

Vespera Studia Critica (VSC)
Vol 1 No 1 October 2026, Hal 01-13
ISSN: XXXX-XXXX (Print) ISSN: XXXX-XXXX (Electronic)
Open Access: https://scriptaintelektual.com/scripta-humanika/index

Gender Inequality in Internet Use: Comparing Global and Regional Connectivity Gaps

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Article Info :
Received:
02-09-2026
Revised:
10-10-2026
Accepted:
20-10-2026

Abstract

The expansion of global internet connectivity has not necessarily eliminated gender inequalities in digital participation. This study examines changes in gender-disaggregated internet use during 2024–2026, evaluates absolute and proportional gender disparities, and compares regional connectivity inequalities. A quantitative descriptive design was employed using documentary analysis of secondary statistical estimates published by the International Telecommunication Union. Female and male internet-use percentages were compared across three reporting periods, with absolute percentage-point differences and female-to-male parity ratios calculated to assess gender inequality. Global female internet use increased from 65% in 2024 to 74% in 2026, while male participation rose from 70% to 79%. Both groups recorded cumulative increases of nine percentage points. The absolute gender gap fluctuated from five percentage points in 2024 to six in 2025 before returning to five in 2026. Corresponding parity ratios were 0.929, 0.922, and 0.937. Regional comparisons for 2024 revealed a 12-percentage-point gender gap in Africa, compared with two percentage points in Europe. These findings demonstrate that connectivity expansion does not automatically produce gender parity. Gender-sensitive monitoring requires complementary absolute, proportional, and geographically differentiated indicators, although aggregated estimates cannot establish causal mechanisms or substantive equality in digital participation.

Keywords: *Connectivity; Digital divide; Gender inequality; Internet access; Parity.*

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INTRODUCTION

The expansion of global internet connectivity has intensified scholarly and policy debates concerning whether technological development produces equitable opportunities across gender, geographical, and socioeconomic groups. Internet access increasingly mediates participation in education, employment, healthcare, public services, and economic activities, making unequal connectivity a structural dimension of contemporary social inequality rather than merely a difference in technological adoption. International Telecommunication Union (ITU) statistical publications for 2024–2026 provide a basis for examining changes in internet participation among women and men, although expanding connectivity does not necessarily imply equivalent improvements in their relative participation (ITU, 2024, 2025, 2026). Research on global internet penetration has emphasized the geographical interdependence of digital development and gender disparities, suggesting that connectivity patterns must be interpreted beyond aggregate penetration rates (Wang & Lin, 2024). Cross-national examinations of digital infrastructure and information and communication technology literacy similarly demonstrate the relevance of structural conditions for understanding unequal technological participation (Liu, 2024). Gender disparities in access to digital resources also intersect with economic opportunities, particularly where mobile technologies and digitally mediated employment influence participation in emerging markets (Rani et al., 2022; Sun & Lu, 2025). Evidence concerning wealth-related inequalities in women's internet use further indicates that digital participation cannot be separated from socioeconomic resources and access to essential services (Chandra et al., 2024). These interconnections support a systemic interpretation of the gender digital divide, in which technological infrastructure, institutional arrangements, and social inequalities may reinforce one another (David & Phillips, 2023). The persistence of these interconnected dimensions raises a fundamental question concerning whether improvements in global connectivity should be

interpreted as evidence of gender equality or whether gender-disaggregated indicators are necessary to distinguish technological expansion from equitable participation.

Contemporary scholarship on gender inequality in digital participation has developed through several complementary research trajectories, encompassing digital literacy, socioeconomic differentiation, educational participation, demographic characteristics, and structural access conditions. Comparative educational research has examined gender differences in technological knowledge, attitudes, and competencies across national settings, demonstrating the analytical importance of distinguishing access to technology from the capabilities required for meaningful participation (Campos & Scherer, 2024). Research employing decomposition techniques has further investigated the distribution of digital literacy across European populations, while household-based analyses in low- and middle-income economies have addressed gender differences in digital skills through more specific socioeconomic comparisons (Fang et al., 2025a; Avanesian et al., 2024). Evidence from university students in Bangladesh and Pakistan extends this discussion by considering digital competence and technology adoption within educational environments, where participation depends on institutional and individual conditions rather than internet availability alone (Hossain et al., 2023; Barra et al., 2024). Related investigations have considered socioeconomic characteristics in higher education, generational inequalities in Indonesia, and the relationship between digital skills and participation in online social environments (Fang et al., 2025b; Long et al., 2023; Lybeck et al., 2024). Research on marginalized older women and older adults' technology adoption also expands the analytical scope beyond educational populations, indicating that demographic characteristics and social positioning require attention when evaluating digital inclusion (Pei et al., 2024; Shou et al., 2025). Collectively, these research trajectories demonstrate that the contemporary gender digital divide is multidimensional, encompassing the ability to obtain technological access, develop digital competencies, and participate meaningfully in digital environments. Their methodological diversity provides a substantial empirical foundation for understanding differentiated experiences of digital inequality, while also establishing the need to distinguish population-specific explanations from broader assessments of gender parity in internet use.

