



Secondary School Expansion and Gender Parity in Indonesia 2000 to 2024

YunHaoChuang¹, Syimir Asyraf Bin Eddie Halim², Ali Anhar Syi'bul Huda³, Ismaul Fitroh⁴, Sarbiland Durrani⁵

¹ National Chi Nan University, Taiwan

² Universiti Sains Malaysia, Malaysia

³ STIES Saleh Budiman Tasikmalaya, Indonesia

⁴ Universitas Negeri Gorontalo, Indonesia

⁵ Muslim Youth (MY) University, Pakistan

email: Winhau89310@gmail.com¹

Article Info :

Received:

01-07-2025

Revised:

23-07-2025

Accepted:

28-07-2026

Abstract

Indonesia experienced substantial secondary-school expansion between 2000 and 2024, but national participation parity does not establish equality in educational attainment. This study examined changes in female and male gross secondary enrolment and the temporal pattern of gender differences using a descriptive longitudinal analysis of 25 annual national observations from the World Development Indicators. Enrolment levels, endpoint changes, female-minus-male percentage-point gaps, female-to-male ratios, and descriptive Theil–Sen slopes were calculated. Female gross enrolment increased from 55.13% to 98.67% (43.54 percentage points), while male enrolment increased from 56.05% to 99.00% (42.95 points). The female-to-male ratio shifted from 0.984 to 0.997. Female gross enrolment exceeded male enrolment in 20 of 25 years; the largest female advantage was 2.74 points in 2023, whereas the largest male advantage was 2.05 points in 2013. Theil–Sen slopes were 2.07 and 2.04 points annually for females and males, respectively. These results identify substantial expansion for both sexes alongside reversible annual differences rather than uninterrupted gender convergence. National gross enrolment cannot establish age-appropriate attendance, completion, learning outcomes, or causal policy effects. The aggregate series also cannot reveal disparities across regions, household income groups, or learner characteristics. Educational equity assessment requires complementary disaggregated indicators of participation, retention, and achievement.

Keywords: educational inequality, gender parity, Indonesia, secondary education, time series.



©2026 Authors.. This work is licensed under a Creative Commons Attribution-Non Commercial 4.0 International License.
(<https://creativecommons.org/licenses/by-nc/4.0/>)

INTRODUCTION

The expansion of secondary education in Indonesia has increased formal educational participation, although improvements in enrolment do not necessarily correspond to equivalent gains in learning or educational attainment. Between 2000 and 2024, Indonesia experienced substantial growth in secondary-school enrolment alongside continuing concerns about the quality and distribution of educational opportunities (Beatty et al., 2021). World Bank data indicate that female gross secondary enrolment increased from 55.13% in 2000 to 98.67% in 2024, while male enrolment rose from 56.05% to 99.00% during the same period (World Bank, 2026). These developments demonstrate a considerable expansion in participation for both sexes, but the similarity of their enrolment levels at the beginning and end of the observation period does not establish a continuous movement toward gender parity. Gross enrolment measures the number of students enrolled at a particular educational level, regardless of age, relative to the population of the official age group. It therefore provides information about aggregate participation rather than direct evidence of age-appropriate attendance, educational completion, or acquired competencies. This distinction is relevant to Indonesia, where increased schooling has not consistently produced corresponding improvements in measured learning outcomes (Angrist et al., 2021; Beatty et al., 2021).

Gender differences in secondary-school participation require examination beyond comparisons of national enrolment totals. The female-to-male enrolment ratio identifies

relative participation between sexes, whereas the percentage-point gap measures the absolute difference between their gross enrolment rates. A ratio approaching one indicates numerical parity but does not establish equivalent educational opportunities across geographical locations, household economic conditions, or other population characteristics. Moreover, a relatively narrow national gap may conceal changes in which sex records the higher enrolment rate across individual years. Research examining gender-related educational disadvantages and interventions has demonstrated that participation disparities depend on institutional and socioeconomic conditions that cannot be adequately represented by national parity measures alone (Evans & Yuan, 2022; Evans et al., 2021). The direction and magnitude of annual gender differences therefore warrant examination alongside the long-term expansion of secondary education.

The relationship between educational participation and educational equity also requires careful differentiation. Studies of educational investment, teacher remuneration, and returns to schooling indicate that increased participation and educational inputs do not independently establish improvements in learning or subsequent economic outcomes (de Ree et al., 2018; Psacharopoulos & Patrinos, 2018). Additional inequalities may arise from differences in access to educational resources and the conditions under which learning occurs. Evidence of geographical disparities in internet access in Indonesia and international findings on learning disruption during the COVID-19 pandemic illustrate dimensions of educational inequality that are not captured by aggregate enrolment statistics (Sujarwoto & Tampubolon, 2016; Betthäuser et al., 2023). These findings provide contextual evidence concerning the limitations of participation indicators rather than explanations of observed changes in Indonesian secondary enrolment. The present analysis does not measure digital access, instructional quality, pandemic effects, or learning achievement.

