

Equal Access to the Internet Among Schools Across Subdistricts as the Basis for Local Government Policies on Digital Educational Infrastructure Development

Aiman Sabar Rezeky^{1*}, Andi Rahmat Nizar Hidayat²

¹² Department of Public Administration, Universitas Negeri Makassar, Makassar, Indonesia

*Corresponding author e-mail: aimansrezeky@gmail.com

Abstract

The digitization of educational services requires equitable internet access across all educational institutions. However, high access coverage does not necessarily indicate equitable service distribution at the regional level. This study aims to analyze the equity of internet access in elementary schools and junior high schools in Gowa Regency, identify subdistricts with the highest disparities, and analyze the relationship between the number of schools and the level of internet dead zones. The study employs a quantitative descriptive approach with a comparative analysis across subdistricts. Data were obtained from the Gowa Regency Education Office in 2026 and cover all 562 schools across 18 subdistricts. The analysis was conducted using the School Internet Access Ratio, blank spot rates, descriptive statistics, Spearman's correlation, and the Mann-Whitney test. The results showed that school internet access in Gowa Regency was relatively high, with an aggregate coverage rate of 97.33 percent and an average across subdistricts of 96.89 percent. However, as many as 15 schools (2.67 percent) still do not have internet access, and all of them are concentrated in six subdistricts. The Tinggi Moncong subdistrict has the highest blank spot rate, at 12.90 percent. The results showed a weak association between the number of schools and the blank spot rate (Spearman's $\rho = 0.119$; $p = 0.637$). The Mann-Whitney test also showed no statistically significant difference in the number of schools between subdistricts with blank spots and those with full access ($U = 32.0$; $p = 0.743$). Because the analysis covered all 18 subdistricts, these p -values are reported as supplementary measures of the observed patterns rather than as evidence for generalization from a sample to a wider population. The results of the analysis show that the number of schools has no significant relationship with the level of blank spots (Spearman's $\rho = -0.119$; $p = 0.637$), while the difference in the number of schools between subdistricts with blank spots and those with full access is also not significant ($p = 0.743$). These findings indicate that, although aggregate school internet coverage is high, remaining access gaps are concentrated in a limited number of subdistricts and schools. This pattern has policy implications for more targeted interventions at the school level. Therefore, policies should focus on school-based targeting, strengthening interagency coordination, improving the connectivity database, and conducting regular monitoring of access.

Keywords: Blank Spot; Digital Divide; Educational Services; Gowa Regency; School Internet Access Ratio

Received: 9 September 2026

Accepted: 4 Oktober 2026

Published: 6 Oktober 2026

1. INTRODUCTION

Educational services in this decade rely on digital infrastructure. Student enrollment, school budget reporting, national assessments, and even teacher professional development are conducted through digital networks and systems. In the concept of a "networking society," access to information infrastructure is regarded as a prerequisite for participation, not merely an additional amenity (Castells, 2010). Research in various developing countries also shows that information technology infrastructure contributes to human development just as significantly as transportation infrastructure (Acheampong et al., 2022). Expanding internet access can also improve educational outcomes, not just facilitate administrative tasks (Henriksen et al., 2022). Therefore, when a school lacks network access, the impact is not merely a technical issue but can also hinder various educational services. In this study, equity refers specifically to the distribution of basic internet access availability across schools and subdistricts, rather than to broader dimensions of digital equity such as connection quality, affordability, stability, digital skills, or meaningful use.

The digital divide is a multidimensional concept that extends beyond the presence or absence of devices and internet connections. According to Van Dijk (2020), it also encompasses motivation, skills, and the ability to use technology meaningfully. However, this study focuses on the most basic material dimension of digital access: whether schools have internet connectivity available. Accordingly, the equity examined here concerns the distribution of basic internet access availability across subdistricts, rather than the broader dimensions of digital equity involving affordability, connection quality, stability, skills, or meaningful use. This means that simply providing devices and internet access is not enough if people lack the ability to use them. Norris (2001) also categorizes the digital divide into several forms, such as the global, social, and democratic divides. Various studies also show that equitable digital access does not occur automatically due to increased internet use but requires specifically designed policies (Robinson et al., 2020). In addition to socioeconomic conditions, concerns about information security can also influence reasons for using the internet (Lamberti et al., 2023).

In the field of education, the digital divide can have a greater impact. The COVID-19 pandemic has shown that disparities in access to technology and resources both at home and in schools can widen the learning gap (Bonafé & González, 2020; Suriyansyah, 2021). Research in Tamil Nadu also indicates that limited access to technology disproportionately harms students who were already falling behind (Jafar et al., 2023). In South Africa, the availability of technological devices in schools plays a key role in determining students' ability to access educational information (Oyediran-Tidings et al., 2021). Schools with limited resources also face various challenges in procuring technology (Olusegun & Nthotho, 2025). Therefore, ensuring equitable access to technology for low-income communities must be a priority in education policy (Adako & Ekundayo, 2025). A study across four ASEAN countries even indicates that digital equity must be addressed both in terms of infrastructure provision and the public's ability to utilize it (McFarlane et al., 2024).

