Rapid assessment of Ebola impact on reproductive health services and service seeking behaviour in Sierra Leone

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Table of Contents

Tables

Figures

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Acronyms

ANC	Antenatal Care
BAU	Business as Usual
BEmONC	Basic Emergency Obstetric and Neonatal Care
CEmONC	Comprehensive Emergency Obstetric and Neonatal Care
CHA	Community Health Assistant
CHO	Community Health Officer
COIA	Commission on Information and Accountability for Women's and Children's Health
E4A	Evidence for Action
EmONC	Emergency Obstetric and Neonatal Care
EVD	Ebola Virus Disease
FD	Facility Delivery
FGD	Focus Group Discussion
FHCI	Free Health Care Initiative
FIT	Facility Improvement Team Assessment method
FP	Family Planning
HCP	Health Care Provider
HSB	Health Seeking Behaviour
HCW	Health Care Worker
IEC	Information, Education and Communication
IPC	Infection Prevention and Control
IUD	Intrauterine Device
IUCD	Intrauterine Contraceptive Device
KAP	Knowledge, Attitude and Practice
KII	Key Informant Interview
MCHA	Maternal and Child Health Aide
MNH	Maternal and Neonatal Health
MOHS	Ministry of Health and Sanitation
NGO	Non-governmental Organisation
PCMH	Princess Christian Maternity Hospital
Penta 3	Third and final dose of the Pentavalent vaccine (DPT-HB-Hib)
PI	Principal Investigator
PNC	Postnatal Care
PPE	Personal Protective Equipment
QuIC	Quality of Institutional Care approach
RH	Reproductive Health
RMNCAH	Reproductive, Maternal Neonatal, Child and Adolescent health
SECHN	State Enrolled Community and Health Nurse
SLDHS	Sierra Leone Demographic and Health Survey
STI	Sexually Transmitted Infection
TBA	Traditional Birth Attendant
UNFPA	United Nations Population Fund
W/A Rural	Western Area Rural
YFS	Youth-Friendly Services

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Finally, we extend recognition to the Ministry of Health and Sanitation UNFPA in Sierra Leone who identified the need to strengthen an evidence base to design and amend approaches to address reproductive health needs, instigated this study and made it possible through funding from the UK Department for International Development and Irish Aid. In particular, we thank Afrina Karim for her commitment, time and support in ensuring the final report met the standards required.

Options and Dalan remain firmly committed to supporting the Government of Sierra Leone, UNFPA and other partners in sharing evidence to support appropriate decision-making and we hope that this study will contribute to those working towards saving the lives of mother and child.

Contributors to the design and implementation of this study and report include the following people from Options Consultancy Services Ltd: Mohamed Yilla; Sara Nam; Camille Thomas; Laura Sochas; Rachel Cullen; Rosanna le Voir; Eleanor Hukin; Eleanor Brown; Sara Bandali and Bockarie Sesay; and Fatu Yumkella From Dalan consultancy Services.

Executive Summary

The current outbreak of Ebola Virus Disease, EVD or Ebola, in West Africa is the longest and largest Ebola outbreak to date. In addition to the direct impact of deaths and infection from Ebola, the outbreak is exacerbating already weak health systems and threatening to reverse progress made in recent years improving reproductive, maternal, neonatal, adolescent, and child health (RMNCAH) in Sierra Leone. The Government of Sierra Leone, its Ministry of Health and Sanitation, and development partners have set in motion plans to inform evidence-based approaches to mitigate further impact on health outcomes. This report adopts a mixed-method approach to understand the context in which RMNCAH care is being used (demand) and provided (supply). Namely, the key objectives of this report are to:

1. Identify RMNCAH care-seeking behaviour and care practices by women, adolescents and children; and identify the socio-cultural practices of women being caregivers in Ebola context through focus group discussions;
2. Identify RMNCAH service providers' attitude and practices in light of the Ebola through key informant interviews;
3. Synthesise secondary data on service utilisation and availability since the onset of Ebola;
4. Estimate the drop in utilisation of RMNCAH services as a result of the Ebola outbreak; and
5. Estimate the impact of the reduced coverage of RMNCAH services on maternal neonatal, child deaths and unplanned pregnancies.

Findings from this report identify that the indirect negative effects of Ebola on RMNCAH service utilisation are based primarily upon fear of contracting Ebola among health providers and women from one another. In particular, findings highlight:

- A lack of trust in the health system to provide adequate protection of its own staff and users
- Health providers' fear is resulting in desertion of already understaffed health facilities or limiting the standard of care provided to patients, particularly women in labour
- Communities report being turned away from facilities and avoiding facilities for fear of contracting Ebola
- Health staff often lack adequate protection and training in infection prevention control (IPC) and Ebola case management
- The readiness to provide adolescent and youth-friendly services is lacking in many facilities.

Health service utilisation has dropped as a result of these factors, and the modelling shows deteriorating RMNCAH health outcomes if the level of service utilisation observed in the wake of the outbreak were to continue after December 2014. Comparing modelled RMNACH outcomes in the current Ebola outbreak to a hypothetical situation without Ebola suggests:

- An average of 22% more maternal deaths and 25% more newborn deaths over the year May 2014 - April 2015
- A higher burden of unplanned pregnancies in three districts for which there is adequate HMIS data (Kailahun, Port Loko and Kenema), as adolescents report having more time to spend recreationally, less interaction with school-based SRH programmes and more transactional sex
- Estimates for unplanned pregnancies range from an increase of 44% in Kenema, to 172% in Kailahun when compared to a hypothetical situation without Ebola.

The next steps that the Government of Sierra Leone and their developing partners take will be crucial to saving the lives of vulnerable women, adolescents and newborns. Findings from this study highlight key issues to be taken into consideration to mitigating the impact of Ebola, both immediately, and in the longer-term. Crucially, there is a need to prioritise immediate provision of personal protective equipment and IPC training to health providers. There is also a need to provide specialist emergency obstetric and neonatal care for women suspected of having Ebola, which will require continual assessment of how to minimise the risk to healthcare workers and enable them to safely continue caring for their patients. In the longer-term, securing investments in professional education to train and retain adequate numbers of health providers is essential to meet RMNCAH needs. This will include continued scale up of interventions to reduce unwanted pregnancies, alongside massive scale up of training of health care providers.

1. Introduction

Progress had been made in improving reproductive maternal, neonatal, adolescent and child health, RMNCAH, in Sierra Leone over the last decade. Figures from the latest 2013 Sierra Leone Demographic and Health Survey (SLDHS) demonstrate an increased uptake of certain RMNCAH services. For example, the percentage of births that take place in a health facility doubled over the time since the last SLDHS in 2008 (from 25% to 54% of live births); almost all women received at least one antenatal care visit by a skilled provider (97%); and the proportion of women receiving a postnatal check-up within two days of delivery increased to more than two thirds (73%). Similarly, the use of modern family planning methods among all women increased from 8% in 2008 to 21% [1] in 2013 and the proportion of adolescent women (age 15-19) who are already mothers or who are pregnant decreased from 34% to 28% (Statistics Sierra Leone (SSL) and ICF International, 2014; Statistics Sierra Leone (SSL) and ICF Macro, 2009). These achievements reflect, in part, the introduction of the *Free Health Care policy* by the Government of Sierra Leone in 2010.

