Health Facility Study Report

Adamawa State ETS Programme

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2 List of Acronyms

ANC	Antenatal Care
BMGF	Bill and Melinda Gates Foundation
ETS	Emergency Transport Scheme
GH	General Hospital
HF	Health Facility
LGA	Local Government Area
MMR	Maternal Mortality Ratio
NDHS	Nigeria Demographic and Health Survey
NGO	Non-Governmental Organisation
NPM	National Project Manager
NURTW	National Union of Road Transport Workers
PHC	Primary Health Care
PPH	Postpartum Haemorrhage
SFH	Society for Family Health
SMoH	State Ministry of Health
UNICEF	United Nations Children's Fund

3 Executive Summary

The Emergency Transport Scheme (ETS) programme started in July 2013 and will conclude in June 2018. The programme, implemented in partnership with the Nigerian NGO Society for Family Health, aims to contribute to reducing maternal mortality in Adamawa State, Northern Nigeria, through a collaboration with the National Union of Road Transport Workers' (NURTW) commercial taxi drivers who are trained to provide an affordable, accessible, safe and timely emergency transport service for pregnant women in labour or for those experiencing complications during their pregnancy. During the fourth year of the programme a study was undertaken to understand the impact of ETS on the health condition of women arriving at a health facility.

The hypothesis for this research is that; *"The provision of ETS across the State makes a significant difference to the level of severity of Obstetric Complications presenting at Local Government Areas Emergency Obstetric Care centres for low income women in Adamawa who suffer from medical complications when giving birth and who need Emergency Obstetric Care".*

Inadequate transport services and infrastructure are a major contribution to high maternal mortality in Africa (Lema, 2010). Gil-González *et al*. (2006) estimated that 35% of maternal deaths can be directly attributed to lack of transport, and Babinard and Roberts (2006) estimated that in 75% of cases where maternal deaths occur, transport is an influential factor. This study focuses on the programme's third objective, to determine the effect of the use of ETS on the health status of women on arrival at a facility for maternal health care, to understand if ETS can make an impact on maternal deaths by transporting women to health facilities in a timelier manner and thus arriving in a better health condition then those using other modes of transport. There is limited evidence-based guidance for practitioners and policy-makers in both the health and transport sectors on how best to reduce the negative impact that a lack of transport has on Africa's maternal mortality burden and so this study can add to global learning.

Methodology

The study was implemented over a 14-week period in nine facilities across three Local Government Areas (LGAs) and 312 women attending those facilities were interviewed. Four forms were used to gather data for the study; Written informed consent form - to request for informed consent from women to participate in the study, Condition assessment form - to collect basic information from the patient upon arrival at a health facility such as date, name, time of arrival at the facility and basic non-invasive vital signs information, Hospital referral form - used at the referral level health facility to gather the same information as the condition assessment form and the Follow up form - to collect socio-economic data from the participants in the study.

To ensure comparable data from all the 16 programme LGAs[1] for the selection of LGAs and health facilities, the 13-month period of September 2015 to September 2016 was selected as during this period ETS was fully functioning in all the LGAs. The average number of transfers per LGA over this period was calculated and two LGAs were selected based on one LGA performing lower and one LGA performing higher than the majority of LGAs in terms of the average monthly ETS transfers. Additionally, a third LGA was selected that had the facility with the highest number of ETS transfers over the 13-month period to allow the best opportunity of capturing data relating to ETS. In each LGA one higher level hospital/health facility and three health centres were selected along with the highest performing facility. Subject selection was based on women aged 13-49 who had arrived at a health facility as a result of labour or a complication during pregnancy or as a result of an unsafe abortion.

[1] Demsa, Fufore, Ganye, Girei, Gombi, Guyuk, Hong, Jada, Lamurde, Mayo-Belwa, Numan, Shelleng, Song, Toungo, Yola North and Yola South

Findings

The data shows that **ETS users arrive in a better health condition at a facility than those using other modes of transport**. **The data also indicates that the poorest women, those in the lowest economic quintile, are benefitting from ETS and that these women also have a better health condition than non-ETS users upon arrival at a facility**. While ETS is accessible to all women, it was always envisaged that ETS would serve the poorest members of society, those who would struggle to pay for available transport.

The study data demonstrates that across the sample of facilities selected for the study, the health condition of women arriving at the facilities varies significantly. There are likely to be many contributing factors to this finding such as distance to the nearest health facility and the local terrain, which both lead to time delay and negatively impact on the woman's health condition. Likewise delays due to delayed decision making, which could be based on cultural factors or due to the need to find cash to pay for transport, have a negative impact.

Women who used ETS for referral to a higher level health facility did not present with better vital signs than women who did not use ETS. However, the sample size for ETS is very small, only five, and not statistically significant.

Time taken to arrange and be transported to a facility is considered to be an important variable in the health condition of a woman on arriving at a health facility and there is evidence to show that the longer a woman takes to reach a health facility during a maternal emergency, the worse her health condition is likely to become.[2] **The study shows that ETS users have a greater chance of organising transport and reaching a health facility within one hour in comparison with those using non ETS modes of transport during this study.**

An interesting trend emerged from the study data with regards to women who had experienced a complication during a previous live birth. A significantly high proportion of women interviewed in the study (94%) who had had at least one previous live birth also stated experiencing a maternal complication during a previous pregnancy. This would indicate that previous bad experiences have had an impact on women and their family's decision making during pregnancy around having an institutional delivery. Although this programme cannot, in its closing stages, further investigate this finding, it would be an interesting topic for further research.

Considerations for future research

This study has yielded data that appears to prove the hypothesis that ETS makes a significant difference to the level of severity of Obstetric Complications presenting at health facilities for low income women. Interesting research questions for future ETS programmes and studies could be:

- Why is birth preparedness so much better for the women interviewed during the study versus those from previous studies?
- What is the relationship between women who experienced a complication during a previous live birth and their decision making for an institutional delivery for subsequent pregnancies?
- What is the relationship between the different factors of the clinical condition score (percentage contribution of what health centre is used, percent contribution of if ETS is used, percent contribution of income quintile, etc)? Is there any way to explain cause and effect?
- What role does ETS play in reducing transfer times between lower level and higher level health facilities for maternal cases, and how does this effect women's overall health condition / vital signs?

[2] Turner et al., 2013, Linking Rural Communities with Health Services: Assessing the Effectiveness of the Ambulance Services in Meeting the Needs of Rural Communities in West Africa; Africa Community Access Programme (AFCAP), Transaid, 2013

These questions show how the valuable data gathered during the study could be unpacked and analysed more and built upon in future studies.

Conclusion

It can be said with confidence that ETS has an effect on the health status of women arriving at a facility for maternal health care. This study identified a statistically verifiable positive difference over those using other modes of transport. The outcome of the t-tests and other statistical testing appears to show that ETS serves poorer women more than the general population and that they are in a better health condition (based on an assessment of vital signs) upon arrival at a health facility as a result of using ETS.

Anecdotal information points to several influences on decision making regarding referral cases. Misunderstanding of being referred, associating a referral with an operation, as well as lack of money for transport, food and care and seeking spousal permission all impact upon the decision to seek additional care at a higher-level facility. This information is anecdotal and each influence cannot be separated out and weighted based on impact on decision making in this study. However, understanding these barriers exist assists in creating an understanding of the current situation.

The findings of this study serve as an evidence base to prove ETS is contributing to maternal health improvements through statistically significant data. They can be used in the future to not only advocate for scale up of ETS initiatives generally, but also to advocate for investment in ETS within Nigeria by the government and states for funding and support.

4 Introduction

4.1 Maternal health profile in Nigeria and in Adamawa State

With a Maternal Mortality Ratio (MMR) of 576 deaths per 100,000 live births, Nigeria has one of the highest MMRs in sub-Saharan Africa according to the 2013 Nigerian National Demographic and Health Survey (NDHS) estimates[3]. In the seven years preceding the 2013 NDHS, for every 1,000 live births in Nigeria, approximately six women died during pregnancy, childbirth, or within two months of childbirth. A 2007 UNICEF publication[4] on Maternal, Newborn and Child Health suggests the disparity between the six zonal areas of Nigeria can be quite significant. The publication states that the MMR in the North-East zone (which includes Adamawa State) is 1,549/100,000 in comparison to the South West zone which has a MMR of 165/100,000. This suggests that Adamawa State's MMR is almost certainly much higher than the official national rate.

The NDHS[5] states that 33.4% of women deliver at health facilities in Adamawa State, against a national average of 36%. In comparison, data from the programme's baseline study in 2013 indicates that less than 20% of women in Adamawa deliver in a health facility. It is known that there is a correlation between the proportion of women that give birth at a health facility and the number of maternal deaths.

Health service vehicles are few, distances between communities and health centres can be large, and transport is prohibitively expensive for the majority of people in Adamawa State. This is particularly true for those experiencing complications who typically experience exploitive fare price increases when emergency transportation is required. For these reasons, it is beyond the means of many women to seek assistance during childbirth or when they suffer potentially life-threatening complications.

4.2 Study Rationale

Inadequate transport services and infrastructure are a major contribution to high maternal mortality in Africa (Lema, 2010). Gil-González et al (2006) estimated that 35% of maternal deaths can be directly attributed to lack of transport, and Babinard and Roberts (2006) estimated that in 75% of cases where maternal deaths occur, transport is an influential factor. However, there is limited evidence-based guidance for practitioners and policy-makers in both the health and transport sectors on how best to reduce the negative impact that a lack of transport has on Africa's maternal mortality burden. In Katsina State, Turner *et al.* (2013) developed an evaluation framework to better understand the interaction between physical access and health outcomes and to measure the differences in patient condition when being referred from local health centres to higher-level referral facilities. The research in Katsina provided some interesting insights into the relationship between transport (time) and women's health conditions. Using the vital signs approach (as is used in this study), statistical associations were found between a number of vital signs and the condition in which women arrived at the referral facility and how long it took to be referred.

This Health Facility study proposes monitoring women's health conditions and builds on the conceptual innovations developed by Turner, tracking women's health conditions.

The ETS programme in place in Adamawa State has three primary objectives:

1. To provide pregnant women in the State of Adamawa access to an affordable, safe and timely means of transportation to a registered health facility whenever a maternal health emergency occurs

[3] National Population Commission (NPC) [Nigeria] and ICF International. 2014. Nigeria Demographic and Health Survey 2013. Abuja, Nigeria, and Rockville, Maryland, USA: NPC and ICF International.
[4] https://www.unicef.org/nigeria/ng_publications_advocacybrochure.pdf
[5] Ibid.

2. To mobilise community members in Adamawa to value and use the ETS services in response to maternal and new-born health emergencies
3. To determine the effect of the use of ETS on the health status of women on arrival at a facility for maternal health care.

This study focused on the third objective. To be able to measure the health status of women on arrival at a facility, the programme examines the difference between the health condition of women arriving at facilities via ETS, compared with those arriving using other means of transport. This programme indicator enables monitoring of the effect of ETS on the health condition of those who use the service with a particular focus on the most economically vulnerable.

In 2014 a protocol for this study was submitted to the Adamawa State Ethics Committee of the State Ministry of Health for ethical clearance. This protocol was designed to cover the programme's baseline, midline and endline studies, as well as the monitoring of women's health conditions throughout the referral chain. This protocol examined the three delays model (see Table 1) and attempted to study all three delays in different ways. The scope of the programme has changed since the development of that protocol and lessons have been learned on the ground which have required a different approach. The new protocol submitted for ethical clearance better responded to the programme's needs.

Table 1: Original 2014 protocol

Three Delays Model – Original protocol	Rational for change in protocol scope
Delay I – delay in deciding to seek care A workshop and focus groups were going to be used to promote ETS and enhance awareness of the eight maternal danger signs. Once the promotion was completed data would be collected from SURE-P[6] village health worker logbooks both before and after the intervention and the data analysed.	This is no longer applicable as the approach to community engagement has changed and both SFH and Transaid have, over the past 2 years, been conducting light community engagement at different levels within the programme communities. The programme did not receive funding specifically for community engagement from the Bill and Melinda Gates Foundation (BMGF) (which was expected at programme design stage) due to the BMGF not expanding its activities into Adamawa State.
Delay II – delay in identifying and reaching health facilities To ensure NURTW volunteer taxi drivers complete the ETS drivers' logbook. At the Primary Health Centre (PHC) or General Hospital (GH) level, assess pregnant woman's health status. Data analysis would look at the health status of women being referred and this would allow for a review of the condition of women prior to arrival at a PHC and once at the PHC.	An updated indicator, agreed in discussion with the donor (Comic Relief), which requires a comparison of the health condition of women using ETS versus non ETS modes of transport arriving at a health facility. This updated protocol now appropriately covers this indicator.

[6] Subsidy Reinvestment and Empowerment Program (SURE-P) is a scheme established by the Federal Government of Nigeria to re-investing the Federal Government savings from fuel subsidy removal on critical infrastructure projects and social safety net programmes with direct impact on the citizens of Nigeria.

Delay III – delay in receiving adequate and appropriate treatment To map PHCs and GHs available resources, and to combine best evidenced-based practice and available resources to create recommendations to enhance maternal wellbeing by giving healthcare providers an easy-to-read map of next-step procedures during obstetric emergencies and which resources to use. This would have involved an evaluation over six months of every PHC and GH resource.	It is not within the programme's scope to study the third delay and the level of appropriate care. Initially this would have been an area the programme could have studied, especially with the wider BMGF funding. However, following the baseline study and discussion with Comic Relief on what the programme could and should achieve and based on the reality on the ground it was agreed to de-scope this aspect.

4.3 The research hypothesis

The hypothesis for this research is as follows;

"The provision of ETS across the State makes a significant difference to the level of severity of Obstetric Complications presenting at LGA Emergency Obstetric Care centres for low income women in Adamawa who suffer from medical complications when giving birth and who need Emergency Obstetric Care".

