



THE REPUBLIC OF UGANDA
MINISTRY OF HEALTH

ASSESSMENT REPORT

Implementing the New Antenatal Care Model in Uganda: Ultrasound and Sonography

Last revised: March 15, 2023

Updated following the National ANC TWG meeting on February 02, 2023.



Acknowledgments

This assessment report results from a combined effort of staff from the Uganda Ministry of Health, the Maternal Child Health Technical Working Group – Antenatal Care Subcommittee, United States Agency for International Development (USAID) and USAID’s supported partners, including Maternal Child Health and Nutrition Activity (MCHN), Regional Health Integration to Enhance Services (RHITES)-North Acholi, RHITES-South West, RHITES-East, UNICEF Uganda, and AVSI Foundation Uganda, and all the participating district health teams, health facilities, and health workers.

Table of Contents

Background.....	1
Implementation Framework.....	1
Assessment.....	1
Study Objectives.....	2
Methods.....	2
Design.....	2
Sampling Strategy.....	2
Data Collection.....	2
Data Management.....	3
Data Analysis.....	4
Results.....	4
1. Characteristics of health facilities assessed	4
Number of health facilities assessed.....	4
Relationship between level of care and managing authority.....	4
2. Ultrasound machines and supplies	4
Have an ultrasound machine.....	4
Number of ultrasound machines.....	5
Functionality of ultrasound machines.....	5
Number of ultrasound services provided in the last three months.....	6
How ultrasound machine was obtained.....	6
Average age of ultrasound machines.....	7
Maintenance plan.....	7
Repair plan.....	8
Current availability of ultrasound-related supplies.....	8
3. Facility infrastructure	9
Electricity.....	9
<i>Facility connected to power</i>	9
<i>Power source for charging medical devices</i>	9
<i>Number days facility lost power for two hours or more during open hours in the last week</i>	9
Space and equipment.....	10
Designated scanning area/room.....	10
Secure storage for ultrasound.....	10
Examination bed for scanning.....	10
Bar stool for ultrasound operator.....	11

4. Workforce	11
Number of trained health workers for sonography.....	11
Number of trained health workers for obstetric ultrasound sonography	11
Cadre of health worker providing ultrasound services.....	11
Training received	12
Support supervision	12
5. Information systems	12
Have register to document ultrasound services	13
Ultrasound service delivery recorded in Health Management Information System (HMIS)/District Health Information System 2 (DHIS2)	13
6. Funds	13
How ultrasound-related costs are covered.....	13
User fee for ultrasound services	14
7. Service delivery	14
Accessing ultrasound services.....	14
Turnaround time of results	14
8. Factors influencing effective service delivery	14
Number of days ANC services were offered in a week.....	14
Number of days health worker available to provide obstetric ultrasounds in a week.....	15
Provider availability to conduct obstetric ultrasounds during ANC days.....	15
Discussion, Recommendations, and Considerations for Scale	15
Appendix: Data Tables	17

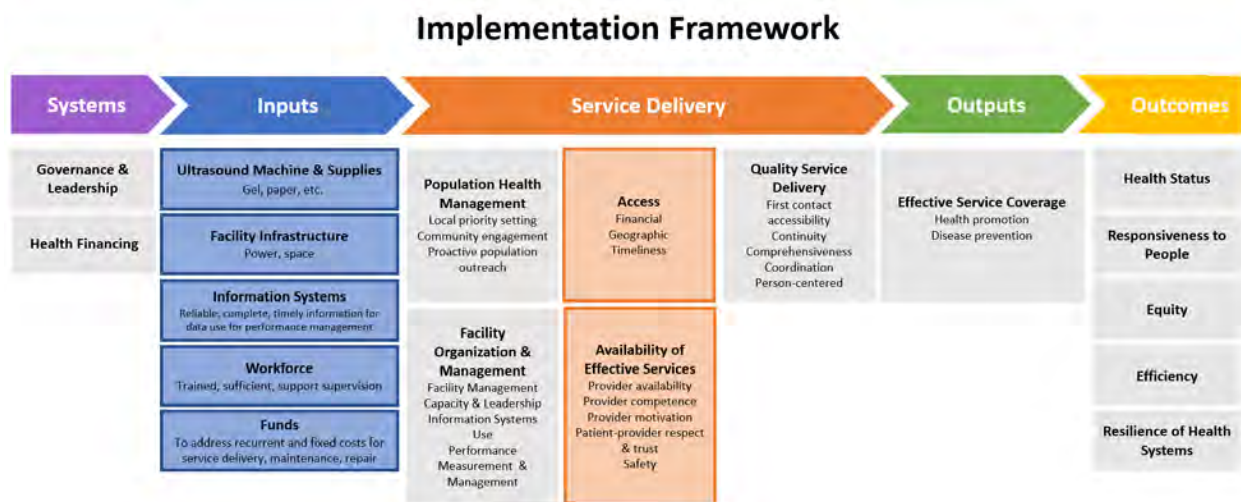
Background

In 2016, the World Health Organization (WHO) recommended one ultrasound scan before 24 weeks gestational age to improve detection of fetal anomalies and multiple births, reduce induction of labor for post-term pregnancy, and improve a woman’s pregnancy experience.¹ In 2021, Uganda expanded its Goal-Oriented Antenatal Care Protocol to include the WHO recommendation on ultrasonography; the revised protocol is known as the New Antenatal Care (ANC) Model. The New ANC Model was approved by the ANC Subcommittee, Maternal Child Health Cluster, Senior Management Committee, Health Policy Advisory Committee (April 2021), and Top Management (September 2021). In December 2021, the Ministry of Health submitted a Cabinet Memorandum to the Cabinet proposing the financial scale-up of ultrasonography in Health Center (HC) IIIs and IVs to effectively implement the New ANC Model.

Implementation Framework

The ANC ultrasound sonography implementation framework depicted in Figure 1 details the critical components necessary to achieve effective service coverage of an ultrasound scan for every pregnant woman before 24 weeks gestation. Notably, the scope of this assessment is restricted to understanding the inputs necessary for service delivery (blue) and the access and availability of effective services (orange); other factors for systems, population health management, facility organization and management, quality service delivery, service delivery outputs, and outcomes are not assessed (grey).

Figure 1. ANC Ultrasound Sonography Implementation Framework



Adapted from the Primary Health Care Performance Initiative (PHCPI) Conceptual Framework, 2022, showing the critical components of a strong PHC system. Available from: <https://www.improvingphc.org/phcpi-conceptual-framework>.

Assessment

In March 2022, the Ministry of Health requested the United States Agency for International Development (USAID) Maternal Child Health and Nutrition (MCHN) Activity to design an assessment tool to assess existing ultrasound availability and the human resource capacity for sonography at public, private-not-for-profit, and private-for-profit HC IIIs, IVs, hospitals, and other imaging centers.

¹ World Health Organization (WHO). WHO recommendations on antenatal care for a positive pregnancy experience. Geneva: WHO; 2016. Available from: <https://www.who.int/publications/i/item/9789241549912>.

Study Objectives

1. To characterize the **availability of critical inputs**, such as ultrasound equipment and related supplies, facility infrastructure, information system, workforce, and funds to support ANC ultrasound at eligible health facilities in regions and districts participating in the assessment.
2. To describe **patient-related accessibility** to obstetric ultrasound sonography, such as fee for service and timeliness of sonography results at eligible health facilities in regions and districts participating in the assessment.

Methods

Design

The assessment was a cross-sectional interviewer-administered semi-structured survey for which data collection at health facilities took place one time from June to October 2022.

Sampling Strategy

The assessment utilized a purposeful sampling strategy: all static health facilities providing ANC services were eligible to be surveyed (Table 1). This included clinics, HC IIs,² IIIs, IVs, and hospitals (e.g., district/general, regional referral [RRH], national referral [NRH]), and other imaging centers managed by the government, private-not-profit (PNFP) organizations, and private-for-profit (PFP) organizations.

Table 1. Health facilities (HFs) eligible to be included in the assessment

Region	No. HFs in Region	No. (%) HFs Out of Region
Acholi	284	22 (8%)
Ankole	381	16 (4%)
Bugisu	243	14 (6%)
Bukedi	166	3 (2%)
Bunyoro	225	7 (3%)
Kampala	318	62 (19%)
Teso	190	9 (5%)
West Nile	309	90 (29%)

Data Collection

Assessment data were collected in collaboration with district local government (DLG), District Health Teams (DHTs), and implementing partners responsible for maternal child health activities at the district level (Table 2). MCHN provided virtual training sessions for collaborating implementing partners to orient them to the assessment tool, the use of Kobo Collect® (a mobile data collection platform), and to data management practices to ensure data quality and security.

² HC IIs were included because some private-for-profit HC IIs provided ultrasound services.

Table 2. Implementing partners responsible for MCH activities, by region

Region	Implementing Partners
Acholi	USAID RHITES North Acholi, Gulu DLG
Ankole	USAID RHITES South West, Elizabeth Glaser Pediatric Aids Foundation
Bugisu	USAID RHITES East, IntraHealth
Bukedi	USAID RHITES East, IntraHealth
Bunyoro	Kiryandongo District Health Team
Kampala	USAID MCHN Activity, Kampala Capital City Authority
Teso	USAID RHITES East, IntraHealth
West Nile	AVSI

RHITES=Regional Health Integration to Enhance Services; AVSI=Association of Volunteers in International Service

Data Management

The semi-structured survey questions were programmed into digital and mobile data entry forms in Kobo Collect® with customized logic patterns, range checking, and automatic skip patterns to maximize collection of accurate and reliable data. Kobo Collect® will allow interviewers to record responses in offline settings and upload and back-up the data onto a secure server. Data from the secure Kobo Collect® server was downloaded onto FHI 360³'s secure server daily to ensure data security and back-up. At the end of data collection, the Kobo Collect® database was downloaded as an Excel file (.xlsx) for data cleaning and analysis. Table 3 summarizes the recoded measurements.

Table 3. Measurements

Label	Original	Recoding
Number of days health facility offers ANC services	7 binary variables (Y/N) for the seven days of the week	Recoded to a composite variable summarizing the total number of days ANC services are offered in a week; range from 0 to 7.
Age of ultrasound machine (years)	Continuous variable of years	Recategorized to 1–5 years (ideal lifespan of an ultrasound machine), 6–7 years (maximum threshold of an ultrasound machine's lifespan), and >7 years.
Functionality of ultrasound machine composite score	3 binary variables (Y/N) on the functionality of components: probe, screen, keyboard	Recoded to a composite variable summarizing the total number of functional components from 0 to 3.
Timely maintenance of ultrasound machine	Date variable, Never, Don't know	Recoded date of last maintenance to months by subtracting the month/year of interview to the month/year of maintenance; recategorized the months to ≤3 months (ideal period for maintenance), 4–6 months, 7–9 months, 10–12 months, and >12 months
Current availability of ultrasound-related supplies composite score	8 binary variables (Y/N) on the availability of gel, condoms, plastic sheet, cotton cloths/toilet paper (TP), sonographic paper, toner, computer, and printer	Recoded to a composite variable summarizing the total number of currently available supplies from 0 to 8.

³ FHI 360 is the prime leading the USAID Maternal Child Health and Nutrition Activity

Data Analysis

Quantitative data were summarized using descriptive statistics by region, level of care, and managing authority. Discrete data are summarized by frequencies and percentages, and continuous data are summarized by means, standard deviations, minima, and maxima.

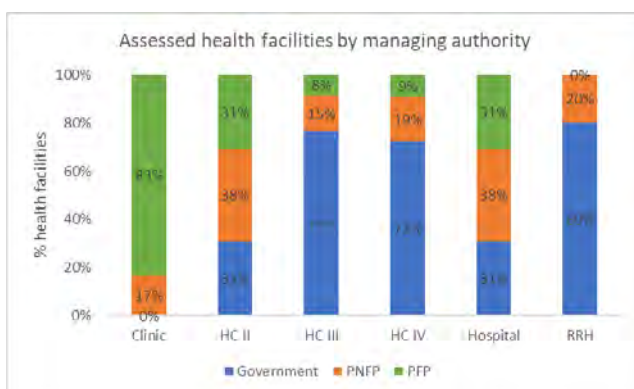
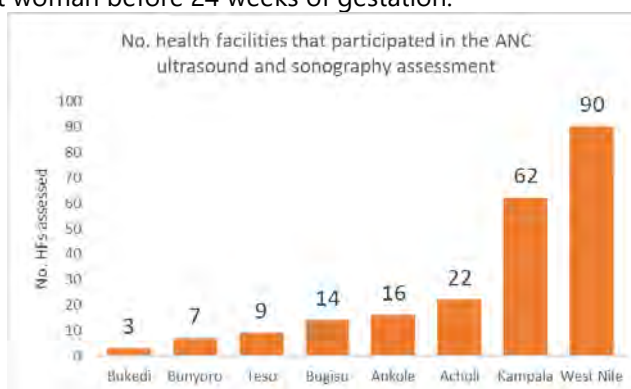
Results

1. Characteristics of health facilities assessed

Number of health facilities assessed

A total of 223 health facilities were assessed for critical components necessary to achieve effective service coverage of an ultrasound scan for every pregnant woman before 24 weeks of gestation.