In Indonesia, basic education is one of the mandatory responsibilities of regency and city governments under Law Number 23 of 2014 on Regional Government. In addition, the Electronic-Based Government System promotes the integration and equitable distribution of digital infrastructure in government services, including in the field of education (Presidential Regulation Number 95 of 2018). The quality of educational services is also monitored through the Education Report Card, as stipulated in Regulation of the Minister of Education, Culture, Research, and Technology Number 9 of 2022. However, the implementation of digitization varies across regions. Research in the city of Bandung indicates that there remains a gap between the policies designed and the government's capacity to implement them (Rachmawati & Fitriyanti, 2021). The digitization of education in Indonesia continues to be directed toward supporting sustainable development, but its success still depends on the readiness of each region (Sholeh et al., 2025). In fact, the availability of digital infrastructure has been shown to correlate with school accreditation outcomes across various regions of Indonesia (Supardi et al., 2024).

Assessing equity in educational internet access requires attention not only to aggregate coverage but also to how access is distributed across geographic areas and institutions. A high overall coverage rate may coexist with localized gaps affecting specific schools or subdistricts. Therefore, this study examines equity primarily in terms of the distribution of basic internet access availability across subdistricts. This approach does not imply that access availability alone represents digital equity in its broader sense, since dimensions such as connection quality, affordability, stability, digital skills, and meaningful use are beyond the scope of the available data.

Gowa Regency is an interesting case to study because the level of school internet access is already quite high. Data from the Gowa Regency Education Office for the year 2026 shows that there are 562 elementary schools and junior high schools spread across 18 subdistricts, consisting of 430 elementary schools and 132 junior high schools. Of this total, 547 schools or 97.33 percent already have internet access, while 15 schools or 2.67 percent are still located in blank spots. Looking only at the overall figures, the situation appears to be very good. However, when broken down by subdistrict, it is found that the 15 schools without internet access are located in only six subdistricts, while the other 12

subdistricts already have full access. This indicates that the remaining issue is no longer simply the overall coverage level, but rather the geographic distribution of basic internet access across subdistricts and schools.

Studies on the digital divide have thus far been conducted primarily at the national or broad regional level. Some studies have developed indicators to measure the digital divide at the regional level, such as in Europe (Bruno et al., 2023), China (Zhou et al., 2024; Liu et al., 2024), South America (Pazmiño-Sarango et al., 2022), and Ukraine (Deineko et al., 2022). Other studies have also examined interregional educational disparities in Colombia (Jaraba Vergara et al., 2025). Meanwhile, research on internet access among indigenous communities in North America indicates that remaining gaps are typically localized and exhibit specific characteristics (Korostelina & Barrett, 2023). However, subdistricts as units of policy analysis in Indonesia have not yet been extensively studied in research on educational digital divides.

Given these circumstances, this study has three objectives. First, to analyze the distribution of basic internet access availability among elementary and junior high schools across subdistricts in Gowa Regency. Second, to identify subdistricts with the widest gaps in basic internet access and examine whether these gaps are associated with the number of schools per subdistrict. Third, to formulate policy implications for local government efforts to reduce geographic gaps in digital infrastructure access. The novelty of this study lies primarily in the use of subdistricts as the unit of analysis to identify disparities in school internet access at the subdistrict level. This unit of analysis is combined with connectivity data for all schools as an empirical indicator to assess the distribution of basic internet access across subdistricts as a dimension of digital education service provision. To support policy targeting needs, this study uses the School Internet Access Ratio (SIAR) as an operational measure that allows access conditions to be compared consistently across subdistricts. Thus, the study's contribution lies not only in measuring access levels but also in providing more granular spatial information to support policies aimed at reducing geographic gaps in basic internet access infrastructure.

2. METHOD

This study employs a quantitative descriptive approach with a comparative analysis across subdistricts. Descriptive analysis was used to describe internet access levels and disparities among subdistricts, while nonparametric analysis was used as a supplementary method to explore the relationship between the number of schools per subdistrict and the level of internet coverage gaps, as well as differences in the number of schools between subdistricts with coverage gaps and those with full access. This analysis is intended to identify patterns of statistical relationships and is not used to draw causal conclusions.

The study was conducted throughout Gowa Regency, South Sulawesi Province, which consists of 18 subdistricts. The research data were sourced from two official documents from the Gowa Regency Education Office in 2026: data on elementary and junior high schools based on internet access, and data on the distribution of schools in each subdistrict (Gowa Regency Education Office, 2026). The data used covered all 562 schools; therefore, this study employed a census method rather than sampling. Consequently, the research findings reflect the actual conditions of all schools studied. Subdistricts served as the unit of analysis, while schools formed the basis for calculating indicators within each subdistrict.

