



Quadrant-Based Analysis of Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) for Mapping Educational Participation in North Sumatra Province, Indonesia (2020–2024)

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Abstract:

This study aims to analyze educational participation in North Sumatra Province at the primary, junior secondary, and senior secondary education levels during the period of 2020–2024 based on the indicators of Gross Enrollment Rate (GER) and Net Enrollment Rate (NER). The study employed a descriptive quantitative approach using a quadrant-based analysis method. Secondary data were obtained from the Central Statistics Agency (BPS) of Indonesia and analyzed by comparing the GER and NER of North Sumatra Province with national average indicators at each educational level and year of observation. The findings reveal that primary education consistently falls into Quadrant I (high GER and high NER), indicating broad and age-appropriate educational participation. Junior secondary education tends to fall into Quadrant III (relatively lower GER and high NER), reflecting effective participation among students within the ideal school-age group despite relatively limited overall access. Meanwhile, senior secondary education is categorized into Quadrant II (high GER and low NER), indicating age-grade distortion and delayed educational participation. The study concludes that educational participation at the primary level in North Sumatra has been relatively equitable and effective, while challenges remain at the secondary level, particularly regarding age-appropriate participation and continuity of educational access. These findings imply the importance of quadrant-based educational policies to improve equitable, inclusive, and sustainable educational participation.

INTRODUCTION

Education is a fundamental pillar in human development and in improving the quality of life of society. In this regard, the Indonesian government has implemented various educational policies to enhance access, quality, and equity of education across all regions, including through the 12-year compulsory education program (Khairunnisa & Tinus, 2018; Pratiwi & Siswanto, 2023). This

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program aims to ensure that all school-age children have continuous learning opportunities from primary to upper secondary education levels. Equitable access to quality education is one of the important indicators used to measure the achievement of social development within a region, including in Indonesia. However, the implementation of this policy still reveals disparities among regions, both in terms of educational quality and participation rates.

Improving educational quality is also a crucial foundation for preparing Indonesia to face a competitive and dynamic future (Abels et al., 2021; et al., 2020). A high level of educational participation reflects the success of providing affordable, equitable, and quality educational services. To assess this achievement, two main indicators widely used by the Central Statistics Agency (BPS) are the Gross Enrollment Rate (GER) and the Net Enrollment Rate (NER). GER measures the proportion of all students enrolled at a particular level of education regardless of age compared to the official school-age population at the same level. Meanwhile, NER indicates the proportion of students of the appropriate age who are enrolled at the corresponding education level (Pudyastuti & Mulyaningsih, 2021; Rohmani, 2020; Safira & Wibowo, 2021). These indicators not only reflect educational coverage but also serve as important benchmarks for evaluating the effectiveness of the education system, particularly in the context of strategic planning to ensure timely access to education for school-age populations.

In line with this, the importance of strategic planning in education has increasingly attracted scholarly attention. Mahardhika and Raharja (2023) revealed that one of the primary weaknesses of educational institutions in Indonesia lies in their limited capacity to formulate and implement strategic planning that adapts to rapid societal changes. Without measurable and collaborative strategies, many educational programs remain administrative in nature and lack sustainability. This argument is reinforced by Aini (2024), who emphasized that sustainable and competitive education can only be achieved through the integration of soft-skills-based curriculum planning, technology utilization, and cross-sector collaboration, including partnerships with industry.

National data indicate an increasing trend in educational participation at all levels during the period of 2020–2024. The national GER at the primary school level remained relatively stable, changing from 106.32% to 105.50%. At the junior secondary level, GER increased from 92.06% to 94.80%, while at the senior secondary level it rose from 80.46% to 84.00%. Similarly, NER also demonstrated positive growth, with primary school increasing from 98.67% to 98.89%, junior secondary school from 78.84% to 80.50%, and senior secondary school from 60.94% to 62.30%. Nevertheless, these national achievements still conceal substantial regional disparities.

In Indonesia, disparities in educational access among regions remain a significant challenge. North Sumatra Province, as one of the largest provinces outside Java Island, presents an interesting dynamic regarding educational participation over the last five years. Based on BPS data from 2020–2024, the GER for primary education in North Sumatra consistently exceeded the national average, reaching 108.53% in 2020, while the NER remained high at approximately 97.68%–98.00%. This condition indicates that nearly all primary school-age children have participated in education, including students outside the ideal age range. Therefore, North Sumatra can be categorized into Quadrant I (high GER–

high NER), representing ideal and comprehensive educational participation.

