A4AI ALLIANCE FOR AFFORDABLE INTERNET

The Costs of Exclusion

Economic Consequences of the Digital Gender Gap

Acknowledgements

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A4AI ALLIANCE FOR AFFORDABLE INTERNET

The **Alliance for Affordable Internet (A4AI)** is a global coalition working to drive down the cost of internet access in low- and middle-income countries through policy and regulatory reform. We bring together businesses, governments, and civil society actors from across the globe to deliver the policies needed to reduce the cost to connect and make universal, affordable internet access a reality for all.

WORLD WIDE WEB FOUNDATION

The **World Wide Web Foundation** was established in 2009 by web inventor Sir Tim Berners-Lee and Rosemary Leith to advance the open web as a public good and a basic right. We are an independent, international organisation fighting for digital equality — a world where everyone can access the web and use it to improve their lives. The Foundation holds the secretariat of the Alliance for Affordable Internet.

Executive Summary

Governments are missing out on hundreds of billions of dollars because of the digital gender gap. Closing this gap in the next five years gives policy makers a $524 billion USD opportunity.

Across the world, millions of people are still unable to access the internet and participate online — **and women are disproportionately excluded.** Men are 21% more likely to be online than women globally, rising to 52% in Least Developed Countries.

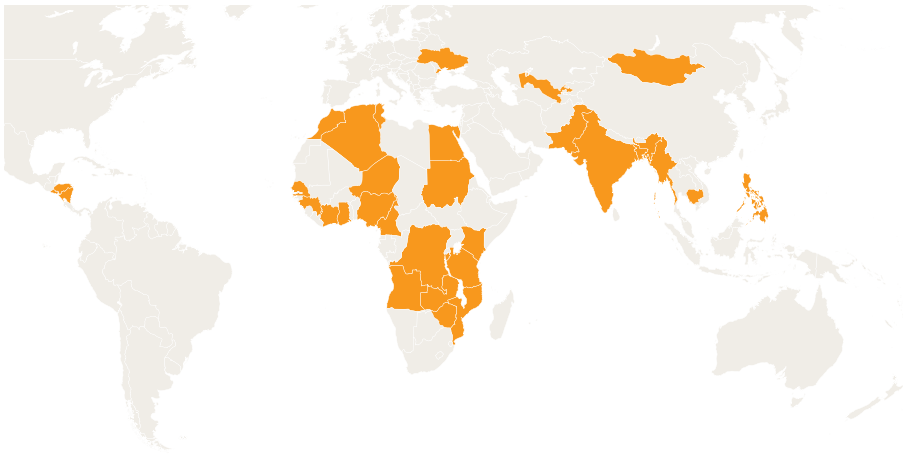
Various barriers prevent women and girls from accessing the internet and participating online, including unaffordable devices and data tariffs, inequalities in education and digital skills, social norms that discourage women and girls from being online, and fears around privacy, safety, and security.

While digital exclusion limits the opportunities for those women and girls unable to connect, it also has broader societal and economic impacts that affect everyone. With hundreds of millions fewer women able to use the internet, the world is missing out on untold social, cultural, and economic contributions that they could make if they were able to harness the internet's benefits.

This report estimates the economic impact of women's digital exclusion. Further, it underlines the economic opportunity governments have to include women in a fully inclusive digital economy.

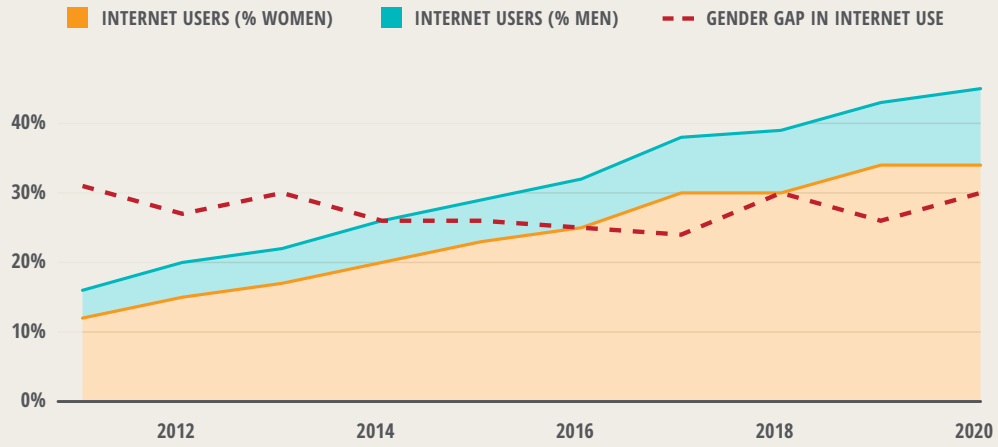
Measuring the economic cost of digital exclusion

This research focuses on low and lower-middle income countries (LLMICs), where the digital gender gap is often greatest. To understand the economic impact of digital exclusion, this report models the gender gaps in 32 LLMICs, covering over 70% of the collective gross domestic product (GDP) of all LLMICs, and pairs it with existing models from the International Telecommunication Union (ITU) that calculate the economic effect of increasing mobile and fixed broadband penetration. This model gives an estimate of the total effect of the digital gender gap on the gross domestic products (GDP) of these 32 countries and projects the future impact if governments do not act to address the problem.



What we found

1 **There is a substantial digital gender gap — and it's not getting better.** In the 32 countries we studied, just over a third of women were connected to the internet compared to almost half of men. Since 2011, the gender gap has only dropped half a percentage point, from 30.9% to 30.4%.



Source: *Alliance for Affordable Internet, 2021*

2 **Countries have missed out on $1 trillion USD in GDP as a result of women's exclusion from the digital world.** In 2020, the loss to GDP was $126 billion USD.

3 **This economic hit means billions in lost taxes that could be invested to improve education, health, and housing.** This lost productivity translates to a missing $24 billion in tax revenues annually for these governments, based on current tax-to-GDP ratios.