Table 1. *Operational Definitions of Research Variables*

Variables	Operational definition	Calculation Method	Data sources
School Internet Access Ratio (SIAR)	The percentage of educational institutions with internet access out of the total number of educational institutions in a subdistrict	$\frac{(\text{number of schools} - \text{number of blank spots})}{\text{number of schools}} \times 100$	Gowa Regency Department of Education (2026)

Blank spot rate	The percentage of educational institutions without internet access in a subdistrict	number of blank spots ÷ number of schools × 100	Gowa Regency Department of Education (2026)
Number of schools per subdistrict	The number of elementary and junior high schools in a subdistrict as a comparison variable	number of elementary schools + number of junior high schools (units)	Gowa Regency Department of Education (2026)

This study uses three variables: the School Internet Access Ratio (SIAR), the blankspot rate, and the number of schools per subdistrict. SIAR is calculated based on the percentage of schools with internet access compared to the total number of schools in each subdistrict. The blankspot rate indicates the percentage of schools that do not yet have internet access. Meanwhile, the number of schools per subdistrict refers to the total number of elementary and junior high schools in each subdistrict and is used as a comparison variable to examine whether the number of schools is associated with the blank spot rate.

An initial review of the data revealed inconsistencies in the number of schools with internet access. In the original data, the number of schools with internet access equaled the total number of schools in each subdistrict, even though the “blank spot” column included schools that did not yet have internet access. Since both sets of data could not be correct at the same time, this study calculated the number of schools with internet access by subtracting the number of “blank spot” schools from the total number of schools. The “blank spot” data was used as the basis for the calculation because it directly indicates the number of schools that do not yet have access. This condition is one of the study’s limitations, which is openly acknowledged.

Since most subdistricts have a SIAR of 100 percent, quartile-based classification was not used. This study instead employed operational thresholds for policy mapping purposes, namely SIAR = 100 percent as full access, SIAR 90–<100 percent as moderate disparity, and SIAR <90 percent as high disparity. The 90 percent categorization threshold is an operational threshold developed for the purposes of this study’s analysis; therefore, the categorization results should be interpreted contextually and should not be treated as a universal standard for digital service equity. Consequently, these categories are used to facilitate the identification of target areas and are not intended as a normative measure of equity levels applicable to all regions.

Data analysis was conducted in four stages. First, descriptive statistics for internet access in the 18 subdistricts were calculated, including the mean, median, minimum, maximum, range, and standard deviation. Second, subdistricts were ranked based on their level of internet coverage gaps and grouped into three gap categories. Third, the relationship between the number of schools per subdistrict and the blank spot rate was examined using Spearman’s rank correlation, while the number of schools per subdistrict was compared between subdistricts with blank spots and those with full access using the Mann–Whitney test. These nonparametric tests were used as supplementary analyses to characterize the observed patterns in the complete set of 18 subdistricts. Fourth, the research results were presented in the form of tables, bar charts, scatter plots, and inter-subdistrict classifications.

Although the study covers all 18 subdistricts in Gowa Regency, Spearman’s rank correlation and the Mann–Whitney test were retained as supplementary analytical tools to characterize the strength of the observed association and the distributional difference between the two observed subdistrict groups. Because the study uses census data rather than a sample, the resulting p-values are not interpreted as evidence for generalization from the 18 subdistricts to a wider population. Instead, the primary interpretation is based on the descriptive characteristics and observed patterns across all subdistricts under study. The tests are therefore used to complement, rather than replace, the descriptive analysis. The Spearman correlation was used to describe the direction and strength of the association between the number of schools per subdistrict and the blank spot rate within the observed 18-subdistrict dataset.

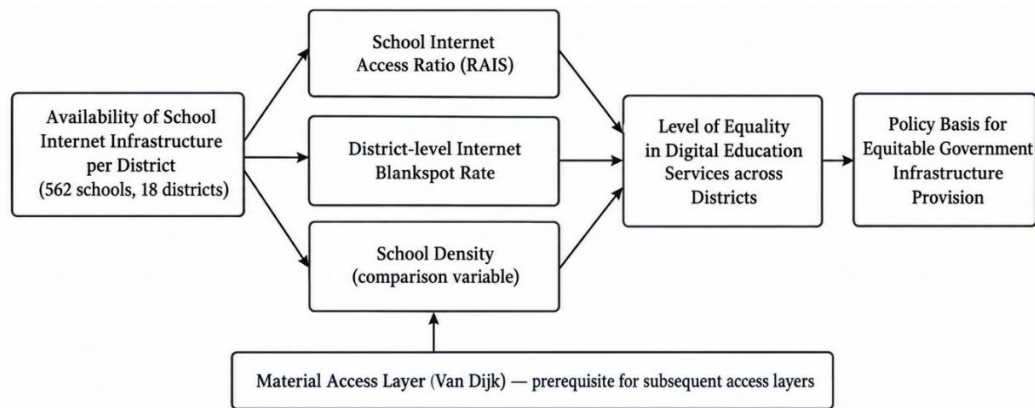


Figure 1. Framework for Analyzing Equity in Digital Education Services Across Subdistricts

Source: Developed by the Author (2026).