Currently there is a limited amount of academic literature aimed at understanding poor physical access as a factor in the number of women giving birth in health facilities in sub-Saharan Africa. However, the literature that is available acknowledges that poor physical access plays a significant factor.

One study[7] in 2011, funded by DfID's Africa Community Access Programme (AFCAP), was undertaken to explore the impact that poor community access in West Africa has on maternal health. As well as looking at referral travel times it also looked at the health condition of women at the local health centre upon point of referral and at the referral facility upon arrival. Amongst other findings, the study showed that there was a significant relationship between the modes of transport to the initial health centre and their vital signs for neurological condition, blood pressure, pulse, urine and temperature. The project showed that improving access to a referral facility may have a positive impact on the health condition of women in childbirth. It also showed that poor physical access does contribute to the poor health condition of women when they arrive at a facility.

The hypothesis of this study in Adamawa adds a learning opportunity for the Emergency Transport Scheme as well as adding to the wider body of knowledge about poor access and the impact it has on maternal and new born health in sub-Saharan Africa. Previous programmes utilising this form of ETS in Nigeria have not had the opportunity to conduct such a study that compares the health condition of women utilising ETS on arrival at the health facility with those who have not used ETS to get to a health facility.

[7] http://www.transaid.org/wp-content/uploads/2015/09/AFCAP-Linking-Rural-Communities-to-Health-Services.pdf

5 Methodology

5.1 Timeline

Formative research was carried out in Adamawa State in November 2013 to inform the programme design and gather information related to indicators. Baseline and midline studies were conducted in 2014 and 2016, respectively, and consisted of fieldwork, data entry, cleaning and analysis and report writing. In 2017 the ethically approved ETS User Survey was completed. Additionally, in February 2017, the Adamawa State Ministry of Health (SMoH) gave ethical clearance for this Health Facility Study to be conducted.

Table 2: Research activities to date

Activities to date	Date
Formative research	November 2013
Ethical approval	June 2014
Baseline study	August 2014
Midline study	August 2016
ETS User survey	March 2017
Health Facility Study	June 2017

5.2 Study forms and data collected

During the study four forms were used;

1) Written informed consent form:
   This form was used to request for informed consent from women to participate in the study and allow the programme to use the information provided for the research. The form specified that information given will be kept confidential and the information will remain anonymous.
2) Condition assessment form:
   This form was used to collect basic information from the patient upon arrival at a health facility such as date, name, time of arrival at the facility and basic non-invasive vital signs information consisting of breaths per minute, temperature, pulse, blood pressure and urine (amount in millilitres) per hour.
3) Hospital referral form:
   This form was used at the referral level health facility. It gathered the same information as the condition assessment form, including the non-invasive vital signs, and additional time information relating to the referral.
4) Follow up form:
   This was used to collect socio-economic data from the participants in the study. The information was collected after treatment had been administered and the patient was in a stable and coherent condition. The form included questions about the household, assets, transportation habits and maternal components such as birth preparedness.

5.3 LGA and Health Facility Selection

The following details the selection process and criteria for the study.

5.3.1 Timeframe

In order to have comparable data from all 16 programme LGAs[8] for the selection of LGAs and health facilities, the 13-month period of September 2015 to September 2016 was selected. This period allowed for the ETS to be fully functioning in all the LGAs as ETS was established in different LGAs at different times during the initial programme implementation. During the 13-month period 6,636 transfers were completed across all 16 LGAs by the ETS volunteers. The average number of transfers per LGA per month over this period was 32 with the highest and lowest average transfers per month being 94 and nine respectively.

5.3.2 LGA Selection

Two LGAs were selected for this study according to the following criteria:

- One LGA that was performing less well than the majority of LGAs in terms of the average number of monthly ETS transfers
- One LGA that was performing better than the majority of LGAs in terms of the average number of monthly ETS transfers

LGA was selected as the LGA performing lower than average and Jada LGA as the LGA performing higher than average in terms of number of ETS transfers per month. A third LGA was selected, Ganye LGA, as the health facility with the highest number of ETS transfers over the 13-month period.

Anecdotal evidence suggests that the difference in levels of uptake of ETS in LGAs depends on many factors; including whether an LGA is predominately urban or rural, whether areas are hard to reach areas and so on. To ensure a representative sample, the above LGA selection criteria enabled a selection of LGAs that likely have different geographical layout, population density, rural to urban ratio, security and socio-economic structures.

5.3.3 Health Facility Selection

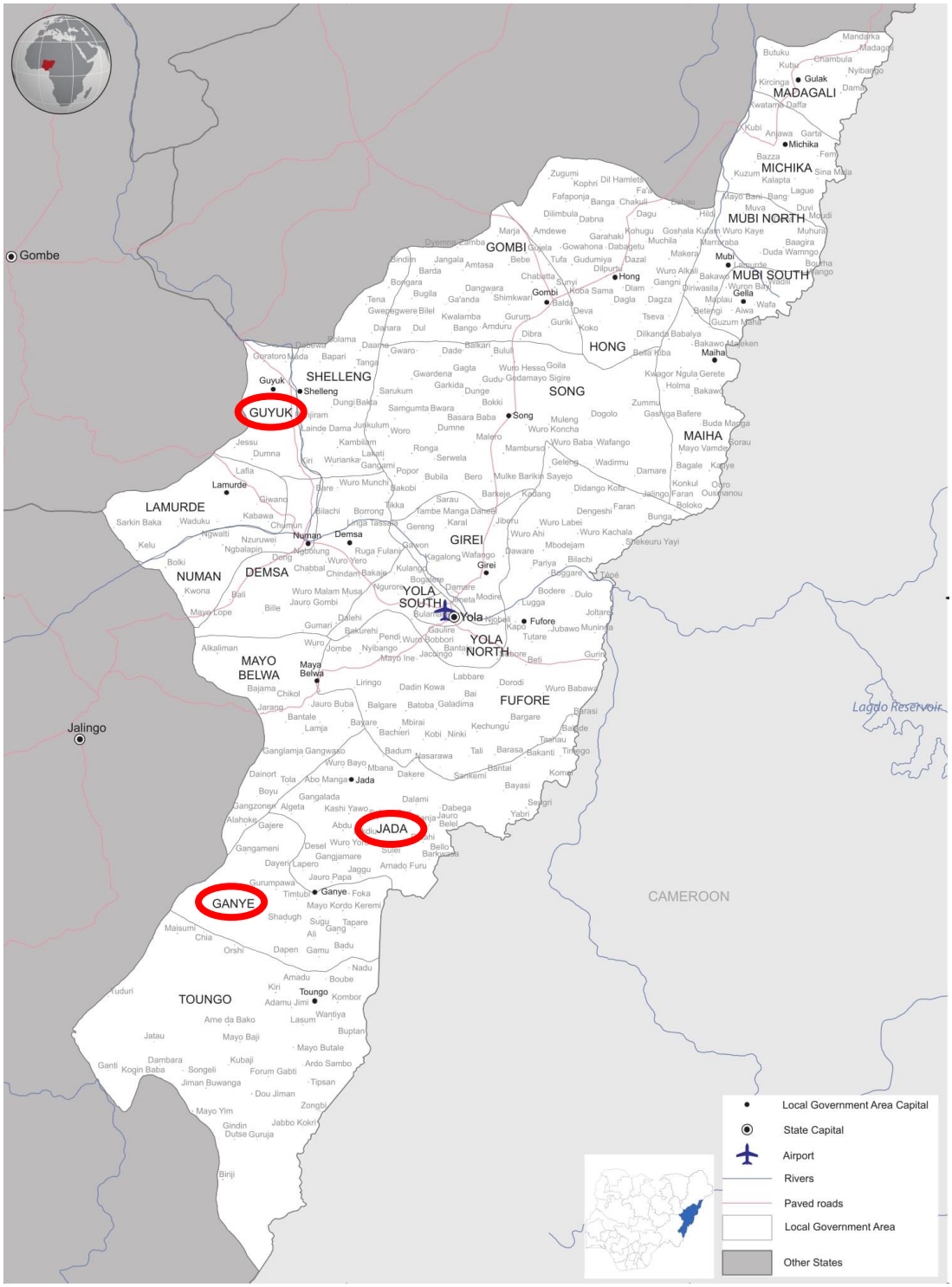
In each LGA, one higher level hospital/health facility and three health centres were selected based on the following criteria:

- Higher-level referral hospital/facility that provides comprehensive emergency obstetric care
- Lower level health centre must:
    - refer to the selected higher-level referral hospital/facility
    - be one of the top six performing health facilities in the LGA in terms of number of ETS transfer cases per month during the selected 13-month period. This criterion was used to ensure the best opportunity to capture ETS transfer cases as well as those using other modes of transport to reach a facility.
- Level of accessibility – distance, time and affordability. If accessible by ETS none of these factors are deemed a prohibiting factor in accessing the facility

As previously stated, another health facility, Ganye General Hospital, in a third LGA (Ganye) was selected due to it being the highest performing facility across all the LGAs in the 13-month period. This was selected to have a representation of the state by selecting LGAs and facilities of varying performance and in different locations.

[8] Demsa, Fufore, Ganye, Girei, Gombi, Guyuk, Hong, Jada, Lamurde, Mayo-Belwa, Numan, Shelleng, Song, Toungo, Yola North and Yola South.

Figure 1: The locations of the three selected LGAs in Adamawa State.



The data in Table 3 was developed in collaboration with the health facility staff at each study location. The number of ETS transfers was collected from the programme's Driver Database, which is the primary data collection tool used to record the number of ETS transfers completed during the programme by ETS volunteer drivers and is based on information gathered from ETS logbooks.

Table 3: Average number of deliveries, complications and ETS transfers per month per health facility

LGA	Health facility	Average no. of deliveries a month	Average no. of complications a month (out of the total no. of deliveries)	Average no. of ETS transfer per month (out of the total no. of deliveries)
Jada	Jada General Hospital	12	8	5.08
	Kojoli PHCC	20	5	7
	So'o PHCC	25	8	15.15
	Mapeo PHCC	15	2	5
Guyuk	Cottage Hospital Guyuk	20	8	1.67
	Gunda PHCC	26	12	0.22
	Purakayo PHCC	31	5	1.11
	Maternity Guyuk	35	5	0.78
Ganye	General Hospital Ganye	110	20	18.08
	Total	294	73 (24.8%)	54.09 (18.4%)

The data in the table above gives an initial understanding of the split of ETS and non ETS transfers. The data indicated that on average approximately 18% of all deliveries at the targeted health facilities were transported by the programme's ETS. However, it must be noted that for the study it was understood that not every maternal case 24 hours a day, 7 days a week would be captured by the researchers. Patient selection criteria and researcher's workload and working hours would all effect the number of cases that would be captured during the study.

5.4 Researcher Selection

Health facility staff in the selected facilities, upon being told about the study and what it comprised, gave their names to be considered for the role of researcher for the study. A group of researchers comprising of Maternity in-Charge and health workers from the participating facilities attended a one-day training that included the following topics:

1) Objective of the study
2) Category (age group) of women participating
3) Study areas
4) Data recording and record keeping
5) Data collection tools such as:
    a) Written informed consent (Appendix 1)
    b) Follow up form (Appendix 2)
    c) Referral form (Appendix 3)
    d) Condition Assessment (Appendix 4)

The training was conducted in March 2017 and as well as the programme team, a doctor was present to ensure full understanding of the vital signs assessment that formed part of the Referral form and the Condition Assessment form. This section of the training was important and time was dedicated to a questions and answers session with the researchers and the doctor, followed by the doctor's discussion and demonstration of correct medical and data collection techniques. For example, when taking the heartrate per minute of a patient the correct method is to count the heartbeats for 60 seconds. Some health professionals, in an effort to save time, count the heartbeats for six seconds and simply multiply by 10 to get the heartrate per minute, which can give an inaccurate result. This session gave the researchers confidence and ensured a greater degree of data accuracy for the study.

5.5 Subject Selection

In each of the lower level health facilities sampled, a research assistant (a facility staff member) gathered data using the forms provided for patients who met the criteria, as laid out in Table 4 below, for participation in the study.

Table 4: **Health facility patient selection criteria**

Included	Excluded
Women aged 13-49	Women younger than 13 years of age and older than 49 years of age
Women who arrive at the health centre as a result of a medical complication whilst in labour or a complication during pregnancy	Women pregnant or in labour who arrive at the health centre **not** as a result of medical complication whilst in labour or a complication during pregnancy
Women who were referred as a result of an unsafe abortion	

Women who met the above criteria (or their accompanying family member/partner) were asked to sign an informed consent form to take part in the study. If the patient consented, a Condition Assessment form (see Appendix 4) was completed.

At each referral hospital, a research assistant gathered data provided from patients fulfilling the criteria for participation in the study. These included those who were referred by the lower level health facilities and those who self-referred from the communities served by the health centres being sampled.

Table 5: **Referral hospital patient selection criteria**

Included	Excluded
Women who are not referred by the health centre but who self-refer, hence 'bypassing' the health centre but are based within the catchment area of the chosen health centres.	Those who self-refer to referral hospitals/facilities and are not from the communities served by the health centres being sampled will not be included.
Women who are referred from a health centre as a result of a medical complication whilst in labour or during pregnancy.	Women pregnant or in labour who arrive at the health centre **not** as a result of medical complication whilst in labour or from a complication during pregnancy.
Women who were referred as a result of an unsafe abortion.	

Women who met the criteria and presented themselves at the health centre during the study period, including those who were clinically assessed by health centre staff as being in need of emergency referral due to medical complications, were asked (or their accompanying family member/partner) to sign an informed consent form to take part in the study.

If the patient consented, a referral form (see Appendix 3) was completed, in addition to the existing State Ministry of Health referral form. The study referral form travelled with the patient and the existing standard State Ministry of Health "Referral slip". The patient was clinically assessed upon arrival at the referral hospital and the details of the assessment completed on the study referral form along with the time of arrival and the means of transport.