Existing scholarship provides substantial evidence concerning educational quality, gender-related disadvantages, institutional interventions, and unequal learning resources. However, these research strands do not directly resolve the descriptive question of how national female and male gross secondary enrolment levels and their associated gender differences evolved throughout Indonesia's 2000–2024 expansion period. A comparison restricted to initial and final observations may suggest convergence while concealing intermediate reversals, temporary advantages, and differences in the pace of enrolment growth. Similarly, examining the female-to-male ratio without considering the underlying enrolment levels may produce an incomplete interpretation of educational progress. The specific analytical gap addressed in this study concerns the joint assessment of participation expansion, absolute gender differences, and relative parity using a consistent annual national series. Examining these dimensions together permits a distinction between growth shared by both sexes and changes in their relative participation, without assuming that numerical parity represents broader educational equity.

This study addresses two research questions: (1) How did female and male gross secondary enrolment in Indonesia change between 2000 and 2024? (2) How did the female-minus-male percentage-point gap and female-to-male enrolment ratio evolve during this period, and what do these patterns indicate about national gender parity? A descriptive longitudinal analysis of twenty-five annual national observations is employed to examine sex-specific enrolment levels, endpoint changes, annual gender gaps, relative enrolment ratios, and descriptive trends. The study's contribution lies in identifying the temporal characteristics of gender parity within a period of substantial educational expansion, particularly the distinction between apparent endpoint convergence and fluctuations in annual participation differences. By integrating absolute and relative measures across the same observation period, the analysis provides a reproducible national description of secondary enrolment patterns while maintaining the distinction between measured participation and

unobserved dimensions of educational equity. Its findings are descriptive and do not establish the causal effects of educational reforms or other policy interventions.

RESEARCH METHODS

This study employed a descriptive longitudinal analysis of annual national aggregate data to examine changes in gross secondary enrolment and gender parity in Indonesia between 2000 and 2024. The dataset consisted of sex-disaggregated observations obtained from the World Development Indicators through the World Bank Application Programming Interface (API) on 17 September 2026. Female and male gross secondary enrolment were identified using indicator codes SE.SEC.ENRR.FE and SE.SEC.ENRR.MA, respectively, with IDN as the country identifier and 2000–2024 as the calendar-year interval. The corresponding API requests specified the country, indicator, observation period, and JSON response format. Both series contained valid observations for all twenty-five years. The unit of analysis was the country-year, yielding twenty-five paired annual observations rather than individual-level student records. The dataset represented the national series available at the specified retrieval date, recognising that subsequent revisions to the underlying international statistics may alter individual observations (World Bank, 2026).

Gross secondary enrolment was defined as the total number of students enrolled in secondary education, regardless of age, expressed as a percentage of the population belonging to the official secondary-school age group. The female and male indicators applied this definition to their respective sex-specific enrolment totals and reference populations. Consequently, gross enrolment rates could exceed 100% when students outside the official age range were included in the numerator. These indicators measured aggregate enrolment relative to the official school-age population rather than individual attendance probabilities, completion rates, or learning achievement. The female and male series were matched by calendar year, and observations were retained at their original numerical precision. No missing-value imputation, interpolation, smoothing, or artificial adjustment was applied. Reported enrolment percentages and percentage-point differences were rounded to two decimal places, while female-to-male ratios were presented to three decimal places. All derived statistics were calculated from unrounded source values.

The analysis incorporated four complementary descriptive procedures. First, annual female and male enrolment levels were examined to identify the magnitude and direction of participation changes, with endpoint differences calculated by subtracting the 2000 observation from the corresponding 2024 value. Second, the annual gender gap was calculated as the female gross enrolment rate minus the male gross enrolment rate, expressed in percentage points. Positive values indicated higher female gross enrolment, negative values indicated higher male gross enrolment, and zero represented equality between the two rates. Third, the female-to-male ratio was calculated by dividing the female gross enrolment rate by the male rate for each year. A ratio of 1.000 indicated numerical parity, values above 1.000 indicated higher female relative enrolment, and values below 1.000 indicated higher male relative enrolment. The number of years with a positive female-minus-male gap was counted across all twenty-five observations. Annual gaps and ratios were retained alongside the original enrolment values to distinguish changes in absolute differences from changes in relative parity.

Fourth, descriptive Theil–Sen slopes were calculated to summarise the long-term direction and approximate annual magnitude of changes in female enrolment, male enrolment, and the gender gap. For each series, the slope was estimated as the median of $(y_j - y_i)/(t_j - t_i)$, where y represented the observed enrolment rate or gender gap and t represented the observation year, across all pairs satisfying t_j greater than t_i . The twenty-five annual observations produced 300 pairwise slopes for each series. The Theil–Sen

estimator was selected because its median-based calculation is less sensitive to unusually large individual observations than an ordinary least-squares trend coefficient. This property was relevant to annual enrolment series containing short-term fluctuations and reversals alongside substantial long-term growth. The estimated slopes were interpreted exclusively as descriptive measures of percentage-point change per year. They were not treated as evidence of a constant annual growth process, formal statistical convergence, or the effects of particular educational interventions.

