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# Maternal health after Ebola: unmet needs and barriers to healthcare in rural Sierra Leone

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## Abstract

Sierra Leone has the world's highest estimated maternal mortality. Following the 2014–16 Ebola outbreak, we described health outcomes and health-seeking behaviour amongst pregnant women to inform health policy. In October 2016–January 2017, we conducted a sequential mixed-methods study in urban and rural areas of Tonkolili District comprising: household survey targeting women who had given birth since onset of the Ebola outbreak; structured interviews at rural sites investigating maternal deaths and reporting; and in-depth interviews (IDIs) targeting mothers, community leaders and health workers. We selected 30 clusters in each area: by random GPS points (urban) and by random village selection stratified by population size (rural). We collected data on health-seeking behaviours, barriers to healthcare, childbirth and outcomes using structured questionnaires. IDIs exploring topics identified through the survey were conducted with a purposive sample and analysed thematically. We surveyed 608 women and conducted 29 structured and 72 IDIs. Barriers, including costs of healthcare and physical inaccessibility of healthcare facilities, delayed or prevented 90% [95% confidence interval (CI): 80–95] (rural) vs 59% (95% CI: 48–68) (urban) pregnant women from receiving healthcare. Despite a general preference for biomedical care, 48% of rural and 31% of urban women gave birth outside of a health facility; of those, just 4% and 34%, respectively received skilled assistance. Women expressed mistrust of healthcare workers (HCWs) primarily due to payment demanded for 'free' healthcare. HCWs described lack of pay and poor conditions precluding provision of quality care. Twenty percent of women reported labour complications. Twenty-eight percent of villages had materials to record maternal deaths. Pregnant women faced important barriers to care, particularly in rural areas, leading to high preventable mortality and morbidity. Women wanted to access healthcare, but services available were often costly, unreachable and poor quality. We recommend urgent interventions, including health

promotion, free healthcare access and strengthening rural services to address barriers to maternal healthcare.

**Keywords**: Maternal health, barriers, Ebola, healthcare, mortality

**Key Messages**

- Barriers, including costs of healthcare and physical inaccessibility of healthcare facilities, delayed or prevented 90% of rural and 59% of urban pregnant women from receiving healthcare.
- Forty-eight percent of rural and 31% of urban women gave birth outside of a health facility; of those, just 4% and 34%, respectively received skilled assistance.
- Women expressed mistrust of healthcare workers (HCWs) primarily due to payment demanded for 'free' healthcare and HCWs described lack of pay and poor conditions precluding provision of quality care.
- Less than one-third of rural villages had materials to record maternal deaths.

## Introduction

Sierra Leone is one of the poorest countries in the world (United Nations Development Programme, 2017). The population has the highest reported maternal mortality ratio and lifetime risk for women dying in childbirth worldwide (World Health Organization, 2016). The 2014–16 Ebola outbreak led to considerable morbidity and mortality and placed unprecedented strain on an already under-resourced health system (World Health Organization, 2016). Substantial numbers of healthcare worker (HCW) deaths, a lack of provision and breakdown in trust in healthcare systems unable to respond to the needs of patients, contributed to widespread disengagement with healthcare services (Plan International, 2015; World Health Organization, 2015; Elston *et al.*, 2016; Elston *et al.*, 2017; Sochas *et al.*, 2017). These negative factors had the greatest impact on pregnant women and young children, probably leading to greatly increased morbidity and mortality (Menéndez *et al.*, 2015; Popova *et al.*, 2015; Brolin Ribacke *et al.*, 2016; Jones *et al.*, 2016; Sochas *et al.*, 2017).

Improving healthcare provision and access to care for women and children are longstanding national priorities for Sierra Leone. The Free Health Care Initiative (FHCI) was launched in 2010 with the intention that healthcare should be provided free of charge at the point of care for pregnant and breastfeeding women and for young children (UNICEF, 2009). Byelaws proscribing home births and imposing severe fines for mothers and those facilitating were introduced with the intention of encouraging use of 'safer' health facilities. Reducing maternal morbidity and mortality were key objectives of the Reproductive, Newborn and Child Health Strategies of 2011–15 and 2017–21 produced by the Sierra Leone Ministry of Health and Sanitation (MoHS) (Edoka *et al.*, 2016; Government of Sierra Leone Ministry of Health and Sanitation, 2017). Post-Ebola, saving lives and improving the health of women was a key tenet of the Sierra Leone President's Recovery Priorities (Government of Sierra Leone, 2016). However, an enabling policy environment has yet to translate to effective maternal health services.

In order to plan and deliver effective and efficient services which are culturally appropriate and acceptable to the local population, it is first necessary to assess population health needs and gain sufficient and timely understanding of health behaviours and their determinants. Delays in receiving emergency obstetric care and treatment are major contributing factors to maternal death, particularly in resource-limited settings (Nyamtema *et al.*, 2011), and these factors can be understood using the 'three delays model' (Thaddeus and Maine, 1994). These are: (1) delay in deciding to seek care, (2) delay in reaching care and (3) delay in receiving adequate healthcare (Thaddeus and Maine, 1994). These three delays were probably exacerbated during the Ebola outbreak (Figueroa *et al.*, 2018).

Médecins Sans Frontières (MSF) has been providing maternal and child healthcare in Tonkolili District in partnership with the MoHS since January 2016 with the goal of reducing morbidity and mortality through improving timely access to free quality healthcare. In order to inform health policy and service planning post-Ebola, we conducted a study in Tonkolili District to describe health, health-seeking behaviour and determinants during pregnancy and childbirth, and the circumstances and reporting of maternal deaths.

## Methods

### Setting

Tonkolili (area ~7003 $km^2$) is located in the centre of the country and has a mostly rural population of ~531 000 (Statistics Sierra Leone, 2017). The majority (~80%) of the population is of Temne ethnicity, though there are large minority Koranko, Kono and Limba ethnic groups; and the predominant religion is Islam (~85%) (Statistics Sierra Leone, 2017). The age and sex profile of the district are consistent with the national profile with ~40% of the population under 15 years of age (Statistics Sierra Leone, 2017). The capital and largest city is Magburaka. The district comprises 11 chiefdoms. Tonkolili is under resourced and has a poor road network with many areas proving inaccessible during the rainy season. In a country with widespread poverty, the population of Tonkolili is considered among the most deprived with around three quarters of the population living in poverty, and, although an extractive industry exists, the majority (~76%) of the population are engaged in subsistence agriculture as their main livelihood (World Bank and Statistics Sierra Leone, 2014). Tonkolili is poorly served by healthcare services with approximately 0.5 higher cadre HCWs (doctors, nurses or midwives) per 10 000 population, the second-lowest provision of all districts (Government of Sierra Leone, 2016).

During the Ebola outbreak transmission in the district was intense: between May 2014 and April 2016, Tonkolili District reported 406 Ebola Virus Disease (EVD) cases including 162 EVD deaths (Nic Lochlainn *et al.*, 2018). MSF supported the Ebola response, running an Ebola Management Centre (EMC) in

Magburaka from December 2014 and supporting surveillance and outreach infection prevention and control activities (Theocharopoulos *et al.*, 2017).