This study has several limitations. The data only indicate the presence or absence of internet access; therefore, it cannot yet describe the quality, speed, and stability of the network. The data also come from a single period, so they cannot yet show developments or changes over time. Additionally, the blank spot data are not differentiated by educational level, so comparisons between elementary and junior high schools cannot yet be made separately.

3. RESULTS AND DISCUSSION

3.1 Overview of School Internet Infrastructure in Gowa Regency

Internet service coverage in schools in Gowa Regency is relatively high. Of the 562 schools, 547 (97.33 percent) already have internet access, while 15 schools (2.67 percent) do not yet have access. By educational level, there are 430 elementary schools (76.51 percent) and 132 junior high schools (23.49 percent). On average, each subdistrict has about 31 schools, ranging from a low of 16 schools in Parigi Subdistrict to a high of 79 schools in Somba Opu Subdistrict. Complete data on the number of schools and internet access in each subdistrict are presented in Table 2.

Table 2. Distribution of Educational Institutions and School Internet Access Ratio by Subdistrict

No.	Subdistrict	Elementary Schools	Junior High Schools	Total	Blank spot	School Internet Access Ratio (%)
1	Bajeng	39	11	50	0	100,00
2	Parang Loe	17	4	21	2	90,48
3	Tinggi Moncong	25	6	31	4	87,10
4	Bungaya	16	6	22	0	100,00
5	Tompobulu	24	7	31	2	93,55
6	Barombong	17	4	21	0	100,00
7	Biring Bulu	24	8	32	0	100,00
8	Tombolo Pao	26	8	34	3	91,18
9	Bontolempangan	13	7	20	2	90,00
10	Pattallassang	19	7	26	0	100,00
11	Bontonompo Selatan	20	3	23	0	100,00
12	Parigi	12	4	16	0	100,00
13	Somba Opu	56	23	79	0	100,00
14	Pallangga	42	10	52	0	100,00
15	Manuju	16	8	24	2	91,67
16	Bontomarannu	21	7	28	0	100,00
17	Bontonompo	28	6	34	0	100,00
18	Bajeng Barat	15	3	18	0	100,00
	Kabupaten Gowa	430	132	562	15	97,33

Source: Compiled from the Gowa Regency Education Office database for 2026

Schools without internet access are located in only six subdistricts. These six subdistricts have 161 schools or 28.65 percent of all schools in Gowa Regency comprising 121 elementary schools and 40 junior high schools. This means that, although the number of schools without internet access is only 2.67 percent, the areas facing this issue account for a significant portion of educational services in Gowa Regency. On the other hand, the high level of internet coverage indicates that Gowa Regency is already in fairly good shape. However, the challenge now is to reach the schools that are still left behind. This situation differs from areas that are just beginning to build networks, as schools that are not yet connected are typically located in more remote areas and require higher costs (Korostelina & Barrett, 2023).

3.2 Rankings and Distribution of Disparities Among Subdistricts

When viewed by the level of internet coverage gaps, the disparities are concentrated in six subdistricts. The analysis identified six subdistricts with blank spots, while the remaining 12 subdistricts had full school-level internet coverage. The term “blank spots” refers to schools without recorded internet access within the respective subdistricts and does not imply that the entire subdistrict lacks internet coverage. Meanwhile, the other 12 subdistricts have achieved 100 percent internet access. The Tinggi Moncong subdistrict has the highest level of coverage gaps, at 12.90 percent or 4 out of 31 schools. Next is Tombolo Pao with 3 schools in blank spots, followed by four other subdistricts, each with 2 schools in blank spots. The complete rankings are shown in Table 3, while Figure 2 displays the distribution of blank spot rates across all subdistricts.

Table 3. Subdistrict Rankings by Blank Spot Rate

Rank	Subdistrict	Number of Schools	Blank Spots	Blank Spot Rate (%)	SIAR
1	Tinggi Moncong	31	4	12,90	87,10
2	Bontolempangan	20	2	10,00	90,00
3	Parang Loe	21	2	9,52	90,48
4	Tombolo Pao	34	3	8,82	91,18
5	Manuju	24	2	8,33	91,67
6	Tompobulu	31	2	6,45	93,55
7–18	12 other subdistricts	401	0	0,00	100,00

Source: Compiled from the Gowa Regency Education Office database for 2026.