The outbreak of Ebola Virus Disease, EVD or Ebola, in Sierra Leone threatens to wipe out these achievements and negatively affect reproductive, maternal, child and adolescent health. As of 6th February 2015, there were a cumulative number of 10,792 confirmed cases of Ebola and 3,301 deaths(WHO, 2015b). Case incidence is decreasing yet there were still in excess of 100 new cases reported in the second week of January 2015, and the areas of most intense transmission are around Freetown, Port Loko and Western Area(WHO, 2015a).

Mitigating the potential negative effect of Ebola on RMNCAH is vitally important. Despite the achievements in increased service utilisation, Sierra Leone still faces one of the highest levels of maternal and child mortality in the world. The maternal mortality ratio is an estimated 1,165 maternal deaths per 100,000 live births; the under-five mortality rate is an estimated 156 deaths per 1,000 live births; and the neonatal mortality rate is an estimated 39 deaths per 1,000 live births (Statistics Sierra Leone (SSL) and ICF Macro, 2009). These mortality figures indicate that access and quality of care is a priority for Sierra Leone if both the supply and demand side of services are to continue to yield positive effects on RMNCAH.

Evidence suggests that the Ebola outbreak has had an effect on the uptake and provision of RMNCAH services. However, the context has changed rapidly over the course of the epidemic, and continues to change. As of mid-December 2014, more than seven months into the epidemic, case detection, management and prevention measures had improved and information was readily available to communities, but this is set against concerns that other essential health needs are being neglected for many complex reasons. There are valid concerns about the ability of the fragile health system to meet RMNCAH needs and the potential to further impact negatively on health outcomes.

The Government of Sierra Leone, the Ministry of Health and Sanitation, MoHS, and development partners have set in motion plans to inform evidence-based approaches to mitigate further impact on health outcomes. As part of this, it is important to understand the context in which health service is being used (demand) and provided (supply). This report aims to understand the effect of Ebola on RMNCAH health seeking behaviour, on provision of care and of its potential outcome, in order to inform strategies to mitigate further negative impact.

2. Literature review

This section presents demand–side issues that were identified through a literature review of secondary evidence. See Annex 1 for a description of methods.

[1] Current use of modern family planning among married women (rather than all women), use of family planning was 6.7% in the 2008 DHS and 15.6% in the 2013 DHS.

Influences on women's RMNCAH care seeking behaviour

In Sierra Leone, key factors found to influence women's RMNCAH care seeking behaviour before the Ebola outbreak include: cultural norms, beliefs about disease aetiology, the acceptability of interventions, perceptions about the quality of care provided, household power relations and social networks (Scott, McMahon, Yumkella, Diaz, & George, 2014).

While these factors remain important, literature highlights additional influencers on women's RMNCAH care-seeking behaviour since the outbreak, especially, fear of infection, mistrust of health care workers or an inability to find clinics that are open and staffed for non-Ebola cases(Black, 2014; Dynes, Miller, Sam, Vandi, & Tomczyk, 2015; Milland & Bolkan, 2015). Further, the breakdown of already weak health systems and worsening of suboptimal access to RMNCAH care limits women's ability and decision to use maternal care, family planning services, and immunisation programmes (Lazuta, 2015).

Women who access RMNCAH services are not receiving appropriate treatment, (Black, 2014; Boseley, 2014; Chastain, 2014; Dynes et al., 2015; Lang, 2014; Maron, 2014) which could further dissuade women from seeking care. As identified, pregnant women or women in labour are being refused care or neglected at facilities, as health workers are fearful of coming into contact with fluids of women with unknown Ebola status (Black, 2014; Boseley, 2014; Chastain, 2014; Dynes et al., 2015; Maron, 2014). Moreover, the ability to seek care is even worse for pregnant women with confirmed or suspected Ebola infections, and there is suggestion that some hospitals won't allow in Ebola-infected pregnant women (Lang, 2014).

While denying a woman access to health care violates her universal human rights (Black, 2014; United Nations) and undoubtedly influences her health seeking behaviour, health workers' actions highlight ethical quandaries in the Ebola context. In particular, overlap in the symptoms of Ebola and a woman with pregnancy complications hinders health workers' ability to differentiate between a women with an obstetric emergency requiring "immediate and potentially lifesaving care, and a women who is suspected of having Ebola, where invasive procedures must be absolutely limited" (Black, 2014). Additionally, women in labour may fear stigmatisation, isolation, or refusal of care and be untruthful about their Ebola exposure history, thereby putting health workers at even greater risk (Black, 2014)

Very few studies report on pregnant women infected with Ebola, however, evidence to date indicates that pregnant women's immune systems' react differently to the Ebola infection, resulting in higher rates of maternal mortality and miscarriage among Ebola-infected pregnant women (Lazuta, 2015; Menéndez, Lucas, Munguambe, & Langer, 2015; Mupapa et al., 1999) and 100% mortality in neonates (Mupapa et al., 1999). Thus, in addition to fear of Ebola infection, health workers' actions may be driven by an awareness that, given resource constraints, any time and medicine given to an infected pregnant women is "time and medicine that her neighbour will not receive"(Lang, 2014).

Adolescents' reproductive health seeking behaviour

Reliable data on adolescent's RMNCAH care seeking behaviour since the Ebola outbreak is relatively scarce; however, reports and newspaper articles highlight both increased need for sexual and reproductive health services and reduced ability to use these services since the outbreak.

Media and grey reports identify concerns about rising levels of teenage pregnancy due to the increased time that girls are out of school whilst educational institutions are closed; taking more responsibility in caring roles; increased early marriage or engaging in increased transactional sex (Bah, 2014; CRS, UNICEF, & Focus, 2014; Dixon, 2014; Fleischman, 2014; Gettleman, 2014; Sannoh, 2014; Showers, 2014). Reports also indicate that girls are suffering more sexual violence and exploitation when they are isolated, quarantined or moved to other areas to escape the virus (Bah, 2014; Fleischman, 2014; Guensburg, 2014; TRF, 2014).

At the time of this report, access to reproductive health services is reported to have dropped since May 2014. Of note, over 40 public facilities have been transformed into Ebola holding centres, thus preventing patients from accessing non-Ebola health services; this is particularly putting adolescent girls (13-19) at risk (Campbell, 2014a). Other media reports highlight that the mass reallocation of funds to fight Ebola

means resources are being drawn away from health services which are specific to young girls (Campbell, 2014b; Gettleman, 2014), thus reducing young peoples' access to these services.