This study was implemented separately in two localities within Tonkolili District: Magburaka town, hereby referred to as 'urban area'; and Yoni chiefdom, a predominantly rural chiefdom, hereby referred to as 'rural area'.

## Study design and data collection

A mixed-methods sequential explanatory design was employed. This consisted of two distinct phases. Phase 1 was quantitative, comprising a household survey in urban and rural areas and structured interviews in the rural area. Phase 2 consisted of qualitative in-depth interviews (IDIs), carried out in urban and rural areas. Implementation of Phase 2 was informed by findings derived from Phase 1. The detailed protocol is publicly available on the MSF research platform https://remit.oca.msf.org/studies/141. Ethical approval for this research was granted by the authors' institutes.

### Phase 1—Household survey

The survey was conducted during October and November 2016 using a two-stage cluster sampling methodology. Thirty clusters were selected in both the urban and rural areas.

The minimum target sample size was 190 in each of two areas. This was calculated using population estimates derived from national census projections and household composition from the Demographic and Health Survey (DHS) 2013 (Government of Sierra Leone, 2013). To reflect maximal uncertainty, calculations were based on an estimated 50% prevalence of the main outcome (utilization of health services for labour), and assumed 80% power, precision of 0.10, design effect of 2 and a 94% response.

Clusters in the urban area were selected by randomly assigning global positioning system (GPS) points. Magburaka was traced into OpenStreetMap to the building, street and boundary level. The residential areas of the town were then imported into Quantum GIS software (Version 2.12.1) and random points generated. The points were saved as GPX format, which allowed the identification of the starting survey household.

To select households within an urban cluster, the nearest house to the GPS point was identified (distance measured from GPS location where appropriate) and selected as the first house to assess for participant eligibility. If a member of the household was eligible the next household to be assessed was the next house to the left or, if the cluster was perceived to have a sufficient number of houses, the second or third house to the left. The interval between houses was based on practicality and determined by the survey team lead on arrival at the cluster depending on the number of houses within the selected village or urban area and the location of the nearest survey site (and avoidance of cluster contamination). In the rural area, we stratified by population size (2006 census-estimated village population $\geq$500 or $<$500) and selected villages randomly within each stratum.

The standard WHO/EPI methodology was used in the rural area to select households within a cluster: accordingly, a pen was thrown twice, at the centre and at the edge of a cluster, and the first household selected by use of a random number table (Henderson and Sundaresan, 1982). Further selection of households was performed as for the urban area.

A woman was eligible for the survey if she had given birth in Tonkolili District since the start of the Ebola outbreak in Sierra Leone, defined as mid-May 2014, and had provided verbal consent. If the household contained more than one eligible woman, one was selected randomly by drawing of lots. Ten women meeting these inclusion criteria were recruited at each cluster site. Information was collected by means of bespoke questionnaires. Information collected pertained to the woman including: health behaviour during their most recent pregnancy and labour; perceived barriers to healthcare and impact (whether barriers delayed or prevented access to quality healthcare); health during their most recent pregnancy; and labour outcomes for the baby and mother. Labour outcomes for baby included live or stillbirth (defined as baby born alive or dead, respectively) and for this question women were asked about all childbirths within the preceding 8 years. Outcomes for the mother included symptoms consistent with obstetric fistula (defined as constant leakage of urine and stool following childbirth). Questionnaires were uploaded to Sony Experia tablet devices, in English and administered to participants verbally in the local language (Temne, Mende or Krio) by trained data collectors.

The survey team comprised eight data collection teams of two persons and between two and four supervisors per day. The survey team underwent 5 days of formal training prior to survey implementation and questionnaires were developed with data collectors and piloted to ensure acceptability and cultural sensitivity. Quantitative data arising from household questionnaires were entered into Dharma platform software by the data collection team.

### Phase 1—Structured interviews

In order to describe maternal mortality, circumstances of death and barriers to death reporting, one structured interview was conducted at each rural survey cluster site with one or more of Head or deputy Head of village or HCW subject their verbal consent. For logistical reasons including uncertainties with section boundaries structured interviews were not attempted in the urban area. Informants were asked to describe the number, cause and circumstances of maternal death occurring in their village since the start of the Ebola outbreak in Sierra Leone (mid-May 2014), and to describe village demographics, death reporting and barriers to reporting. This was an adaption of the informant method used elsewhere (Roberts *et al.*, 2010). Maternal deaths were defined as deaths from any cause whilst pregnant or during childbirth or within 2 months of the birth or termination of pregnancy.

### Phase 2—In-depth interviews

Phase 2 comprised IDIs with four participant groups: (1) women who had given birth (live or stillbirth) since the start of the Ebola outbreak in Sierra Leone (mid-May 2014); (2) caregivers for a child under 5 years; (3) community leaders; and (4) skilled or unskilled HCWs. IDIs were conducted during December 2016 and January 2017.

Selection of locations for IDIs was informed by preliminary analysis of the survey data. Sites for the IDIs were selected purposively, prioritizing locations visited during the survey with the highest proportion of respondents reporting barriers which delayed and or prevented access to healthcare and to include sites with a diverse range of relevant characteristics (e.g. sites with and without easy access to a health facility; on a main road and more remote).

Sample size was determined as the study progressed (Marshall, 1996), and interviews were conducted until theoretical saturation was reached, i.e. until no new themes were emerging (Guest *et al.*, 2006; Green and Thorogood, 2009).

Participants were selected purposively, subject to verbal consent, to include key informants who had experience of pregnancy and

useful perspectives on childbirth. Maximum variation sampling was used to ensure the consideration of key demographic variables likely to have an impact on participant's views (e.g. age, ethnicity and occupation).

IDIs were based on a topic guide informed by preliminary survey analysis. Topic guides were piloted to ensure the responses were natural and optimal descriptive responses captured. Flexible, iterative and participatory techniques were used to permit emergent themes (as well as discrepancies from majority themes) to be further explored and tested. IDIs were conducted over 45–60 min in English or the local language (Temne or Krio), as preferred by the participant, in mutually agreed, confidential locations. Interviews were audio recorded and subsequently translated and transcribed into English by trained transcribers. A selection of transcriptions was back-translated and checked by a second transcriber to ensure quality and accuracy of transcription.

The IDI team comprised two qualitative researchers, three research assistants/translators and five transcribers/translators. Two teams (comprising one researcher and one research assistant/translator) conducted interviews. Research assistants/translators received a 3-day training programme. Transcribers received a 1-day training and close ongoing supervision. Daily debriefing sessions were conducted with all field teams for quality assurance.

### Data analysis

Means or medians (range) of numerical variables were calculated. For categorical variables, proportions were calculated using the non-missing values as denominators and 95% confidence intervals (95% CI) allowing for clustering. To identify potential associations, we calculated adjusted prevalence ratios using Poisson regression. Data cleaning and analysis was conducted using STATA v14 (Stata Corporation, TX, USA).

A combination of inductive and deductive analysis was used: following close reading of data, open coding was conducted to identify phenomena and patterns emerging from the data. Codes were then grouped under categories within the three delays framework, whilst also allowing for the identification of emergent categories and themes. Agreement between researchers was obtained for all final coded data. Similarities and differences across sub-groups were explored, and deviant cases analysed in order to revise, broaden and confirm the patterns emerging from data analysis. Qualitative data were analysed using NVivo ©11 software.