The analytical procedure combined endpoint comparisons, annual gap inspection, relative parity measurements, and median pairwise trends without introducing explanatory variables or a counterfactual model. Formal hypothesis testing and statistical significance estimates were not employed because the objective was to describe the observed national series rather than infer an underlying population trend from independent random observations. Serial dependence, possible revisions to administrative statistics, and the absence of a comparison group further limited causal interpretation. The complete annual sequence was used in deriving the reported counts, extrema, and descriptive trends. The analysis was restricted to national sex-disaggregated enrolment and did not measure regional inequalities, socioeconomic differences, attendance, educational completion, or achievement. The use of publicly accessible aggregate statistics involved no identifiable individual participants.

RESULTS AND DISCUSSION

Expansion In Female And Male Participation

Female gross secondary enrolment rose by 43.54 percentage points between 2000 and 2024, compared with 42.95 points for males. Both changes are large relative to their starting levels, and neither is attributable to a shift in the sign of the gender gap alone. The paired increase indicates that the principal descriptive development was expansion across both groups. Table 1 reports the common benchmarks, while Figure 1 displays the full trajectories. These participation changes should be read alongside research distinguishing schooling from learning (Angrist et al., 2021; Beatty et al., 2021).

Table 1. Selected Annual Gross Secondary Enrolment and Gender Parity

Year	Female (%)	Male (%)	Gap (points)	Ratio
2000	55.13	56.05	-0.92	0.984
2005	61.95	61.34	0.62	1.010
2010	76.54	74.81	1.73	1.023
2013	80.84	82.89	-2.05	0.975
2015	88.01	87.68	0.33	1.004
2018	93.75	91.92	1.84	1.020
2020	97.25	96.63	0.62	1.006
2023	97.40	94.67	2.74	1.029
2024	98.67	99.00	-0.33	0.997

Note. Gap = female minus male. Source: World Bank (2026); calculations from unrounded values.

In 2000, female and male gross secondary enrolment were 55.13% and 56.05%, producing a female-to-male ratio of 0.984. By 2024, the corresponding levels were 98.67% and 99.00%, with a ratio of 0.997. Both years were close to numerical gender parity, yet they represented very different levels of participation. Gender parity is a relational measure describing the similarity of female and male participation, whereas educational equity is broader and concerns whether learners have fair opportunities to enter, remain in, complete,

and benefit from schooling. A ratio close to one can therefore occur under both relatively low and very high participation. Parity should consequently be interpreted together with the underlying participation level and with other distributional indicators rather than as evidence that equity has been achieved (Evans & Yuan, 2022; Evans et al., 2021)

The high 2024 gross ratios should also not be read as evidence that virtually every secondary-school-age adolescent was enrolled. Gross enrolment includes students outside the official age range and therefore cannot be translated directly into age-specific coverage. Claims about universal attendance would require net or age-specific enrolment together with information on persistence and completion.

The descriptive Theil–Sen slopes were 2.07 percentage points per year for females and 2.04 for males. Their similarity reinforces the interpretation of broadly shared expansion, although it does not mean that annual increases were identical. A median pairwise slope describes the series as a whole and should not be projected mechanically into future years. Near the end of the period, denominator composition, grade repetition, late entry, and changing age structures may influence the observed ratios alongside changes in access.