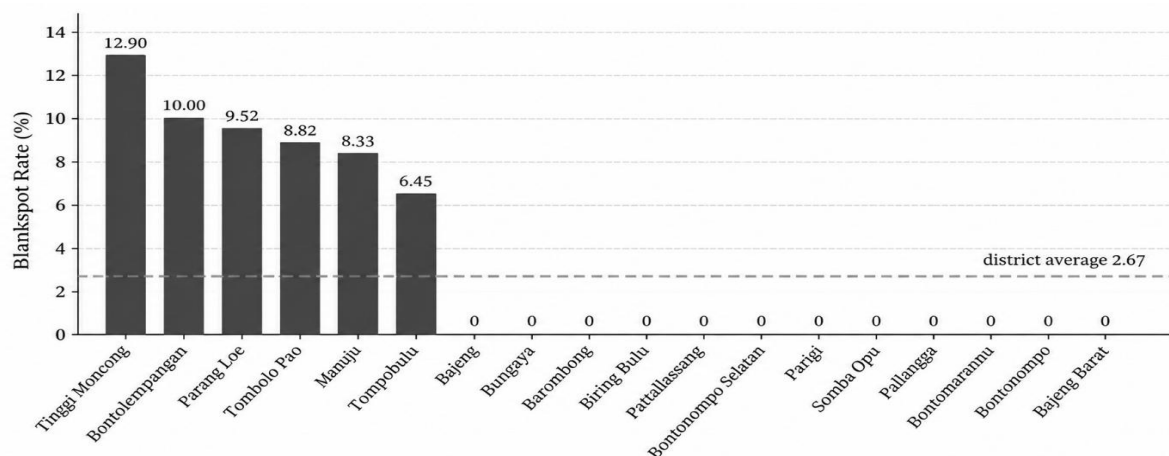


Figure 2. School Blank Spot Rates in 18 Subdistricts in Gowa Regency
Source: Compiled from the Gowa Regency Education Office database for 2026.

Priorities can be determined based on the number of schools without access or their percentage. Based on the number, Tinggi Moncong Subdistrict ranks first with 4 schools, followed by Tombolo Pao Subdistrict with 3 schools. However, based on the percentage, Bontolempangan Subdistrict ranks second with 10 percent, while Tombolo Pao Subdistrict ranks fourth with 8.82 percent. These two measures serve different purposes. The absolute number indicates the number of schools that need to be addressed, while the percentage indicates the magnitude of the gap experienced by a region. Since this study focuses on equity, the percentage is used as the basis for ranking, while the number of schools is still used to help determine intervention targets.

The data patterns also reveal fairly clear differences among subdistricts. Twelve subdistricts have a “blank spot” rate of 0 percent, while the other six subdistricts have “blank spot” rates ranging from 6.45 to 12.90 percent. This means that the gap is not evenly distributed throughout Gowa Regency but is concentrated in certain specific areas. According to Van Dijk’s (2020) concept of the digital divide, this situation falls under the category of a basic access gap that is, when schools lack access to digital infrastructure.

The six subdistricts that still have schools in “blank spot” areas are Tinggi Moncong Subdistrict, Tombolo Pao Subdistrict, Parang Loe Subdistrict, Tompobulu Subdistrict, Bontolempangan Subdistrict, and Manuju Subdistrict. The relatively higher blank spot rate observed in Tinggi Moncong may be associated with its geographic characteristics, such as mountainous terrain and more dispersed settlements. However, these factors were not directly measured in this study and therefore should be considered possible contextual explanations rather than established causes of the observed access gaps.

3.3 Summary of Statistics on Inter-Subdistrict Equity

Table 4. *Descriptive Statistics on School Internet Access Rates by Subdistrict*

Statistical Measures	Skor	Notes
Number of subdistricts	18	All subdistricts in Gowa Regency (census)
Average SIAR across subdistricts	96,89	Unweighted average number of schools
Median SIAR	100,00	Twelve subdistricts are at the maximum value
Minimum value	87,10	Tinggi Moncong Subdistrict
Maximum value	100,00	Twelve subdistricts with full coverage
Range	12,90	Difference between the maximum and minimum values
Standard deviation	4,68	Measure of inter-subdistrict variation
Coefficient of variation	4,83%	Standard deviation from the mean
Aggregate SIAR for the regency	97,33	547 out of 562 educational institutions

Source: Compiled from the Gowa Regency Education Office database for 2026

The analysis results show that the distribution of internet access in Gowa Regency is relatively good, but there are still several subdistricts that lag behind. Based on Table 4, the average School Internet Access Ratio across the 18 subdistricts is 96.89 percent, slightly lower than the regency-wide ratio of 97.33 percent. This difference arises because the sub-district average assigns equal weight to each sub-district, whereas the regency ratio accounts for the number of schools. A median of 100 percent indicates that most sub-districts already have full internet access, while disparities exist only in a few sub-districts.

A standard deviation of 4.68 and a coefficient of variation of 4.83 percent indicate that differences between regions are generally relatively small. However, there is a gap of 12.90 points between the subdistrict with the lowest access and the one with the highest. This means that the average figure

does not fully reflect the conditions in each subdistrict. Therefore, the information needs to be examined in greater detail through indicators and regional groupings (Zhou et al., 2024; Bruno et al., 2023).

Based on the classification in Figure 3, there is one subdistrict with a high disparity, five subdistricts with moderate disparity, and 12 subdistricts that already have full access. This grouping helps the government identify areas that need to be prioritized. The use of classifications and rankings can also make the measurement results easier to use in policy formulation (Busco et al., 2025).