## Results

### Overview

A total of 301 and 307 women were included in 30 urban clusters and 30 rural clusters, respectively (Table 1).

Structured interviews to capture details of maternal deaths and recording were conducted in 29 of 30 rural clusters (villages); HCWs were interviewed in 19/29 (66%) villages (Table 1).

Seventy-two IDIs were conducted in survey cluster sites: five urban locations and six rural villages (Table 1). Health workers represented the most heterogeneous group and as a result had the most interviewees (Table 1). There were no documented refusals to participate in Phase 1 and only one refusal in Phase 2 of the study.

The median age of women included in the survey was similar between both areas: 25 years (range: 15–59) in urban area and 26 years (range: 15–46) rurally. Participants in the rural area overall had lower levels of literacy and educational attainment and were more likely to be married and or pregnant at time of the survey (Table 2).

**Table 1** Overview of study participants

| Study component | Participant group | Number included | | |
|---|---|---|---|---|
| | | Urban | Rural | Total |
| Survey | Women (given birth since Ebola) | 301 | 307 | 608 |
| Structured interviews | Health worker | n/a | 21 | 21 |
| | Community leaders | n/a | 22 | 22 |
| In-depth interviews | Mothers | 9 | 10 | 19 |
| | Caregivers | 6 | 6 | 12 |
| | Community leaders | 8 | 9 | 17 |
| | Health workers | 12 | 12 | 24 |

IDI participants were aged between 18 and 40 years, 15 (79%) were aged between 18 and 30.

### Health outcomes

Self-reported complications/difficulties in labour were common in both areas, most frequently bleeding (Table 3). A relatively high proportion of childbirths resulted in stillbirth, which was more commonly experienced by urban women (Table 3). Four urban and one rural woman had received an operation to address symptoms consistent with obstetric fistula; none of the urban women remained symptomatic though 7 (47%) rural women had unresolved symptoms.

### Maternal deaths and death recording

According to structured interview informants, deaths (including maternal deaths) were normally recorded in 16/29 (55%) surveyed rural villages. However, only 8 (28%) villages had a death registration book.

From mid-May 2014 to the beginning of November 2016, informants recalled 25 maternal deaths in total. These deaths occurred in 12 (41%) villages (number of deaths per village ranging from 1 to 7). There was general uncertainty in denominator population by village. Median age of women who died was 23 years, range was 15–42 years; 5 (24%) were aged <20 years. Of the 19 deaths where the informants confidently recalled the timing in relation to pregnancy and labour, 3 (16%) occurred during pregnancy, 7 (37%) during childbirth and 9 (47%) after childbirth. Of 18 deaths where the informant confidently recalled cause of death: 8 (44%) were due to bleeding, 3 (17%) eclampsia, 2 (11%) obstructed labour, 2 (11%) infection and 3 (17%) other causes. Sixteen (76%) deaths occurred in the community, 5 occurred in a healthcare facility. In 4 (19%) cases, the woman died whilst on the way to a health facility. Healthcare was not sought by 11 (55%) of 20 women for whom this information was known: the explanation provided for all was that the health facility was too far away or was inaccessible in the time required.

IDI participants suggested that both communities and rural health workers could be reticent to report deaths. District-level health workers explained that people in rural communities became panicked or afraid when they were asked for information, and sometimes refused to give it. This was generally ascribed to a fear of the investigation process which was perceived to be recriminatory and punitive, as well as health workers' concerns over admitting to 'failure':

*They don't want to report the deaths . . . . Sometimes they push away the death from their own centre . . . I'll tell you, most of them falsify those reports . . . because if you have a maternal death, you have a whole team coming to interview you, the maternal death*

**Table 2** Demographics of women included in survey

| Characteristic | Variable | Urban ($n = 301$) | | | Rural ($n = 307$) | | |
|---|---|---|---|---|---|---|---|
| | | *n* | % | 95% CI | *n* | % | 95% CI |
| Literacy and education | Literate (able to read and write) | 168 | 56 | 48–63 | 48 | 16 | 10–23 |
| | Educated to primary level | 24 | 8.0 | 4.1–11 | 29 | 9.4 | 6.4–14 |
| | Educated to secondary level | 128 | 43 | 36–49 | 38 | 12 | 7.8–19 |
| | Educated to higher level | 20 | 6.6 | 4.1–11 | 0 | 0 | |
| Marital status | Never married | 78 | 26 | 21–31 | 16 | 5.2 | 2.4–11 |
| | Married | 215 | 71 | 66–76 | 281 | 92 | 86–95 |
| | Divorced | 2 | 0.7 | 0.2–2.7 | 2 | 0.7 | 0.2–2.7 |
| | Widowed | 5 | 1.7 | 0.7–3.8 | 8 | 2.6 | 1.1–5.9 |
| Pregnancy status | Pregnant | 9 | 2.9 | 1.7–5.3 | 35 | 11 | 8.5–15 |

**Table 3** Health outcomes, health behaviours and healthcare experiences in labour and pregnancy

| | | Urban | | | | Rural | | | |
|---|---|---|---|---|---|---|---|---|---|
| Category | Factor | *n* | Total | % | 95% CI | *n* | Total | % | 95% CI |
| Health outcomes—self-reported complications related to labour | Any complication | 50 | 301 | 17% | 13–21 | 69 | 307 | 23% | 17–29 |
| | Bleeding | 25 | 301 | 8.3% | 5.7–12 | 41 | 307 | 13% | 9.1–19 |
| | Stillbirth[a] | 38 | 583 | 6.5% | 4.0–11 | 19 | 775 | 2.5% | 1.6–3.8 |
| | Prolonged/obstructed labour | 11 | 301 | 3.7% | 1.8–7.5 | 6 | 307 | 2.0% | 0.8–4.8 |
| | Symptoms consistent with obstetric fistula[b] | 7 | 297 | 2.4% | 1.0–5.2 | 15 | 305 | 4.9% | 2.1–11 |
| Care seeking in labour | Sought assistance during labour | 259 | 301 | 86% | 78–92 | 282 | 307 | 92% | 81–97 |
| Reaching healthcare—mode of travel for labour[a] | Walked | 93 | 206 | 45% | 36–54 | 115 | 165 | 70% | 55–81 |
| | Motorbike taxi | 95 | 206 | 46% | 37–56 | 42 | 165 | 25% | 15–40 |
| | Taxi car | 18 | 206 | 8.7% | 5.4–14 | 4 | 165 | 2.4% | 0.9–6.5 |
| | Was carried | 4 | 206 | 1.9% | 0.5–7.8 | 4 | 165 | 2.4% | 0.7–7.9 |
| | Ambulance | 1 | 206 | 0.5% | 0.1–3.6 | 1 | 165 | 0.6% | 0.1–4.7 |
| | Other | 1 | 206 | 0.5% | 0.1–3.7 | 1 | 165 | 0.6% | 0.1–4.7 |
| Place of delivery | Healthcare facility | 208 | 301 | 69% | 60–77 | 161 | 307 | 52% | 41–64 |
| | Home | 93 | 301 | 31% | 23–40 | 142 | 307 | 46% | 35–58 |
| | Beside road (on way to health facility) | 0 | 301 | 0% | | 4 | 307 | 1.3% | 0.4–4.3 |
| Healthcare experience and quality of care during labour | Skilled assistance[b] during labour—overall | 223 | 301 | 74% | 65–81 | 148 | 301 | 48% | 38–59 |
| | Skilled assistance[b] during labour—in health facility | 191 | 208 | 92% | 83–96 | 141 | 161 | 89% | 76–95 |
| | Skilled assistance[b] during labour—outside health facility | 32 | 93 | 34% | 21–51 | 6 | 146 | 4.1% | 1.3–12 |
| | Caesarean section | 26 | 301 | 8.6% | 6.0–12 | 3 | 307 | 1.0% | 0.3–3.0 |
| | Used native herbs in labour | 36 | 300 | 12% | 7.2–19 | 139 | 307 | 45% | 34–57 |
| | Paid for services in labour | 38 | 296 | 14% | 9.2–18 | 149 | 305 | 49% | 38–60 |
| | Received dignified and respectful care by HCWs | 204 | 207 | 99% | 96–100 | 131 | 160 | 82% | 69–90 |
| Healthcare experience during pregnancy | Told no medicines available | 23 | 301 | 7.6% | 4.4–13 | 118 | 307 | 38% | 26–52 |
| | Refused care by HCW | 5 | 301 | 1.7% | 0.5–5.3 | 52 | 307 | 17% | 9.8–28 |