- **Regions:** The assessed facilities represented eight regions and 55 districts. West Nile region represented the largest sample (90, 40%), followed by Kampala district (62, 28%), Acholi region (22, 10%), Ankole region (16, 7%), Bugisu region (14, 6%), Teso region (9, 4%), Bunyoro region (7, 3%), and Bukedi region (3, 1%).
- **Level of care:** Most of the assessed facilities were HC IIIs (106, 48%) followed by HC IVs (54, 24%), hospitals (39, 17%), HC IIs (13, 6%), clinics (6, 3%), and RRHs (5, 2%). Nearly all levels of care were represented in Acholi, Ankole, Kampala, Teso, and West Nile. Bugisu and Bukedi had only HC IVs and hospitals, and Bunyoro had only HC IIIs.
- **Managing authority:** Most of the assessed facilities were public (140, 63%) followed by PNFP (48, 22%) and PFP (35, 16%). In Acholi, Ankole, Bugisu, Kampala, and Teso, all managing authorities were represented. In Bukedi and Bunyoro, only government facilities were assessed. In West Nile, only government and PNFP facilities were assessed.



Relationship between level of care and managing authority

Among the assessed facilities, most of the clinics were PFPs (83%), and most of the HC IIIs, IVs, and RRHs were government sites (>70%). HC IIs and hospitals were more evenly represented among government (31%), PNFP (38%), and PFP sites (31%).

2. Ultrasound machines and supplies

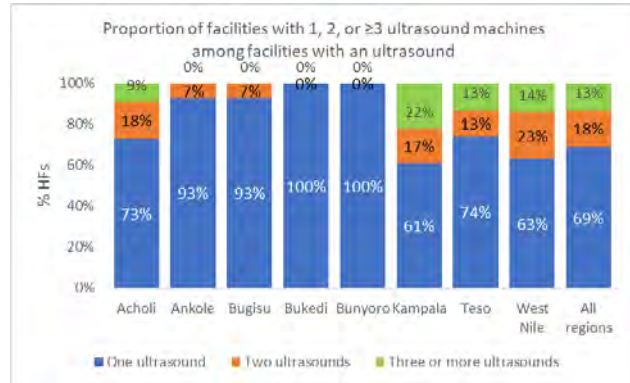
Have an ultrasound machine

Overall, 61% (137/223) of the purposefully sampled facilities had an ultrasound machine (note: the sampled facilities do not represent all the facilities in its region or nationally); and the 86 health facilities without an ultrasound were dropped from subsequent analyses.

- **Region:** All the sampled facilities in Acholi and Bukedi had an ultrasound machine (100%); 80%–99% in Ankole, Bugisu, Kampala, and Teso had an ultrasound machine; <50% in Bunyoro and West Nile had an ultrasound machine.
- **Level of care:** All the assessed clinics, hospitals, and RRHs had an ultrasound (100%); >80% of the HC IVs had an ultrasound machine; >50% of the HC IIs had an ultrasound machine; and <50% of the HC IIIs had an ultrasound machine.
- **Managing authority:** The majority of PFP (94%) and PNFP (81%) facilities had an ultrasound machine compared to 46% public facilities that had one.

Number of ultrasound machines

The majority (69%) of assessed facilities had only one ultrasound machine, followed by 18% with two machines, 8% with three, 2% with four, and 3% with five or more machines.



- **Regions:** Most facilities across the regions had only one ultrasound machine (Acholi 73%, Ankole 88%, Bugisu 93%, Bukedi 100%, Bunyoro 100%, Kampala 61%, Teso 75%, and West Nile 64%).
- **Level of care:** Higher levels of care had more ultrasound machines; facilities with three or more machines were hospitals and RRHs.
- **Managing authority:** A greater proportion of PNFP facilities had three or more ultrasound machines (20%) than PFP facilities (15%) and public facilities (9%).

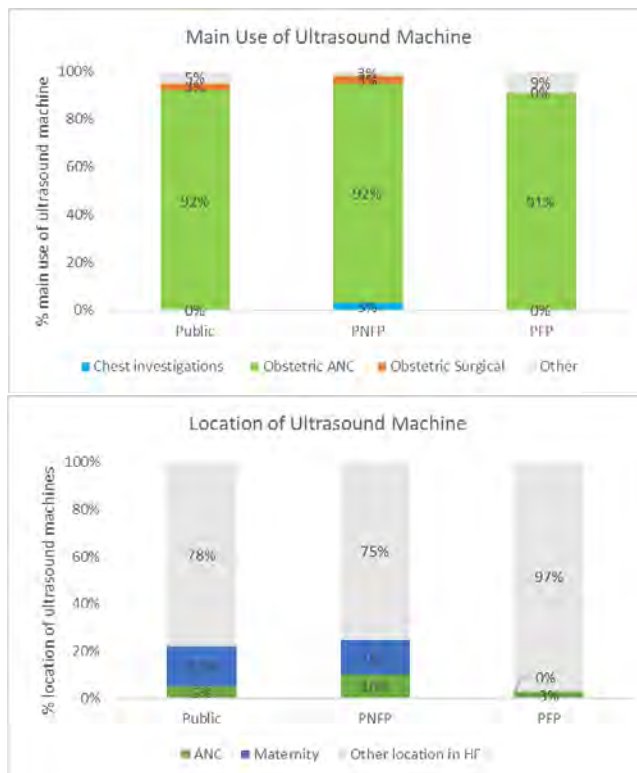
Functionality of ultrasound machines

Ultrasound functionality was defined by functionality of three critical components: the probe, screen, and keyboard. Overall, 96% of probes, 98% of screens, and 96% of keyboards were functional among the assessed facilities. The average composite score was 2.90 (0 being the lowest score with no functioning components and 3 being the highest score with all functioning components).

- **Regions:** Acholi, Bukedi, and Bunyoro all scored 3 of 3 on the composite score for functionality, and all the remaining regions scored at least 2.67 of 3.
- **Level of care:** Clinics, HC IIs, and RRHs all scored 3 of 3 on the composite score for functionality, and all the remaining levels of care scored at least 2.82 of 3.
- **Managing authority:** PFPs scored 2.97 of 3 compared to public facilities (2.89) and PNFPs (2.85) for functionality among the assessed facilities.

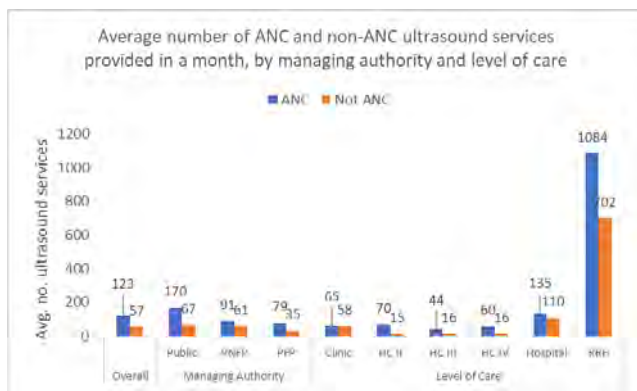
Main use, location, and portability of ultrasound machines

Nearly all assessed facilities (93%) across regions, levels of care, and managing authority reported that the main use of the ultrasound machine is for obstetric ANC. However, only 6% reported keeping the ultrasound machines in ANC (public: 5%, PNFP: 10%, PFP: 3%), and 12% reported keeping the ultrasound machines in maternity (public: 17%, PNFP: 15%, PFP: 0%). At clinics, ultrasound machines were mainly kept in the ultrasound unit. At HC IIs and IIIs, ultrasound machines were mainly kept in the ultrasound unit and maternity. At HC IVs, ultrasound machines were kept in the ultrasound unit, maternity, outpatient department (OPD), and radiography department. At hospitals and RRHs, ultrasound machines were mainly located in the radiography department and ultrasound unit. The majority (85%) reported ultrasound machines were portable.



Number of ultrasound services provided in the last three months

Ninety (90%) of the assessed facilities with an ultrasound documented the number of ultrasound services provided in the last three months. Among the 123 facilities that documented ultrasound service delivery, each provided an average of 369 ultrasound scans for ANC (min 0, max 15,000) and 170 ultrasound scans (min 0, max 3,700) for conditions other than ANC in the last three months, corresponding to 123 ultrasound scans for ANC per month and 57 non-ANC ultrasound scans per month.



- **Regions:** Kampala provided the most ANC ultrasound services (201 per month), followed by West Nile (118), Bukedi (82), Ankole (58), Bugisu (46), Acholi (40), Teso (29), and Bunyoro (26).
- **Level of care:** RRHs provided the most ANC ultrasound services (1,084 per month), followed by hospitals (135), HC IIs (70), clinics (65), HC IVs (60), and HC IIIs (44).
- **Managing authority:** Public facilities provided the most ANC ultrasound services (170 per month), followed by PNFPs (91), and PFPs (79).

How ultrasound machine was obtained

Overall, 30% of the assessed facilities obtained ultrasound machines from the government, 39% from a private entity, and 31% were donated.

Average age of ultrasound machines

An ultrasound machine system typically lasts 5–7 years.⁴ Overall, 55% of assessed facilities had ultrasound machines 1–5 years old, 22% were 6–7 years old, and 23% were greater than 7 years old. The average age of the machines was 5.74 years (min 1, max 20).

- **Regions:** In Teso region 43% of machines were 7 years and older, followed by 33% in Bukedi, 32% in Acholi, 21% in Kampala, 14% in West Nile, and 13% in Ankole. In Bunyoro, the only assessed machine was within 5 years old.
- **Level of care:** Half the ultrasound machines (50%) in assessed clinics were older than 7 years, compared to 11% in HC IIs, 12% in HC IIIs, 27% in HC IVs, 28% in hospitals, and 20% in RRHs.
- **Managing authority:** Machines older than 7 years: 25% public, 15% PNFP, and 30% PFPs.

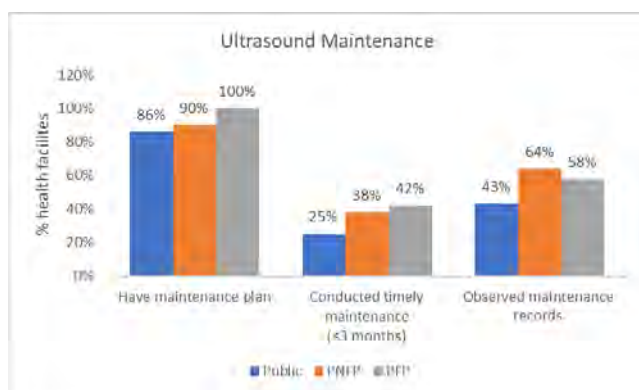
Maintenance plan

Overall, 91% of the assessed facilities had a maintenance plan, and 9% did not. Among the facilities with a plan, 39% would get maintenance by a biomedical engineer from outside the region, 36% by a biomedical engineer within the region, 13% by a biomedical engineer at the health facility, and 2% by a service provider.

- **Regions:** A greater proportion of assessed facilities in Bukedi (67%) reported no maintenance plan compared to 33% in Bugisu, 20% in Ankole, 13% in Teso, 5% in Acholi and West Nile, and 2% in Kampala. The assessed facility in Bunyoro (n=1) had a maintenance plan.
- **Level of care:** A greater proportion of RRHs (20%) reported no maintenance plan compared to 13% HC IVs, 6% HC IIIs, 5% hospitals. All clinics and HC IIs had a maintenance plan.
- **Managing authority:** A greater proportion of public facilities (14%) reported no maintenance plan compared to 10% of PNFP facilities and 0% of PFP facilities.

Timely maintenance (within three months) and observable maintenance records

Only one-third (33%) of all the assessed facilities reported maintaining the ultrasound machine within the past three months, the recommended timeframe of ultrasound maintenance; 28% performed maintenance beyond the three-month threshold, 11% did not know if the machine was ever maintained, and 27% reported never maintaining the machine. Maintenance records were observed in 53% of the assessed facilities.



- **Regions:** Kampala had the greatest proportion (54%) of facilities that conducted timely maintenance of the ultrasound machines, followed by Acholi (27%), Bugisu (25%), West Nile (18%), and Ankole and Teso (both 13%). None of the facilities conducted timely maintenance in Bukedi and Bunyoro. Bunyoro and Kampala also had the highest observed maintenance records (100% and 80%, respectively) compared to 58% in Bugisu, 38% Teso, 32% in Acholi and West Nile, and 0% in Bukedi.
- **Level of care:** Nearly half the hospitals assessed (46%) maintained the ultrasound machine within the recommended three-month threshold, followed by 39% at HC IIIs, 22% at HC IVs and HC IIs, 20% at RRHs, and 17% at clinics. Maintenance records were observed in 59% hospitals, followed by 55% at HC IIIs, 50% at clinics, 49% at HC IVs, 44 at HC IIs, and 40% in RRHs.

⁴ European Society of Radiology. Renewal of radiological equipment. Insights Imaging 2014 Oct;5(5):543-546. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4195838/>.

