THE GENDER DIGITAL DIVIDE: EVIDENCE FROM DEMOGRAPHIC AND HEALTH SURVEYS

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The Gender Digital Divide:
Evidence from Demographic and Health Surveys

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PREFACE

The Demographic and Health Surveys (DHS) Program is one of the principal sources of international data on fertility, family planning, maternal and child health, nutrition, mortality, environmental health, HIV/AIDS, malaria, and provision of health services.

One of the objectives of The DHS Program is to analyze DHS data and provide findings that will be useful to policymakers and program managers in low- and middle-income countries. DHS Analytical Studies serve this objective by providing in-depth research on a wide range of topics, typically including several countries and applying multivariate statistical tools and models. These reports are also intended to illustrate research methods and applications of DHS data that may build the capacity of other researchers.

The topics in this series are selected by The DHS Program in consultation with the U.S. Agency for International Development.

It is hoped that the DHS Analytical Studies will be useful to researchers, policymakers, and survey specialists, particularly those engaged in work in low- and middle-income countries.

Sunita Kishor
Director, The DHS Program

ABSTRACT

Women may have less access to digital resources and use them less often than men; further, certain groups of women may be particularly disadvantaged in their use of digital technologies. The contours of the gender digital divide may have implications for mobile health interventions that rely on mobile phones or the internet to reach their intended audiences.

This study describes the gender digital divide in multiple Demographic and Health Surveys (DHS) across several information and communication technology (ICT) indicators: weekly internet use, mobile phone ownership, and use of mobile phones for financial transactions among women and men. We also examine equity in digital access across different subgroups, including residence, age, and wealth, for women and men separately.

We find that men's and women's weekly internet use lags behind both their ownership of mobile phones and weekly use of traditional media (for example, radio or television). We further find clear gender gaps— favoring men—in mobile phone ownership, their use for financial transactions, and weekly internet use, with the biggest gap seen in mobile phone ownership. Across all countries, a greater percentage of women than men lack access to both mobile phones and internet, whereas a greater proportion of men have both technologies.

We also find residence, age, and wealth gaps related to these technologies. All three ICT measures are higher among urban residents and wealthier groups. Young people age 15–19—women and men—are most disadvantaged with regard to mobile phone ownership, but those age 40–49 are most disadvantaged in regard to internet use.

These patterns by residence, age, and wealth are largely the same for women and men. However, the residence and wealth gaps in mobile phone ownership tend to be wider for women than for men while age gaps in mobile phone ownership and all other gaps for internet use are wider for men.

Our results suggest that implementers of mobile health interventions should account for existing inequalities related to access and use of digital technologies, innovate ways to reach their intended target population, and guard against unintentionally worsening existing health inequalities.

Key words: digital divide, mobile phone, mobile banking, internet, gender inequality

1   BACKGROUND

1.1   Gender Digital Divide

Information and communication technologies (ICT), such as the internet and mobile phones, have become an integral part of daily life, impacting political, social, academic, health, and economic domains. The "digital divide" refers to the gap between populations in ICT use, with some populations facing greater difficulties in accessing or using these technologies than others. Existing research on the digital divide examines the gap across different populations (countries, organizations, individuals, etc.), characteristics (age, gender, wealth, geography, education, etc.), type of technology (phone, internet, computer, etc.), and, less frequently, exposure (access, frequency of use, type of use). Some research seeks to describe or quantify the digital divide across these lines, while other studies measure the impact of the digital divide on various outcomes of interest.

The gender digital divide has emerged as a significant gender-related issue due to concerns that women are not able to experience the advantages that technology provides to the same extent as men. Individuals' access to employment, markets, income, education, and health services has become increasingly reliant on ICTs. The onset of the COVID pandemic brought the role of ICTs as critical health infrastructure into sharp relief. Narrowing the gender digital divide has important implications for individuals, the economy, population health, and society.

Several studies suggest that a gender digital divide does exist (Acilar and Sæbø 2021; ITU 2020) and may limit women's employment, health, educational, and economic opportunities (Acilar and Sæbø 2021; Hilbert 2011). Additionally, there is some evidence that the gender digital divide also intersects with regional, generational, and residential inequalities to further restrict access to digital technologies for some disadvantaged subpopulations (Borgonovi et al. 2018). Causes of the gender digital divide include affordability of these technologies, lack of education and technological literacy, and sociocultural norms. Each of these dimensions impacts women's ability to access and use ICTs to the same extent as men (Borgonovi et al. 2018).

Evidence suggests that the digital gender divide increases with the cost of ownership of technologies. Affordability not only impacts the ability to use ICTs among those who are not yet users, but also poses a barrier to expanding the frequency or sophistication of use (Borgonovi et al. 2018). Illiteracy and lack of education is another potential contributor to the gender digital divide. Approximately 19% of adult women in low- and middle-income countries (LMICs) are illiterate compared to 11% of men (World Bank 2021).

Illiterate women tend to use online platforms that are easier to access and use or are more familiar to them, further hindering their ability to access online services to the same extent as men (Borgonovi et al. 2018). A 2012 study by Intel and Dalberg revealed that over half of women with no formal education were either unfamiliar or uncomfortable with technology (Intel Corporation and Dalberg Global Development Advisors 2012).

Safety is also a barrier to using the internet and digital devices among women in LMICs (Borgonovi et al. 2018). Women using the internet may be exposed to risks such as cyberstalking, harassment, and sexual

trafficking. This risk of violence may lead to familial or societal opposition to women's and girls' use of the internet or ownership of a mobile phone (Borgonovi et al. 2018).

(Acilar and Sæbø 2021; Borgonovi et al. 2018; Hilbert 2011; ITU 2020)Interventions deploying mobile phone apps have demonstrated real promise to improve health and other outcomes (Rotondi et al. 2020), and mobile health apps and internet tools have proliferated (WHO 2019). However, the effectiveness of these interventions may be stymied if their intended audience lacks equitable access to the digital resources on which they rely.

1.2   Rationale and Study Objective

The objective of this study is to document and describe the gender digital divide in multiple Demographic and Health Surveys (DHS) across several ICT indicators. We compare internet use, mobile phone ownership, and use for financial transactions among women and men. We also contextualize these digital technologies by comparing frequency of internet use with that of traditional media, namely radio and television. We examine the overall gender digital divide, but also equity in digital access across different subgroups, including residence, age, and wealth, for women and men separately.

2   METHODS

2.1   Data

This study uses data from 23 DHS that:

▪ Were conducted since 2015 with data publicly released by March 2022
▪ Administered both women's and men's questionnaires
▪ Contain complete data on the digital variables of interest
▪ Included the domestic violence module[1]

These surveys and their sample sizes are listed in Table 1. DHS surveys are nationally representative, household-based surveys and collect data from the household, all de facto women age 15–49, and frequently all de facto men age 15–49 or older. Sample sizes for the men's surveys are frequently smaller than those for the women's surveys because they are often administered in a sub-sample of one-half or one-third of selected households, whereas the woman's survey is administered in all selected households. All data are made publicly available in standard recode data files in a variety of formats from https://www.dhsprogram.com/Data/.

Table 1   Study surveys and sample sizes

Survey	Number of women age 15–49 (weighted)[a]	Number of men age 15–49 (weighted)[b]
Armenia 2015–16	6,115	2,755
Benin 2017–18	15,928	7,595
Burundi 2016–17	17,269	7,552
Cameroon 2018–19	14,677	6,978
Ethiopia 2016	15,683	12,688
Gambia 2019–20	11,865	4,636
Guinea 2018	10,874	4,117
Haiti 2016–17	15,513	9,795
Jordan 2017–18	14,689	6,429
Liberia 2019–20	8,065	4,249
Malawi 2015–16	24,562	7,478
Maldives 2016–17	7,699	4,342
Mali 2018	10,519	4,618
Nepal 2016	12,862	4,063
Nigeria 2018	41,821	13,311
Pakistan 2017–18	12,362	3,145
Rwanda 2019–20	14,634	6,513
Sierra Leone 2019	15,574	7,197
Tanzania 2015–16	13,266	3,514
Timor-Leste 2016	12,607	4,622
Uganda 2016	18,506	5,336
Zambia 2018–19	13,683	12,132
Zimbabwe 2015	9,955	8,396

[a] The Haiti 2016–17 survey sampled women age 15–64.
[b] The following surveys sampled men age 15–54: Malawi 2015–16, Uganda 2016, and Zimbabwe 2015.
The following surveys sampled men age 15–59: Burundi 2016–17, Ethiopia 2016, Gambia 2019–20, Guinea 2018, Jordan 2017–18, Mali 2018, Nigeria 2018, Rwanda 2019–20, Sierra Leone 2019, Tanzania 2015–16, Timor–Leste 2016, and Zambia 2018.
The following surveys sampled men age 15–64: Benin 2017–18, Cameroon 2018, and Haiti 2016–17.

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[1] The availability of data from the Domestic Violence module is a prerequisite for related analyses presented in AS86, *Impact of Digital Access and Use on Health Outcomes*, though it was not a requirement for the analyses presented in this study.

2.2   Measures

This study focuses on several measures contained in the core woman's and man's questionnaires related to access to and use of digital resources as well as traditional media.

Mobile phone ownership is assessed through a single question asked of all respondents, Q116: "Do you own a mobile telephone? (yes/no)." As such, it is coded as a dichotomous variable in the standard recode files.

Use of mobile phone for financial transactions. All respondents who own a mobile phone are subsequently asked Q117, "Do you use your mobile phone for any financial transactions? (yes/no)." This question is asked without regard to whether the respondent has an account at a bank or other financial institution. In a recoding of the standard variable, all cases who report using their mobile for financial transactions are coded as 1, and all cases who either do not own a mobile phone or report they do not use it for financial transactions are coded as 0.

Use of the internet is captured through a series of questions, as follows:

Q119.   Have you ever used the internet? (yes/no)

Q120.   In the last 12 months, have you used the internet? (yes/no)

Q121.   During the last one month, how often did you use the internet: almost every day, at least once a week, less than once a week, or not at all?

We formulate a dichotomous variable coded as 1 if the respondent used the internet at least once a week or almost every day in the last month and 0 if otherwise. This construction mirrors available variables for frequency of listening to the radio and watching television.

Radio use. Respondents are asked how frequently they listen to the radio with Q114, "Do you listen to the radio at least once a week, less than once a week, or not at all?" We dichotomize the corresponding variable in the standard recode files into two categories, coded 1 if the respondent listens to the radio at least once a week, and 0 if they listen to the radio less than once a week or not at all.

Television use. Data on the frequency of watching television is collected in parallel fashion as frequency of listening to the radio. Q115 asks, "Do you watch television at least once a week, less than once a week, or not at all?" Again, we code 1 if the respondent watches television at least once a week, and combine less than once a week or not at all responses into code 0.

Residence is coded as 1 if the respondent resides in an urban area and 2 in a rural area, as designated by the survey's sampling frame (typically, the most recent census).

Age. Respondents are categorized into groups based on completed age at time of interview as follows: age 15–19, 20–29, 30–39, and 40–49.

Household wealth quintile. Relative household wealth is calculated as a numerical index based on a range of assets owned in the household, housing materials, and source of water and toilet facilities (Rutstein and Johnson 2004). The same index value is assigned to every resident of the household. This index is grouped in quintiles and labeled poorest, poorer, middle, richer, and richest.