[a]Several modes of transport/travel may have been employed to get to the health facility.
[b]From trained HCW such as midwife, nurse, doctor, and not including traditional birth attendant.
[c]From trained HCW such as midwife, nurse, doctor, and not including traditional birth attendant.

*review committee, and then the results, in the health centre itself and in your community.* [Urban healthcare worker (UHCW) 71].

## Over-arching barriers to healthcare

Fifty-nine percent (176/310) (95% CI: 48–68) of urban and 90% (276/307) (95% CI: 80–95) of rural women experienced at least one problem which delayed or prevented them accessing and receiving healthcare during their most recent pregnancy and/or labour. Rural women generally reported a greater number of barriers and their attendances were delayed and prevented to a more substantial degree compared with urban women (Figure 1).

Lack of money for either paying for a consultation with a HCW or for paying for transport to get to a health facility was a problem for 26% (95% CI: 19–34) of urban women and 82% (95% CI: 71–90) of rural women. Distance to a health facility, fear of contracting Ebola, not wanting to travel alone and concerns about being treated disrespectfully by HCWs led to a substantial proportion of women, especially rurally, to delay or abandon their attempt to access health facilities (Figure 1).

IDI participants indicated several additional barriers including lack of medications and HCW absences. Qualitative findings are discussed in the context of delay categories below.

## Care seeking and delays in deciding to seek care

The large majority of women in both areas sought assistance during labour (any assistance, skilled or unskilled) (Table 3).

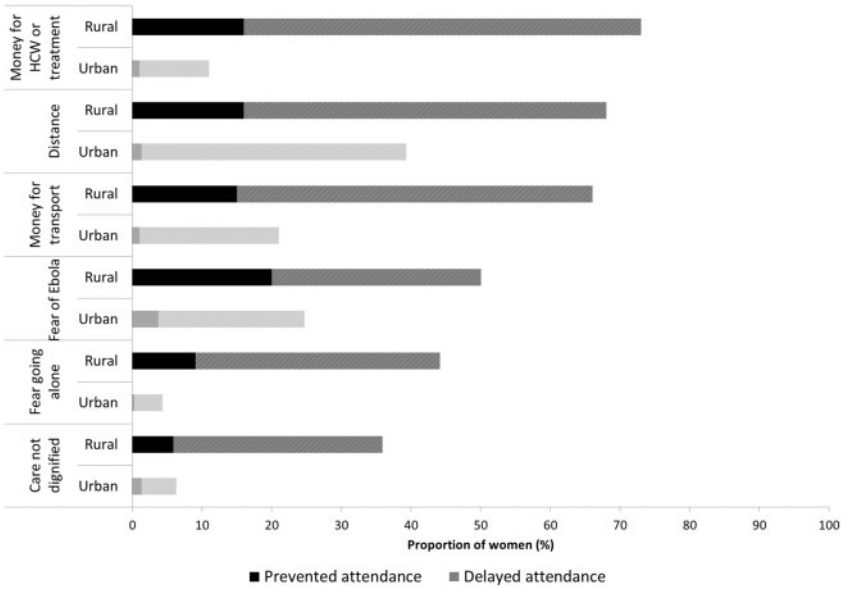


**Figure 1** Factors that delayed or prevented urban and rural women from receiving healthcare during their most recent pregnancy.

**Table 4:** Demographic associations with health behaviours and healthcare experience

| Behaviour/healthcare experience | Explanatory factor | Category | Urban | | | Rural | | |
|---|---|---|---|---|---|---|---|---|
| | | | Adjusted[a] prevalence ratio | 95% CI | *P*-value | Adjusted[a] prevalence ratio | 95% CI | *P*-value |
| Seeking assistance for labour | Educational level | Per unit increase[b] | 1.02 | 1.00–1.04 | 0.02 | 1.02 | 0.98–1.01 | 0.30 |
| Giving birth at a health facility | Educational level | Per unit increase | 1.08 | 1.00–1.17 | 0.06 | 1.19 | 1.04–1.37 | 0.01 |
| Skilled assistance[c] for labour | Educational level | Per unit increase | 1.08 | 1.01–1.15 | 0.02 | 1.28 | 1.11–1.48 | 0.001 |
| | Age of woman | Per 1 year increase | 1.01 | 1.00–1.02 | 0.01 | 1.01 | 0.99–1.04 | 0.35 |
| | Additional childbirth | Per unit increase | 0.95 | 0.90–1.00 | 0.052 | 0.97 | 0.89–1.03 | 0.25 |
| Taking native herbs for labour | Educational level | Per unit increase | 0.95 | 0.92–0.98 | 0.002 | 0.89 | 0.84–0.95 | <0.001 |
| Receiving undignified treatment from HCW | Educational level | Per unit increase | 0.51 | 0.32–0.82 | 0.005 | 1.02 | 0.60–1.72 | 0.95 |

[a]Adjusted by age, additional childbirths and marital status.
[b]From none to primary, secondary and higher.
[c]From trained HCW such as midwife, nurse, doctor and not including traditional birth attendant.

However, the mean interval from the start of labour until seeking assistance was 17 (95% CI: 14–21) hours for urban and 16 (95% CI: 12–20) hours for rural women. In the urban area, educated women were more likely to have sought assistance: the proportion increased by 2% for each increasing level of their educational attainment (Table 4). There were no similar observations for rural women (Table 4), or by other demographic characteristics (data not shown).

IDI participants in the urban area explained that the main factors delaying decisions to seek care were concerns about costs associated with seeking care, long waiting times and previous experiences of poor care—notably being given prescriptions and told to buy drugs and being mistreated by health staff.

