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Digital Access and Barriers in Displacement-affected Communities in White Nile, Sudan

Results of a Connectivity Needs and Usage Assessment (CoNUA) by the Norwegian Refugee Council, the GSMA and REACH Initiative

June 2022





NORWEGIAN REFUGEE COUNCIL

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Executive summary

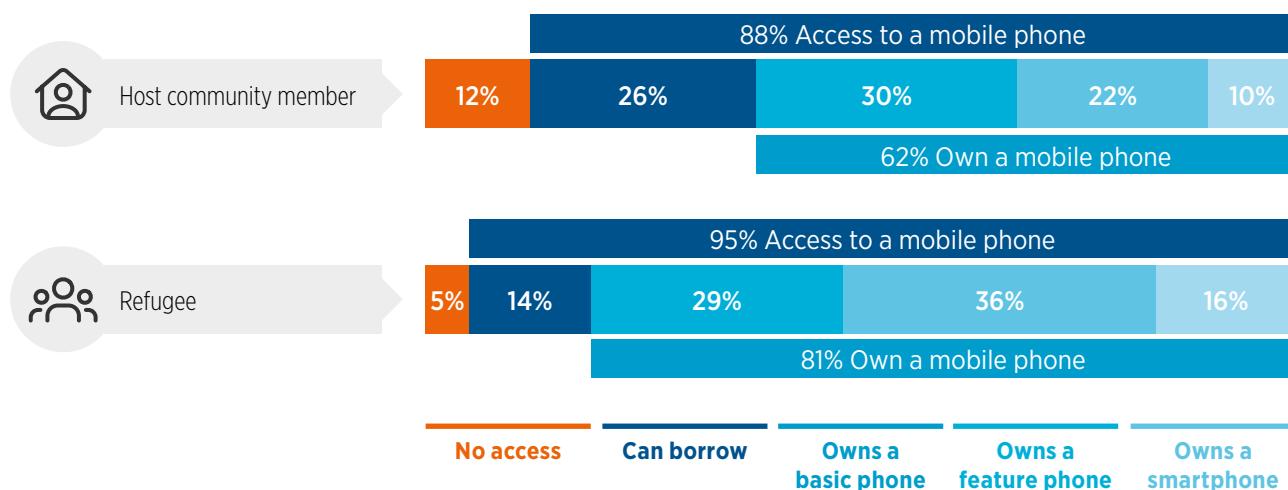
According to the United Nations, 14.3 million people in Sudan will need humanitarian assistance in 2022 due to numerous overlapping crises. 1.2 million are refugees, roughly 800,000 of whom have been displaced from South Sudan. In a context such as Sudan, where protracted and sudden-onset crises often take place in highly insecure environments, humanitarian access can be extremely challenging and unpredictable. Although some of these challenges could be overcome by using digital platforms, digital humanitarian assistance remains underexplored in Sudan, hampered by a lack of evidence on current access to and use of digital technology among those in need.

This report shares findings on the access and use of mobile technology among South Sudanese refugees and the communities that host them in three areas of White Nile, Sudan. White Nile is a state in southern Sudan sharing a border and refugee crossing points with South Sudan. It is home to nearly 700,000 people in need of humanitarian assistance. More than 280,000 refugees from South Sudan are

currently hosted in White Nile and represent more than a third of all refugees living in Sudan, as well as roughly 100,000 returnees who arrived from South Sudan when it seceded in 2011. Most refugees live in one of nine official refugee camps. Additionally, there are nearly 400,000 people experiencing acute food insecurity.

Understanding mobile access and ownership is essential when considering the use of digital technology for humanitarian assistance. Our research indicates that access to mobile phones is high in both communities, with 91 per cent of respondents reporting that their household owns at least one handset. Personal ownership is also high, with 81 per cent of refugees and 62 per cent of host community members reporting that they own their own mobile phone. This figure obscures some important discrepancies, however. For example, refugees are more likely to own an internet-enabled handset than host community members, and women, persons with disabilities and older people are less likely to have access to mobile phones.

Figure i
Individual access to a mobile phone, by status



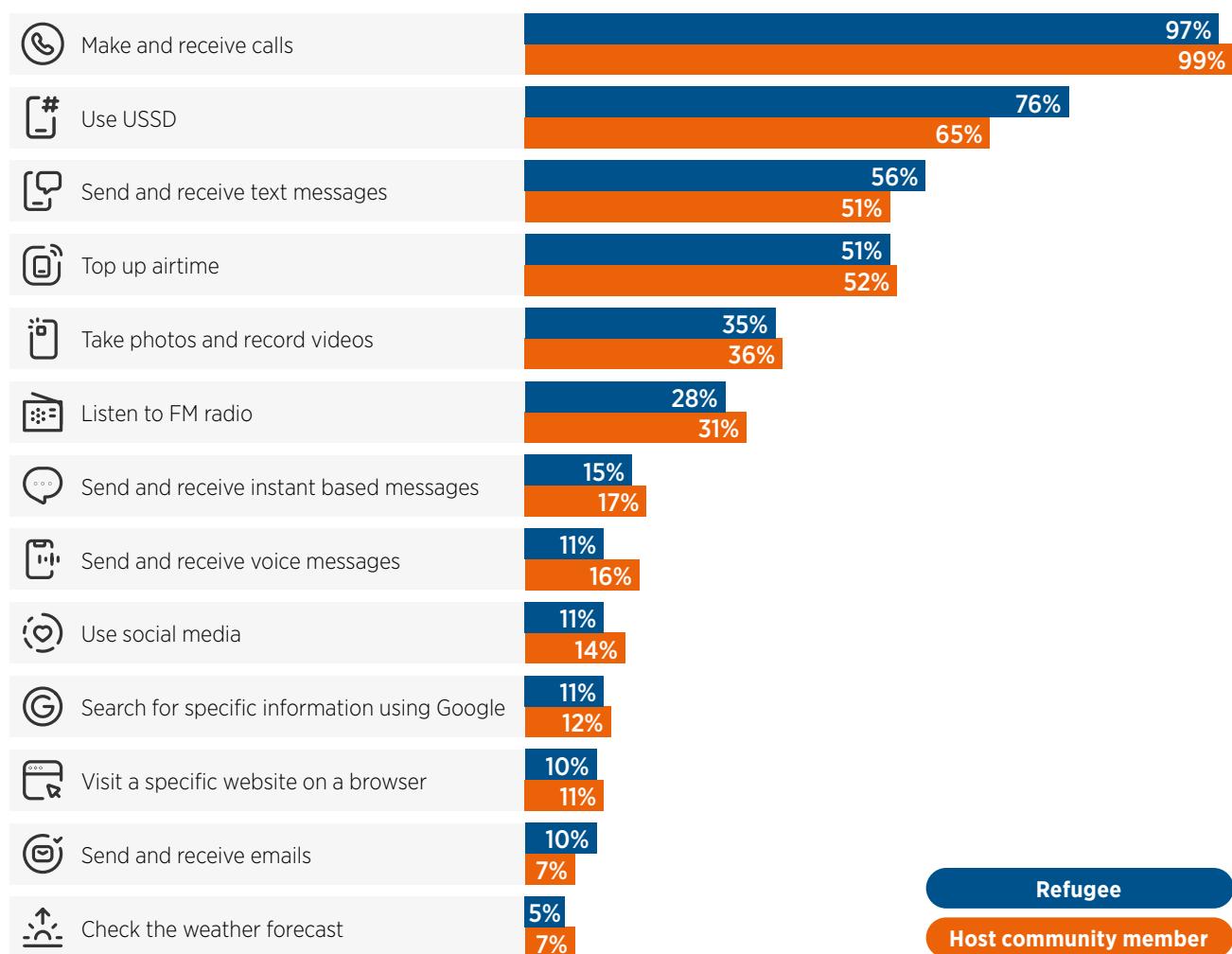


The most prevalent barriers to owning a mobile handset are related to cost and affordability. Among those who do not own a handset, 81 per cent of refugees and 70 per cent of host community members report that the cost of a handset is too high to purchase one.

Access to a handset is only one component of accessing digital services and being digitally

included. It is equally important to understand digital literacy and knowledge levels and the ways in which people use specific services. While less than one per cent said they did not know how to turn a mobile handset on and off, and nine in 10 respondents knew how to charge one, less than 20 per cent of each group knew how to use any service that required internet access.

Figure ii
Knowledge of mobile services, by status



Virtually all mobile phone users reported using their handset to make and receive calls, and a majority also reported sending and receiving text messages (57 per cent of refugees and 60 per cent of host community members). However, SMS was less likely to be used by women, older people or those who do not speak Arabic as a primary language.

Awareness and use of mobile internet was low in both communities; just 56 per cent of refugee respondents and 66 per cent of host community members had heard of it. Similarly, just 16 per cent of refugee respondents and 11 per cent of host community members use mobile internet on a phone that they own. Surprisingly, 30 per cent of smartphone owners in both groups reported that they do not use it to access the internet. The assessment also found that digital literacy, as well as the availability of networks and charging, were the greatest barriers to increasing their use of mobile internet. As with mobile phone access, there were lower rates of internet awareness and use among women, persons with disabilities, older people and those who do not speak Arabic.

Very few mobile phone users reported using mobile money; just one per cent of refugees and two per cent of host community members. This may be partially explained by the fact that most mobile phone users in the survey are customers of Zain, which at the time of this research had not launched a mobile money service in Sudan, but are expected to in 2022. The research did, however, reveal potential unmet consumer demand. Nearly half of mobile phone users reported sending and receiving phone credit between friends and family as a way to transfer money.

The assessment results also show the state of the digital ecosystem in the research settings in White Nile, including the availability of networks, charging, agents and other services. Researchers were able to send an SMS and make a phone call on at least

one mobile network in each of the six locations, and in three locations they were able to access mobile internet services from at least one operator. These findings indicate that each location has some network coverage and this was supported by the survey results.

Interviews with merchants providing mobile-enabled services revealed that a range of products and support are available to users. Merchants reported selling airtime/data, providing access to charging services, and selling phones and SIM cards (to varying degrees). They also provide a range of problem-solving services and a handful of merchants repair broken handsets to extend the life of their customers' mobile phones.

Humanitarian organisations and other essential service providers can play a key role in the development of digital ecosystems because they can enable the development and deployment of digital products and services. It was clear from both the focus group discussions and the end user survey that few to no humanitarian services are provided digitally (less than 10 per cent of survey respondents said they use their mobile phones to learn about humanitarian assistance or provide feedback to NGOs).

The conclusions from this assessment lead to recommendations for how a variety of actors, including humanitarian agencies, donors, and the private sector (including mobile network operators), might work to expand access to and use of mobile services by displacement affected communities in White Nile. Some key suggestions include stakeholders across sectors working together to identify innovative ways to encourage market-friendly approaches to increasing phone ownership (importantly smartphone ownership); increasing the range, quality and value of charging options; and developing context specific digital literacy training programmes.



Introduction

In Sudan, numerous overlapping crises have left 14.3 million people in need of humanitarian assistance in 2022. This includes 1.2 million refugees, roughly 800,000 of whom have been displaced from South Sudan.¹ This group currently experiences significant barriers to meeting multiple basic and essential needs and are in acute need of support.²



1 UN OCHA. (2021). [Humanitarian Needs Overview: Sudan](#).

2 REACH Initiative. (2020). [Sudan 2020 Multi-sector Needs Assessment: Final Report](#).



There is growing recognition that mobile technology and mobile network operators (MNOs) have an important role to play in delivering dignified, efficient and impactful humanitarian assistance. In a context such as Sudan, which is often insecure and where humanitarian access can be extremely challenging and unpredictable, mobile and digital assistance can help overcome these challenges.