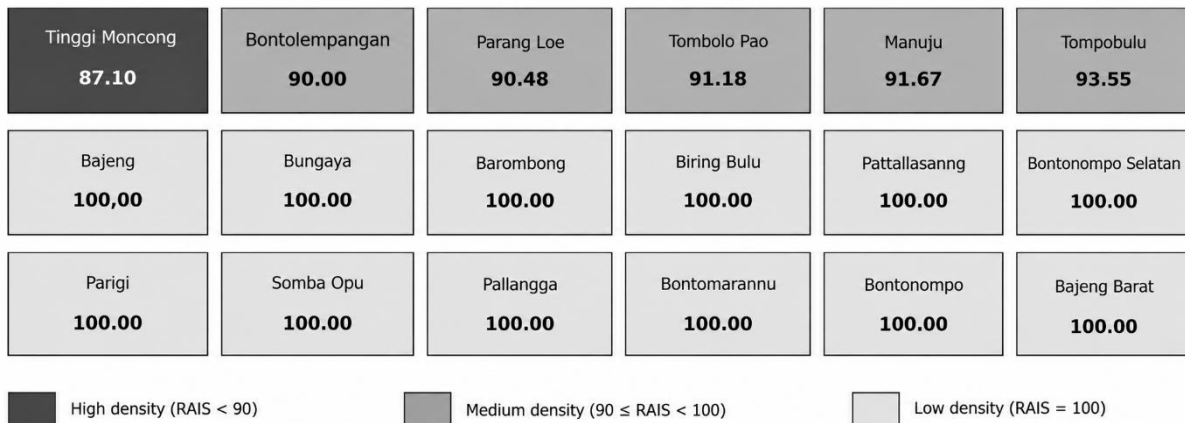


Figure 3. Classification of Subdistricts by Level of Internet Access Equity in Schools
 Source: Compiled from the Gowa Regency Education Office database for 2026

The number of schools that still lack access is actually relatively small only 15 schools. Therefore, the remaining issue is better viewed as one of implementation and targeting rather than a problem of large-scale network expansion. However, the remaining schools are likely located in harder-to-reach areas, requiring a different approach from previous network expansion efforts.

3.4 Comparing the Number of Schools by Internet Access Condition

The six subdistricts with blank spots had an average of 26.83 schools, while the 12 subdistricts with full internet access had an average of 33.42 schools. The Mann–Whitney test produced $U = 32.0$ ($p = 0.743$). Because all 18 subdistricts were included in the analysis, the test result is treated as supplementary statistical information rather than as evidence for inference beyond the observed subdistricts. Descriptively, the difference in the number of schools between the two groups does not indicate a clear pattern linking the number of schools to the presence of blank spots.

The Mann–Whitney test indicated a difference in the distribution of the number of schools between the two observed subdistrict groups, with $U = 32.0$ and $p = 0.743$. Given that the analysis covered all 18 subdistricts, the p -value is treated as a supplementary statistical indicator rather than as evidence for generalization beyond the observed population. Descriptively, subdistricts with blank spots had an average of 26.83 schools, compared with 33.42 schools in subdistricts with full coverage. The observed difference therefore does not provide a clear descriptive pattern indicating that number of schools per subdistrict is associated with the presence of blank spots.

Table 5. Comparison of Subdistrict Groups with Blank Spots and Full Coverage

Comparative Aspects	Subdistricts with no coverage	Subdistricts with full coverage
Number of subdistricts	6	12
Number of educational institutions	161	401
Average number of schools per subdistrict	26,83	33,42
Range of school counts	20–34	16–79

Number of schools in blank spots	15	0
Average number of SIAR	90,66	100,00

Source: Compiled from the Gowa Regency Education Office database for 2026.

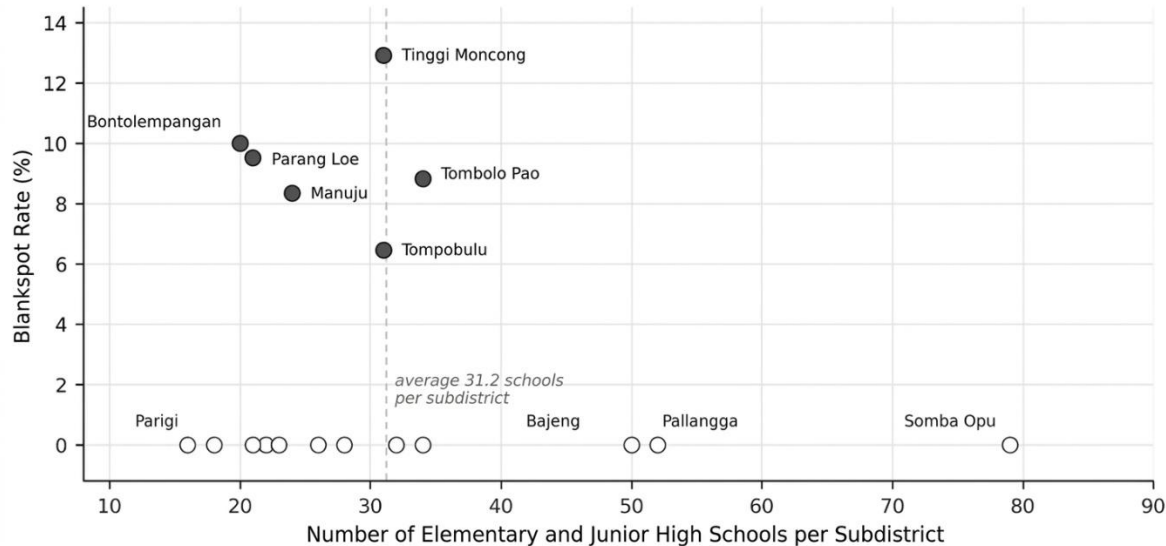


Figure 4. Distribution of number of schools per subdistrict by Blank Spot Level per Subdistrict

Source: Compiled from the Gowa Regency Education Office database for 2026.