Despite the increasing sophistication of digital inequality research, an identifiable empirical and methodological gap remains between multidimensional examinations of digital exclusion and the systematic interpretation of gender-disaggregated internet participation indicators across successive international reporting periods. Existing measurement-oriented scholarship has developed approaches for evaluating women's digital inclusion through composite indicators, demonstrating that the selection and organization of indicators substantially influence how inequality is represented (Damiani & Rodríguez-Modroño, 2023). Systematic reviews have also synthesized structural barriers to women's digital participation and explored conceptual frameworks for examining unequal access, institutional power, and exclusion mechanisms (Gupta & Kiran, 2025; Sharma & Ojha, 2025; Singh et al., 2025). Research addressing gender inequality in digital education and migrant women's digital experiences further illustrates the importance of population characteristics, institutional conditions, and differentiated forms of participation (Peláez-Sánchez et al., 2023; Fung et al., 2025). Geographically focused investigations have examined spatial variation in women's internet use in Ethiopia and rural–urban inequalities among women in India, demonstrating the relevance of subnational and demographic differentiation for evaluating connectivity disparities (Meshesha et al., 2024; Roy et al., 2026). Research on mobile phone use in India similarly addresses gendered patterns of technological adoption within a specific national setting (Vyas, 2025). These contributions provide important explanations of particular dimensions of digital inequality, but their distinct populations, measurement frameworks, and analytical objectives do not directly resolve the narrower question of how changes in global female and male internet-use rates should be assessed through consistent absolute and proportional parity indicators. The research gap addressed here is therefore not an alleged absence of studies on gender and digital inequality, but the need for an explicitly documented descriptive comparison that distinguishes connectivity expansion from changes in gender parity while recognizing regional heterogeneity and the limitations of successive international statistical estimates.

Failure to distinguish aggregate connectivity growth from gender-equitable participation has significant consequences for both scientific interpretation and the evaluation of digital inclusion policies. A monitoring framework emphasizing the total number or proportion of connected individuals may register progress without adequately identifying whether women and men are

approaching comparable levels of internet participation. Research conceptualizing the digital divide as a gradient of technological engagement illustrates the limitations of treating digital participation as a simple distinction between users and non-users (Anaraky et al., 2025). Studies connecting digital literacy with broader social inclusion similarly indicate that technological access requires interpretation alongside individuals' capacities to participate in digitally mediated activities (Méndez-Domínguez et al., 2023). In healthcare, investigations of internet-based medical services and rural gender inequality highlight the relevance of differentiated technological opportunities for understanding inequalities in access to services, although aggregate connectivity statistics alone cannot establish specific healthcare outcomes (Jia et al., 2024). Educational research addressing strategies for reducing gendered digital exclusion likewise demonstrates the practical significance of institutional responses tailored to unequal participation conditions (Nkosi & Maphalala, 2026). Questions of online safety further complicate conventional connectivity assessments because the presence of internet access does not establish whether participation occurs under conditions of autonomy and protection from technology-facilitated harm (López-de-Arana Prado, 2025). These considerations indicate that connectivity monitoring and broader assessments of digital inclusion serve related but analytically different purposes. The scientific urgency lies in preventing descriptive evidence of technological expansion from being interpreted as proof of substantive gender equality, whereas the practical urgency concerns the design of monitoring systems capable of detecting persistent differences in participation. Gender-sensitive evaluation consequently requires transparent indicators that reveal disparities without attributing unobserved mechanisms or policy effects to aggregated statistics.

The present study is positioned at the intersection of comparative digital inequality research, gender-disaggregated statistical measurement, and the evaluation of international connectivity indicators. Its contribution differs from investigations primarily concerned with digital competencies, household-level determinants, educational populations, socioeconomic decomposition, or the explanatory mechanisms underlying technology adoption. Rather than developing an additional causal model or a multidimensional digital inclusion index, this research examines the interpretive relationship between aggregate connectivity expansion and gender parity using publicly reported ITU observations for 2024, 2025, and 2026. Previous research on spatial patterns in internet penetration establishes the relevance of geographical differences, while measurement-oriented studies demonstrate the importance of selecting indicators appropriate to the inequality being examined (Wang & Lin, 2024; Damiani & Rodríguez-Modroño, 2023). Systems-oriented scholarship further supports the need to avoid interpreting observed disparities independently of their broader social environments, although identifying these mechanisms requires information beyond descriptive connectivity statistics (David & Phillips, 2023). Against this background, the proposed analytical contribution consists of integrating three complementary components within a transparent descriptive framework: annual comparisons of female and male internet-use percentages, absolute male–female differences expressed in percentage points, and proportional parity measured through female-to-male participation ratios. A regional comparison based on available gender-disaggregated indicators is incorporated to examine how geographical variation qualifies the interpretation of global averages. This approach does not claim methodological originality in the mathematical calculation of differences or ratios; its more specific contribution is the coordinated application and explicit interpretation of these established measures across successive reporting periods. The resulting framework is designed to distinguish changes in connectivity levels from changes in relative gender equality while acknowledging revisions in international estimates, differences in geographical coverage, and the inability of aggregate observations to establish individual experiences or causal relationships.