4 **Governments are not adopting the policies they need to bridge the digital gender gap.** Of all the policy areas covered by the Alliance for Affordable Internet (A4AI) in its annual Affordability Drivers Index, gender consistently receives the lowest scores. In the 2020 Affordability Report, over 40% of countries studied had no meaningful policies or programs to expand women's access to the internet.

5 **Policymakers have a $500 billion+ economic opportunity.** Closing the digital gender gap in these countries would deliver an estimated $524 billion increase in economic activity by 2025.

Bridge the digital gender gap and grow digital economies

These findings show the magnitude of the digital gender gap and the opportunity that exists for governments willing to take action. As economies have contracted in the face of the Covid-19 pandemic, governments are looking to the digital world as a new, robust source of economic productivity and growth. This growth must be inclusive and must invest in programmes, policies, and infrastructure that enable more women to use the internet.

This policy approach will include investment in infrastructure to make sure stable, high-speed internet access is available and affordable to everyone. But a strategy for an inclusive digital economy must go beyond infrastructure to also address the economic, technical, and social barriers of digital exclusion.

The REACT framework, developed by the Web Foundation, defines five core pillars that give policymakers a holistic way to develop policy to promote women's inclusion in technology through: **Rights, Education, Access, Content,** and **Targets.** An effective broadband strategy must include policies that guarantees the rights of women and girls; provide skills and training for all; make internet access available and affordable; promote relevant, local content; and include clear policy targets to create accountability in the policy process.

A digital economy without the full participation of women cannot scale to reach its potential. Digital inclusion is not only good policy — it's good economics.

The digital divide is real — and it's sexist

By the latest estimates from the International Telecommunication Union (ITU), a majority of women in the world have never used the internet. It estimates that, in 2019, 55% of men in the world had used the internet while only 48% of women had. This gap, known as the **digital gender gap**, represents 303 million people – almost the population size of the United States of America.[1]

The digital divide and its cousin, the digital gender gap, have been near-permanent legacies of technological innovation, and the adoption of the internet has been no exception to this. As a global trend, women and girls are less likely to use the internet than men and boys. This has been the internet's history: but it neither has to be nor should be its future.

In several parts of the world, the number of men online vastly outnumber the number of women online. The ITU's regional estimates for Africa put the gender ratio at nearly three-to-two in favour of men over women. According to the GSMA, around 234 million fewer women in low- and middle-income countries use the mobile internet than men. This divide is most stark in sub-Saharan Africa and South Asia where the gender gap persists over 55% more men than women.[2]

What are the digital divide and the digital gender gap?

These terms are often used interchangeably by many people.

The **digital divide** typically refers to a binary division of people into the connected and the unconnected. It can also relate to the division of different user experiences (e.g., the feature phone-smartphone digital divide) or different groups of people (e.g., the urban-rural digital divide). It simply refers to the disparities of technological access and use.

The **digital gender gap** speaks to many of the same aspects of the digital divide, as measured by gender. However, a focus on the 'gender gap' emphasises that this digital inequality is just one aspect of a broader system of discrimination and disadvantages that limit women's and girls' potential to participate in society.

The digital divide is a technological problem: the digital gender gap is a human one.

1 This is calculated using the ITU's gender gap projections for 2019 and the UNDESA's estimates for world population by gender in the same year.
2 This is calculated using the Web Foundation's women-centric approach. See more on Page ##.

Several barriers limit women's use of the internet.

There is no single reason women are less likely to use the internet than men. A combination of individual and societal factors accumulate into forms of intentional or incidental discrimination and disadvantages that discourage women from participating in the online world as equals. The outcome of this is measured simply in the digital gender gap.

Affordability

The cost of connectivity keeps women offline. Handset cost remains one of the most frequently cited reasons among mobile phone users in low- and middle-income countries for not using the internet. Beyond handsets, the cost of data tariffs negatively limited how much 25% of respondents used the internet in three low- and middle-income countries.

Wage gaps

Gender pay gaps make the problem of the cost of connectivity worse for women. In a 2021 survey of device costs in 187 countries around the world, the cheapest new smartphone cost US$104 on average. As a fraction of the average monthly income, this is roughly one quarter. However, in the context of the global gender wage gap, where women globally earn around 77 cents for each dollar a man earns, these costs are, on average, higher for women as a percentage of their income. By that ratio, if a man could pay for a smartphone on one month's wages, a woman would need to work an extra ten days to afford the same device.

Device gaps

In part because of cost, women globally have lower rates of device ownership. By way of illustration, women in low- and middle-income countries are estimated to be 15% less likely to own a smartphone than men. This carries consequences for the behaviours that mobile phone users have. For example, in a GSMA consumer survey among women who use mobile phones in Nigeria, 93% of smartphone users use the internet while only 12% with a basic or feature phone do. Lower rates of smartphone ownership among women forms a technical limitation to what women are able to do, even when they're connected to the internet.

These lower rates of device ownership replicate into lower rates of meaningful connectivity. The Alliance for Affordable Internet (A4AI) introduced the concept of meaningful connectivity in 2020 to start tracking the depth of different online experiences between simply being connected and having internet access of sufficient quality to enable someone to work, live, and participate in the online world. One of its four targets is smartphone ownership: where women's smartphone ownership generally lags across the world. This represents part of the digital gender gap that policymakers need to address.

Privacy/security

Women, generally, also hold higher fears around online privacy and security. In nationally representative surveys in Colombia, Ghana, and Uganda, women more frequently reported being afraid about personal data privacy at the same time as they reported lower rates of creating content online. In our focus groups in Côte d'Ivoire, Nigeria, India, and Bangladesh, women remarked on the fear of being manipulated or targeted because of what they posted on social media. In their own eyes, the internet is not a safe place for women.