2.3   Limitations

The measures that we use in this study have some limitations. First, we cannot tell from our mobile phone ownership measure whether the mobile phone is a smartphone or not. Many mobile health interventions are app-based or otherwise require smartphone capabilities, while a few rely on SMS/text services to relay information.

The measure on using mobile phones for financial transactions can serve, in some capacity, as a proxy measure as to the intensity and sophistication with which people use their mobile phones. However, it too does not indicate with certainty that the phone has smartphone capabilities.

Further, this measure may be conflated with either wealth or other measures of gender equity, such as control over financial resources, particularly in settings where conducting financial transactions via mobile phones requires a bank account.

Finally, the use of mobile phones for financial transactions is predicated on the presence of a well-developed infrastructure for mobile banking and payment. This infrastructure may not be present in all study countries and low levels of using mobile phones for such purposes may reflect this lack of infrastructure. Nonetheless, the gender gap in the use of mobile phones is revealing even in these settings.

2.4   Analytical Strategy

In this study, we describe levels of and differentials between men's and women's access to and use of various ICTs. We primarily examine use (and frequency of use) of the internet, ownership of mobile phone, and use of mobile phone for financial transactions. To put newer, digital technologies in context, we compare frequency of using the internet with frequency of using traditional media, namely listening to the radio and watching television.

Our focus is on the gender gap in the use of digital ICT. However, we also describe patterns by rural/urban residence, age, and wealth for both women and men. We do so because we expect use of these digital resources to vary by these factors as well. These factors are also potentially important "equity stratifiers"—strata along which unfair differences in digital access or health outcomes between groups may emerge or become entrenched (WHO 2013). We rely heavily on a graphical presentation of results, using Equiplots (International Center for Equity in Health 2014) to describe gender gaps and educational, age, and wealth gaps in digital resources.

2.5   How to Read and Interpret Equiplots

Equiplots, such as the example provided in Figure 1, are an effective plot for equity data because they show simultaneously the levels of an indicator for each group and the gap between each group (International Center for Equity in Health 2014). Equiplots coincide with equity visualization best practices (WHO 2015). These guidelines suggest that, when examining two subgroups, it is advisable to present the absolute or relative difference between groups.

Figure 1   Heuristic model of an Equiplot
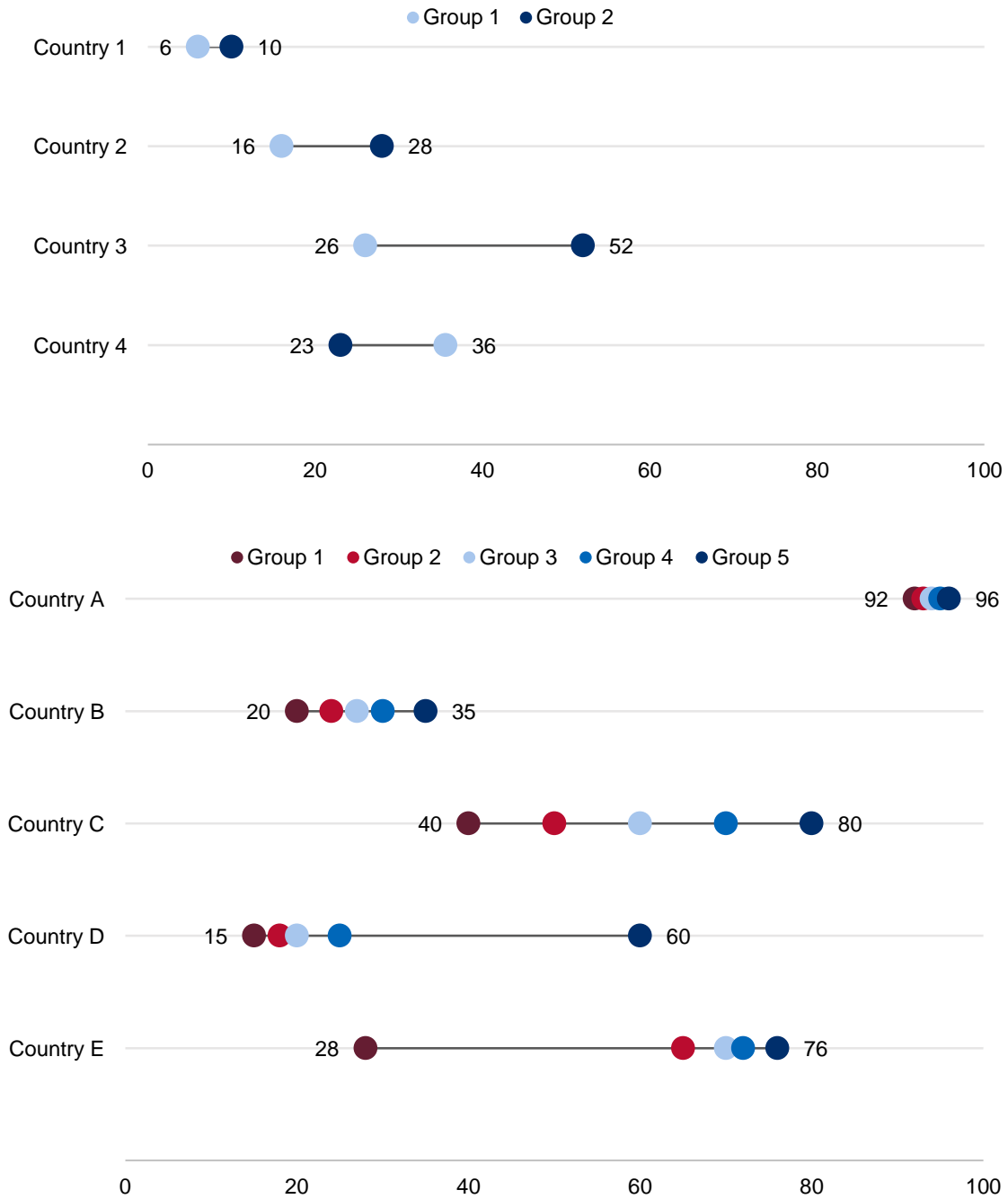
In the upper panel of Figure 1, we can see that there is higher coverage of the indicator for Group 2 (in dark blue) compared to Group 1 (in light blue) in Countries 1, 2, and 3. The absolute difference is greatest in Country 3, where there is a 26 percentage point difference between Groups 1 and 2. In Country 4, the pattern is reversed and the indicator is higher in Group 1 (36%) compared with Group 2 (23%). We use these types of Equiplots when presenting digital access and use indicators by equity stratifiers with two categories, namely by gender and rural/urban residence.

We show Equiplots that resemble the lower panel of Figure 1 when presenting digital access and use indicators by equity stratifiers with multiple categories, as in age and wealth. Both age and wealth are ranked, or interval, variables. That is, they have an explicit order or progression to their categories. In this example, the indicator is lowest in Group 1 (dark red) and highest in Group 5 (dark blue) across all example countries. If these groups represented wealth quintiles, we could interpret this pattern as the indicator increases with wealth in these four countries. In Equiplots showing age and wealth inequalities, we label the prevalence only for the lowest and highest categories.

The World Health Organization classifies several different patterns of inequality that can be observed in Equiplots of ranked groups (WHO 2013).

Complete Coverage describes a pattern in which the indicator is consistently high across all categories, with no or small differences between groups. Country A is an example of complete coverage in Figure 1.

A *Queuing Pattern* is depicted by Country B and Country C. In these two examples, the indicator increases steadily with each category of the group variable (for example, age or wealth). The differences between groups are larger, indicating greater inequality, in Country C.

Mass Deprivation is exemplified in Country D. In this pattern, only the highest ranked group has adequately high values of the indicator, whereas the other groups are similarly disadvantaged in that indicator.

Marginal Exclusion is a pattern of inequality, demonstrated by Country E, in which most groups have adequate coverage with the exception of one, marginalized and disadvantaged group.

3 RESULTS

3.1 Media Use

The emergence of digital technologies like the internet and smart phones has the potential to rival traditional media like radio and television as sources of information and entertainment. This section provides an overview of media exposure across multiple formats ranging from radio, television, and internet use and sets the context for analysis of any gender divide in digital ICTs. The following figures show that there is much variation in use across media formats, and within each format, across countries.

There is a vast range in the percentage of women and men who listen to the radio at least once per week (Figure 2). Radio use is lowest in Pakistan (4% among women and 8% among men) and highest in Haiti (63% among women and 79% among men) and Rwanda (62% among women and 80% among men). In all surveys except Maldives, listening to the radio at least once a week is higher among men than it is among women—and in some cases, substantially higher. The gender gap is only 4 percentage points in Pakistan and 8–9 points in Armenia, Mali, and Nepal. However, it is more than 20 points in Burundi and Zambia and 29 points in Gambia.

- Internet use lags behind use of traditional media like listening to the radio or watching television.
- There is a clear gender gap—favoring men—in both radio use and internet use.
- The gender gap in television watching has more variability, both in terms of whether there is a gender gap and whether it favors men or women.

Figure 2   Frequency of listening to radio, % reporting "at least once per week"
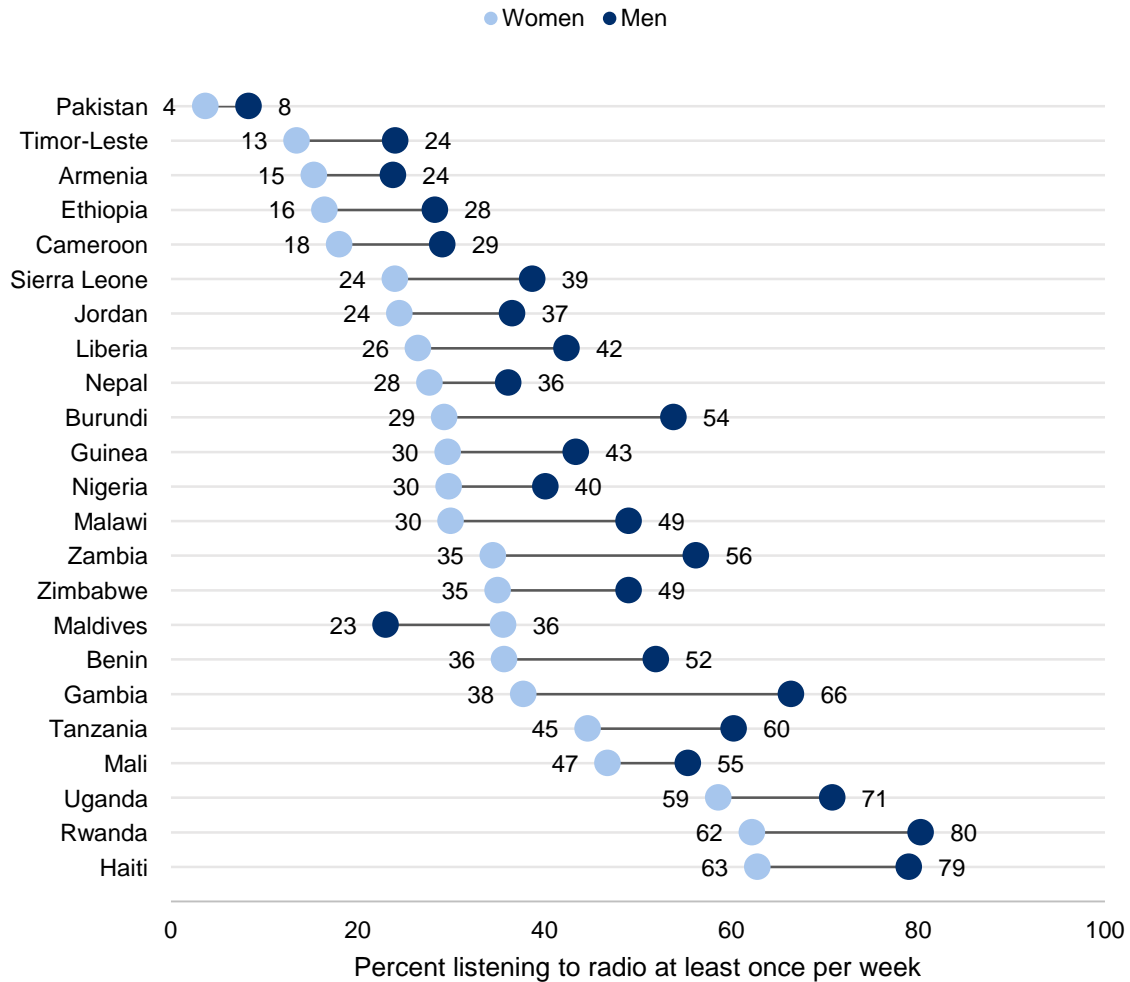
The range across surveys is even greater for the percentage watching television at least once per week (Figure 3). Television watching is lowest in Burundi (5% among women and 9% among men) and highest in Armenia (94% among women and 88% among men), with most surveys having less than 50% of men or women watching at least once per week.