Socio-cultural practices of women being caregivers

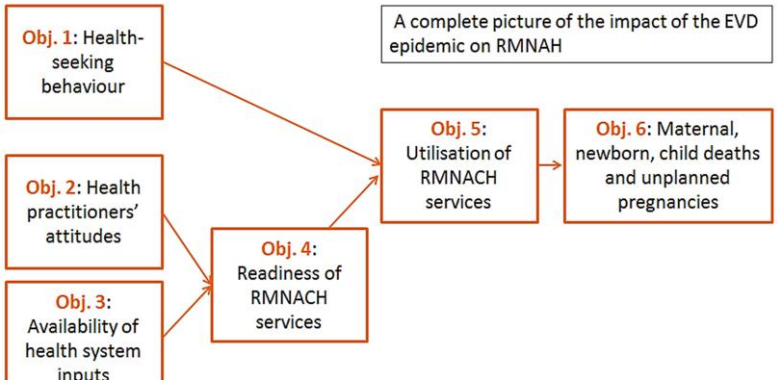
In Sierra Leone, socio-cultural norms dictate that women tend to sick family members, nurse children, and work as traditional healers and healthcare assistants (Kamara, 2014). Evidence from previous outbreaks found higher rates of Ebola infection in women than men, largely due to socio-cultural practices, including the role of women as caregivers and their involvement in burial practices (Hewlett & Amola, 2003; Jamieson, Uyeki, Callaghan, Meaney-Delman, & Rasmussen, 2014). Additionally, women's increased interaction with the health system may put them at greater risk of infection. Indeed, findings from the current epidemic indicate that women are avoiding seeking health care, for fear of contracting the disease in health facilities, and routine evidence points to reduced uptake of RMNCAH care since the declaration of the Ebola outbreak (UNICEF, 2014).

3. Objectives

Maintaining the provision of RMNCAH services will be vital in mitigating further negative impact on health due to Ebola in Sierra Leone, and it is important that strategies adopted are informed by evidence. This study has been designed to contribute to the evidence base by addressing the six objectives specified by UNFPA listed below; which we illustrate in a conceptual framework for this study shown in figure 1:

1. Identify RMNCAH health-seeking behaviour and care practices by women, adolescents and children; and identify the socio-cultural practices of women being caregivers in Ebola context;
2. Identify RMNCAH service providers' attitude and practices in light of the Ebola epidemic Sierra Leone;
3. Assess the availability of essential RMNCAH Human Resources, commodities and services at public facilities;
4. Readiness of RMNCAH services at public facilities in the context of Ebola;
5. Identify emerging RMNCAH service gaps and estimate their magnitude throughout the outbreak; and
6. Estimate the impact of the reduction of access to Reproductive Health services because of the Ebola Outbreak on maternal mortality, infant mortality, unwanted pregnancies.

Figure 1 showing conceptual framework of the study



4. Methods

This project adopted a mixed-methods approach to achieve each objective, specified above. This section presents the methods for each objective as shown in figure 1, above. Findings from all objectives are presented according to the structure requested by UNFPA, and are drawn together in the discussion section.

Objective 1: Identify RMNCAH health-seeking behaviour and care practices by women, adolescents and children; and identify the socio-cultural practices of women being caregivers in Ebola context through focus group discussions

Focus group discussions, FGDs, were conducted to understand what key behavioural issues positively and negatively affect heath seeking behaviour (HSB) or care practices among women and adolescent girls. We included female Ebola survivors to seek insights to their experiences in terms of RCH and men as known influencers of HSB. One hundred community members participated in 7 FGDs from two communities, one in Western Area rural and Moyamba districts; the focus groups were among the following groups (one in each district):

1. Women aged 25-49 years
2. Women aged 15-24 years
3. Adolescent girls aged 10-14 years
4. Female Ebola survivors aged 18-49 years
5. Men aged 18-49 years who are married or in a civil relationship.

Objective 2: Identify RMNCAH service providers' attitude and practices in light of the Ebola epidemic in Sierra Leone through key informant interviews

Key informant, in-depth one-to-one interviews were conducted among 28 health care workers (HCWs) to identify the key issues acting as barriers for health workers in being able to provide quality sexual and reproductive health services in the context of the Ebola epidemic. As decided by the project steering group, the interviewees were front-line health workers rather than health planners and other decision-makers. See Annex 2 for a detailed of methods and description of participants.

Objective 3: A synthesis of secondary evidence on service utilisation and availability data since the onset of EVD

A non-systematic literature review of quantitative evidence was conducted on the availability of essential RMNCAH resources and service uptake in Sierra Leone and provided a background to the current understanding of changes in service utilisation. A non-systematic literature review has been selected as many of the reports, which we needed to include on this method were grey literature not readily available through on-line literature search strategies that are now commonly used for structured literature reviews. Thus, we used our on-the-ground knowledge and contacts in Sierra Leone to gather reports and presentations summarising findings from surveys that have taken place since the Ebola outbreak and that are relevant to this study. We also searched on line using Google and PubMed academic libraries to source additional information to identify published papers on service utilisation in Sierra Leone. The review included evidence from the onset of the Ebola outbreak exploring changes in terms of health services, human resources, and commodities (See Annex 3).

Objective 4: Development of RMNCAH service readiness and availability scorecards in the context of Ebola using data obtained through FIT and QuIC-FIT approach – the QuIC-RH-EVD approach.

The purpose of this objective is to identify emerging reproductive, maternal, neonatal, child and adolescent health (RMNCAH) service gaps including gaps in quality of care, inability to provide treatment and care of pregnant women and adolescents as well as preventative care such as antenatal care (ANC), postnatal care (PNC), delivery, family planning (FP) and immunisation in the context of Ebola. This requires not only the availability and readiness to provide RMNCAH services, but also to provide them safely in the context of Ebola, thus ensuring the safety of staff and service users.

This component of the study adapted an approach called QuIC to rapidly assess and score facility service readiness to i) provide RMNCAH services, and ii) to manage RMNCAH patients presenting with Ebola symptoms. For the purposes of this study, we developed a tool to provide a rapidly available indication of facilities' readiness and ability to provide RMNCAH services in the context of Ebola. The tool for RMNCAH is based on standards as set by the Government of Sierra Leone and the Ebola preparedness domains are based on standards as set by WHO and adapted for the Sierra Leone context (see Annex 4 for an outline of the questionnaire domains and standards).

To develop the scorecards for this study, we adapted the QuIC approach and used data collected during the December 2014 Facility Improvement Team (FIT) assessment[2]. The FIT assessments collect data from 78 facilities across the country which have been identified as facilities which should provide emergency obstetric and neonatal care (EmONC), based upon the UN Signal Functions[3]; this includes assessing 13 district hospitals that should provide CEmONC services and 65 community health centres (CHCs) – representing one CHC per chiefdom and 5 CHCs per district who should provide BEmONC services.