- **Managing authority:** About 25% public, 38% PNFP, and 42% PFP facilities reported maintaining the ultrasound machine within the recommended three-month threshold. Maintenance records were observed among 43%, 64%, and 58% of public, PNFP, and PFP facilities, respectively.

Repair plan

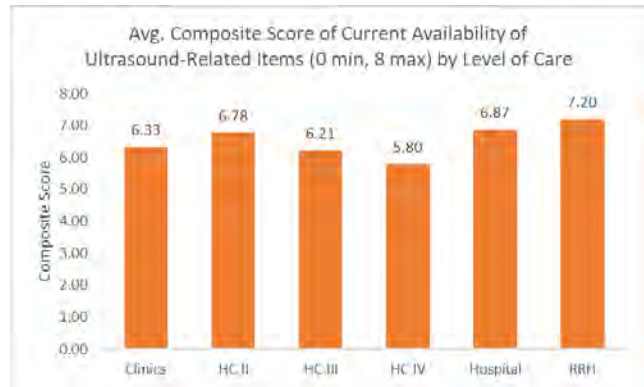
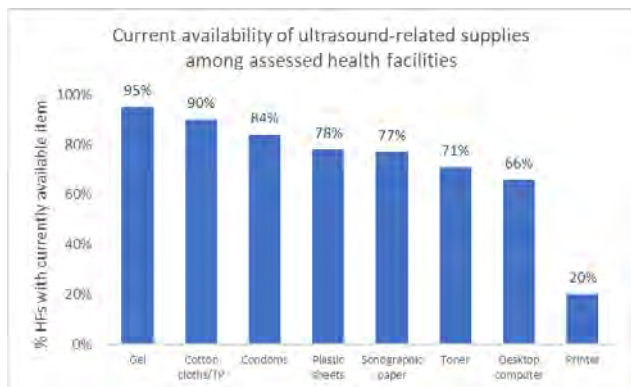
Overall, 89% of the assessed health facilities had a repair plan; 39% would get repairs by a biomedical engineer from outside the region, 36% from the region, 12% from the facility, and 1% from a service provider.

- **Regions:** The greatest proportions of assessed facilities without a repair plan were Bukedi (67%), followed by Bugisu (42%), Ankole and Teso (13%), West Nile and Acholi (9%), and Kampala (2%). The assessed facility in Bunyoro (n=1) had a plan.
- **Level of care:** All clinics and RRHs had a repair plan. The greatest proportions of assessed facilities without a repair plan were HC IIIs (15%), followed by HC IIs (11%) and hospitals (8%).
- **Managing authority:** A greater proportion of public facilities (17%) reported no repair plan compared to 10% of PNFPs and 0% of PFPs.

Current availability of ultrasound-related supplies

Overall, most of the assessed facilities had a current supply of gel (95%), cotton cloths/TP (90%), condoms (84%), plastic sheets (78%), sonographic paper (77%), toner (71%), and desktop computer (66%). Only 20% had a printer available for the ultrasound. When these eight items were summarized into a composite score on *current availability of ultrasound-related supplies* with a score range between 0 (no item current available) and 8 (all items currently available), the overall average score was 6.34 (min 0 and max 8).

- **Regions:** Kampala had the highest score (7.59), followed by Ankole (6.47), West Nile (6.45), Teso (6.38), Acholi (4.77), Bugisu (4.50), Bugisu (2.78), and Bunyoro (2.52).
- **Level of care:** RRHs had the highest score (7.20), followed by hospitals (6.87), HC IIs (6.78), clinics (6.33), HC IIIs (6.21), and HC IVs (5.80).
- **Managing authority:** PFP facilities had the highest score (7.55), followed by PNFPs (6.49) and public facilities (5.65).



3. Facility infrastructure

Electricity

Facility connected to power

Overall, 95% of assessed facilities were connected to power.

- **Regions:** All assessed facilities were connected to power, except for 13% of facilities in West Nile that were not connected.
- **Level of care:** Facilities across all levels of care were connected to power, except for 10% of HC IIIs and 2% of HC IVs in West Nile that were not connected to a power source.
- **Managing authority:** All PFPs (100%), 98% of PNFPs, and 92% of public facilities were connected to a source of power.

Power source for charging medical devices

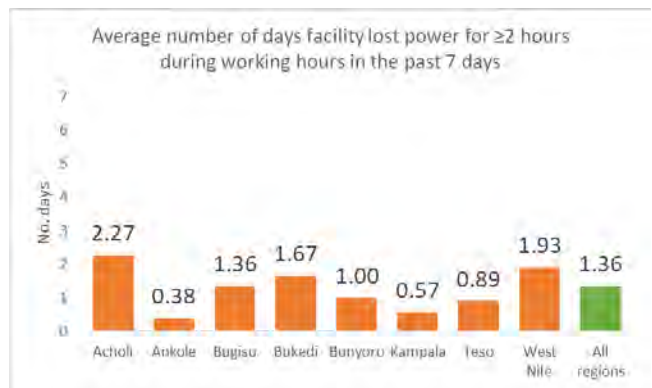
Among the facilities connected to power, for most the main source of power for charging medical devices was the national grid (69%), followed by solar panels (20%), generator (1%), and other, including hydropower.

- **Regions:** Over 80% of assessed facilities in Acholi, Ankole, Bugisu, Bukedi, Kampala, and Teso were connected to a national grid compared to 71% in Bunyoro and 32% in West Nile.
- **Level of care:** Over 80% of the clinics, HC IVs, hospitals, and RRHs were connected to the national grid and 50–79% of assessed HC IIs and HC IIIs were connected to a national grid.
- **Managing authority:** A greater proportion of PFPs (94%) were connected to the national grid compared to PNFPs (85%) and public (63%) facilities. Public facilities represent the greatest proportion with solar panels (31%).

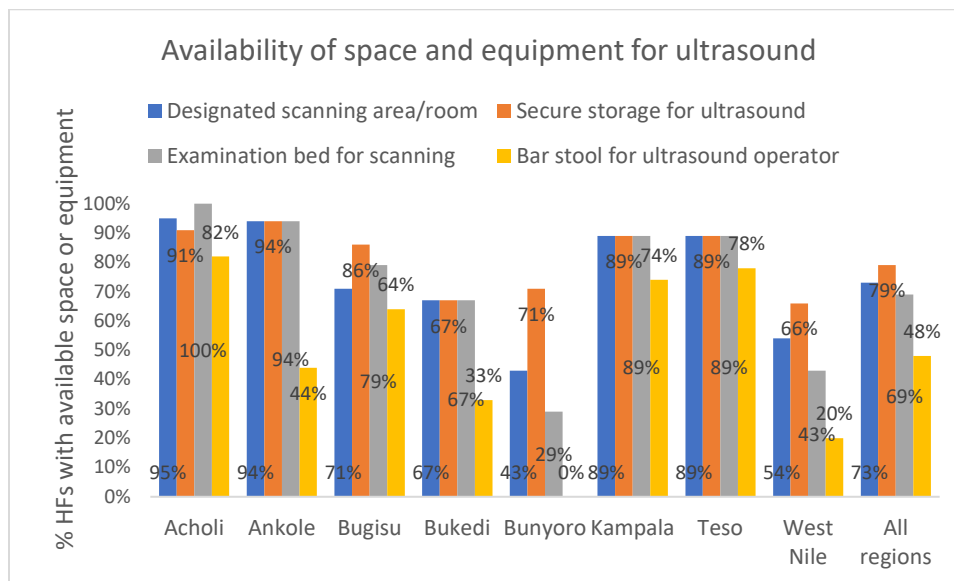
Number days facility lost power for two hours or more during open hours in the last week

Overall, 57% of all assessed facilities reported loss of at least two or more hours of power during facility open hours in the past seven days. On average, facilities reported losing power for two or more hours for one day in the last week (min: 0, max: 7 days).

- **Regions:** Acholi, West Nile, and Bukedi reported the highest average days of power loss (two days per week), followed by Bugisu and Bunyoro (one day in a week), and Ankole, Kampala, and Teso (<1 day in a week).
- **Levels of care:** On average, all levels of care reported losing two or more hours of power during one of the past seven days.
- **Managing authority:** PNFP and PFP facilities reported fewer days with power loss (0.67 and 0.77 days, respectively) compared to public facilities (1.75).



Space and equipment



Designated scanning area/room

Overall, 73% of assessed facilities had a designated scanning area/room.

- **Regions:** In Acholi, Ankole, Kampala, and Teso, greater than 80% of assessed facilities had a designated scanning area/room. In Bugisu, Bukedi, and West Nile, 50–80% had a designated scanning area/room, and in Bunyoro, only 43% did.
- **Level of care:** All assessed clinics, hospitals, and RRHs had a designated scanning area/room, compared to 80% of HC IVs, 62% of HC IIs, and 58% of HC IIIs.
- **Managing authority:** A greater proportion of PFPs (94%) and PNFPs (85%) had a designated space compared to 64% of public facilities.

Secure storage for ultrasound

Overall, 79% of assessed facilities had a secure room to store the ultrasound(s) when not in use.

- **Regions:** More than 80% of assessed facilities had secure storage in Acholi, Ankole, Bugisu, Kampala, and Teso. In Bukedi, Bunyoro, and West Nile, 50–80% had secure storage.
- **Level of care:** All assessed clinics, hospitals, and RRHs had secure storage for ultrasound, compared to 83% of HC IVs, 77% of HC IIs, and 68% of HC IIIs had secure storage.
- **Managing authority:** A greater proportion of assessed PFPs (97%) and PNFPs (90%) had secure storage compared to 71% of public facilities.

Examination bed for scanning

Overall, 69% of assessed facilities had an examination bed for scanning.

- **Regions:** In Acholi, Ankole, Kampala, and Teso, more than 80% of facilities had an examination bed for scanning, compared to 50–79% in Bugisu and Bukedi and less than 50% in Bunyoro and West Nile.
- **Level of care:** Only the RRHs had examination beds for scanning, compared to 97% of hospitals, 83% of clinics and HC IVs, 62% of HC IIs, and 49% of HC IIIs.
- **Managing authority:** A greater proportion of PFPs (97%) and PNFPs (85%) had an examination bed for scanning compared to 56% of public facilities.

Bar stool for ultrasound operator

Overall, 48% of assessed facilities had a bar stool for the ultrasound operator.

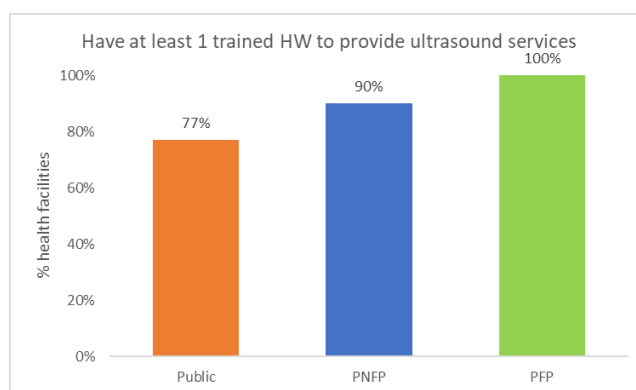
- **Regions:** Acholi was the only region where more than 80% of the assessed facilities had a bar stool for the ultrasound operator, compared to 50–80% in Bugisu and Kampala and less than half in Ankole, Bukedi, Bunyoro, and West Nile.
- **Level of care:** More than 80% of hospitals and RRHs had a bar stool for the ultrasound operator, compared to 50–79% of clinics, HC IIs, and HC IVs, and 25% of HC IIIs.
- **Managing authority:** A greater proportion of PFPs (71%) and PNFPs (69%) had an examination bed for scanning compared to 34% of public facilities.

4. Workforce

Number of trained health workers for sonography

Overall, 86% of assessed facilities with an ultrasound machine had at least one health worker to provide ultrasound services.

- **Regions:** All assessed facilities (100%) in Bunyoro and Kampala had at least one health worker to provide ultrasound services, compared to 87% in Ankole, 86% in Acholi, 75% in Bugisu and Teso, and 64% in West Nile.
- **Level of care:** All clinics, HC IIs, hospitals, and RRHs had at least one health worker to provide ultrasound services; 82% HC IIIs and 71% HC IVs had at least one.
- **Managing authority:** All PFPs had at least one health worker to provide ultrasound services, compared to 90% PNFPs and 77% public facilities.



Number of trained health workers for obstetric ultrasound sonography

The average number of health workers who could provide obstetric ultrasound services was 2.15 (min 0, max 13).

- **Regions:** Kampala had the highest average number of health workers who could provide obstetric ultrasound services (2.85) compared to Bukedi (2.00), Bugisu (1.89), Ankole (1.54), Teso and West Nile (1.50), Acholi (1.47), and Bunyoro (1.00).
- **Level of care:** RRHs had the highest average number of health workers who could provide obstetric ultrasound services (5.20) compared to hospitals (2.32), HC IVs (1.63), HC IIIs (1.52), HC II (1.33), and clinics (1.00).
- **Managing authority:** PFPs had the highest average number of health workers who could provide obstetric ultrasound services (2.70) compared to PNFPs (2.06) and public facilities (1.86).