However, the gender gaps for television are generally much smaller than for listening to the radio. The gender gap is virtually nonexistent in Cameroon, Nepal, Nigeria, Liberia, Sierra Leone, Timor-Leste, and Zimbabwe, whereas there is approximately a 13-percentage point difference in Guinea (26% among women and 39% among men) and Gambia (56% among women and 68% among men). With the exception of Jordan, Maldives and Armenia, in countries where a gender gap is seen, a higher percentage of men than women watch television at least once per week.

Figure 3   Frequency of watching television, % reporting "at least once per week"

● Women ● Men

Country	Women	Men
Burundi	5	9
Malawi	11	18
Sierra Leone	15	17
Ethiopia	16	21
Liberia	17	17
Rwanda	20	29
Benin	21	26
Uganda	21	30
Guinea	26	39
Tanzania	27	39
Zimbabwe	32	32
Haiti	32	40
Nigeria	33	34
Timor-Leste	38	40
Zambia	38	43
Mali	43	51
Cameroon	45	46
Nepal	50	51
Pakistan	51	55
Gambia	56	68
Jordan	74	68
Maldives	86	78
Armenia	94	89

Percent watching television at least once per week

Overall, weekly internet use across countries is substantially lower than either listening to the radio or watching television (Figure 4). Only in Armenia, Gambia, Jordan, and Maldives do a majority of women and men use the internet at least once per week. Elsewhere, fewer than one in four women use the internet this frequently. Frequent internet use is lowest in Ethiopia (3% among women and 8% among men).

Additionally, men's internet use universally exceeds women's use. Although gender gaps are small in Armenia (where frequent internet use is high) and in Ethiopia (where it is low), on average, there is a 10-percentage point gap in women's and men's use of the internet at least once per week. The gender gap is greatest in Nepal where women's internet use (20%) is half that of men's internet use (40%).

Figure 4   Frequency of internet use, % reporting "at least once per week"

● Men   ● Women

Country	Women	Men
Ethiopia	3	8
Burundi	4	10
Malawi	5	13
Benin	5	17
Tanzania	6	14
Uganda	7	17
Zambia	10	20
Rwanda	10	18
Pakistan	10	25
Sierra Leone	12	21
Guinea	13	25
Mali	13	29
Nigeria	13	27
Liberia	17	25
Timor-Leste	19	25
Nepal	20	40
Haiti	21	30
Zimbabwe	21	32
Cameroon	22	30
Gambia	54	64
Jordan	74	80
Maldives	75	82
Armenia	77	79

Percent using the internet at least once per week
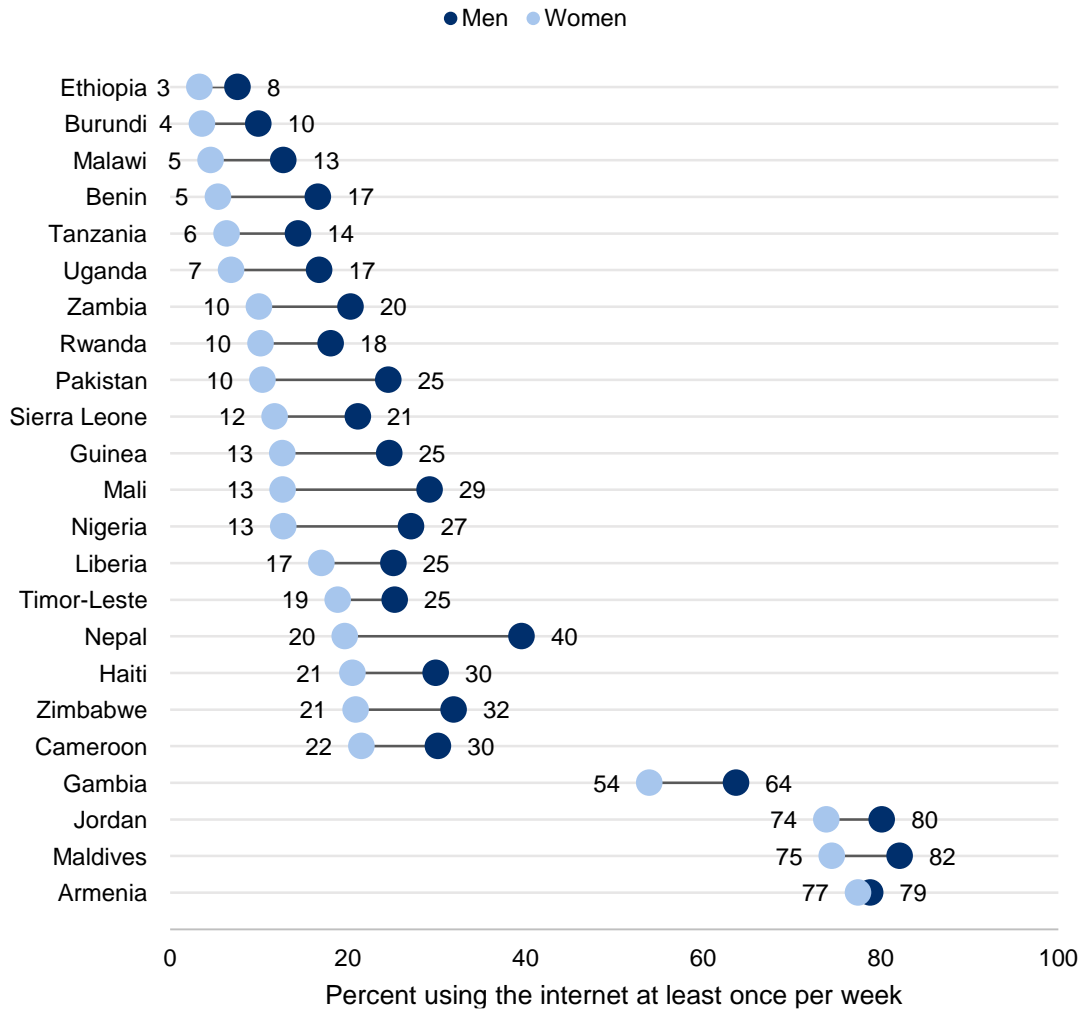
3.2 Mobile Phone Ownership

As shown in Figure 5, mobile phone ownership is common in most countries, and gender gaps in mobile phone ownership are typically larger than those in internet use. Except for Jordan, it is more common for men to own a mobile phone than for women. The gender gap is small in Armenia, Jordan, and Maldives, the three countries in which mobile ownership is nearly universal (>90%), and Zimbabwe, where 70–74% of adults own mobile phones.

Elsewhere, the difference between women and men in mobile phone ownership is highly variable and does not appear to be related to the overall prevalence of mobile ownership. The gap is greatest in Pakistan, with just 39% of women owning a mobile phone compared to 93% of men. Women's ownership of mobile phones is lowest in Burundi (24%), Ethiopia (27%), and Malawi (33%) where gender gaps range between 19–27 percentage points.

- Mobile phone ownership is more common than weekly internet use, and gender gaps—favoring men—tend to be larger.
- Mobile phone ownership is higher among urban residents and wealthier groups and lower among those age 15-19—for both women and men.
- The residence and wealth gaps tend to be wider for women while the age gaps tend to be wider for men.

Figure 5   Mobile phone ownership, by sex

● Women ● Men

Country	Women	Men
Burundi	24	46
Ethiopia	27	54
Malawi	33	52
Pakistan	39	93
Sierra Leone	43	64
Uganda	46	66
Liberia	47	61
Rwanda	48	61
Benin	51	80
Tanzania	52	69
Zambia	53	66
Nigeria	55	81
Haiti	55	67
Mali	58	87
Cameroon	63	77
Timor-Leste	66	76
Guinea	69	86
Zimbabwe	69	74
Nepal	73	89
Gambia	76	86
Jordan	92	88
Maldives	95	97
Armenia	97	99