Fortunately, the Sudanese digital ecosystem demonstrates potential for the use of digital tools. As of 2022, 70 per cent of Sudan's population were covered by a 3G network, 49 per cent by a

4G network and overall unique mobile subscriber penetration was 49 per cent, indicating that around half the population has a mobile phone. The number of mobile internet subscribers is also growing nine per cent year on year.³

However, digital humanitarian assistance remains underexplored in Sudan. The deployment of effective pilots and development of digital humanitarian strategies are hampered by a lack of evidence on current access to and use of digital technology among those in need.

Objectives

This report highlights the findings of one of two Connectivity Needs and Usage Assessments (CoNUA)⁴ conducted by the Norwegian Refugee Council (NRC) Sudan and supported by the GSMA and the REACH Initiative. This report focuses on findings from White Nile state while the other focuses on West Darfur.⁵

This assessment was conducted with three key objectives in mind:

1. To understand mobile phone use and access by refugees and the communities that host them in White Nile.
2. To understand network coverage and strength in displacement settings in White Nile.
3. To assess the availability and feasibility of mobile money services in White Nile from the perspective of users.

A major theme of this assessment was identifying groups and communities at risk of digital exclusion.

This was done to inform the deployment of digital technology and ensure programming does not exacerbate existing inequalities.

NRC has a regional objective to improve access to digital technology and communication for displaced populations and the communities that host them, including providing humanitarian assistance via digital platforms. NRC Sudan plans to use the findings of this assessment to design and pilot context-appropriate, evidence-based digital solutions. These pilots will be conducted through strategic partnerships and collaboration to enhance the digital ecosystem in Sudan.

It is hoped, that by making the results of this assessment public, other actors, including government, humanitarian organisations and the private sector, will consider how mobile and digital technology might be used effectively in these settings, and identify the work needed to facilitate equitable digital access and inclusion.

3 GSMA Intelligence, Data by market (Sudan) (website), <https://data.gsmaintelligence.com/data/market-metrics> (accessed 4 April 2022)

4 Baah, B., Downer, M., Kruk, L. (2020) *Humanitarian Connectivity Needs and Usage Assessment (CoNUA) Toolkit*. GSMA.

5 Caswell, P. and Downer, M. (2022) Digital Access and Barriers in Displacement-affected Communities in West Darfur, Sudan, GSMA and NRC.



Context

White Nile

White Nile is a state in southern Sudan sharing a border and refugee crossing points with South Sudan. The area is home to nearly 700,000 people in need of humanitarian assistance. More than 280,000 refugees from South Sudan are currently hosted in White Nile and represent more than a third of all refugees in Sudan. White Nile also hosts roughly 100,000 returnees who arrived from South Sudan when it seceded in 2011. The state houses nine of Sudan's 11 official refugee camps, where two-thirds of all refugees in the state live. As well as displacement affected communities, White Nile is also home to around 380,000 people experiencing acute food insecurity and in 2021 around 80,000 people were impacted by flooding. Not including government actors, the United Nations Office for the Coordination of Humanitarian Affairs (UN OCHA) identified 28 partners providing humanitarian assistance in White Nile as of March 2022.⁶

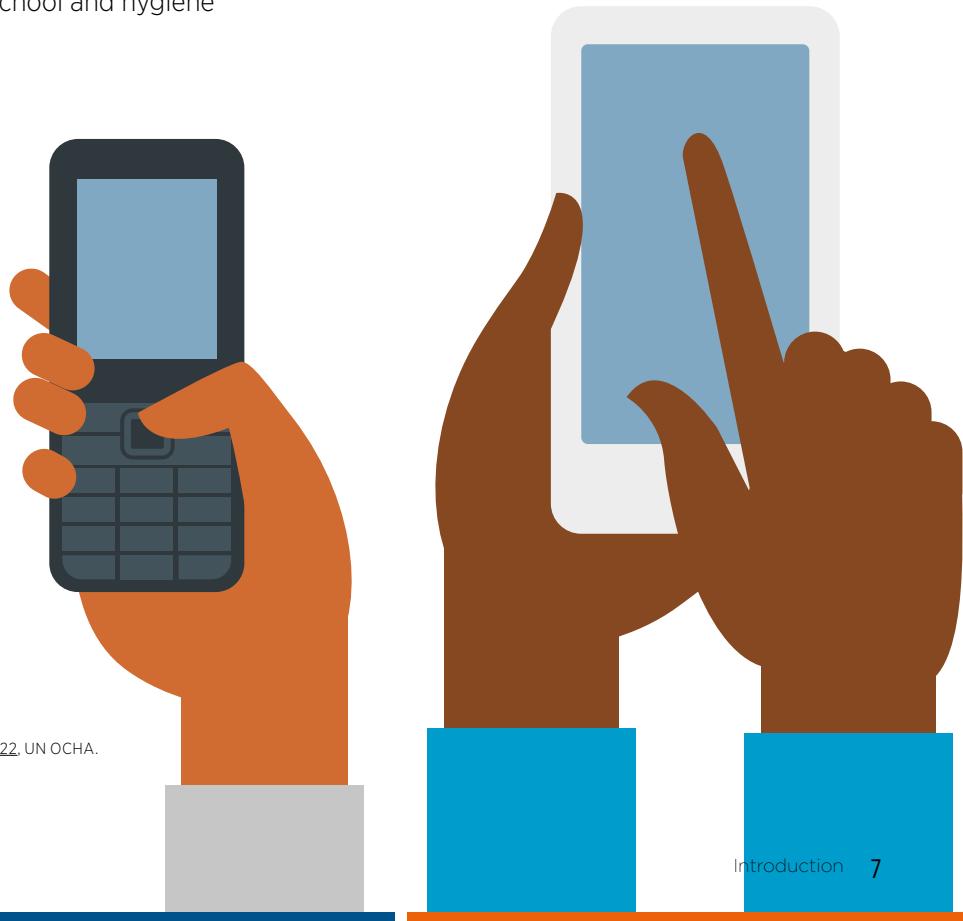
NRC began operations in White Nile in July 2021, focusing on the construction and rehabilitation of schools and providing teachers with essential teaching materials. Their back to school and hygiene

promotion campaign aims to increase enrolment of girls and boys in formal education. They also distributed cash assistance to 6,435 refugees and host community members after large-scale flash flooding.

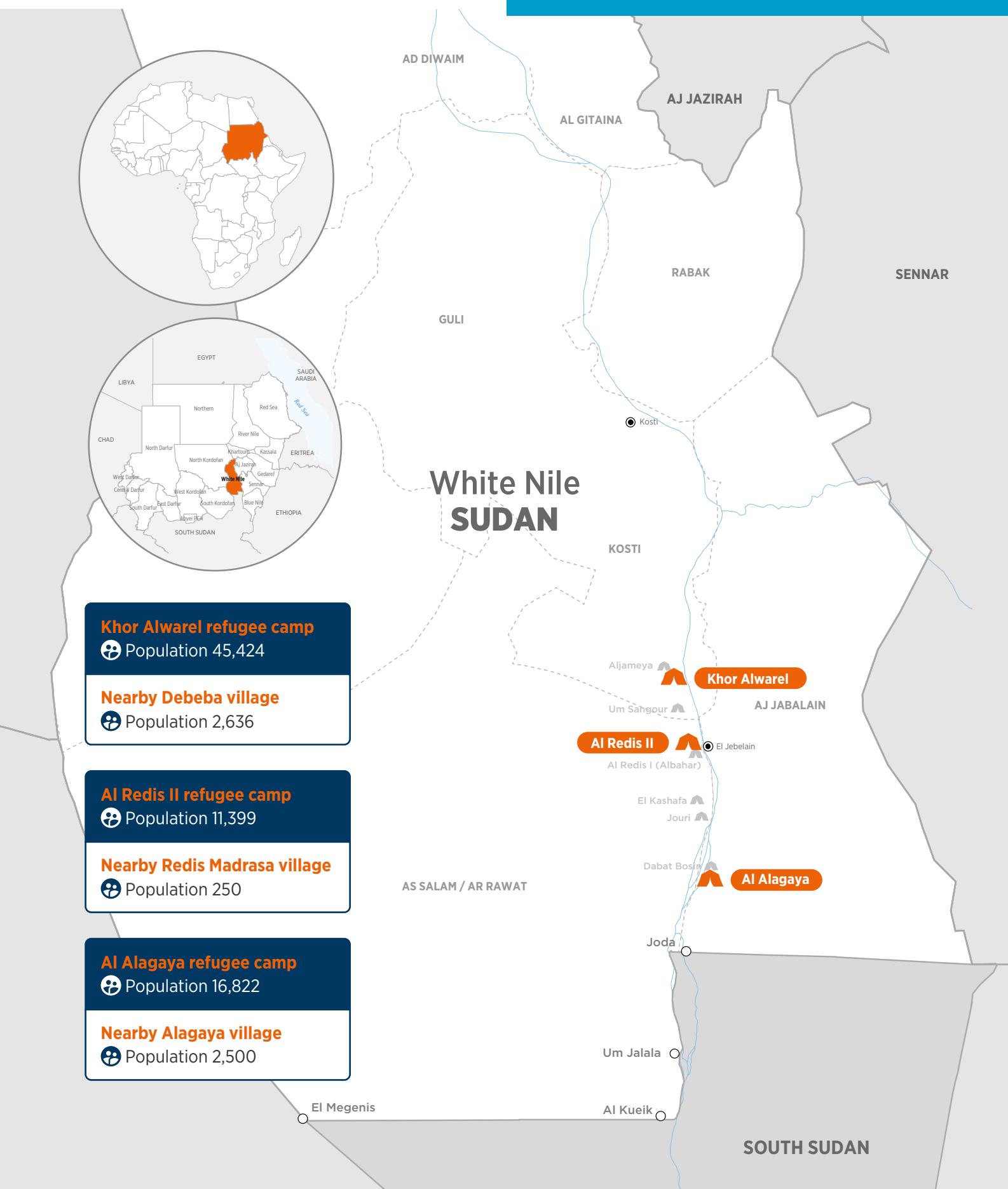
All three of Sudan's mobile network operators (MNOs) – MTN, Sudatel (trading as Sudani) and Zain – have a presence in White Nile, with varying degrees of coverage and market penetration. Both MTN and Sudani have mobile money deployments and Zain plans to launch one in 2022.

Research locations

White Nile was selected as a research location due to the scale of humanitarian coverage, the increasing level of need in the state and the current lack of available evidence on digital access for those in need. To make data collection feasible, three locations in White Nile were selected, ensuring a range of communities along the Nile were included. Each location consisted of a refugee camp and one nearby host community village.



⁶ UN OCHA (2022) [White Nile State Profile - March 2022](#), UN OCHA.



Methodology

This assessment used four tools from the GSMA CoNUA toolkit (Table 1).⁷ The **end user survey instrument** was used to collect representative quantitative data from refugee and host communities. The **end user focus group discussion (FGD) guides** were used to collect qualitative data from both communities. The **merchant survey instrument** was used to collect data from agents on the services provided in the research locations. The **signal strength mapping tool** was used to collect data on network availability in each location. Full details on the methodology can be found in Annex 2.

Table 1

Assessment sample by location

	 End user survey	 End user FGD	 Merchant survey	 Signal strength
📍 Al Alagaya camp	295	1	11	3
📍 Alagaya village	314	1	13	3
📍 Al Redis II camp	329	1	23	3
📍 Redis Madrasa village	144	1	0	3
📍 Khor Alwarel camp	312	1	15	3
📍 Debeba village	268	0	5	3
Total	1,662	5	67	18

⁷ Baah, B., Downer, M. and Kruk, L. (2020). Humanitarian Connectivity Needs and Usage Assessment (CoNUA) Toolkit. GSMA.



Mobile phone access and ownership

Understanding mobile phone access and ownership is essential when considering the use of digital technology for humanitarian assistance. This chapter quantifies mobile phone ownership by breaking it down by handset type and establishing the extent to which people can borrow someone else's handset. It also delves into the landscape of access for groups traditionally at risk of digital exclusion.