The FIT assessment does not collect data about readiness to provide adolescent and youth friendly services, so we also collected primary data about readiness to provide youth friendly services (YFS) in January 2015. To do this, we drew upon our QuIC approaches and collected this by telephone. Scorecards were produced highlighting where major gaps in ability to provide factors, which enable quality provision of RMNCAH services.

The QuIC Approach asks only a few questions which provide a proxy to help understand and expose gaps in service readiness and quality of care. This information is then translated into a traffic light code for QuIC-RH-EVD domains, that is, each item from the QuIC enablers is organised into domains from 1-4 outlined in **Annex 4.** The QuIC-RH-EVD has been adapted to include measures to provide a snapshot of facilities' availability and readiness to provide RMNCAH services in the context of Ebola, labelled as 'Additional' enablers A to D[4].

Figure 2 showing Traffic light scoring system for scorecards *(scores vary according to the number of criteria for each enabler)*

Traffic light code	Colour	Score	Facility has:
	Green	6	Met all criteria
	Yellow	5	Mostly met criteria
	Amber	4	Partially met criteria
	Red	0-3	Fewer than 50% of criteria met

For every item that is available a "1" is scored and for each item that is not available a "0" is scored. The total scores for each enabler correspond to a traffic light colour and the scores for each question are described in the QuIC EVD Questionnaire attached at Annex 4, but the scoring system is broadly as shown in figure 2, above. Note, Recognising that where data is missing does not necessarily denote lack of readiness or poor quality, but does highlight a need to pursue further investigations, where data is missing, then an items is scored "No = 0".

[2] For more information on the FIT approach and findings please go to URL:http://www.mamaye.org.sl/en/evidence/facilities-improvement-team-assessments-2012-2013-2014 ; and for more information on the QuIC approach, go to URL: http://www.mamaye.org.sl/en/evidence/mamaye-factsheet-quality-institutional-care-rapid-data-transforming-action

[3] A **BEmONC** should be able to provide, at minimum, the following signal functions: 1. Administer parental antibiotics; 2. Administer uterotonic drugs (i.e. parental oxytocin); 3. Administer parental anticonvulsants for pre-eclampsia and eclampsia (i.e. magnesium sulphate); 4. Manual Removal of placenta; 5. Remove retained products (eg. Manual vacuum extraction, dilatation and curettage); 6. Perform assisted vaginal delivery (eg. vacuum extraction, forceps delivery); and 7. Performs basic neonatal resuscitation (e.g. with bag and mask).
A **CEmONC** should be able to provide, at minimum, the following signal functions: all above (1-7); plus: 8. Perform surgery (e.g, Caesarean section) and 9. Perform blood transfusion.
Taken from (UNICEF, WHO, & UNFPA, 1997)

[4] We have avoided repeating analysis that are available through other assessments such as the FIT report and scorecards from December 2014, available from this URL: http://www.mamaye.org.sl/en/evidence/facility-improvement-team-fit-assessment-exercise-%E2%80%93-december-2014 [accessed 09 February 2015]

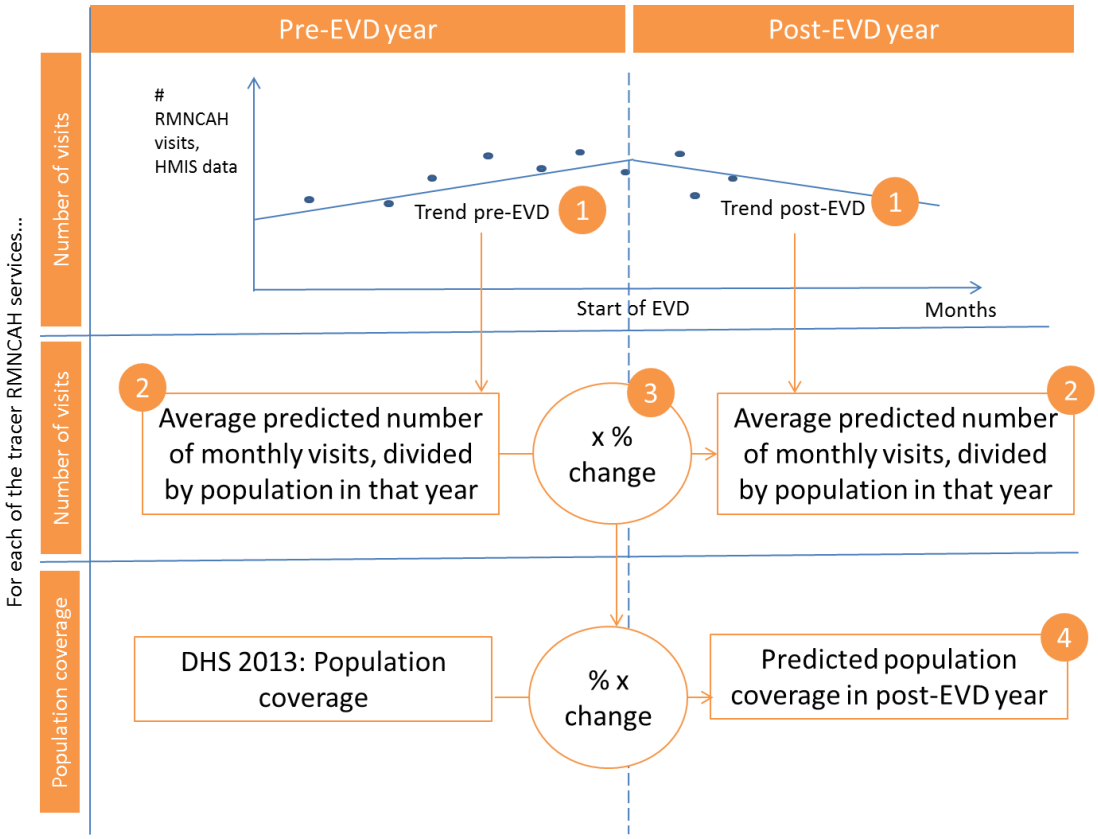
Results for each facility are reported in a scorecard format, enabling the scores of all facilities in a district to be seen side by side – similar to the way in which FIT results are reported. In addition, a district wide score is calculated based upon the performance of all the BEmONC facilities in the district.

An android application (App) has been developed to support the data and analysis for assessing facility availability and readiness to provide RMNCAH services in the context of Ebola (see Annex 5).

Objective 5: Estimating the drop in utilisation of RMNCAH services as a result of the EVD outbreak

We needed to estimate the drop in population coverage of key RMNCAH interventions in the year following the EVD outbreak (May 2014 to April 2015), as population coverage and mortality outcomes. The ideal way to measure population coverage is through a large DHS-type survey. While we have such data for 2013, as collected by the DHS, it was not feasible to conduct another DHS-type survey after the EVD outbreak for obvious reasons. This part of the analysis therefore estimated population coverage after the EVD outbreak by using trends in HMIS data (between January 2013 and September 2014, the latest month for which such data is available), for a select number of "tracer interventions": family planning visits, attendance for fourth ANC visits (ANC4), facility deliveries, postnatal care visits, and Penta 3 vaccinations[5].

