Feb, 2026
GRINS DISCUSSION PAPER SERIES DP N° 87/2026 ISSN 3035-5576

GRINS

Educational Poverty in Naples: Insights from a Multilevel Latent Class Model

DP N° 87/2026

Authors:
Cristina Davino, Rosa Fabbricatore, Rosaria Romano

Feb, 2026
GRINS DISCUSSION PAPER SERIES DP N° 87/2026 ISSN 3035-5576

Educational Poverty in Naples: Insights from a Multilevel Latent Class Model

Cristina Davino, Rosa Fabbricatore, Rosaria Romano

KEYWORDS

#Educational poverty #Educational opportunities #Naples #Upper-secondary students #Multilevel Latent class model

JEL CODE

I24, I28

ACKNOWLEDGEMENTS

This study was funded by the European Union - NextGenerationEU, in the framework of the GRINS - Growing Resilient, INclusive and Sustainable project (GRINS PE00000018). The views and opinions expressed are solely those of the authors and do not necessarily reflect those of the European Union, nor can the European Union be held responsible for them.

CITE THIS WORK

Author(s): Cristina Davino, Rosa Fabbricatore, Rosaria Romano. Title: Educational Poverty in Naples: Insights from a Multilevel Latent Class Model. Publication Date: 2026.

In recent years, educational poverty (EP) has gained institutional and political attention due to its significant impact on individual development and well-being. Drawing on Sen's capability approach, EP is conceptualized as the lack or inadequacy of educa- tional opportunities within a person's living environment, which hinders the development of cognitive, cultural, and social capabilities.
These disparities in learning conditions disproportionately affect young people from disadvantaged socio-economic backgrounds and pose particular risks for adolescents, who are at a pivotal stage of personal and edu- cational growth. This study examines EP among adolescents in Naples and its province, a context marked by enduring socio-economic inequalities and territorial fragmentation that restrict access to meaningful and empowering educational opportunities.
To achieve this goal, a multidimensional framework of EP is proposed, encompassing family, school, and environmental dimensions, each reflecting distinct yet interconnected domains shaping young people's educational trajectories. To assess these dimensions at the individual level, we developed a set of Likert-type indicators and collected data from a representa- tive sample of upper-secondary students aged 15–19 using a two-stage stratified sampling design based on school type, municipality, and grade level."
For the analysis, a multilevel latent class model was applied to identify student- and neighbourhood-level profiles of EP and to examine how individual factors influence the membership

probability in each profile. The findings offer valuable insights for policy design, underscoring the need for interventions targeting both individual conditions and territorial inequalities.

Educational Poverty in Naples: Insights from a Multilevel Latent Class Model

Cristina Davino, Rosa Fabbricatore, Rosaria Romano
Department of Economics and Statistics, University of Naples Federico II, Italy

Abstract *In recent years, educational poverty (EP) has gained institutional and political attention due to its significant impact on individual development and well-being. Drawing on Sen's capability approach, EP is conceptualized as the lack or inadequacy of educational opportunities within a person's living environment, which hinders the development of cognitive, cultural, and social capabilities. These disparities in learning conditions disproportionately affect young people from disadvantaged socio-economic backgrounds and pose particular risks for adolescents, who are at a pivotal stage of personal and educational growth. This study examines EP among adolescents in Naples and its province, a context marked by enduring socio-economic inequalities and territorial fragmentation that restrict access to meaningful and empowering educational opportunities. To achieve this goal, a multidimensional framework of EP is proposed, encompassing family, school, and environmental dimensions, each reflecting distinct yet interconnected domains shaping young people's educational trajectories. To assess these dimensions at the individual level, we developed a set of Likert-type indicators and collected data from a representative sample of upper-secondary students aged 15–19 using a two-stage stratified sampling design based on school type, municipality, and grade level." For the analysis, a multilevel latent class model was applied to identify student- and neighbourhood-level profiles of EP and to examine how individual factors influence the membership probability in each profile. The findings offer valuable insights for policy design, underscoring the need for interventions targeting both individual conditions and territorial inequalities.*

Keywords: *Educational poverty, Educational opportunities, Naples, Upper-secondary students, Multilevel Latent class model*

1. Introduction

Measurement of educational poverty is an important challenge and a responsibility of society and governments today, as studying the phenomenon means identifying the deep-rooted causes of inequalities in order to reduce them and limit their intergenerational transmission. Educational poverty, moreover, does not concern only the lack of formal education but also the absence of cultural, social, and relational opportunities.