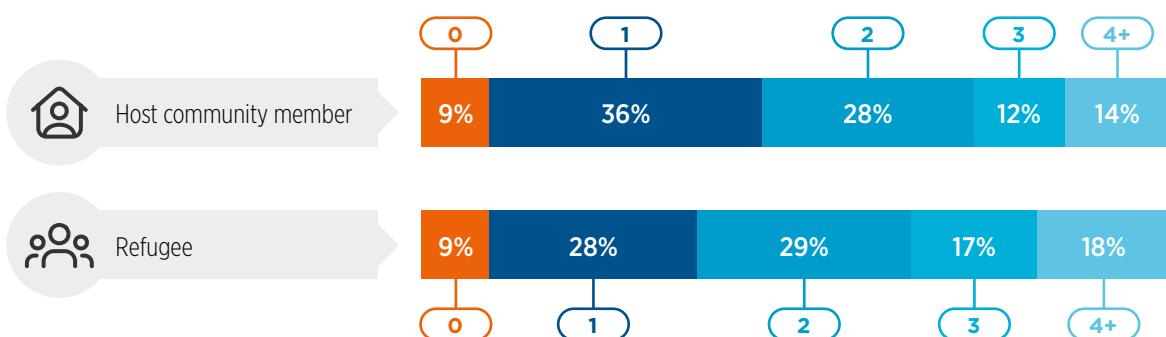
Trends in mobile phone access

The survey data indicates that **most people in the research locations have access to a mobile phone**.

Ninety-one per cent of respondents in both the refugee camps and host communities said that their household owns a handset (on average, refugees

owned 2.3 handsets and host community members owned 2.0) (Figure 1). The majority of both groups reported using a mobile phone in the last three months (85 per cent of refugees and 70 per cent of host community members).

Figure 1
Number of mobile phones in the household, by status



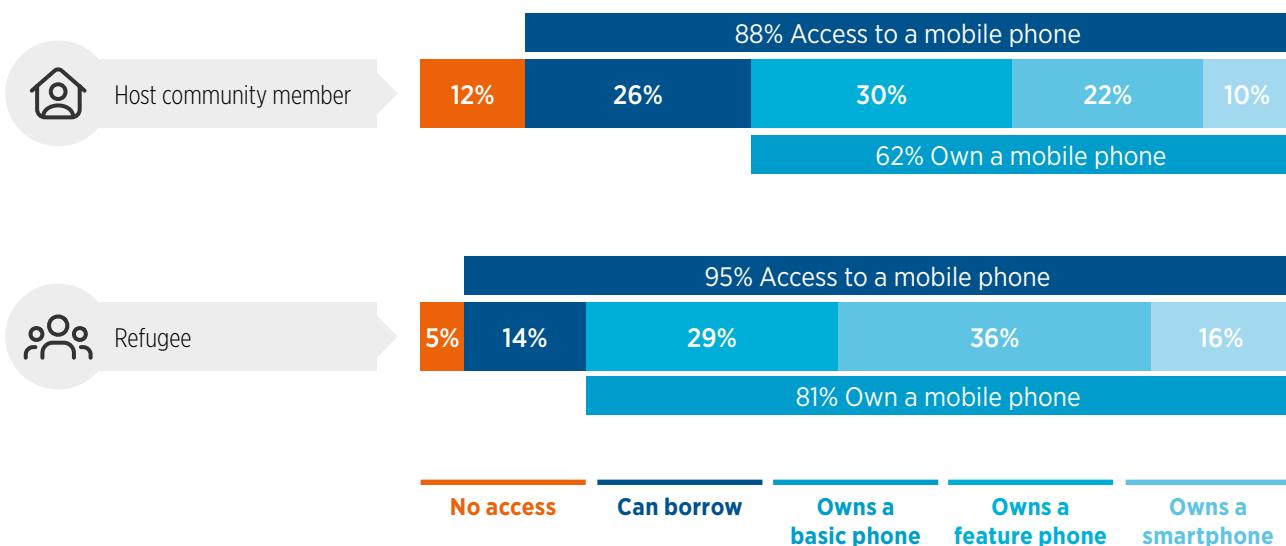
Q: How many mobile phones does your household own?
Base: All respondents; n: Refugees=939, Host community members=723



In terms of mobile ownership, **81 per cent of refugees and 62 per cent of host community members reported owning their own phone** (Figure 2). When those who reported being able to borrow another person's handset are included, **95 per cent of refugees and 88 per cent of host community members were able to access a mobile phone**. Overall, refugees were more likely to own an internet-enabled phone (a feature phone or a smartphone) while host community members disproportionately relied on borrowing someone else's handset.

Access to a mobile phone, however, is not always an indicator of current use. Sixteen per cent of host community members and six per cent of refugees reported being able to borrow a handset, but also said they had not used one in the last three months. Equally, the presence of a mobile phone in the household does not always mean that a person can access it; **five per cent of respondents from both groups reported they had no access to a phone despite their household owning at least one**.

Figure 2
Individual access to a mobile phone, by status



Q: What kind of phone do you personally own? (None, Basic, Feature, Smart) and Do you have access to someone else's mobile phone?
Base: All respondents; n: Refugees=939, Host community members=723



Barriers to mobile phone ownership

Understanding the barriers people face to owning a mobile phone of their own can inform strategies to increase mobile access and foster digital inclusion in communities in need of humanitarian assistance. This information is often not well known by humanitarian organisations or private sector stakeholders, and can highlight nuanced and interrelated issues.

Based on responses to the end user survey by individuals who do not own their own handset, **cost is the greatest barrier to mobile ownership** (Table 2). This may not be surprising given that, according to UNHCR, six in 10 households in White Nile have high or severe vulnerability to monetary shocks and virtually all households (90 per cent of refugees and 100 per cent of host community members) have a monthly income of less than SDG 20,000 (USD 44.69).⁸

Table 2
Top five barriers to mobile phone ownership, by status

	The cost of buying a mobile phone is too high	The cost of buying airtime is too high	I do not have the necessary registration or ID documents to buy a SIM card	I don't know how to use a mobile phone	There is limited or no network coverage in my area
Refugee	81%	27%	17%	13%	12%
Host community member	70%	24%	10%	15%	19%

Q: Which of the following reasons prevent you from owning a mobile phone?

Base: Non-phone owners; n: Refugees=175, Host community members=270

⁸ UNHCR. (2021). Basic Needs and Vulnerability Assessment (BaNVA) for refugees hosted in Sudan.

SIM cards

A SIM card registered in one's own name is a prerequisite to accessing mobile services. Sudanese law requires SIM cards to be registered using a recognised identity document (ID). Electronic refugee ID cards issued in Khartoum are currently accepted. In 2021, UNHCR and the Telecommunications and Post Regulatory Authority (TPRA) reached an agreement on the use of ID cards issued by the Commission for Refugees (COR) for SIM registration. This agreement was being formalised at the time this report was written.⁹

A recent UNHCR study found that although many refugees in Sudan do not have legal access to a SIM card in their own name, there are common "workarounds". Most refugees access a SIM card by registering their SIM in someone else's name, using

an unregistered SIM card until it is disconnected or using SIM cards that have been bulk registered by an organisation.¹⁰

More than half of mobile phone owners reported that their SIM was registered in their own name (Table 3). However, the survey did not provide an option for a SIM card to be unregistered. Based on a broader understanding of the context unregistered SIM users are likely to respond that their SIM is registered in their own name, since an individual would have purchased the SIM themselves. The results also show that host community members disproportionately rely on another household member to register their SIM card while refugees rely more on agents or merchants, who may not always be formal agents of the MNO but likely have bulk-registered SIM cards.

Table 3
SIM card registration, by status

	Mine	Another household member	A friend or neighbour	A mobile agent or sales assistant	Don't know	An NGO
Refugee	53%	13%	3%	29%	1%	0%
Host community member	63%	31%	3%	1%	1%	0%

Q: Whose name is registered with your main phone number?

Base: Mobile phone owners; n: Refugees=760, Host community members=450

9 UNHCR. (2022). Displaced and Disconnected.

10 Ibid.



Access gaps

Mobile phone access and ownership rates often reflect existing inequalities in a community, which means the use of digital services has the potential to exacerbate these inequalities.¹¹ This section looks at differing levels of access to mobile phones based on gender, disability status, age and language. These differences represent access gaps presented as proportional differences.¹²



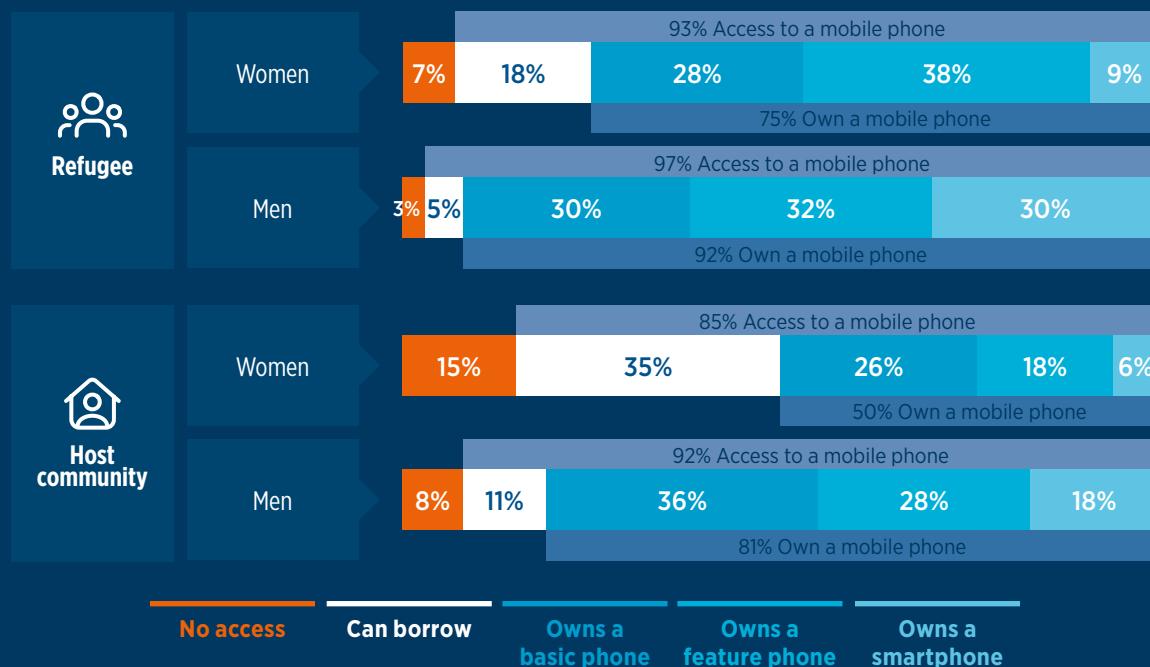
Gender gap

Rates of mobile phone ownership differ between men and women in both the refugee and host communities (Figure 3). Refugee women are 18 per cent less likely to own a mobile phone than men and 70 per cent less likely to own a smartphone. Similarly, women in the host community are 38 per cent less likely to own a phone, 67 per cent less likely to own a smartphone and 3.2 times more likely to rely on borrowing someone else's phone. Focus group

participants suggested this may be because women find it more challenging to afford a handset and that household dynamics, such as the disapproval of husbands and partners, may act as a deterrent.