Cadre of health worker providing ultrasound services

Radiographers were the main cadre providing ultrasound services across all assessed facilities (42%), followed by radiologists (23%), nurses (14%), and clinical officers (7%).

- **Regions:** Nurses made up a substantial proportion of health workers providing ultrasound services in Acholi (36%), Ankole (27%), and Bugisu (17%). In Kampala, 52% of assessed facilities used radiologists (physicians) to carry out ultrasound services, compared to 17% in Bugisu, 13% in Teso, 5% in Acholi, and 0% in Ankole, Bukedi, Bunyoro, and West Nile.

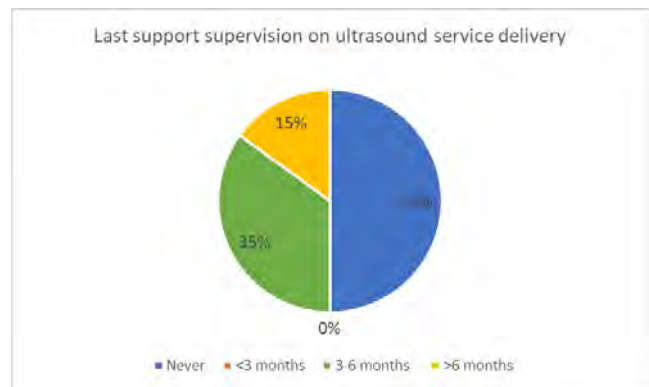
- **Level of care:** Tertiary-level facilities such as hospitals and RRHs employed mainly radiologists and radiographers to provide ultrasound services. Lower-level facilities employed mainly radiographers, nurses, and clinical officers.
- **Managing authority:** PFPs employed 42% radiologists compared to 21% at PNFPs and 15% at public facilities. Radiographers were a substantial cadre employed across all managing authorities: 37% public, 44% PNFP, and 48% PFPs. A greater proportion of nurses were employed at public (14%) and PNFPs (23%) to conduct ultrasound services compared to PFPs (3%).

Training received

Overall, 97% of assessed facilities had a sonographer who was trained in a formal program, 1% had a sonographer who was self-trained, and 2% never trained. Among those who were trained formally, about half (51%) were reported to have been trained at ECUREI Mengo Hospital; others were trained by Imaging the World Association and Mulago Hospital (11% each), Makerere University (4%), Mulago Paramedic (1%), Mulago School of Radiography (1%), UIAHS-Mulago (1%), and UMU-MKPMS (1%).

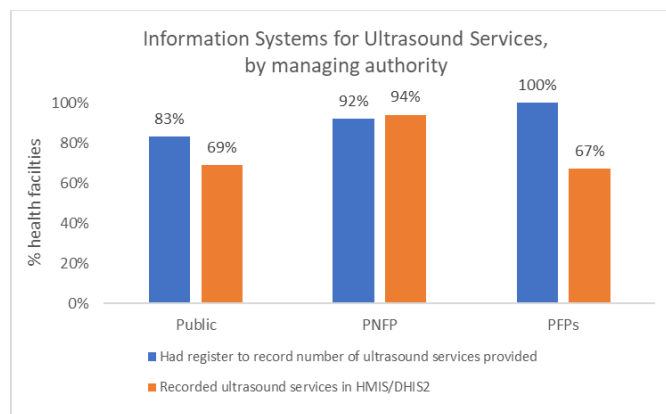
Support supervision

Overall, 50% of the assessed facilities reported never receiving support supervision on ultrasound. No assessed facility reported receiving support supervision in the last three months, 35% had three to six months ago, and 15% had more than six months ago. Among facilities that received support supervision, 65% was external, 27% was internal, and 7% was both external and internal (2% missing).



- **Level of care:** Private sites (clinics and HC IIs) and RRHs were more likely to report never receiving support supervision on ultrasound use than HC IIIs, HC IVs, and hospitals.
- **Managing authority:** A greater proportion of PFPs (58%) and PNFPs (44%) reported never receiving support supervision than public sites (35%). About one-third (33%) across all managing authority sites received support supervision between three and six months.

5. Information systems



Have register to document ultrasound services

Overall, 90% of assessed facilities had a register available to record the number of ultrasound services provided.

- **Regions:** All assessed facilities in Bunyoro, Kampala, and Teso had a register available to record the number of ultrasound services, followed by Acholi (95%), Bugisu (83%), Ankole (80%), West Nile (68%), and Bukedi (67%).
- **Levels of care:** Clinics, HC IIs, hospitals, and RRHs all had a register available to record the number of ultrasound services, compared to HC IIIs (88%) and HC IVs (78%).
- **Managing authority:** All PFPs had a register to document ultrasound services, compared to 92% PNFPs and 83% public facilities.

Ultrasound service delivery recorded in Health Management Information System (HMIS)/District Health Information System 2 (DHIS2)

Overall, about three-quarters of assessed facilities (76%) compiled ultrasound data into HMIS 105 and entered it in DHIS2.

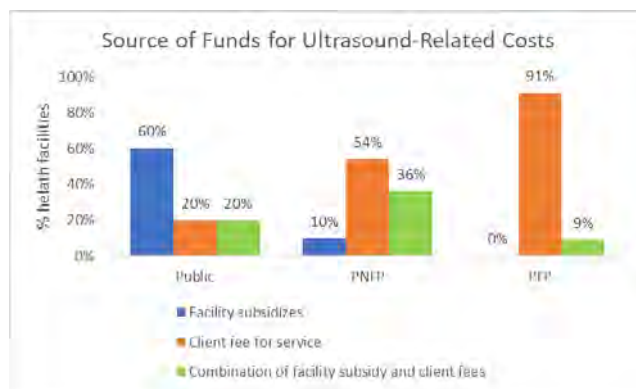
- **Regions:** All assessed facilities in Bugisu and Bunyoro compiled ultrasound data into HMIS 105 and entered it in DHIS2, compared to 93% of facilities in West Nile, 83% in Ankole, 81% in Acholi, 75% in Teso, 63% in Kampala, and 50% in Bukedi.
- **Levels of care:** HC IIIs had the greatest proportion of facilities that compiled data into the HMIS and DHIS2 (75%), compared to clinics (83%), hospitals (82%), RRHs (80%), and HC IIs (78%).
- **Managing authority:** The majority of PNFPs (94%) compiled ultrasound data into the HMIS/DHIS2 compared to 69% public and 67% PFP sites.

6. Funds

How ultrasound-related costs are covered

Overall, nearly half of the assessed facilities relied on patients to cover the cost of ultrasound services (fee for service 47%), 31% relied on the health facility to cover costs, and 22% relied on a combination of patient fees and the facility subsidizing the ultrasound service delivery.

- **Regions:** In Acholi, Kampala, and Teso, most assessed health facilities relied on patients' fee for service to cover ultrasound-related costs. In Bukedi, Bunyoro, and West Nile, most relied on the health facility to cover costs. In Ankole and Bugisu, facilities mainly relied on both patient fee for service and the facility to subsidize the ultrasound-related costs.
- **Levels of care:** Most clinics, HC IIs, HC IIIs, and hospitals relied on patients' fee for service to cover ultrasound-related costs. HC IVs mainly relied on the facility to cover costs. RRHs mainly relied on both patient fee for service and the facility.
- **Managing authority:** As expected, most public facilities (60%) relied on the facility to cover ultrasound-related costs, compared to 10% at PNFPs and 0% at PFPs. Both PNFPs (54%) and PFPs (47%) relied mainly on patients' fee for service. Lastly, 20% public, 36% PNFP, and 9% PFP relied on both patient fee for service and the facility.



User fee for ultrasound services

Overall, user fees for ultrasound services ranged from 0 UGX to 100,000 UGX with an average of 20,483 UGX.

- **Regions:** Acholi, Ankole, Bukedi, Bunyoro, and West Nile's user fees were below the overall average. Bugisu and Kampala's user fees were equal to or greater than the overall average.
- **Level of care:** Clinics, HC IVs, and hospitals had higher than overall average user fees. HC IIs, HC IIIs, and RRHs had equal or less than overall average user fees.
- **Managing authority:** As expected, the average user fee for ultrasound services at a public facility was less than the average (13,928 UGX), compared to 23,402 UGX at PNFPs and 39,486 UGX at PFPs.

7. Service delivery

Accessing ultrasound services

Overall, a variety of health cadres can "prescribe" ultrasounds, including physicians/medical officers (in 80% of assessed facilities), clinical officers (85%), midwives (82%), and nurses (72%). In Ankole, 13% (two of 15 facilities) reported Village Health Teams could prescribe; in Teso, 13% (one of eight) reported laboratory technicians could. A substantial proportion of clinics, HC IIs, and RRHs accepted self-referrals to ultrasound services (>80%) compared to HC IIIs (61%), HC IVs (42%), and hospitals (54%). As expected, more PNFPs (74%) reported that most ultrasound patients were self-referred compared to PFPs (64%) and public facilities (45%).

A referral note was required to access ultrasound services in the vast majority (82%) of assessed facilities; this was true in Acholi (64%), Bugisu (92%), Bukedi (100%), Bunyoro (100%), Kampala (98%), Teso (100%), and West Nile (68%). In Ankole, only 47% of facilities reported the need for a referral note.

Turnaround time of results

Nearly all assessed facilities (99%, 136 of 137) have same-day turnaround for ultrasound results. Only one assessed facility in Bugisu (public, HC IV) reported that ultrasound results were provided on a separate day from scanning.

8. Factors influencing effective service delivery

Number of days ANC services were offered in a week

On average, ANC services were offered five days in a week (min 0, max 7) among all assessed facilities.

- **Regions:** On average, facilities in Kampala and Acholi offered ANC services six days a week; facilities in Ankole, Bugisu, Bunyoro, and West Nile offered ANC services five days, and facilities in Bukedi offered four days.
- **Level of care:** On average, HC IIs offered ANC services every day of the week (7/7), clinics and hospitals offered six days a week, HC IIIs, IVs, and RRHs offered five days in a week.
- **Managing authority:** On average, PFP facilities offered ANC services six days of the week compared to public and PNFP facilities offering five days of the week.

Number of days health worker available to provide obstetric ultrasounds in a week

The average number of days a health worker was available to provide obstetric ultrasound services was 5.78 (min 1, max 7).

- **Regions:** Kampala had the highest number of days a health worker was available (6.31), followed by Acholi and Teso (6.00), Ankole (5.80), Bugisu and Bukedi (4.50), West Nile (4.30), and Bunyoro (4.00).
- **Level of care:** Clinics had the highest average number of days a health worker was available (7.00) compared to HC IIs (6.67), hospitals (6.13), HC IIIs (5.55), RRHs (5.00), and HC IVs (4.91).
- **Managing authority:** PFPs had the highest number of days a health worker was available (6.88) compared to PNPFs (6.34) and public facilities (4.53).

Provider availability to conduct obstetric ultrasounds during ANC days

We compared availability of a trained health worker to provide ultrasound during days the facility had ANC services. Coverage of a health worker to provide obstetric ultrasound during an ANC day was 106% overall.

- **Regions:** Bukedi had the highest coverage of health workers to provide obstetric ultrasound during an ANC day (150%), followed by Ankole (117%), Kampala (109%), Teso (108%), Acholi (105%), West Nile (95%), Bugisu (93%), and Bunyoro (57%).
- **Level of care:** Clinics had the highest coverage of health workers during an ANC day (120%) compared to hospitals (111%), HC IIIs (107%), HC IIs (104%), RRHs (100%), and HC IVs (93%).
- **Managing authority:** PFPs had the highest coverage of health workers during an ANC day (116%) compared to PNPFs (114%) and public facilities (90%).

Discussion, Recommendations, and Considerations for Scale

Recommendation 1. Develop guidelines on ultrasound use for ANC.

To move provision of ultrasound during antenatal care forward into implementation, the Ministry of Health should develop clear guidelines on the following:

- **Who, when, and how to request ultrasound services in antenatal care.** Which cadre can request for ultrasound services? At what point during ANC should this occur? What is the recommended process (for example, is a referral note required?). The process should be balanced to ensure appropriate use of ultrasound sonography for ANC, while encouraging women to use this service and improve early and timely ANC.
- **User fees.** What user fees, if any, should be attached to ultrasound for ANC? Recommend a subsidized user fee for ultrasound for ANC at private-not-for-profit sites.
- **Ultrasound models.** Type of ultrasound machines to be procured based on level of care and with consideration of the availability of power to charge the devices at health facility contexts.
- **Maintenance, repair, and replacement of ultrasound machines.** Streamline expectations on routine maintenance of the equipment, how to fund it (e.g., clarify this with hospital leadership, hospital board, and health unit management committees), how to source maintenance and repair, and to have a plan for replacement of old machines beyond repair.

Recommendation 2. Ensure availability of ultrasound use for ANC is incorporated and aligned in the ANC Communications Campaign materials.

Social and behavioral change messaging will be needed to encourage pregnant women to seek timely ANC within the first trimester. The message on availability of ultrasound for ANC by 24 weeks gestation (including which sites within each district/region) should be aligned with the ANC Communications Campaign.