Figure 3 showing methodology for Objective 5



Very briefly, the steps in the analysis included (see Figure 3, above):

1. Determining the trends in the number of visits recorded in HMIS for the 5 tracer interventions, both before the EVD outbreak and after the outbreak, using segmented regression analysis.
2. Calculating the average predicted[6] number of monthly visits, divided by population, between the "pre-EVD year" (May 2013-April 2014) and the "post-EVD" year (May 2014-April 2015). As HMIS data was not available after September 2014, it was assumed that the monthly number of visits

[5]Please refer to section, 'Population coverage of what?' p.46 Annex 7 for an explanation of why these interventions were selected
[6] Please refer to p.45 of Annex 7for an explanation of why it was necessary to use predicted values rather than average values

between September 2014 and April 2015 was equal to the number of visits in September 2014 for each tracer intervention.

3. Calculating the *change* in the average number of monthly visits, divided by population, between the "pre-EVD year" and the "post-EVD" year.
4. Applying this change to the 2013 population coverage of a set of key RMNCAH interventions measured in DHS (see Table 1 of annex 7), in order to obtain post-EVD population coverage[7].

The methodology for this part of the analysis is complex and can only be fully understood by referring to the Methodology section of the Component Report for Objectives 5 & 6 (Annex 7), which explains the methodology in depth, in non-technical language, including *why* each step was taken.

Objective 6: Estimating the impact of reduced coverage of RMNCAH services on maternal, newborn, child deaths and unplanned pregnancies

The impact of reduced coverage on deaths and unplanned pregnancies should be analysed in comparison with a situation where the EVD outbreak had not occurred[8]. The first task, therefore, was to estimate population coverage of key interventions in the post-EVD year (i.e. May 2014 to April 2015) in a "business as usual" (BAU) scenario. The BAU scenario calculated future coverage by projecting the trends seen in the pre-EVD year, from May 2013 to April 2014, into the post-EVD year, i.e. May 2014 to April 2015.

Subsequently, the following steps were taken:

1. Input predicted population coverage for 2013/14 and 2014/15 under the ***EVD scenario*** (described under objective 5) into the Lives Saved Tool (LiST) and FamPlan software[9]
2. Input predicted population coverage for 2013/14 and 2014/15 under the ***Business As Usual scenario*** into The Lives Saved Tool and FamPlan software
3. Use LiST to calculate maternal deaths, newborn deaths, and child deaths (1-59 months) under both scenarios
4. Use FamPlan to calculate unmet need for family planning under both scenarios
5. Use the resulting unmet need projections to derive the number of unplanned pregnancies[10].

5. Findings

The findings from all components of the study are presented here and structured by demand- and supply-side issues and separated by user types.

5.1 Demand side: RMNCAH Service seeking behaviour in the Context of EVD

Sections 5.1.1 to 5.1.3 that follow, presents findings from the FGDs (objective 1) and a summary of the FGD participants is provided in box 2. A summary of the qualitative study participants is also provided (for details see annex 2).

Box 2: summary of FGD participants

In total, 100 community members took part in focus group discussions, almost equally spilt between both districts – Western Area Rural and Moyamba:

- 31 Women aged 25-49 years
- 31 Women aged 15-24 years
- 16 Adolescent girls aged 10-14 years
- 9 Female Ebola survivors aged 18-49 years
- 13 Men aged 18-49 years

[7] Please refer to, 'Population coverage of what?' p.46 of Annex 7 for an explanation of the rationale for applying the change in a limited set of interventions to a broader set of interventions to estimate population coverage.
[8] Please refer to p.47 of Annex 7 for further explanation.
[9] Please refer to p.47 of Annex 7 for more detail on LiST.
[10] Please refer to p.47 of Annex 7 for more detail on the unplanned pregnancy calculations.

5.1.1 Barriers to Reproductive, Maternal Newborn & Child Health Service (including family planning) Seeking Behaviour

Overall, there was agreement that the right place to seek RMNCAH care is from government facilities. Despite this expressed preference, participants identified important factors limiting women's use of RMNCAH services since the Ebola outbreak:

- **Mistrust of health workers and government facilities**
- **Fear of being refused care or lack of government providers**
- **Concern with the standard of treatment provided**
- **Concern about drug shortages and expenses for medications, services, or other items**

Mistrust of health workers and government facilities

Participants described **mistrust of health workers and government facilities** since the outbreak, often citing a pervasive rumour that health workers were injecting patients with Ebola virus. Participants did not offer reasons why they might be suspicious of government health workers, although it should be noted that expression of this rumour was not necessarily a personal view.

> *Some people in this community at the start of this time were telling us that we must not go to the clinic because the government has brought in some medicines to kill all of us. So if someone is sick he/she should not go to the clinic because the nurses there will just inject the person backed up with the poisoned tablet to kill the person.* (Female, 15-24, W/A Rural)

> *Women were told that when they go to the hospital their babies blood will be taken as a sample and they will be injected and when you come home the child will begin to sick and die and the Ebola burial team will have to take the child away and they will spray your house which will lead to your death, so these are the causes that made us afraid to take our children to the hospital ...* (Female, 25-49, Moyamba)

Women's fear of PPE was also cited as a reason for hesitating to seek care at government facilities:

> *Most of the women in this community are afraid of the way the nurses dress now-a-days is scaring. The government needs to put in place or change the dressing of those dealing with normal cases that those working at the Ebola centre* (Female, 15-24, Moyamba)

Women expressed fear of seeking FP from government facilities, especially injections or implants:

> *Before this time, it was very easy for us to go for family planning. But since the outbreak of this sickness in this community, we are now afraid to go to hospital to either remove or take an implant or to even have an injection for fear that if you are unfortunate you will contact Ebola* (Female, 25-49, Moyamba)

> *There is conflicting reports as some people are saying with an injection, you can easily contact Ebola and also if you persist going to the health posts especially the one in this community, you will contact Ebola as Ebola is in health facilities and hospitals in this country as most of the health workers are victim of the virus* (Female, 15-24, Moyamba)

Availability of care

Women in both Western Area Rural and Moyamba districts described how the **lack of choice of government providers** or the belief that they would be refused care at government facilities influenced their decision about if and where to seek RMNCAH care. In particular, women described how the **fear of being refused care** during labour had led to a preference for home-births or births with traditional birth attendants, rather than seeking care from government facilities:

> *Why people are not also going to the hospital is that, three weeks ago, a pregnant woman was in labour and when they took her to X hospital she was then refer to the Y hospital when they also get there the nurses ask them to return home since they cannot treat her, on their way coming home the woman passes away… so many women have seen that happen that is why they prefer to give birth at home.* (Female, 15-24, W/Area Rural)

The hospital has been closed since the Ebola outbreak. Now we take our children to the "Arabs[11]" whenever they are sick and they do provide treatment for them. (Female, 25-49, W/A Rural)