Literacy and skills

Educational gaps by gender also keep women offline. Along with handset cost, literacy and skills are one of the two most common barriers to mobile internet use. As the literacy gap between men and women in the world persists (90% of adult men, compared to only 83% of adult women as of 2019), this gap replicates itself into the digital world. Differences in mean years of schooling also replicate into lower access to digital skill-building in an educational context. Together, the educational disadvantages against girls become digital divides for women.

Cumulative effect

The accumulation of these individual barriers that discourage women from using the internet – each a small manifestation of the digital gender gap — has a cumulative impact on the content that women see and the experiences they have online. At the same time, women report facing greater family and social pressures against internet use.

Together, the financial, technical, safety, and educational gaps faced by women on an individual basis accumulate into a social norm that reinforces the myth that "access to technology and the internet by women is … immoral, inappropriate, or unnecessary." This myth discourages women and girls from participating in the online world, defers the potential benefits to their own education, health, or wellbeing, and hinders the potential cultural and economic benefits of the greater digital inclusion of women and girls throughout the world.

Continued failure to act on gender inequality has **cost countries billions over the past decade**

Governments throughout the world have failed women and girls in rising to the challenge to close the digital gender gap. However, this is not just a failing *for* women and girls: the costs of this exclusion are shared throughout society. There is an untold wealth of cultural, social, and scientific knowledge lost because of the exclusion of women's and girls' voices from the online world.

Gender-responsive broadband policy has so far been an exception to the rule.

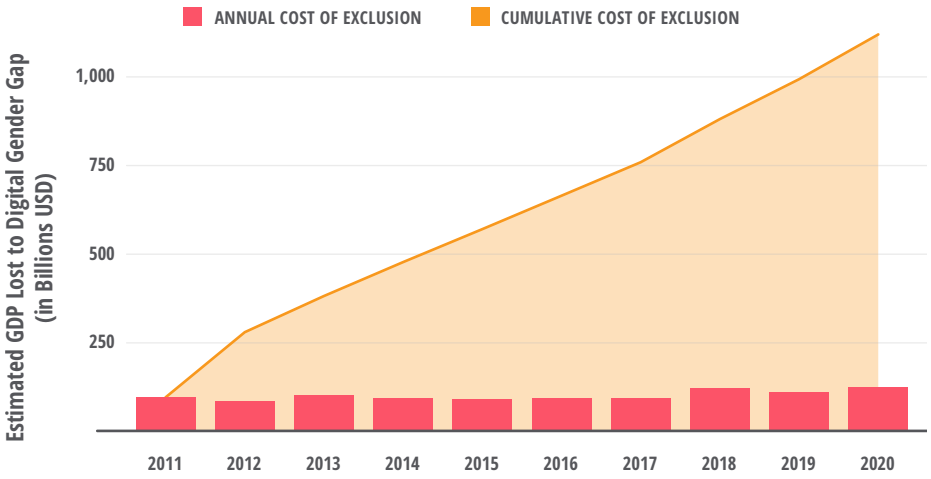
Broadband policy to date has failed to respond to the digital gender gap. Since 2017, A4AI has tracked gender-responsive policy making in the telecommunications sector for all countries within the annual Affordability Drivers Index. Of all the policy areas studied by A4AI, gender consistently receives the lowest average scores. In the 2020 Affordability Report, just over 40% of the countries in the study had no meaningful policies or programs for women's access to the internet.

This failure comes with a huge economic cost.

Beyond the social cost, excluding women from the digital economy takes a significant economic toll on low and lower-middle income countries (LLMICs). **A4AI estimates that, over the last decade, LLMICs have lost a total of $1 trillion USD in gross domestic product (GDP) to the gender gap in internet use.** Based on current tax-to-GDP ratios in these countries, this loss represents an estimated $24.7 billion in lost tax revenue in 2020.

In 2020, within our sample of 32 countries (covering 72.2% of LLMICs' total GDP) just over a third of women were connected to the internet, compared to almost half of men. This same year, A4AI estimates that the gender gap cost the 32 countries in the sample $126 billion USD. Unless the gap significantly narrows, LLMICs will likely continue to lose billions more of economic activity (USD) each year if women continue to be excluded from the digital world.

Figure A. Cumulative cost of women's exclusion from internet use in 32 countries, 2011–2020



Source: *Alliance for Affordable Internet, 2021*

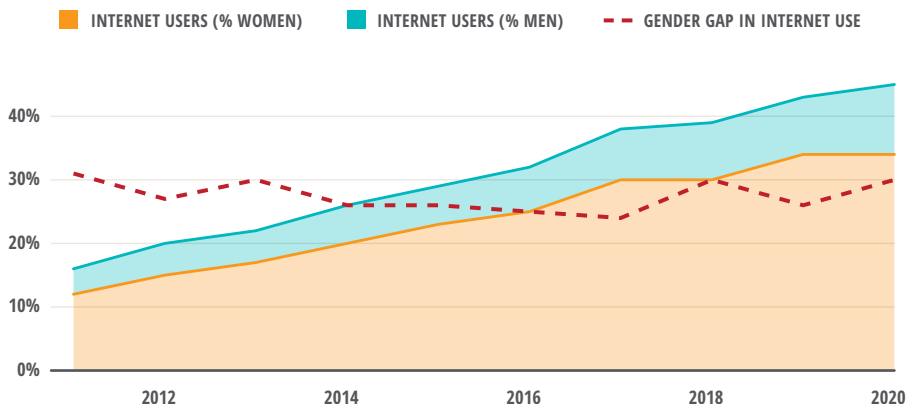
The past decade failed to close the digital gender gap.

In the early 2000s, the overwhelming majority of new internet users were male. This began to change about a decade later as the internet became more ubiquitous throughout the world. Between 2011 and 2020, the share of women connected to the internet rose from 12.2% to 34.3%. Despite this increase, it wasn't substantial enough for women to catch up with their male counterparts.

Despite gains in women's access, men continue to connect to the internet at a faster pace. In the last decade, the gender gap in internet use in LLMICs appears stable despite steady increases in the number of women online. In 2011, the gap was 30.9% and by 2020, it dropped only half a percentage point to 30.4%.