However, this achievement has not been equally reflected at the secondary education level. The GER for junior secondary education in North Sumatra declined from 91.68% in 2020 to 90.66% in 2024, while the NER gradually increased from 80.56% to 82.15%. Although the GER remained slightly below the national average, the NER was above the national average. This indicates that North Sumatra tends to fall into Quadrant III (low GER–high NER), suggesting effective participation among students within the ideal age group but indicating challenges in accommodating students outside the ideal age range.

A more concerning situation can be observed at the senior secondary education level. The GER for senior secondary schools increased from 94.68% in 2020 to 97.43% in 2024, whereas the NER only slightly increased from 68.00% to 69.72%. Although this figure is still above the national average in 2024 (62.30%), it indicates that nearly 30% of senior-secondary-school-age children are not attending school at the appropriate age. This condition reflects problems in educational continuity, particularly during the transition from junior secondary to senior secondary education. Consequently, North Sumatra can be classified into Quadrant II (high GER–low NER), which indicates age mismatch among students as well as potential delays or grade repetition.

The low participation rate at the senior secondary level may be influenced by several factors, including limited geographical access, socio-economic conditions of families, low parental awareness regarding the importance of continuing education, and unequal distribution of educational facilities (UNESCO, 2021; Murniati, 2022). Considering the diverse topographical and demographic conditions of North Sumatra, these issues require further in-depth investigation.

These findings are consistent with the study conducted by Ristanto et al. (2022), which stated that the gap between GER and NER should be analyzed as an indicator of latent inequality within the education system, such as grade repetition, school dropouts returning to school, and delayed school entry. The study also emphasized that quadrant mapping is an effective method for identifying hidden weaknesses in educational statistics that may appear satisfactory on the surface.

Theoretically, the quadrant approach has been widely used as an analytical method for mapping regional performance based on two critical variables simultaneously. In the field of education, mapping GER and NER through a quadrant approach provides a visual and strategic classification of regions with high, moderate, or low educational participation. Ristanto et al. (2022) explained that quadrant-based mapping functions as an effective diagnostic tool for educational policy because it simultaneously separates the dimensions of actual participation and ideal participation.

Several international studies also support the importance of in-depth analysis of GER and NER indicators in educational planning. Schendel and Alcott (2024) highlighted that GER is often misinterpreted as an indicator of educational success even though it includes students outside the ideal age range, potentially masking actual inequalities in educational access. Meanwhile, Baruah and Goswami (2024) demonstrated that affirmative policies such as Rashtriya Uchchar Shiksha Abhiyan (RUSA) in India successfully improved GER despite persistent regional disparities. On the other hand, Pal (2024) explained that

China's high GER achievement resulted from integrated educational governance and sustainable educational investment.

In the context of North Sumatra, which demonstrates dynamic educational participation patterns based on GER and NER indicators, these findings emphasize the importance of further studies that focus not only on achievement rates but also on age-appropriate schooling as an indicator of educational quality and inclusiveness. The quadrant approach employed in this study offers a strategic and data-driven method to map educational participation dynamics more accurately.

Previous studies have shown that quantitative approaches in mapping educational participation have been widely used to analyze regional disparities. Rachmawati et al. (2022) demonstrated that quadrant mapping based on GER and NER effectively identifies regions requiring more intensive educational policy interventions. Meanwhile, Rahman and Yuliana (2023) emphasized the importance of integrating longitudinal data to evaluate the effectiveness of regional educational policies. However, most previous studies have focused on national contexts or provinces located on Java Island, while the specific context of North Sumatra remains relatively underexplored.

Based on the review of previous studies, a research gap still exists regarding the application of quadrant analysis of GER and NER at the provincial level, particularly in North Sumatra. Previous studies tended to focus on national macro-level analyses or relied on a single educational indicator. Therefore, this study offers novelty through the application of GER–NER quadrant analysis to map educational participation levels in North Sumatra Province during the 2020–2024 period. The uniqueness of this study lies in the integration of five years of data to analyze trends and the relative positions of districts/cities within four educational participation quadrants, namely: (1) high GER–high NER, (2) high GER–low NER, (3) low GER–high NER, and (4) low GER–low NER. Accordingly, this study is expected to enrich scientific discourse concerning spatial- and temporal-based educational planning and policymaking.

Given this urgency, this study is important to further analyze the factors influencing educational participation in North Sumatra, particularly at the junior and senior secondary education levels. In addition, this study aims to identify patterns of correlation and the positioning of educational participation within the GER–NER quadrant mapping at the primary, junior secondary, and senior secondary education levels over the five-year period.