Over the past 30 years, the scientific literature has evolved along a path that, starting from an initial identification of educational poverty in terms of educational attainment or cognitive skills, and, thanks to the contribution of Sen's capability approach (Sen and Anand, 1997), has finally recognized the multidimensional nature of the concept.

In particular, the approach followed in this paper frames the phenomenon in terms of the lack of opportunities that some people experience, which can affect not only their cognitive skills but also their future lives, in terms of social relationships, lifestyles, and the contribution they can provide to society.

Furthermore, it is well known that this type of study is particularly relevant when focused on children and adolescents who still have a long life ahead of them and for whom the effects of any lack of opportunities will only become evident after a long time (Heckman et al., 2013) (OECD, 2017).

Before considering the consequences of a lack of educational opportunities, it is necessary to investigate the determining factors underlying such inequalities. The scientific literature is very active on this subject and attributes a crucial role to the family, viewed not only in terms of socioeconomic status (Boonk et al. 2018) but also in terms of behavior within the family itself and the importance attributed to study and education. School is also the place where people spend most of their time until adolescence and are exposed to important stimuli. For this reason, school organization, teacher quality, and, more generally, all stimuli that school is able to provide play a crucial role in the process of measuring educational poverty (OECD, 2017). Regardless of the individual's background, it is essential to consider environmental factors such as the opportunity to live in a safe, clean place with cultural opportunities (Nieuwenhuis and Hooimeijer, 2016).

In this regard, the NGO Save the Children took a significant step towards a more comprehensive definition of EP with the publication of the report *La lampada di Aladino* (2014), in which educational poverty is described as 'the deprivation of children and adolescents from the opportunity to learn, experience, develop, and freely cultivate their capabilities, talents, and aspirations' (p. 4). This lack of opportunities has an impact on cognitive and problem-solving skills (*learning to understand*), psychological and emotional development (*learning to be*), ability to promote social and inter-personal relationships (*learning to live together*), health, physical integrity, and food security (*learning to lead an autonomous and active life*) (Save the Children, 2015).

Based on this premise, the authors of this paper proposed in 2023 a comprehensive model to measure EP in terms of EO (The study was part of the Measuring and Mapping Poverty Education project, supported by the University Research

Funding Program (FRA) of the Federico II University of Naples for $2023-2025$). We developed a conceptual framework defining EP as a latent, multidimensional construct marked by limited access to educational opportunities (EO) in family, school, and environmental contexts. This model has been presented at the 4th international conference on "Data Science & Social Research" which was held in Naples (Italy) on 25th-27th March 2024 (Title of the presentation: Defining a composite measure of Educational Poverty at the individual level: a multidimensional approach.). Our approach aligns with the ISTAT 2024 scientific commission's distinction between opportunities and outcomes but measures EO at the individual level, focusing on ages 15-19, while ISTAT focuses on territorial aggregates and draws exclusively on official statistical sources for constructing indicators.

The present paper presents the first results of a survey carried out on high school students aged 15-19 in Naples and its suburbs focusing on EO dimensions and their links to personal and family backgrounds. The survey was funded by the European Union - NextGenerationEU, in the framework of the GRINS - Growing Resilient, INclusive and Sustainable project project GRINS

The present study aims to shed light on the phenomenon of EP among adolescents in Naples and its province, a context characterized by persistent socio-economic disparities and territorial fragmentation that produce unequal access to educational experiences. In particular, our analysis is guided by the following research questions:

RQ1: Are there distinct EP profiles at the individual level?

RQ2: Do neighborhood level EP profiles emerge from the distribution of individual level profiles?

RQ3: Which individual characteristics (e.g., socio-demographic background) influence the probability of belonging to a specific EP profile?

A multilevel latent class model (Vermunt, 2003) was employed as analytical strategy to identify student- and neighborhood-level profiles of EP. The analysis also explored the influence of individual factors - such as gender, parent education, family income, school type, and household size - on the probability of belonging to each profile.

2. The survey and the sample characteristics

The survey was conducted with the support of Save the Children on a representative sample of upper-secondary school students (aged 15 - 19) in Naples and its metropolitan area The sample was obtained through a two-stage stratified sampling design by school type (high school, technical/professional institute), municipality, and school year (second/third class, fourth/fifth class). Based on a population of 114.865 students, more than 3800 students were interviewed according to the previous sampling plan. Approximately 53% of the population under investigation is composed of males, mainly residing in the province (69%). In terms of attended school, there is an almost equal distribution between high schools (52%) and other institutions (technical or vocational).