Figure 4 illustrates these results. Tombolo Pao Subdistrict, for example, has 34 schools but still has a blank spot rate of 8.82 percent. In contrast, Parigi Subdistrict, which has only 16 schools, already has full internet access. The same is true for Bajeng Barat Subdistrict, which has 18 schools but has already achieved full coverage. Subdistricts that still have internet dead zones range from 20 to 34 schools and do not follow a clear pattern. Thus, the observed distribution does not show a consistent pattern in which subdistricts with fewer schools tend to have higher blank spot rates.

These results indicate that the number of schools alone does not provide a clear explanation for the observed variation in internet access gaps across subdistricts in Gowa Regency. Because this variable is easily obtained, the number of schools is often used as the basis for setting priorities. However, the study's findings suggest that the government cannot rely solely on the number of schools when identifying areas in need of internet connectivity. Previous research has also shown that the factors causing the digital divide are not always related to the most easily measurable variables (Pazmiño-Sarango et al., 2022). Several factors, such as geographic conditions, the distance of schools from the main network, population density around schools, and economic viability for internet service providers, could theoretically be related to variations in access. However, these factors were not measured in this study and therefore cannot be used to empirically explain the pattern of blank spots in Gowa Regency. These factors are more appropriately considered as possible explanations that need to be tested in future research.

3.5 Digital Equity as a Dimension of Public Service Equitability

Findings regarding the concentration of the digital divide hold significant implications for understanding the distribution of governmental responsibilities. Basic education is a mandatory responsibility related to basic services and falls under the jurisdiction of district governments pursuant to Law Number 23 of 2014. Therefore, the provision of educational support infrastructure is also part of the local government's responsibility. This obligation applies to all educational institutions, including schools that are geographically more difficult to reach. An internet access rate of 97.33 percent indicates that the program has generally achieved good results. However, this figure does not yet indicate that internet access is evenly distributed. Thus, program success and the equitable distribution of services

are two distinct matters. A high coverage rate does not guarantee that all schools have received equal access to services.

The availability of school infrastructure is also one of the indicators in the evaluation of regional Minimum Service Standards based on Regulation of the Minister of Education, Culture, Research, and Technology Number 9 of 2022. Schools that do not yet have internet access not only face limitations in accessing digital services but may also affect a region's performance in national evaluations. The problem identified is not merely the absence of policy but also the lack of sufficiently detailed information regarding the locations of schools still experiencing "blank spots." If reporting only shows achievements at the regency level, the existence of 15 unconnected schools may go unnoticed in the planning and budgeting process. Therefore, information at the subdistrict and school levels is necessary so that the government can identify priority locations for intervention.

The digital divide in internet access can lead to a divide in the use of technology. Schools need internet access as a prerequisite for using various e-government services. Research in several European countries indicates that the digital divide can reduce the use of e-government services (Botrić & Božić, 2021). Levels of trust in e-government services and the results of their evaluations can also influence the rate of service utilization when access gaps persist (Pérez-Morote, Pontones-Rosa, & Núñez-Chicharro, 2020). A similar situation occurs in e-participation. Limited access can reduce the ability of citizens and institutions to participate in various digital-based government activities (Pérez-Morote, Rosa, & Cortés, 2020). Developing digital competencies as part of efforts to achieve public service inclusion also requires internet access as a prerequisite (Morte-Nadal & Esteban-Navarro, 2022). Thus, access gaps can lead to disparities in the ability to use technology and participate in digital services (Kozaman Aygün & İnal Çekiç, 2025).

The success of digitization is determined not only by the availability of technology but also by the government's institutional capacity to manage it. Institutional quality determines the extent to which investments in information technology can be translated into social services that are truly accepted by the public (Evans, 2023). Schools play a crucial role in ensuring equitable access to digital opportunities because they are not only recipients of services but also play a key role in shaping the digital competencies of the next generation. The relationship between education and digital opportunity equity has been demonstrated in the research by Chen et al. (2020). Other public institutions, such as libraries, also play a role in supporting digital inclusion (Wang & Si, 2024). Therefore, the fact that 15 schools still lack internet access warrants the attention of local governments. If this situation is not addressed promptly, the access gap could widen into disparities in technology use, the utilization of digital services, and opportunities to benefit from the digitization of education.