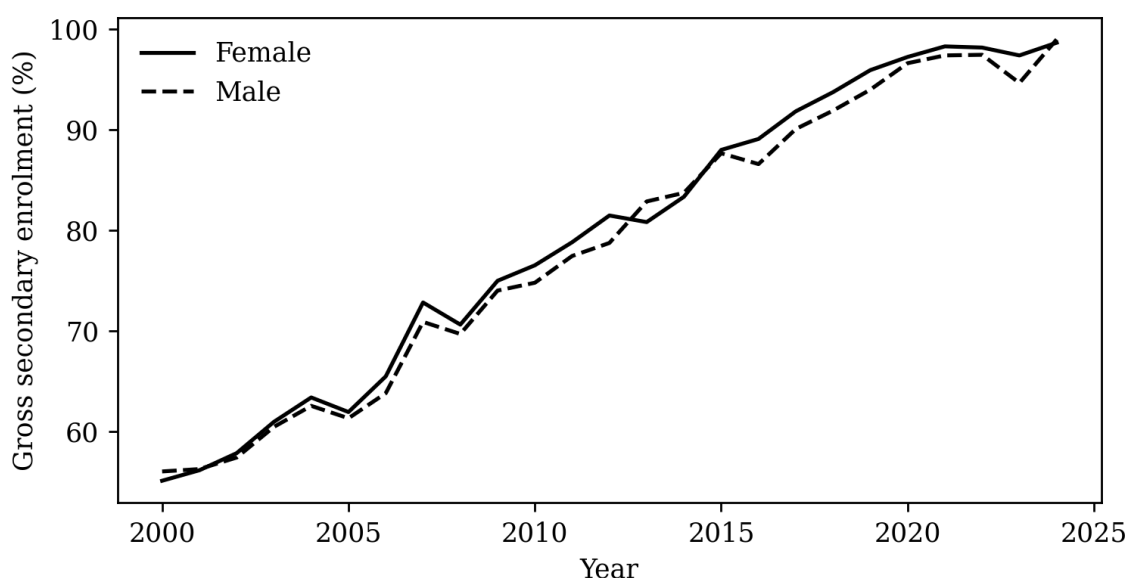


Figure 1. Female and Male Gross Secondary Enrolment in Indonesia

Long-run improvement did not remove annual interruptions. The series contains local reductions as well as gains, so endpoint comparisons cannot represent every stage of the trajectory. Such variation may reflect real participation changes, population estimates, or administrative reporting differences; the present dataset cannot determine their separate contributions. Treating every annual movement as a response to a specific policy would overstate the design. Evidence on Indonesian schooling and teacher reforms instead supports matching a policy claim to an outcome and identification strategy appropriate to that claim (Beatty et al., 2021; de Ree et al., 2018).

Participation expansion also creates a larger population for whom resource quality matters. Enrolment indicates entry into institutional provision, whereas access to suitable learning materials and technologies differentiates experiences within that provision. Digital readiness research directs attention to these within-school and between-school conditions. The national series does not measure them, but its interpretation can still acknowledge that a growing number of enrolled learners may encounter unequal instructional opportunities.

Increased coverage is compatible with persistent differences in the resources available to pupils (van de Werfhorst et al., 2022; van Laar et al., 2017).

The annual data do not reveal whether growth was concentrated in rural or urban areas. This omission is consequential because spatial inequalities may remain hidden when values are aggregated nationally. Research on Indonesia's internet divide illustrates why the geography of opportunity deserves separate measurement even when the present outcome is enrolment. The result supports a national descriptive statement, not a conclusion about every province or district. Subnational educational records would be required to examine whether access expanded evenly across localities (Sujarwoto & Tampubolon, 2016).

An expansion in participation cannot be converted into an estimate of earnings gains using a single average return from the literature. The educational level completed, the quality of learning, and labour-market conditions all affect the interpretation of such a calculation. The present series does not observe completion or employment and therefore does not support a monetary valuation of the increase. Research on returns to schooling is relevant as a motivation for participation analysis, while remaining distinct from the quantity measured here (Psacharopoulos & Patrinos, 2018).

The common upward movement is most useful as a foundation for a broader monitoring system. It identifies an important change in the scale of participation and shows why attention should increasingly include retention, learning, and the distribution of resources among enrolled learners. This is an implication of the measurement structure rather than evidence that those outcomes improved automatically. Gender-sensitive interventions and general educational improvements may both matter, but their effectiveness cannot be ranked from these aggregates (Evans & Yuan, 2022; Farias-Gaytan et al., 2023).

Alternating Gender Advantages and The Interpretation of Parity

The female-to-male ratio increased from 0.984 in 2000 to 0.997 in 2024. An endpoint reading would describe movement toward numerical parity, but the annual gaps reveal a more varied pattern. Female enrolment exceeded male enrolment in twenty of the twenty-five years. The final near-parity value consequently followed a long interval containing female advantages rather than a simple uninterrupted reduction in male advantage. Table 2 summarises the principal gap measures and Figure 2 preserves their changing sign.

Table 2. Summary of Expansion and Gender Differences

Measure	Value
Female endpoint change	43.54 percentage points
Male endpoint change	42.95 percentage points
Years with a female advantage	20 of 25
Largest female advantage	2.74 points in 2023
Largest male advantage	2.05 points in 2013
Female Theil–Sen slope	2.07 points per year
Male Theil–Sen slope	2.04 points per year

Note. Slopes are descriptive and are not policy effects.

The largest observed female advantage was 2.74 percentage points in 2023, whereas the largest male advantage was 2.05 points in 2013. These are differences between gross ratios, not direct counts of excluded female or male adolescents. Their interpretation depends on both enrolment and the sex-specific population denominators. A policy response based only on the sign of a national gap could overlook the experiences of disadvantaged members of both groups. The gender-equity literature supports examining distribution and mechanism together (Evans & Yuan, 2022; Evans et al., 2021).