Therefore, this study aims to analyze educational participation in North Sumatra Province during 2020–2024 using the GER–NER quadrant approach by mapping the position of each region or education level into four quadrants based on the national midpoint values of GER and NER. This approach enables the identification of regions or educational levels that are in ideal conditions (high GER and high NER), experiencing delayed school-age participation (high GER and low NER), or still facing low educational participation. This study not only describes trends in both indicators at the primary and secondary education levels but also evaluates educational participation from the perspective of age-appropriate schooling, identifies influencing factors, and formulates strategic policy implications for policymakers at both regional and national levels.

The findings of this study are expected to serve as a basis for formulating

more targeted educational policies, particularly in strengthening continuity across educational levels and ensuring equitable access to quality education for all school-age children in North Sumatra. Furthermore, this study is expected to provide relevant recommendations for policymakers in designing strategies to improve inclusive, equitable, and sustainable educational participation.

RESEARCH METHOD

This study employed a quantitative descriptive approach to objectively analyze the condition of educational participation in North Sumatra Province based on two main indicators, namely the Gross Enrollment Rate (GER) and the Net Enrollment Rate (NER). The study focused on three levels of education: primary school (SD/equivalent), junior secondary school (SMP/equivalent), and senior secondary school (SMA/equivalent) during the period of 2020–2024.

The research design used in this study was non-experimental and descriptive longitudinal because the analysis was conducted using historical statistical data over five years without any direct intervention or manipulation of variables. This approach was selected because it is appropriate for identifying educational participation patterns, trends, and regional positions through statistical and comparative analysis (Sugiyono, 2021).

The population of this study consisted of all provinces in Indonesia whose GER and NER data were officially published by the Central Statistics Agency (BPS) during the period of 2020–2024. Meanwhile, the sample of this study was North Sumatra Province, which was purposively selected as the primary unit of analysis due to its dynamic educational participation trends and regional disparities across educational levels.

The data used in this study were secondary data obtained from official publications of the Central Statistics Agency (BPS), particularly annual educational statistical reports published from 2020 to 2024. Data collection techniques were conducted through documentation and systematic searches of relevant educational statistics. To ensure data validity and consistency, cross-checking and source triangulation were conducted across different years and official publications.

The data analysis technique was carried out in several stages. First, GER and NER data were normalized and compared across years to ensure consistency of measurement scales. Second, the national average values of GER and NER were calculated as midpoint references in the quadrant classification process. These midpoint values functioned as horizontal and vertical axes in determining the relative position of educational participation.

After determining the midpoint values, each district and city in North Sumatra Province was classified into one of four quadrants based on its GER and NER position relative to the national average. The quadrant classifications were as follows: (1) Quadrant I representing high GER and high NER, (2) Quadrant II representing high GER and low NER, (3) Quadrant III representing low GER and high NER, and (4) Quadrant IV representing low GER and low NER. This classification was used to identify patterns of educational participation and disparities among regions.

Furthermore, spatial-temporal trend analysis was conducted to observe changes in quadrant positions from 2020 to 2024. This analysis enabled the

identification of regions experiencing improvement, stagnation, or decline in educational participation. The findings were then interpreted to formulate strategic policy implications related to equitable and sustainable educational development in North Sumatra Province.

RESULTS AND DISCUSSION

RESULTS

1. Trends in GER and NER in North Sumatra

Regional Scope	GER and NER Achievement at Primary School Level/Equivalent in North Sumatra Province									
	GER					NER				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
North Sumatra	108,3	107,5	108,31	106,5	108,1	97,73	97,69	98	97,95	97,68
Indonesia	106,3	106,2	106,27	105,6	105,5	98,67	98,75	98,8	98,85	98,89

Source: BPS Education Statistics (2020–2024)

Table 1 shows that the Gross Enrollment Rate (GER) at the primary education level in North Sumatra consistently remained above the national average during the 2020–2024 period. Meanwhile, the Net Enrollment Rate (NER) also remained relatively high and stable, indicating broad access to primary education among school-age children.

Table 2. GER and NER Achievement at Junior Secondary School Level/Equivalent

Regional Scope	GER and NER Achievement at Junior Secondary School Level/Equivalent in North Sumatra Province									
	GER					NER				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
North Sumatra	91,68	91,87	90,31	92,11	91,79	80,56	81,13	81,84	82,09	82,15
Indonesia	92,06	92,8	93,58	94,21	94,8	78,84	79,23	79,65	80,02	80,5

Source: BPS Education Statistics (2020–2024)

Table 2 indicates that although the GER at the junior secondary level in North Sumatra remained slightly below the national average, the NER consistently exceeded the national average. This reflects relatively effective participation among students within the appropriate school-age group.