In comparison, GSMA research has found that across the Middle East and North Africa, women are nine per cent less likely to own a mobile phone than men.¹³

Figure 3
Individual access to mobile phones, by status and gender



Q: What kind of phone do you personally own? (None, Basic, Feature, Smart) and Do you have access to someone else's mobile phone?
Base: All respondents; n: Refugees (Women=646, Men=293); Host community members (Women=443, Men=280)

11 Casswell, J. (2019). [The Digital Lives of Refugees](#). GSMA.

12 See Annex 2: Methodology for more detail on how these gaps are calculated.

13 GSMA. (2021). [The Mobile Gender Gap Report 2021](#).



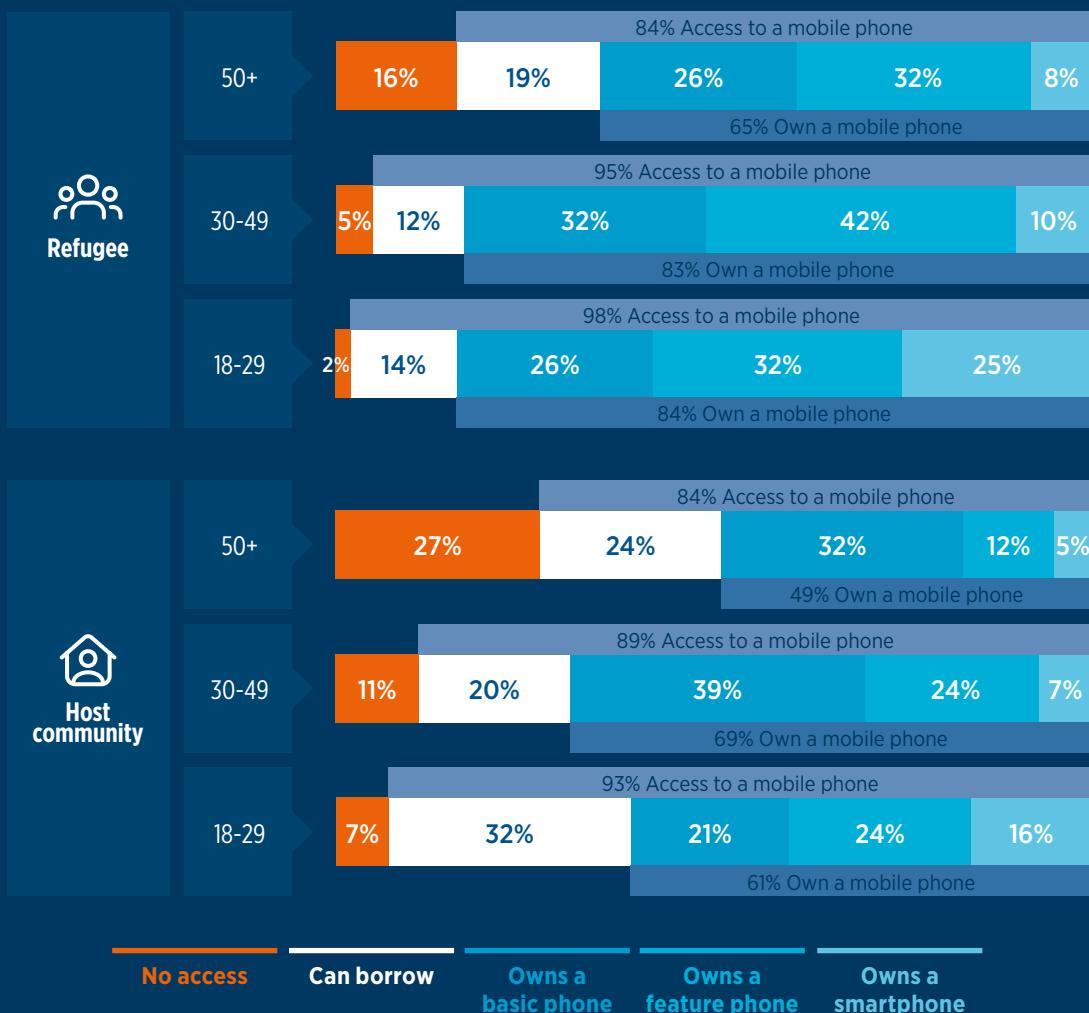
Age gap

Focus group participants were clear that younger people were more likely to own and use a mobile phone, and this was confirmed by survey responses (Figure 5). Those aged 50 and over were significantly less likely to own or access a mobile phone and those aged 18 to 29 were significantly more likely to own a smartphone than older people.

Of those who do not own a mobile phone and were 50 and over, 35 per cent of refugees and

56 per cent of host community members said that not knowing how to use a phone was a barrier to owning one. Focus group participants suggested that humanitarian organisations might create schemes whereby young people are encouraged to teach older members of the community how to use a mobile phone, specifically smartphones, to help address this issue of digital literacy.

Figure 4
Individual access to mobile phones, by status and age



Q: What kind of phone do you personally own? (None, Basic, Feature, Smart) And Do you have access to someone else's mobile phone?
Base: All respondents; n: Refugees (18 to 29=397, 30 to 49=397, 50+=145); Host community members (18 to 29=300, 30 to 49=283, 50+=140)



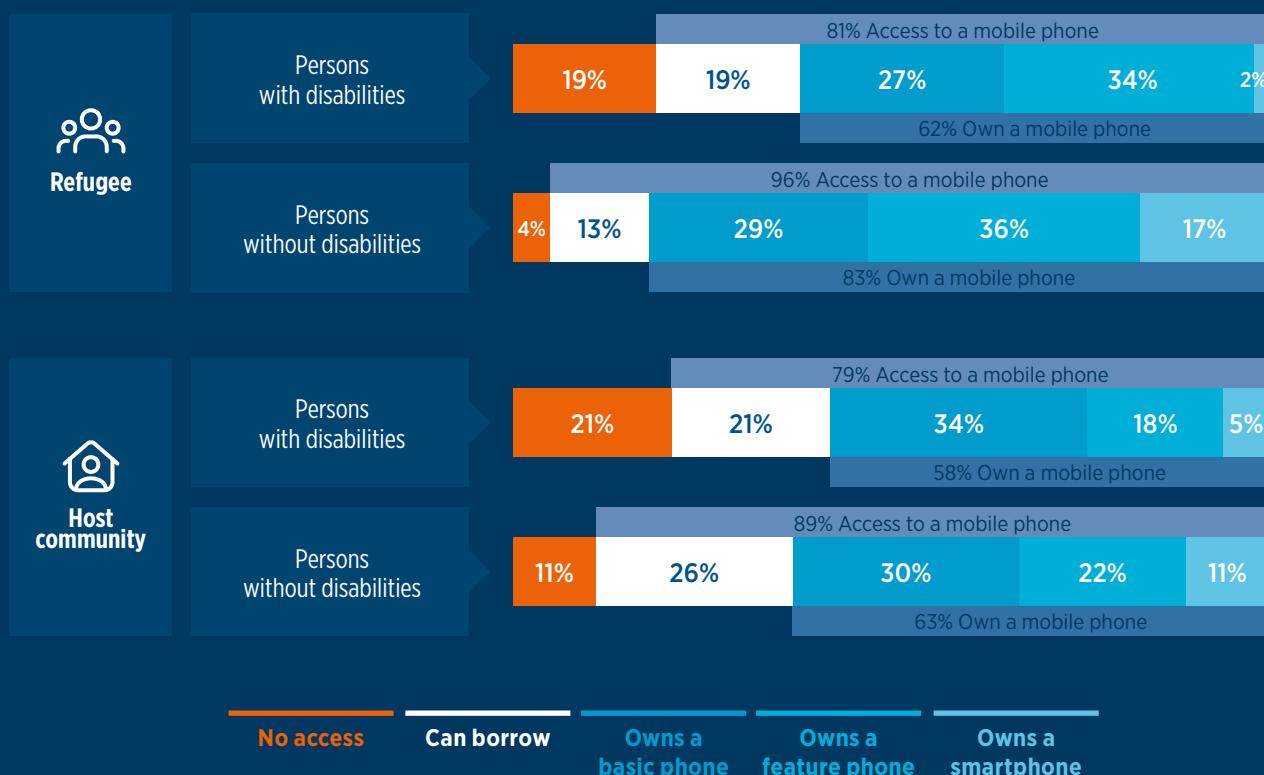
Disability gap

Refugees with a disability were 28 per cent less likely than those without one to own a mobile phone and 88 per cent less likely to own a smartphone. Differences were not statistically significant for host

community members, however, given that only eight per cent of the sample have a disability,¹⁴ it is difficult to draw a definitive conclusion.

Figure 5

Individual access to a mobile phone, by status and disability status



Q: What kind of phone do you personally own? (None, Basic, Feature, Smart) and Do you have access to someone else's mobile phone?
 Base: All respondents; n: Refugees (Persons with disabilities=59, Persons without disabilities=880); Host community members (Persons with disabilities=56, Persons without disabilities=667)



Language gap

There were no significant differences in mobile phone ownership and access based on whether respondents spoke Sudan's majority language¹⁵ (Arabic) or not.

¹⁴ According to the Washington Group Short Set of Questions.

¹⁵ As per CLEAR Global (formerly Translators Without Borders), "People who speak the languages of power rarely struggle to find information in their language", which means speaking a minority or marginalised language can galvanise digital exclusion and present a barrier to accessing vital information and services. CLEAR Global, CLEAR Tech (website), <https://clearglobal.org/clear-tech/> (accessed 28 April 2022).

Digital literacy and use of services

Access to handsets is only one component of accessing digital services and being digitally included. It is equally important to understand the level of digital literacy and knowledge that people have and the ways in which they use specific services. This section looks at knowledge of mobile services, use of offline services, awareness and use of mobile internet and concerns surrounding the use of mobile phones.





Knowledge of mobile phone use

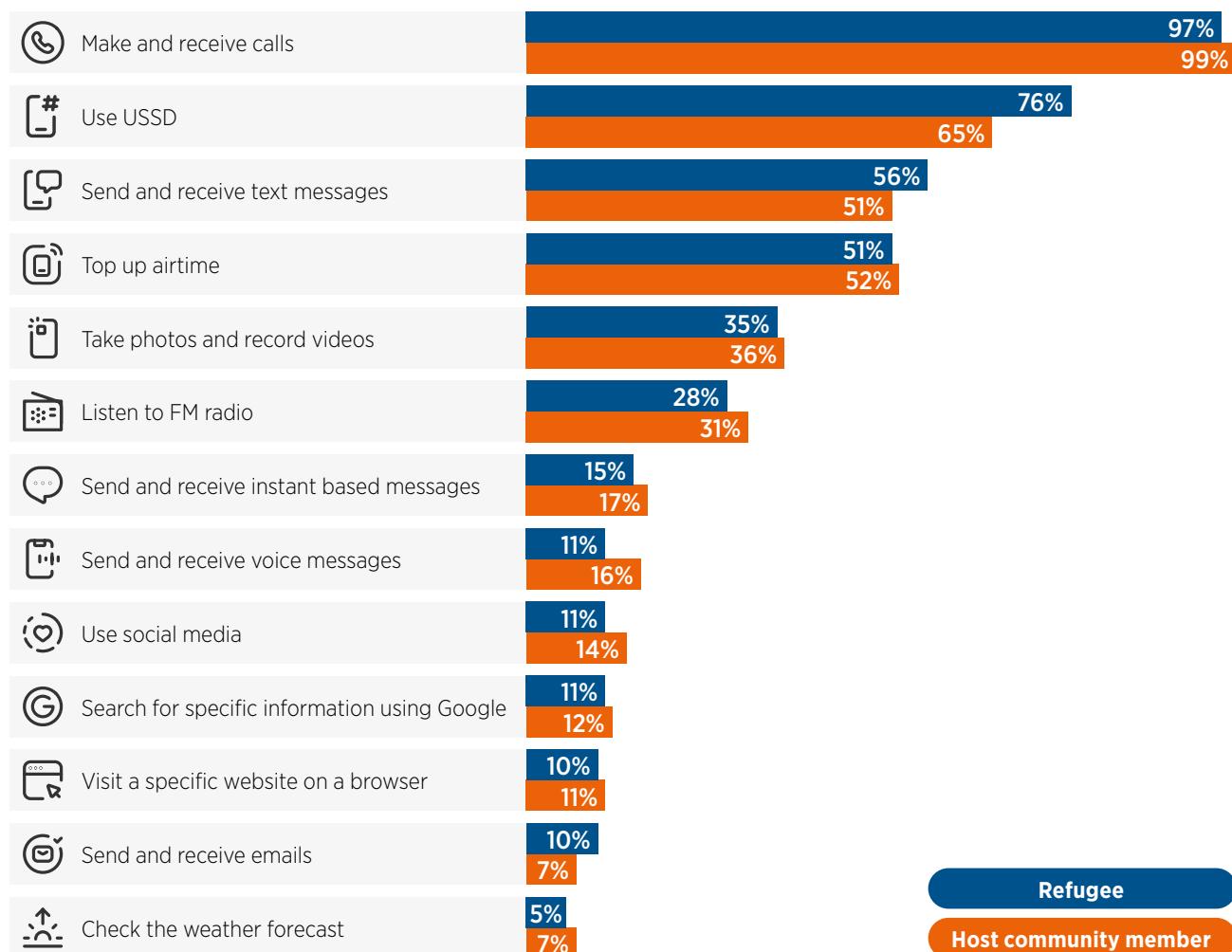
All respondents, regardless of mobile phone access, were asked whether they knew how to perform specific tasks on a mobile. Knowledge of the basic functionality of a mobile phone was generally high. Only three refugee and six host community respondents said they did not know how to turn a phone on and off, and nine out of 10 in both groups said they knew how to charge a phone (87 per cent of refugees and 86 per cent of host community members) and how to remove and insert a SIM card (86 per cent and 87 per cent, respectively).