Table 6: **Special procedures to ensure consent was secured for cases where the patients were:**

Reason for inability to give consent	Procedure
Incapable of giving consent	Adult family member of this category of patient are asked to kindly give consent.
Adolescents (under the age of consent)	Adult family member of this category of patient are asked to kindly give consent.
Cultural reasons	The researcher can request that they can help sign on their behalf if verbal consent is given. A religious or community leader can be requested that is immediately available/within the hospital to consent on their behalf.
Unconscious	For those that are unconscious, medical care is given prior to seeking consent. Consent is later brought to the attention of the patient when she has recovered and is in a coherent state.

With the patient in a stable and coherent condition, the hospital-based research assistant collects a small amount of follow-up information using the separate follow-up form (see Appendix 2) which included:

- A matching Subject Identification Number to the one on the condition assessment or referral form
- Socio-demographic data (including age, household structure, assets, location and consent required for journey to be made)
- Obstetric history

5.6 Study Implementation

Data collection took place from March 2017 until June 2017 and 312 cases were surveyed across the nine health centres in the three selected LGAs. Within each health centre the researcher gathered data using the forms provided for the study over the 14-week fieldwork period.

Once patients met the selection criteria and had given consent to an interview, a form was used to conduct the interview. For those women at the lower level health facility a condition assessment form (Appendix 4) was used. The form included information such as:

- Personal Identification Number
- A vital signs assessment of their condition
- Record of time of departure to health facility from starting location/home
- Record of time of arrival at health facility

At the referral level, a referral form (Appendix 3) was completed in addition to the existing State Ministry of Health referral form. The referral form included information such as:

- Personal Identification Number
- A vital signs assessment of their condition at the point of referral
- Record of time of call made for emergency transport
- Record of time of departure to health facility from starting location/home
- Record of time of departure from health centre (for referrals only)
- Record of time of arrival

Supervisors collected data from each facility every two weeks. This gave the researchers the time to collect the data in-between visits as well as being a quality control mechanism for the study. The supervisors could discuss any issues regarding data collection or entry with the researchers as well as quality assure their methods of data collection in accordance to the protocol. Data collection was also structured this way in order to continually monitor the number of interview respondents to ensure a large enough sample size so as to be statistically significant for analysis. Towards the end of the fieldwork it was determined that more respondents were required who had used ETS to ensure robust data for analysis. The decision was taken to extend the data collection by an additional two weeks from 12 to 14 weeks and during this period a total of 312 women were interviewed.

Data was carefully treated throughout the study. Data was entered into Excel spreadsheet templates by the two supervisors. Due to the sensitive nature of the data collected, only select Transaid staff have access to the archived forms.

5.7 Stopping and discontinuing the study

The study would have stopped or discontinued if:

- Patients had objected to it and the collection of their information
- The data gathering and assessment process was deemed to be unnecessarily delaying the patient care or referral process
- Changes to the referral hospital or health centre rendered the results invalid

6 Data Analysis

Data was regularly collected from the researchers for monitoring purposes and to allow for the ability to rectify or resolve any arising issues or concerns. The forms collected were checked by the supervisors and any necessary clarifications were obtained from the researchers. The data from the forms was then entered by the supervisors into Excel templates. Cleaning and verification was undertaken by the international technical advisor with any clarification or additional information provided by the National Project Manager and supervisors. In total 312 women were interviewed across the three LGAs in nine health facilities, of which 52 women had used ETS and 260 women had used other modes of transport to reach a facility.

The data in Table 3[9] indicates approximately 18% of all deliveries at the study facilities are transported using ETS. The information gathered during the study was in line with this result with 17% of all cases recorded having used ETS to reach a health facility.

6.1 Tests used:

The t-test: This statistical test is used to compare sample populations and determine if there is a significant difference between their means. The result of the t-test is a 't' value; this value is then used to determine the p-value. The p-value is the probability that 't' falls into a certain range. In other words, this is the value used to determine if the difference between the means in the sample populations is significant. For the study purposes, a p-value < 0.05 suggests a significant difference between the means of the sample population and would lead to a rejection of the null hypothesis (i.e. the null hypothesis is a more formal statement of the study's original hypothesis)[10]. A p-value > 0.05 suggests no significant difference between the means of the sample populations meaning that the null hypothesis would not be rejected.[11]

Levene's test: In statistics, Levene's test is an inferential statistic used to assess the equality of variances for a variable calculated for two or more groups. Some common statistical procedures assume that variances of the populations from which different samples are drawn are equal. Levene's test assesses this assumption. It tests the null hypothesis that the population variances are equal (called homogeneity of variance or homoscedasticity). If the resulting p-value of Levene's test is less than some significance level (typically 0.05), the obtained differences in sample variances are unlikely to have occurred based on random sampling from a population with equal variances. Thus, the null hypothesis of equal variances is rejected and it is concluded that there is a difference between the variances in the population.[12]

F-test: An F-test is any statistical test in which the test statistic has an F-distribution under the null hypothesis. It is most often used when comparing statistical models that have been fitted to a data set, in order to identify the model that best fits the population from which the data were sampled.[13] It is designed to test if two population variances are equal. It does this by comparing the ratio of two variances.[14]

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[9] Average number of deliveries, complications and ETS transfers per month per health facility.

[10] A general statement or default position that there is no relationship between two measured phenomena, or no association among groups. Rejecting or disproving the null hypothesis—and thus concluding that there are grounds for believing that there is a relationship between two phenomena (e.g. that a potential treatment has a measurable effect)—is a central task in the modern practice of science. https://en.wikipedia.org/wiki/Null_hypothesis

[11] https://www.nku.edu/~intsci/sci110/worksheets/basic_ttest_info.html

[12] https://en.wikipedia.org/wiki/Levene%27s_test#cite_note-Levene1960-1

[13] https://en.wikipedia.org/wiki/F-test

[14] https://people.richland.edu/james/lecture/m170/ch13-f.html

The tests detailed above allow, among other analysis, the comparison of the socio-economic characteristics of those who used ETS and those who used other modes of transport. They have the ability to compare the combined clinical condition score (vital signs) of those patients who used ETS versus those who used other modes of transport. These are key in understanding the research hypothesis.

6.2 Socio-economic Characteristics

This section details the comparison of the socio-economic characteristics of those who used ETS and those who used other modes of transport to reach a facility. Of the 312 women interviewed 309 answered the follow up form which was the basis for the socio-economic data detailed below. The statistical tests and graphs for this data are presented in Appendix 5.

6.2.1 Age

As per the Midline study, conducted in August 2016, and the recent ETS User Survey conducted in March 2017, 82% of women who took part in the study were between 20 and 39 years of age. Table 7 breaks down the proportion of women participants for each age range category.

Table 7: Distribution of women's age across the sample

Age (years)	Frequency	Percentage
13 – 19	47	15%
20 – 29	158	51%
30 – 39	97	31%
40 – 49	6	2%
Age unknown	1	1%

The average age for the combined sample is 25.98 years (ETS 26.20; non-ETS 25.94). There is no significant age difference between the two groups i.e. those who used ETS and those who used other modes of transport (t=0.787 assuming equal variances; t=0.747 assuming different variances). Variances not equal (Levene test: F=10.09 p=0.02). There is greater variability in ages among those using other modes of transport. This finding could indicate that those who use ETS fall into a more specific age range of the population rather than being spread across all the age ranges.

6.2.2 Marital Status

The majority of women interviewed (303 out of 309) were married. This is a reflection of the cultural norm of the area where the vast majority of women have children in wedlock. Six women who used non-ETS transport were single. No women were identified as being separated, divorced or widowed. It is plausible that single women prefer to deliver at home for reasons such as having no husband to pay for transport and hospital bills, being too embarrassed (from a cultural perspective) to arrive at a hospital without having a husband accompanying them or the social stigma of being pregnant out of wedlock in a part of Nigeria where such situations are still the exception and can be frowned upon by communities in general.

6.2.3 Wealth Ranking

Factor analysis has been used to rank households by a number of variables that correlate with wealth status. Factor analysis is a statistical method used to describe variability among observed, correlated variables in terms of a potentially lower number of unobserved variables called factors.

The observed variables are modelled as linear combinations of the potential factors, plus "error" terms. The variables used in this dataset are;

- materials used for walls, floors and roof
- type of water source
- type of latrine/toilet
- type of fuel used
- ownership of assets
- number of livestock owned.

The households were ranked from lowest to highest and divided into quintiles. On the basis of the wealth rankings, the following conclusions were reached:

- **Significantly more women using ETS fall in the lowest 2 quintiles (59%) compared to those using non-ETS (35%). P<0.01.**
- **The majority of ETS users are the most economically vulnerable women.**

6.2.4 Wealth Ranking Dataset

As stated above, there were several variables in the dataset used to determine the wealth ranking of those interviewed during the study. Below are the key variables with their results. All the variables and their respective statistical tests and graphs are presented in Appendix 5.

- Materials used for walls, floors and roof

Walls: Most women who used ETS (83%) indicated that the main material of the walls of their homes was "Natural materials or no walls (millet stalks/woven thatch/mud)" compared to 49% of women who used other modes of transport. A comparison of women with walls made of "Natural materials or no walls (millet stalks/woven thatch/mud)" shows significant difference in means ($p<0.01$). The variance of the two groups is also significantly different ($F=188.9$; $p<0.001$). These results appear to suggest that ETS is used by women with houses made with natural materials, that is, poorer women. The reverse is also true, significantly more women using non-ETS modes of transport have cement/bricks/planks for their walls and so would indicate more wealth. This lends to the overall wealth ranking analysis that women who are the most economically vulnerable appear to be the largest user of the ETS.

Floors: 46% of women not using ETS identified that the main material of the floor in their homes is natural materials compared to 83% of women who used ETS. This reflects the information for the materials used for walls.

Roof: A similar pattern to materials used for the walls and floors was observed with 77% of women who used ETS stating they used natural materials for their roof compared to 43% of those women who used other modes of transport.

- Type of water source

Surface water is used by more ETS users (54%) compared to non-ETS users (23%). An ETS user is twice as likely to use surface water as a non-ETS user. Surface water could indicate rural areas as these areas would have less access to other water sources such as boreholes or piped water. ETS targets rural areas with greater distances to health facilities and in some instances harder to reach areas.

- Type of latrine/toilet

Significantly more non-ETS users have toilets (67%) compared to ETS users (30%) $p<0.01$. Much like the water source information rural areas would have less access to toilets than urban areas which is directly linked to wealth with rural areas typically being poorer than urban areas.

- Number of livestock owned

There is no difference in the mean number of animals owned. However, there is a significant variation in ownership of chickens/ducks between the two groups. The reasoning behind this variation is unclear however poorer families may favour these animals due to their low capital cost, quick reproduction and constant production of food - eggs, in comparison to a goat or cow which are much more expensive. This information may, once again, point to the ETS being used by more rural, less wealthy women than those using other modes of transport.

6.3 Comparison of combined clinical condition scores and ETS

A t-test was conducted on the combined clinical condition score (vital signs) of those patients who used ETS versus those who used other modes of transport. As outlined in Section 5.2, the vital signs measured on arrival of a patient at the health facility were: breaths per minute, temperature, pulse, blood pressure and urine (amount in millilitres) per hour. The vital signs indicate the body's vital life-sustaining functions. The measurements are taken to give an indication of the overall condition of a patient presenting at the health facility and have a bearing on the eventual health outcome for both mother and child. Survey respondents were given a clinical condition score based on the status of their vital signs: the lower the score, the better the patients' vital signs.

6.3.1 Using the data from the Condition Assessment form

The mean condition assessment score for women who used ETS (2.68) is significantly lower than that of women who did not use ETS (3.67) P= 0.007. This difference is significant at p=0.01 (we can reject that the scores are the same at 99% confidence level). Women who use ETS therefore score lower on condition assessments. Data also shows that the variances in the scores are significantly different (F=12.117; p=0.001). Women who use ETS have a lower variation of total condition assessment score than those who do not use ETS.

This data indicates that women using ETS arrive at a health facility in a better health condition (i.e. their vital signs are better) than those using other modes of transport. This is an important finding as the premise of ETS is an affordable, safe and quick[15] mode of transport for women experiencing a delay in their ability to access health care. Arriving in a better health condition suggests that women using ETS do indeed reach health facilities faster than other modes of transport and time is a vital component during delivery or a maternal complication.

Table 8: Condition assessment score at lower level health facilities, ETS and non ETS

Group Statistics

	Used ETS	N	Mean	Std. Deviation	Std. Error Mean
Combined Clinical Condition Score	non-ETS	122	3.67	2.879	.261
	ETS	47	2.68	1.695	.247

[15] The term 'quick' relates to a woman or her family being able to organise and utilise ETS quicker than attempting to arrange other modes of transport (which may involve trying to find a vehicle or transporter willing to transport a woman and may include drawn-out negotiations about fares), rather than speeding to reach a health facility quicker.

Table 9: Levene's test for variance across condition assessment score (at lower level health facilities)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Combined Clinical Condition Score	Equal variances assumed	12.117	.001	2.215	167	.028	.991	.448	.108	1.875
	Equal variances not assumed			2.759	139.518	.007	.991	.359	.281	1.702

6.3.2 Using data from the Referral form

The mean condition assessment score for women who used ETS for referral to a higher level health facility (4.20) is not significantly different from that of women who did not use ETS (3.36) P= 0.845. In other words, women who sought care at higher level referral health facilities had similar vital signs whether they used ETS or other modes of transport. This difference is not significant at p=0.05 (we cannot reject that the scores are different). The sample size for ETS cases referred upwards to a higher level health facility is very small (number = 5). Data also shows that the variances in the scores are not significantly different (F=0.498; p=0.482).