The gender gap oscillated from year to year. In some years the gap narrowed; in others, it widened. Overall, the contractions in the gap were only marginally larger than the expansions. This is how the gap appears to have changed so little during this period.

Figure B. Percentage internet users, 32 model countries, by gender and gender gap, 2011–2020



Source: *Alliance for Affordable Internet, 2021*

How we measure gender gaps

There are different ways to calculate the digital gender gap, depending on the particular lens through which each person sees the world and which group you choose as the reference. We always calculate the gap as the difference between how many men and how many women are online, as a proportion of how many women are online. The lower the percentage of women online, the larger the digital gender gap will be. We use women as the reference group in order to put the focus on the disparity and disadvantages faced by women.

More specifically, our approach explains how many more women need to come online in order to reach gender parity using the formula on the right.

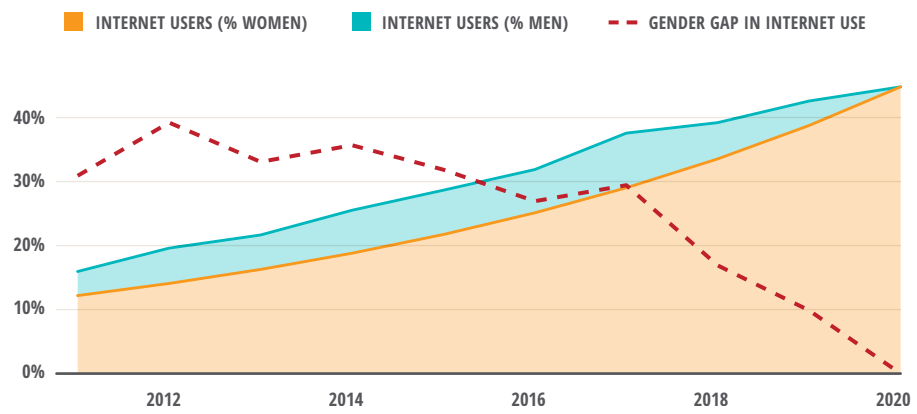
$$\frac{\text{\% of men online} - \text{\% of women online}}{\text{\% of women online}}$$

Gaps will remain constant as long as the relationship between the two groups remains in proportion to each other. This is how, despite the fact that more women are coming online every year, the gender gap has not closed over the past decade.

The year-to-year fluctuations may be due to random variation. The long term trend runs in parallel to the absence of a sustained and concerted effort on the part of policymakers to remove barriers that keep women unconnected or only marginally connected. Extrapolating from these results, it stands to reason that if policymakers do not prioritise reducing the digital gender gap, they run the risk of allowing any future progress made in one year to be washed away by a reversal in a subsequent year.

Over the last decade, the share of women online has increased at a rate of 12.2% a year. For the gap to have closed by 2020, women would have had to have connected at a rate of 15.6%. It means an additional 150.9 million women would have had to have connected.

Figure C. Closing the gender gap in internet use, 2011–2020



Source: *Alliance for Affordable Internet, 2021*

This is our past, but it should not be our future.

Positive policy examples do exist for ways to close the digital gender gap. Leaders in this area include Botswana, Costa Rica, and Senegal: all of which include clear targets for women's inclusion within their national broadband plans. Botswana's national broadband strategy includes gendered targets for smartphone access, digital literacy, and ICT graduates, and the Digital Senegal plan includes a high-level commitment to mainstream gender in all broadband policy decisions. In Costa Rica, the national broadband plan includes women's access as a core component and sets targets for women's online entrepreneurship. These policies are a crucial starting point for governments looking to change history and need to be followed up with implementation plans to revisit and evaluate progress.

At a programmatic level, countries have implemented projects that have a clear gender dimension to help address the digital gender gap. In the Philippines, the Technology for Economic Development (Tech4ED) project — with over 2,200 public access centres built across the country since 2015 — have had women as a majority of their users. In Rwanda, half of the positions within the government-backed Digital Ambassadors program are reserved for women to enable them to be advocates within their own communities and networks to encourage other women and girls to come online. These examples demonstrate what can be done in words and in action to reduce the digital gender gap.

As governments look to the digital economy as an engine for growth in the post-Covid recovery, they must keep women's access in mind.

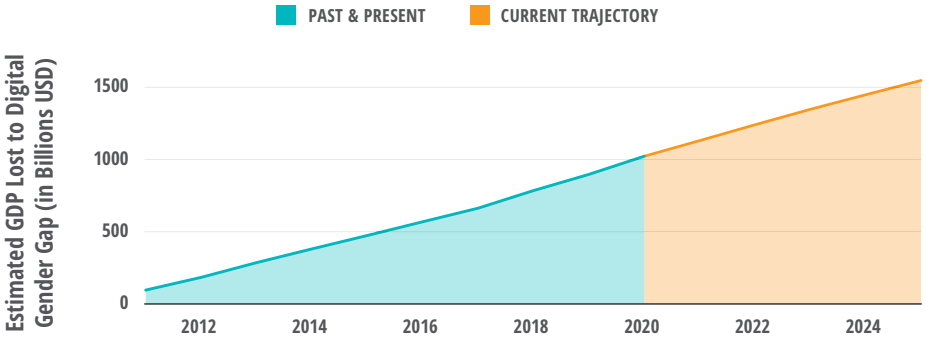
For much of the past decade of the internet's growth, men have been coming online in greater numbers than women across the 32 low and lower-middle income countries included within our research. At the same time, broadband policy has been underwhelming in setting targets and enacting policies to close the digital gender gap.

Closing the digital gender gap offers a $524 billion increase in economic activity over the next five years.