The only functional task that respondents

demonstrated less ability was locking and unlocking a handset (49 per cent of refugees and 43 per cent of host community members). Unsurprisingly, smartphone owners were much more likely to know how to do it (88 per cent of refugees and 89 per cent of host community members).

Virtually all respondents knew how to make and receive calls, and many knew how to use USSD, send a text message and top up airtime. Importantly, **less than 20 per cent of each group knew how to use any service that required internet access** (Figure 6).

Figure 6
Knowledge of mobile services, by status



Q: Do you know how to use a phone to....?

Base: All respondents; n: Refugees=905; Host community members=678

Use of mobile phones

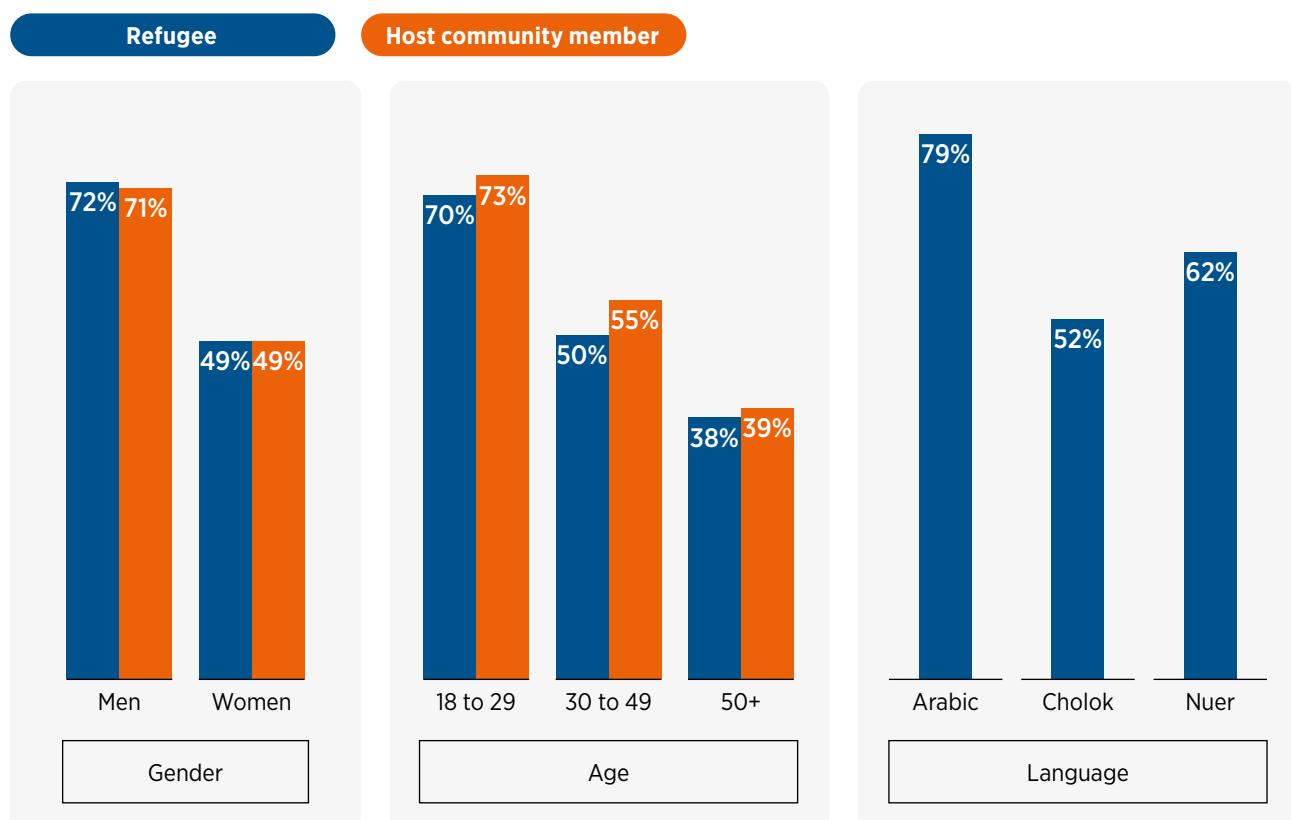
Everyone who said that they use a mobile phone (owned or borrowed) were asked what they use it for. This section presents the findings for use cases and services that do not require internet access. It does not look at mobile money.

Nearly all phone users reported using their phones to make and receive phone calls (97 per cent of refugees and 98 per cent of host community

members), and most also reported sending and receiving text messages (57 per cent of refugees and 60 per cent of host community members). Across both samples, SMS services were more likely to be used by younger people and men. This was also true among refugees who speak Arabic at home (Figure 7).

Figure 7

SMS use, by status, gender, age and main language spoken at home



Q: Do you use a phone to send and receive text messages (SMS)?

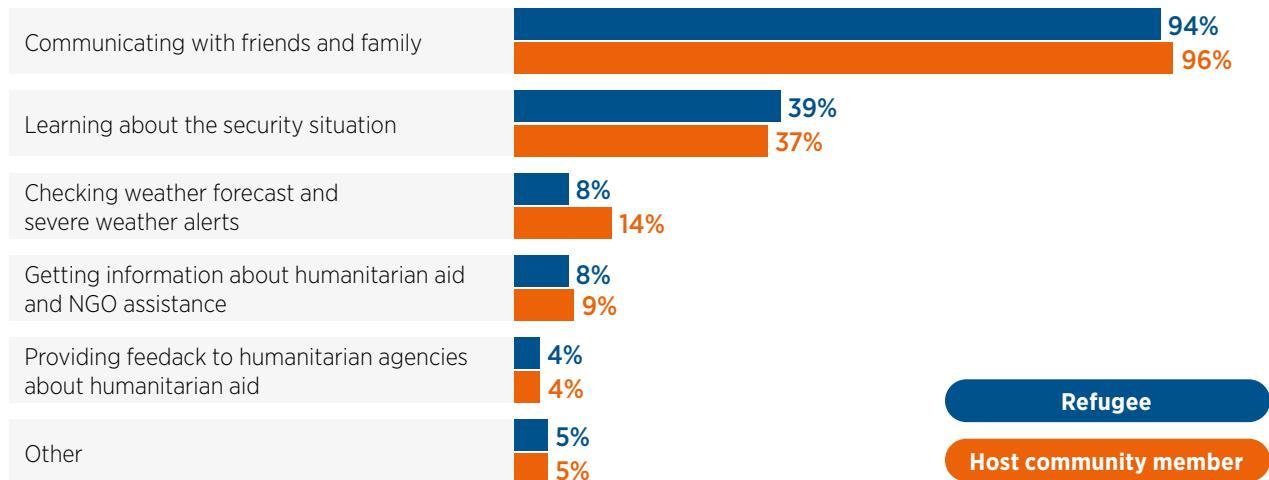
Base: Phone users; n: Refugees (Men=272, Women=490, 18 to 29=332, 30 to 49=334, 50+=96, Arabic=86, Cholok=528, Nuer=145);
Host community members (Men=229, Women=222, 18 to 29=185, 30 to 49=197, 50+=69)



In terms of relatively simple service use, most mobile phone users in the sample reported using their phones only to communicate with loved ones, with a

notable minority also using it to monitor the security situation (Figure 8).

Figure 8
Mobile phone use cases, by status



Q: What do you use your mobile phone for?

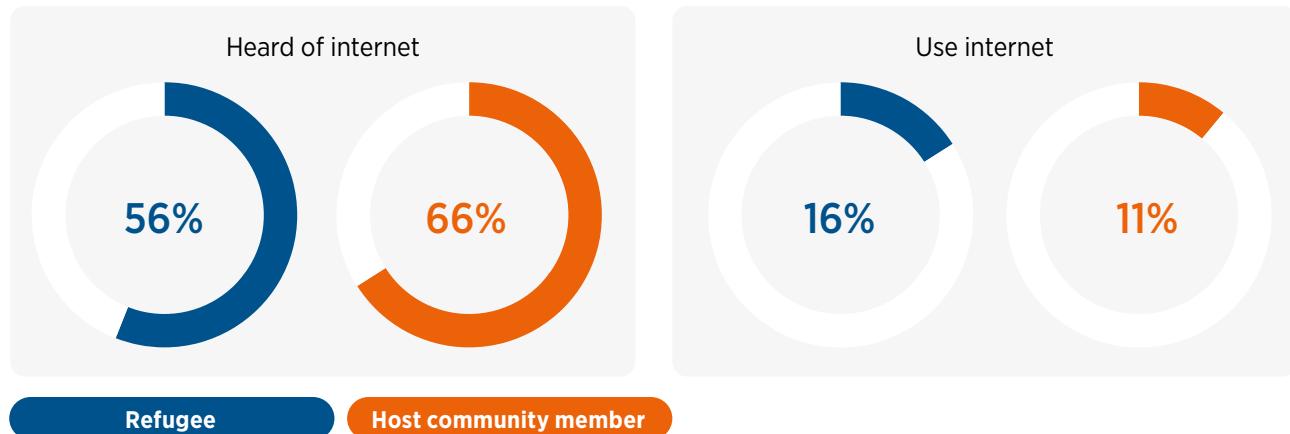
Base: Mobile phone users; n: Refugees=796, Host community members=508

Mobile internet

Awareness and use of mobile internet was low in both communities. **Just 56 per cent of refugee respondents and two-thirds of host community respondents had heard of it** (Figure 9). Even among owners of internet-enabled mobile phones, only three in 10 reported using mobile internet (31 per cent of refugees and 34 per cent of host community

members). This translates to **just 16 per cent of refugees and 11 per cent of host community members using mobile internet on a phone that they own**. Surprisingly, 30 per cent of smartphone owners in both groups reported they did not use it to access the internet.

Figure 9
Internet awareness and use, by status



Q: Have you ever heard of the internet (apps, services, and websites like Facebook, WhatsApp, Messenger)? and Do you currently own a phone and use mobile internet?

Base: All respondents; n: Refugees=939, Host community members=723



Owners of internet-enabled handsets who were not using the internet were asked what was preventing them from doing so. Five barriers were selected by 10 per cent or more of both groups, with digital literacy identified as the primary barrier (Figure 10).

Figure 10
Barriers to mobile internet use, by status

	I do not know how to use the internet by myself	There is limited or no coverage to access the internet in my area	Using the internet on my mobile phone uses too much battery	It is hard to find a mobile agent to buy mobile internet data	I do not find the internet relevant or interesting for me
Refugee	64%	21%	7%	4%	2%
Host community member	62%	46%	20%	12%	10%

Q: Which of the following reasons limit your use of mobile internet?