The 2023 and 2024 comparison demonstrates the sensitivity of a narrative built from a single year. A positive female advantage of 2.74 points was followed by a male advantage of 0.33 points. This reversal does not, by itself, indicate that a gender-focused intervention failed or that girls became disadvantaged across the country. It indicates that the ordering of the two published gross ratios changed. Explaining the reversal requires information about administrative revisions, cohort composition, and age-specific participation that is absent from the present extraction.

The gap's descriptive Theil–Sen slope was approximately 0.066 percentage points per year, much smaller than the growth slopes of either enrolment series. The scale difference is substantively informative: participation expansion dominated the long-run movement, while relative differences remained comparatively narrow. This does not prove that gender is unimportant, because a narrow national gap can conceal large inequalities within population subgroups. The result instead establishes the scale at which the available aggregate series registers gender differentiation.

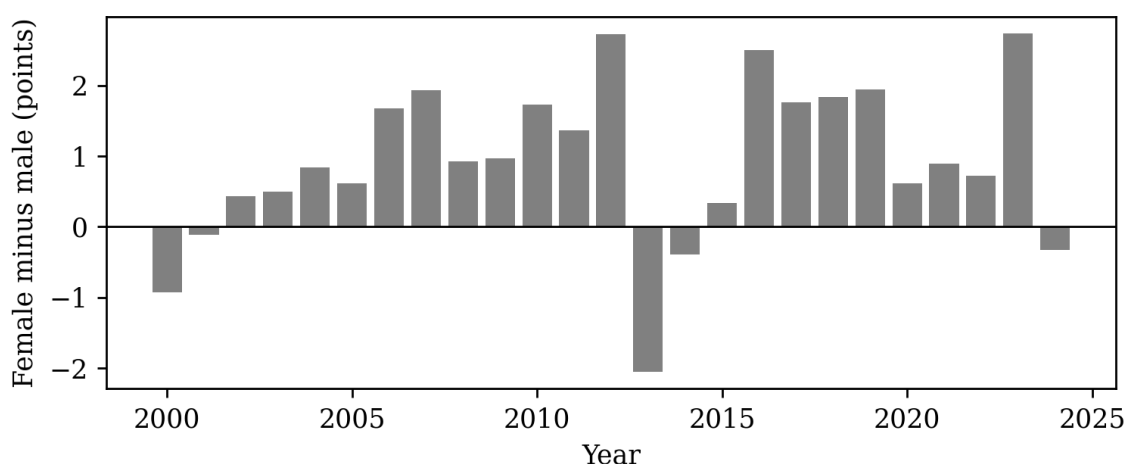


Figure 2. Annual Female Minus Male Enrolment Gap

A positive female gross-enrolment gap is not a direct measure of female advantage in digital learning. Device ownership, connection stability, confidence, and the purposes for which technology is used are separate dimensions. Research on material access and internet outcomes demonstrates that access categories can mask substantial differences in what people can accomplish. The present analysis cannot estimate those differences for Indonesian students. Its contribution is to prevent a participation-parity measure from being extended to outcomes that were never observed (Scheerder et al., 2017; van Deursen, 2020; van Deursen & van Dijk, 2014; van Deursen & van Dijk, 2019).

The female-minus-male gap and the female-to-male ratio answer related but different questions. The gap records an absolute difference in points, whereas the ratio expresses one group relative to the other. Because overall participation increased substantially, a similar point gap could correspond to a smaller proportional difference later in the period. Reporting both measures reduces the risk of a misleading interpretation based on one scale. Neither measure replaces analysis of the socioeconomic composition of the populations represented in the numerator.

International evidence on school closure experiences also cautions against assuming that participation parity implies equal educational resilience. Household resources and the ability to substitute home instruction for classroom instruction can differ within the same enrolment category. Research on unequal remote schooling, home learning, and educational

disparities identifies dimensions that national annual participation statistics do not resolve. Those studies support the need for additional measures, but they do not establish the magnitude or direction of Indonesian gender differences during the pandemic (Andrew et al., 2020; Blaskó et al., 2022; Zhao et al., 2020).

The present results do not warrant a choice between supporting girls and supporting boys. Their practical value lies in showing that both groups should remain visible in monitoring and that national averages should not determine eligibility for assistance. A programme may appropriately target particular disadvantaged girls or boys even when its target group has the higher national gross ratio. Evidence on interventions benefiting girls is especially relevant to distinguishing the design of a programme from the aggregate distribution of enrolment (Evans & Yuan, 2022).

Parity is best treated here as one component of an educational profile. The analysis identifies a narrow and reversible national gap alongside substantial expansion in both series. The unresolved question concerns who remained outside age-appropriate participation and who entered school without achieving sustained learning. Addressing that question requires linking participation records to completion, achievement, geography, and household circumstances. These additional dimensions would turn the descriptive national pattern into a more specific investigation of educational disadvantage (Jakubowski et al., 2025; Mikhailov et al., 2024).