As the Covid-19 pandemic has had a devastating toll on low and lower-middle income countries (LLMICs) and as their economies have contracted, the need for new, robust sources of economic productivity has rarely been greater. At the same time, the pandemic and subsequent lockdowns throughout the world have shown how internet access is an essential lifeline for millions and enabled economic activity in helping suppliers reach new markets, enabling consumers to purchase essentials in the context of the pandemic, and facilitating digital payments. Since the pandemic has pushed more of the world online, the economic returns associated with connectivity have likely risen. We estimate that closing the gender gap offers billions in economic activity, but further analysis of the economic impact of Covid-19 on the digital world will offer a full picture of the consequences of not being connected during and after the pandemic.

A4AI estimates that if countries are able to break with the past and significantly close the gender gap in internet connectivity in the next few years, LLMICs will be able to generate over half a trillion USD in additional gross domestic product (GDP) between 2021 and 2025. Conversely, **if little changes during this time, the total loss of GDP between 2011 and 2025 among LLMICs due to the gender gap will surpass $1.5 trillion USD.**

Figure D. Cumulative costs of exclusion in lost GDP, 2011–2025



Source: *Alliance for Affordable Internet, 2021*

In the next few years, the gender gap will narrow, but it will remain — unless we act.

A4AI estimates that, in the next five years, the number of women connected to the internet in LLMICs will rise from just over a third of all women to nearly a half. This model predicts that the rate at which women who connect to the internet for the first time will be greater than that of men. In part, this is because, as a smaller share of women are connected today, the possibility for greater internet penetration among them increases while for men lowers. During this period, A4AI estimates women will connect to the internet at a growth rate of 7.16%, compared to men who will connect at a rate of 5.5%. Based on these estimates in 2025, 46.8 million women will gain an internet connection, compared to 45.7 million men.

According to the estimates, the digital gender gap in these countries will shrink from 30.4% to 20.6% by 2025. This will mean that the GDP lost to the gender gap will also be less in 2025 than what it is today. Despite this, by 2025 the cost of exclusion will remain high, at an estimated $99 billion USD.

The UN Broadband Commission for Sustainable Development has set various targets regarding broadband infrastructure, access, and use. **Based on these estimates, it is clear that LLMICs will not reach gender equality in broadband-internet user penetration and will consequently fail to reach the Commission's Targets 3 and 7.**

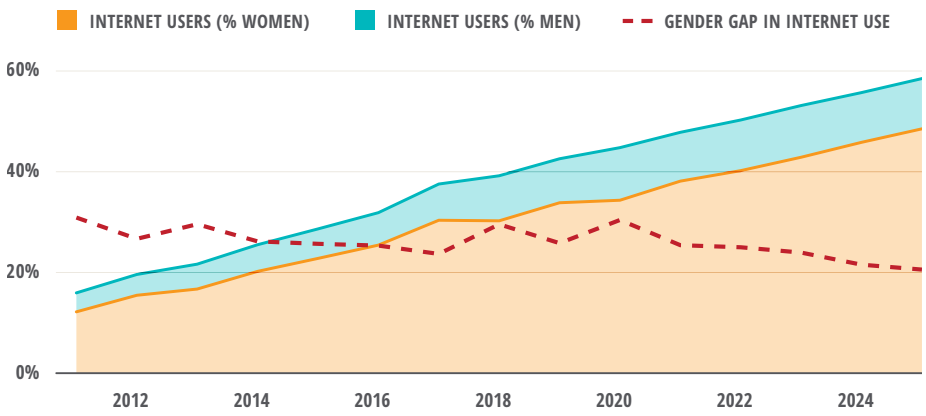
Gender Equality Targets from the UN Broadband Commission

3 By 2025, countries should reach various levels of internet penetration based on development classification, each with gender equality.

7 By 2025, all other targets — including affordability, skills, and use — shall be met with gender equality between men and women.

Source: *UN Broadband Commission, 2018*

Figure E. Current forecast of percentage internet users, 32 model countries, by gender and gender gap, 2011–2025



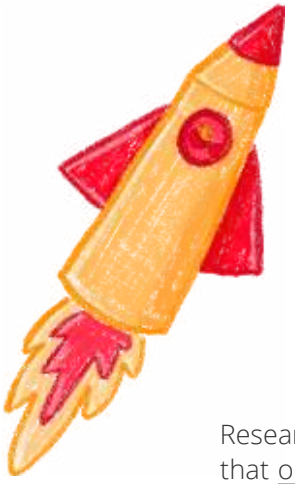
Source: *Alliance for Affordable Internet, 2021*

The cost of exclusion is not just economic.

A4AI's estimates regarding the cost of exclusion are based exclusively on the gender gap in internet use. However, as mentioned above, the digital gender gap comprises many dimensions — financial, technological, educational, and social. Closing the digital divide of connected and unconnected in use will not do away with the entirety of this gender gap. A4AI has not estimated what the economic gains would be if every dimension of the gender gap in internet use was closed, including in meaningful connectivity. However, in all likelihood, this number would be higher than the estimates here.

This stresses the urgency of, along with closing the gender gap in internet use, closing the gender gap in meaningful connectivity. Often, women who connect to the internet only benefit from a very limited connection. In many instances, women are only able to connect infrequently or are limited by a slow connection with minimal bandwidth. Where this is the case, users will not be able to benefit from data-intensive online activities (e.g., video calling, online education, and telemedicine) and will unlikely be able to reap all the economic benefits the internet can offer.

Everyone should have the same opportunity to access a high-speed internet connection and be able to use it regularly, without a prohibitively limited bandwidth, and through an appropriate device. Research conducted by A4AI in Indonesia, Ghana, and Colombia shows that the gap in meaningful connectivity is larger than the gap in internet use. Even countries that have closed the gap in internet use, suffer from a significant gender gap in meaningful connectivity. In addition to helping women simply connect for the first time, governments should also work to eliminate the barriers preventing women from having a truly meaningful internet connection. Women that only benefit from a marginal connection are also unlikely to reach their full potential — economic or personal.