Base: People with feature phones and smartphones who do not use the internet; n: Refugees=338, Host community members=153

Only one in 10 owners of internet-enabled handsets said they used the internet as much as they would like (eight per cent of refugees and 11 per cent of host community members). Those who do not use the internet as much as they would like were asked what barriers they face, and seven were cited by more than 10 per cent of each group (Figure 11).

This was also emphasised in focus group discussions, with participants stressing that there is a lack of understanding of smartphones and the internet in their communities.

Figure 11
Barriers limiting internet use, by status

	There is limited or no coverage to access the internet in my area	Using the internet on my mobile phone uses too much battery	The internet on my phone is too slow	The cost of buying data is too high for me	I do not know how to use the internet by myself	It is hard to find a mobile agent to buy mobile internet data	I am concerned that I would receive unwanted contact from people online
Refugee	53%	31%	17%	25%	19%	8%	7%
Host community member	76%	52%	26%	22%	17%	15%	11%

Q: Which of the following reasons limit your use of mobile internet?

Base: People who do not use the internet as much as they would like; n: Refugees=114, Host community members= 54



Services and use cases

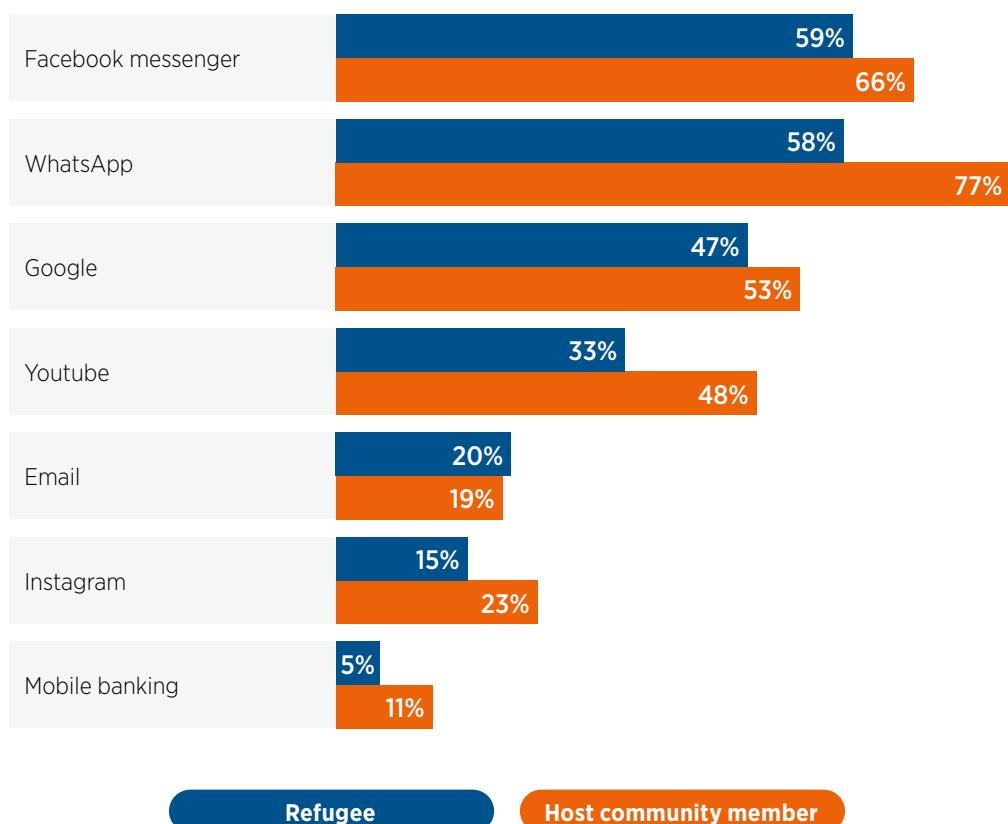
Internet users highlighted a range of online uses for their mobile phones, including messaging, video calling or talking with friends and family (71 per cent of refugees and 89 per cent of host community members); sharing information and content over apps and social media (52 per cent of refugees and 64 per cent of host community members); consuming the news (45 per cent of refugees and 56 per cent of host community members); and searching for specific information on browsers (40 per cent of refugees and 44 per cent of host

community members).

This was reflected in the apps and services they reported using (Figure 12). A smaller group reported using the internet on their phones for educational purposes (25 per cent of refugees and 31 per cent of host community members). In the focus group discussions, the key use cases mentioned were keeping in touch with loved ones (both within and outside Sudan), listening to the Quran and downloading music and videos.

Figure 12

Use of internet-enabled services by feature phone and smartphone owners, by status



Q: What do you use your mobile phone for?
Base: Internet users; n: Refugees=153, Host community members=80

Internet access gaps

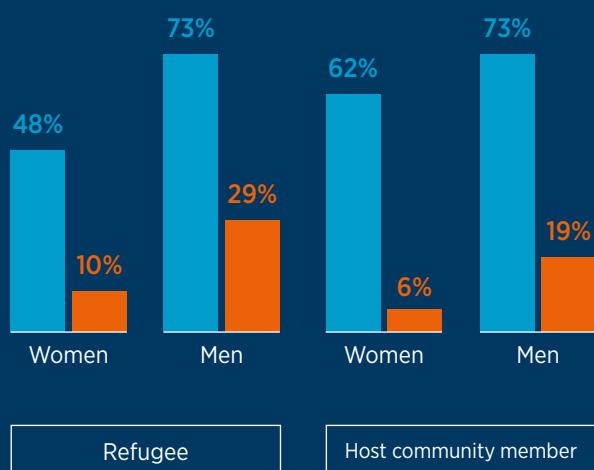
The survey data highlights notable differences in mobile internet awareness and use by gender, age, disability status and primary language spoken.

Gender gap

Among refugees, **women are 34 per cent less likely to have heard of the internet and 66 per cent less likely to use it than men**. Among host community members, these gaps were 15 per cent and 68 per cent, respectively (Figure 13). **Refugee women disproportionately faced digital literacy barriers**, with 73 per cent saying it was a barrier to using the internet versus 42 per cent of refugee men.



Figure 13
Internet awareness and use by status and gender



Q: Have you ever heard of the internet (apps, services and websites like Facebook, WhatsApp, Messenger)? and Do you currently own a phone and use mobile internet?

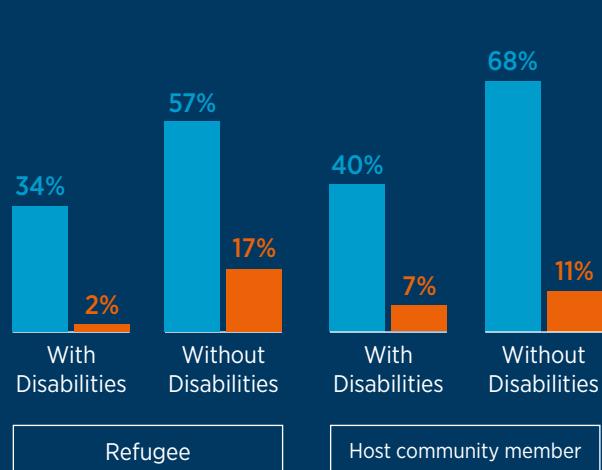
Base: All respondents; n: Refugees (Women=646, Men=293; Host community members (Women=442, Men=180)

Disability gap

There were also clear differences between persons with disabilities and those without disabilities (Figure 14). For example, refugees with a disability were 88 per cent less likely to be using the internet than those without a disability, and host community members with a disability were 42 per cent less likely than those without a disability to have heard of the internet.



Figure 14
Internet awareness and use by status and disability status



Q: Have you ever heard of the internet? and Do you currently own a phone and use mobile internet?

Base: All respondents; n: Refugees (Persons with disabilities=59, Persons without disabilities=880); Host community members (Persons with disabilities=665, Persons without disabilities=55)

Heard of internet

Use internet

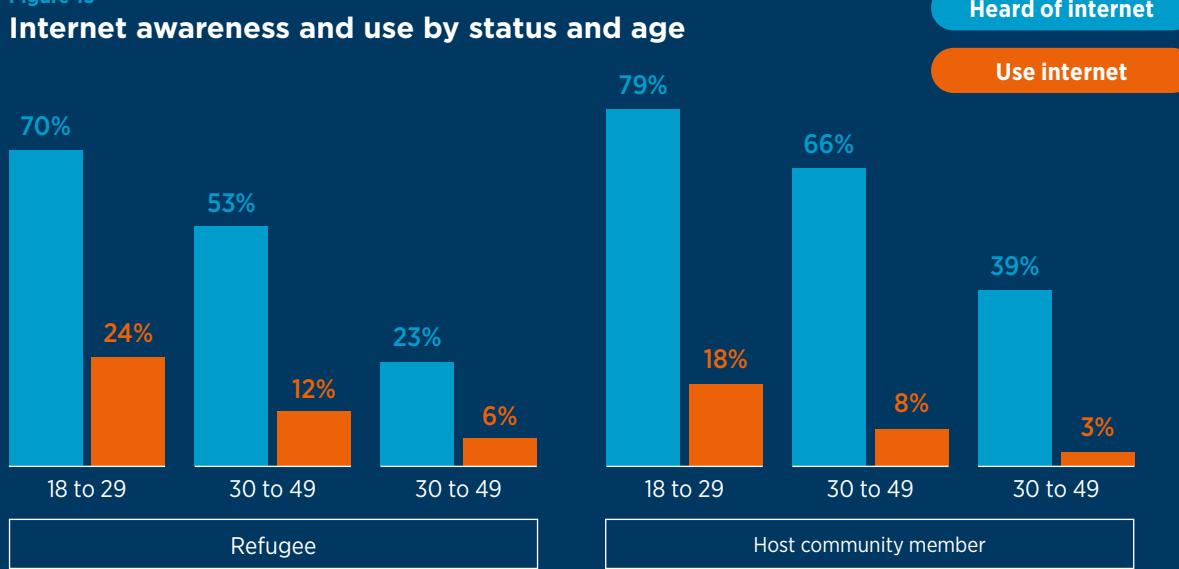


Age gap

Younger people were notably more likely to have heard of and use mobile internet (Figure 15). **Refugees aged 50 and over were 75 per cent less likely to use mobile internet than those aged 18 to 29; within host communities this gap is 83 per cent.**



Figure 15
Internet awareness and use by status and age



Q: Have you ever heard of the internet? and Do you currently own a phone and use mobile internet?

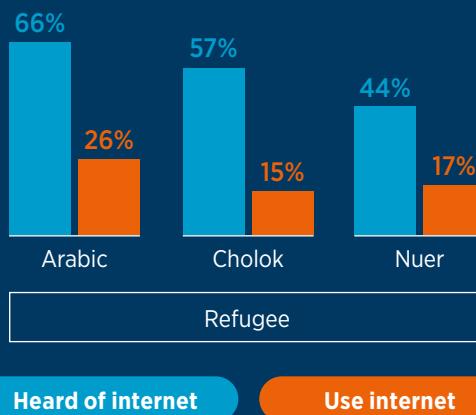
Base: All respondents; n: Refugees (18 to 29=397, 30 to 49=397, 50+=145); Host (18 to 29=300, 40 to 49=283, 50+=140)

Language gap

The official language of Sudan is Arabic, which is also the language of most digital services. However, refugees in White Nile speak a mix of Arabic, Cholok and Nuer, amongst others, and there are clear differences between refugees whose main language is Arabic and those who speak Cholok or Nuer (Figure 16). Individuals who speak only Cholok or Nuer at home are 42 per cent and 35 per cent, respectively, less likely to use mobile internet than Arabic speakers. Only one per cent of Cholok and Nuer speakers who do not use the internet said it was because there was limited content in their language, indicating there are nuanced barriers to uptake.



Figure 16
**Internet awareness and use
by language spoken at home**



Q: Have you ever heard of the internet? and Do you currently own a phone and use mobile internet?