Percent owning a mobile phone
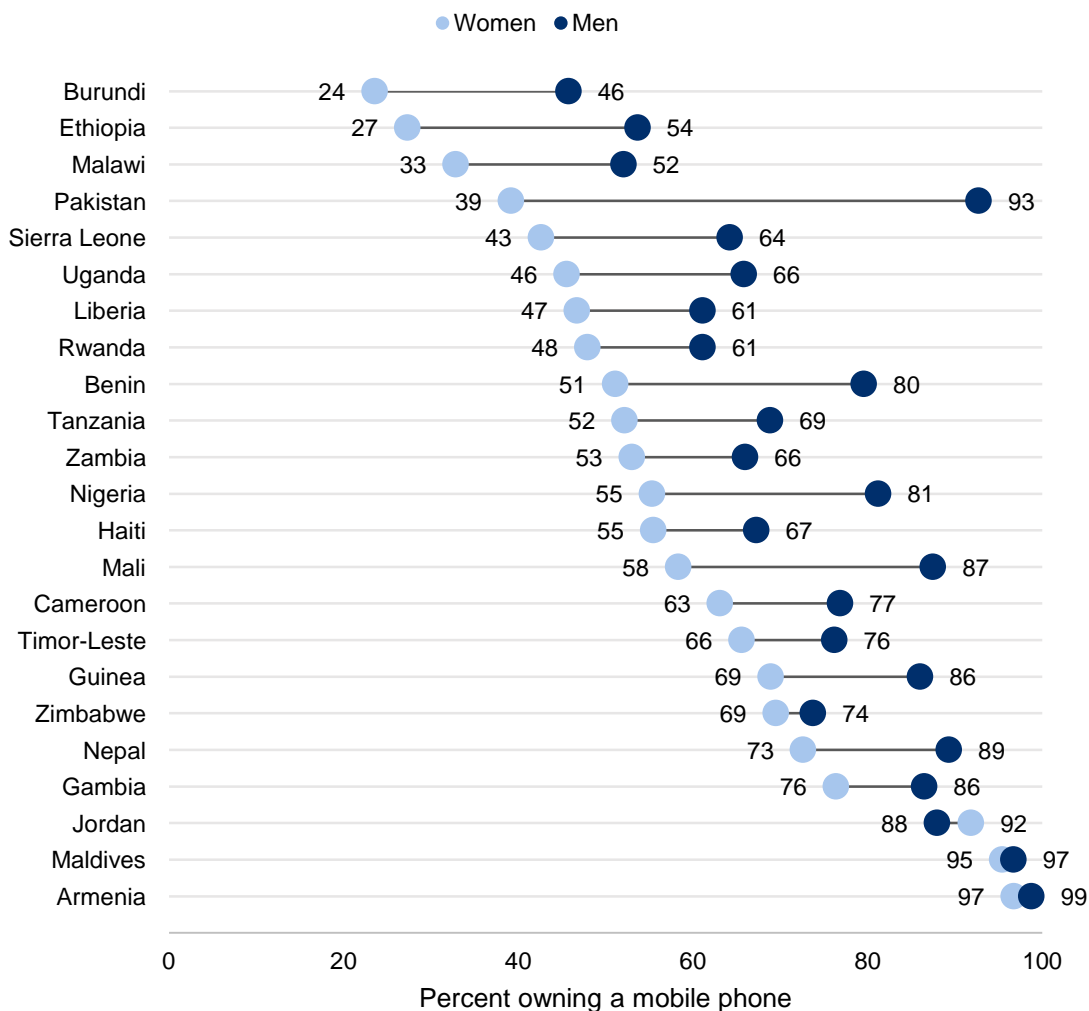
Residential, age, and wealth gaps in mobile phone ownership

Mobile phone ownership is higher in urban areas than in rural areas, and this pattern holds for both women and men (Figure 6). The urban-rural gap tends to be wider for women than it is for men, especially in Benin, Ethiopia, Gambia, Guinea, Mali, Nepal, Nigeria, Pakistan, Tanzania, Uganda, and Zambia. For example, in Mali, the urban-rural gap is 33 percentage points among women compared to just 8 points among men. In five of these countries—Benin, Gambia, Mali, Nepal, and Pakistan—mobile phone ownership among urban women lags behind that of rural men.

Figure 6   **Mobile phone ownership among women and men, by residence**

Women

Men

Percent owning a mobile phone

● Rural   ● Urban
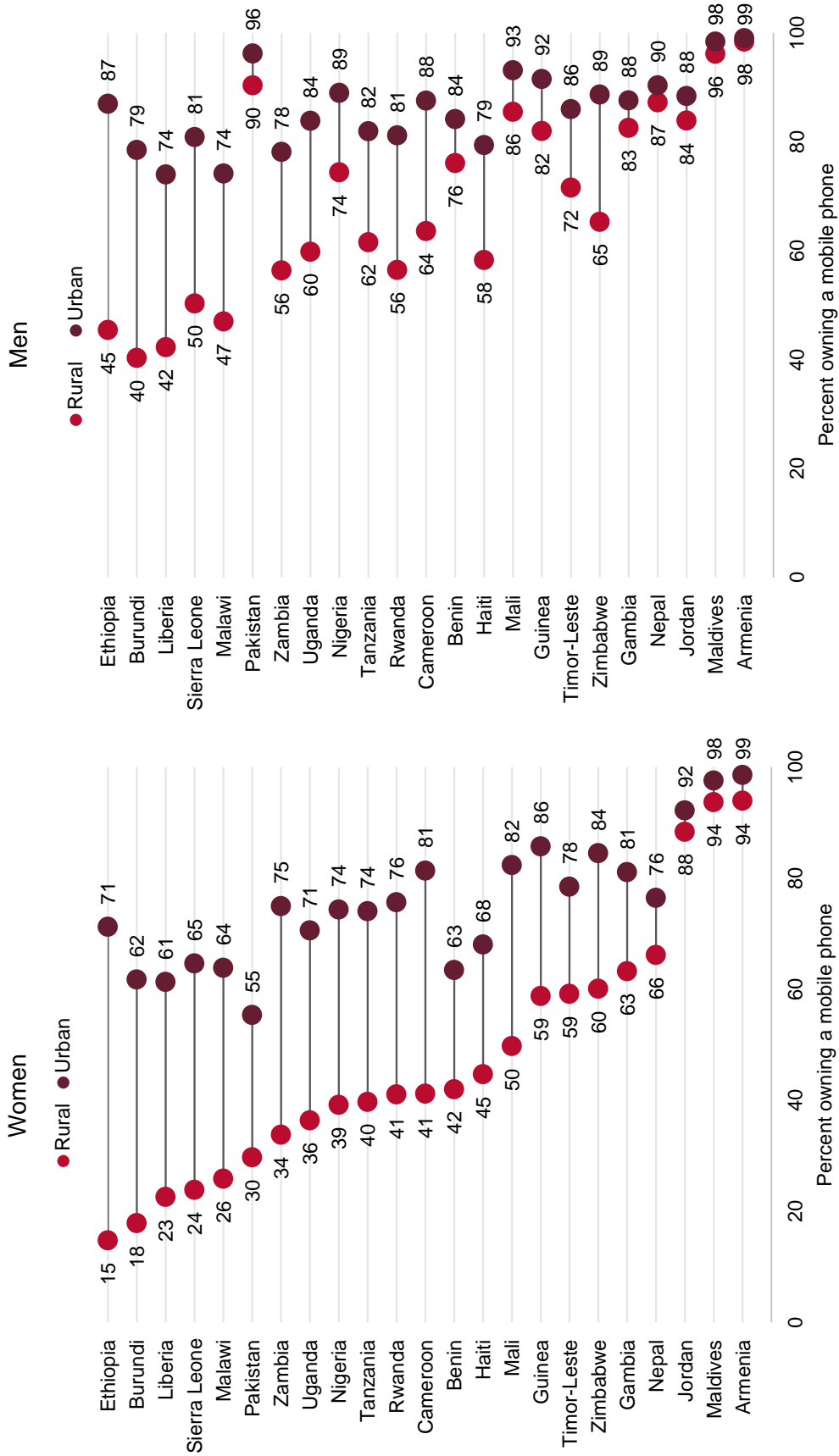
Mobile phone ownership also varies with age group in most surveys (Figure 7). Where age gaps are evident, typically the same age pattern for women and men emerges. However, gaps between age groups tend to be larger for men (who have overall greater ownership) than for women. In most countries, mobile phone ownership is lowest among those age 15–19, and in many countries mobile phone ownership is lower in the oldest age group compared to those age 20–29 or age 30–39. The most common pattern, of which Benin is an example, is for mobile phone ownership to be similarly high among all three older age groups and to lag far lower among those age 15–19. This is a pattern of marginal exclusion for the youngest age category (WHO 2013).

Figure 7   Mobile phone ownership among women and men, by age

Women

Men

Percent owning a mobile phone

17
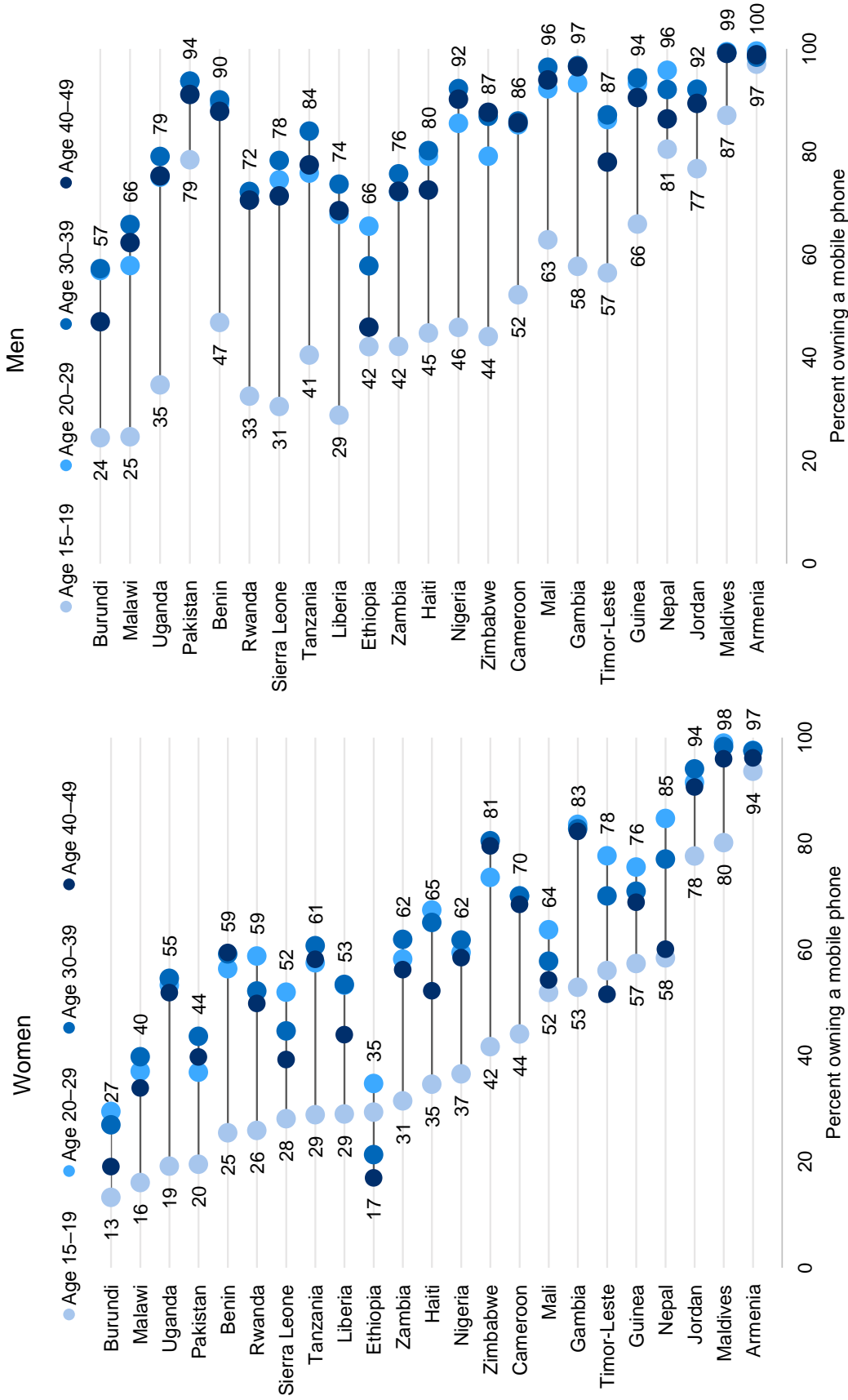
There are virtually no differences in mobile phone ownership across age groups for either women or men in Armenia. In Ethiopia, both women and men present a queuing pattern, but the sequence of the age groups differs.[2] Men in Mali and Sierra Leone demonstrate a marginal exclusion pattern whereas women in these countries demonstrate a queuing pattern. In Nepal and Timor-Leste, men also demonstrate the archetypal marginal exclusion pattern, but among women the marginal exclusion pattern leaves behind two age groups (15–19 and 40–49). As shown in Figure 8, mobile phone ownership increases with household wealth for both women and men in almost all countries—a classic depiction of a queuing pattern. Wealth gaps tend to be wider for women than men, though this is not universally the case. An exception to this pattern are women and men in Maldives and men in Armenia who show near-universal mobile phone ownership, regardless of wealth. Women—but not men—in Ethiopia show a mass deprivation pattern in which all but the richest women lack substantial mobile phone ownership. Men in Gambia and women in Jordan demonstrate patterns of marginal exclusion. Finally, men in Guinea are split such that those in the poorest three wealth quintiles have similar levels of mobile phone ownership that lag behind the richest two wealth quintiles.