The results presented in this paper refer to sections of the questionnaire. dedicated, respectively, to collecting information on the three dimensions of educational opportunities (family, school, environment) and the individual characteristics of the respondents.

The Family dimension, measured on a seven-point Likert response scale, captures the resources within the household that support learning: space, equipment and time at home (i.e. A quiet space to study, a own desk, internet connection, etc.") (8 items), cultural stimulations (5 items) (i.e. Visit museum, go to the cinema, play music, travelling, etc.), economic condition in terms of availability of primary goods and opportunities (7 items) (i.e. Paying for food, clothes, daily food supply, etc.), books at home.

The School dimension, again measured on a seven-point Likert response scale, examines the resources provided by educational institutions: library, gym and/or sports grounds, support for catching up or improving skills, cultural activities (trips, visits to museums or historical sites), adequate access to digital tools (tablets/PCs) for teaching activities and fast Internet connections. accessible psychological support service. Lastly, the Environment dimension, measured on a seven-point Likert response scale, assesses the presence of community resources: parks, gardens, meeting places, cultural facilities (libraries, theatres, cinemas, museums), sports facilities (gyms, swimming pools, sports fields), public transport, security at night, crime and violence, street cleaning and maintenance.

3. Multilevel latent class model

A multilevel latent class model (Vermunt, 2003) allows to identify unobserved profiles of educational opportunities at both the individual and contextual levels, with students as Level-1 units and neighborhoods of residence (i.e., the ten municipalities of Naples and the nine homogeneous areas of its province) as Level-2 units. More formally, let Y_{ijk} denote the response of student $i = 1, \ldots, n_j$

nested within the neighborhood $j = 1, \ldots, J$ on the categorical item $k = 1, \ldots, K$. The vector $\mathbf{Y}_{ij} = (Y_{ij1}, \ldots, Y_{ijK})'$ denote the full response vector to the K categorical indicators - here, the items measuring different dimensions of educational opportunities.

In latent class analysis, the clustering is modeled as an underlying discrete variable with some number of categories or latent classes. When the data have a hierarchical structure, a second latent categorical variable is added at the group level to account for higher-level dependencies among units - in our case, students within the same neighborhood - leading to a multilevel LC model.

Thus, let W_j be the higher (neighborhood) level categorical latent variable with possible categories $m = 1, \ldots, M$ and X_{ij} be the lower (student) level categorical latent variable, defined conditional on the values of W_j, with possible values $t = 1, \ldots, T$. The multilevel latent class models specify the joint probability of the observed response vector $\mathbf{Y}_{ij}$ as follows:

$$P(\mathbf{Y}_{ij}) = \sum_{m=1}^{M} P(W_j = m) \sum_{t=1}^{T} P(X_{ij} = t | W_j = m) P(\mathbf{Y}_{ij} | X_{ij} = t), \tag{1}$$

where a conditional independence assumption holds between Y_{ijk} and W_j given X_{ij}. The joint conditional-response probability, because of the local independence assumption, can be factorized as:

$$P(\mathbf{Y}_{ij} | X_{ij} = t) = \prod_{k=1}^{K} P(Y_{ijk} | X_{ij} = t). \tag{2}$$

Given the ordinal nature of our indicators, the conditional-response probabilities $P(Y_{ijk} | X_{ij} = t)$ are parameterized using adjacent-category ordinal logits (Bartolucci et al., 2015).

According to the multilevel LC framework, the distribution of student-level classes is allowed to vary across neighborhood-level classes. The model assumes that each student belongs to one of Level-1 latent classes and that each neighborhood belongs to one of Level-2 latent classes. Class membership is determined by assigning each unit to the class associated with the highest posterior probability; see (Fabbricatore et al., 2025, Supplementary material) for the analytical formulation.

When a vector of lower-level covariates $\mathbf{Z}_{ij}$ is included to examine the influence of individual factors on the probability of belonging to each profile, class membership probabilities can be parameterized using a multinomial logistic model as follows:

$$P(X_{ij} = t | W_j = m, \mathbf{Z}_{ij}) = \frac{\exp(\gamma_t' \mathbf{Z}_{ij})}{1 + \sum_{s=2}^{T} \exp(\gamma_s' \mathbf{Z}_{ij})}, \tag{3}$$

where γ_t' is the vector of regression coefficients. Parameter estimation has been performed using Latent GOLD 6.0 Vermunt and Magidson (2021), which implements a hybrid estimation strategy. The software applies the EM algorithm in earlier stages of model fit (i.e., when far from the local optimum) and subsequently switches to Newton-Raphson for faster convergence when closer to the (local) maximum.

