.org/10.1787/9789264306707-en>
- OECD** (2020a). Education at a glance: OECD indicators. OECD Publishing. <https://www.oecd.org/en/publications/2020/>. Accessed on 16.10.2025.
- OECD** (2020b). Rural well-being: Geography of opportunities. OECD Publishing.
- OECD** (2021), Delivering Quality Education and Health Care to All: Preparing Regions for Demographic Change, OECD Rural Studies, OECD Publishing, Paris, URL: <https://doi.org/10.1787/83025c02-en>. Accessed on 06.11.2025
- OECD** (2023). PISA 2022 results. OECD Publishing. https://www.oecd.org/en/publications/pisa_2022_results_volumei_53f23881_en.html. Accessed on 17.10.2025.
- OECD** (2024), Reforming school education in Romania: Strengthening governance, evaluation and support systems”, OECD Education Policy Perspectives, No. 92, OECD Publishing, Paris, URL: <https://doi.org/10.1787/5333f031-en>. https://www.oecd.org/content/dam/oecd/ro/publications/reports/2024/03/reforming-school-education-inromania_82abd45a/943c9230-ro.pdf. Accessed on 06.11.2025
- OMS** (2023). Results Report, <https://www.who.int/news/item/07-05-2024-who-results-report-2023->
- ONU** (1977). „Determinants and Consequences of Population Trends” (1977), https://www.un.org/development/desa/pd/sites/www.un.org.development.desa.pd/files/files/documents/2020/Jan/un_1978_determinant-and-consequences-of-population-trends_-_volume_2_0.pdf

Orchid Health. (2019). <https://www.orchidhealth.com/>

Papachrysou, P., Vasilakos, C. (2026). Quality of life indicators and geospatial methods across multiple spatial scales: A systematic review. *Urban Science*, 10(1), 52. <https://doi.org/10.3390/urbansci10010052>

Pearson, K. (1894). Mathematical Contributions to the Theory of Evolution. *Philosophical Transactions of the Royal Society of London, Series A, Volume 185*, pages 71–110, [doi:10.1098/rsta.1894.0003](https://doi.org/10.1098/rsta.1894.0003)

Peccei, A. (1977). *The human quality*. Oxford, 216 p., ISBN: 9781483285450.

Peifer, M. (2025). We must not ignore eugenics in our genetics curriculum. *Trends in Genetics*. Volume 41, Issue 4, Pages 261-265. <https://doi.org/10.1016/j.tig.2025.02.002>

Petre, A. A., Dumitrache, L., Mareci, A., Cioclu, A. (2025), The urban–rural education divide: A GIS-based assessment of the spatial accessibility of high schools in Romania. *International Journal of Geo-Information*, 14(5), 183. DOI: <https://doi.org/10.3390/ijgi14050183>

Pop, A.M. et al. (2023). The COVID-19 Pandemic as Catalyst for Virtual Events, *Journal of Settlements and Spatial Planning*, DOI: [10.24193/JSSP.2023.1.02](https://doi.org/10.24193/JSSP.2023.1.02)

Pop, C. E. (2010). Starea de sănătate a populației din România în context european. O abordare din perspectiva calității vieții, *Calitatea Vieții*, XXI, nr. 3–4, p. 274–305

Pop, L. M. (2002). *Dicționar de politici sociale*, Editura Expert, București, pp. 376–378. ISBN 973-8177-44-8

Precupeț, I. (2006). *Strategii de dezvoltare comunitară*, Editura Expert Projects, Iași, ISBN (10) 973-86263-9-0

Preston, S. H., Heuveline, P., & Guillot, M. (2001). *Demography: Measuring and Modeling Population Processes*. Blackwell. <https://gwers.net/doc/statistics/2001-preston-demography.pdf>

Psacharopoulos, G. (1981), Returns to education: An updated international comparison. *Comparative Education* 17 (3), 321–341. World Bank Reprint Series: Number 210, DOI: <https://doi.org/10.1080/0305006810170308>