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[2] A queuing pattern typically increases (or decreases) steadily with intervals on the stratifying variable (here, age) (WHO 2013). In the case of mobile phone ownership, regular gaps appear between all age groups, but the age groups are not in sequence from youngest to oldest.

Figure 8   Mobile phone ownership among women and men, by household wealth quintile
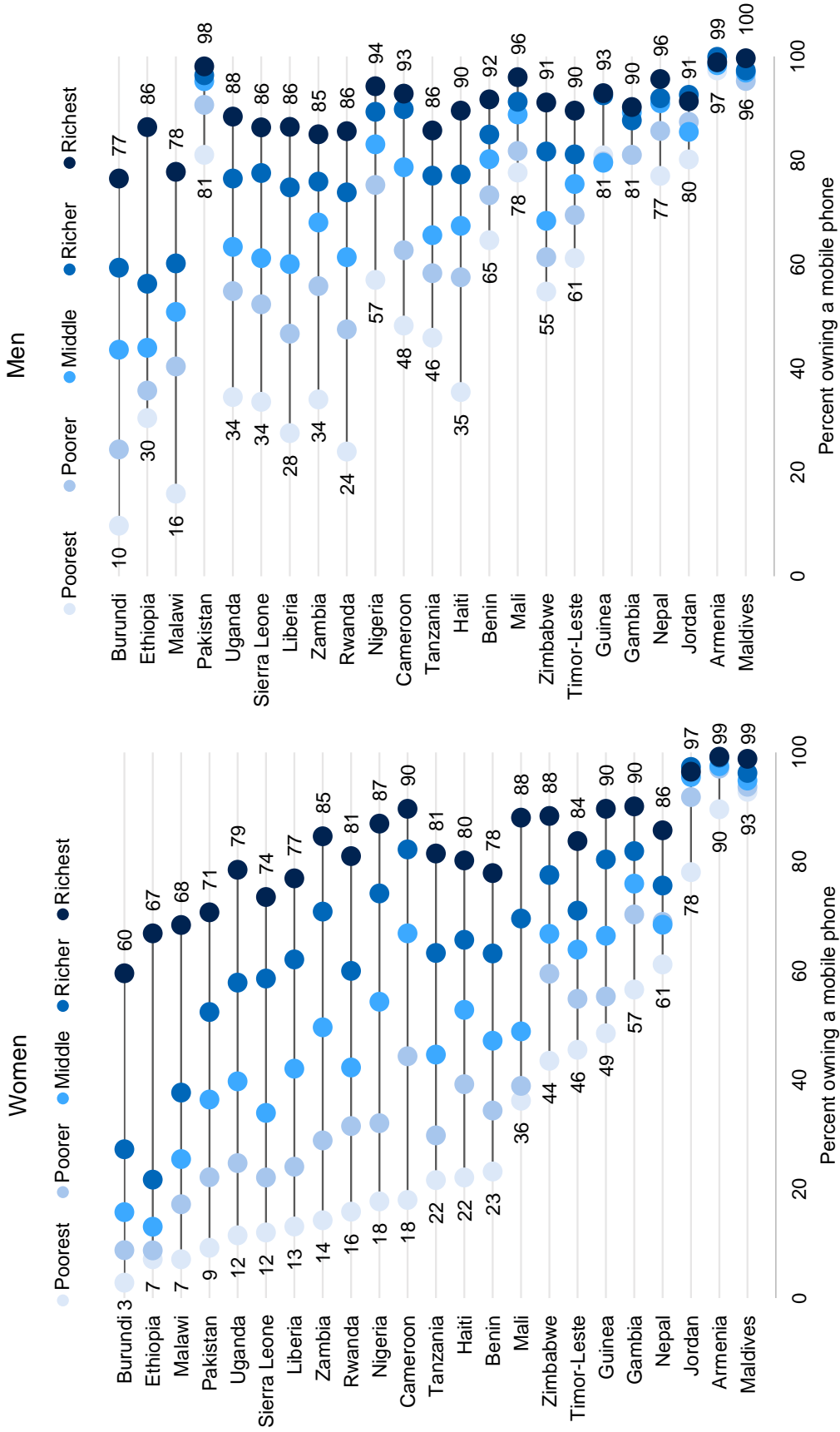
3.3   Use of Mobile Phone for Financial Transactions

Because using a mobile phone for financial transactions requires owning a mobile phone, the prevalence of this use, by definition, is less than phone ownership. Whereas sizable gender gaps in mobile phone ownership appear in the vast majority of surveys (Figure 4), the gender gaps in use of mobile phones for financial transactions are plentiful but not universal. They are sizable in about 14 of 26 surveys (Figure 9). Typically, men are more likely than women to use mobile phones for financial transactions. These gender gaps are somewhat smaller than those in ownership, and about as large as gender gaps in internet use, averaging about 9 percentage points. However, the gender gap (20 percentage points) is largest in Mali where 39% of men make financial transactions via mobile phone compared to 19% of women.

- Overall levels are lower and gender gaps are smaller for use of mobile phones for financial transactions compared with mobile phone ownership.
- Residence, age, and wealth gaps are similar for women and men, and tend to be slightly larger for men.

Figure 9   Use of mobile phone for financial transactions, by sex
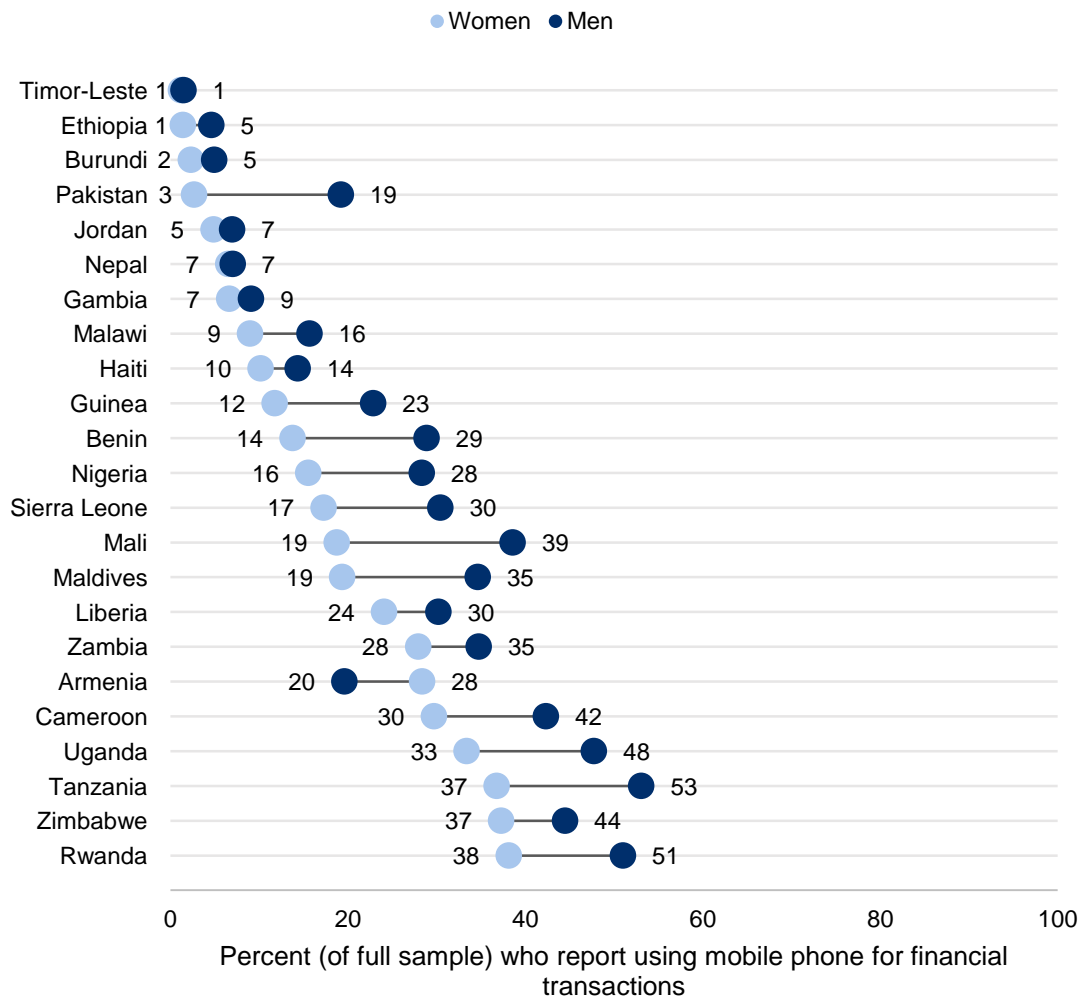
Only in Armenia do women use mobile phones for financial transactions more than men. There are no discernible differences in Nepal and Timor-Leste and differences are small in Burundi, Ethiopia, Gambia, Haiti, and Jordan, where making mobile financial transactions is uncommon for either sex.

Residential, age, and wealth gaps in use of mobile phone for financial transactions

There is a residence gap in the use of mobile phones for financial transactions for both women and men (Figure 10). Women and men in urban areas consistently use their phones for financial transactions more than those in rural areas. Furthermore, the urban-rural gap is of a similar size for both women and men. On average, use for financial transactions is about 18 percentage points higher for urban women and 20 points higher for urban men than their rural counterparts. However, this difference is largest for women in Rwanda (38 points) and for men in Zimbabwe (37 points).