Base: Refugees; n: Arabic=104, Cholok=651, Nuer=180

Mobile money

Very few respondents who were mobile phone users reported using mobile money; just one per cent of the overall refugee sample and two per cent of the overall host community sample members. This may be partially explained by the fact that most phone users in the survey are customers of Zain, which at the time of this research had not launched a mobile money service in Sudan, but are expected to in 2022. However, the research revealed potential unmet consumer demand, given that nearly half of phone users (48 per cent of refugees and 44 per cent of host community members) reported sending and receiving phone credit between friends and family as a form of money transfer.

While phone credit functions similarly to mobile money for the user, it is an informal workaround that does not have consumer protections or the potential for financial inclusion built in. There are also barriers for users, such as a legal daily cap on transfers of SDG 1,000¹⁶ (\$2.24). For mobile money to succeed in these communities, awareness-raising and sensitisation efforts would be needed. Among mobile phone users who do not use mobile money, eight in 10 refugees and host community members reported it was because they did not know what mobile money is.

Trust and concerns

As humanitarian organisations consider how to use digital services to deliver information and assistance, it is essential that they understand the concerns that communities have about the information they receive through digital channels. The assessment identified awareness of fake news and misinformation within the two communities.

In focus groups, participants raised concerns about misinformation and rumours online, specifically on platforms like Facebook where content is perceived largely as opinion rather than fact. This was reflected in the survey: 28 per cent of refugees and 35 per cent of host community members said they were concerned about “receiving wrong information or fake news”.¹⁷ People had more trust in information

found on Google or received directly from someone they know via direct messaging (like WhatsApp). People also reported being concerned about “being a target of a scam or other unfair practice”. These fears were cited by 24 per cent of refugees and 26 per cent of host community members and were more prevalent in groups with higher mobile use.

There were also some concerns about the misuse of personal information shared on a mobile phone, both by humanitarian organisations (11 per cent of refugees and 19 per cent of host community members) and by service providers, such as MNOs (11 per cent of refugees and 14 per cent of host community members). This was not explored in more detail in the focus groups.

¹⁶ As reported by merchants who were interviewed.

¹⁷ Since only 60 per cent of respondents answered this question, the results are presented as a proportion of the overall sample, not just those who gave a response. Reflecting on this approach, it was felt that the issue arose from not offering the option to say, “I have no concerns”. This has been adapted in the toolkit for future deployments.



Digital ecosystem

An essential part of using mobile and digital services in humanitarian settings is a well-functioning digital ecosystem, including the availability of networks, ability to charge devices, provision of services by agents and merchants and much more.¹⁸ This section highlights assessment results related to the digital ecosystems in the research settings in White Nile.



18 Baah, B. and Hamilton, Z. (2021). [Building and strengthening digital ecosystems in humanitarian contexts](#).

Mobile networks

MNOs are a vital service provider and essential for the use of mobile technology. This section highlights the availability and use of Sudan's three MNOs in the research locations.

Network coverage

This assessment uses data from the end user survey as well as signal strength mapping to assess the availability of networks in each research location (see Annex 2: Methodology). Researchers were able to send an SMS and make a phone call on at least one mobile network in each of the six locations, indicating there is some network availability in all areas. In three locations, they were able to access mobile internet services from at least one MNO (Figure 18). This was

largely supported by the survey responses, which recorded the availability of networks and mobile internet. Compared across locations, they show a similar pattern to the signal strength mapping exercise with a degree of nuance. Interestingly, people felt that the type of mobile phone a person used affected their ability to access a network, and researchers were told that Techno brand feature phones were the best.

Figure 18
Network availability, by research location

	AI Alagaya camp	Alagaya village	AI Redis II camp	Redis Madras village	Khor Alwarel camp	Debeba village
Signal	2 networks	1 network	3 networks	3 networks	3 networks	3 networks
SMS	2 networks	1 network	3 networks	3 networks	3 networks	3 networks
Call	2 networks	1 network	3 networks	3 networks	3 networks	3 networks
Data	0 networks	0 networks	3 networks	2 networks	0 networks	1 network
Instant message	0 networks	0 networks	3 networks	2 networks	0 networks	1 network
Internet call	0 networks	0 networks	1 network	2 networks	0 networks	0 networks
Stream video	0 networks	0 networks	2 networks	2 networks	0 networks	0 networks
Mobile network available at home	67%	70%	96%	99%	90%	92%
Mobile data available at home	21%	24%	54%	57%	26%	35%

Signal strength mapping: three measurements per location

Q: Do you have network coverage to make calls and send text messages (SMS) with your mobile phone at home?

Base: Mobile phone owners; n: AAC=221, AV=207, AR2C=268, RMV=71, KAC=269, DV=174

Q: Do you have mobile internet (data) coverage on your phone for apps and websites like Facebook, WhatsApp, etc. at home?

Base: Internet-enabled mobile phone owners; n: AAC=161, AV=136, AR2C=169, RMV=21, KAC=156, DV=78



Customers

Among both refugee and host community respondents, the vast majority (98 per cent) of mobile phone owners reported they were customers of Zain. This was raised in focus group discussions

because it was felt that Zain has greater coverage, more merchants delivering services and better tariffs.

MERCHANTS AND AGENTS

Sixty-seven merchants and agents who provide mobile products and services in the research locations were interviewed as part of this assessment. Agents reported serving an average of 35 customers a day. Across all locations, they serve a mix of refugee and host community customers and provide a range of enabling services to help them stay connected.

Airtime and credit

The most common service provided by merchants is airtime sales, enabling customers to top up their balance. This is clearly an important service, as nearly all mobile phone owners (96 per cent of refugees and 83 per cent of host community members)

reported topping up directly with an agent or via a scratch card, which would also have been purchased from a merchant (39 per cent and 48 per cent, respectively). None of the agents interviewed reported providing mobile money services.

Charging

Provision of charging services is an important aspect of merchant business in these locations, likely because **less than half of phone owners have access to charging at home (34 per cent of refugees and 42 per cent of host community members)**.

Of the 67 merchants interviewed, 45 said they provided charging as part of their business. In the focus group discussions, participants discussed these services and reported charges ranging from SDG 50 to 100 (\$0.11 to \$0.22), which they felt was high. Participants in Redis Madras village also pointed out that there is a service through which

people can rent a battery for SDG 800 (\$1.79) and charge up to six phone batteries. This was also considered very expensive.

Access to charging was frequently identified by focus group participants as a service they would like to see from humanitarian organisations, with several asking for distributions of solar-based solutions. Since there were no notable differences in access to charging at home for potentially marginalised groups, humanitarian organisations might consider focusing potential distributions on those who cannot afford to charge their phones regularly using solutions already available in the market..

Problem solving

As in many settings, merchants and agents are a key resource in White Nile for solving customer issues with their mobile phones. Most of the agents interviewed reported teaching people how to use their handsets, talking them through how to top up their balance and replace SIM cards and batteries. A few agents mentioned providing more advanced

services, such as repairing handsets, screens and speakers. These kinds of services are important for extending the life of handsets and helping people stay connected for longer, especially where the price of handsets is seen as a barrier to digital inclusion as in White Nile.

Sales

Less than half of agents reported selling handsets as part of their business, which is not surprising given that demand for a new handset is likely to be lower than for other services that a mobile phone user would access regularly. Just over a third

reported selling SIM cards, but this is likely low since regulation in Sudan requires SIM cards to be registered at a specific location that was outside the research sites.

Digital humanitarian services

Humanitarians and other providers of vital services can play a key role in the development of digital ecosystems as they can enable the development and deployment of digital products and services.¹⁹ It was clear from both the focus group discussions and the end user survey that there are few to no humanitarian services provided digitally (less than 10 per cent of survey respondents said they use their phones to learn about humanitarian assistance or provide feedback to NGOs).

However, this research has identified ways in which humanitarian organisations could change this. **In focus group discussions, there was consensus that humanitarian organisations should capitalise on widespread phone access to provide information via calls and SMS, which are available in all locations.** There was also a sense that, with sufficient connectivity and access to smartphones, humanitarian organisations could take advantage of WhatsApp to provide information and engage with communities, especially with younger people.

19 Baah, B. and Hamilton, Z. (2021). [Building and strengthening digital ecosystems in humanitarian contexts](#).



Conclusions and recommendations



Mobile phone ownership

Conclusion

Individual access to phones is high amongst both refugee and host communities, however there are notable disparities when looking at the access of women, older people, and people with disabilities. Access to internet enabled phones, especially smartphones, remains low. The primary barrier preventing people owning their own phone is cost.

Recommendations

Humanitarian organisations should investigate ways in which they might enable more people to own their own handset, ideally internet enabled phones. Solutions should prioritise the needs of women and older people, who are less likely to own a phone. Programmes should also prioritise people where there is no mobile phone in the household already. Any programming increasing handset access should be in collaboration with **private sector actors**

and explore activities that promote sustainable ownership without disrupting local markets. **Donors** should also remain open minded about supporting activities around innovative financing solutions.

Previous solutions to this have included long-term financing models where people can make small, regular payments over a period time to pay off a handset, this model has however been found less suitable for low-income or rural groups.²⁰

Additionally, **humanitarian organisations** should design market based programming that supports those most in need, without impacting the sustainability of local businesses. This will likely involve a detailed mapping of the existing market.

All solutions should ensure that handsets are suitable for the context they will be used in (for example being confident that batteries will not swell-up in the heat and render the phone unusable).

20 Carboni, I. (2022) [M-KOPA: Applying the pay-as-you-go model to smartphones in Africa](#). GSMA.



Identity and registration

Conclusion

Whilst most people report having their SIM card registered in their own names, this is not the case for sizeable minorities, especially amongst refugees. The situation may improve over time as UNHCR is working with government stakeholders to clarify Know Your Customer regulations. However, in the current landscape this means that many individuals run the risk of being excluded from accessing value-added services, such as mobile money, until they are able to register for services in their own name.

Recommendations

Humanitarian organisations should consider what they might do to support people to access identity documents that they are entitled to, ensuring as many people as possible possess ID which is accepted by know-your-customer (KYC) and SIM registration rules. Humanitarians should consider

how they can use access to digital services as an explanation for why it is important the people they serve are registered, encouraging as many people as possible to engage with this process. These sensitization activities should also include a risk analysis exploring potential negative impacts from refugee registration.

Where processes hinder the delivery of life-saving assistance, **all stakeholders** should consider how they can partner to best make a case to policy makers for change. This can be best led by different partners, in Mozambique for example, Vodacom was able to advocate the needs of individuals affected by Cyclone Idai to gain a six-month waiver on SIM registration, meaning roughly 10,000 individuals who had lost their identity documents were able to purchase SIMs and communicate.²¹



Charging

Conclusion

People in White Nile have limited access to energy at home to charge their phones and services in marketplaces are felt to be expensive by many. People are hoping that new solutions will be made available to enable them to charge their mobile phones regularly and reliably.

Recommendations

Providers of off-grid energy solutions should investigate whether it may be possible to bring existing services such as pay-as-you-go solar home systems into White Nile. Similar services have demonstrated commercial sustainability in other displacement contexts in Africa.²²

Humanitarians should identify the ways in which they might partner with energy service providers to

help them tailor operational models to suit the needs of displacement-affected communities. Partnerships can lead to adaptations of payment plans, for example, Altech in the Democratic Republic of Congo, are investigating how removing down-payments might increase uptake of solar home systems in camps hosting Burundian refugees.²³

Additionally **MNOs** and **Humanitarians** might work together to continue expanding the number of multipurpose merchants that can provide affordable charging solutions in market places.

Donors might consider how they can provide humanitarian funding to reduce the costs for low-income customers in displacement affected communities as a means of bringing innovative energy solutions to low-income and potentially marginalise groups in these settings.

21 Baah, B. and Downer, M. (2020) *Partnering During Crisis: The Shared Value of Partnerships between Mobile Network Operators and Humanitarian Organisations*. GSMA

22 Caswell, J. (2019) *Mobile-enabled energy for humanitarian contexts: The case for pay-as-you-go solar home systems in Kakuma Refugee Camp*. GSMA

23 GSMA (2022) *Mobile for Humanitarian Innovation Fund: Portfolio 2017-2022*.



Digital literacy

Conclusion

Digital skills are a key barrier to accessing and using service such as mobile internet and they will present a barrier to any future digital humanitarian services. This is especially true amongst older people and women.