This study aims to evaluate gender inequality in global and regional internet use through a descriptive comparative analysis of gender-disaggregated connectivity indicators reported for 2024–2026. Specifically, it seeks to examine changes in female and male internet-use percentages across the three reporting periods, calculate annual absolute gender gaps and female-to-male parity ratios, and determine whether observed changes in participation are accompanied by proportional convergence between women and men. The study also examines available regional differences to establish how geographical variation affects the interpretation of global connectivity indicators. Its analytical design relies exclusively on published secondary statistical observations and explicitly derived calculations,

without constructing individual-level records, estimating unreported uncertainty, or attributing observed changes to particular interventions. The principal scientific contribution is a transparent distinction between aggregate technological expansion and the distributional condition of gender parity, offering an operational interpretation of connectivity inequality that remains consistent with the descriptive capacity of the available data. Its methodological contribution lies in presenting complementary absolute and proportional indicators together while documenting the limitations associated with successive international estimates and regional aggregation. The practical contribution is to provide an evidence-based framework for interpreting gender-disaggregated connectivity statistics in digital inclusion monitoring and policy assessment, particularly where improvements in internet penetration may coexist with persistent inequalities in participation. The study consequently provides a bounded empirical assessment of gender parity in internet use while identifying the analytical conditions required for more detailed investigations of digital exclusion.

RESEARCH METHODS

This study employed a quantitative descriptive research design based on documentary analysis of publicly available secondary statistical data. The analytical approach consisted of repeated cross-sectional comparisons of gender-disaggregated internet-use estimates reported by the International Telecommunication Union (ITU) in its *Facts and Figures* publications for 2024, 2025, and 2026. These reporting periods constituted three successive statistical observations rather than longitudinal measurements of the same individuals or households. The principal units of analysis were published internet-use percentages disaggregated by sex at the global level, supplemented by available regional indicators for examining geographical differences in connectivity. The dataset was restricted to the indicators presented in the selected institutional publications, without incorporating individual survey responses, administrative microdata, or independently estimated population characteristics. Data collection involved documentary extraction of reported female and male internet-use percentages, their corresponding reference years, and the geographical classifications available in the source materials. The extracted observations were organized into comparative tables to maintain consistency between reporting periods, population categories, and indicator definitions. The study did not employ respondent recruitment, probability sampling, questionnaires, interviews, experimental interventions, or primary field observations. The ITU publications served as the documentary data sources, while the published statistical indicators constituted the quantitative material used for subsequent calculations. Data integrity was maintained by retaining the original reported values, distinguishing directly published indicators from derived measures, and avoiding the creation of missing observations or adjustments unsupported by the source documents.

Data analysis employed descriptive statistical comparisons to examine changes in internet participation and the magnitude of gender inequality across the selected reporting periods. Female and male internet-use percentages were treated as the primary observed indicators, while absolute gender differences and proportional parity ratios were calculated as derived measures. The absolute gender gap was operationalized as the male internet-use percentage minus the corresponding female percentage, expressed in percentage points. The gender parity ratio was calculated by dividing the female internet-use percentage by the male internet-use percentage for the same reporting period and geographical population. A ratio of 1.00 represented equal participation rates, whereas values below 1.00 indicated lower reported internet use among women. Changes across reporting years were examined through direct comparisons of published percentages, calculated gender gaps, and parity ratios, with regional comparisons restricted to geographical categories for which the relevant sex-disaggregated indicators were available. Descriptive tables and graphical representations were used to present the observed patterns and facilitate comparisons between absolute connectivity growth and proportional gender equality. Analytical accuracy was supported through explicit calculation procedures, consistent application of indicator definitions, and separation of source-reported statistics from arithmetic transformations. Potential inconsistencies arising from revisions to ITU estimates, differences in regional aggregation, and changes in underlying population assumptions were recognized as limitations of comparability across reporting periods. The analysis did not include inferential statistical testing, confidence intervals, causal estimation, or multivariate modeling because the available aggregated observations did not provide the individual-level information or uncertainty estimates necessary for such procedures. Consequently, the methodological framework was confined

to documenting observed differences in internet-use rates, assessing descriptive changes in gender parity, and interpreting geographical variation within the evidentiary limits of the published statistical sources.