A lack of transport and open health facilities was also perceived to delay hospital attendance for women in labour during the night. Participants explained a preference for delivering at home with the assistance of a local off-duty nurse, only seeking hospital care when complications were beyond their skills.

Rurally, costs were also a major barrier to deciding to seek care, combined with distance to health facilities, lack of transport options and poor roads. Participants explained the necessary process of earning or borrowing money before they were able to seek care. Women also mentioned they feared travelling alone, particularly at night, and were worried about leaving their family. Women who went into labour at night or who experienced 'a quick pain' (fast labour) explained they had no option other than to deliver at home. Some reported delivering by the roadside on the way to a health facility.

*The distance again prevents the people not to attend clinic that would result to this maternal death also. If the clinic is about four or five miles to the village the pregnant women are living, so they would find it difficult to go there. They would say: 'Ha, the distance is too far, I would not go, in fact I don't have money to pay for Okada [motorbike taxi] to go there, I won't go'. So, they would decide to sit until problems come.* [Urban Healthcare Worker (UHCW) 23].

In both areas, IDI participants explained it could take time to reach a consensus about care, largely as decisions involved allocation of limited financial resources. For the majority of the participants the husband was the ultimate decision maker. Several

**Box 1 Themes and quotes relating to delayed care seeking**

Concerns about practical barriers and costs

*Without money, you cannot go to the hospital* [Urban Community Leader (UCL) 04].

Decision-making processes

*You know when you are sick, any treatment that they prescribe for you, you just have to follow… anything they rub you just have to bear up… You should not deny your mother.* [Urban Mother (UMO) 07].

Ebola perceptions

*I decided to give birth at home during Ebola because they made the thing so fearful; that when you went [to the clinic] they will put you into a vehicle and then go and kill you.* (Y_11_MO).

**Box 2 Themes and quotes relating to delays in reaching health facilities**

Hard to reach facilities

*They only deliver at home because there is no option; if it we had a hospital closer to us here no woman would have delivered at home… Because some will be on their way to the hospital—like this woman [gesturing]—she delivered on the way, because there is no money for a motorbike… this is the hardship of the world…* [Rural health worker (RHCW) 39].

Delayed referrals

*…the nurses, the health workers [at rural health facilities], will hold onto them for a while… The delay is: one, for them to make a decision, and then: two, the means of transportation. This is what's making the referral come too late.* (UHCW71).

participants indicated that the 'older generation' influenced mothers' care choices, often advocating for traditional care (Box 1). In some instances, women expressed a lack of control in the face of varied and often contradictory advice.

*The responsibility lies on them [husbands] for us women that are about to deliver.* [Rural Mother (RMO) 10].

Several IDI participants explained that teenage girls faced particular challenges in deciding to access care for pregnancy and childbirth due to the social stigma attached to their condition.

Younger mothers described hiding their pregnancy and a lack of support from their family.

*When I was pregnant my parents never want me to get pregnant so they were angry at me. I beared up till the time I gave birth; when my pregnancy was due I was on my way to the hospital and I just gave birth there, by the road. And that baby never lived long; it was just two days - then the baby died…* [Rural Care Giver (RCG) 19)].

Participants explained that a fear of Ebola had deterred them from seeking care in health facilities during the outbreak. However, generally participants recognized that the outbreak was over, and they were no longer concerned (Box 3).

## Delays in reaching healthcare facilities

Whilst over half of urban women who attended a health facility for labour used a motorbike taxi or taxi car to get there, 70% of rural women walked despite the distance probably being greater in general than for urban women (Table 3). Just one person in each of the two areas reported using an ambulance (Table 3). Of women who reported paying for transport to attend a health for labour, 16/22 (73%) of urban and 14/20 (70%) of rural women, reported that they were charged a higher than normal price by the moto/taxi driver.

IDI participants explained that accessing care in rural areas was challenging due to lack of transport, costs of available transport, and bad or non-existent roads particularly during the rainy season. In several villages far from a health facility, participants described carrying pregnant women in a hammock over several miles to reach the nearest facility.

*If any problem arises within the village it's is difficult to find motorcycle; we use our bare feet to walk. Sometimes this leads to death of the individual. Sometimes it costs 10,000 Leones to go to the health facility, and also cost 10,000 Leones on the way back home. We normally pay 15,000 Leones when the problem arises in the night.* [Rural Community Leader (RCL 35)].

Participants explained that referrals from rural areas were often delayed as rural health workers and traditional birth attendants (TBAs) did 'not know their limits', trying to manage until the situation became critical and referring too late (Box 2).

Health workers also explained that in some cases mothers or accompanying family members delayed or resisted referral as they were unable to take the decision alone, were concerned about the financial implications of referral, and/or about leaving their families.

Participants reported poor ambulance coverage and slow response times and considered these as critical factors contributing to avoidable maternal deaths.

*If we had a standby ambulance here [at the clinic], when these [rural health facilities] call for an emergency, the ambulance can move from here pick them up very early and bring them here earlier. But because of that people come here very late. They come here with a lot of complications. …because of that so many lives have been perishing.* (RCL65).

## Places where healthcare was sought and care preferences

Thirty-one percent urban vs 46% rural women reported that they gave birth at home; the remainder gave birth in a healthcare facility, with exception of four rural women who gave birth by the roadside on their way to a healthcare facility (Table 3). Fifty-seven percent (95% CI: 49–65) of urban women gave birth in a hospital compared with 1.6% (95% CI: 0.7–3.8) of rural women. Rurally, more educated women were more likely to have sought healthcare during labour (Table 4). 95% (95% CI: 92–98) of urban and 88% (95% CI: 76–94) of rural women stated that for future childbirths they would prefer to give birth in a health facility, with the remainder preferring to give birth at home.

Among IDI participants there was also general preference for delivery in a health facility. A general shift in preference from 'traditional' to 'biomedical' care was observed, and a corresponding increase in institutional births. Particularly younger generations explained that 'this is modern times' and 'delivery at home is no more', and TBAs noted a corresponding decrease in business.

**Box 3 Themes and quotes relating to care preference for place of birth**

Shift from 'traditional' to 'biomedical'/'modern' medicine
*The law is already being enacted at the hospital that no one should deliver at home... For us it is not just because of the law that is why people are rushing to the hospital, it's not like that. For us, we like visiting the hospital.* [Rural Mother (RMO) 10].

Byelaws and health messaging
*The law has been legalized by the nurse that nobody should give birth at home.* (RMO 10).

Positive perceptions of biomedical care
*[With TBAs] sometimes they deliver safely, but there's more risk than at the hospital. At the hospital, when there's no way to deliver, the operation is there...* (RMO 20).
*If they are tired of delivering the natural way, [there is] no way, unless either the child lost their life or the mother lost their life. The doctor is the difference between the hospital and the home.* (UCL 57).

Pragmatic choices based on barriers to formal sector care
*They just have a notion of 'don't want to come to hospital', until, the only thing, the hospital is the last resort. I want to repeat this, until there are complications, then they will come. Otherwise, they will not want to come to the hospital... We have a few health workers who are quacks, that go around and treat them at home.* (UHCW 71).