Table 3. GER and NER Achievement at Senior Secondary School Level/Equivalent

Regional Scope	GER and NER Achievement at Senior Secondary School Level/Equivalent in North Sumatra Province									
	APK					APM				
	2020	2021	2022	2023	2024	2020	2021	2022	2023	2024
North Sumatra	94,68	96,75	97,23	98,02	97,43	68	67,99	68,27	68,67	69,72

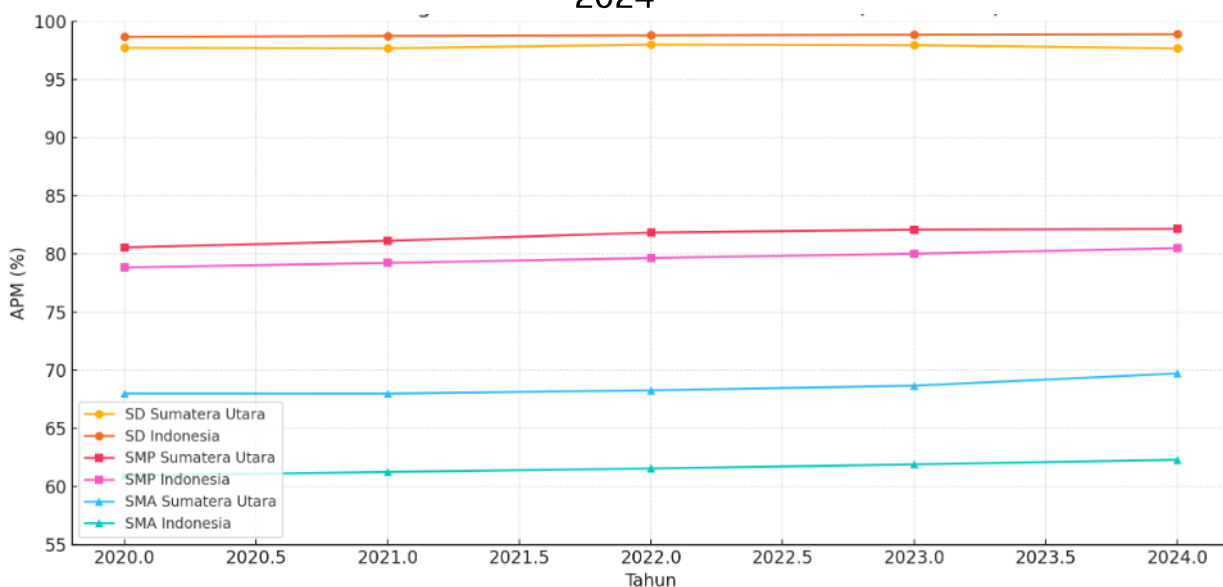
Indonesia	80,46	81,32	82,13	83,45	84	60,94	61,23	61,55	61,9	62,3
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Source: BPS Education Statistics (2020–2024)

Table 3 demonstrates that North Sumatra recorded a relatively high GER at the senior secondary level, but the NER remained comparatively low. This condition indicates the persistence of age-grade distortion and delayed educational participation.

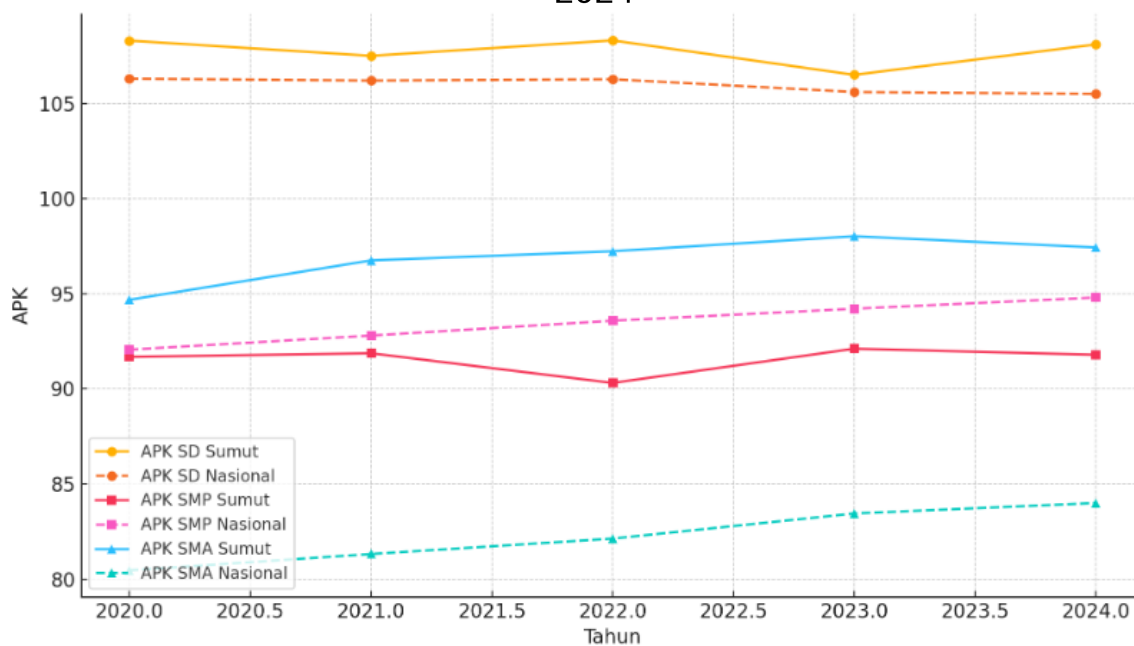
Based on the presented tables, the researcher conducted further analysis of the Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) data at the primary, junior secondary, and senior secondary education levels in North Sumatra Province for the period from 2020 to 2024. To facilitate a better understanding of the trends in educational participation, the numerical data were simplified and presented in the form of graphical visualizations as follows.