RESULTS AND DISCUSSION

Aggregate Connectivity and Persistent Gender Differences

The comparative assessment of gender-disaggregated internet-use indicators for 2024–2026 reveals a sustained expansion in global connectivity accompanied by continuing differences between female and male participation rates. The published observations indicate that technological expansion occurred across both population groups, although the pace of improvement did not consistently reduce their relative disparity. This distinction is analytically significant because aggregate connectivity growth measures the expansion of internet participation, whereas gender parity reflects the distribution of that participation between women and men. Previous research has similarly emphasized that increasing technological penetration cannot independently establish equitable digital inclusion, particularly when structural inequalities influence access and participation (David & Phillips, 2023; Wang & Lin, 2024).

The reported global internet-use percentage among women increased from 65% in 2024 to 71% in 2025 and subsequently reached 74% in 2026, representing a cumulative increase of nine percentage points. Male internet use followed a comparable upward trajectory, rising from 70% in 2024 to 77% in 2025 and 79% in 2026, also producing a cumulative increase of nine percentage points. These observations demonstrate that both groups experienced equivalent cumulative percentage-point gains, although their respective participation levels remained unequal throughout the reporting periods. Research examining the relationship between digital infrastructure and gender differences in technological literacy provides a relevant analytical foundation for distinguishing improvements in connectivity conditions from the persistence of unequal technological participation (Liu, 2024).

Annual changes reveal a more differentiated pattern than the identical cumulative gains initially suggest, particularly when the direction and magnitude of gender convergence are examined separately. Between 2024 and 2025, female internet use increased by six percentage points, whereas male participation increased by seven percentage points, indicating that the initial expansion was accompanied by a widening absolute gender gap. Between 2025 and 2026, the corresponding increases were three and two percentage points, respectively, indicating a subsequent reduction in the absolute difference between the groups. These alternating developments are consistent with the broader argument that digital inequality should be examined through differentiated indicators rather than interpreted exclusively through aggregate technological adoption (Anaraky et al., 2025; Damiani & Rodríguez-Modroño, 2023).

A comparison of the absolute gender gap demonstrates that the difference between male and female internet-use percentages remained positive throughout the three reporting periods. The estimated difference increased from five percentage points in 2024 to six percentage points in 2025 before declining to five percentage points in 2026, indicating fluctuation rather than a sustained downward trajectory. Table 1 consolidates the reported participation percentages and the corresponding arithmetic calculations to distinguish observed connectivity expansion from changes in the relative position of women and men. This measurement approach is consistent with scholarship emphasizing the importance of differentiated digital inclusion indicators when evaluating gender inequalities in technological participation (Gupta & Kiran, 2025).

Table 1. Global Internet Use and Gender Parity Indicators, 2024–2026

Indicator	2024	2025	2026
Female internet users (%)	65	71	74
Male internet users (%)	70	77	79
Male–female gap (percentage points)	5	6	5
Female-to-male parity ratio	0.929	0.922	0.937
Annual female change (percentage points)	—	+6	+3
Annual male change (percentage points)	—	+7	+2

Source: ITU (2024, 2025, 2026); gender gaps, parity ratios, and annual changes calculated from the reported percentages.

The descriptive indicators presented in Table 1 demonstrate that higher internet-use percentages did not produce a consistent reduction in gender inequality across successive reporting periods. The female-to-male parity ratio declined from approximately 0.929 in 2024 to 0.922 in 2025 before increasing to 0.937 in 2026, indicating that proportional convergence followed a non-monotonic pattern. Although the 2026 ratio was higher than the corresponding values in the preceding observations, it remained below the equality benchmark of 1.00, confirming that the reported female participation rate continued to be lower than the male rate. This distinction between absolute and proportional inequality reinforces the methodological relevance of using multiple measures when assessing gender differences in digital development (Damiani & Rodríguez-Modroño, 2023; Sharma & Ojha, 2025).

The relationship between technological expansion and gender parity also requires consideration of the structural factors examined in existing digital inequality research. Studies of household-level digital skills in low- and middle-income economies have demonstrated the relevance of socioeconomic characteristics when investigating gender differences in technological capabilities, while cross-national educational research has examined inequalities in digital knowledge, attitudes, and skills (Avanesian et al., 2024; Campos & Scherer, 2024). These findings suggest that improvements in internet connectivity may coexist with differences in the resources and competencies required for effective digital participation. The present aggregate indicators cannot establish whether such mechanisms explain the observed annual differences, but they demonstrate why participation rates should not be interpreted as complete measurements of substantive digital inclusion.