In Western Area Rural District, some women identified that government facilities no longer offered family planning, claiming that there was no way to continue contraception since the Ebola outbreak:

Nothing [No family planning] as of now because they are not treating us, so there is no way for us to escape any pregnancy (Female, 15-24, W/A Rural)

The last time I went to the health centre to take the injection but the nurse there refused to give it to me saying she is afraid. My sister-in-law also went there for the same injection; they refused to give it to her. It was only nurse X that finally injects me in my hand... (Female, 24-49, W/A Rural)

In Moyamba, participants reported that private pharmacies and clinics were closed since the Ebola outbreak, leaving only government facilities available for family planning. For some, pharmacies were preferable, as they enabled women to seek family planning in secret:

Well there are women in this community who do not want others to know that they are using family planning as they are married. They don't want their husband or other relatives to know that they are using family planning and as such decide to go to the pharmacy and buy the drugs (Female, 15-24, Moyamba)

Standard of care

There was expression of **concern with the standard of care** given to women at health facilities. Some women described issues, which prevailed from before the outbreak, with additional concerns due to Ebola. Participants described discontent at having to be screened for Ebola before receiving treatment, and for some women, this apprehension about having an Ebola test was a barrier to seeking care.

It is a very big constraint for women wishing to go for family planning because with this Ebola disease, they sometimes hesitate to visit the clinic thinking that they might be tested of Ebola (Female, 15-24, Moyamba)

There was frustration that nurses would no longer touch or "sound" (examine or auscultate the foetal heart) pregnant women to know the baby's position or gestational age and they would not weigh their babies. Rather than examine children to understand the illness, health workers now simply prescribed paracetamol:

For me I have observed that nurses do not touch our children directly but before Ebola they embrace our children when we visit the hospital. Even when we want to weigh our children they do not touch the scale instead it is we the parents that weigh our children. This situation is worrisome and we want this virus to end now (Female, 25-49, Moyamba*)*

At first when we do not have anything like Ebola, nurses will talk to you well, they will sound you as a pregnant woman to know how you feel but now nothing like that is going on. They will have to take their time in treating you. (Female, 25-49, Moyamba)

Many of the more critical reports about health workers' behaviour came from Moyamba, but there were also reports of dissatisfaction from the participants in Western Area Rural.

…They [health workers] will have to take your blood sample for Ebola test and until the result is out they will not touch you. They don't care what will happen to you but as long as the result is not available, you will continue to suffer the pain (Female, 15-24, Moyamba)

There was a woman at the point of delivery and I took her the government clinic but the nurses there did not treat her with care. They failed to assist her during delivery, and after she had delivered by herself, these nurses were nowhere to be seen until after some hours they came dressed themselves like those in the Ebola burial team. They then wrapped the baby with ordinary plastic without proper washing and when asked, they said that they are preventing themselves from Ebola…they could have given her a better treatment by assisting her to safe delivery being that she was not an Ebola suspect (Female, 15-24, Moyamba)

Drug shortages and out-of pocket expenditure

[11]This is the term used to describe a private clinic whose owners are of Arabic descent.

Women and men highlighted **issues of drug shortages**, reporting that health workers would only prescribe paracetamol and all other essential drugs were either unavailable or costly. Although participants identified these issues before the outbreak, they described that concerns had been exacerbated.

> *I have heard from the government that the free health care services is no longer free but when you take your child or baby to the hospital, the nurses or the health workers will only give you Panadol[12] tablets and write prescriptions for you to buy the remaining drugs at the pharmacy. That is the reason why most parents decided to take their child to the pharmacy, as free health drugs are always scarce at the facilities. We want to know from the government if the free health care they were talk about is no longer free.* (Female, 15-24, Moyamba)

> *Even myself when my child felt sick sometimes before the Ebola, I took her to the government clinic in order to use the free health care. But most times drugs were not available at that time and all the nurses could do is to tell us to cope with situation because they said it was not their fault.* (Female, 15-24, Moyamba)

Out of pocket expenses for unexpected items also caused concern, and there was confusion as to whether the services provided for free under the FHCI were still available. For some, services that offered payment in kind or when possible were a motivation to attend alternative or private care.

> *Sometimes the messages we hear from our women about free health care services does not really go down well to us. …when they get to the hospital, the nurses will ask them to perform. That is, they should buy an exercise book for registration and some other unnecessary expenditures…* (Male FGD participant, Moyamba)

> *Also when especially women go there [to X's Pharmacy] for childbirth and that they do not have money to pay for services he render to them, they will pay him in kind like; give some rice, palm oil, groundnut etc. That is what has been happening*. (Male FGD participant, Moyamba)

5.1.2 Barriers to Adolescent and Youth Health Seeking Behaviour

Discussions with adolescents identified important factors limiting young people's use of reproductive health services since the Ebola outbreak, namely:

- **Fear and mistrust of health workers**
- **Insufficient information contributing towards low demand for modern family planning**
- **Shortages of family planning commodities**

Fear and mistrust of health workers

Adolescents found **attitudes of health staff a deterrent** from seeking services, describing that Ebola screening was carried out before care was provided. Adolescents described poor relationships and fear of health workers; this stands in contrast to the pre-Ebola context, where it was described that student guidance programmes fostered positive relationships between youth and health workers.

> *Now, it is very difficult for us to go to the health centre because there is the rumour going around that they are drawing the blood of patients at the hospitals so most times when some of us get sick we go to the local herbalist in the community and get some local treatment; and sometimes that could even worsen the situation that leads to many deaths.* (Adolescent female, W/A Rural)

> *The nurses are afraid to treat us because of Ebola disease, when you go there, they will ask you to sit under the mango stalk while asking you about your health* (Adolescent female, Moyamba)

Insufficient information and alternative sources of care

Adolescents reported that before the Ebola outbreak, the **information they received was insufficient** to prevent adolescent pregnancies. Since the Ebola outbreak, access to information is even harder now that schools have closed, mobile services are no longer present in the communities and family planning counselling with nurses is less readily available. The inadequacy of information is reflected in adolescents' limited knowledge of methods of contraception:

[12] Panadol is the trade name for the painkiller paracetamol or acetaminophen

What I know is that, after you finished having sex with your boyfriend, you should straightaway take water and cleanse yourself so that you won't become pregnant. (Adolescent female, W/A Rural)

What I know, and what I have heard is when you finished having sex with your boyfriend, you should take water and go to urinate very hard even if you don't want to so all the sperm which has been injected in you will come out there by averting any possible chances of becoming pregnant. (Adolescent female, W/A Rural)

There are some elderly women who sells those ropes[13] *around the community, so if you don't want to become pregnant you can use it and whenever you want to have babies you can simply remove it and throw it away so when you have sex you will then become pregnant.* (Adolescent female, W/A Rural)

Although adolescents reported government facilities to be the first point of call for modern family planning methods before Ebola, they also described alternative sources of care, which they could access, including **traditional healers as well as other private** facilities.