Digitization does not always automatically reduce inter-regional disparities. If the benefits of technology are primarily reaped by regions that already have good infrastructure and capacity, digitization may actually widen the gap (Liu et al., 2024). Research in Ukraine indicates that the digital divide is linked to sustainable development outcomes at the local level (Deineko et al., 2022). Meanwhile, research in Colombia shows that differences in administrative capacity across regions can lead to disparities in the quality of educational services (Jaraba Vergara et al., 2025). In the context of Gowa Regency, this situation is still relatively manageable, as only 15 out of 562 schools lack internet access. However, this issue needs to be addressed immediately. If these schools remain offline, the gap may widen as more educational and government services transition to digital systems.

Compared to previous studies, Gowa Regency is in a relatively better position. Research in four ASEAN countries indicates that the access gap between rural and urban areas occurs at lower coverage levels (McFarlane et al., 2024). Research in Tamil Nadu also shows that limited internet access remains a significant problem (Jafar et al., 2023). Gowa Regency is at a different stage. Most schools already have internet access, so the main issue is no longer expanding the network in general but rather addressing the gap in schools that are still unconnected. Therefore, future policies need to be more targeted and tailored to the conditions of each region. Research on the diffusion of digital education

policies indicates that success in later stages requires adapting policies to local conditions, rather than simply replicating previously implemented policies (Xie et al., 2025). Furthermore, improving performance in regions that have already achieved high levels of success tends to require greater effort and higher costs (De la Cruz & Mergoni, 2024).

3.6 Implications for Local Government Infrastructure Equity Policies

First, refining program targets. Network expansion programs designed at the subdistrict level are no longer efficient when the remaining targets consist of only 15 schools spread across six subdistricts. At this stage, targets need to be directed specifically at the individual school level, taking into account the coordinates and technical feasibility of each school. This approach is better suited to the increasingly specific nature of the problem. A priority list can be compiled based on Table 3, with Tinggi Moncong Subdistrict as the first target.

Second, strengthening the implementing institutions. Addressing blank spots falls within the overlapping jurisdiction of the Education Office, as the manager of educational data, and the Communications and Information Technology Office, as the agency mandated to oversee digital infrastructure. Therefore, a formal cooperation mechanism between these two agencies must be established within the framework of the Electronic-Based Government System. For locations with geographical constraints and those that are commercially unviable, the Gowa Regency Government can collaborate with digital infrastructure providers. Additionally, partnerships in procuring technology for schools with limited resources can be one alternative worth considering (Olusegun & Nthontho, 2025).

Third, improving the database. Inconsistencies between the "access availability" column and the "blank spot" column in the source data must be resolved before the data is used as the basis for decision-making and budgeting. Data updates should also expand the recorded variables to include not only the presence or absence of internet access but also connection quality. This is crucial because the availability of access does not necessarily mean that internet services can be used optimally. Schools that are recorded as having internet access but have connection speeds or quality that are insufficient to support national assessments still face practical obstacles in utilizing digital services. This situation cannot be identified if the data only records whether access is available or not.

Fourth, institutionalizing monitoring. The School Internet Access Ratio (SIAR) can be established as a performance indicator reported periodically and disaggregated by subdistrict. Thus, aggregate district-level achievements will no longer be the sole information used by decision-makers. Data disaggregated by region will help the government identify schools and subdistricts that still face access gaps. Measurements of digital service provision at the city government level indicate that periodic monitoring can drive more significant improvements compared to one-time assessments (Busco et al., 2025). Experiences with local e-government in Indonesia also show that the sustainability of digital initiatives is greatly influenced by the existence of monitoring institutions (Rachmawati & Fitriyanti, 2021).

4. CONCLUSION

The findings show that overall internet access coverage among schools in Gowa Regency is high, reaching 97.33% (547 of 562 schools). However, the remaining access gaps are spatially concentrated, with blank spots identified in a limited number of schools and subdistricts. The number of schools per subdistrict does not show a clear descriptive association with the blank spot rate, indicating that school count alone does not provide a clear explanation for the observed geographic variation in access gaps.

The observed concentration of remaining gaps may be interpreted from a policy perspective as a last-mile challenge, in which broad access coverage has been achieved while localized gaps remain. However, this study does not empirically classify the observed condition as a specific last-mile stage because such a classification would require additional indicators beyond internet availability. Geographic

and technical factors may contribute to the remaining gaps, but these factors were not directly measured and therefore require further investigation.

From a policy perspective, school-level targeting may provide a more precise basis for identifying and addressing schools with remaining access gaps. Nevertheless, the study does not assess implementation costs or efficiency, so the relative cost-effectiveness of different targeting approaches cannot be established. The findings therefore support geographically and school-level targeted interventions to address the remaining access gaps while recognizing the limitations of internet availability as the primary measure examined in this study.

AI USAGE STATEMENT

In the process of writing this article, the author used Artificial Intelligence (AI) as a tool to assist with language editing, grammar correction, clarity, readability, and sentence structure refinement. AI was also used to a limited extent to help refine the design and format of visual elements and illustrations supporting the article, based on the data and information provided by the author. All AI-generated content was reviewed, verified, and edited by the author to ensure consistency with the research findings and academic standards.

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