Figure 1. Comparison of GER in North Sumatra vs National Average, 2020–2024



The comparison of Net Enrollment Rate (NER) between North Sumatra and the national average from 2020 to 2024, across primary to senior secondary education levels, is presented as follows.

Figure 2. Comparison of NER in North Sumatra vs National Average, 2020–2024



Based on the analysis of trends in the Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) from 2020 to 2024 at the basic and secondary education levels in North Sumatra Province, several scientific findings were identified that provide a comprehensive overview of the conditions and dynamics of educational participation in the region. The graphical visualizations presented reveal varying patterns of GER and NER achievements across different education levels. When examined more closely, these patterns can serve as a scientific basis for assessing student age appropriateness, the effectiveness of transitions between education levels, and systemic challenges in the implementation of education.

At the primary education level, GER in North Sumatra consistently exceeded 106%, reaching 108.1% by 2024. This suggests the inclusion of students outside the official age group of 7–12 years, which can be interpreted through the lens of age-grade distortion theory—a framework that explains enrollment anomalies due to late entry, grade repetition, or early admission. These factors lead to a student population that surpasses the ideal age-based cohort. Despite this, NER at the same level remained remarkably high and stable, ranging from 97.6% to 98%, indicating that nearly all children of primary school age are accessing education. This dual condition—high GER and high NER—places primary education in North Sumatra within the ideal participation quadrant, although efforts to improve age-grade regularity remain necessary. These findings align with Mulyadi et al. (2022), who identified similar patterns in regions where high GER is not accompanied by parallel NER growth, suggesting latent age disparities in primary education access.

In junior secondary education, both GER and NER demonstrated steady increases during the observation period. GER rose modestly from 91.68% in 2020 to 91.79% in 2024, while NER increased from 80.56% to 82.15%. These upward trends reflect improvements in the transition from primary to junior secondary education, as well as enhanced participation among adolescents aged 13–15. This progress may be attributed to the continued implementation of the Nine-Year

Compulsory Education Program, supplemented by affirmative policies such as the Indonesia Smart Program (PIP), which aims to keep economically disadvantaged students enrolled. Notably, North Sumatra's junior secondary NER consistently exceeded the national average, suggesting a relatively effective transition mechanism and stronger age-appropriate retention compared to the national context. These findings are supported by Suryadi and Fatimah (2021), who noted that regions with strong policy support and better geographic access to educational facilities demonstrate more sustainable and inclusive secondary education participation.

In contrast, senior secondary education presents a more complex scenario. While GER rose significantly from 94.68% in 2020 to 97.43% in 2024, NER remained relatively low, fluctuating between 68% and 69%. This discrepancy reflects age misalignment at this level, indicating that a substantial proportion of students enrolled in senior secondary schools are outside the ideal age range of 16–18. Contributing factors include grade repetition, delayed transitions from junior secondary education, and school discontinuities. From a structural perspective, this may reflect limited school capacity in certain areas, socioeconomic disparities that hinder education continuity, and low post-basic education motivation, particularly in rural settings. These observations are consistent with World Bank (2018) findings, which emphasize that upper secondary participation is often constrained by indirect costs, school accessibility, and parental perceptions of education's value among low-income households. As such, senior secondary education in North Sumatra can be classified within the high-GER, low-NER quadrant, commonly referred to as the delayed-age participation quadrant.