Learning vulnerability and limits of national participation indicators

The series extends through the pandemic and subsequent years, but it does not isolate the consequences of school closures. Observed enrolment is an administrative participation measure whose relationship to instructional exposure is incomplete. Evidence on learning losses uses different outcomes and designs, including achievement comparisons and evidence synthesis. Combining these literatures should clarify the distinction between outcomes rather than create an unsupported causal narrative. Stable enrolment during disruption would not contradict a decline in learning, because the quantities describe different processes (Bethhäuser et al., 2023; Engzell et al., 2021; Maldonado & De Witte, 2022).

Pandemic projections illustrate another distinction between estimated scenarios and observed historical data. Simulations of schooling and learning consequences relied on assumptions about closure duration, instructional substitution, and recovery. The present calculations instead reproduce published annual enrolment values. Their numerical precision should not be mistaken for causal certainty, but neither should they be described as modelled learning-loss estimates. Keeping the two forms of evidence separate protects interpretation when national participation trends are discussed alongside pandemic research (Azevedo et al., 2021; Kuhfeld et al., 2020).

Systematic reviews of pandemic learning identify variation across settings and methods. Such variation is a reason to avoid importing a pooled international result as an Indonesian outcome without country-specific evidence. The annual series analysed here supplies no achievement test, control group, or measure of exposure to remote instruction. It can describe participation before and after disruption but cannot quantify learning foregone. The most defensible contribution is a clearly bounded participation baseline for a future study integrating additional outcomes (Bethhäuser et al., 2023; Donnelly & Patrinos, 2022; Hammerstein et al., 2021).

The digital divide may have shaped access to replacement instruction, yet internet access alone does not measure the quality of that instruction. Research on educational digital inequality and digital literacy makes this distinction central to interpreting remote learning opportunities. The present data contain neither household connectivity nor digital skills, so neither can be entered as an explanatory variable without a separate dataset and an explicit

design. Discussion of digital mechanisms therefore identifies plausible questions for further study rather than explanations established by this analysis (Farias-Gaytan et al., 2023; Surianshah, 2021; van de Werfhorst et al., 2022).

Differences in achievement during school closure can also vary across prior attainment levels. A national enrolment series has no information on that heterogeneity, even when the female and male trajectories remain close. Research examining high- and low-achieving students and subsequent achievement patterns demonstrates why distributional learning outcomes should be analysed directly. A policy dashboard that reports only participation could miss educational deterioration among students who remain formally enrolled. The present finding of expansion is compatible with that possibility (Grewenig et al., 2021; Kuhfeld et al., 2023).

The measurement limitations have consequences for accountability. Educational authorities should distinguish the achievement of participation targets from the achievement of learning and completion targets. Requiring a single indicator to represent all three weakens the ability to identify where additional support is needed. Comparative education monitoring and evidence on disrupted schooling provide a basis for maintaining separate outcome definitions. The results reported here can populate a participation component of such a system, but they cannot substitute for its other components (Blaskó et al., 2022; Jakubowski et al., 2025; Schleicher, 2020).

The national data also omit disability, migration, household income, and intersecting social disadvantages. A small gender gap may conceal inequalities that emerge only after disaggregation along those dimensions. Internet inequality research is relevant because it demonstrates how the meaning of access changes when attention shifts from a binary category to resources and outcomes. The same analytical caution applies to educational participation. A near-parity ratio should invite more detailed examination of inclusion rather than terminate it (Scheerder et al., 2017; van Deursen & van Dijk, 2019).

Several limitations constrain generalisation. The study includes one country, administrative aggregates, and a fixed source vintage; future revisions may change individual values. It cannot evaluate attendance intensity, learning quality, or the causal effectiveness of reforms. No individual-level relationship can be inferred from the co-movement of national female and male series. These limits do not remove the descriptive finding of broad expansion, but they define the kinds of questions that require a different design and additional observations.

The central monitoring implication is to preserve the distinction between levels and disparities. Indonesia's gross secondary participation expanded strongly for both sexes while the gender gap remained relatively small and changed direction. A useful subsequent analysis would combine the present annual records with age-specific enrolment, completion, and comparable learning data, using the same observation years wherever possible. That extension would permit a clearer assessment of whether expanded participation was accompanied by equitable educational attainment rather than assuming that relationship from enrolment alone (Angrist et al., 2021; Beatty et al., 2021; Mikhailov et al., 2024).