Ramsden, E. (2008). Eugenics from the New Deal to the Great Society: genetics, demography and population quality. *Stud Hist Philos Biol Biomed Sci*; 39(4):391-406. doi: [10.1016/j.shpsc.2008.09.005](https://doi.org/10.1016/j.shpsc.2008.09.005)

Ramsden, E. (2009). Confronting the Stigma of Eugenics: Genetics, Demography and the Problems of Population, *Social Studies of Science*, Vol. 39, No. 6, pp. 853-884, Published By: Sage Publications, Ltd. <https://www.jstor.org/stable/27793328>

- Ray, C.** (2006). Neo-endogenous rural development in the EU. In P. Cloke, T. Marsden & P. Mooney (Eds.), *Handbook of rural studies* (pp. 278–291). Sage. <https://doi.org/10.4135/9781848608016.n19>
- Rebedeu, A., Zamfir, C.** (1982). Calitatea vieții și modul de viață. Schiță a unei prognoze a evoluției lor în următoarele decenii. București. Editura Politică.
- Rees, P. H.** (2018). Education and demography: a review of world population and human capital in the 21st century, *Vienna Yearbook of Population Research*, Vienna Institute of Demography (VID) of the Austrian Academy of Sciences in Vienna, vol. 16(1), pages 037-053. DOI:[10.1553/populationyearbook2018s037](https://doi.org/10.1553/populationyearbook2018s037)
- Ridevsky, G.V.** (2015). Human capital of Belarusian regions: the main results of post-Soviet development, in *Non-economic factors of spatial development*, Moscow, 420 p., 243-256 p., ISBN 978-5-94101-293-0.
- Rypl, O., Macků, K., Pászto, V.** (2024). The quality of life in Czech rural and urban spaces. *Humanities and Social Sciences Communications*, 11, 43. <https://doi.org/10.1057/s41599-023-02423-1>
- Rodríguez-Pose, A.** (2013). Do institutions matter for regional development? *Regional Studies*, 47(7), 1034–1047. <https://doi.org/10.1080/00343404.2012.748978>
- Rotaru, F., Matei, A., Bolboacă, S. D., Cordoș, A. A., Bulboacă, A. E., & Muntean, C.** (2024). Age-Inclusive Healthcare Sustainability: Romania's Regulatory and Initiatives Landscape in the European Union Context. *Sustainability*, 16(5), 1827. <https://doi.org/10.3390/su16051827>
- Rotariu, T.** (2009). Demografie și sociologia populației. Structuri și procese demografice. Editura Polirom. ISBN 978-973-46-1250-5
- Rotariu, T.** (2011). Some Considerations on the End of the Demographic Transition and Post-Transitional Processes.. *Romanian Journal of Population Studies*, 15(1), 87–102. ISSN (online) 3061-225X.
- Rotariu, T., Dumănescu, L., Hărăguș, M.** (2017). Demografia României în perioada postbelică (1948-2015). Iași: Editura Polirom. ISBN 978-973-46-6865-6
- Rus, R.** (2025). Comunități în schimbare. Evoluții demografice și mobilitatea socială în satele de pe valea Gurghiului (1850 – 1910). Editura MEGA Cluj-Napoca. ISBN 978-606-020-950-8
- Rutherford, A.** (2022). *Control. The Dark History and Troubling Past of Eugenics*. Weidenfeld & Nicolson London.