It appears that women who were referred to higher level health facilities included in the study were women who did not seem to utilise ETS. This does not necessarily mean women do not use ETS to refer, it simply means during the study period and in the facilities selected for the study there were very few cases of women using ETS to refer. As the sample size is so small it is not statistically significant and no real definitive assumption or inference can be made from the result. If the study was to capture statistically significant numbers of both ETS and non ETS modes of transport used for referral the results may be very different.

Table 10: Condition assessment score at referral level health facilities, ETS and non ETS

Group Statistics

	Used ETS	N	Mean	Std. Deviation	Std. Error Mean
Combined Clinical Condition Score	non-ETS	138	3.36	2.370	.202
	ETS	5	4.20	1.643	.735

Table 11: Levene's test for variance across condition assessment score (at referral level health facilities)

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Combined Clinical Condition Score	Equal variances assumed	.498	.482	-.789	141	.431	-.845	1.071	-2.962	1.272
	Equal variances not assumed			-1.109	4.625	.322	-.845	.762	-2.853	1.163

6.4 Comparison of ETS and combined assessment scores for lowest quintile

A t-test was conducted on the combined clinical condition score (vital signs) of those patients who used ETS versus those who used other modes of transport for the lowest quintile. Quintiles were calculated based on the baseline study for consistency. The "Wealth explained – Baseline" document (Appendix 6) was used as a guide and all questions mentioned in this document are the same as those used during the baseline study and the Health Facility Study - "Follow up form" (Appendix 2).

Records for the poorest quintile of women were filtered into new variables for both combined assessment score and mode of transport used. These were then used to construct the t-test required. 14 women who used ETS and 34 who did not, constitute the total number of women making up the quintile, and with data for both variables.

The results show that the mean combined score for ETS users (2.43) is significantly higher than that for non-ETS Users in the lowest quintile (4.06); $p=0.025$. The F-test for equality of variance shows that the variances from the two subgroups of woman is not equal $F=15.79$; $p<0.01$.

This means that the poorest 20% of women who used ETS had a significantly lower combined assessment score, and their scores were less variable than those of women, in the same wealth quintile, who used other modes of transport.

ETS is accessible by all women however it was always envisaged that it would serve the poorest members of society, those who would struggle to pay for other modes of transport and the data above proves the poorest members of society are accessing ETS and it is making a difference to their health condition.

Table 12: Statistics for type of vehicle used to reach a health facility for lowest wealth quintile

Group Statistics

	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
Combined Assessment Score Poor	ETS	14	2.4286	1.50457	.40211
	non-ETS	36	4.0556	3.46364	.57727

Table 13: Levene's test for variance across condition assessment score for lowest wealth quintile

Independent Samples Test

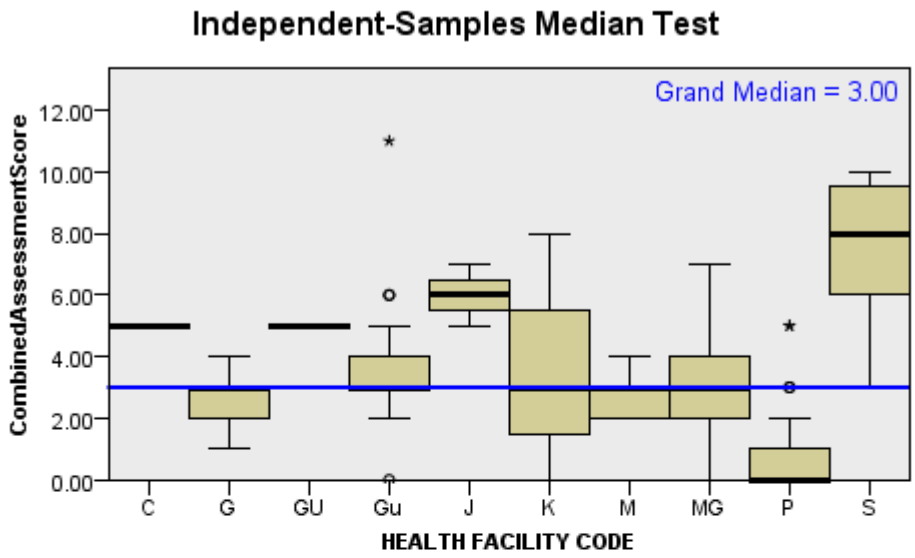
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Combined Assessment Score Poor	Equal variances assumed	15.797	.000	-1.688	48	.098	-1.62698	.96366	-3.56456	.31059
	Equal variances not assumed			-2.313	47.253	.025	-1.62698	.70352	-3.04208	-.21188

6.5 Non-parametrical test for each facility

Non-parametrical tests were conducted for each facility on the clinical condition score (vital signs).

The median combined assessment score varies from health facility to health facility. This could indicate that there are many contributing factors that influence the score from distance, terrain and cultural reasons to delays due to decision making to economic reasons.

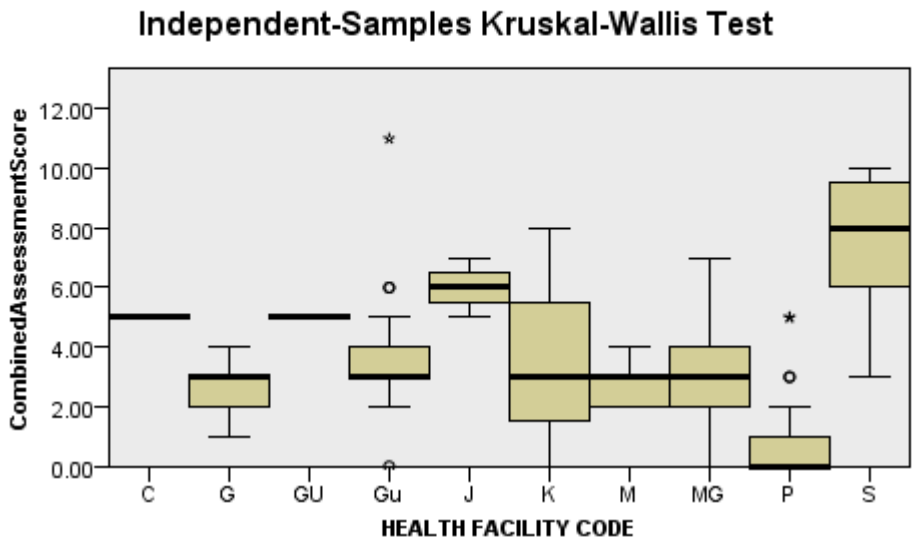
Graph 1: Non-parametrical test for each health facility



Total N	166
Median	3.000
Test Statistic	67.103
Degrees of Freedom	9
Asymptotic Sig. (2-sided test)	.000

1. At least one cell has an expected value less than one.
2. More than 20% of the cells have expected values less than five.

Graph 2: tests the hypothesis that the distribution of combined assessment score is the same across the health facilities



Total N	166
Test Statistic	96.896
Degrees of Freedom	9
Asymptotic Sig. (2-sided test)	.000

1. The test statistic is adjusted for ties.

The Kruskal-Wallis test is a method to test the hypothesis that the distribution of combined assessment score is the same across all the health facilities. The distribution of combined assessment scores varies significantly across the health facilities and so rejects this hypothesis.

6.6 Modelling combined assessment score

The study explored a number of models (linear regression, logistic regression, correlation analysis) where the dependent variable was overall clinical condition score and Independent Variables were health centre location, health facility type (PHCC or referral hospital), use/non-use of ETS, socio-economic variables. The model showing the best fit was a linear regression model with the following parameters:

Table 14: Linear regression model summary

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.581[a]	.338	.304	2.21717

a. Predictors: (Constant), GOAT, SHEEP OR CATTLE, WRIST WATCH, T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW), GENERATOR, BED, MOTORCYCLE, TV, MOBILE PHONE

Table 15: ANOVA test (comparing amount of variation between groups with the amount of variation within the groups)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	394.173	8	49.272	10.023	.000[b]
	Residual	771.785	157	4.916		
	Total	1165.958	165			

a. Dependent Variable: Combined Assessment Score
b. Predictors: (Constant), GOAT, SHEEP OR CATTLE, WRIST WATCH, T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW), GENERATOR, BED, MOTORCYCLE, TV, MOBILE PHONE

Table 16: Coefficients table

Coefficients[a]					
		Unstandardized Coefficients	Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.770	.890		3.112	.002
	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	1.046	.405	.175	2.582	.011
	TV	.738	.432	.131	1.707	.090
	MOBILE PHONE	-1.387	.507	-.237	-2.738	.007
	BED	1.188	.566	.160	2.098	.037
	WRIST WATCH	-1.743	.394	-.325	-4.420	.000
	MOTORCYCLE	-1.009	.376	-.190	-2.681	.008
	GENERATOR	1.460	.484	.220	3.015	.003
	GOAT, SHEEP OR CATTLE	-.040	.016	-.167	-2.453	.015

a. Dependent Variable: Combined Assessment Score

The regression model suggests that a woman's condition on arrival at the health facility is related to the level of asset owning (livestock, possessions etc). This confirms that ETS appears to serve different (i.e. poorer) populations than non-ETS users.

6.7 Additional Data Analysis

Along with the data analysis in sections 5.2 to 5.6 some additional information (e.g. previous complications, ante-natal care use etc) was analysed to understand its effect on health access / use of ETS.

6.7.1 Previous Complications

An interesting trend emerged from this Health Facility Study with regards to women who had experienced a complication during a previous live birth. 94% of women who took part in the study who had at least one previous live birth also had a complication during a previous pregnancy. This would indicate that previous bad experiences have had an impact on women and their families and they have taken the conscious decision to have institutional deliveries as a result. Although this programme cannot, in its closing stages, further investigate this observation of behaviour it would be an interesting topic for future research.

6.7.2 Antenatal Care (ANC)

Women had attended antenatal care on average three times during their most recent pregnancy. In comparison, the project's midline study showed that women attended ANC on average four times[16] during their pregnancy. Of those women who took part in both studies, 75% of women from this Health Facility Study had attended ANC and 70% had attended from the midline study. This relatively consistent information indicates a general acceptance and use of ANC in Adamawa State. The 2013 Nigerian National Demographic and Health Survey estimates that nationally on average 51% of women had attended at least four ANC visits during their pregnancy. There did not appear to be any difference between those using ETS and other modes of transport for the average number of ANC visits.

[16] In all studies this data is sourced through discussion with the women and not verified through health facility records.

6.7.3 Birth Preparedness

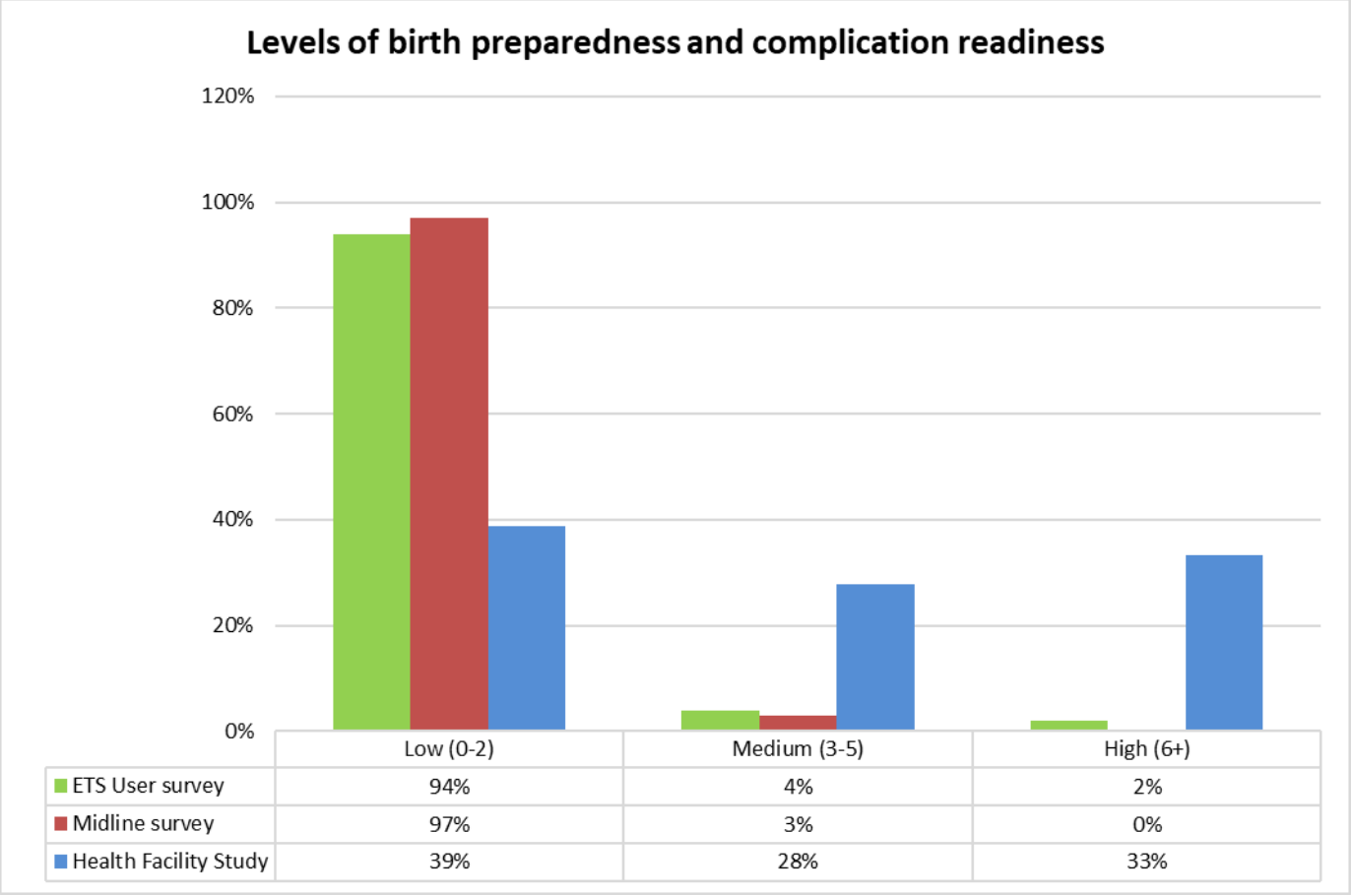
The level to which a woman and her family prepare for an impending delivery indicates their level of understanding of the potential risks that pregnancy and childbirth can present. Preparations can include actions such as; setting aside money to pay for service fees and transport, recognising danger signs in pregnancy, deciding where to deliver, buying a clean delivery kit, identifying or establishing available transport in order to reduce delays in reaching care once a problem arises[17].