From a methodological standpoint, the quadrant analysis approach—which combines GER and NER indicators—proves valuable for assessing the equity and efficiency of educational participation. Primary education has reached near-ideal conditions in terms of access, albeit with persisting issues of age irregularity. Junior secondary education demonstrates a stable and promising trajectory, warranting further reinforcement. Meanwhile, senior secondary education requires focused policy attention due to its low NER, which highlights access gaps and delayed progression among students.

These findings emphasize the importance of designing education policies that not only target access expansion (GER) but also address age-appropriate participation (NER), transition continuity, and interregional disparities. A comprehensive and inclusive approach is essential for ensuring educational equity and sustainability. To that end, the local government and education stakeholders in North Sumatra are urged to adopt strategies that integrate age-regularity mechanisms, strengthen transitions, and mitigate socioeconomic and geographic barriers.

In conclusion, the overall trends of GER and NER in North Sumatra between 2020 and 2024 indicate positive progress, particularly in widening access across all educational levels. However, the persistent challenges associated with NER—especially in junior and senior secondary levels—highlight ongoing age-grade mismatches, largely driven by delayed school entry, repetition, and socioeconomic constraints. Thus, while access has improved significantly, ensuring effective and timely educational progression remains a critical area for future

policy intervention. Based on the comparative analysis of GER and NER across primary, junior secondary, and senior secondary levels during this period, data were further classified into quadrants using general definitions and midpoint benchmarks for GER and NER to assess the relative performance of each level more systematically.

Table 4. General Definitions of Quadrants in GER and NER Analysis

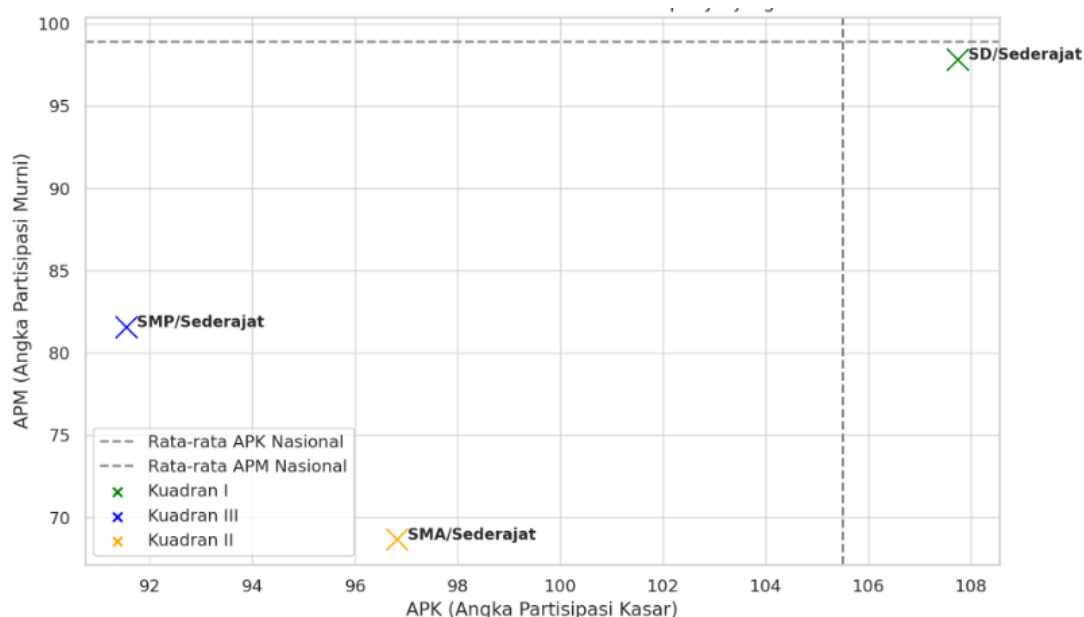
Quadrant	GER	NER	Interpretation
I	High	High	Ideal Participation: Reflects broad access combined with age-appropriate enrollment. Indicates an effective, inclusive, and equitable education system.
II	High	Low	Age-Grade Distortion: Indicates that while access is high, many students are outside the ideal age group due to delayed enrollment or grade repetition.
III	Low	High	Targeted Inclusion: Shows efficient inclusion of students in the correct age group, despite limited overall access. Suggests potential for growth with expanded access.
IV	Low	Low	Critical Participation Gap: Reflects low access and low age-appropriate enrollment, often indicating systemic issues requiring urgent policy intervention.