- Sageman, J.** (2022), School closures and rural population decline. *Rural Sociology*, 87(3), 960–992. DOI: <https://doi.org/10.1111/ruso.12437>
- Sagradov, A. A.** (1995). Теория и методы изучения качества населения. (Teoria și metodele de studiere a calității populației). Moscova, p. 439. ISBN 5-86310-039-7
- Sagradov, A. A.** (2012). Экономическая демография. Учебное пособие. (Demografie economică. Manual), Mockba, ISBN 978-5-16-003833-9
- Samir, K.C., Lutz, W.** (2017a). The human core of the shared socioeconomic pathways: Population scenarios by age, sex and level of education for all countries to 2100. *Elsevier Global Environmental Change*. Volume 42, January 2017, Pages 181-192 <https://doi.org/10.1016/j.gloenvcha.2014.06.004>
- Samir, K.C., Lutz, W.** (2017b). The Rise of Global Human Capital and the End of World Population Growth, DOI:10.1093/oso/9780198813422.003.0014
- Sandu, D.** (2000). Spațiul social al tranziției. Iași, Editura Polirom. ISBN 973-683-366-6
- Sandu, D.** (2010). Lumile sociale ale migrației românești în străinătate. Iași. Editura Polirom. ISBN: 978-973-46-1650-3
- Sauvy, A.** (1952). Théorie générale de la population. Volumul I, Economie et Population. 27-4 pp. 419-420
- Sauvy, A.** (1966). Théorie générale de la population, Volume II, La vie des populations, Presses Universitaires De France, Paris.
- Schultz, T. W.** (1961). Investment in human capital. *American Economic Review*, Vol. 51, No.1, pp. 1–17. Published By: American Economic Association. URL: <https://www.jstor.org/stable/1818907>.
- Schultz, T., W.** (1987). Education and Population Quality, in *Economics of Education: Research and Studies*, edited by G. Psacharopoulos, The World Bank, Washington, DC, USA, p.11-14, ISBN 978-0-08-033379-3
- Scott, A. J.** (2010). Cultural economy and the creative field of the city. *Geografiska Annaler. Series B, Human Geography*, Vol. 92, No. 2 (June 2010), pp. 115-130 (16 pages), Published By: Taylor & Francis, Ltd., <https://doi.org/10.1111/j.1468-0467.2010.00337.x>
- Sen, A.** (1999). *Development as Freedom*. Oxford University Press. ISBN-13: 978-0-19-289330-7
- Stanef, M. R.** (2013). Sistemul educațional din România, disparități dintre mediul urban și cel rural. *Economie teoretică și aplicată*. Volumul 20(1), pp. 83-93.

- Ștefănescu, M. L.** (2020), The Romanian population's access to education during 1990 - 2010. *Journal of Community Positive Practices*, 20(2), 92-102. DOI: <https://www.jppc.ro/index.php/jppc/article/view/373>
- Surd, V.** (2001). *Geodemografie*, Editura Presa Universitară Clujeană, ISBN 973-8095-65-4
- Surd, V.** (coord.). (2008). *Monografia turistică a Carpaților românești*. Presa Universitară Clujeana, Cluj--Napoca. ISBN: 973-610-051-0
- Suvac, S.** (2018), Educația – parte componentă a calității populației în Republica Moldova. *Scientific Symposium of Young Researchers*, 16th Edition (27-28 April), 54-60. URL: https://ibn.idsi.md/sites/default/files/imag_file/54-60_8.pdf
- Suvac, S.** (2020). *Calitatea populației Republicii Moldova. Studiu geodemografic*. Chișinău.
- Todaro, M. P., Smith, S., C.** (2020). *Economic Development* (13th ed.). Harlow: Pearson Education Limited, ISBN 978-0-13-801388-2
- Tomulețiu, E.-A., Moraru, A.** (2010). Rural education in Romania: Present and perspectives. *Elsevier Procedia - Social and Behavioral Sciences*, Volume 2, Issue 2, 2010, Pages 402-406, <https://doi.org/10.1016/J.SBSPRO.2010.03.034>
- Trebici, V.** (1979). *Demografia*. Editura Științifică și Enciclopedică, București.
- Trebici, V.** (1991). *Populația Terrei*. Editura Științifică. București. ISBN 973-44-0061-4
- Țăruș R., Dezsı Ș., Pop F.** (2021). Ageing Urban Population Prognostic between 2020 and 2050 in Transylvania Region (Romania). *Sustainability*, 13, 9940; <https://doi.org/10.3390/su13179940>
- Țigănașu, R., Încălțărău, C., Pascariu, G., C.** (2018). Administrative Capacity, Structural Funds Absorption and Development. Evidence from Central and Eastern European Countries. *Romanian Journal of European Affairs*, Vol. 18, No. 1: 39-59
- Țoc, S.** (2018), *Clasă și educație. Inegalitate și reproducere socială în învățământul românesc*. Editura Pro Universitaria, București. ISBN: 978-606-26-0985-6
- Țoc, S.** (2021). Cercetarea calității vieții în România. O analiză a studiilor publicate în revista „Calitatea Vieții” în intervalul 1990–2020. Vol. 32 No. 3 (2021) /Studies. <https://doi.org/10.46841/RCV.2021.03.05>
- UNESCO** (2024), UNESCO in action: Education highlights in 2024. URL: <https://www.unesco.org/en/articles/unesco-actioneducation-highlights-2024>. Accessed on 15.11.2025
- UNESCO**, Institute for Statistics. (UIS). Methodology for literacy/education indicators. uis.unesco. <https://www.uis.unesco.org/en/themes/education-literacy>