The observed persistence of a male advantage also has implications for distinguishing numerical access from the potential benefits associated with internet participation. Research addressing gender differences in digital literacy across generations in Indonesia and digital competence among university students in Bangladesh illustrates how the conditions surrounding technological participation can vary according to demographic and educational characteristics (Long et al., 2023; Hossain et al., 2023). Investigations of digital capital further emphasize the relationship between technological competencies, educational resources, and participation in online environments, extending the meaning of digital inequality beyond simple connectivity status (Lybeck et al., 2024). These scholarly contributions provide an interpretive foundation for recognizing that identical cumulative increases in female and male internet-use percentages do not necessarily imply equivalent changes in digital opportunities or outcomes.

The interpretation of annual changes must also account for the methodological characteristics of the international statistical series. The three observations represent successive published estimates rather than repeated measurements of an identical sample, and revisions to population assumptions or statistical estimation procedures may affect direct comparisons between reporting periods. The calculated differences consequently describe the relationships among the reported indicators without establishing that the observed annual changes represent statistically significant shifts or the effects of particular digital inclusion interventions. This distinction is especially relevant to research on digital inequality because studies employing household fixed effects, decomposition techniques, or multivariate approaches can investigate relationships that cannot be identified from a limited series of aggregated percentages (Avanesian et al., 2024; Fang et al., 2025a).

The combination of sustained connectivity growth and persistent gender differences demonstrates the analytical limitations of assessing digital development exclusively through increasing internet penetration rates. Global female and male participation each increased by nine percentage points over the selected reporting periods, yet the absolute gender gap in the final observation remained equal to that recorded in 2024, while the proportional parity ratio showed only a modest net improvement. Research examining economic gender inequality in relation to mobile technology and gendered participation in the digital economy provides a broader rationale for treating access disparities as relevant to development analysis, without assuming that the present statistics establish economic consequences (Sun & Lu, 2025; Rani et al., 2022). These findings establish the empirical basis for extending the analysis beyond global averages to geographical differences, where variations in connectivity and gender participation may reveal inequalities that aggregate international indicators cannot adequately represent.

Regional Patterns and Multidimensional Exclusion

Regional variations in internet participation demonstrate that global connectivity indicators conceal substantial geographical differences in the distribution of digital opportunities between women and men. The 2024 International Telecommunication Union estimates reported female internet-use rates of 31% in Africa and 90% in Europe, compared with corresponding male participation rates of 43% and 92%, respectively (ITU, 2024). These differences indicate that the magnitude of gender inequality varies considerably across geographical settings, even when the same indicator is applied to both populations. Research examining spatial relationships in global internet penetration supports the analytical relevance of geographical differentiation, particularly where disparities in connectivity emerge alongside broader patterns of technological development (Wang & Lin, 2024).

The African and European observations reveal differences not only in the extent of internet participation but also in the relative position of women within regional connectivity structures. Africa recorded an absolute gender gap of 12 percentage points, whereas Europe exhibited a considerably smaller difference of two percentage points, indicating that the disparity in Africa was six times the European value. This contrast suggests that regional averages can identify unequal distributions of connectivity without establishing the specific socioeconomic, institutional, or infrastructural mechanisms responsible for those distributions. Comparative research on information and communication technology infrastructure has emphasized the relevance of structural conditions to gender differences in technological literacy, offering an explanatory perspective that complements descriptive regional comparisons (Liu, 2024).

Absolute differences alone provide an incomplete representation of geographical inequality because they do not account for the relative magnitude of female participation compared with male participation. The female-to-male internet-use ratio calculated from the 2024 regional indicators was approximately 0.721 in Africa and 0.978 in Europe, demonstrating a substantial difference in proportional gender parity. These values indicate that the female participation rate represented approximately 72.1% of the male rate in Africa, compared with approximately 97.8% in Europe, without implying that the underlying populations or socioeconomic conditions were directly comparable. Research on women's digital inclusion has similarly highlighted the measurement implications of using indicators that capture different dimensions of inequality, reinforcing the analytical value of interpreting absolute and relative differences together (Damiani & Rodríguez-Modroño, 2023).

Geographical comparisons must distinguish observed regional inequalities from the broader demographic and socioeconomic conditions potentially associated with unequal internet participation. Studies examining women's internet use in Ethiopia and wealth-related differences in digital access among women in India demonstrate the relevance of spatial location and economic resources for understanding differentiated patterns of participation (Meshesha et al., 2024; Chandra et al., 2024). These investigations provide empirical grounds for considering regional connectivity disparities as potentially multidimensional rather than exclusively technological. Table 2 presents the available global and regional indicators for 2024, permitting direct comparison of the magnitude of gender differences without introducing additional observations beyond those documented in the secondary dataset.

Table 2. Global and Regional Gender Differences in Internet Use, 2024

Geographical population	Female internet use (%)	Male internet use (%)	Gender gap (percentage points)	Female-to-male parity ratio
Global	65	70	5	0.929
Africa	31	43	12	0.721
Europe	90	92	2	0.978

Source: ITU (2024); absolute gender gaps and parity ratios calculated from the reported percentages.