If you don't want to take the tablets [contraceptive pills], you will take the injection and if none of them fits you then you will go to the native doctors and they will give you some herbs to prevent you. (Adolescent female, Moyamba)

Availability of family planning

In Western Area Rural, adolescents reported that **family planning services are no longer available** at health centres, due to Ebola. Based on stories they had heard at elders' homes, adolescents recounted that the government had requested hospitals to stop administering family planning.

Some hospitals are still administering these treatments to women even though government has said they should stop doing that (Adolescent female, W/A Rural)

Some of them had them before the Ebola outbreak so now they just keep on using them secretly (Adolescent female, W/A Rural)

5.1.3 Enablers to RMNCAH care seeking behaviour

FGD and KII identified factors, which can improve RMNCAH care seeking behaviour. Overall, findings suggest improvements now compared to earlier in the Ebola outbreak; these were attributed to:

- **Community sensitisation and education**
- **Sexual behaviour changes**
- **Involvement of local influencers**
- **Positive experiences at government facilities**

Community sensitisation and education

At the time of data collection, seven months after the onset of Ebola, sensitisation conducted by health implementers related to Ebola was cited as encouraging demand generation for RMNCAH services. Both men and women seemed to perceive a positive change in availability as led by health workers and that fewer pregnant women and children were being refused care.

Well, at the start of this Ebola, a good number of us were afraid of visiting the facility. But due to the intervention of the nurses in this facility and other health workers who constantly paid visit to the entire community, made a lot of sensitization on this Ebola virus, but we have again started using the facility even in the midst of this Ebola crisis. (Female, 15-24, Moyamba)

Some of us can tell because we did the sensitisation from house to house to the pregnant women that when they go to the hospital they will save their lives. We thank God now because the people are attending clinics because at first there were not treating them but for now they are ready to take good care of them. (Male FGD participant, W/A)

[13] "The rope" is a traditional method of family planning, whereby doctors in the villages tie rope around a girl's waist to prevent pregnancy (IPPF et al., 2011; Nam et al., 2013)

Sexual behaviour changes that influence family planning demand

Findings indicated changes in male and female sexual behaviour in light of Ebola, leading to **reduced concurrency and abstinence to avoid not only the risk of Ebola, but also of unwanted pregnancy and STIs**, thus avoiding the need to seek care from unwelcoming or ill-equipped health facilities. Participants also described advising their partners to stop other sexual relationships outside of their union, and described avoiding sex if they were feeling unwell and the need to abstain for three months after recovering from Ebola:

> *If you want to have it maybe because of pressure from your partner, you should put on a condom. And I have seen a survivor comes with a carton of condoms given to him at the treatment centre.* (Male FGD participant, Moyamba)

> *For me my husband has got a lot of girlfriends and for now I do not want him to have sexual intercourse with me. So on bed I always push far from him so that he may not be tempted to request for sex from me. Maybe one of his lovers has some infections and that he may not be aware, that is why I do not want to encourage him for any issue that has to do with sex.* (Female, 25-49, Moyamba)

> *With Ebola around, I have actually disciplined myself in the area of sex. Before Ebola, I had up to four girlfriends whom I have sex with sometimes everyday excluding my wife. But now I only have sex with my wife because I do not want to endanger my life and that of my family.* (Male FGD participant, Moyamba)

Local influencers

Women described how involvement of local influencers helped ensure women received appropriate RMNCAH care, and this was an enabler to using services.

> *Some of the people in the community do go to the town chief to explain to him that they are refusing to treat them in the hospital and he will call on the nurse immediately and say they need to be fully dressed so that they will treat patient that are going to the hospital be it Ebola patient or not. We are still appealing to pregnant women and lactating mother to keep on going to the hospital because at this point in time we are all looking for good health.* (Female, 25-49, Moyamba)

> *The Health Management Committee announced it and most of us went on house-to-house sensitization to encourage people to go to the hospital because the government has trained the nurses and when you go there they will treat you well and if they do not treat you well, make sure you report the matter to the headman or chief and they will forward the matter...* (Female, 24-49, W/A Rural)

Positive experiences

Discussions suggested that women who had used government facilities since July 2014, generally perceived health workers' intentions and abilities more favourably than "non-users", who had not accessed care. Although some "users" also expressed frustration about changes in RMNCAH provision since the outbreak, these women seemed to maintain the belief that government facilities offered quality care:

> *… Even though this Ebola is here, I have been advising …my sister who is pregnant now that she should not be afraid of using the clinic. I even explained to her what the nurses have been telling us about this free health care and … that in the midst of this sickness we must ask our sisters, friends to have faith in the services that the nurses in the clinic are providing. So at the end of it all, I was able to persuade her to visit the facility and she is doing very well now.* (Female, 25-49, Moyamba)

> *When I used to take my children to the hospital, we have two nurses there, they always take good care of our children, even if you go there at night they will treat you even now that the Ebola is here. People need to go to the hospital to see for themselves, we should stop listening to what people are saying.* (Female, 25-49, W/A Rural)

5.2 Supply side: RMNCAH Service Provision in the Context of EVD

In this section, we present findings from data from all objectives in the study, including data from the key informant interviews.

Key informant interviewees comprised 28 front-line health workers from two districts, including maternal and child health aides (5), state enrolled community health nurses (5), traditional birth attendants (5), community health officers (4), midwives (2), community health assistant (2), doctors (2), volunteer nurse (1), nursing aide (1), and a health care worker form a third sector provider. Key informant interviews were held across the districts and included health workers from several locations.

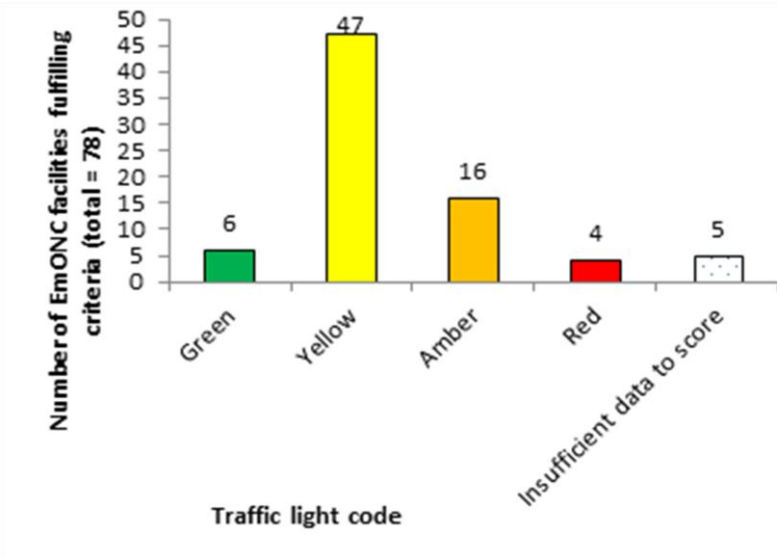
5.2.1 Availability and readiness to provide RMNCAH services in the context of Ebola

In the current Ebola epidemic context, all facilities and providers supplying health services must be ready to protect themselves and patients from contracting or onward transmission of Ebola (or other highly-transmissible infectious diseases). This section reports findings from the QUIC-RH-EVD scorecards, the review of evidence on RMNCAH service commodities, and the qualitative study, to assess availability and readiness to provide RMNCAH services in the context of Ebola.