Birth preparedness was divided into three groups for the purpose of this study:

1. Those who took up to two actions to prepare
2. Those that took three to five actions to prepare
3. Those who took six or more actions to prepare for childbirth.

The justification behind this analysis is that, in birth preparedness, taking one single action may not suffice in saving pregnant mothers' lives.[18]

Graph 3: Level of birth preparedness



[17] M. Kaso and M. Addisse, 2014, Birth preparedness and complication readiness in Robe Woreda, Arsi Zone, Oromia Region, Central Ethiopia: a cross-sectional study, Reproductive Health Journal. http://www.reproductive-health-journal.com/content/11/1/55

[18] JHPIEGO, 2004, Monitoring birth preparedness and complication readiness. Tools and indicators for maternal and newborn health, Baltimore: USA.

Graph 3 shows that both the Midline and ETS User surveys found similarly low levels of birth preparedness amongst the people interviewed, with the vast majority (up to 97%) only having taken 0-2 actions to prepare for childbirth. In contrast the Health Facility Study shows a far larger proportion of the 309 participants stating an increased level of birth preparedness. While 39% of respondents were found to show a low level of preparedness, 33% were considered to show a high level of preparedness having carried out six or more actions ahead of delivery. 61% of respondents carry out a minimum of three actions which contribute to birth preparedness which shows a marked increase in comparison with the findings from the Midline and ETS User survey.

This could in part be explained by the composition of the study's participants, all of whom were interviewed at health centres and therefore had already made the decision to travel prior to childbirth or during labour. Having made this journey, it is perhaps expected that respondents were likely to exhibit a higher level of birth preparedness. In comparison, both the Midline and ETS User surveys were carried out at community/household level. In the Midline study participants were randomly sampled, however in the ETS User survey respondents had all used the ETS to travel to a health centre previously, which makes it difficult to explain the low levels of preparedness. This could be explained by the finding that ETS users are generally of a lower socioeconomic status and might imply that birth preparedness not only involves making a conscious decision to do so, but also having the means to follow through. As the majority of the participants of the Health Facility Study used other modes of transport other than ETS it is conceivable they are wealthier and therefore can afford to prepare to a greater extent, skewing the results somewhat.

6.7.4 Mobile Communications

If a maternal emergency occurs, quick access to a mobile telephone is essential. Interestingly, the findings related to mobile telephone use for this study show a differing trend found in the baseline and midline studies which were both relatively consistent in their findings. As can be seen from Table 17 below, ownership levels and general access to mobile telephones remained relatively unchanged between the baseline and midline. For the Health Facility Study however, ownership of mobile telephones is almost double the level found in the previous two studies. General access to mobile telephones was also found to be higher. The baseline and midline are samples representative of the state population. However, the Health Facility Study is directly targeting women who have travelled to a health facility. This difference in the sample may account for the variance in the data. The majority of women interviewed during this study did not use ETS and, as explained previously in this report, were economically wealthier than those using ETS. It could suggest that those women are wealthy and so mobile telephone ownership is an expected occurrence in comparison to the general population.

The importance of mobile telephones as a means of contacting ETS drivers was highlighted in the midline study when 83% of the women confirmed that ETS drivers were contactable by telephone. High levels of ownership and general access to mobile telephones leads to higher confidence in participating communities' ability to contact ETS volunteers and other modes of transport when required and indicates that communication is not a significant barrier.

Table 17. Ownership and availability of mobile phones

	Baseline	Midline	HF Study
Ownership of a mobile phone	**Women**	**Women**	**Women**
Yes	27%	25%	56%
No	73%	75%	44%
Access to a mobile phone	**Women**	**Women**	**Women**
Yes	70%	77%	86%
No	30%	23%	14%

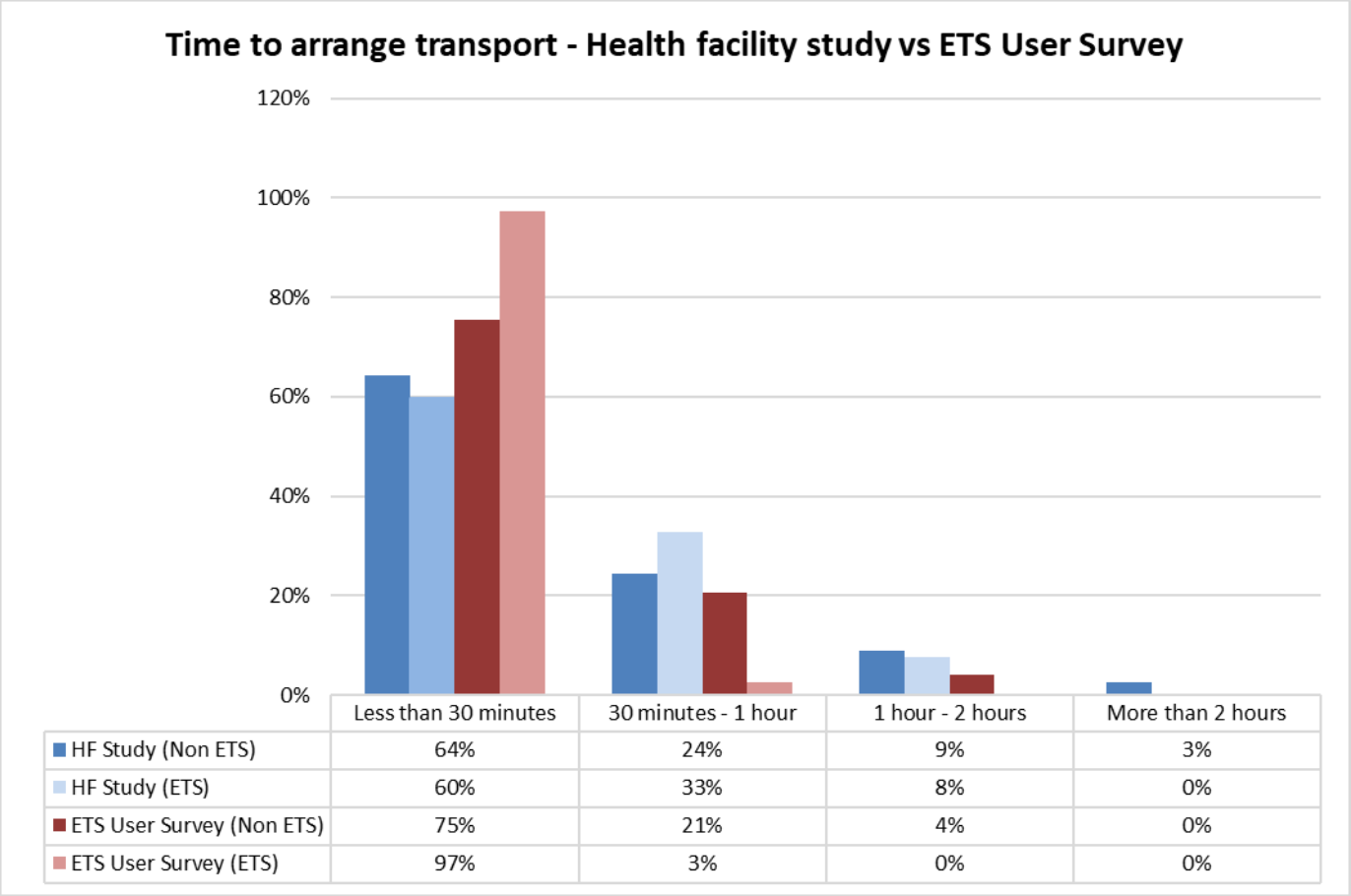
6.7.5 Time Taken to Arrange Travel

As evidenced above in section five, this study shows that women using ETS arrive at health facilities in a better health condition than those not using ETS as a mode of transport. Time taken to organise and utilise transport is considered to be an important variable in the health condition of a woman on arrival at a health facility and there is evidence showing that the longer a woman takes to reach a health facility during a maternal emergency, the worse her health condition is likely to become.[19]

As can be seen from Graph 4 below, the trends for time taken to arrange transport established in the ETS User Survey are similar to the Health Facility Study. The focus of the ETS User Survey was on those women who had used ETS and the number of women interviewed was greater than the number of women who had used ETS during the Health Facility Study (150 compared to 52 women). **The ability to organise ETS transport in under one hour (93%) is higher among ETS users compared to users of non ETS modes of transport (88%) in the Health Facility Study.**

[19] Turner et al., 2013, Linking Rural Communities with Health Services: Assessing the Effectiveness of the Ambulance Services in Meeting the Needs of Rural Communities in West Africa; Africa Community Access Programme (AFCAP), Transaid, 2013

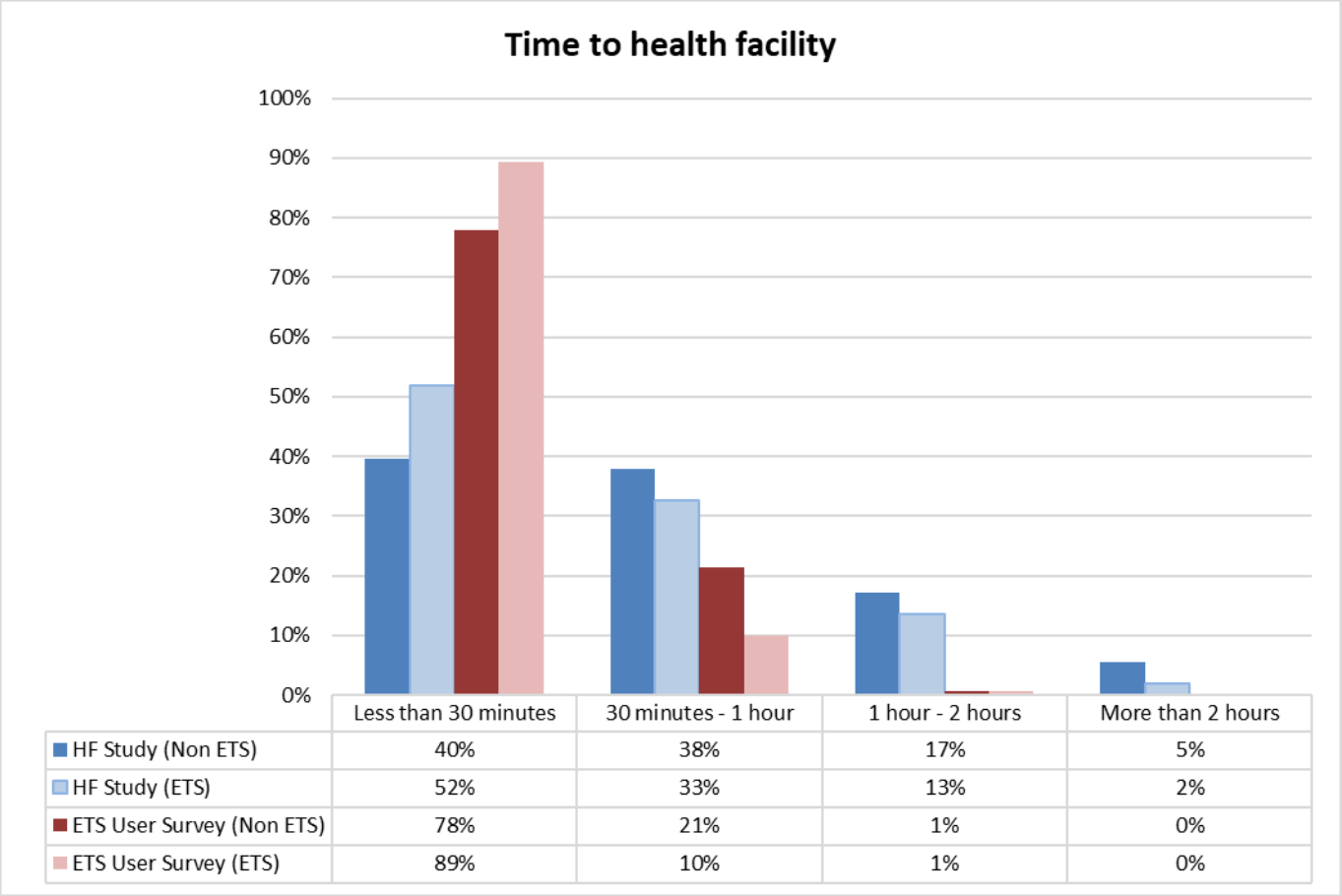
Graph 4: Time to arrange transport



	Less than 30 minutes	30 minutes - 1 hour	1 hour - 2 hours	More than 2 hours
HF Study (Non ETS)	64%	24%	9%	3%
HF Study (ETS)	60%	33%	8%	0%
ETS User Survey (Non ETS)	75%	21%	4%	0%
ETS User Survey (ETS)	97%	3%	0%	0%

The Health Facility Study data also shows that using the ETS is, in more instances, a quicker way of reaching the health facility with 52% of all ETS cases reaching the health facility in under 30 minutes, while for non ETS modes of transport it was 40% (Graph 5). In the ETS User Survey there was a similar difference of 11% with ETS outperforming non ETS modes of transport in getting to a health facility in under 30 minutes. Many factors such as seasonal rains, distance and the changing security situation can influence the time taken to get to a health facility. However, both studies show that ETS is consistently quicker in getting to health facilities. This is conceivable due to ETS volunteer drivers having been trained and understanding the need to get to a health facility in a timely and safe manner. Some of the barriers that are known to exist, such as negotiating the cost of the journey, can delay the transportation of a woman. With ETS these barriers do not exist and hence the transfer is expedited.