The indicators in Table 2 demonstrate that regional inequality cannot be adequately characterized by the global gender gap of five percentage points alone. Africa exhibited both

substantially lower internet participation and a larger gender disparity than the global estimates, whereas Europe approached proportional parity under conditions of considerably higher connectivity. The contrast establishes a descriptive association between regional connectivity levels and the magnitude of gender inequality within the selected observations, but the limited number of geographical categories does not support a general statistical relationship between these variables. Research on rural–urban differences in women's internet use in India reinforces the importance of geographical disaggregation, while investigations of gendered mobile phone adoption demonstrate that national and subnational characteristics may influence technological participation in ways that regional aggregates cannot identify (Roy et al., 2026; Vyas, 2025).

Socioeconomic differentiation introduces an additional analytical dimension because geographical inequalities may coincide with unequal access to financial resources, educational opportunities, and digital competencies. Research on digital competence among university students in Bangladesh and technology adoption among Pakistani higher education students has examined how educational environments and gender-related conditions shape patterns of digital participation (Hossain et al., 2023; Barra et al., 2024). Evidence concerning sociodemographic and socioeconomic influences on the digital divide in higher education further supports the need to distinguish the presence of connectivity from the resources required to use digital technologies effectively (Fang et al., 2025b). The regional estimates examined here cannot determine the distribution of such characteristics within female and male populations, making their relevance interpretive rather than evidence of directly observed mechanisms in the present dataset.

Demographic variation also complicates the interpretation of regional gender inequality because aggregate internet-use percentages combine individuals with different ages, educational backgrounds, and social circumstances. Research concerning marginalized older women in the Global South and older adults' adoption of information and communication technologies has examined the relationship between demographic positioning and digital participation (Pei et al., 2024; Shou et al., 2025). Systematic evidence concerning migrant women's digital exclusion likewise demonstrates the relevance of social and institutional circumstances that may not be represented in broad geographical categories (Fung et al., 2025). The present regional observations contain no disaggregated information sufficient to identify these population-specific relationships, preventing conclusions about whether age, migration status, or other demographic characteristics account for the differences recorded between Africa and Europe.

Digital inclusion also encompasses the substantive conditions under which technological participation occurs, extending beyond the binary distinction between internet users and non-users. Research on digital literacy and social inclusion has examined the relevance of technological capabilities for participation in digitally mediated environments, while scholarship on gender-based violence in virtual spaces has emphasized the importance of safety in assessments of digital inequality (Méndez-Domínguez et al., 2023; López-de-Arana Prado, 2025). Studies of internet-based medical services and gender differences in health opportunities further illustrate how the consequences of technological participation may extend into access to essential services (Jia et al., 2024). These dimensions cannot be measured through the regional internet-use percentages employed in the present study, but they establish why a relatively high participation rate should not automatically be interpreted as evidence of equal digital capabilities, autonomy, or benefits.

The interpretation of regional inequality is further constrained by the relationship between geographical aggregation and the identification of population-level mechanisms. Although the African and European indicators demonstrate substantial differences in both absolute gender gaps and proportional parity, regional averages conceal variation among countries, urban and rural populations, and socioeconomic groups. International research on gendered digital inclusion and educational strategies has emphasized the need to recognize differentiated barriers rather than assume that populations experience identical technological conditions (Singh et al., 2025; Nkosi & Maphalala, 2026). The available dataset does not permit estimation of within-region dispersion, statistical uncertainty, or the relative contributions of infrastructure, affordability, education, and social norms to the observed differences.

The regional evidence establishes that gender inequality in internet use differs markedly across the geographical populations represented in the available international statistics. The contrast between Africa and Europe indicates that both absolute percentage-point gaps and proportional parity ratios are

necessary to interpret the relationship between connectivity expansion and unequal participation, while the global average provides an insufficient description of regional conditions. Research using multidimensional frameworks to examine women's digital exclusion offers a broader conceptual basis for recognizing the institutional and socioeconomic factors that may accompany these differences without treating them as empirically established causes in the present analysis (Gupta & Kiran, 2025; Sharma & Ojha, 2025). These findings support geographically differentiated connectivity monitoring and provide a basis for evaluating whether international digital inclusion indicators adequately distinguish aggregate technological development from measurable progress toward gender parity.

Equity Indicators and Policy Measurement

The evaluation of gender equality in internet participation requires measurement frameworks capable of distinguishing technological expansion from improvements in the distribution of connectivity between women and men. The global observations for 2024–2026 demonstrate that increasing internet-use percentages can coexist with persistent absolute differences and fluctuations in proportional gender parity. These findings establish an analytical distinction between connectivity indicators, which describe the extent of internet participation, and equity indicators, which assess the relative positions of population groups within that participation. Research on women's digital inclusion and multidimensional measurement has similarly emphasized that the selection of indicators influences the interpretation of technological inequality and the identification of populations experiencing exclusion (Damiani & Rodríguez-Modroño, 2023; Gupta & Kiran, 2025).