Recommendation 3. Ensure the necessary supplies for ultrasound services, e.g., gel, are incorporated on the Essential Drug List.

Government facilities need to be able to procure related supplies for ultrasound services (e.g., gel) from the National Medical Stores to ensure effective rollout of this service. Review the supplies required for ultrasound service delivery and ensure inclusion on the Essential Drug List.

Recommendation 4. Allocate trained staff for most effective use.

For public facilities, consider effective allocation of trained staff so staff with capacity to conduct ultrasounds and interpret sonogram findings are posted to facilities with ultrasound machines to maximize use of these human resources for health. Also, consider how trained staff are allocated when reshuffling staff at the end of each financial year.

Recommendation 5. Provide training (pre- and in-service models required).

Partners and training institutions should support the government to train targeted cadres. Prioritize training sites with ultrasounds already, and concentrate on facilities that can provide a full package of services. Also, incorporate ultrasound use and interpretation into the pre-service curriculum of midwives and other lower-level cadres per WHO recommendation to task shift.

Appendix: Data Tables

Table A1. Characteristics of health facilities assessed by region, level of care, and managing authority

Health facility characteristics	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	N	%
Percent of all facilities																		
Total no. health facilities in region	N=284		N=381		N=243		N=166		N=225		N=318		N=190		N=309		N=2,116	
Total no. (%) of health facilities assessed	22	8%	16	4%	14	6%	3	2%	7	3%	62	19%	9	5%	90	29%	223	11%
Level of care																		
RRH	0	0%	0	0%	0	0%	0	0%	0	0%	3	5%	1	11%	1	1%	5	2%
Hospital	3	14%	4	25%	4	29%	1	33%	0	0%	17	27%	3	33%	6	7%	39	17%
HC IV	6	27%	6	38%	10	71%	2	67%	0	0%	14	23%	3	33%	14	16%	54	24%
HC III	4	18%	4	25%	0	0%	0	0%	7	100%	25	40%	2	22%	64	71%	106	48%
HC II	5	23%	0	0%	0	0%	0	0%	0	0%	3	5%	0	0%	5	6%	13	6%
Clinic	4	18%	2	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	6	3%
Managing authority																		
Public	8	36%	10	63%	8	57%	3	100%	7	100%	21	34%	6	67%	77	86%	140	63%
PNFP	8	36%	4	25%	5	36%	0	0%	0	0%	17	27%	1	11%	13	14%	48	22%
PFP	6	27%	2	13%	1	7%	0	0%	0	0%	24	39%	2	22%	0	0%	35	16%

Regional Referral Hospital (RRH), GH (General Hospital), HC (Health Centre), MC (Medical Centre), PNFP (private not for profit), PFP (private for profit)

Table A2a. Availability of ultrasound machines and related supplies by region

Infrastructure	Acholi (N=22)		Ankole (N=16)		Bugisu (N=14)		Bukedi (N=3)		Bunyoro (N=7)		Kampala (N=62)		Teso (N=9)		West Nile (N=90)		Total (N=223)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
No. US Machines																		
Have ultrasound (Y)	22	100%	15	94%	12	86%	3	100%	1	14%	54	87%	8	89%	22	24%	137	61%
No. ultrasound machines at facility																		
1 machine																		
2 machines	16	73%	14	93%	7	93%	3	100%	1	100%	33	61%	6	75%	14	64%	94	69%
3 machines	4	18%	1	7%	5	7%	0	0%	0	0%	9	17%	1	13%	5	23%	25	18%
4 machines	2	9%	0	0%	0	0%	0	0%	0	0%	5	9%	1	13%	3	14%	11	8%
5 or more machines	0	0%	0	0%	0	0%	0	0%	0	0%	3	6%	0	0%	0	0%	3	2%
	0	0%	0	0%	0	0%	0	0%	0	0%	4	7%	0	0%	0	0%	4	3%
Functionality																		
Probe functional (Y)	22	100%	14	93%	11	92%	3	100%	1	100%	53	98%	7	88%	20	91%	131	96%
Screen functional (Y)	22	100%	14	93%	11	92%	3	100%	1	100%	54	100%	8	100%	21	95%	134	98%
Keyboard functional (Y)	22	100%	15	100%	10	83%	3	100%	1	100%	53	98%	8	100%	20	91%	132	96%
Functionality composite score																		
Mean (Std)																		
Min, Max	3.00 3, 3	(0.00)	2.87 1, 3	(0.52)	2.67 0, 3	(0.89)	3.00 3, 3	(0.00)	3.00 3, 3	(0.00)	2.96 2, 3	(0.19)	2.88 2, 3	(0.35)	2.77 0, 3	(0.69)	2.90 0, 3	(0.44)
Portability																		
Machine portable (Y)	22	100%	13	87%	12	100%	3	100%	1	100%	40	74%	7	88%	19	86%	117	85%
Location of machine																		
ANC	1	5%	0	0%	3	25%	0	0%	0	0%	1	2%	0	0%	3	14%	8	6%
Children	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	2	1%
Clinical Room	0	0%	3	20%	1	8%	0	0%	0	0%	1	2%	0	0%	0	0%	5	4%
EPI	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	1	1%
Health Facility (gen)	1	5%	4	27%	1	8%	3	100%	1	100%	10	19%	0	0%	0	0%	20	15%
Isolation	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	1	1%
Maternity	8	36%	3	20%	0	0%	0	0%	0	0%	1	2%	1	13%	4	18%	17	12%
OPD	2	9%	1	7%	3	25%	0	0%	0	0%	1	2%	0	0%	5	23%	12	9%
Radiography	2	9%	3	20%	4	33%	0	0%	0	0%	12	22%	2	25%	4	18%	27	20%
Store	0	0%	1	7%	0	0%	0	0%	0	0%	0	0%	1	13%	0	0%	2	1%
Theatre	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%	1	13%	1	5%	3	2%
Ultrasound unit	6	27%	0	0%	0	0%	0	0%	0	0%	28	52%	3	38%	1	5%	38	28%
Unknown	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	5%	1	1%
Main Use																		
Main use																		
Chest investigation	0	0%	0	0%	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	1	1%
Obstetric ANC	21	95%	15	100%	12	86%	3	100%	1	100%	51	96%	8	89%	17	77%	128	93%

Infrastructure	Acholi (N=22)		Ankole (N=16)		Bugisu (N=14)		Bukedi (N=3)		Bunyoro (N=7)		Kampala (N=62)		Teso (N=9)		West Nile (N=90)		Total (N=223)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Obstetric surgical	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	2	9%	3	2%
Other surgical	0	0%	0	0%	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	1	1%
Other	0	0%	1	0%	2	14%	0	0%	0	0%	1	2%	1	11%	3	14%e	4	3%
How US machine was obtained																		
Acquired by																		
Government	3	14%	3	20%	5	36%	3	100%	0	0%	16	30%	5	56%	6	27%	41	30%
Private entity	8	36%	4	27%	2	14%	0	0%	0	0%	35	66%	2	22%	2	9%	53	39%
Donated	11	50%	8	53%	5	36%	0	0%	1	100%	3	6%	1	11%	14	64%	43	31%
Maintenance and repair																		
Machine age																		
1-5 years	10	45%	12	80%	5	42%	2	67%	1	100%	26	49%	3	43%	16	73%	75	55%
6-7 years	5	23%	1	7%	2	17%	0	0%	0	0%	17	32%	2	29%	3	14%	30	22%
>7 years	7	32%	2	13%	5	42%	1	33%	0	0%	11	21%	3	43%	3	14%	32	23%
Average (std)	6.55	(4.91)	3.73	(3.03)	7.58	(3.92)	7.67	(10.69)	5.00		5.78	(3.17)	7.25	(4.59)	4.45	(3.67)	5.74	(4.00)
Min, Max	1, 19		1, 10		2, 15		1, 20		5, 5	(NA)	1, 16		2, 14		1, 15		1, 20	
Last maintenance																		
≤3 months	6	27%	2	13%	3	25%	0	0%	0	0%	29	54%	1	13%	4	18%	45	33%
4-6 months	2	9%	2	13%	1	8%	0	0%	0	0%	6	11%	0	0%	2	9%	13	9%
7-9 months	0	0%	0	0%	0	0%	0	0%	0	0%	1	2%	1	13%	0	0%	2	1%
10-12 months	1	5%	0	0%	2	17%	0	0%	0	0%	4	7%	0	0%	0	0%	7	5%
>12 months	5	23%	2	13%	2	17%	0	0%	0	0%	4	7%	2	25%	3	14%	18	13%
Don't know	5	23%	2	13%	0	0%	0	0%	0	0%	1	2%	3	38%	4	18%	15	11%
Never	3	14%	7	47%	4	33%	3	100%	1	100%	9	17%	1	13%	9	41%	37	27%
Maintenance records observed (Y)	7	32%	4	27%	7	58%	0	0%	1	100%	43	80%	3	38%	7	32%	72	53%
Maintenance to be conducted by a biomedical engineer from																		
Facility	5	23%	0	0%	1	8%	1	33%	0	0%	11	20%	0	0%	0	0%	17	12%
Region	12	55%	2	13%	4	33%	0	0%	1	100%	17	31%	0	0%	13	59%	49	36%
Outside region	4	18%	9	60%	1	8%	0	0%	0	0%	25	46%	0	0%	8	36%	54	39%
Service provider	0	0%	1	7%	2	17%	0	0%	0	0%	0	0%	7	88%	0	0%	3	2%
No plan	5	23%	3	20%	4	33%	2	67%	0	0%	1	2%	1	13%	1	5%	13	9%
Repair to be conducted by a biomedical engineer from																		
Facility	6	27%	0	0%	0	0%	0	0%	0	0%	10	19%	0	0%	0	0%	16	12%
Region	11	50%	3	20%	4	33%	0	0%	1	100%	17	31%	1	13%	13	59%	50	36%
Outside region	3	14%	10	67%	1	8%	1	33%	0	0%	26	48%	6	75%	7	32%	54	39%
Service provider	0	0%	0	0%	2	17%	0	0%	0	0%	0	0%	0	0%	0	0%	2	1%
No plan	2	9%	2	13%	5	42%	2	67%	0	0%	1	2%	1	13%	2	9%	15	11%

Infrastructure	Acholi (N=22)		Ankole (N=16)		Bugisu (N=14)		Bukedi (N=3)		Bunyoro (N=7)		Kampala (N=62)		Teso (N=9)		West Nile (N=90)		Total (N=223)	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Supplies: current availability																		
Gel (yes)	22	100%	14	93%	10	83%	2	67%	1	100%	53	98%	8	100%	20	91%	130	95%
Condom (yes)	14	64%	14	93%	8	67%	2	67%	0	0%	54	100%	5	63%	18	82%	115	84%
Plastic sheets (yes)	13	59%	12	80%	7	58%	0	0%	0	0%	48	89%	6	75%	21	95%	107	78%
Cotton cloths/TP (yes)	17	77%	15	100%	10	83%	0	0%	1	100%	52	96%	7	88%	21	95%	123	90%
Sonographic paper (yes)	14	64%	11	73%	5	42%	1	33%	0	0%	52	96%	8	100%	15	68%	106	77%
Toner (yes)	10	45%	9	60%	5	42%	2	67%	0	0%	49	91%	6	75%	16	73%	97	71%
Desktop computer (yes)	6	27%	10	67%	4	33%	0	0%	0	0%	50	93%	5	63%	16	73%	91	66%
Printer (yes)	6	27%	5	33%	3	25%	0	0%	1	100%	4	7%	2	25%	6	27%	27	20%
Supplies composite score (0-8)																		
Average (Stdev)	4.77	(2.05)	6.47	(1.41)	4.5	(2.78)	2.67	(2.52)	2.00	(NA)	7.59	(0.94)	6.38	(1.77)	6.45	(2.18)	6.34	(2.14)
Min, Max	1, 8		4, 8		0, 8		0, 5		2, 2		4, 8		3, 8		0, 8		0, 8	
Supplies: stockout in the last 3 months																		
Gel (yes)	13	59%	3	20%	1	8%	2	67%	1	100%	5	9%	1	13%	6	27%	32	23%
Condom (yes)	13	59%	2	13%	1	8%	2	67%	1	100%	3	6%	3	38%	4	18%	29	21%
Plastic sheets (yes)	12	55%	3	20%	2	17%	0	0%	1	100%	7	13%	3	38%	5	23%	33	24%
Cotton cloths/TP (yes)	12	55%	2	13%	1	8%	0	0%	1	100%	4	7%	0	0%	4	18%	24	18%
Sonographic paper (yes)	10	45%	5	33%	4	33%	2	67%	1	100%	5	9%	2	25%	7	32%	36	26%
Toner (yes)	8	36%	5	33%	4	33%	2	67%	1	100%	6	11%	2	25%	7	32%	35	26%
Desktop computer (yes)	7	32%	5	33%	5	42%	0	0%	1	100%	1	2%	4	50%	5	23%	28	20%
Printer (yes)	6	27%	5	33%	3	25%	0	0%	1	100%	4	7%	2	25%	6	27%	27	20%
Total ultrasound services provided in the last 3 months among facilities that document ultrasound service provision																		
	n=21		n=12		n=10		n=2		n=1		n=54		n=8		n=15		n=123	
Ultrasound for ANC																		
Average (Stdev)	121	(200)	175	(183)	138	(96)	247	(217)	77	(NA)	604	(2119)	87	(82)	355	(326)	369	(1422)
Min, Max	0, 923		0, 660		0, 276		93, 400		77, 77		0, 15000		0, 220		34, 1050		0, 15000	
Average number of ultrasounds for ANC in a month	40		58		46		82		26		201		29		118		123	
Ultrasound for other reasons, not ANC																		
Average (Stdev)	54	(93)	80	(63)	96	(111)	339	(228)	82	(NA)	182	(502)	99	(90)	439	(922)	170	(472)
Min, Max	0, 32		0, 180		0, 231		177, 500		82, 82		0, 2500		0, 253		9, 3699		0, 3700	
Average number of ultrasounds, not for ANC in a month	18		27		32		113		27		61		33		146		57	