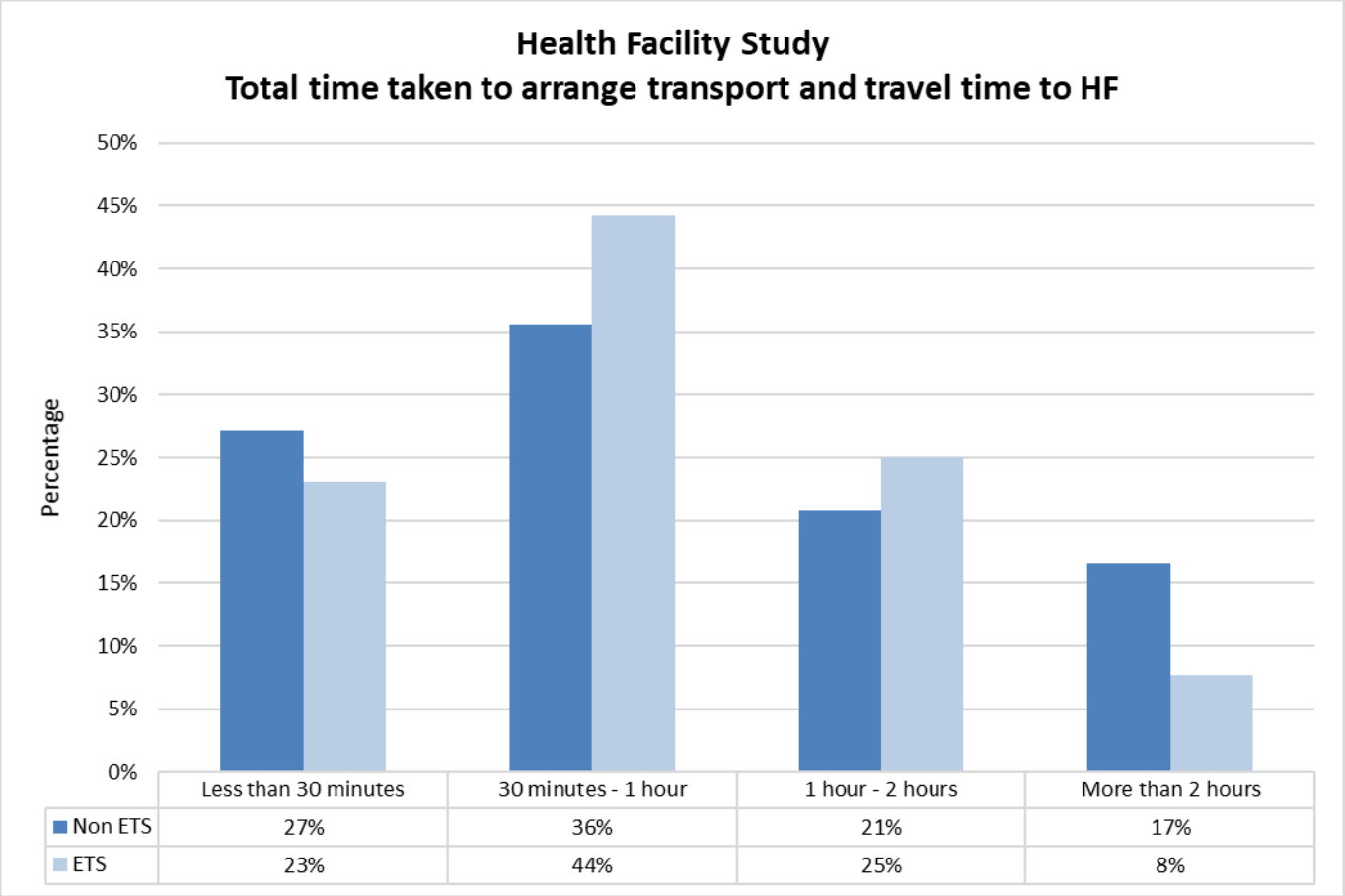
Graph 5: Journey time to health facility



	Less than 30 minutes	30 minutes - 1 hour	1 hour - 2 hours	More than 2 hours
HF Study (Non ETS)	40%	38%	17%	5%
HF Study (ETS)	52%	33%	13%	2%
ETS User Survey (Non ETS)	78%	21%	1%	0%
ETS User Survey (ETS)	89%	10%	1%	0%

It is generally accepted that if pregnant women experiencing a complication or who are in labour receive health care within a two-hour window it can result in a better health condition for both the woman and the baby. Graph 6 below shows that **92% of those using ETS get to a health facility in under two hours, compared to 84% of the time for non ETS modes of transport. This includes time taken to arrange transport and travel time. However, the results also show that 67% of ETS users get to the health facility in under an hour compared 63% of non-ETS users. This could imply that ETS is faster when longer distances need to be travelled.**

Graph 6: Total transport time



6.8 Referral Compliance

Although it was not initially a part of the study, the research team felt that it would be beneficial if the opportunity presented itself, to ask an additional non-medical question to the women who agreed to take part in the study. The question was to discover if women who had been referred to another health facility followed the medical advice and referred themselves to the next level of health care or not. Additionally, for those at the referral level health facility, if they had been referred from another facility, did they do it immediately or did other factors interfere with their compliance.

Other studies have looked at the uptake of referrals and the reasons behind the compliance rate. One such study was conducted in Burkina Faso in 2008 to ascertain the compliance rate for referral and to identify the factors associated with successful referral. The compliance rate was 41.5% although measures had been put in place to reorganise the referral system. It cited barriers to compliance as season, sex of the patient and if the condition was an emergency or not.[20] Another study was conducted in Afghanistan and looked at the determinants of delays in travelling to an emergency obstetric care facility. This study cited the reasoning behind such delays included a husband's large social

[20] https://academic.oup.com/heapol/article/27/3/256/615715

network and complications with less-alarming symptoms. On the other hand, complications with dramatic symptoms (e.g. postpartum haemorrhage - PPH[21]) shortened the delay.[22]

Unfortunately, in the Health Facility Study only 2% (number = 6) of the 312 respondents were identified as having been referred from a lower level health facility to a higher-level health facility and were able to answer the questions relating to referral. Although this data is not statistically significant and no solid conclusions can be drawn from it, it is of interest to note the responses.

- For those women referred to the next level facility, six in total, they all left the lower level health facility and went straight to the higher-level facility without delay. The women used motorcycles, a private vehicle and a tricycle to reach the referral facility. One woman was reported to have died with the reason being lack of money to pay for a blood transfusion (the study team were unable to verify this finding).
- From the lower level facilities four women were referred to higher-level facilities for care. Two women went home without referring, one citing lack of money and the other to seek permission from her husband, who refused. Of the remaining two women, one initially went home due to an issue with the husband's motorcycle however she did eventual travel to a higher-level health facility. The other also went home as the husband deemed it unnecessary to be referred. However, she did eventually go to a higher-level facility as the problem persisted.

Some anecdotal evidence also suggests that women fear being referred as they assume that a referral automatically means an operation. There is fear of the operation itself as well as cost and recovery time. All of these affect women's, and their husbands and families, decision making about whether or not to follow referral advice given by health facility staff.

ETS is a service for all women to access health care for delivery or due to maternal health complications. ETS volunteer drivers do transfer women to higher level health facilities if required. However, the anecdotal evidence outlined above indicates that women, even if required to refer, do not always take the medical professionals advice to refer. ETS programmes in the future can learn from this and build components into their programmes to specifically address these issues during health facility and community engagement activities. Trust in the health care system is vital to ETS being a useful and advantageous part of any community. If women do not trust the health care system or the advice of the health care professionals, they fundamentally will not want to go to health facilities and ETS's mandate of reducing the access barriers to health care will be affected as access will not be the barrier, delay in deciding to seek care[23] will be.

[21] Postpartum haemorrhage (PPH) is heavy bleeding after birth: PPH is usually defined as when a woman loses more than 500ml of blood within the first 24hrs after birth.
[22] https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-015-0435-1
[23] 1st delay in the Three Delays Model.

7 Considerations for future research

This study has yielded data and information that proves the hypothesis that ETS makes a significant difference to the level of severity of Obstetric Complications presenting at health facilities for low income women. However, future studies could yield further learning if they addressed the following questions:

- Explain the results in terms of odds-ratios, such as, "using ETS would increase the probability of a particular condition score by x"
- Why is birth preparedness so much better for the women interviewed during the Health Facility Study (delivering in facilities) versus those from previous studies?
- What is the impact of increasing mobile phone ownership in northern Nigeria on ETS uptake and the condition of the mother upon arrival at the health facility?
- Developing a model that represents the relationship (if it exists) between the different factors of the clinical condition score (percentage contribution of what health centre is used, percent contribution if ETS is used, percent contribution of income quintile, etc) and if there is any way to explain cause and effect.
- The effect of a community engagement intervention on ETS uptake and health condition on arrival at the health facility: would adding a component on awareness-raising of and mobilisation around the importance of birth preparedness and risk reduction affect the speed of decision-making and transfer to a health facility and, in turn, affect the health condition of the mother upon arrival at the health facility, and the overall health outcome?
- The relationship between the perceived level of social support provided to women by their husbands and other relatives, ETS uptake, speed of transfer to a health facility and a mother's health condition on arrival at the facility. This would provide an opportunity to examine vulnerability and maternal health-seeking and outcomes from a different angle (i.e. extend beyond a focus on poverty status to include an emphasis on the effect of social factors on health care access and outcomes).

These are a sample of how the valuable data gathered during the study could be unpacked and analysed more or build upon in future studies to garner more useful and interesting findings.

8 Conclusion

This report presents keys findings and data from the 2017 Health Facility Study. 312 cases were surveyed across the nine health centres in the three selected LGAs. This study focused on the programme objective, "To determine the effect of the use of ETS on the health status of women on arrival at a facility for maternal health care".

It can be said with confidence that ETS has an effect on the health status of women arriving at a facility for maternal health care. The study identified a statistically verifiable positive difference over those using other modes of transport. The outcome of the t-tests and other statistical testing appears to show that ETS serves poorer women more than the general population and that they are in a better health condition (based on analysis of their vital signs) upon arrival at a health facility as a result of using ETS.

The results show that the health condition on arrival at the health facility of ETS users is significantly better than that of non-ETS users in the lowest quintile. The poorest 20% of women who used ETS had a significantly lower combined assessment score (i.e. were in a better condition on arrival at the health facility) than non-ETS users in the same quintile, and their scores were less variable than those of women who used other modes of transport.

When looking at the birth preparedness of women interviewed during the Health Facility Study, there is a substantial difference in comparison with both the midline and ETS User surveys. Women appear to be much more prepared and prepared to a greater extent than those in the other, earlier studies. This may be due to previous bad experiences and an understanding of the need to prepare for birth. 94% of women who took part in the study who had at least one previous live birth also had a complication during a previous pregnancy. This would indicate that previous bad experiences have had an impact on women and their families and their decision making.

Anecdotal information points to several influencers on decision making regarding referral cases. Misunderstanding of being referred, associating a referral with an operation, as well as lack of money for transport, food and care and seeking spousal permission all impact upon the decision to seek additional care at a higher-level facility. This information is anecdotal and each factor's influence cannot be separated out and weighted based on impact on decision making in this study. However, understanding these barriers exist assists in creating an understanding of the current situation.

Ultimately the purpose of this study was to ascertain if the Emergency Transport Scheme is in fact having a positive impact on the health condition of women who utilise ETS to be transported to a facility for delivery or due to maternal health complications. The data analysis appears to confirm this hypothesis. ETS is not only having a positive impact on the health condition of women but is also supporting the poorest women to get to health facilities. With the main hypothesis of the study confirmed, the data shows there is the potential to learn more, through research, about what is happening in the state both behaviourally, socially and economically.

The findings of this study serve as an evidence base to prove ETS is contributing to maternal health improvements through statistically significant data. The results of this study can be used in the future to not only advocate for scale up of ETS initiatives generally but also to advocate for investment in ETS within Nigeria by the government and states for funding and support.

In Nigeria, the NURTW's commitment to the Emergency Transport Scheme is highly commendable. Their efforts in supporting women in their communities can now not only rely on anecdotal evidence but also statistical evidence that proves impact, that is that women using ETS arrive in a better health condition at a health facility than if they were to take other modes of transport. It is hoped that this report can be used as a resource by the NURTW and other organisations and entities to advocate for funding both locally and internationally for ETS. ETS is making a measurable

difference and continued sustainability of current ETS activities as well as new ETS activities are vital for the economically vulnerable of Nigeria.

9 Appendices

9.2 Appendix 1 – Written informed consent form

Written informed consent form

Title of Project: **Linking Pregnant Women to Maternal Health Services**

Name of Principal Investigators: Edward O'Connor, Jeff Turner and Ismaila Aliyu Balogun

Transaid, a UK-based transport organisation together with Society for Family Health (SFH) are undertaking a project in Adamawa State which is funded by Comic Relief, a UK-based charity. The project is implementing an Emergency Transport Scheme (ETS) in 16 LGAs in Adamawa State in conjunction with the NURTW (National Union of Road Transport Workers). NURTW taxi drivers act as emergency service for pregnant women in labour and during a pregnancy related emergency. As part of this project we want to look at what difference the ETS can have on the lives of women who suffer complications when giving birth and need to travel to reach medical attention in an emergency. The study is looking at whether women suffering complications when giving birth arrive at hospital faster and in a better condition than those who arrive by non-ETS taxi, walking or other means. To help us with this study, we ask that you let the health worker monitor your condition as you are being transferred to the hospital and on arrival. We also ask that you allow us to use the information for our research. The information you give will be kept confidential and your information will remain anonymous.