- UNICEF România.** (2021). Accesul la educație timpurie în România. București: UNICEF.
<https://www.unicef.org/romania/ro/topics/educa%C8%9Bie-timpurie>
- United Nations,** Department of Economic and Social Affairs, Population Division. (2019). World Population Ageing 2019. New York: United Nations.
- Vert, C.** (2001). Geografia populației. Teorie și metodologie, Editura Mirton, Timișoara, 208 p. ISBN 973-585-468-6
- Vlăsceanu, L., Hancean, M., G.** (2017). Modernitatea românească, Editura Paralela 45. ISBN: 978-973-47-1999-0
- Voicu, B., Marian, V.** (2010). Rural urban Inequalities and Expansion of Tertiary Education in Romania, Journal of Social Research and Policy, No. 1, ISSN: 2067-2640.
- Voicu, B.** (2005). Penuria Pseudo-Modernă a Postcomunismului Românesc. Volumul I. Schimbarea socială și acțiunile indivizilor (The Pseudo-Modern Penury of the Romanian Postcommunism. Volume I. Social change and individual actions), Editura Expert Projects, Iași.
- Weeks, J. R.** (2020). Population: An Introduction to Concepts and Issues (13th ed.). Cengage Learning. ISBN: 9780357705049
- World Bank.** (2018). Efficiency and Equity in Romanian Education. World Bank Publications.
- World Bank** (2021). Romania: Learning Poverty Brief. World Bank Publications.
<https://documents1.worldbank.org/curated/en/663171624624044748/pdf/Romania-Learning-Poverty-Brief2021.pdf>. Accessed on 17.11.2025.
- World Economic Forum (WEF).** (2016). <https://www.weforum.org/publications/the-human-capital-report-2016/>
- Zamfir, C** (1984). Indicatori și surse de variație a calității vieții. București: Editura Academiei.
- Zamfir, C.** (1989). Stil de viață și mod de viață. Reflecții asupra stadiului actual al analizei sociologice. 33-54.
- Zamfir, C., Stănescu, S.** (coord.). (2007). Enciclopedia dezvoltării sociale. Polirom. ISBN 978-973-46-0702-0
- Zamfir, C., Filipescu I.** (eds.). (2015). Sociologia românească: 1900-2010 O istorie socială. Publisher: Eikon, Cluj-Napoca, ISBN: 978-606-8699-22-6
- Zamfir, C., Vlăsceanu, L.** (1998). Dicționar de sociologie. București. Editura Babel. ISBN 973-48-1011-1

Zotic, V., Alexandru, D.-E. (2024). Settlement Population Size in Romania. Dynamics and Reranking, Journal of Settlements and Spatial Planning, vol. 15(2), 155-173. DOI: <https://doi.org/10.24193/JSSP.2024.2.07>