Table A2b. Availability of ultrasound machines and related supplies by level of care

Infrastructure	Clinic (N=6)		HC II		HC III		HC IV		Hospital		RRH		Total	
	n	%	N=13	%	N=106	%	N=54	%	N=39	%	N=5	%	N=223	%
No. US Machines														
Have ultrasound (Y)	6	100%	9	69%	33	31%	45	83%	39	100%	5	100%	137	61%
No. ultrasound machines at facility														
1 machine	6	100%	7	78%	30	91%	35	78%	15	38%	1	20%	94	69%
2 machines	0	0%	2	22%	3	9%	10	22%	9	23%	1	20%	25	18%
3 machines	0	0%	0	0%	0	0%	0	0%	10	26%	1	20%	11	8%
4 machines	0	0%	0	0%	0	0%	0	0%	3	8%	0	0%	3	2%
5 or more machines	0	0%	0	0%	0	0%	0	0%	2	5%	2	40%	4	3%
Functionality														
Probe functional (Y)	6	100%	9	100%	32	97%	43	96%	36	92%	5	100%	131	96%
Screen functional (Y)	6	100%	9	100%	32	97%	43	96%	39	100%	5	100%	134	98%
Keyboard functional (Y)	6	100%	9	100%	32	97%	41	91%	39	100%	5	100%	132	96%
Functionality composite score														
Mean (Std)	3.00	(0.00)	3.00	(0.00)	2.91	(0.52)	2.82	(0.58)	2.92	(0.27)	3.00	(0.00)	2.90	(0.44)
Min, Max	3, 3		3, 3		0, 3		0, 3		2, 3		3, 3		0, 3	
Portability														
Machine portable (Y)	6	100%	9	100%	25	76%	39	87%	34	87%	4	80%	117	85%
Location of machine														
ANC	0	0%	0	0%	3	9%	3	7%	2	5%	0	0%	8	6%
Children	0	0%	0	0%	0	0%	2	4%	0	0%	0	0%	2	1%
Clinical Room	1	17%	0	0%	1	3%	3	7%	0	0%	0	0%	5	4%
EPI	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	1	1%
Health Facility (gen)	1	17%	0	0%	6	18%	4	9%	9	23%	0	0%	20	15%
Isolation	0	0%	0	0%	1	3%	0	0%	0	0%	0	0%	1	1%
Maternity	0	0%	4	44%	7	21%	6	13%	0	0%	0	0%	17	12%
OPD	1	17%	0	0%	1	3%	8	18%	2	5%	0	0%	12	9%
Radiography	0	0%	1	11%	1	3%	5	11%	18	46%	2	40%	27	20%
Store	0	0%	0	0%	1	3%	0	0%	0	0%	1	20%	2	1%
Theatre	0	0%	0	0%	0	0%	3	7%	0	0%	0	0%	3	2%
Ultrasound unit	3	50%	4	44%	11	33%	10	22%	8	21%	2	20%	38	20%
Unknown	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%
Main Use														
Main use														
Chest investigation	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%	1	1%
Obstetric ANC	6	100%	9	100%	31	94%	43	96%	34	87%	5	100%	128	93%
Obstetric surgical	0	0%	0	0%	0	0%	1	2%	2	5%	0	0%	3	2%
Other surgical	0	0%	0	0%	1	3%	0	0%	0	0%	0	0%	1	1%
Other, none of the above	0	0%	0	0%	1	3%	1	2%	2	5%	0	0%	4	3%
How US machine was obtained														
Acquired by														
Government	0	0%	0	0%	8	24%	20	44%	9	23%	4	80%	41	30%

Infrastructure	Clinic (N=6)		HC II		HC III		HC IV		Hospital		RRH		Total	
	n	%	N=13	%	N=106	%	N=54	%	N=39	%	N=5	%	N=223	%
Private entity	6	100%	4	44%	12	36%	8	18%	22	56%	1	20%	53	39%
Donated	0	0%	5	56%	13	39%	17	38%	8	21%	0	0%	43	31%
Maintenance and repair														
Machine age														
1-5 years	1	17%	5	56%	23	70%	22	49%	21	54%	3	60%	75	55%
6-7 years	2	33%	3	33%	6	18%	11	24%	7	18%	1	20%	30	22%
>7 years	3	50%	1	11%	4	12%	12	27%	11	28%	1	20%	32	23%
Average (std)	8.00	(3.58)	4.67	(2.50)	4.09	(2.94)	6.69	(4.28)	6.05	(4.46)	5.00	(3.39)	5.74	(4.00)
Min, Max	4, 14		1, 8		1, 10		1, 19		1, 20		1, 10		1, 20	
Last maintenance														
≤3 months	1	17%	2	22%	13	39%	10	22%	18	46%	1	20%	45	33%
4-6 months	0	0%	0	0%	1	3%	7	16%	4	10%	1	20%	13	9%
7-9 months	0	0%	0	0%	1	3%	0	0%	0	0%	1	20%	2	1%
10-12 months	0	0%	3	33%	0	0%	3	7%	1	3%	0	0%	7	5%
>12 months	1	17%	1	11%	3	9%	7	16%	5	13%	1	20%	18	13%
Don't know	2	33%	2	22%	5	15%	2	9%	2	5%	0	0%	15	11%
Never	2	33%	1	11%	10	30%	9	31%	9	23%	1	20%	37	27%
Maintenance records observed (Y)	3	50%	4	44%	18	55%	22	49%	23	59%	2	40%	72	53%
Maintenance to be conducted by a biomedical engineer from														
Facility	1	17%	0	0%	4	12%	1	2%	12	31%	0	0%	18	13%
Region	2	33%	6	67%	12	36%	20	44%	8	21%	1	20%	49	36%
Outside region	3	50%	3	33%	13	39%	16	36%	16	41%	3	60%	54	39%
Service provider	0	0%	0	0%	0	0%	2	4%	1	3%	0	0%	3	2%
No plan	0	0%	0	0%	2	6%	6	13%	2	5%	1	20%	13	9%
Repair to be conducted by a biomedical engineer from														
Facility	1	17%	0	0%	4	12%	1	2%	9	23%	1	20%	16	12%
Region	2	33%	6	67%	15	45%	20	44%	7	18%	0	0%	50	36%
Outside region	3	50%	2	22%	9	27%	17	38%	19	49%	4	80%	54	39%
Service provider	0	0%	0	0%	0	0%	1	2%	1	3%	0	0%	2	1%
No plan	0	0%	1	11%	5	15%	6	13%	3	8%	0	0%	15	11%
Supplies: current availability														
Gel (yes)	6	100%	9	100%	30	91%	41	91%	39	100%	5	100%	130	95%
Condom (yes)	5	83%	9	100%	28	85%	34	76%	34	87%	5	100%	115	84%
Plastic sheets (yes)	5	83%	9	100%	25	76%	33	73%	31	79%	4	80%	107	78%
Cotton cloths/TP (yes)	6	100%	9	100%	29	88%	37	82%	37	95%	5	100%	123	90%
Sonographic paper (yes)	6	100%	8	89%	22	67%	33	73%	33	85%	4	80%	106	77%
Toner (yes)	4	67%	6	67%	21	64%	31	69%	32	82%	3	60%	97	71%
Desktop computer (yes)	3	50%	5	56%	26	79%	23	51%	29	74%	5	100%	91	66%

Infrastructure	Clinic (N=6)		HC II		HC III		HC IV		Hospital		RRH		Total	
	n	%	N=13	%	N=106	%	N=54	%	N=39	%	N=5	%	N=223	%
Printer (yes)	3	50%	6	67%	24	73%	29	64%	33	85%	5	100%	100	73%
Supplies composite score (0-8)														
Average (Stdev)	6.33	(1.51)	6.78	(1.30)	6.21	(2.10)	5.80	(2.57)	6.87	(1.82)	7.20	(1.30)	6.34	(2.14)
Min, Max	5, 8		4, 8		1, 8		0, 8		2, 8		5, 8		0, 8	
Supplies: stockout in the last 3 months														
Gel (yes)	3	50%	5	56%	10	30%	5	11%	8	21%	1	20%	32	23%
Condom (yes)	3	50%	5	56%	7	21%	7	16%	6	15%	1	20%	29	21%
Plastic sheets (yes)	3	50%	5	56%	8	24%	9	20%	7	18%	1	20%	33	24%
Cotton cloths/TP (yes)	3	50%	5	56%	7	21%	5	11%	4	10%	0	0%	24	18%
Sonographic paper (yes)	3	50%	5	56%	6	18%	11	24%	10	26%	1	20%	36	26%
Toner (yes)	1	17%	5	56%	7	21%	12	27%	9	23%	1	20%	35	26%
Desktop computer (yes)	1	17%	0	0%	5	15%	13	29%	8	21%	1	20%	28	20%
Printer (yes)	1	17%	3	33%	7	21%	11	24%	5	13%	0	0%	27	20%
Total ultrasound services provided in the last 3 months among facilities that document ultrasound service provision														
	n=6		n=9		n=29		n=35		n=39		n=5		n=123	
Ultrasound for ANC														
Average (Stdev)	196	(117)	211	(294)	131	(202)	179	(513)	406	(688)	3252	(6575)	368	(1422)
Min, Max	72, 360		19, 923		0, 900		0, 3048		12, 3150		0, 15000		0, 15000	
Average number of ultrasounds for ANC in a month	65		70		44		60		135		1084		123	
Ultrasound for other reasons, not ANC														
Average (Stdev)	175	(125)	46	(51)	47	(70)	47	(67)	330	(715)	702	(989)	170	(472)
Min, Max	5, 332		1, 140		0, 249		0, 300		7, 3700		0, 2400		0, 3700	
Average number of ultrasounds, not for ANC in a month	58		15		16		16		110		234		57	

Table A2c. Availability of ultrasound machines and related supplies by managing authority

Infrastructure	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=35	%	N=223	%
No. US Machines								
Have ultrasound (yes)	65	46%	39	81%	33	94%	137	61%
No. ultrasound machines at facility								
1 machine	48	74%	23	59%	23	70%	94	69%
2 machines	12	18%	8	21%	5	15%	25	18%
3 machines	3	5%	6	15%	2	6%	11	8%
4 machines	1	2%	0	0%	2	6%	3	2%
5 or more machines	1	2%	2	5%	1	3%	4	3%
Functionality, among facilities that report having an ultrasound								
Probe functional (yes)	62	95%	37	95%	32	97%	131	96%
Screen functional (yes)	64	98%	37	95%	33	100%	134	98%
Keyboard functional (yes)	62	95%	37	95%	33	100%	132	96%
Functionality composite score								
Mean (Std)	2.89 (0.36)		2.85 (0.67)		2.97 (0.17)		2.90 (0.44)	
Min, Max	0, 3		0, 3		2, 3		0, 3	
Portability, among facilities that report having an ultrasound								
Machine portable (yes)	58	89%	32	82%	27	77%	117	85%
Location of machine								
ANC	3	5%	4	10%	1	3%	8	6%
Children	2	3%	0	0%	0	0%	2	1%
Clinical Room	2	3%	1	3%	2	6%	5	4%
EPI	1	2%	0	0%	0	0%	1	1%
Health Facility (gen)	8	12%	9	23%	3	9%	20	15%
Isolation	1	2%	0	0%	0	0%	1	1%
Maternity	11	17%	6	15%	0	0%	17	12%
OPD	9	14%	2	5%	1	3%	12	9%
Radiography	8	12%	9	23%	10	29%	27	20%
Store	2	3%	0	0%	0	0%	2	1%
Theatre	3	5%	0	0%	0	0%	3	2%
Ultrasound unit	14	22%	8	21%	16	46%	38	28%
Unknown	1		0	0%	0	0%	1	1%
Main Use								
Main use								
Chest investigation	0	0%	1	3%	0	0%	1	1%
Obstetric ANC	60	92%	36	92%	32	91%	128	93%
Obstetric surgical	2	3%	1	3%	0	0%	3	2%
Other surgical	0	0%	0	0%	1	3%	1	1%
Other, none of the above	3	5%	1	3%	2	6%	4	3%
How US machine was obtained								
Acquired by								
Government	40	62%	1	3%	0	0%	41	30%
Private entity	2	3%	19	49%	32	91%	53	39%
Donated	23	35%	19	49%	1	3%	43	31%