For further information about the project, please contact Edward O' Connor, Project Manager, Transaid, Ismaila Aliyu Balogun, National Project Manager, Transaid or Michael Ochoqwu, Team Manager, SFH Yola.

Initial the box if you agree with the statement to the left

1	I confirm that I have read and understand the information sheet explaining the above study and I have had the opportunity to ask questions about the project.	
2	I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason and without there being any negative consequences. In addition, should I not wish to answer any particular question or questions, I am free to decline.	
3	I understand that information will be recorded on paper forms and entered into a computer database and that this information will be kept confidential and anonymous. I give my permission for members of the research team to have access to this information. I understand that my name will not be used in any papers, reports or other publications that result from the research.	
4	I agree for the information collected to be used in future research	
5	I agree to take part in the above research study.	

----------	----------	
Signature/Thumbprint	Date	
----------	----------	----------
Witness	Date	Signature
----------	----------	----------
Name of person taking consent	Date	Signature

Once this has been signed by all parties the participant should receive a copy of the signed and dated participant consent form. A copy of the signed and dated consent form should be kept with the project's main documents which must be kept in a secure location.

9.3 Appendix 2 – Follow up form

FOLLOW UP FORM

No.	Questions		
B101	Unique Identification Number		
B102	Date		
B103	Name of Health Worker		
B104	Patients name		
B105	Name of Community where you live?		
B106	How old are you?		
B107	What is your marital status?	Married ---------- 1 Single ---------- 2 Widowed/Separated/Divorced ----- 3	

No.	Questions	Coding categories	
H101	In your house, what is the main material of the walls?	Natural materials or no walls (millet stalks/woven thatch/mud) ---------- 1 Bamboo/plywood/stone with mud -- 2 Cement/bricks/planks ---------- 3 Other (Specify)---------- 6	
H102	What is the main floor material?	Natural floor (earth/sand/dung) --------1 Rudimentary floor (wood/palm/bamboo) ----------2 Finished floor (polished wood/vinyl/tiles/cement/carpet) ------- 3	
H103	What is the main material of the roof?	Thatch/mat/cardboard/grass -----1 Iron sheets/tiles/cement ----------2 Other (specify) ---------- 6	
H104	What kind of toilet facilities does your household have?	No facility/bush ----------1 Bucket toilet ----------2 Pit toilet/latrine ----------3 Flush toilet ----------4	

<table>
<tr><td>H105</td><td>What is the main source of water for members of your household?</td><td>Surface water (river/dam/lake/etc.) ---1
Water from spring ----------2
Dug well ----------3
Borehole ----------4
Public tap ----------5
Piped water into yard/plot ----------6
Piped water into dwelling ----------7
Tanker truck ----------8
Bottled water ----------9
Water vendor/sachets ----------10
Other (specify)----------11</td><td></td></tr>
<tr><td>H106</td><td>What type of fuel does your household mainly use for cooking?</td><td>Dung ----------1
Firewood/straw ----------2
Charcoal ----------3
Kerosene ----------4
Gas ----------5
Electricity ----------6
Other (specify) ----------7</td><td></td></tr>
<tr><td>H107</td><td>Is your house connected to electricity?</td><td>Yes ----------1
No ----------2</td><td></td></tr>
<tr><td></td><td>In this house, is there anyone who owns the following?</td><td><table><tr><th></th><th></th><th>Yes</th><th>No</th></tr><tr><td>H108</td><td>Fridge</td><td>1</td><td>2</td></tr><tr><td>H109</td><td>TV</td><td>1</td><td>2</td></tr><tr><td>H110</td><td>Radio</td><td>1</td><td>2</td></tr><tr><td>H111</td><td>Bicycle</td><td>1</td><td>2</td></tr><tr><td>H112</td><td>Mobile phone</td><td>1</td><td>2</td></tr><tr><td>H113</td><td>A bed</td><td>1</td><td>2</td></tr><tr><td>H114</td><td>A kerosene lamp/ pressure lamp</td><td>1</td><td>2</td></tr><tr><td>H115</td><td>Wrist watch</td><td>1</td><td>2</td></tr><tr><td>H116</td><td>Motorcycle</td><td>1</td><td>2</td></tr><tr><td>H117</td><td>Car/van</td><td>1</td><td>2</td></tr><tr><td>H118</td><td>Generator</td><td>1</td><td>2</td></tr><tr><td>H119</td><td>Fan</td><td>1</td><td>2</td></tr></table></td><td></td></tr>
<tr><td>H120</td><td>Do you have animals in this house, like ducks or chickens? How many?
Write the number; 0 if none; 999 if respondent doesn’t know</td><td></td><td></td></tr>
<tr><td>H121</td><td>Do you have animals in this house, like goat, sheep or cattle? How many?
Write the number; 0 if none; 999 if respondent doesn’t know</td><td></td><td></td></tr>
</table>

H122	Do you have animals in this house, like horses, donkeys or mules? How many? **Write the number; 0 if none; 999 if respondent doesn't know**		

No.	Questions	Coding categories			
M101	Have you ever given birth before? **['Baby cried or showed signs of life after delivery']**	Yes ---------- 1 No ---------- 2			
M102	How many pregnancies have you had previously?	Number;			
M103	How many live births have you had?	Number;			
M104	How many children do you have that are alive today?	Number;			
	During previous pregnancies, did you experience any of the following problem(s)? **[READ OUT OPTIONS]**			Yes	No
		M105	Fever	1	2
		M106	Swollen feet/hands/ face	1	2
		M107	Prolonged labour	1	2
		M108	Severe headache	1	2
		M109	Bleeding	1	2
		M110	Retained placenta	1	2
		M111	Eclampsia	1	2
		M112	Baby's abnormal presentation	1	2
M113	During this pregnancy, how many times did you visit a health facility during your antenatal period?	Number of times;			
	What preparations did you make in this pregnancy in readiness for delivery? [**DO NOT READ OUT OPTIONS**]			Yes	No
		M114	Saved money for contingencies	1	2
		M115	Identified the transporter	1	2
		M116	Decides where to deliver	1	2

		M117	Bought Clean Delivery Kit	1	2	
		M118	Recognition of danger signs	1	2	
		M119	Identified a skilled provider/facility for birth	1	2	
		M120	Know how to contact or reach the provider/facility	1	2	
		M121	Identified the TBA in the community to contact	1	2	
		M122	Agree who take decision in emergency if husband is away	1	2	
		M123	Others (Specify)	1	2	
M124	What caused you to seek medical care on this occasion?					
M125	Who and where was the first place you sought medical care?					
M126	Who helped you travel to the health centre? (husband, mother, friend etc.)					

No.	**Questions**	**Coding categories**	
T101	Do you have a mobile phone?	Yes ----------1 No ----------2	**If YES go to T103**
T102	Do you have access to a mobile phone within the community you can use in cases of emergencies?	Yes ----------1 No ----------2	

What type of vehicle did you use to get to the facility?

[READ OUT THE OPTIONS ONE BY ONE, CIRCLE APPROPRIATELY]

		Yes	No
T103	ETS Driver (NURTW) **(explain with little detail if not known)**	1	2
T104	Car (Private)	1	2
T105	Car (Public)	1	2
T106	Bicycle	1	2
T107	Motor Cycle	1	2
T108	Tri-Cycle/Keke NAPEP	1	2
T109	Cow/Donkey	1	2
T110	Cart	1	2
T111	Truck	1	2
T112	None (I walk)	1	2
T113	Others (Specify)	1	2

9.4 Appendix 3 – Referral form

Referral form

1	Unique Identification Number:	
2	Date:	
3	Health Centre name: *(If Self-Referral to Hospital answer SELF-REFERRAL)*	
4	Name and signature of Health Worker	
5	Patient's name (sick person/child)	
6	Patient's address	
7	**(Complete only in case of SELF-REFERRAL)** Time of call made for emergency transport	**:** **AM/PM**
8	**(Complete only in case of SELF-REFERRAL)** Time of departure from start location/home	**:** **AM/PM**
9	**(Complete only in case of SELF-REFERRAL)** Time of arrival at health facility/hospital	**:** **AM/PM**
10	Time of Referral requested	**:** **AM/PM**
11	Time of Departure	**:** **AM/PM**
12	Time of Arrival at Final Referral Hospital	**:** **AM/PM**
13	Reason for referral	
14	Vital Signs Assessment	*Complete on table below*

TEMP	
PULSE	
BP systolic (top)	
BP diastolic (bottom)	
RESPS	
NEURO (Glasgow Coma Score)	
URINE	
TOTAL	

Warning	2	1	0	1	2	CSA ACTION
Breaths in a minute (circle measurement)	0-5	6-10	11-20	21-29	30 or more	Help now Observe/ review Normal
Temperature (circle measurement)	Less than 31.0	31.1-36.0	36.1-37.5	37.6-38.0	38.1 or more	Help now Observe/ review Normal
Pulse- heart rate per minute (circle measurement)	Less that 40	41-50	51-100	101-119	120 or more	Help now Observe/ review Normal
Blood pressure systolic (top) (circle measurement)	Less than 89	90-99	100-150	151- 159	160 or more	Help now Observe/ review Normal
Blood Pressure Diastolic (bottom) (circle measurement)	Less than 40	41-50	51-79	80-90	91 or more	Help now Observe/ review Normal
Urine per hour (circle measurement)	Less than 10 mls/hour	11-29 mls/hour	30 mls/hour or more			Help now Observe/ review Normal

9.5 Appendix 4 – Condition Assessment form

Condition Assessment Form

1	Unique Identification Number:	
2	Date:	
3	Health Centre name:	
4	Name and signature of Health Worker	
5	Patient's name (sick person/child)	
6	Patient's address	
7	Time of call made for emergency transport	: **AM/PM**
8	Time of departure from start location/home	: **AM/PM**
9	Time of arrival at health facility/hospital	: **AM/PM**
10	**(Complete only in case of referral)** Time of Referral requested	: **AM/PM**
11	**(Complete only in case of referral)** Time of Departure	: **AM/PM**
12	Vital Signs Assessment	*Complete on table below*

TEMP	
PULSE	
BP systolic (top)	
BP diastolic (bottom)	
RESPS	
URINE	
TOTAL	

Warning	2	1	0	1	2	CSA ACTION
Breaths in a minute (circle measurement)	0-5	6-10	11-20	21-29	30 or more	Help now Observe/ review Normal
Temperature (circle measurement)	Less than 31.0	31.1-36.0	36.1-37.5	37.6-38.0	38.1 or more	Help now Observe/ review Normal
Pulse- heart rate per minute (circle measurement)	Less that 40	41-50	51-100	101-119	120 or more	Help now Observe/ review Normal
Blood pressure systolic (top) (circle measurement)	Less than 89	90-99	100-150	151- 159	160 or more	Help now Observe/ review Normal
Blood Pressure Diastolic (bottom) (circle measurement)	Less than 40	41-50	51-79	80-90	91 or more	Help now Observe/ review Normal
Urine per hour (circle measurement)	Less than 10 mls/hour	11-29 mls/hour	30 mls/hour or more			Help now Observe/ review Normal

9.6 Appendix 5 - Socio economic characteristics

Age

Table 18: Age statistics, ETS and non ETS

Group Statistics					
	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
B106: HOW OLD ARE YOU	ETS	51	26.20	4.928	.690
	non-ETS	257	25.94	6.448	.402

Table 19: Levene's test for variance across age

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
B106: HOW OLD ARE YOU	Equal variances assumed	10.091	.002	.271	306	.787	.258	.954	-1.619	2.136
	Equal variances not assumed			.323	87.771	.747	.258	.799	-1.329	1.846

The average age for the combined sample is 25.98 years (ETS 26.20; non-ETS 25.94). There is no significant age difference between the two groups i.e. those who used ETS and those who used other modes of transport (t=0.787 assuming equal variances; t=0.747 assuming different variances). Variances not equal (Levene test: F=10.09 p=0.02). There is greater variability in ages among those using non-ETS transport.

Marital Status

Table 20: Marital status statistics, ETS and non ETS

Count				
		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
B107: WHAT IS YOUR MARITAL STATUS	Married	52	251	303
	Single	0	6	6
Total		52	257	309

Main material of the walls

Table 21: Main material of walls, ETS and non ETS

H101.1: WHAT IS THE MAIN MATERIAL OF THE WALLS * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW) Cross tabulation

Count

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H101.1: WHAT IS THE MAIN MATERIAL OF THE WALLS	Natural materials or no walls (millet stalks/woven thatch/mud)	43	126	169
	Bamboo/plywood/stone with mud	5	45	50
	Cement/bricks/planks	4	83	87
	Other	0	3	3
Total		52	257	309

Table 22: Main material of walls cross tabulation, ETS and non ETS

H101.1: WHAT IS THE MAIN MATERIAL OF THE WALLS * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW) Cross tabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H101.1: WHAT IS THE MAIN MATERIAL OF THE WALLS	Natural materials or no walls (millet stalks/woven thatch/mud)	82.7%	49.0%	54.7%
	Bamboo/plywood/stone with mud	9.6%	17.5%	16.2%
	Cement/bricks/planks	7.7%	32.3%	28.2%
	Other		1.2%	1.0%
Total		100.0%	100.0%	100.0%

Table 23: Main material of wall is natural statistics, ETS and non ETS

Group Statistics

	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
H101.1: MAIN MATERIAL OF THE WALLS is natural	ETS	52	.83	.382	.053
	non-ETS	257	.49	.501	.031

Table 24: Levene's test for variance

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	Df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
H101.1: MAIN MATERIAL OF THE WALLS is natural	Equal variances assumed	188.897	.000	4.582	307	.000	.337	.073	.192	.481
	Equal variances not assumed			5.474	90.472	.000	.337	.062	.214	.459

A comparison of women with walls made of "Natural materials or no walls (millet stalks/woven thatch/mud)" shows significant difference in means ($p<0.01$). The variance of the two groups is also significantly different ($F=188.9$; $p<0.001$).