Women, when given access to the internet, achieve **extraordinary things**

Research from S&P Global in 2021 estimates that only around a third of ICT professionals around the world are women, with even fewer occupying senior or management roles — and identifies the ICT sector as one of the worst for gender parity. A 2019 report from the EQUALS Coalition summarises the depth of the problem in the gender disparities in ICT skills, educational degrees, and professions around the world. This is not a sector built by or for women: and yet, examples of resilience emerge.

Navigating without instruments: limits of data availability

The lack of data disaggregated by gender, especially in LLMICs, limits policy-making processes. For a country to set targets, and allocate the resources and investments required to close the gender gap, accurate and up to date data is critical. Unfortunately, this sort of data is rarely available for LLMICs.

Today, the main available sources for ICT data disaggregated by gender with a broad country coverage are the ITU, the Inclusive Internet Index, the Digital Gender Gaps project, and GSMA. Unfortunately, these data sets offer limited historical coverage of LLMICs. In 2019, out of the 82 LLMICs in the world only 10 had ITU indicators on internet use disaggregated by gender. A lack of household surveys or other instruments regularly collecting gender-disaggregated data in ICT is a worrisome and persistent problem.

Moreover, few countries and organizations have committed to dedicate additional resources to collect data disaggregated by gender, especially in LLMICs. If countries are to close the gender gap, they should allocate more financial resources to collecting data that could inform policy making.

Figure F. ITU data availability disaggregated by gender in 82 LLMICs, 2010 - 2019

Despite the barriers that exist, women are increasingly using the internet to navigate a place for themselves in the digital economy. In interviews and focus groups commissioned by A4AI-Web Foundation in 2021, women used the internet to further their economic prospects across a wide range of sectors, across different geographies and cultural backgrounds.

In India, one person started with a single plot of land to develop her own floriculture business with national reach by expanding her potential customer base beyond her immediate community. In Côte d'Ivoire, a restauranteur saved her business and moved to online orders during the Covid-19 pandemic. A duo worked in two cities in Bangladesh — a full seven hours' drive away from each other — to run a grocery and spice shop. In Nigeria, a fashion designer finds inspiration and customers online. These are just samples of what is happening, which is itself just a sample of what is possible with an inclusive digital economy.

In particular, the digital economy has reduced upfront capital costs and opened up the potential for new markets. For Idjatou Diallo, a restauranteur in Côte d'Ivoire, she was able to set up her business without a physical store, using the internet for sales that she commissioned from her home. For Swati Lodh Kundu, a career coach in India, the internet helped her extend her reach to find clients in other countries and continents and in turn increase her income.

However, these advances are not without concerns. Across different countries, women spoke about the fear of balancing a career, personal health, and family life — and the social expectations of that balance. In particular, the freelancing approach to many online opportunities comes with greater insecurity for a woman's income, healthcare, and employment rights than may otherwise be available to her. Many of these battles are not new, but the economic relationships and responsibilities are, as platforms take a new role in the marketplace.

Security and safety remain urgent problems for women participating in the online economy. Across continents, economic class, and skill level, women experience harassment and other forms of online gender-based violence. Women operating online businesses are targeted by male customers to answer personal questions, while women considering online shopping for the first time worry about scams and losing out their money in a world they cannot trust yet.

As an entrepreneur:

"Recently there was this customer who texted me and wanted to know product details. Turns out, he started texting me almost every day and instead of talking about the product, he started asking me personal questions. This was quite disturbing for me, yet I tried my best to be polite and focused more on talking about the products since he was my customer. This happened a couple of times."

— Most. Humayera Kabir Oshie, Bangladesh

As a consumer:

"Often, I want to try [online shopping], but I'm a bit afraid. And after all, there are so many scams."

— Anonymous, suburban Côte d'Ivoire

While currently, many of these stories are exceptions rather than expected, an inclusive digital economy uses the foundations of equal access to the internet to enable people to achieve their potential.

The best innovations of an inclusive digital economy may not be societal transformations but simply better ways of living and working for everyone. Overall, and beyond the roles of content creators and entrepreneurs, women look to technology to make everyday life easier. In multiple countries, women spoke of desires for technology to improve the speed and convenience of everyday activities. The hopes for the digital economy were accessing healthcare via the internet rather than making an arduous trip to a hospital, online shopping, and making administrative tasks more efficient.

The failure to close the gap has enormous costs — not just for the people left behind, but for the entire world in lost opportunities. It is time for governments to close the digital gender gap and build the right foundations for a digital economy that is inclusive and resilient in the face of a post-Covid economic recovery.

Governments urgently need to use public policy to close the digital gender gap

Adopted in 2016 by attendees of the inaugural Africa Summit for Women and Girls in Technology, the REACT framework still offers strong guiding principles for closing the digital gender gap. As the name implies, it pulls together five pillars for policy action: **R**ights, **E**ducation, **A**ccess, **C**ontent, and **T**argets.

Importantly, the framework emphasises that a broadband strategy for an inclusive digital economy cannot simply be about the infrastructure that grants access to the internet. It must come with guarantees for the rights of women and girls; skills and training for all; relevant, local content; and clear policy targets to create accountability in the policy process.

The underwhelming reaction from policymakers to the digital gender gap has created an economic shortfall estimated to be around one hundred billion USD each year. The gender gap is more stark — and the problem more urgent — in certain parts of the world. However, the digital gender gap is not an individualistic concern. It has consequences for us all.

Governments in 32 LLMICs have already lost out an estimated $1 trillion USD in gross domestic product over the past decade because of the digital gender gap. Without action, this number will grow to $1.5 trillion USD by 2025. Equitable access to the internet is an economic and moral priority.

Women already achieve incredible things in the digital economy. However, their experiences as content creators and entrepreneurs are more an exception than part of everyday life. Those who have been early leaders in their fields have been left vulnerable to scams and abuse. Millions have been left behind without sufficient support to access the internet, know how it works, or realise their full potential in using it. **If governments want to see a digital economy as a core engine to a post-Covid recovery, they must invest in gender-equitable foundations to include everyone.**

Pathways exist to move the policy debate forward and to close the digital gender gap. The REACT framework — engrossed by the attendees of the inaugural Africa Summit for Women & Girls in Technology — offers a set of guiding principles for policy action on this issue. **Policy change designed by women and for women must occur to close the digital gender gap — or we will all suffer the costs of exclusion.**

Policy strategies for an inclusive digital economy

RIGHTS

Protect and enhance everyone's rights online.