Infrastructure	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=35	%	N=223	%
Maintenance and repair								
Machine age								
1-5 years	37	57%	24	62%	14	60%	75	55%
6-7 years	12	18%	9	23%	9	27%	30	22%
>7 years	16	25%	6	15%	10	30%	32	23%
Average (std)	5.89	(4.62)	5.05	(2.71)	6.27	(3.95)	5.74	(4.00)
Min, Max	1, 20		1, 12		1, 16		1, 20	
Last maintenance								
≤3 months	16	25%	15	38%	14	42%	45	33%
4-6 months	5	8%	6	15%	2	6%	13	9%
7-9 months	2	3%	0	0%	0	0%	2	1%
10-12 months	1	2%	3	8%	3	9%	7	5%
>12 months	13	20%	2	5%	3	9%	18	13%
Don't know	6	9%	6	15%	3	9%	15	11%
Never	22	34%	7	18%	8	24%	37	27%
Maintenance records observed (Y)	28	43%	25	64%	19	58%	72	53%
Maintenance to be conducted by a biomedical engineer from								
Facility	4	6%	9	23%	5	15%	18	13%
Region	31	48%	11	28%	7	21%	49	36%
Outside region	20	31%	14	36%	20	61%	54	39%
Service provider	1	2%	1	3%	1	3%	3	2%
No plan	9	14%	4	10%	0	0%	13	9%
Repair to be conducted by a biomedical engineer from								
Facility	3	5%	8	21%	5	15%	16	12%
Region	32	49%	10	26%	8	24%	50	36%
Outside region	19	29%	16	41%	19	58%	54	39%
Service provider	0	0%	1	3%	1	3%	2	1%
No plan	11	17%	4	10%	0	0%	15	11%
Supplies: current availability								
Gel (yes)	60	92%	37	95%	33	100%	130	95%
Condom (yes)	50	77%	34	87%	31	94%	115	84%
Plastic sheets (yes)	44	68%	33	85%	30	91%	107	78%
Cotton cloths/TP (yes)	52	80%	38	97%	33	100%	123	90%
Sonographic paper (yes)	44	68%	29	74%	33	100%	106	77%
Toner (yes)	39	60%	28	72%	30	91%	97	71%
Desktop computer (yes)	35	54%	28	72%	28	85%	91	66%
Printer (yes)	43	66%	26	67%	31	94%	100	73%
Supplies composite score (0-8)								
Average (Stdev)	5.65	(2.36)	6.49	(2.02)	7.55	(0.94)	6.34	(2.14)
Min, Max	0, 8		1, 8		5, 8		0, 8	

Infrastructure	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=35	%	N=223	%
Supplies: stock out in the last 3 months								
Gel (yes)	16	25%	11	28%	5	15%	32	23%
Condom (yes)	14	22%	10	26%	5	15%	29	21%
Plastic sheets (yes)	19	29%	9	23%	5	15%	33	24%
Cotton cloths/TP (yes)	9	14%	11	28%	4	12%	24	18%
Sonographic paper (yes)	20	31%	10	26%	6	18%	36	26%
Toner (yes)	20	31%	10	26%	5	15%	35	26%
Desktop computer (yes)	21	32%	3	8%	4	12%	28	20%
Printer (yes)	18	28%	5	13%	4	12%	27	20%
Total ultrasound services provided in the last 3 months among facilities that document ultrasound service provision								
	n=54		n=36		n=33		n=123	n=54
Ultrasound for ANC Average (Stdev) Min, Max	511 0, 15000	(2062)	274 0, 3150	(647)	236 0, 2000	(380)	368 0, 15000	(1422)
Average number of ultrasounds for ANC in a month	170		91		79		123	
Ultrasound for other reasons, not ANC Average (Stdev) Min, Max	200 0, 3700	(594)	183 0, 2500	(474)	105 0, 500	(120)	170 0, 3700	(472)
Average number of ultrasounds, not for ANC in a month	67		61		35		57	

Table A3a. Summary of available inputs: workforce, by region

Workforce	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	N=22	%	N=16	%	N=14	%	N=3	%	N=7	%	N=62	%	N=9	%	N=90	%	N=223	%
Available HR																		
Have at least 1 health worker to provide ultrasound services (Y)	19	86%	13	87%	9	75%	2	67%	1	100%	54	100%	6	75%	14	64%	118	86%
No. health workers who can provide ultrasound services Mean (Std) Min, Max	1.47 (0.84) 1, 4		1.54 (1.13) 1, 5		1.89 (1.36) 1, 5		2 (1.41) 1, 3		1 (NA) 1, 1		2.85 (2.39) 0, 13		1.5 (0.84) 1, 3		1.50 (0.94) 1, 4		2.15 (1.88) 0, 13	
No. days a health worker is available to provide obstetric ultrasound services at facility (max 7 days) Mean (Std) Min, Max	6 (1.53) 1, 7		5.85 (1.86) 2, 7		4.56 (2.13) 1, 7		4.50 (3.54) 2, 7		4.00 (NA) 4, 4		6.31 (0.99) 4, 7		6.00 (1.10) 5, 7		4.36 (1.86) 1, 7		5.78 (1.60) 1, 7	
No. days ANC services available at facility (max 7 days) Mean (Std) Min, Max	5.74 (1.82) 0, 7		5.00 (2.04) 0, 7		4.89 (1.27) 2, 7		3.00 (2.83) 1, 5		7.00 (NA) 7, 7		5.79 (1.74) 0, 7		5.57 (0.98) 5, 7		4.57 (1.09) 2, 5		5.44 (1.73) 0, 7	
Proportion of days with HR coverage for obstetric ultrasound during ANC days	105%		117%		93%		150%		57%		109%		108%		95%		106%	
Cadre providing ultrasound services																		
Cadre providing US																		
Radiologist	1	5%	0	0%	2	17%	0	0%	0	0%	28	52%	1	13%	0	0%	32	23%
Radiographer	8	36%	8	53%	4	33%	2	67%	1	100%	20	37%	5	63%	9	41%	57	42%
Midwife	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Clinical officer	2	9%	1	7%	1	8%	0	0%	0	0%	3	6%	0	0%	3	14%	10	7%
Nurses	8	36%	4	27%	2	17%	0	0%	0	0%	3	6%	0	0%	2	9%	19	14%
Training & Support Supervision																		
Training program:																		
ECUREI	14	73%	8	62%	6	67%	1	50%	1	100%	26	48%	5	83%	9	41%	70	59%
IWA	3	17%	3	23%	1	11%	0	0%	0	0%	8	15%	0	0%	0	0%	15	13%
Makerere	0	0%	0	0%	0	0%	1	50%	0	0%	4	7%	0	0%	0	0%	5	4%
Mulago-unspe	0	0%	0	0%	0	0%	0	0%	0	0%	13	24%	0	0%	2	9%	15	13%
Mulago Paramedic	0	0%	1	8%	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	2	2%
Mulago SoR	0	0%	1	8%	0	0%	0	0%	0	0%	0	0%	1	17%	0	0%	2	2%

Workforce	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	N=22	%	N=16	%	N=14	%	N=3	%	N=7	%	N=62	%	N=9	%	N=90	%	N=223	%
UIAHS-Mulago	0	0%	0	0%	1	11%	0	0%	0	0%	0	0%	1	17%	0	0%	2	2%
UMU-MKPMS	1	5%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%
Other	1	5%	0	0%	1	11%	0	0%	0	0%	0	0%	0	0%	2	9%	4	3%
Self trained	0	0%	0	0%	0	0%	0	0%	0	0%	2	4%	0	0%	0	0%	2	2%
Never trained	0	0%	0	0%	0	0%	0	0%	0	0%	2	4%	0	0%	1	5%	3	3%
Last support supervision on US																		
Never	11	58%	8	62%	3	33%	1	50%	1	100%	24	44%	4	67%	7	50%	59	50%
<3 months	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
3 to <6 months	4	21%	4	31%	3	33%	1	50%	0	0%	23	43%	1	17%	5	36%	41	35%
6 to <9 months	2	11%	0	0%	0	0%	0	0%	0	0%	3	6%	0	0%	0	0%	5	4%
9 to <12 mons	0	0%	0	0%	1	11%	0	0%	0	0%	1	2%	0	0%	2	14%	4	3%
> 12 months	2	11%	1	8%	2	22%	0	0%	0	0%	3	6%	1	17%	0	0%	9	8%
Type of support supervision if ever received																		
Internal	1	13%	1	20%	0	0%	1	100%	0	0%	8	27%	2	67%	3	43%	16	27%
External	6	75%	4	80%	4	67%	0	0%	0	0%	20	67%	1	33%	4	57%	39	65%
Internal & external	1	13%	0	0%	1	17%	0	0%	0	0%	2	7%	0	0%	0	0%	4	7%
Missing	0	0%	0	0%	1	17%	0	0%	0	0%	0	0%	0	0%	0	0%	1	2%

Table A3b. Summary of available inputs: workforce, by level of care

Workforce	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=13	%	N=106	%	N=54	%	N=6	%	N=13	%	N=106	%
Have at least 1 health worker to provide ultrasound services (Y)	6	100%	9	100%	27	82%	32	71%	39	100%	5	100%	118	86%
No. health workers provide ultrasound services														
Mean (Std)	1.00	(0.00)	1.33	(0.50)	1.52	(0.85)	1.63	(1.39)	3.00	(2.32)	5.20	(2.28)	1.50	(0.84)
Min, Max	1, 1		1, 2		0, 4		1, 8		1, 13		3, 9		1, 3	
No. days a health worker is available to provide obstetric ultrasound services at facility (max 7 days)														
Mean (Std)	7.00	(0.00)	6.67	(0.71)	5.55	(1.92)	4.91	(2.16)	6.13	(1.26)	5.00	(0.71)	5.69	(1.75)
Min, Max	7, 7		5, 7		0, 7		0, 7		2, 7		4, 6		0, 7	
No. days ANC services available at facility (max 7 days)														

Workforce	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=13	%	N=106	%	N=54	%	N=6	%	N=13	%	N=106	%
Mean (Std)	5.83	(2.86)	6.44	(0.73)	5.21	(2.09)	5.27	(1.51)	5.51	(1.64)	5.00	(0.71)	5.44	(1.73)
Min, Max	0, 7		5, 7		0, 7		2, 7		0, 7		4, 6		0, 7	
Proportion of days where obstetric ultrasound services are available during ANC days	120%		104%		107%		93%		111%		100%		105%	
Mean (Std)														
Min, Max														
Cadre providing US														
Radiologist	1	17%	2	22%	8	24%	8	18%	10	26%	3	60%	32	23%
Radiographer	4	67%	4	44%	10	30%	11	24%	26	67%	2	40%	57	42%
Midwife	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
Clinical officer	1	17%	1	11%	2	6%	6	13%	0	0%	0	0%	10	7%
Nurses	0	0%	2	22%	7	21%	7	16%	3	8%	0	0%	19	14%
Training program:														
ECUREI	3	50%	9	100%	16	48%	20	44%	20	51%	2	40%	70	51%
IWA	1	17%	0	0%	9	27%	3	7%	2	5%	0	0%	15	11%
Makerere	0	0%	0	0%	0	0%	2	4%	3	8%	0	0%	5	4%
Mulago-unspe	0	0%	0	0%	4	12%	3	7%	7	18%	1	20%	15	11%
Mulago Paramedic	0	0%	0	0%	0	0%	1	2%	1	3%	0	0%	2	1%
Mulago SoR	1	17%	0	0%	0	0%	0	0%	0	0%	1	20%	2	1%
UIAHS-Mulago	0	0%	0	0%	0	0%	1	2%	1	3%	0	0%	2	1%
UMU-MKPMS	1	17%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%
Other	0	0%	0	0%	0	0%	2	4%	2	5%	0	0%	4	3%
Self trained	0	0%	0	0%	0	0%	0	0%	2	5%	0	0%	2	1%
Never trained	0	0%	0	0%	0	0%	1	2%	1	3%	1	20%	3	2%
Last support supervision on US														
Never at this HF	4	67%	5	56%	14	42%	17	38%	16	41%	3	60%	59	43%
<3 months	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%
3 to <6 months	2	33%	3	33%	9	27%	9	20%	16	41%	2	40%	41	30%
6 to <9 months	0	0%	1	11%	3	9%	0	0%	1	3%	0	0%	5	4%
9 to <12 months	0	0%	0	0%	0	0%	2	4%	2	5%	0	0%	4	3%
> 12 months	0	0%	0	0%	1	3%	4	9%	4	10%	0	0%	9	7%
Type of support supervision if ever received	n=2		n=4		n=14		n=15		n=23		n=2		n=60	
Internal	0	0%	1	25%	5	36%	2	13%	8	35%	0	0%	16	27%
External	2	100%	3	75%	8	57%	12	80%	13	57%	1	50%	39	65%
Internal & external	0	0%	0	0%	1	7%	1	7%	1	4%	1	50%	4	7%
Missing	0	0%	0	0%	0	0%	0	0%	1	4%	0	0%	1	2%