Figure 10   Use of mobile phone for financial transactions among women and men, by residence

Women

● Rural ● Urban

Timor-Leste 0 · 3
Ethiopia 0 · 5
Burundi 1 · 9
Pakistan 2 · 5
Gambia 3 · 8
Jordan 3 · 5
Guinea 4 · 25
Nepal 4 · 8
Malawi 5 · 25
Nigeria 6 · 27
Benin 7 · 23
Sierra Leone 7 · 29
Haiti 8 · 13
Liberia 8 · 34
Cameroon 10 · 46
Mali 10 · 42
Zambia 11 · 47
Maldives 17 · 23
Armenia 22 · 33
Tanzania 23 · 60
Uganda 24 · 58
Zimbabwe 26 · 56
Rwanda 30 · 69

Percent (of full sample) who report using mobile phone for financial transactions

0   20   40   60   80   100

Men

● Rural ● Urban

Timor-Leste 1 · 2
Ethiopia 3 · 10
Burundi 3 · 17
Pakistan 14 · 28
Gambia 6 · 10
Jordan 7 · 7
Guinea 14 · 36
Nepal 3 · 9
Malawi 10 · 39
Nigeria 15 · 44
Benin 21 · 40
Sierra Leone 17 · 47
Haiti 10 · 20
Liberia 16 · 40
Cameroon 22 · 59
Mali 30 · 63
Zambia 21 · 53
Maldives 34 · 38
Armenia 15 · 23
Tanzania 42 · 72
Uganda 41 · 69
Zimbabwe 31 · 68
Rwanda 45 · 77

Percent (of full sample) who report using mobile phone for financial transactions

0   20   40   60   80   100

22

As with mobile phone ownership, the most common age pattern of use for financial transactions is one of marginal exclusion—for both women and men (Figure 11). Except for Armenian women, use of mobile phones for financial transactions is lowest among those age 15–19. Use of phones for financial transactions among those age 40–49, though not the highest, is usually closer to those age 20–29 or 30–39, typifying the marginal exclusion pattern. Among women in Cameroon and Liberia and men in Guinea, the rates among the oldest age group lie between those for the youngest age group and those age 20–29 or 30–39, presenting neither a queuing nor marginal exclusion pattern. There are few age gaps among women in Burundi, Ethiopia, Timor-Leste, and for women only, in Pakistan. Again, as with mobile phone ownership, gaps between age groups tend to be larger for men than for women.

Figure 11   Use of mobile phone for financial transactions among women and men, by age

Women

● Age 15–19   ● Age 20–29   ● Age 30–39   ● Age 40–49

Burundi	0 3
Timor-Leste	1 2
Pakistan	1 2
Jordan	1 5
Ethiopia	1 2
Gambia	2 8
Malawi	4 11
Nigeria	4 21
Haiti	5 16
Benin	5 17
Guinea	8 16
Nepal	3 9
Sierra Leone	9 23
Maldives	10 28
Liberia	10 30
Zambia	11 34
Zimbabwe	11 51
Mali	12 22
Uganda	13 40
Cameroon	13 38
Rwanda	18 50
Tanzania	20 43
Armenia	22 34

Percent (of full sample) who report using mobile phone for financial transactions

Men

● Age 15–19   ● Age 20–29   ● Age 30–39   ● Age 40–49

Burundi	0 8
Timor-Leste	1 3
Pakistan	7 21
Jordan	3 9
Ethiopia	2 5
Gambia	1 13
Malawi	4 22
Nigeria	5 37
Haiti	5 20
Benin	10 37
Guinea	11 31
Nepal	3 10
Sierra Leone	10 42
Maldives	11 48
Liberia	9 41
Zambia	13 44
Zimbabwe	13 62
Mali	15 48
Uganda	20 60
Cameroon	15 55
Rwanda	23 64
Tanzania	28 68
Armenia	8 24

Percent (of full sample) who report using mobile phone for financial transactions

24

While mobile phone ownership regularly shows a queuing pattern for wealth, there are more heterogenous patterns shown for use of phones for financial transactions (Figure 11). However, the wealth pattern is usually similar for women and for men. Queuing patterns are revealed for women and men in almost half of the countries—Cameroon, Gambia, Haiti, Liberia, Maldives, Nigeria, Rwanda, Sierra Leon, Tanzania, Uganda, Zambia, and Zimbabwe. Mass deprivation patterns are revealed for women and men in Burundi, Ethiopia, Guinea, Malawi, and Timor-Leste. Mali displays a pattern that is in between a queuing and mass deprivation pattern for both women and men.

The patterns differ for women and men in Armenia, Benin, Jordan, Nigeria, and Pakistan, where men present a queuing pattern while women present a mass deprivation pattern. In Nepal, the opposite is true, with men displaying mass deprivation, but women demonstrating a combination of a mass deprivation and a queuing pattern.

Figure 12   Use of mobile phone for financial transactions among women and men, by household wealth quintile
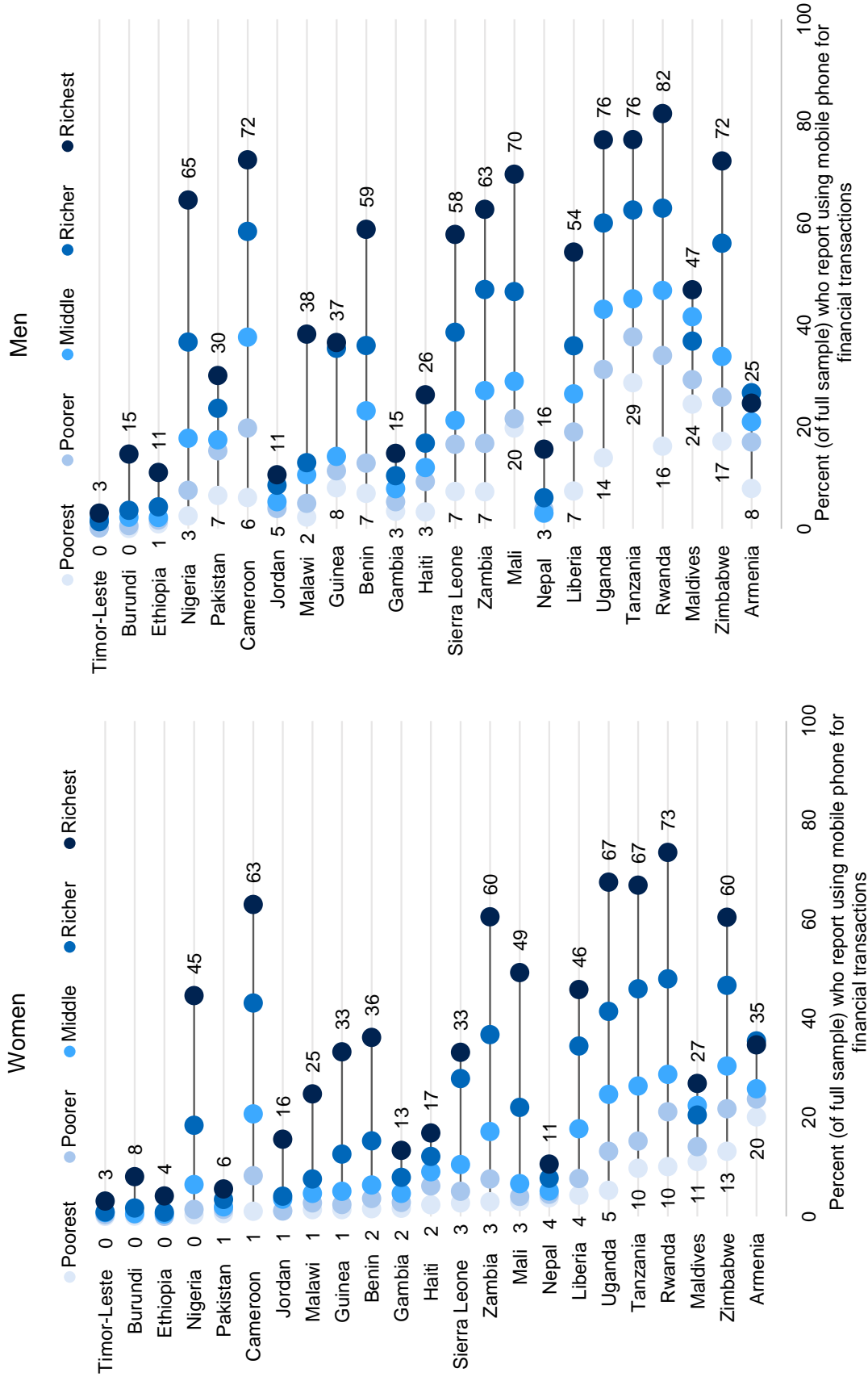
3.4   Internet Use

As shown earlier in Figure 4, the gender gap in using the internet at least once per week averages about 10 percentage points. This gender gap is smaller than the gap in mobile phone ownership. It is similar in magnitude, but more consistent than the gender gap in using mobile phones for financial transactions.

Residential, age, and wealth gaps in internet use

There is a residence gap in the frequent use of the internet for both women and men, which universally advantages urban residents (Figure 13). There is an average difference of 21 percentage points between urban and rural women. The residence gap for women is as small as 10 percentage points in Benin and as large as 35 percentage points in Zimbabwe. The residence gap tends to be wider on average for men (29 percentage points) but is more variable. Only 6 percentage points separate urban and rural men in their use of the internet in Jordan, but in Zimbabwe this gap is 48 percentage points.

- Residence, age, and wealth gaps in internet use show a generally similar pattern for women and men. These gaps are somewhat wider for men than women.

- Internet use is highest among urban residents, the middle age groups, and richer groups.

- Internet use is nearly non-existent among the poorest and poorer men and women in the vast majority of countries.

Figure 13   Internet use among women and men, by residence

Women

● Rural ● Urban

Country	Rural	Urban
Ethiopia	0	14
Burundi	1	23
Benin	1	11
Tanzania	2	15
Malawi	2	18
Sierra Leone	2	23
Zambia	2	19
Guinea	2	30
Uganda	3	18
Liberia	3	26
Cameroon	4	36
Nigeria	4	23
Rwanda	5	32
Pakistan	5	19
Mali	6	32
Zimbabwe	7	43
Timor-Leste	9	39
Nepal	9	26
Haiti	11	32
Gambia	33	61
Jordan	64	75
Armenia	65	86
Maldives	66	85

Percent (of full sample) who report using the internet at least once a week

Men

● Rural ● Urban

Country	Rural	Urban
Ethiopia	2	30
Burundi	6	36
Benin	9	27
Tanzania	6	30
Malawi	7	36
Sierra Leone	6	39
Zambia	8	36
Guinea	8	47
Uganda	9	39
Liberia	5	39
Cameroon	9	47
Nigeria	15	41
Rwanda	11	49
Pakistan	18	34
Mali	17	65
Zimbabwe	14	63
Timor-Leste	12	53
Nepal	26	47
Haiti	17	47
Gambia	46	69
Jordan	74	81
Armenia	71	85
Maldives	79	92

Percent (of full sample) who report using the internet at least once a week

28

For both women and men, frequent internet use declines with increasing age—a descending queuing pattern (Figure 14). Using the internet at least once per week is least common among women and men age 40–49 and most common among those age 15–19 or sometimes 20–29. This age pattern is different from the age pattern of mobile phone ownership and use for financial transactions, which was least common among those age 15–19.

The age gaps are generally larger for men than they are for women, for whom levels of internet use are overall lower. For example, the difference across age groups for women in Benin is one-fourth the difference for men (4 percentage points versus 16), and the age gap is 23 percentage points for Nepali women but 39 points for men. Maldives, which shows something akin to a marginal exclusion pattern, is an exception with a wider range across age groups for women (43 points) compared to men (30 points).