CONCLUSION

Gross secondary enrolment in Indonesia increased substantially for both females and males between 2000 and 2024. Female enrolment rose from 55.13% to 98.67%, representing an increase of 43.54 percentage points, while male enrolment increased from 56.05% to 99.00%, equivalent to 42.95 percentage points. Descriptive Theil–Sen slopes of 2.07 percentage points per year for females and 2.04 for males indicated broadly similar long-term expansion. The female-to-male ratio increased from 0.984 to 0.997, suggesting closer numerical parity between the endpoint observations. Nevertheless, the annual pattern was not

characterised by uninterrupted convergence. Female gross enrolment exceeded male enrolment in twenty of the twenty-five years, with the largest female advantage of 2.74 percentage points recorded in 2023 and the largest male advantage of 2.05 points observed in 2013. The reversal from a female advantage in 2023 to a male advantage of 0.33 points in 2024 further demonstrated that endpoint parity did not represent a continuously narrowing gender gap. The principal empirical finding was substantial participation expansion for both sexes accompanied by relatively narrow but variable annual gender differences.

These results establish national progress in secondary-school participation without demonstrating equivalent progress in educational attainment or broader educational equity. Gross enrolment does not distinguish students within and outside the official school-age population and cannot independently establish attendance, retention, completion, or learning achievement. The national aggregation also prevents identification of inequalities associated with geographical location, household circumstances, and other population characteristics. Educational monitoring in Indonesia should therefore distinguish sex-specific participation levels from absolute and relative gender differences while incorporating age-specific enrolment, completion, and learning indicators. Further analysis integrating these measures with subnational and socioeconomic data would provide a stronger empirical basis for assessing whether expanded secondary-school participation has been accompanied by more equitable educational outcomes.

REFERENCES

- Andrew, A., Cattan, S., Costa Dias, M., Farquharson, C., Kraftman, L., Krutikova, S., Phimister, A., & Sevilla, A. (2020). Inequalities in children's experiences of home learning during the COVID-19 lockdown in England. *Fiscal Studies*, 41(3), 653-683. <https://doi.org/10.1111/1475-5890.12240>
- Angrist, N., Djankov, S., Goldberg, P. K., & Patrinos, H. A. (2021). Measuring human capital using global learning data. *Nature*, 592(7854), 403-408. <https://doi.org/10.1038/s41586-021-03323-7>
- Azevedo, J. P., Hasan, A., Goldemberg, D., Geven, K., & Iqbal, S. A. (2021). Simulating the potential impacts of COVID-19 school closures on schooling and learning outcomes: A set of global estimates. *The World Bank Research Observer*, 36(1), 1-40. <https://doi.org/10.1093/wbro/lkab003>
- Beatty, A., Berkhout, E., Bima, L., Pradhan, M., & Suryadarma, D. (2021). Schooling progress, learning reversal: Indonesia's learning profiles between 2000 and 2014. *International Journal of Educational Development*, 85, Article 102436. <https://doi.org/10.1016/j.ijedudev.2021.102436>
- Bethäuser, B. A., Bach-Mortensen, A. M., & Engzell, P. (2023). A systematic review and meta-analysis of the evidence on learning during the COVID-19 pandemic. *Nature Human Behaviour*, 7(3), 375-385. <https://doi.org/10.1038/s41562-022-01506-4>
- Blaskó, Z., Costa, P. d., & Schnepf, S. V. (2022). Learning losses and educational inequalities in Europe: Mapping the potential consequences of the COVID-19 crisis. *Journal of European Social Policy*, 32(4), 361-375. <https://doi.org/10.1177/09589287221091687>
- de Ree, J., Muralidharan, K., Pradhan, M., & Rogers, H. (2018). Double for nothing? experimental evidence on an unconditional teacher salary increase in Indonesia. *The Quarterly Journal of Economics*, 133(2), 993-1039. <https://doi.org/10.1093/qje/qjx040>
- Donnelly, R., & Patrinos, H. A. (2022). Learning loss during COVID-19: An early systematic review. *PROSPECTS*, 51(4), 601-609. <https://doi.org/10.1007/s11125-021-09582-6>
- Engzell, P., Frey, A., & Verhagen, M. D. (2021). Learning loss due to school closures during the COVID-19 pandemic. *Proceedings of the National Academy of Sciences*, 118(17), Article e2022376118. <https://doi.org/10.1073/pnas.2022376118>
- Evans, D. K., & Yuan, F. (2022). What we learn about girls' education from interventions that do not focus on girls. *The World Bank Economic Review*, 36(1), 244-267. <https://doi.org/10.1093/wber/lhab007>