**Box 4 Themes and quotes relating to payment for healthcare, healthcare experience and quality of care received in health facilities**

Payment for 'free' healthcare
*During my last pregnancy, the care was not good. Before your [MSF] intervention....they [HCWs] would demand money frequently. [They would] say, 'We don't have that medicine unless you buy it.' ...unless you buy their drugs they won't see to you. Even syringes, they will tell you, 'Syringes have finished. I have them for sale,' and their prices are very special. Outside, if they sell this thing for 1,000 Leones then they will say its 2,000 Leones....That was a bitter experience; if you don't have money you may even lose your life.* (UMO 54).

Patient experiences of care provided
*This last time I was in labour I was feeling torment, and I didn't want lie down in the bed because I am not used to it. So I told the nurse to take me [off the bed]. She told there is no chance for that, and told me to leave the hospital so I left. Some of my friends took me to their place and I gave birth there...* (RMO 28).

*...when you go [to the hospital] they will not see you quickly. They are busy doing other things while you are waiting... They sit and talk, talk, talk, talk, instead of treating the patient. That is my experience.* (UMO 54).

Challenges staying in hospital

*... some of them when they came here they have nobody to visit them, they will be alone.... They leave a lot of children and they have nobody to take care of them. They sometimes want to go back... they say, 'I've got to go and take care of my husband, if I'm not there, my husband will not be mine'.* (UHCW 71).

Participants explained that byelaws prohibiting delivering at home (a fine of 50,000 Leones for home births was repeatedly mentioned) and health education messaging promoting institutional birth influenced care preferences. When asked why they preferred institutional deliveries, participants regularly stated 'because they told us...', referring to pervasive messaging from health workers, community leaders and the media. However, decisions were also strongly informed by past experiences and recommendations shared within families and communities, with negative or positive experiences of care having an impact on the choices of others in the future. This was combined with positive perceptions of medication, diagnostic tests, and treatment available at health facilities and seen to ensure a 'safer' and 'quicker' delivery (Box 3).

*We see that the clinic is the fastest... when a person has a prolonged labour pain... in the hospital, they will give you some injections or drugs that will help to expedite the delivery. When there are complications, they will give you injections that will help you, but at home, you will suffer until God naturally brings the time of delivery...* (RMO 18).

In the urban area, the presence of MSF was a clear incentive for many women to deliver in the hospital due to the good quality, free care available.

Despite these preferences, participants explained that in practice they often gave birth at home with the assistance of a TBA (in both rural and urban areas) or a 'local nurse' (in urban areas). The main reasons for this were proximity and availability that they allowed flexible payment based on the means of their patients. They were also often known and trusted by pregnant women, their families and communities, and were perceived to offer good care (Box 3).

*I delivered at home, but it was a bitter experience for me. It was raining heavily. I was having severe pain, meaning I could not even walk to the hospital. So I had my nurse [TBA], who delivered me at home. [The TBA] she tried, but she only has that ancient experience. But she's my friend. Since she's lives locally I decided to use her. So even if I have a problem at midnight, she will see to my aid immediately, so that's why [she helped me deliver].* (UMO 54).

## Healthcare experience and delays in receiving quality care

Overall, 74% of urban women reported having assistance from a skilled provider (trained HCW such as midwife, nurse or doctor, not TBA) compared with 48% of rural women (Table 3). Whilst the majority of women who gave birth at healthcare facilities received skilled assistance, among those who gave birth outside health facilities, 34% urban women and just 4% of rural women received skilled assistance (Table 3). More educated women were more likely to have received skilled assistance during labour in both areas

(Table 4). In the urban area, women who had more children were less likely, though older women more likely, to have obtained skilled assistance (Table 4).

Just 3 (1%) rural women received a Caesarean section (Table 3). Use of native herbs to 'assist labour' was common, particularly rurally (45% women) (Table 3). In both areas, less educated women were more likely to have used native herbs to assist labour (Table 4). 14% urban vs 49% rural women were required to pay for services in labour (delivery charge, medicines, HCW charge, instrument, operation and blood transfusion) (Table 3).

Lack of medicines at health facilities and being refused care by HCWs were common problems rurally (Table 3). Ninety-nine percent of urban women who delivered in healthcare facilities (most commonly the government hospital) reported that they were satisfied that they received dignified care (Table 3). Rurally, 18% reported undignified treatment with the most frequent complaints: not being attended to or excessive waiting time [10/28 (36%) respondents] and being verbally abused by HCWs [11/28 (39%) respondents]. More educated women were less likely to receive undignified treatment from HCWs (decrease of 49% for each increasing level of education); this association was not observed rurally (Table 4).

IDI participants in both areas reported that paying for medication and treatment was common practice, and in some instances prevented them receiving the care they needed (Box 4). In addition, rural participants explained routine charging for other aspects of care such as 'registering' a baby born at home. People often felt obligated to 'show a sign of appreciation' to the nurse; generally, money or food was seen as necessary to 'keep him/her sweet' and ensure good care in the future. For women delivering in the hospital many fees were detailed, including paying for drips, tests, cannulas and blood. Participants expressed particular frustration with these charges in the context of promises of 'free healthcare'.

*Well you see, they are saying free health care for pregnant and lactating women, but when we get there we will not see the free health care they are talking about. . ..we understand that the free health care is not operating.* (UCG 03).

Several health workers explained during IDIs the practice of charging for care in the context of their own limited or non-existent salaries, inconsistent drug supply and a lack of other basic equipment. Particularly when 'free healthcare' drugs ran out, health workers explained that they would buy 'cost recovery' drugs and sell them to patients. A lack of clarity between what medication should be 'free' and what should be 'cost recovery', and why drugs were charged for led to misunderstandings between health workers and patients/communities. Participants also explained that 'volunteer' workers would charge for care or services in order to support themselves, and in some cases would continue to do so once salaried in order to 'make up for' unpaid years.

*You come to work, and sometimes, you don't have transportation. So, when we had a huge number of volunteer nurses they had to sell one or two drugs so that they could have their transportation to go home. . . Even those of us on the salary, it's a very small salary here; a million or less, a million per month. Imagine what that can do for you? This has the tendency to make people corrupt, to ask for payment for services, because you have to also keep yourself and take care of your family.* (RHCW).

IDI participants commonly complained that they did not receive 'enough drugs' from healthcare facilities. Often HCWs were absent from the facilities when they visited, and they had then to travel on to the next health facility, if they had the means, or rely on less qualified staff present at the facility. In both areas, getting care at night was presented as a particular challenge.

*For me, if not for the elder people [TBAs] that were there [in the facility] and that helped me when I was in labour I would have died, because [the nurse] was not there until I was finished.* (RMO 27).

In both areas, mothers and caregivers spoke about their experiences of health workers being disrespectful, aggressive and insulting; e.g.: being criticized by nurses for lack of 'smart' clothing; for coming too late or with evidence of use of traditional remedies; and for their age (being too young or too old to be a mother) (Box 4).

For some, the poor attitudes of health workers were a manifestation of hierarchy and social distance between them and 'poor village people', and the complex interplay of fear and respect this entailed (Box 4). For others, it reflected 'negligent' or 'lackadaisical' attitudes of health staff due to 'lack of motivation' and poor financial incentivization; 'If they are not motivated, either they are corrupt or they work less. . ..' (UHCW 71).