- Challenge gender norms that would curb a woman's or a girl's right to own a device, use the internet, and express herself.
- Adopt adequate data protection laws that ensure users' privacy is respected.
- Update consumer protection laws to build confidence in the online marketplace.

EDUCATION

Use education to equip everyone – especially women – with the skills they need to access and use the web.

- Close the educational gap and support the schooling of all children with free primary and secondary education.
- Include digital skills within the curriculum to introduce new technologies.
- Attract and retain women as teachers and professors in STEM fields, especially computer science.

ACCESS

Deliver affordable — or free — access to an open web.

- Reduce the cost of connectivity through policy strategies such as the A4AI Good Practices.
- Adopt, regularly review, and update the National Broadband Plan and the Universal Access Strategy/ Policy, including gender as part of its mandate.
- Include gender and inclusivity as an evaluation criterion in public access projects and the operation of the Universal Service & Access Fund.

CONTENT

Ensure relevant and empowering content for women is available and used.

- Support the creation of locally-relevant content, including through institutions such as the Universal Service & Access Fund.
- Prioritise the development of content in local languages and audiovisual content that reduces the need for literacy to participate in the digital economy.
- Provide fair and free information to women and girls on topics important to them, including sexual and reproductive health, legal rights, and digital financial services.

TARGETS

Set and measure concrete gender-equity targets.

- Set clear targets, including for indicators on meaningful connectivity, with gender-disaggregation within policies.
- Regularly collect gender-disaggregated data through standard statistical practices to track progress and monitor any other emerging gender gaps.
- Make targets and data publicly available for other stakeholders to engage and create accountability.

Appendix 1: Costs of Exclusion Model Methodology

Research design

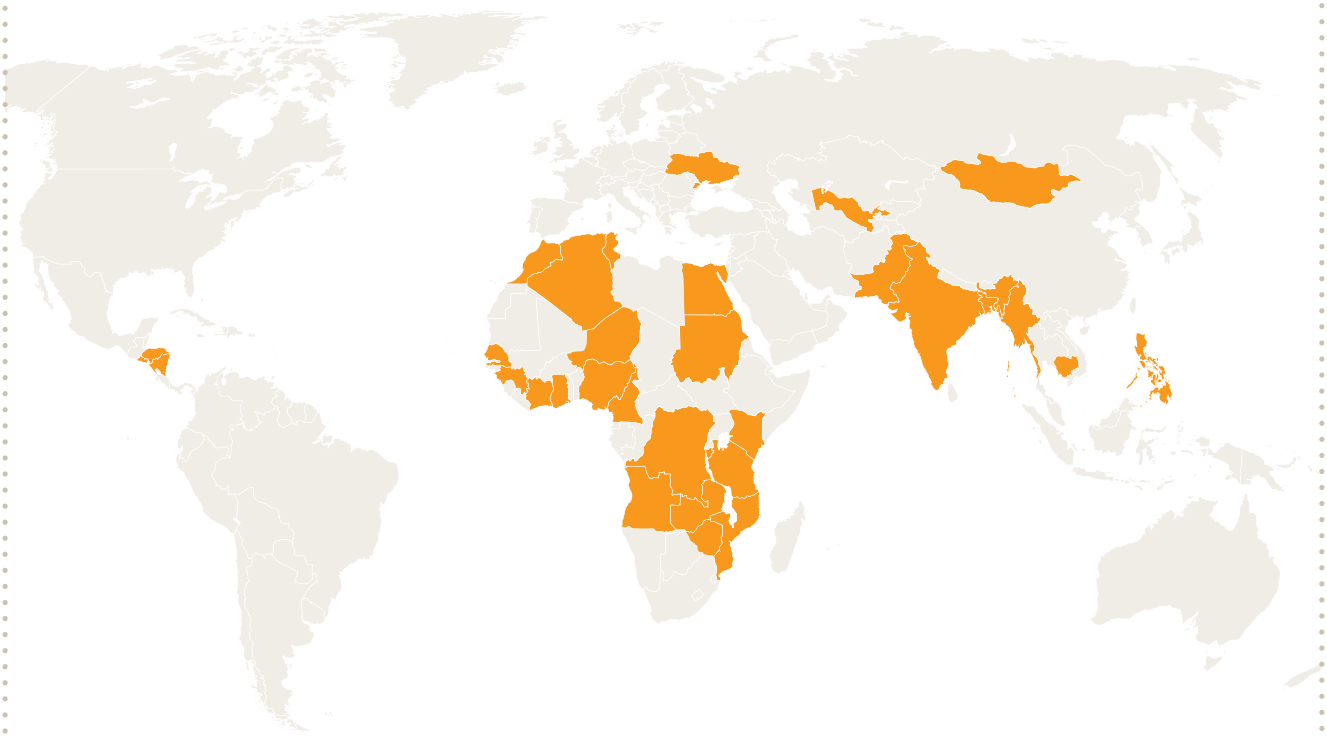
In our analysis, we used panel data (also referred to as time-series–cross-sectional data) to (1) estimate the share of women and men connected to the internet; (2) calculate the gender gap in internet connectivity; and (3) estimate the cost of the gap today and in the next five years.

A number of organizations collect data on internet use disaggregated by gender. Examples include the University of Oxford in collaboration with the Qatar Computing Research Institute, GSMA, ITU, the Economist Intelligence Unit, and Equals, among others. Despite the collection efforts carried out by these organizations, time-series-cross sectional data for most LLMICs is either scarce or nonexistent. Where data has been collected by more than one source, commonly there are large discrepancies between the sources.