- Evans, D. K., Akmal, M., & Jakiela, P. (2021). Gender gaps in education: The long view. *IZA Journal of Development and Migration*, 12(1), Article 20210001. <https://doi.org/10.2478/izajodm-2021-0001>
- Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M. S. (2023). Digital transformation and digital literacy in the context of complexity within higher education institutions: A systematic literature review. *Humanities and Social Sciences Communications*, 10(1), Article 386. <https://doi.org/10.1057/s41599-023-01875-9>
- Grewenig, E., Lergetporer, P., Werner, K., Woessmann, L., & Zierow, L. (2021). COVID-19 and educational inequality: How school closures affect low- and high-achieving students. *European Economic Review*, 140, Article 103920. <https://doi.org/10.1016/j.euroecorev.2021.103920>
- Hammerstein, S., König, C., Dreisörner, T., & Frey, A. (2021). Effects of COVID-19-related school closures on student achievement-a systematic review. *Frontiers in Psychology*, 12, Article 746289. <https://doi.org/10.3389/fpsyg.2021.746289>
- Jakubowski, M., Gajderowicz, T., & Patrinos, H. A. (2025). COVID-19, school closures, and student learning outcomes. new global evidence from PISA. *npj Science of Learning*, 10(1), Article 5. <https://doi.org/10.1038/s41539-025-00297-3>
- Kuhfeld, M., Lewis, K., & Peltier, T. (2023). Reading achievement declines during the COVID-19 pandemic: Evidence from 5 million U.S. students in grades 3–8. *Reading and Writing*, 36(2), 245-261. <https://doi.org/10.1007/s11145-022-10345-8>
- Kuhfeld, M., Soland, J., Tarasawa, B., Johnson, A., Ruzek, E., & Liu, J. (2020). Projecting the potential impact of COVID-19 school closures on academic achievement. *Educational Researcher*, 49(8), 549-565. <https://doi.org/10.3102/0013189x20965918>
- Maldonado, J. E., & De Witte, K. (2022). The effect of school closures on standardised student test outcomes. *British Educational Research Journal*, 48(1), 49-94. <https://doi.org/10.1002/berj.3754>
- Mikhailov, A., Tikhonov, A., & Fedulov, V. (2024). Digital inequality in education: Features of manifestation and types of discrimination during COVID-19 pandemic. *Education and Information Technologies*, 29(15), 20493-20504. <https://doi.org/10.1007/s10639-024-12640-z>
- Psacharopoulos, G., & Patrinos, H. A. (2018). Returns to investment in education: A decennial review of the global literature. *Education Economics*, 26(5), 445-458. <https://doi.org/10.1080/09645292.2018.1484426>
- Scheerder, A., van Deursen, A., & van Dijk, J. (2017). Determinants of internet skills, uses and outcomes. a systematic review of the second- and third-level digital divide. *Telematics and Informatics*, 34(8), 1607-1624. <https://doi.org/10.1016/j.tele.2017.07.007>
- Schleicher, A. (2020). *The impact of COVID-19 on education: Insights from education at a glance 2020*. OECD. <https://web-archive-storage.oecd.org/aemint-web-archive-prod/web-archive/4d/4d53dfd5bbe9ea78f182b73e828be6df04ab0bae5159655fc5c78b4ee4c09208.pdf>
- Sujarwoto, S., & Tampubolon, G. (2016). Spatial inequality and the internet divide in Indonesia 2010–2012. *Telecommunications Policy*, 40(7), 602-616. <https://doi.org/10.1016/j.telpol.2015.08.008>
- Surianshah, S. (2021). Digital divide in education during COVID-19 pandemic. *Jurnal Ekonomi Malaysia*, 55(3), 103-112. <https://doi.org/10.17576/jem-2021-5503-07>
- van de Werfhorst, H. G., Kessenich, E., & Geven, S. (2022). The digital divide in online education: Inequality in digital readiness of students and schools. *Computers and Education Open*, 3, Article 100100. <https://doi.org/10.1016/j.caeo.2022.100100>
- van Deursen, A. J. (2020). Digital inequality during a pandemic: Quantitative study of differences in COVID-19-related internet uses and outcomes among the general population. *Journal of Medical Internet Research*, 22(8), e20073. <https://doi.org/10.2196/20073>
- van Deursen, A. J., & van Dijk, J. A. (2014). The digital divide shifts to differences in usage. *New Media & Society*, 16(3), 507-526. <https://doi.org/10.1177/1461444813487959>
- van Deursen, A. J., & van Dijk, J. A. (2019). The first-level digital divide shifts from inequalities in physical access to inequalities in material access. *New Media & Society*, 21(2), 354-375. <https://doi.org/10.1177/1461444818797082>

- van Laar, E., van Deursen, A. J. A. M., van Dijk, J. A. G. M., & de Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in Human Behavior*, 72, 577-588. <https://doi.org/10.1016/j.chb.2017.03.010>
- World Bank (2026). *World development indicators* [Data set]. Retrieved September 10, 2026, from <https://databank.worldbank.org/source/world-development-indicators>
- Zhao, Y., Guo, Y., Xiao, Y., Zhu, R., Sun, W., Huang, W., Liang, D., Tang, L., Zhang, F., Zhu, D., & Wu, J. L. (2020). The effects of online homeschooling on children, parents, and teachers of grades 1–9 during the COVID-19 pandemic. *Medical Science Monitor*, 26. <https://doi.org/10.12659/msm.925591>