*Some [health workers] they grow up like that, to be harsh. They don't know how to talk to people politely. And some of them think that, because those people are coming from the villages, any way you treat them they will just appreciate. Of course people are afraid of nurses. . . Whenever you are in the villages and you say, 'This is a nurse,' they have high respect for you. If a nurse tells you something and you don't do it, the next time if you come to them, they will not help you.* (UHCW 66).

Health workers themselves acknowledged they could be aggressive but explained this was due to difficulties working with 'stubborn' communities where patients consistently presented too late, and to the challenges they faced working with limited resources, notably inadequate facilities lacking adapted spaces and equipment for delivery (Box 4).

*Some women say they are used to giving birth without going to the hospital . . . children nowadays are stubborn; they will still not come [to the clinic] unless we use some force and force them like goats. . .* (RHCW 62).

All IDI participant groups emphasized that a bad experience in a health facility would deter an individual from seeking care in the same facility in the future. Moreover, such experiences were described to have a 'multiplier effect', as women based their decisions on where to seek care on the experiences of others, both good and bad. '. . .when [women] come back they explain some of the wrong things that have been going on in the hospital, and that will hinder others not to go'. (UCL 04).

## Discussion

This study provides additional evidence on access to healthcare, and valuing community experience and practice to inform Policy on maternal health in remote communities. This is of particular relevance in a context where trust in the health system has been previously weakened by the Ebola outbreak.

Findings indicate that since the start of the Ebola outbreak, health indicators in both urban and rural areas were poor. Complications in labour appeared common and the stillbirth rate was considerably above the current national target (Government of Sierra Leone Ministry of Health and Sanitation, 2017). This study also provides evidence for avoidable maternal morbidity and mortality. This study indicates chronic under-recording of maternal deaths in the community, in line with findings of the MoHS Maternal Death Surveillance and Response Annual Report 2016 (Government of Sierra Leone Ministry of Health and Sanitation, 2016).

A high proportion of women gave birth at home or outside health facilities. This finding must be explicitly recognized in order

to develop interventions, especially given the finding that home births were usually without skilled assistance, particularly rurally, and therefore considered unsafe.

Community narrative gathered in this study underlines how home birth penalties may increase inequality of access between urban and rural area and add economic burden on families as observed in other settings (Greeson *et al.*, 2016).

The vast majority of women did seek assistance in labour, but many did not subsequently receive it. This suggests that help was unavailable to a substantial proportion of women particularly rurally. Most women stated a preference for attending a health facility for their next childbirth suggesting that for most giving birth at home was not out of choice, rather as a default when healthcare was inaccessible/unavailable. Substantial barriers delayed and prevented people from accessing and receiving healthcare. Practical problems faced in reaching a health facility (delay phase 2) and receiving adequate and appropriate healthcare (delay phase 3) were often critical to delays in deciding to seek healthcare (delay phase 1). This suggests that if free quality healthcare was accessible then delay phase 1 might be substantially reduced. Whilst other studies using the three delays model have aimed to quantify which delay presents the most issues (Barnes-Josiah *et al.*, 1998; Yunus *et al.*, 2013; Mgawadere *et al.*, 2017), our research demonstrates that each stage is not mutually exclusive.

Previous studies have viewed a women's decision to deliver at home through a risk aversion lens, stating that 'a women's choice to deliver in the village is not a result of passive inaction or lack of knowledge about the potential risks she may face, but rather an active choice to reduce risks that she perceives as being of more importance' (Treacy and Sagbakken, 2015), a statement with which, our findings are aligned. Decisions to seek care were frequently made hierarchically or collectively, indicating a lack of autonomy in decision making for women, and often entailing delay. Educational attainment was found to be statistically associated with healthcare seeking (though may reflect relative empowerment such as financial means); this finding was consistent with a previous cross-sectional survey in rural Sierra Leone (Kanu *et al.*, 2014). Our study also provides additional evidence for social norms of delaying care seeking until perceived important enough to justify efforts (Sharkey *et al.*, 2017).

Biomedical healthcare was generally considered safer and more effective than alternatives in pregnancy and for management of labour. This is a salient finding contradicting much published work from Sierra Leone which largely states that for childbirth, pregnant mothers prefer visiting TBAs (Maxmen 2013; Treacy and Sagbakken 2015). However, the outbreak could have contributed to a shift in care-seeking preferences. Nevertheless, the implication is that if quality healthcare is available and accessible people will come.

Distance to health facilities and associated costs appeared particularly critical to health behaviour especially rurally; this is in keeping with findings of other studies in Sierra Leone (Treacy and Sagbakken, 2015; Treacy *et al.*, 2018). Young mothers/teenagers were apparently more likely to have faced additional barriers and be stigmatized. These findings are aligned with a previous study which indicated that adolescent pregnant girls in this context often lacked psychosocial support leading to delayed health seeking and care (November and Sandall, 2018). Over-charging of pregnant women, who were not in a position to negotiate, by moto and taxi drivers was evident. Practical constraints in urgent/emergency situations especially at night meant that in many situations it was simply not practical to get to a health facility. Participants linked delays/inability to reach healthcare with severe consequences, including death. This is consistent with previous studies in similar settings linking distances to health facilities and extended travel times with maternal deaths (Schoeps *et al.*, 2011; Okwaraji and Edmond, 2012; Okwaraji *et al.*, 2012). Lack of or absence of HCWs, lack of medications and cost of 'free healthcare' were major barriers to receiving quality healthcare. The findings of this study suggest that free provision of healthcare for pregnant women was not available to a large proportion of the rural population. This finding is supported by other studies demonstrating that beneficiaries of the FHCI often had to pay for supplies and drugs (McCollum *et al.*, 2016).

Loss of trust between communities and the health system during the Ebola outbreak has been well documented (Coltart *et al.*, 2017); though this study indicates deeper seated trust issues. Primarily participants attributed loss of trust in HCWs to the practice of charging money for free healthcare and the suspicion of personal gain from the sale of medicines and services. Lack of trust was exacerbated by sub-optimal communication, poor treatment and mistreatment by HCWs. The finding that women generally had preference for biomedical care implies that many were prepared to tolerate these undesirable HCW behaviours in order to access safer care for themselves and their babies and highlights a need for advocacy.

Poor morale amongst HCWs was evident primarily in view of lack of or absence of pay and sub-optimal working conditions. The former was associated with charging patients for care and medicines and, as also highlighted in a recent qualitative study, poor working conditions are not conducive to providing a friendly supportive environment for mothers (Theuring *et al.*, 2018). A perception of a punitive culture and fear of failure apparently led to delayed referrals and under-reporting of deaths. Further, these substantial issues suggest a lack of trust between HCWs and the health system which had not met their needs. Poor referral mechanisms and lack of ambulances were also important issues. A recent systematic review has highlighted the importance of facility-level barriers in contributing to avoidable maternal deaths (Gunawardena *et al.*, 2018). Our study incorporates HCW perspectives and further emphasizes the critical importance of barriers for the provider in relation to patients receiving quality care.