Table A3c. Summary of available inputs: workforce, by managing authority

Workforce	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=140	%	N=48	%
Have at least 1 health worker to provide ultrasound services (Y)	50	77%	35	90%	33	100%	118	86%
No. health workers provide ultrasound services Mean (Std) Min, Max	1.86 (1.48) 0, 9		2.06 (1.61) 1, 7		2.70 (2.52) 1, 13		2.15 (1.88) 0, 13	
No. days a health worker is available to provide obstetric ultrasound services at facility (max 7 days) Mean (Std) Min, Max	4.53 (1.80) 0, 7		6.34 (1.30) 2, 7		6.88 (0.48) 5, 7		5.69 (1.75) 0, 7	
No. days ANC services available at facility (max 7 days) Mean (Std) Min, Max	5.06 (1.12) 1, 7		5.54 (1.85) 1, 7		5.94 (2.24) 0, 7		5.44 (1.73) 0, 7	
Proportion of days where obstetric ultrasound services are available during ANC days Mean (Std) Min, Max	90%		114%		116%		105%	
Cadre providing US								
Radiologist	10	15%	8	21%	14	42%	32	23%
Radiographer	24	37%	17	44%	16	48%	57	42%
Midwife	0	0%	0	0%	0	0%	0	0%
Clinical officer	7	11%	1	3%	2	6%	10	7%
Nurses	9	14%	9	23%	1	3%	19	14%
Training program received:								
ECUREI	29	55%	25	71%	16	48%	70	58%
IWA	9	17%	3	9%	3	9%	15	12%
Makerere	1	2%	2	6%	2	6%	5	4%
Mulago-unspecified	5	9%	3	9%	7	21%	15	12%
Mulago Paramedic	1	2%	0	0%	1	3%	2	2%
Mulago School of Radiology	1	2%	0	0%	1	3%	2	2%
UIAHS-Mulago	2	4%	0	0%	1	3%	2	2%
UMU-MKPMS	0	0%	0	0%	0	0%	1	1%
Other	2	4%	2	6%	0	0%	4	3%
Self trained	0	0%	0	0%	2	6%	2	2%
Never trained	3	6%	0	0%	0	0%	3	2%
Last support supervision on US								
Never at this HF	23	46%	17	49%	19	58%	59	50%
<3 months	0	0%	0	0%	0	0%	0	0%
3 to <6 months	19	38%	12	34%	10	30%	41	35%

Workforce	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=140	%	N=48	%
6 to <9 months	1	2%	3	9%	1	3%	5	4%
9 to <12 months	1	2%	3	9%	0	0%	4	3%
> 12 months	6	12%	0	0%	3	9%	9	8%
Type of support supervision if ever received	n=28		n=18		n=14		n=60	
Internal	8	29%	5	28%	3	21%	16	27%
External	18	64%	11	61%	10	71%	39	65%
Both internal and external	1	4%	2	11%	1	7%	4	7%
Missing	1	4%	0	0%	0	0%	1	2%

Table A4a. Summary of available inputs: information systems, by region

Information Systems	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	N=22	%	N=16	%	N=14	%	N=3	%	N=7	%	N=62	%	N=9	%	N=90	%	N=223	%
Documentation																		
Register available to record no. US services provided (yes)	21	95%	12	80%	10	83%	2	67%	1	100%	54	100%	8	100%	15	68%	123	90%
Where register is available, US data compiled into HMIS 105 and entered into DHIS2 (yes)	17	81%	10	83%	10	100%	1	50%	1	100%	34	63%	6	75%	14	93%	93	76%

Table A4b. Summary of available inputs: information systems, by level of care

Information Systems	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=13	%	N=106	%	N=54	%	N=6	%	N=13	%	N=106	%
Documentation														
Register available to record no. US services provided (yes)	6	100%	9	100%	29	88%	35	78%	39	100%	5	100%	123	90%
Where register is available, US data compiled into HMIS 105 and entered into DHIS2 (yes)	5	83%	7	78%	17	85%	28	80%	32	82%	4	80%	93	76%

Table A4c. Summary of available inputs: information systems, by managing authority

Information Systems	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=140	%	N=48	%
Documentation								
Register available to record no. US services provided (yes)	54	83%	36	92%	33	100%	123	90%
Where register is available, US data compiled into HMIS 105 and entered into DHIS2 (yes)	37	69%	34	94%	22	67%	93	76%

Table A5a. Summary of available inputs: funds, by region

Costs	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	N=22	%	N=15	%	N=12	%	N=3	%	N=1	%	N=54	%	N=8	%	N=22	%	N=137	%
Costs of ultrasound services among facilities with an ultrasound																		
Cost of US covered by Health facility	8	36%	5	33%	4	33%	2	67%	1	100%	6	11%	2	25%	15	68%	43	31%
Patient	10	45%	3	20%	4	33%	0	0%	0	0%	40	74%	4	50%	3	14%	64	47%
Subsidized by HF and partially covered by patient	4	18%	7	47%	4	33%	1	33%	0	0%	8	15%	2	25%	4	18%	30	22%
User fee for ultrasound at HF	18,929	(14830)	14,545	(8501)	20,000	(16499)	3000	(NA)	15,000	(21213)	38,340	(21194)	18,333	(13292)	3,181	(5316)	20,483	(21124)
Mean (Std)	60000		30000		50000		3000		30000		100000		30000		15000		100000	
Min, Max																		

Table A5b. Summary of available inputs: funds, by level of care

Costs	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=9	%	N=33	%	N=45	%	N=39	%	N=5	%	N=137	%
Costs of ultrasound services among facilities with an ultrasound														
Cost of US covered by Health facility	0	0%	1	11%	12	36%	21	47%	8	21%	1	20%	43	31%
Patient	5	83%	7	78%	15	45%	15	33%	22	56%	0	0%	64	47%
Subsidized by health facility and partially covered by patient	1	17%	1	11%	6	18%	9	20%	9	23%	4	80%	30	22%
User fee for ultrasound at HF	26,667	(16,633)	20,000	(21,320)	12,917	(19,229)	21,516	(20,951)	33,468	(20,782)	17,500	(13,229)	20,483	(21124)
Mean (Std)	15000,		0,		0,		0,		0,		0,		0,	
Min, Max	16633		60000		100000		70000		80000		30000		100000	

Table A5c. Summary of available inputs: funds, by managing authority.

Costs	Public		PNFP		PFP		Total	
	N=140	%	N=48	%	N=140	%	N=48	%
Costs of ultrasound services among facilities with an ultrasound	n=65		n=39		n=33		N=137	
Cost of US covered by								
Health facility	39	60%	4	10%	0	0%	43	31%
Patient	13	20%	21	54%	30	91%	64	47%
Subsidized by health facility and partially covered by patient	13	20%	14	36%	3	9%	30	22%
User fee for ultrasound at HF								
Mean (Std)	8,941	(13,928)	23,402	(17,692)	39,486	(21,858)	20,483	(21,124)
Min, Max	0, 60000		0, 80000		0, 100000		0, 100000	

Table A6a. Ultrasound service, by region

Services	Acholi		Ankole		Bugisu		Bukedi		Bunyoro		Kampala		Teso		West Nile		Total	
	N=22	%	N=15	%	N=12	%	N=3	%	N=1	%	N=54	%	N=8	%	N=22	%	N=137	%
Who can tell patient to get US at HF																		
Physician/MO	14	64%	14	93%	5	42%	3	100%	1	100%	51	94%	7	88%	14	64%	109	80%
Clinical officer	19	86%	15	100%	12	100%	2	67%	1	100%	40	74%	8	100%	20	91%	117	85%
Midwife	17	77%	15	100%	11	92%	3	100%	1	100%	40	74%	7	88%	19	86%	113	82%
Nurse	14	64%	15	100%	8	67%	3	100%	1	100%	37	69%	7	88%	14	64%	99	72%
Self-referral	16	73%	11	73%	2	17%	2	67%	0	0%	32	59%	3	38%	13	59%	79	58%
Referrals – oth. HF	1	5%	2	13%	1	8%	0	0%	0	0%	1	2%	2	25%	10	45%	17	12%
VHTs	0	0%	2	13%	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	2	1%
Lab Tech	0	0%	0	0%	0	0%	0	0%	0	0%	0	0%	1	13%	0	0%	1	1%
Referral note required to get US (yes)	14	64%	7	47%	11	92%	3	100%	1	100%	53	98%	8	100%	15	68%	112	82%
Turnaround time on result of US																		
Same day	22	100%	15	100%	11	92%	3	100%	1	100%	54	100%	8	100%	22	100%	136	99%
Separate day	0	0%	0	0%	1	8%	0	0%	0	0%	0	0%	0	0%	0	0%	1	1%

Table A6b. Ultrasound service, by level of care

Services	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=9	%	N=33	%	N=45	%	N=39	%	N=5	%	N=137	%
Who can tell patient to get US at HF														
Physician/MO	5	83%	4	44%	26	79%	35	78%	34	87%	5	100%	109	80%
Clinical officer	5	83%	9	100%	25	76%	41	91%	32	82%	5	100%	117	85%
Midwife	4	67%	8	89%	26	79%	40	89%	30	77%	5	100%	113	82%

Services	Clinic		HC II		HC III		HC IV		Hospital		RRH		Total	
	N=6	%	N=9	%	N=33	%	N=45	%	N=39	%	N=5	%	N=137	%
Nurse	3	50%	7	78%	23	70%	35	78%	26	67%	5	100%	99	72%
Self-referral	6	100%	8	89%	20	61%	19	42%	21	54%	5	100%	79	58%
Referrals – oth. HF	0	0%	0	0%	1	3%	1	2%	1	3%	1	20%	4	3%
VHTs	0	0%	0	0%	1	3%	1	2%	0	0%	0	0%	2	1%
Lab Tech	0	0%	0	0%	0	0%	0	0%	1	3%	0	0%	1	1%
Referral note required to get US (yes)	2	33%	6	67%	27	82%	40	89%	32	82%	5	100%	112	82%
Turnaround time on result of US														
Same day	6	100%	9	100%	33	100%	44	98%	39	100%	5	100%	136	99%
Separate day	0	0%	0	0%	0	0%	1	2%	0	0%	0	0%	1	1%

Table A6c. Ultrasound service, by managing authority

Services	Public		PNFP		PFP		Total	
	N=65	%	N=39	%	N=33	%	N=137	%
Who can tell patient to get US at HF								
Physician/MO	51	78%	27	69%	31	94%	109	80%
Clinical officer	51	78%	37	95%	29	88%	117	85%
Midwife	53	82%	36	92%	24	73%	113	82%
Nurse	48	74%	27	69%	24	73%	99	72%
Self-referral	29	45%	29	74%	21	64%	79	58%
Referrals – oth. HF	3	5%	1	3%	0	0%	4	3%
VHTs	1	2%	1	3%	0	0%	2	1%
Lab Tech	0	0%	1	3%	0	0%	1	1%
Referral note required to get US (yes)	53	82%	31	79%	28	85%	112	82%
Turnaround time on result of US								
Same day	64	98%	39	100%	33	100%	136	99%
Separate day	1	2%	0	0%	0	0%	1	1%

Table A7a: Summary on availability of effective services by region

	Acholi	Ankole	Bugisu	Bukedi	Bunyoro	Kampala	Teso	West Nile	Total
Number of days a week a health facility offers ANC services									
Average	5.64	4.69	5.36	3.67	5.43	5.77	5.44	4.63	5.14
Min	0	0	2	1	4	0	5	0	0
Max	4	7	7	5	7	7	7	7	7
Number of days a week health worker at health facility is available to provide ultrasound services									
Average	5.18	4.75	2.93	3	0.57	5.61	4	0.68	3.10
Min	0	0	0	0	0	0	0	0	0
Max	7	7	7	7	4	7	7	7	7
% of ANC days where ultrasound services are available									
Average	92%	101%	55%	82%	10%	97%	74%	15%	60%

Table A7b: Summary on availability of effective services by level of care

	Clinic	HC II	HC III	HC IV	Hospital	RRH	Total
Number of days a week a health facility offers ANC services							
Average	5.83	6.69	4.92	5.13	5.51	5.00	5.14
Min	0	2	0	0	0	4	0
Max	7	7	7	7	7	6	7
Number of days a week health worker at health facility is available to provide ultrasound services							
Average	7.00	4.62	1.52	3.00	6.13	5.00	3.10
Min	7	0	0	0	2	4	0
Max	7	7	7	7	7	6	7
% of ANC days where ultrasound services are available							
Average	120%	69%	31%	58%	111%	100%	60%

Table A7c: Summary on availability of effective services by managing authority

	Public	PNFP	PFP	Total
Number of days a week a health facility offers ANC services				
Average	4.82	5.46	6.0	5.14
Min	0	1	0	0
Max	7	7	7	7
Number of days a week health worker at health facility is available to provide ultrasound services				
Average	1.71	4.63	6.49	3.10
Min	0	0	0	0
Max	7	7	7	7
% of ANC days where ultrasound services are available				
Average	35%	85%	108%	60%