Floors

Table 25: Main floor material cross tabulation, ETS and non ETS

H102: WHAT IS THE MAIN FLOOR MATERIAL * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY

ETS (NURTW) Cross tabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY

ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H102: WHAT IS THE MAIN FLOOR MATERIAL	Natural floor (earth/sand/dung)	82.7%	45.9%	52.1%
	Rudimentary floor (wood/palm/bamboo)	7.7%	10.1%	9.7%
	Finished floor (polished wood/vinyl/tiles/cement/carpet)	9.6%	44.0%	38.2%
Total		100.0%	100.0%	100.0%

Table 26: Main floor material is natural statistics, ETS and non ETS

Group Statistics

	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
H102: MAIN FLOOR MATERIAL is natural	ETS	52	.83	.382	.053
	non-ETS	257	.46	.499	.031

Table 27: Levene's test for variance

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
H102: MAIN FLOOR MATERIAL is natural	Equal variances assumed	162.945	.000	5.020	307	.000	.368	.073	.224	.512
	Equal variances not assumed			5.985	90.204	.000	.368	.061	.246	.490

A comparison of women with floors made of natural materials shows significant difference in means ($p<0.01$). The variance of the two groups is also significantly different ($F=162.9$; $p<0.001$). The results seem to confirm that ETS is used by women with houses made with natural materials, that is, poorer women.

Roofing materials

Table 28: Main roof material cross tabulation, ETS and non ETS

H103.1: WHAT IS THE MAIN MATERIAL OF THE ROOF * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H103.1: WHAT IS THE MAIN MATERIAL OF THE ROOF	Thatch/mat/cardboard/grass	76.9%	43.2%	48.9%
	Iron sheets/tiles/cement	23.1%	56.4%	50.8%
	Other		0.4%	0.3%
Total		100.0%	100.0%	100.0%

Toilet facilities

Table 29: Toilet type cross tabulation, ETS and non ETS

H104: WHAT KIND OF TOILET FACILITIES DOES YOUR HOUSEHOLD HAVE * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H104: WHAT KIND OF TOILET FACILITIES DOES YOUR HOUSEHOLD HAVE	No facility/bush	69.2%	32.7%	38.8%
	Bucket toilet		1.9%	1.6%
	Pit toilet/latrine	26.9%	62.6%	56.6%
	Flush toilet	3.8%	2.7%	2.9%
Total		100.0%	100.0%	100.0%

Table 30: Toilet ownership and age correlation

Correlations

		B106: HOW OLD ARE YOU	H104: WHAT KIND OF TOILET FACILITIES DOES YOUR HOUSEHOLD HAVE
B106: HOW OLD ARE YOU	Pearson Correlation	1	.018
	Sig. (2-tailed)		.754
	N	308	308
H104: WHAT KIND OF TOILET FACILITIES DOES YOUR HOUSEHOLD HAVE	Pearson Correlation	.018	1
	Sig. (2-tailed)	.754	
	N	308	309

Significantly more non-ETS users have toilets (67%) compared to ETS users (30%) $p<0.01$. Toilet ownership does not correlate with age.

Water Sources

Table 31: Main source of water cross tabulation, ETS and non ETS

H105.1: WHAT IS THE MAIN SOURCE OF WATER FOR MEMBERS OF YOUR HOUSEHOLD * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H105.1: WHAT IS THE MAIN SOURCE OF WATER FOR MEMBERS OF YOUR HOUSEHOLD	Surface water (river/dam/lake/etc.)	53.8%	22.6%	27.8%
	Water from spring		5.4%	4.5%
	Dug well	15.4%	20.2%	19.4%
	Borehole	26.9%	45.1%	42.1%
	Public tap	3.8%	5.1%	4.9%
	Piped water into yard/plot		0.4%	0.3%
	Piped water into dwelling		0.4%	0.3%
	Water vendor/sachets		0.8%	0.6%
Total		100.0%	100.0%	100.0%

Fuel for cooking

Table 32: cooking fuel type cross tabulation, ETS and non ETS

H106.1: WHAT TYPE OF FUEL DOES YOUR HOUSEHOLD MAINLY USE FOR COOKING * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H106.1: WHAT TYPE OF FUEL DOES YOUR HOUSEHOLD MAINLY USE FOR COOKING	Dung	5.8%	2.3%	2.9%
	Firewood/straw	86.5%	89.9%	89.3%
	Charcoal	3.8%	3.9%	3.9%
	Kerosene	3.8%	3.1%	3.2%
	Electricity		0.8%	0.6%
Total		100.0%	100.0%	100.0%

Table 33: Cooking fuel type statistics, ETS and non ETS

Group Statistics

	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
H106.1: Firewood MAINLY USE FOR COOKING	ETS	52	.87	.345	.048
	non-ETS	257	.90	.302	.019

Table 34: Levene's test for variance

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
H106.1: Firewood MAINLY USE FOR COOKING	Equal variances assumed	1.917	.167	-.710	307	.478	-.033	.047	-.126	.059
	Equal variances not assumed			-.651	67.768	.517	-.033	.051	-.136	.069

The main fuel type used by women interviewed, 89%, is firewood/straw. There is no significant difference between the percentage of ETS and non-ETS women who use firewood (ETS 87%; non-ETS 90%). P=0.47 assuming equal variances. F-test for testing difference in variances not significant- F=1.92; p=0.167. Therefore, there is the same variance in the two subgroups.

Electricity

Table 35: Connected to electricity cross tabulation, ETS and non ETS

H107: IS YOUR HOUSE CONNECTED TO ELECTRICITY * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY
ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
H107: IS YOUR HOUSE CONNECTED TO ELECTRICITY	Yes	48.1%	37.7%	39.5%
	No	51.9%	62.3%	60.5%
Total		100.0%	100.0%	100.0%

Asset ownership

Table 36: Asset ownership, ETS and non ETS

Asset	ETS	non-ETS	Total
Fridge	14%	11%	12%
Tv	33%	35%	34%
Radio	67%	69%	69%
Bicycle	38%	40%	39%
Mobile phone	87%	79%	81%
Bed	90%	86%	87%
Kerosene Lamp / Pressure lamp	48%	62%	60%
Wrist Watch	60%	63%	62%
Motorcycle	48%	51%	51%
Car / Van	4%	10%	9%
Generator	25%	25%	25%
Fan	38%	32%	33%

There is high ownership of items such as beds (87%) mobile phones (81%) and radios (69%). There is low ownership of items such as cars (9%), fridges (12%) and generators (25%), the more expensive goods associate with higher wealth levels.

Table 37: Levene's test for variance

Asset ownership		*Levene's Test for Equality of Variances*		*t-test for Equality of Means*		
		F	Sig.	t	df	Sig. (2-tailed)
FRIDGE	Equal variances assumed	0.938	0.333	0.494	306	0.621
	Equal variances not assumed			0.465	67.515	0.644
TV	Equal variances assumed	0.31	0.578	-0.268	307	0.789
	Equal variances not assumed			-0.269	73.433	0.789
RADIO	Equal variances assumed	0.184	0.668	-0.221	307	0.825
	Equal variances not assumed			-0.218	72.177	0.828
BICYCLE	Equal variances assumed	0.117	0.733	-0.165	307	0.869
	Equal variances not assumed			-0.164	73.03	0.87
MOBILE PHONE	Equal variances assumed	6.664	0.01	1.189	307	0.235
	Equal variances not assumed			1.324	82.266	0.189
BED	Equal variances assumed	3.148	0.077	0.85	307	0.396
	Equal variances not assumed			0.942	81.81	0.349
KEROSEE LAMP	Equal variances assumed	2.908	0.089	-1.852	307	0.065
	Equal variances not assumed			-1.808	71.507	0.075
WRIST WATCH	Equal variances assumed	0.561	0.454	-0.41	307	0.682
	Equal variances not assumed			-0.404	72.124	0.688
MOTORC YCLE	Equal variances assumed	0.027	0.87	-0.431	307	0.667
	Equal variances not assumed			-0.429	72.786	0.669

CAR / VAN	Equal variances assumed	8.429	0.004	-1.369	307	0.172
	Equal variances not assumed			-1.8	105.94	0.075
GENERATOR	Equal variances assumed	0.008	0.93	-0.044	307	0.965
	Equal variances not assumed			-0.044	72.947	0.965
FAN	Equal variances assumed	2.515	0.114	0.915	307	0.361
	Equal variances not assumed			0.885	70.886	0.379

No significant difference at p=0.05 in ownership of all assets among women from both subgroups. There is a significant difference in variance between ETS and non-ETS in ownership of mobile phones (p=0.01) and cars/vans (p=0.004).

Animals owned

Table 38: Animal ownership, ETS and non ETS

Group Statistics

Animal ownership	T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)	N	Mean	Std. Deviation	Std. Error Mean
DUCKS OR CHICKENS	ETS	50	8.86	10.808	1.529
	non-ETS	220	6.99	7.444	.502
GOAT, SHEEP OR CATTLE	ETS	50	7.02	11.855	1.677
	non-ETS	221	6.17	10.274	.691
HORSES, DONKEYS OR MULES	ETS	51	.02	.140	.020
	non-ETS	239	.05	.380	.025

Table 39: Levene's test for variance

Independent Samples Test

Animal ownership		Levene's Test for Equality of Variances		t-test for Equality of Means						
									95% Confidence Interval of the Difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
DUCKS OR CHICKENS	Equal variances assumed	7.379	.007	1.461	268	.145	1.869	1.279	-.649	4.387
	Equal variances not assumed			1.162	59.977	.250	1.869	1.609	-1.349	5.087
GOAT, SHEEP OR CATTLE	Equal variances assumed	3.554	.060	.512	269	.609	.848	1.657	-2.414	4.110
	Equal variances not assumed			.468	66.639	.642	.848	1.813	-2.772	4.468
HORSES, DONKEYS OR MULES	Equal variances assumed	1.702	.193	-.644	288	.520	-.035	.054	-.141	.071
	Equal variances not assumed			-1.107	217.433	.269	-.035	.031	-.097	.027

There is no difference in the mean number of animals owned. However, there is a significant variation in ownership of chickens/ducks between the two groups.

Wealth ranking

Table 40: Communalities - initial and extracted.

Communalities

	Initial	Extraction
H101.1: WHAT IS THE MAIN MATERIAL OF THE WALLS	1.000	.509
H101.1: MAIN MATERIAL OF THE WALLS is natural	1.000	.472
H102: WHAT IS THE MAIN FLOOR MATERIAL	1.000	.553
H103.1: WHAT IS THE MAIN MATERIAL OF THE ROOF	1.000	.567
H104: WHAT KIND OF TOILET FACILITIES DOES YOUR HOUSEHOLD HAVE	1.000	.425
H105.1: WHAT IS THE MAIN SOURCE OF WATER FOR MEMBERS OF YOUR HOUSEHOLD	1.000	.147
H106.1: WHAT TYPE OF FUEL DOES YOUR HOUSEHOLD MAINLY USE FOR COOKING	1.000	.064
FRIDGE	1.000	.242
TV	1.000	.438
RADIO	1.000	.089
BICYCLE	1.000	.005
MOBILE PHONE	1.000	.245

BED	1.000	.151
KEROSEE LAMP / PRESSURE LAMP	1.000	.002
WRIST WATCH	1.000	.082
MOTORCYCLE	1.000	.123
CAR / VAN	1.000	.207
GENERATOR	1.000	.257
FAN	1.000	.443
DUCKS OR CHICKENS	1.000	.045
GOAT, SHEEP OR CATTLE	1.000	.067
HORSES, DONKEYS OR MULES	1.000	.018

Extraction Method: Principal Component Analysis.

Table 41: Total variance

Total Variance Explained

	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.161	23.458	23.458	5.161	23.458	23.458
2	1.994	9.065	32.523			
3	1.509	6.861	39.384			
4	1.405	6.388	45.772			
5	1.234	5.610	51.382			
6	1.176	5.347	56.729			
7	1.073	4.876	61.606			
8	1.032	4.693	66.298			
9	.923	4.197	70.496			
10	.846	3.844	74.340			
11	.807	3.670	78.010			
12	.754	3.426	81.436			
13	.655	2.977	84.413			
14	.614	2.792	87.205			
15	.509	2.312	89.518			
16	.457	2.075	91.593			
17	.434	1.974	93.567			
18	.409	1.857	95.424			
19	.331	1.503	96.927			
20	.307	1.397	98.324			
21	.261	1.185	99.509			
22	.108	.491	100.000			

Extraction Method: Principal Component Analysis.

The total variance explained by the first eigen value is 23%. The households are then ranked from lowest to highest and divided into quintiles.

Table 42: Percentile group cross tabulation, ETS and non ETS

Percentile Group of FAC1_1 * T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY

ETS (NURTW) Crosstabulation

% within T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)

		T103: WHAT TYPE OF VEHICLE DID YOU USE TO GET TO THE FACILITY ETS (NURTW)		
		ETS	non-ETS	Total
Percentile Group of FAC1_1	Poorest 20%	28.8%	17.9%	19.7%
	2	30.8%	17.9%	20.1%
	3	23.1%	19.5%	20.1%
	4	3.8%	23.3%	20.1%
	Wealthiest 20%	13.5%	21.4%	20.1%
Total		100.0%	100.0%	100.0%

On the basis of the wealth rankings, the following conclusions can be reached:

- Significantly more women using ETS fall in the lowest 2 quintiles (59%) compared to those using non-ETS (35%). P<0.01.
- 59% of ETS users fall into the two lowest wealth quintiles compared to 36% of non-ETS users.

9.7 Appendix 6 – Wealth explained – Baseline

See attached Excel document.