4. Results

In this section, we first describe the latent structure, namely the Level-1 and Level-2 latent classes, and then present the results regarding the effect of individual characteristics on Level-1 class membership probability.

4.1. Latent structure

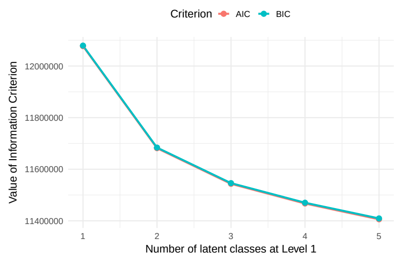
A key aspect of multilevel latent class analysis is the selection of the number of latent classes at both the individual and the group levels. This decision can be informed by theoretical considerations or by data-driven methods using information criteria such as the AIC and BIC. In this work, we selected a number of classes that provides a good compromise between statistical fit and substantive interpretability. Specifically, we adopted a sequential approach: first, we estimated single-level LC models to select the number of classes at the lower level (students); second, once these classes were established, multilevel LC models were estimated to identify the optimal number of groups at the higher level (neighbourhoods). Covariates are not considered at this stage.

Based on the fit statistics reported in Table 1 and on the interpretability of the resulting classifications, we selected four latent classes at both Level 1 and Level 2.

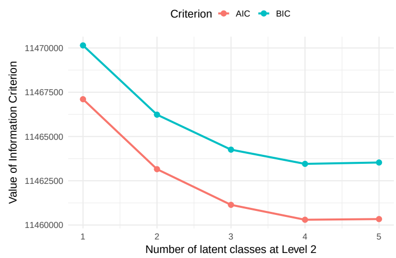
After identifying the optimal number of latent classes, we included covariates in the selected model to account for individual characteristics that affect the membership probability in the Level-1 profiles. The results obtained from this model are now discussed. The measurement model presents well-separated classes at both levels, with an entropy-based R^2 equal to 0.851 and 0.999 at Level 1 and Level 2, respectively. At the lower level, the four latent classes can be characterised based on conditional response probabilities, as shown in Figure 1. The

Table 1: Fit statistics for latent class models.

Level-1 class selection					
No. latent classes					
Level 2	Level 1	Log-likelihood	AIC	BIC	Plot
1	1	-6038432	12077277	12079275	
1	2	-5840542	11681570	11683915	
1	3	-5771398	11543354	11546047	
1	4	-5733203	11467036	11470077	
1	5	-5702564	11405830	11409217	



Level-2 class selection					
No. latent classes					
Level 2	Level 1	Log-lokelihood	AIC	BIC	Plot
1	4	-5733238	11467106	11470147	
2	4	-5731259	11463155	11466234	
3	4	-5730247	11461140	11464258	
4	4	-5729822	11460299	11463455	
5	4	-5729837	11460337	11463531	



profiles reflect different combinations of educational opportunities across the family, school, and environment domains, with higher mean scores indicating greater access to educational resources and opportunities.

In general, across all classes, the lowest scores within the Family dimension are observed for items related to cultural experiences (items "family3_") - such as visiting museums, attending theatre performances, or participating in musical activities - suggesting that this is a particularly deprived area of educational opportunity. Conversely, within the School and Environment dimensions, notable differences emerge between classes 2-3 and classes 1-4. The most critical aspects for schools concern access to digital tools (item "school7_1") and the availability of a functional library (item "school7_3"), whereas the weakest points regarding the Environments are the public transport (item "environment8_4") and street maintenance (item "environment8_8").

Regarding the specific class profiles, students in Class 1 experience favourable family conditions but more limited opportunities in the school and environmental domains. Class 2 displays moderate levels of opportunity across all three contexts. Class 3 represents the most advantaged group, enjoying high opportunities in every domain. Finally, Class 4 shows the most disadvantaged profile, with systematically lower access to educational opportunities in the family, school, and environmental contexts.

Figure 1: Class profiles at Level 1 according to the conditional response probabilities.