The measurement implications become apparent when the cumulative changes in female and male internet participation are evaluated against the corresponding parity indicators. Female internet use increased by nine percentage points between 2024 and 2026, matching the cumulative increase recorded among men, while the absolute gender gap remained at five percentage points in the initial and final observations. The female-to-male parity ratio nevertheless increased from approximately 0.929 to 0.937, indicating a modest improvement in proportional equality despite the unchanged absolute difference. This divergence illustrates why absolute and relative indicators should be interpreted jointly rather than treated as interchangeable measures of gender inequality, particularly when the underlying participation rates change over time (Wang & Lin, 2024; David & Phillips, 2023).

The comparison between absolute and proportional measures also illustrates the sensitivity of parity assessment to the mathematical properties of the selected indicators. An absolute gender gap captures the difference between male and female participation rates in percentage points, whereas the female-to-male ratio expresses women's participation relative to the corresponding male rate. Identical absolute gaps may therefore produce different proportional parity ratios when participation levels differ, as demonstrated by the 2024 and 2026 global observations. Scholarship examining digital inequality through differentiated measurement approaches supports the analytical relevance of distinguishing disparities in access from broader distributions of technological capability and participation (Anaraky et al., 2025; Fang et al., 2025a).

International connectivity monitoring also requires consideration of the geographical variation identified in the regional comparisons. The 2024 observations indicate that Africa recorded substantially lower female and male internet-use percentages than Europe, accompanied by a considerably larger absolute gender gap and a lower proportional parity ratio. These geographical differences suggest that a single global parity indicator may conceal distinct regional conditions and should not independently determine the evaluation of gender-sensitive connectivity objectives. Table 3 consolidates the measurement implications of the available observations by identifying the indicators, their empirical basis, and the interpretive limits relevant to comparative digital inclusion assessment (Liu, 2024; Meshesha et al., 2024).

Table 3. Descriptive Equity Indicators and Their Measurement Implications

Measurement dimension	Available empirical evidence		Analytical interpretation			Measurement limitation
Connectivity	Female:	65%–	Measures	changes	in	Does not establish equality in

.

expansion	74%; male: 70%–79%, 2024–2026	reported internet participation	digital capabilities or outcomes
Absolute gender inequality	Global gaps: 5, 6, and 5 percentage points	Identifies differences between male and female participation rates	Does not express the disparity relative to male participation
Proportional gender parity	Global ratios: 0.929, 0.922, and 0.937	Measures female participation relative to male participation	Does not identify mechanisms producing observed differences
Regional inequality	Africa: 12-point gap; Europe: 2-point gap, 2024	Demonstrates geographical variation in gender disparities	Regional averages conceal national and subnational differences
Regional proportional parity	Africa: 0.721; Europe: 0.978, 2024	Compares relative female participation across regions	Does not measure within-region population heterogeneity
Comparability across reporting periods	Successive ITU estimates, 2024–2026	Supports bounded descriptive comparisons	Methodological revisions and unavailable uncertainty estimates limit inference

Source: ITU (2024, 2025, 2026); calculations and analytical classifications derived from the published gender-disaggregated indicators.

The comparative framework presented in Table 3 demonstrates that the analytical usefulness of connectivity statistics depends on the specific dimension of inequality being evaluated. Participation percentages identify the extent of reported internet use, whereas percentage-point gaps and parity ratios provide complementary information about gender differences within the same population. Regional disaggregation introduces geographical variation into this evaluation, although the available regional estimates cannot reveal the distribution of inequality among countries, households, or demographic groups. Research examining wealth-related inequalities in women's internet use and rural–urban digital differences provides an empirical rationale for extending monitoring beyond aggregate indicators when more detailed data become available (Chandra et al., 2024; Roy et al., 2026).

The distinction between measurable connectivity and substantive digital inclusion becomes especially relevant when gender disparities are considered alongside inequalities in digital skills and educational participation. Research involving students across multiple countries has examined differences in technological knowledge, attitudes, and competencies, while household-level investigations in developing economies have addressed gender disparities in digital skills through socioeconomic comparisons (Campos & Scherer, 2024; Avanesian et al., 2024). Studies examining digital competence in Bangladesh, generational differences in Indonesia, and demographic influences in higher education further indicate that internet participation may occur under unequal conditions of technological capability (Hossain et al., 2023; Long et al., 2023; Fang et al., 2025b). These findings identify dimensions of digital inequality that remain outside the measurement scope of the present dataset, preventing conclusions that improvements in participation rates necessarily correspond to improvements in digital proficiency.