Figure 14   Internet use among women and men, by age

Women

● Age 15–19   ● Age 20–29   ● Age 30–39   ● Age40–49

Burundi	2	5
Malawi	2	7
Benin	3	7
Pakistan	5	13
Ethiopia	1	5
Uganda	2	11
Tanzania	4	9
Zambia	5	14
Rwanda	6	16
Sierra Leone	5	18
Nigeria	7	17
Liberia	9	24
Zimbabwe	13	27
Mali	5	16
Guinea	4	18
Cameroon	12	30
Haiti	8	32
Timor-Leste	5	28
Nepal	6	29
Gambia	37	65
Jordan	67	79
Maldives	45	88
Armenia	63	89

Percent (of full sample) using the internet at least once a week

Men

● Age 15–19   ● Age 20–29   ● Age 30–39   ● Age40–49

Burundi	5	16
Malawi	8	18
Benin	9	25
Pakistan	18	28
Ethiopia	3	12
Uganda	8	26
Tanzania	11	19
Zambia	15	29
Rwanda	12	30
Sierra Leone	11	34
Nigeria	20	37
Liberia	19	35
Zimbabwe	21	39
Mali	18	42
Guinea	14	41
Cameroon	22	43
Haiti	19	47
Timor-Leste	13	39
Nepal	17	56
Gambia	39	80
Jordan	74	89
Maldives	62	92
Armenia	64	87

Percent (of full sample) using the internet at least once a week
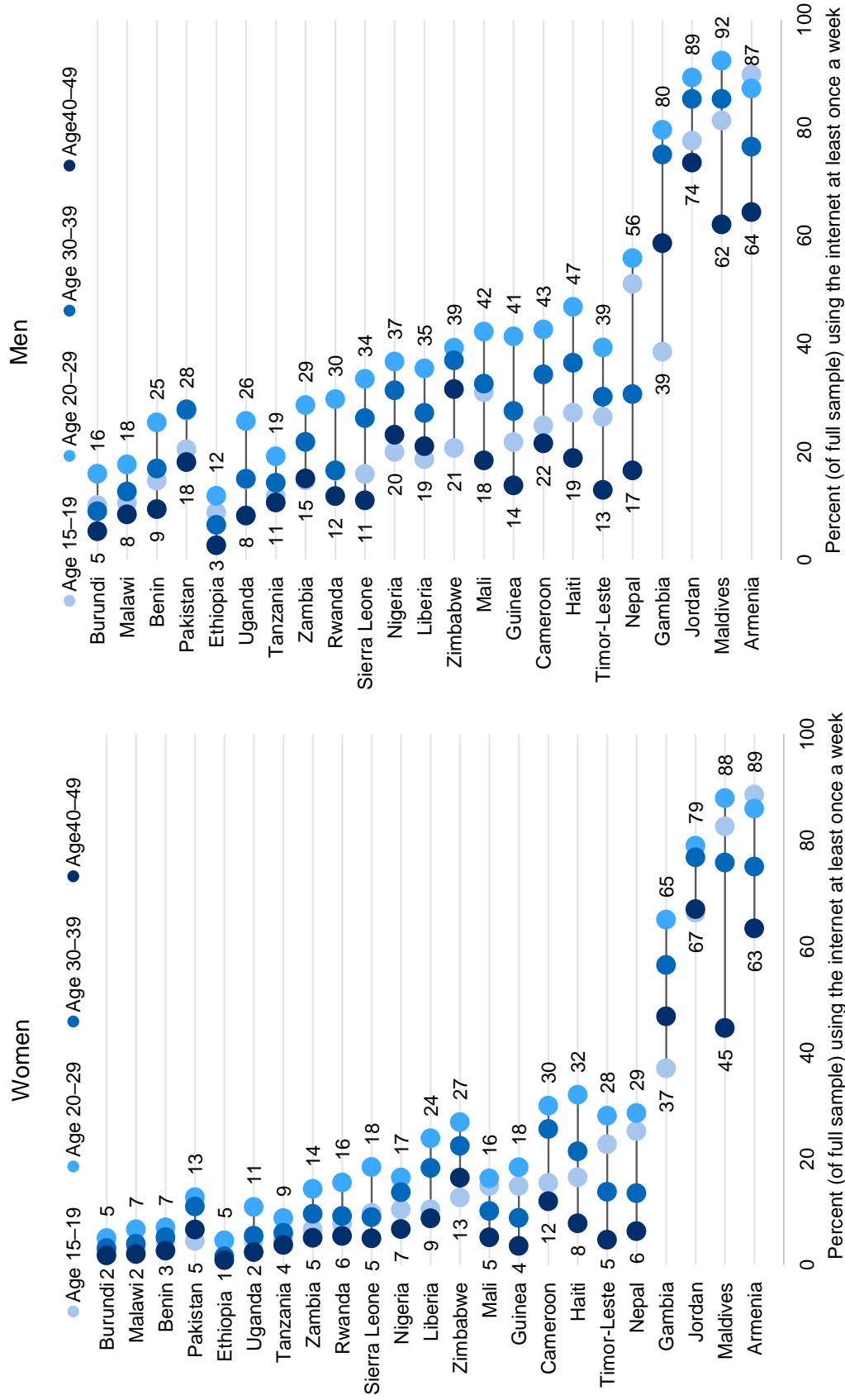
30

Figure 15 shows that internet use is most concentrated among the richest wealth quintile, for both women and men. The wealth gap typically follows a pattern that combines features of a mass deprivation and queuing pattern. Gambia presents a more prototypical queuing pattern while Tanzania and Malawi's wealth gap more resembles the prototypical mass deprivation pattern. Weekly internet use is nearly nonexistent among the poorest wealth quintiles in most countries.

Wealth gaps again tend to be larger for men than for women. Armenia, Jordan, and Maldives—three countries where overall and women's internet use is generally higher—are exceptions, with larger wealth gaps among women than men.

Figure 15   Internet use among women and men, by household wealth quintile
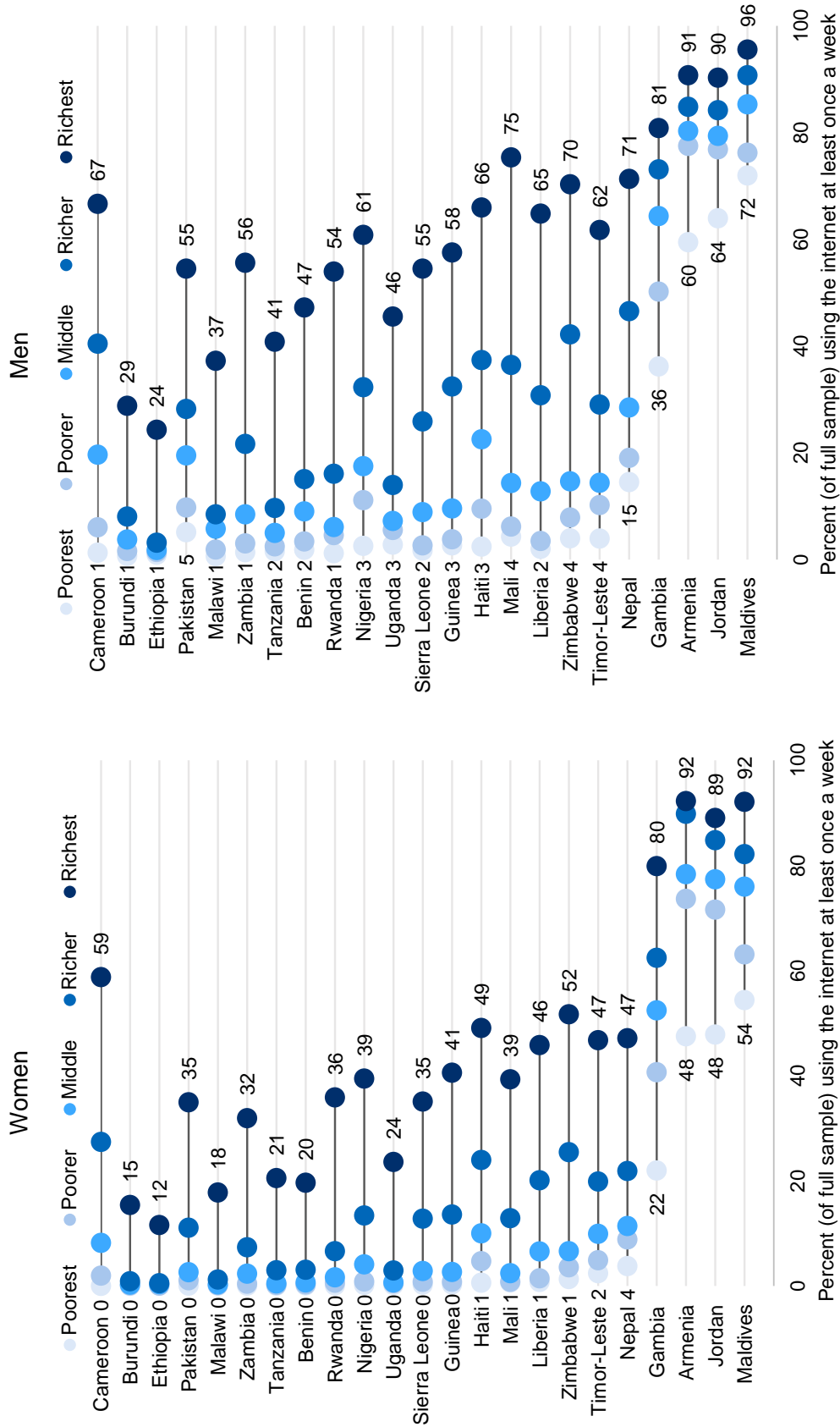
## 3.5 Combination of Mobile Phone Ownership and Internet Use

In 20 of the 23 study countries, substantial proportions of women lack both mobile phone ownership and internet use, with the three exceptions being Armenia, Gambia, and Jordan (Figure 16). In every country, a smaller proportion of men lack access to both of these technologies. Nonetheless, a substantial proportion of men also have neither mobile phones nor internet use in 18 countries.

Figure 16 also shows that it is rare for either women or men to use the internet at least once per week but not have a mobile phone. The proportion of women who only own a mobile phone but do not use the internet frequently ranges from about 20% in Armenia, Burundi, and Jordan to 56% in Guinea, with the average across these countries being 36%. Among men, the range is 12% (Jordan) to 68% (Pakistan), with an average of 44%.

- Across all countries, more women than men lack access to both mobile phones and internet.

- Conversely, more men both own a mobile phone and use the internet weekly than do women.

- Owning a mobile phone while not using the internet weekly is common, but the reverse is rare.

Conversely, both owning a mobile phone and using the internet at least once per week is more common among men than women in all study countries. On average, 31% of men have both technologies, ranging from 7% in Ethiopia to 81% in Maldives. In contrast, the average is 22% among women with a range of 3% in Ethiopia and Burundi to 77% in Armenia.