There was evident inequity in access to and receiving free quality healthcare: whilst the urban population were apparently well served by and satisfied with care provided by the MSF-supported district hospital, the rural population generally lacked access to the hospital and to free quality healthcare. In addition, the urban population had greater access to informal skilled care as evidenced by the higher proportion of assisted deliveries outside of healthcare facilities, which may reflect both greater availability of 'off duty' health workers in the urban area and potentially greater means to pay for such assistance. Disparities in health indicators between urban and rural settings are not uncommon, and our findings support calls for greater attention on the regional variability of health services (Moyer and Mustafa, 2013). This study draws on complementary strengths of three study designs and using mixed methods provides mitigation against some of the limitations of individual components of the study. Triangulation of findings meant that we could identify consistencies and inconsistencies in findings and allowed us to draw robust conclusions in which we have a high degree of confidence. Findings of this study can be considered alongside the framework of post-Ebola health policy and indicate little progress towards the President's Recovery Plan over the period of study, especially rurally.

This study is however, subject to some limitations. For selection of rural clusters, mapping was not practical and limitations with rural population estimates precluded both probability sampling proportional to size and weighting in the analysis. Individuals residing in smaller villages might have therefore been over-represented in the survey

**Panel 1: Recommendations for policy and practice for Sierra Leone and similar contexts**

1. Undertake community engagement, health education and health promotion for maternal health, in line with the MoHS' Health Promotion Strategy 2017–21
   - Increase community-level ownership and responsibility for maternal health, including developing practical measures to enable care-seeking
   - Strengthen the health promotion role of community and religious leaders, and community level groups, in collaboration with local health staff to encourage healthcare seeking
   - Target and prioritize health education and health promotion based on identified gaps
   - Target and prioritize audiences for health education and health promotion
2. Facilitate access to healthcare, particularly in hard to reach areas
   - Develop a transport plan for pregnant women, considering innovative strategies (e.g. incentivizing or reimbursing moto/taxi drivers)
   - Strengthen the ambulance service and improve access for emergencies in hard to reach areas
   - Ensure effective referral pathways
   - Provide maternity waiting homes for late pregnancy/identified complex pregnancies, within close proximity to the District Hospital or Community Health Centres (CHCs)
   - Monitor and enforce implementation of the Free Healthcare Initiative
3. Strengthen rural health services/hard to reach areas to meet the needs of women and children
   - Ensure rural/hard to reach facilities have basic infrastructure, amenities and supply
   - Improve access to care during childbirth through upgrading CHCs to provide Basic Emergency Obstetric Care (BEmONC) services
   - Support and prioritize community outreach activities by health workers
   - Prioritize training of and support to the rural health workforce, particularly Community Health Workers (CHWs) and those serving in remote areas
   - Implement the CHW programme in line with MoHS strategy, and ensure robust supervision and support mechanisms linked to health facilities
   - Establish/consolidate links between communities and health facilities to build trust and accountability, patient orientation of services and facilitate peer-driven quality improvement
   - Actively search for cases of obstetric fistula during community engagement and outreach work and refer for corrective surgery
4. Provide quality training, support and supervision for healthcare workers to deliver free quality healthcare
   - Focus on holistic care provision with a focus on communication skills, empathetic and respectful patient care
   - Support the MoHS to provide supervision and monitoring and facilitate peer support networks
5. Advocate on behalf of women and healthcare workers
   - Raise awareness of the unmet needs of women in pregnancy and childbirth, particularly of teenage pregnant women and young mothers
   - Raise awareness of challenges accessing free healthcare faced by pregnant women
   - Raise awareness of challenges faced by health workers
   - Implementation of non-punitive policy for women delivering outside health facilities
6. Strengthen maternal death surveillance and death review procedures
   - Provide death registration books and training on their use
   - Ensure robust arrangements are in place for recording and reporting
   - Ensure robust and validated procedures for maternal death review

potentially exaggerating observed differences between the two areas. Lack of usable population estimates also precluded derivation of maternal mortality rates. The high participation rate is similar to previous surveys (Government of Sierra Leone, 2013), though it is possible that some prospective participants declined to declare eligibility.

Some responder bias is expected with participants potentially under-reporting socially undesirable behaviours. Byelaws prohibiting home births; prominent health education messaging promoting institutional delivery; and the perception of MSF as a provider of such services may have influenced respondents, potentially fearing repercussions (e.g. fines) if they reported home births. This was evident in IDIs: at the outset of the interview many participants stated their last delivery was in a health facility, but as the discussion and rapport evolved they acknowledged they had delivered at home due to the multiple barriers to institutional delivery. As a consequence, our survey results probably underestimated home births and overestimated facility births. Similarly maternal deaths may have been underestimated (HCWs may have feared punitive measures for lack of reporting). Health-seeking behaviour is dynamic and subject to multiple influences, and we cannot predict whether the apparent preference for healthcare observed in this study will be sustained beyond the study period.

Although women were asked about their most recent pregnancy, the period of recall was long (~2.5 years) so for some recall may have been challenging; likewise recall of maternal deaths over this period may have proven difficult. For pragmatic reasons and to

assist recall, we defined maternal deaths as those occurring during pregnancy or within 2 months postpartum whereas in the International Classification of Diseases for Maternal Mortality (ICD-MM) a maternal death is considered up to 42 days from termination of pregnancy (World Health Organization, 2012). Thus it is possible we may have overestimated maternal deaths.

In terms of generalizability of findings, it is acknowledged that this study was conducted in a relatively small geographical area and there are differences in socio-economic profile and health service provision between districts, with the population of Tonkolili among the poorest and least well served. Nevertheless, poverty and poor service provision are major country-wide challenges and Yoni is considered by MoHS and MSF not dissimilar to many areas of rural Sierra Leone. MSF supports the hospital in Magburaka, providing training, staff and provisions so the urban population resident in Magburaka, or within a short distance to the hospital, may have better access to free healthcare than populations of similar size in neighbouring districts.

## Conclusions

Our study indicates that pregnant women face important barriers to care, particularly in rural areas, leading to high preventable mortality and morbidity. People want to access healthcare, but services available are often costly (despite the national policy for free care), unreachable and poor quality. This is compounded by current byelaws penalizing home births. Urgent action is needed; only by tackling these barriers to care can preventable deaths be realistically reduced.

We make a number of recommendations for Sierra Leone and for other contexts where similar policies and practice are in place, for which women bear the burden (Panel 1)); these are aligned with and compliment the National Reproductive, Maternal, Newborn, Child and Adolescent Health Strategy 2017–21 for Sierra Leone (Government of Sierra Leone Ministry of Health and Sanitation, 2017). Maternal health is a shared responsibility, addressing needs requires the complimentary efforts of multiple partners; recommendations are therefore for consideration of all relevant stakeholders.

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*Ethical approval.* The study protocol was approved both by the Ethics Review Board of MSF and the ethics committee of the MoHS of Sierra Leone. Approval to conduct the study was obtained from traditional authorities in all proposed sites prior to data collection. Participation was voluntary Information forms were provided to participants. Confidentiality was protected during data collection and analysis. Electronic data and audio files were anonymous.

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