At the higher level (Level 2), the four latent classes for the neighbourhoods can be described according to the low-level class proportions, as reported in Table 2. Overall, Level-2 classes do not appear strongly associated with specific Level-1 profiles, suggesting that the Level-2 classification reflects a combination of individual-level experiences rather than a single dominant profile. Specifically, we can define the Level 2 classes as follows: *(i)* Class 1 - High educational opportunities in all dimensions (highest probabilities for Level-1 Classes 2 and 3), *(ii)* Class 2 - Good opportunities provided by the family (highest probability for Level-1 Class 1 and lowest probability for Level-1 Class 4), *(iii)* Class 3 - High heterogeneity in profiles, with lower probability of observing the profile with good opportunities in all dimensions (similar probabilities for all Level-1 classes, with the exception of a lower probability for Level-1 Class 3), *(iv)* Class 4 - Low opportunities in school and environment (highest probabilities for Level-1 Classes 1 and 4).

Table 2: Estimated proportions of low-level (student-level) classes conditional on high-level (neighbourhood-level) class membership. Class weights at both levels are available at the margins.

	Level2 class				
Level1 class	**1**	**2**	**3**	**4**	*Weight*
1	0.21	0.37	0.26	0.45	*0.31*
2	0.33	0.22	0.27	0.17	*0.26*
3	0.28	0.22	0.18	0.15	*0.22*
4	0.18	0.19	0.29	0.23	*0.21*
Weight	*0.32*	*0.31*	*0.21*	*0.16*	

Figures 2 and 3 show the assignment of the ten municipalities of Naples and the nine homogeneous areas of its Province to the Level-2 classes, where assignments are based on the highest posterior probabilities derived from survey responses in each municipality or area.

Within the city, municipalities I (Chiaia, Posillipo, S. Ferdinando), IV (Vicaria, S. Lorenzo, Poggioreale), V (Vomero, Arenella), and X (Bagnoli, Fuorigrotta), mainly located in the central-western part, are assigned to Class 1, characterized by high educational opportunities across all dimensions. This result is consistent with Benassi and De Falco (2025), who identifies these areas among those with the highest socio-economic index and generally good urban accessibility. Peripheral areas such as Pianura and Soccavo (IX municipality), and Miano, Secondigliano, and S. Pietro a Patierno (VII municipality) are associated with Class 2, which reflects good opportunities in the family context. This finding appears somewhat in contrast with previous studies reporting these neighborhoods as among the most socio-economically deprived in Naples (Benassi and De Falco, 2025). However, other studies have shown that the IX municipality, in particular, exhibits a mixed composition, with both high and low concentrations of disadvantaged populations (Saraceno et al. (2020)). Finally, municipalities II (Avvocata, Montecalvario, Porto, S. Giuseppe, Pendino, Mercato), III (Stella, S. Carlo all'Arena), VI (Ponticelli, Barra, S. Giovanni a Teduccio), and VIII (Chiaiano, Piscinola-Marianella, Scampia) belong to Class 3, which shows high heterogeneity in individual profiles and a lower probability of the most advantaged configuration. These areas are in fact characterized by high levels of social and material vulnerability (ISTAT, 2020).