Table 5. Quadrant Analysis Based on Midpoint (Average) of GER and NER

Education Level	GER (Average)	NER (Average)	GER-NER Gap (%)	Quadrant	Explanation
Primary (SD/equivalent)	107,742	97,81	9.93%	Quadrant I	Both GER and NER are above the national average, indicating a highly inclusive primary education system that reaches nearly all children, including those within the ideal age group.
Junior Secondary (SMP/equivalent)	91,552	81,554	10.94%	Quadrant III	Although GER is below the national average, the NER is above, indicating strong participation among students of the appropriate age group despite limited total access.
Senior Secondary (SMA/equivalent)	96,822	68,664	28.16%	Quadrant II	The high GER indicates broad school participation, but the low NER highlights significant age-grade distortion or dropout, suggesting many students are outside the ideal age group.

The following is a quadrant visualization of GER and NER for North Sumatra Province based on levels of education.

Figure 3. GER vs NER Quadrant (North Sumatra vs National)



Based on the comparison between national averages and the Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) achievements in North Sumatra Province, a varied picture emerges across different levels of education.

At the primary level (SD/equivalent), North Sumatra falls into Quadrant I, reflecting an ideal level of educational participation. This is evidenced by a GER of 107.742 and an NER of 97.81, both of which are above the national average. These figures indicate that access to primary education in the province is very strong and successfully reaches all age groups, including children within the official school-age bracket.

In contrast, at the junior secondary level (SMP/equivalent), North Sumatra is positioned in Quadrant III, with a GER of 91.552, which is below the national average, but an NER of 81.554, which exceeds the national average. This situation suggests that the education system at this level is relatively effective in reaching students of the appropriate school age, yet still falls short in accommodating those who are over-age or have been left behind. In other words, while access for students of the ideal age group is strong, there remains a need to expand coverage to be more inclusive of all age categories.

At the senior secondary level (SMA/equivalent), the situation differs once again, as North Sumatra falls into Quadrant II. The province demonstrates a high GER of 96.822, indicating that a significant portion of the population is enrolled at this level. However, the NER, although slightly above the national average at 68.664, reveals that many students are outside the ideal age group. This condition suggests the presence of age-grade distortion, which may be attributed to factors such as grade repetition, delayed school entry, or re-enrollment after temporary dropout. Consequently, this level faces challenges in ensuring timely and continuous participation in education.

DISCUSSION

Factors Influencing Educational Participation

Educational participation is the result of a complex interplay of structural, cultural, economic, and geographical factors. Based on GER (Gross Enrollment Rate) and NER (Net Enrollment Rate) data for primary, junior secondary, and senior secondary education levels in North Sumatra (BPS, 2020–2024), it is evident that although GER remains high across all levels, NER does not always follow suit—particularly at the senior secondary level. This indicates that a significant proportion of students are enrolled outside the ideal age range, often due to delayed school entry, grade repetition, or schooling interruptions caused by socio-economic constraints.

One of the primary factors contributing to the low NER, especially at the senior secondary level, is the economic hardship faced by families (UNESCO, 2021). Additional contributing factors include the limited availability of senior secondary schools in rural areas, low parental educational literacy, and the economic necessity for children to contribute to household income. In several districts such as Asahan, Labuhan Batu, and Mandailing Natal, despite relatively high GER at the senior secondary level, the NER remains significantly below the national average (62.3% in 2024), indicating widespread age-grade mismatch due to these structural barriers.

Moreover, the effectiveness of affirmative policy measures—such as the Indonesia Smart Program (Program Indonesia Pintar, or PIP)—has shown a positive impact on increasing NER, particularly at the junior secondary level. Data indicate that North Sumatra experienced an increase in junior secondary NER from 80.56% in 2020 to 82.15% in 2024, surpassing the national average (80.5%). This demonstrates that targeted cash-transfer interventions can reduce dropout rates and enhance the participation of children within the ideal school-age cohort.

Challenges in Achieving Equitable Access to Education

Although North Sumatra records high Gross Enrollment Rates (GER) across all education levels, quadrant analysis reveals notable spatial disparities among its districts and cities. Districts such as Samosir, North Padang Lawas, and North Tapanuli fall into Quadrant I (high GER and high NER) at the primary and junior secondary levels, reflecting ideal educational participation. However, other areas such as South Labuhan Batu and Gunungsitoli fall into Quadrants II or IV at the senior secondary level, indicating that challenges to equitable access remain significant.

These challenges include limited secondary education infrastructure in remote areas, unequal distribution of qualified teachers, and disparities in education funding across regions. The fact that many districts show high GER but low NER (Quadrant II) illustrates an age mismatch largely due to suboptimal transition systems from junior to senior secondary levels. This situation is further exacerbated by the limited capacity of senior secondary schools in rural areas, which forces many students to delay or even discontinue their education after completing junior secondary school (Ristante et al., 2022).