Our research design required data produced by credible and reliable organisations, with a good historical coverage in terms of time periods as well as countries, with indicators disaggregated by gender. Initially, we anticipated using Digital Gender Gaps data, however, we encounter some limitations with this data as it is not based on household surveys, which did not allow us to estimate the exact number of women and men connected to the internet, and had a limited coverage in terms of time-series, only covering from 2018-2021. In light of these limitations, A4AI selected only the most reliable and consistently collected data points included in the available sources and used this data as the basis of its analysis. We opted to only use data from ITU and the Inclusive Internet Index, even with its limitations, such as the limited availability of data points for LLMICs, these two sources offered the most complete data to base our estimations. We built a time-series-cross-sectional dataset using these two sources, several data points were missing, making it necessary to use an imputation method to fill the missing data points.

The first step of the methodology required assembling a dataset to perform the imputation, given the limited available data. We began this process by compiling a dataset that included the Gross Domestic Product (GDP), Human Development Index (HDI), the Unemployment Gender Ratio (female to male), the total share of internet users and the share of internet users disaggregated by gender. These variables were selected based on the work by Kashyap et al. (2020) and on correlation calculations performed by A4AI. Kashyap et al. (2020) uses the online population of Facebook and Google to monitor the gender gaps around the world, as part of this research they explore the correlations between the gender gaps and several offline variables. This work gave us substantial guidance on which offline variables to include on the dataset to help the model produce the best estimations of the missing values. Using this data and multiple imputation, we created a new dataset for 32 LLMICs consisting of 2 variables – the share of female and male internet users. The data was imputed using an expectation-maximization with bootstrapping (EMB) technique. For this process to have been successful, the variables included in the underlying dataset need to be normally distributed and the missing data needed to be missing at random. We were able to confirm that both these requirements were met.

Figure G. Countries included within the Costs of Exclusion model



Algeria	Angola	Bangladesh	Burundi
Cambodia	Cameroon	Côte d'Ivoire	DR Congo
Egypt	El Salvador	Ghana	Guinea
Honduras	India	Kenya	Mongolia
Morocco	Mozambique	Myanmar	Nicaragua
Niger	Nigeria	Pakistan	Philippines
Senegal	Sudan	Tanzania	Tunisia
Ukraine	Uzbekistan	Zambia	Zimbabwe

Once our dataset was fully assembled, we estimated the share of women and men connected to the internet in each of the 32 countries for every year between 2000 and 2020. Based on these estimates, we then calculated a yearly average of both of these variables. We then forecasted the share of male and women internet users for every year between 2021 and 2025. Based on these forecasted values we calculated the gaps.

We converted the gender gaps (total woman broadband penetration) for each year into the corresponding percentage increase for the total population (women and men) in broadband penetration.

To calculate the gender gap in internet access, we followed the World Wide Web Foundation's women-centred method.

To forecast the share of women and men that will be connected to the internet by 2025, we used an Autoregressive Integrated Moving Average (ARIMA) model. For the model selection and fitting, we took a number of steps to ensure the specific model we used would be appropriate for our purposes. As part of this process, we check for stationarity and plotted Autocorrelation Function (ACF) and Partial Autocorrelation Function (PACF) graphs. We then calculated both the Akaike's Information Criterion (AIC) and Schwartz Bayesian Information Criterion (BIC) and preselected the models with the lowest values of each. Finally, we checked the residuals and successfully ensured there was no autocorrelation that could bias the results.

We used forecasts from the Economic Research Service of the U.S. Department of Agriculture to find estimates for the GDP of the 32 countries in our sample from 2021 – 2025.

To calculate the total broadband penetration, we relied on two models developed by ITU that calculated the impact of an increase in mobile and fixed broadband penetration on GDP. We run an Autoregressive Integrated Moving Average (ARIMA) model, using data from ITU, to calculate the portion of fixed broadband penetration of LLMICs in the next 5 years. Knowing the total broadband penetration figures, we used the fixed broadband penetration estimates to calculate the mobile broadband penetration.

With all the elements in place (total GDP per year, total increase in fixed broadband penetration, total increase in mobile broadband penetration, ITU's fixed impact coefficient, and ITU's mobile impact coefficient), we calculated the total cost of exclusion.

Figure H. Data sources of Costs of Exclusion model.

DATA POINT	SOURCE
Percentage of females using the internet	International Telecommunication Union & Inclusive Internet Index
Percentage of males using the internet	International Telecommunication Union & Inclusive Internet Index
GDP, World Bank Indicators	World Bank Indicators
Human Development Index	United Nations
Unemployment Ratio	World Bank Indicators
Total percentage of the population using the internet	International Telecommunication Union
GDP projections, by country	US Department of Agriculture
Fixed broadband connections	International Telecommunication Union

Limitations

To build the most complete dataset possible, A4AI combined data from the ITU and the Inclusive Internet Index on the shares of internet users broken down by gender. Although A4AI carefully reviewed the data, there is no method that can fully guarantee the data between the two sources is fully comparable. This could create inaccuracies in the final results.

In the absence of a gender-specific econometric model that could quantify the economic loss of women that are not connected to the internet. A4AI estimated that the contribution to the economy of both genders is 50-50. A model that could estimate the impact of connecting women would be a better fit and a more precise estimation of the cost of excluding women from the digital economy.

We estimated the share of women and men connected to the internet in each of the 32 countries for every year between 2000 and 2020. Based on these estimates, we then calculated a yearly average of both of these variables. We then forecasted the share of male and women internet users for every year between 2021 and 2025. Based on these forecasted values we calculated the gaps. A possible different approach would have been to have instead forecasted the gaps for every country by running the model separately for each country and then used these forecasted numbers to find the average gap into the future. However, due to limited data availability in several LLMICs, the present design was chosen to reduce the potential uncertainty in a per-country approach and to improve accuracy.

A global coalition working to make broadband affordable for all

A4AI ALLIANCE FOR AFFORDABLE INTERNET

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