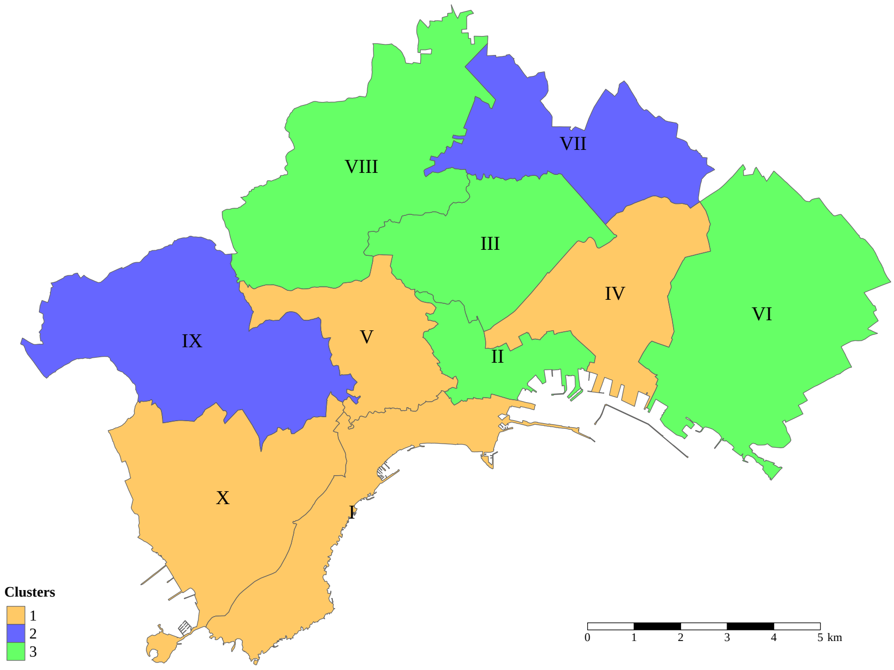


Figure 2: Cartographic representation of the assignment of municipalities of Naples to the high-level classes. List of municipalities: I - Chiaia, Posillipo, S.Ferdinando; II - Avvocata, Montecalvario, Porto, S.Giuseppe, Pendino, Mercato; III - Stella, S.Carlo all'Arena; IV - Vicaria, S.Lorenzo, Poggioreale; V - Vomero, Arenella; VI - Ponticelli, Barra, S.Giovanni a Teduccio; VII - Miano, Secondigliano, S.Pietro a Patierno; VIII - Chiaiano, Piscinola-Marianella, Scampia; IX - Pianura, Soccavo; X - Bagnoli, Fuorigrotta.

In the wider province, similar spatial patterns emerge. Coastal and touristic zones, namely zone I (Zona Costa Sorrentina), II (Zona Costa Vesuvio), and III (Zona Flegrea), belong to Classes 1 and 2, reflecting higher family resources and, especially for areas closer to Naples (II and III), better infrastructural and environmental conditions. The areas of Zona Giuglianese (IV), Zona Interno Vesuvio (V), and Zona Nord-Ovest (IX) are also associated with Class 2, showing relatively favorable family contexts despite more mixed territorial conditions. Conversely, a more isolated spatial pattern can be observed for the peripheral areas VI (Zona Nolana), VII (Zona Nord), and VIII (Zona Nord-Est), which are assigned to Class

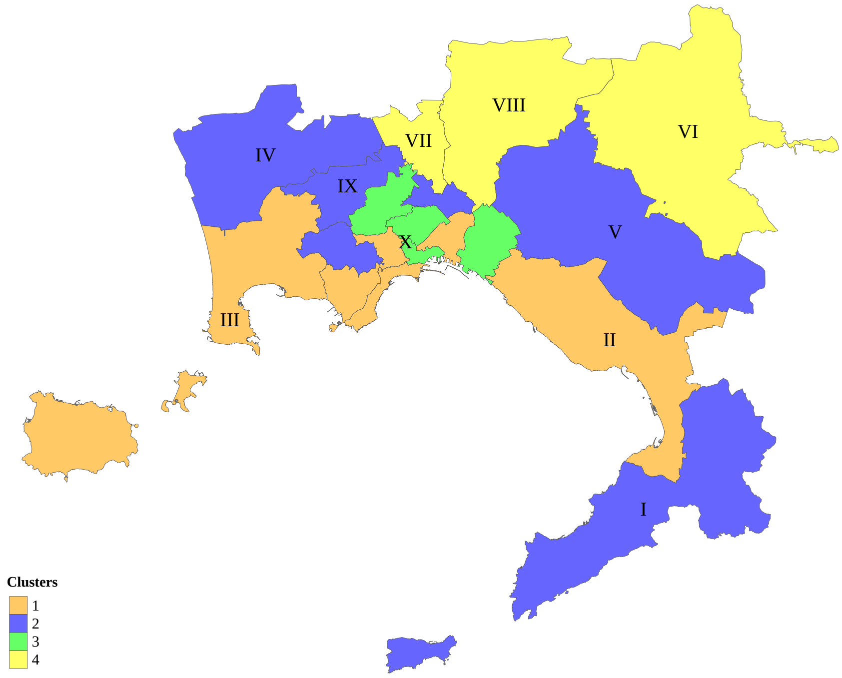


Figure 3: Cartographic representation of the assignment of the homogeneous areas of the Province of Naples to the high-level classes. List of the homogeneous areas of the Province of Naples: I - ZONA Costa Sorrentina; II - ZONA Costa Vesuvio; III - ZONA Flegrea; IV - ZONA Giuglianese; V - ZONA Interno Vesuvio; VI - ZONA Nolana; VII - ZONA Nord; VIII - ZONA Nord-Est; IX - ZONA Nord-Ovest. Number X indicates the Municipality of Naples.

4, particularly characterized by low opportunities in school and environment.