Policy Opportunities Based on Quadrant Classification at Each Educational Level

The quadrant classification provides a robust foundation for evidence-based policy formulation. At the primary education level, North Sumatra consistently falls within Quadrant I (high GER and high NER), indicating that policy efforts should focus on improving quality and ensuring equity across schools. This includes teacher training initiatives and strengthening foundational literacy programs.

At the junior secondary level, North Sumatra is positioned in Quadrant III (low GER, high NER), reflecting that the system has been effective in reaching students within the ideal age group, although access remains limited for those outside this range. As such, policies should prioritize expanding school capacity, providing non-formal education pathways, and implementing inclusive approaches such as Paket B programs for overage students.

In contrast, at the senior secondary level, North Sumatra falls into Quadrant II (high GER, low NER), indicating challenges related to age irregularities. Policy opportunities here include strengthening guidance and counseling services, offering need-based scholarships, and developing technology-based open schools to reach students who are overage or geographically isolated. Utilizing quadrant-based data enables local governments to set precise educational development priorities based on regional profiles.

Strategic Policy Implications for Decision-Makers at Regional and National Levels

The quadrant-based analysis of the Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) yields critical implications for educational policy-making at both regional and national levels. First, local governments can utilize quadrant data to design an education equity roadmap tailored to the characteristics of each region. Areas categorized in Quadrant IV, for example, require urgent interventions such as the development of school infrastructure and incentives for teachers in 3T (disadvantaged, frontier, and outermost) regions.

Second, at the national level, the results of this analysis can serve as a foundation for formulating region-based affirmative policies, such as differentiated education budgets and targeted scholarship allocations. For instance, areas with high GER but low NER indicate the need for school retention programs or psychosocial support services for students (Pal, 2024).

Third, strengthening early warning systems based on quadrant data enables early detection of stagnation or setbacks in educational participation. This is particularly relevant in responding to post-pandemic educational dynamics, which have disproportionately affected vulnerable groups.

Finally, the quadrant analysis can function as a monitoring tool to evaluate the performance of regional leaders or education office heads in meeting the targets set in regional development plans (RPJMD) and education-related development indicators. The implementation of quadrant-based policies can enhance the strategic direction of regional human resource development and support the achievement of Sustainable Development Goal 4 (SDG 4) on inclusive and quality education for all.

CONCLUSION

The quadrant analysis of Gross Enrollment Rate (GER) and Net Enrollment Rate (NER) data for the Province of North Sumatra from 2020 to 2024 reveals significant spatial and educational level-based variations in educational participation. At the primary level (elementary school), participation is largely ideal, as indicated by the predominance of Quadrant I across most districts and municipalities. This implies that educational coverage is both high and age-appropriate, reflecting the effectiveness of the nine-year compulsory education policy and the relatively equitable distribution of basic education infrastructure.

In contrast, the junior secondary level (SMP) is predominantly situated in Quadrant III—characterized by low GER but high NER. This suggests that while the education system is effectively reaching students within the ideal age range, it has not yet achieved full inclusivity in terms of total coverage. The system accommodates age-appropriate students well but falls short in addressing the needs of over-aged or under-aged learners.

Meanwhile, the senior secondary level (SMA or equivalent) is mostly represented in Quadrant II, where GER is high but NER is low. This phenomenon highlights a broad access to upper secondary education, yet a significant proportion of students are not within the ideal age group. The irregular age patterns reflect issues such as delayed school entry, grade repetition, potential dropouts, and adult learners returning to complete their secondary education.

Based on these findings, several strategic recommendations emerge to improve and sustain GER and NER achievements. For the primary level, policies should focus on improving the quality of learning—particularly in foundational literacy and numeracy—and reducing disparities in educational quality across regions. For the junior secondary level, key strategies include expanding school capacity, increasing the availability of schools in remote areas, and strengthening non-formal and alternative education services to reach students outside the ideal age group.

For the senior secondary level, which exhibits the highest age irregularity, efforts must be directed toward strengthening the transition system from junior to senior secondary education, enhancing the relevance of upper secondary curricula, and expanding flexible education services such as Open Senior High Schools (SMA Terbuka) and vocational-based SMKs. Need-based affirmative scholarship programs, boarding schools, and transitional support services are particularly essential in areas where GER is high but NER remains low.

The policy implications of this study are highly relevant at both regional and national levels. At the regional level, quadrant analysis results can guide local governments in developing evidence-based, spatially responsive education planning. Local administrations can prioritize education development strategies according to the quadrant classification at each educational level. At the national level, the quadrant approach offers a foundation for the formulation of affirmative and spatially adaptive policy interventions. This aligns with the broader objectives of education decentralization and supports the achievement of Sustainable Development Goal 4, which promotes inclusive, equitable, and quality education for all.

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