Recommendations

Humanitarians and **MNOs** should investigate ways in which they can collaborate to deliver comprehensive digital skills training that is tailored to the local context. Training should focus on the needs of the most marginalised groups, leverage existing networks within communities (such as mobile agents or humanitarian staff), and be available to learners regularly (rather than being one off).²⁴

GSMA's Mobile Internet Skills Training Toolkit (MISTT), a set of free resources to teach people the basic skills they need to access and use mobile internet could be a good foundation for this work. The toolkit uses a

'train the trainer' approach which could be leveraged through existing networks in the communities.²⁵ It will also be important to complement this training with more foundational information, such as how to use basic functions of a mobile handset, for people earlier on in their digital skills journey.

Humanitarian organisations might also explore how they might support younger, more digital literate, members of the community to share knowledge with older people. Additionally, it will be important to take time to tailor training to the specific needs of women, likely through additional formative research.

Service providers could investigate how they galvanise existing services to extend digital skills training into communities. In Uganda, Grameen Foundation required participants on their programme to help people to set up a new mobile money business to first train 100 members of the community in digital financial skills before they receive benefits.²⁶



Mobile money

Conclusion

Mobile money use is very low, with the main identified barrier being that people are simply unaware of it. However, the fact that a large proportion of people reported sending credit as a means of P2P transfer indicates that there is potential unmet demand for mobile financial services.

Recommendations

Mobile money providers should investigate how they might expand awareness and service provision into White Nile; no interviewed agents reported providing mobile money services and these individuals are likely to be some of the best placed to encourage uptake and provide training in requisite skills which may help drive up demand for the use of formal financial services.

Humanitarian organisations should investigate, alongside **mobile money providers**, ways in which

they can support the upskilling and adoption of mobile financial services by the communities they serve. This could be either as part of a sensitisation for cash programming, or a stand-alone piece as part of a partnership. In Somaliland, when introducing a new voice identification to existing cash programming, CARE and Telesom found combining sensitisation during registration and ongoing recorded instructions to be an effective way of upskilling cash recipients.²⁷ This would likely need to be combined with ongoing training support when introducing people to a whole new service.

Humanitarians and **mobile money providers** will need to continue working together as services expand to ensure products can be tailored, based on understanding of user needs and preferences, to directly suit people in need of humanitarian assistance.

24 Downer, M. (2021) "Digital skills development for equitable and dignified humanitarian assistance." [ITU Digital Skills Insights 2021](#). ITU.
25 GSMA. [Mobile Internet Skills Training Toolkit](#) (website).
26 Downer, M. (2021) "Digital skills development for equitable and dignified humanitarian assistance." [ITU Digital Skills Insights 2021](#). ITU.
27 GSMA (2021) [Verifying recipients of cash assistance through Voice ID: Pilot project lessons and outcomes](#).



Communicating with communities

Conclusion

Most people reported knowing how to use mobile phones for calling and using USSD, with around half also knowing how to send and receive SMS messages. People also said that they would like to receive information and services from humanitarians via these channels.

It was also clear that people are wary of information they receive on social media, as they are aware of issues related to disinformation.

Recommendations

Humanitarian organisations should investigate how they can further leverage calls and USSD to communicate with the communities that they serve. One way to use voice calls might be to use interactive voice response (IVR) technology, which NRC is currently doing as one part of its Digital Community Hub (DCH) whereby people

can call a toll-free line and listen to pre-recorded audio messages in English, Arabic, Tigrinya, and Amharic and navigate the IVR using their mobile phone keypad to get to information on legal civil documentation or leave a voice message requesting additional information. This is alongside other channels such as SMS.

Amongst specific groups, it may also be suitable to try using SMS or WhatsApp, though it will be important to ensure that alternative channels are available to those who do not use these for any reason.

As with all work to communicate with people, **all stakeholders** will need to ensure they understand individuals' broader communication and information needs to contact them in a way in which they are most likely to trust the information served to them.



Network coverage

Conclusion

Many participants identified weak network coverage as a barrier to increased digital inclusion. The assessment itself also highlighted that several research locations had limited access to mobile internet coverage.

Recommendations

Mobile network operators already have systematic approaches to extending their coverage across Sudan, which consider unmet demand of customers. They might consider investigating whether they are able to expand coverage to areas where humanitarians are interested in delivering assistance digitally.

Humanitarians should engage with **MNOs** to discuss needs, and as much as possible, aggregate demand across the sector to help increase scale of need and support the development of a commercial business case. Where this is not the case, **donors** or **development finance institutions** might investigate how they might provide de-risking capital to support expansion into areas where the potential for commercial sustainability is less evident.



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Annex 2: Methodology

This annex provides a methodology note for each of the data collection methods and tools used as part of this assessment.

End user survey

The end user survey used a tailored version of the tool provided in the CoNUA toolkit, which took into account both the local realities and the priorities of NRC. This was coded into Kobo and used to collect data in December 2021. Sampling for the survey was done using a two-stage stratified cluster methodology, with the primary sampling unit being the camp/village and the second the individual. Three camps with distinct characteristics, including population and geographic location along the Nile were selected, while settlements representing the host community were selected based on their proximity to the selected camps.

The final sample provides a five per cent margin of error at 90 per cent confidence. The sample allows statements to be made at a location level and when talking about answers provided by refugee or host community respondents. Using UNHCR data from September 2020,²⁸ it is known that the refugee sample is within three per cent of population splits of gender and age (under 60 against 60 and over).

Of 1,662 survey respondents, 939 people identified as a refugee while 706 people identified as members of the local community and 17 as internally displaced persons (IDPs). For analysis purposes, IDPs and local community members were combined into one “host community” sample. This was because the IDP respondents shared the same primary language (Arabic) and, except for one individual, all lived in the host villages. Table 4 shows the demographic splits of two samples. The two groups are broadly

comparable by disability status and age, with the refugee sample having slightly more female respondents than the host community.

Table 4
Demographics of samples

		Refugee	Host
Gender	Male	31%	39%
	Female	69%	61%
Disability status²⁹	with a disability	6%	8%
	without a disability	94%	92%
Age	18 to 24	30%	33%
	25 to 34	31%	26%
	35 to 44	21%	20%
	45 to 54	9%	11%
	55+	10%	11%
	Mean	35.8	36.0
Displacement status	IDP	0%	98%
	Local	0%	2%
	Refugee	100%	0%
Main language spoken at home	Arabic	6%	100%
	Cholok	70%	0%
	English	0.1%	0.1%
	Nuer	19%	0%
	Mix	5% ³⁰	0%

28 UNHCR. (2020). *Refugees from South Sudan: State Level*.

29 Disability was determined based on the Washington Group Short Set of Questions. Anyone who answered “a lot of difficulty” or “cannot do” to any of the questions were analysed as a person with a disability.

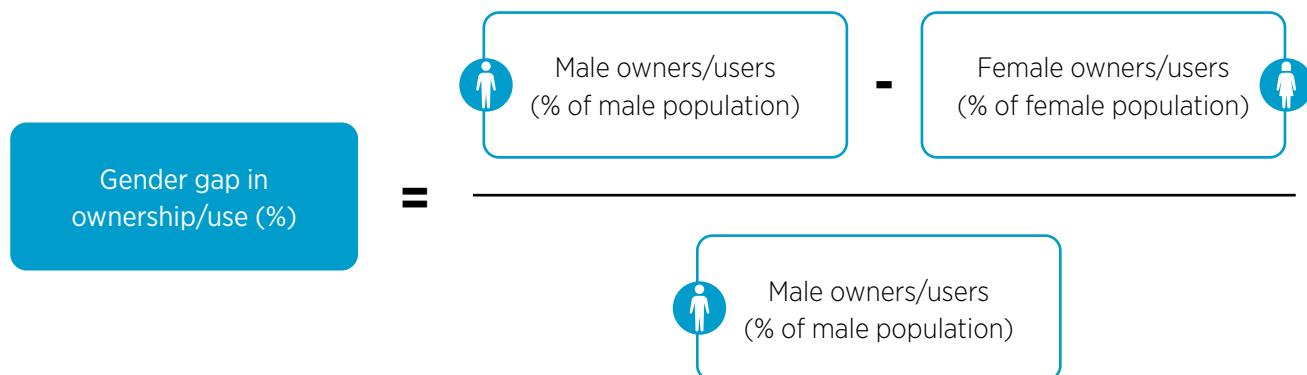
30 All except one of these combinations include Arabic. For much of the analysis, these people are included with Arabic-only households to look at the experience of those who speak minority languages.



All questions in the survey were voluntary and respondents could choose not to answer any of the questions. This means that questions have fluctuating base sizes depending on whether individuals chose not to provide certain answers. Most of the analysis is based on those who provided an answer. Where more than 10 per cent chose not to answer a question, the analysis is based on the total eligible sample and is flagged.

This report pays close analytical attention to patterns of digital exclusion, conducting analysis of groups traditionally at higher risk of being excluded, including women, older people, persons

with disabilities and those who speak a minority language. Often, this analysis is presented by sizing “gaps”, such as the “mobile gender gap” or “mobile disability gap”. Each gap is presented as how much less likely a member of a potentially marginalised group is to own/access a mobile phone compared to those outside the group. For example, a mobile age gap can show how much less likely an older person is to own a mobile phone than a younger person. This assessment uses the Washington Group Short Set of Questions (WGQs) to identify people with a disability.³¹



Finally, where comparisons are made in the text of this report, they are always significant at $p<0.05$ and 95 per cent confidence. This does not apply when the values for refugees and host community

members are simply presented next to each other, but only where such a difference is specifically commented on, such as “refugee respondents were notably more likely to say...”.

³¹ Washington Group on Disability Statistics. (2020). [The Washington Group Short Set on Functioning \(WG-SS\)](#).

Focus group discussions

The assessment used a tailored FGD guide, which drew on questions from different guides available in the CoNUA toolkit. The FGD guide explored the services available in each location, the services that people use and the ways that people can charge their phones. They also explored the perspectives of participants on the digital exclusion of certain groups and the best ways humanitarian organisations might use mobile technology to deliver their services.

One mixed-gender focus group of between six and nine was conducted in each research location, except for Debeba village. Participants were selected in consultation with community leaders and teachers,

ensuring inclusion across a range of demographics and traditionally marginalised groups. In total, 36 people took part in the focus groups: 22 refugees and 14 host community members; 22 men and 14 women; and five people who identified as having a disability. All were aged 18 to 70.

The focus group discussions were conducted in Arabic and Cholok with high-level findings translated back into English by NRC field teams. This means that while the groups have helped to structure and validate findings, the depth of analysis does not enable the qualitative data to lead findings.

Merchant interviews

Using the CoNUA tool, this assessment collected quantitative data from merchants that provide mobile services (such as airtime sales or charging services) across the six locations. Using an interview to collect structured data, this exercise identified the types of services available, with customers helping to create a picture of the market in each of the locations. This

exercise uses convenience sampling of merchants who were operating at the time of data collection and willing to speak to researchers. As such, it is not necessarily a comprehensive mapping of service availability, but an indicative understanding of the state of commercial service provision in the research locations.

Signal strength mapping

The assessment used the CoNUA signal strength mapping tool to assess the availability of mobile networks in each of the six research locations. At a central location, such as a marketplace, and using a SIM card from each of Sudan's three MNOs (MTN, Sudani and Zain), researchers attempted to send an **SMS**, make a **phone call**, send a **WhatsApp message**,

make a **WhatsApp call** and stream a **YouTube video** and then recorded whether it was successful. Although an indicator of network availability, it is a relatively crude one as it does not account for variable access in each location outside the central marketplace, and does not consider atypical outages or disruptions experienced at the time.

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