4.2. Effects of covariates: insights into students' background

Figure 4 shows the coefficients of the multinomial logistic model for membership of the four Level-1 latent classes conditional on covariates. Statistical significance of the coefficient has been evaluated through the Wald test. The results confirm that inequalities in educational opportunities are primarily associated with family background. Indeed, parental education and family income are the most significant predictors of class membership. In particular, higher parental education and higher family income substantially increase the probability of belonging to the more advantaged classes, especially those with high family opportunities (Classes 1 and 3). Conversely, variables such as gender, household size, and school type show weaker but still significant relationships with students' classification into Level-1 profiles. In particular, male students are slightly more likely to belong to classes with higher family opportunities (classes 1 and 3) compared to females. The effect of household size shows a non-linear pattern. Specifically, students from four-member households are less likely to belong to the most disadvantaged profile (Class 4) compared with those from smaller families (2-3 members). However, students from larger households (with more than four members) display a lower probability of belonging to Class 1 rather than Class 4. This pattern suggests that the probability of observing the mixed profile typical of Class 1 (high opportunities in family, low in school and environment) is lower among students from very large households. Finally, attending a technical or professional school is associated with a higher probability of belonging to classes characterized by greater school-related opportunities (Classes 2 and 3), indicating that these schools generally offer more resources and facilities, such as better-equipped laboratories, access to digital tools, libraries, and sports facilities.

5. Conclusion

This study investigated the multidimensional phenomenon of educational poverty (EP) among adolescents living in Naples and its province, using a multilevel latent class approach. Building on Sen's capability framework, we conceptualized EP as the result of limited educational opportunities across family, school, and environmental domains. Our analytical strategy allowed us to address three central research questions concerning (i) the existence of distinct EP profiles at the individual level, (ii) their aggregation into neighborhood-level profiles, and (iii) the role of individual background characteristics in affecting class membership probability.

The findings provide several insights. First, the analysis revealed four well-separated profiles of educational opportunities at the student level, capturing meaningful combinations of resources across the family, school, and environment dimensions. These profiles range from the most advantaged group, characterised by broad access to opportunities in all dimensions, to the most deprived group, marked by systematic disadvantages. In particular, cultural stimulations within the family context emerged as the most critical area of deprivation.

Second, the study identified four neighbourhood-level profiles, reflecting the different distribution of individual patterns of educational opportunities across

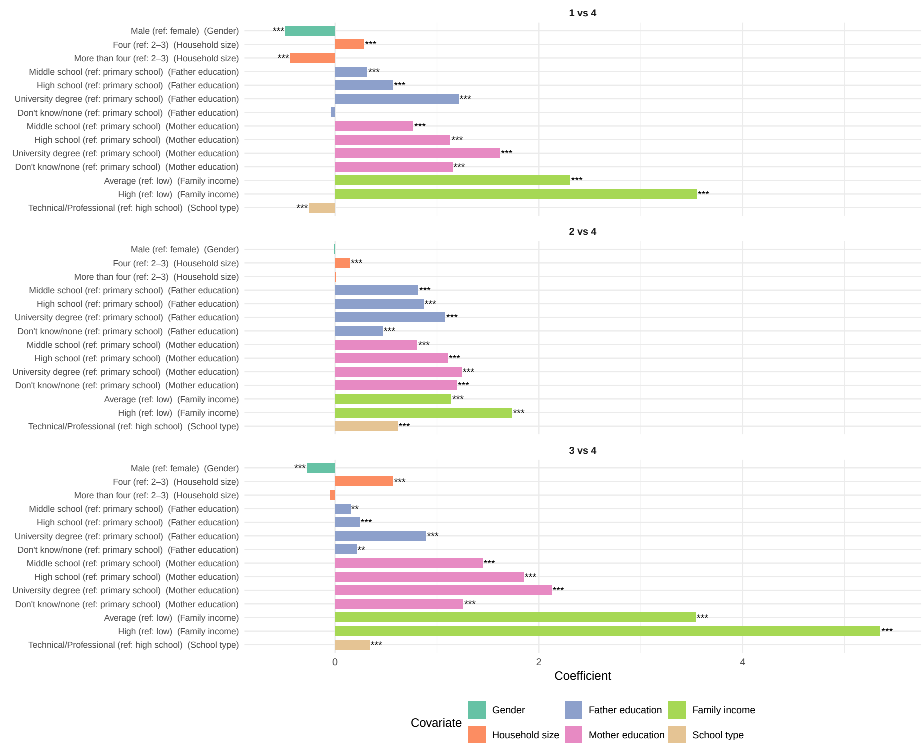


Figure 4: Estimated coefficients of the multinomial logistic model for membership of the four Level-1 latent classes conditional on covariates. Class 4, the most disadvantaged profile, is taken as the reference class. *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

the territorial areas. Although the Level-2 classes are not strongly dominated by a single individual profile, they depict interpretable territorial configurations, from neighbourhoods characterized by high opportunities across all dimensions to those presenting marked disadvantages in school and environmental resources. The spatial distribution of these profiles generally aligns with previous research on socio-economic conditions of Naples: central and coastal areas - typically characterized by better socio-economic conditions and urban accessibility - belong to the most advantaged Level-2 classes, whereas peripheral areas are associated with profiles reflecting more severe educational deprivation.