Figure 16   Percent distribution of those who own mobile phone and use internet at least once per week, by sex
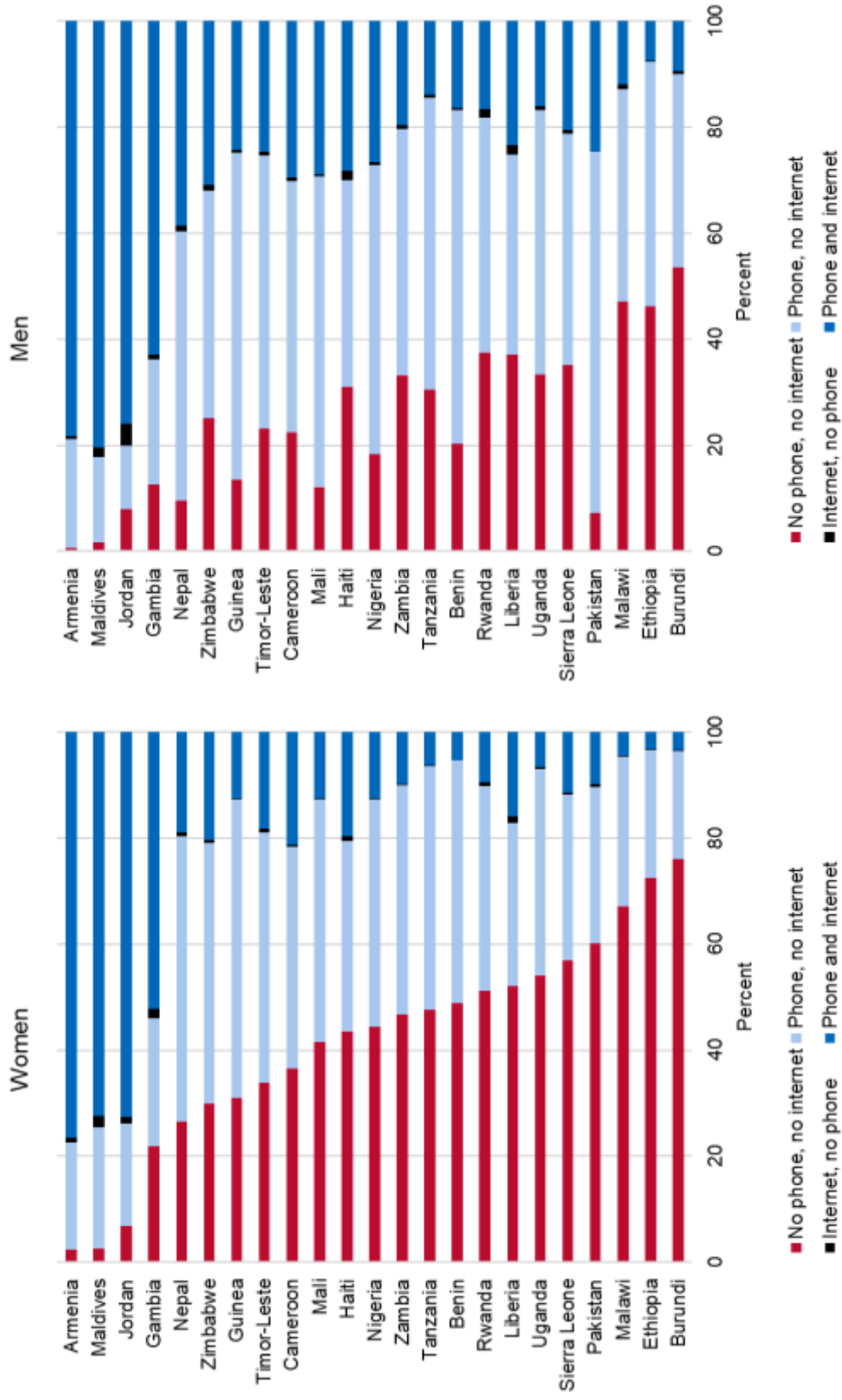
4 DISCUSSION AND CONCLUSIONS

We find that ownership of mobile phones exceeds weekly internet use, and that weekly internet use also lags behind weekly use of traditional media (for example, radio or television). We further find clear gender gaps—favoring men—in mobile phone ownership, their use for financial transactions, and weekly internet use. These gender gaps seen with new digital platforms are not new to ICTs, as gender gaps are also found in traditional media like weekly radio use. Gender gaps tend to be wider in mobile phone ownership than for financial transactions or weekly internet use. Across all countries, a greater percentage of women than men lack access to both mobile phones and internet, whereas a greater proportion of men have both technologies.

This study adds to prior evidence that suggests that the gender gap in internet use not only exists but has increased over time in LMICs (Acilar and Sæbø 2021; ITU 2020). As previously found in a study of multiple Latin American and African countries, we, too find that women tend to use the internet with less frequency and intensity than men (Hilbert 2011). A review study found women in LMICs are about 10% less likely to own a basic mobile phone than men, and even among smartphone owners, women are 18% less likely to use the mobile internet (Borgonovi et al. 2018). As a result, women may have less access to technology-related employment, health services, education, and skills, which restricts their economic and development opportunities (Acilar and Sæbø 2021; Hilbert 2011).

With men's mobile phone ownership and internet use exceeding women's, designers of mobile health interventions may want to consider the extent to which they intentionally target men through such interventions. There may be existing opportunities to reach this often-overlooked population (in reproductive health programming) with digital interventions designed to improve their own reproductive health, increase gender equity, and/or enhance men's roles as supportive partners. Such an approach would take advantage of existing gender gaps without the prerequisite of changing the underlying inequalities in digital access.

Borgonovi et al. found that women also tend to differ from men in how they use mobile phones and smartphones: women prefer to make and receive video calls and men are more likely to browse the internet, and download and use apps (2018). At the same time, women are also less likely than men to own and use a mobile money account (Borgonovi et al. 2018). Our results, showing that women are less likely to use mobile phones for financial transactions, reinforce these findings.

We also found residence, age, and wealth gaps related to these technologies. Mobile phone ownership is higher among urban residents and wealthier groups and lower among those age 15–19, whereas weekly internet use is highest among urban residents, the middle age groups, and richer groups. Use of mobile phones for financial transactions is limited among the poorer wealth quintiles and reserved for those in the richest groups. Young people age 15–19—women and men—are most disadvantaged with regard to mobile phone ownership, but those age 40–49 are most disadvantaged in regard to internet use.

These patterns by residence, age, and wealth are largely the same for women and men. However, the residence and wealth gaps in mobile phone ownership tend to be wider for women than for men. The residence, age, and wealth gaps in their use of ICT for financial transactions and weekly internet use tend to be larger for men, as are most age gaps in mobile phone ownership. A previous study also found that

gender intersected with age and residential gaps in access to digital technologies. Specifically, the gender gap in internet use among 15–24-year-olds was about 3%, but about 8% among 55–74-year-olds, and the gender gap tended to be greater in rural areas (7.5%) than urban areas (6.6%), though internet use as a whole is lower in rural areas (Borgonovi et al. 2018).

A 2020 study by Rotondi et al. found evidence that mobile phone access is associated with lower gender inequality and improved reproductive, maternal, and child health outcomes, particularly among the poorest countries (2020). Women who owned a mobile phone were more informed about sexual and reproductive health services and were more empowered to make household decisions (Rotondi et al. 2020).

Indeed, many program designers have been eager to harness the promise of mobile smart phones and the internet to empower girls and women, enhance gender equality, and improve sexual and reproductive health outcomes. The number of mobile health apps and programs has burgeoned in recent years. Several of these programs specifically target youth and adolescents, such as recent USAID-supported initiatives in India and Rwanda (Howard Delafield International 2022; Nolan et al. 2020; Pain 2021).

However, our findings that women consistently have less access to and use of digital technologies suggests some limits to the reach of these interventions. Some researchers have estimated that 327 million fewer women than men have a smartphone and can access the mobile internet (Acilar and Sæbø 2021). We further find that poorer women, women in rural areas, and (regarding mobile phones) adolescent women particularly lack access to the digital technologies they need to benefit from effective mobile health interventions. It is possible that these efforts may miss a substantial portion of their intended target population. Moreover, by engaging a select audience (urban, non-poor, non-adolescent), mobile health interventions may unintentionally exacerbate existing health inequalities. Equity concerns factor into the World Health Organization's recommendation that programmers ensure mobile health interventions do not inappropriately divert from nondigital approaches in some scenarios (WHO 2019). Our findings suggest that such initiatives should take into account existing inequalities in digital access and consider strategies to expand access or otherwise reach digitally disadvantaged populations through innovative programming.

REFERENCES

Acilar, A., and Ø. Sæbø. 2021. "Towards Understanding the Gender Digital Divide: A Systematic Literature Review." *Global Knowledge, Memory and Communication*. https://doi.org/10.1108/GKMC-09-2021-0147

Borgonovi, F., R. Centurelli, H. Dernis, R. Grundke, P. Horvát, S. Jamet, M. Keese, et al. 2018. *Bridging the Digital Gender Divide: Include, Upskill, Innovate*. Paris, France: OECD. https://www.oecd.org/digital/bridging-the-digital-gender-divide.pdf

Hilbert, M. 2011. "Digital Gender Divide or Technologically Empowered Women in Developing Countries? A Typical Case of Lies, Damned Lies, and Statistics." *Women's Studies International Forum* 34 (6): 479–489. https://doi.org/10.1016/j.wsif.2011.07.001

Howard Delafield International. 2022. *Game of Choice, Not Chance: Project Brief*. Washington, DC and New Delhi, India: Howard Delafield International. https://gameofchoicenotchance.com/

Intel Corporation, and Dalberg Global Development Advisors. 2012. *Women and the Web: Bridging the Internet and Creating New Global Opportunities in Low and Middle Income Countries*. Santa Clara, CA, USA: Intel Corporation. https://www.intel.la/content/dam/www/public/us/en/documents/pdf/women-and-the-web.pdf

International Center for Equity in Health. 2014. Equiplot.Ado. Pelotas, Brazil: International Center for Equity in Health, Universidade Federal de Pelotas. https://www.equidade.org/equiplot.

ITU. 2020. *Measuring Digital Development: Facts and Figures*. Geneva, Switzerland: ITU Publications. www.itu.int/en/ITU-D/Statistics/Documents/facts/FactsFigures2020.pdf

Nolan, C., L. Packel, R. Hope, J. Levine, L. Baringer, E. Gatare, A. Umubyeyi, et al. 2020. "Design and Impact Evaluation of a Digital Reproductive Health Program in Rwanda Using a Cluster Randomized Design: Study Protocol." *BMC Public Health* 20 (1): 1701. https://doi.org/10.1186/s12889-020-09746-7

Pain, P. 2021. Gaming for Empowerment and Choice: Research Shows That Interactive Games Increase Student Motivation to Pay Attention and Learn More Effectively. *SPAN Magazine*. https://spanmag.com/gaming-for-empowerment-and-choice/

Rotondi, V., R. Kashyap, L. M. Pesando, S. Spinelli, and F. C. Billari. 2020. "Leveraging Mobile Phones to Attain Sustainable Development." *Proceedings of the National Academy of Sciences* 117 (24): 13413–13420. https://doi.org/10.1073/pnas.1909326117

Rutstein, S. O., and K. Johnson. 2004. *The DHS Wealth Index*, *DHS Comparative Reports No. 6*. Calverton, MD: ORC Macro.

World Bank. 2021. "Literacy Rate, Adult Male (% of Males Ages 15 and above)—Low and Middle Income." Washington, DC, USA: World Bank.

WHO. 2013. *Handbook on Health Inequality Monitoring with a Special Focus on Low- and Middle-Income Countries*. Geneva, Switzerland: World Health Organization.

WHO. 2015. *State of Inequality: Reproductive Maternal Newborn and Child Health: Interactive Visualization of Health Data*. Geneva, Switzerland: World Health Organization.

WHO. 2019. *WHO Guideline: Recommendations on Digital Interventions for Health System Strengthening*. Geneva, Switzerland: World Health Organization (WHO). https://www.who.int/publications/i/item/9789241550505