Policy-oriented interpretation must also recognize that access to digital technologies does not independently establish the economic, educational, or social benefits derived from their use. Research on women's participation in the digital economy and the relationship between mobile technologies and economic gender inequality demonstrates the relevance of technological participation to broader development questions (Rani et al., 2022; Sun & Lu, 2025). Investigations of technological adoption among higher education students and the role of digital competencies in online participation further illustrate the importance of institutional and individual resources for understanding differentiated opportunities (Barra et al., 2024; Lybeck et al., 2024). The available ITU indicators measure reported internet use rather than income generation, educational attainment, employment outcomes, or the distribution of digital benefits, requiring these policy implications to remain distinct from the empirical findings.

An additional limitation concerns the inability of conventional participation indicators to capture differences in autonomy, safety, and the conditions under which individuals engage with

digital services. Research on digital exclusion among migrant women, marginalized older women, and older adults has examined demographic and institutional circumstances that may influence access and participation beyond the presence of technological infrastructure (Fung et al., 2025; Pei et al., 2024; Shou et al., 2025). Scholarship addressing gender-based violence in virtual environments further indicates that technological participation cannot automatically be equated with secure or autonomous digital engagement (López-de-Arana Prado, 2025). These considerations do not invalidate the descriptive value of internet-use percentages, but they establish that connectivity parity represents a narrower measurement objective than substantive equality in digital experiences.

The interpretation of annual parity changes also depends on the comparability of successive statistical observations and the availability of information concerning estimation uncertainty. The selected ITU publications provide aggregate indicators from different reporting periods, but the analytical dataset does not include standard errors, confidence intervals, or individual-level observations that would support statistical significance testing. Apparent changes in absolute gaps or proportional ratios must consequently be interpreted as descriptive differences between published estimates rather than verified population-level changes attributable to particular interventions. Methodological research employing decomposition analysis and more detailed statistical comparisons demonstrates the additional explanatory possibilities available when suitable disaggregated data are accessible, while systematic examinations of gendered digital exclusion emphasize the importance of maintaining consistency between measurement objectives and empirical evidence (Fang et al., 2025a; Singh et al., 2025).

The integration of connectivity percentages, absolute differences, proportional parity ratios, and regional comparisons provides a defensible basis for evaluating gender inequality within the limitations of publicly reported aggregate statistics. The observed persistence of gender disparities indicates that monitoring frameworks restricted to increasing internet penetration may overlook distributional differences, while broader digital inclusion assessments require additional information about affordability, skills, demographic characteristics, and meaningful participation. Research on digital literacy and social inclusion, technology-mediated health opportunities, and gender-sensitive educational interventions provides a relevant foundation for identifying these additional dimensions without attributing their effects to the present descriptive observations (Méndez-Domínguez et al., 2023; Jia et al., 2024; Nkosi & Maphalala, 2026). The study contributes a transparent comparative interpretation of published connectivity indicators, demonstrating how complementary equity measures can support geographically differentiated policy assessment while preserving a clear distinction between observed statistical disparities, potential explanatory mechanisms, and outcomes that require further empirical investigation.

CONCLUSION

The study demonstrates that the expansion of global internet connectivity during 2024–2026 was not accompanied by a sustained reduction in gender inequality. Female internet use increased from 65% to 74%, while male participation increased from 70% to 79%, with both groups recording cumulative gains of nine percentage points. The absolute gender gap fluctuated from five percentage points in 2024 to six percentage points in 2025 before returning to five percentage points in 2026. The female-to-male parity ratio changed from 0.929 to 0.922 and subsequently increased to 0.937, indicating modest proportional convergence in the final observation without achieving gender parity. Regional comparisons revealed substantial geographical disparities, with Africa recording a 12-percentage-point gender gap and a parity ratio of 0.721 in 2024, compared with a two-percentage-point gap and a ratio of 0.978 in Europe. These findings establish that aggregate connectivity growth, absolute gender differences, and proportional parity represent distinct dimensions of digital inequality that require complementary interpretation.

The principal scientific contribution lies in integrating gender-disaggregated participation rates, absolute differences, proportional parity ratios, and regional comparisons into a transparent descriptive assessment of connectivity inequality. The findings support the use of complementary indicators in digital inclusion monitoring because improvements in internet penetration alone cannot establish equitable participation between women and men. Policy evaluation should incorporate gender-specific and geographically differentiated connectivity measures while recognizing that internet-use percentages do not directly capture affordability, digital competencies, online safety, or

the benefits derived from technological participation. The analysis remains limited by its reliance on successive aggregate statistical estimates, potential methodological revisions, restricted regional observations, and the absence of individual-level data or uncertainty estimates. These limitations prevent causal interpretation, statistical significance testing, and identification of the mechanisms underlying observed disparities. Future research should employ comparable country-level and sex-disaggregated microdata to investigate socioeconomic and geographical differences, evaluate changes in gender parity more precisely, and examine the conditions associated with meaningful digital inclusion.

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