Third, covariate effects highlight the central role of family background in shaping students' opportunities. Parental education, particularly mothers' education, and household income are the strongest predictors of belonging to the most advantaged profiles. Other factors - such as gender, household size, and school type - play a more moderate but still significant role. Notably, students attending technical or professional schools show higher probabilities of belonging to classes with better school-related opportunities than high school students.

These findings highlight how individual disadvantages are deeply intertwined with the structural characteristics of the neighbourhoods in which adolescents grow up. At the policy level, the results point to the need for integrated interventions that act simultaneously on family circumstances and on the broader territorial context.

Despite its contributions, the study has some limitations that open multiple avenues for future research. First, the analysis focuses on enrolled upper-secondary students, excluding out-of-school adolescents; extending the analysis to early school leavers would offer important insights into the relationship between educational poverty and dropout risk. Second, future work could incorporate neighbourhood-level covariates - such as measures of socio-economic disadvantage, urban accessibility, and availability of social services - to explore how contextual factors affect the probability of belonging to specific Level-2 classes. This would lead to a deeper understanding of how territorial inequalities may produce and reinforce educational opportunity gaps.

Acknowledgments

The authors acknowledge the financial support provided by the European Union - NextGenerationEU, in the framework of the GRINS - Growing Resilient, Inclusive and Sustainable project (GRINS PE00000018 - CUP E63C22002140007). The views and opinions expressed are solely those of the authors and do not nec-

essarily reflect those of the European Union, nor can the European Union be held responsible for them.

References

Bartolucci, F., Bacci, S., and Gnaldi, M. (2015). *Statistical analysis of questionnaires: A unified approach based on R and Stata*. CRC press.

Benassi, F. and De Falco, A. (2025). Residential segregation and accessibility: Exploring inequalities in urban resources access among social groups. In *Land*, 14 (2): 429.

Boonk, L., Gijselaers, H., Ritzen, H., and Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. In *Educ.Res. Rev.*, 24: 10–30.

Fabbricatore, R., Bakk, Z., Di Mari, R., de Rooij, M., and Palumbo, F. (2025). Students' proficiency evaluation: a non-parametric multilevel latent variable model approach. In *Studies in Higher Education*, 50 (7): 1528–1555.

Heckman, J., Pinto, R., and Savelyev, P. (2013). Understanding the mechanisms through which an influential early childhood program boosted adult outcomes. In *Am. Econ. Rev.*, 103 (6): 2052–2086.

ISTAT (2020). *Le misure della vulnerabilità: un'applicazione a diversi ambiti territoriali*.

Nieuwenhuis, J. and Hooimeijer, P. (2016). The association between neighbourhoods and educational achievement, a systematic review and meta-analysis. In *J. Hous. Built Environ.*, 31: 321—347.

OECD (2017). *OECD: Educational Opportunity for All: Overcoming Inequality Throughout the Life Course*. OECD Publishing.

Saraceno, C., Benassi, D., and Morlicchio, E. (2020). *Poverty in Italy: Features and drivers in a European perspective*. Policy Press.

Save the Children (2014). *La lampada di Aladino. L'indice di Save the Children per misurare le povert'a educative e illuminare il futuro dei bambini in Italia.* Save the Children Italia.

Save the Children (2015). *Illuminiamo il future 2030. Obiettivi per liberare i bambini dalla povert'a educativa*. Save the Children Italia.

Sen, A. and Anand, S. (1997). Concepts of human development and poverty: A multidimensional perspective. In *United Nations Development Programme*, 1—-20.

Vermunt, J.K. (2003). Multilevel latent class models. In *Sociological methodology*, 33 (1): 213–239.

Vermunt, J.K. and Magidson, J. (2021). Lg-syntax user's guide: manual for latent gold syntax module version 6.0. In *Arlington, MA: Statistical Innovations Inc*.