Reproductive, Maternal, Newborn and Child Health

Figure 4, shows a summary of the RMNCH readiness and availability of 78 EmONC-designated facilities in Sierra Leone in December 2014, based on data from the QUIC-RH-EVD scorecards. Of the 78 facilities, only six (8%) fulfilled all eight criteria for this domain, outlined in Annex 4.

Figure 4: RMNCH readiness and availability of 78 EmONC-designated facilities in Sierra Leone in December 2014 (*Refer to Annex 4 for details on items measured in this domain and Annex 5 for scoring by facility)*



Overall, districts scored well for availability of key drugs, including availability of all three tracer maternity drugs including intravenous oxytocin, magnesium sulphate, ampicillin and gentamycin, located inside the delivery room. Most districts also scored well for contraceptive supplies (insertion kits for intrauterine contraceptive devices, IUCD, and oral contraceptive pills, OCPs), although many facilities did not have IUCD insertion kits. However, the data from December 2014 for Moyamba and Western Area Rural confirms reports from the qualitative data that not all three life-saving EmONC drugs were in stock in 3 facilities (1 in Moyamba and 2 in Western Area Rural).

Overall, findings confirm the lack of capacity to provide timely onward referral of emergency cases, with only 63% of assessed CEmONC and 29% of BEmONC reporting dedicated ambulances for maternity cases available within 2 hours. Availability of immunisations (Penta 3 and Measles) is also low in some districts and needs more investigation.

Reflection upon the FIT assessments of laboratory preparedness would provide insights to the availability of commodities to supply testing for essential medical services and RMNCAH clients, but this was not available at the time of analysis of this report.

Based on data from the FGDs obtained in objective 1, the community perspective suggested that demand exceeded the availability of services in both settings (as discussed above), and that it was lack of choice of providers that was a greater influencing factor than readiness of government facilities. This was related to perceptions and 'stories' presented below:

i. Lack of choice:

We don't have any other hospital or health centre to take anyone to except the government hospital in the community. (Male FGD participant, W/A Rural)

There was a pharmacy here that we use to take our children for treatment. But at one time they treated and Ebola patient that that pharmacy and the pharmacy was quarantined. Because of this we at Moyamba junction now take our children for treatment directly to the health centre at Moyamba. (Female, 25-49, Moyamba)

ii. Difficulties in referral of emergencies cases was noted to be a problem persisting from the pre-Ebola period:

We also lost one of our community iron ladies while taken to Bo for delivery haven been referred from our health centre here, followed by two women, who died of the same conditions. This is a very big problem we have towards our pregnant women. We want to see these stop by providing us an ambulance. (Male FGD participant, Moyamba).

On the positive side, however, focus group participants also reported some cases of care where they had confidence in the health facilities or had received good care, and recognised the facilities provision of care for women in labour and other RMNCAH services. This was linked in particular to the training that communities believed that HCWs had received in relation to Ebola.

But if there is any serious case they will refer the patient to either Connaught or Cottage hospital. (Male FGD participant, Western Area Rural)

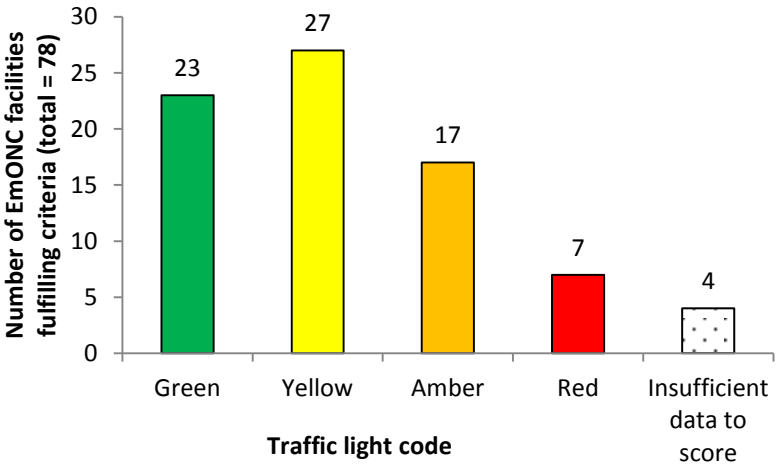
People used to buy drugs from the pharmacy to treat their children at first but for now since they have trained the nurses and also because of the house to house sensitization as well, people have now get confidence to take their children to the relatives to the hospital. (Male FGD participant, W/A Rural)

At first the nurses were not trained about the disease but now they have been trained how to treat and receive the patient and also talk to us well. (Female, 15-24, W/A Rural)

Adolescent and youth friendly services

The primary data collected by telephone for objective 4 of this study assessed three criteria as specified by UNFPA in coherence with the study conducted by Hera (2014) and outlined in Table 1. The findings by facility are summarised in Figure 5, below.

Figure 5: Adolescent and Youth Friendly Services readiness and availability among 78 EmONC-designated facilities in Sierra Leone in January 2015 *(Refer to Annex 4 for details on items measured in this domain and Annex 6 for scoring by facility)*



**19 facilities across Sierra Leone have been upgraded to deliver Adolescent and Youth Friendly Heath Services (AYFS). This sample includes 10 of the upgraded facilities, of which 5 rated green, 3 rated yellow, 1 rated amber, and 1 had insufficient data to score in this assessment. The remaining 59 facilities included in the sample are EmONCs that are not designated AYFS; this assessment of their youth friendly readiness is based on more loosely defined criteria, outlined in Annex 4.*

The QuIC-RH-EVD findings reveal a major gap in ability to provide adolescent-friendly services across the country; the greatest need is for staff to be trained in YFS and provision of a dedicated counselling space.

Based on data from the FGDs (Objective 1), adolescents reported seeking health care or advice at private providers including a "medical person", a private pharmacy and "native doctors in the villages" (also discussed in section 4.1.2).

In Moyamba, adolescents reported that the standard of care had declined since the Ebola outbreaks, reporting delays in providing FP services; where previously they could receive these services immediately, at the time of data collection, patients were asked to go home and "wait". Nurse absenteeism or being told to wait whilst the nurses are cooking were other reasons given by adolescents as deterrents from going to a Government facility. Cost, however, was not an important barrier raised in these focus groups.

General readiness to provide health services in the context of Ebola

In terms of staff availability and Ebola training, findings from the QuIC-RH-EVD scorecards (see annex 4 for more details) show that:

- Only 22% of BEmONCs had all staff required (according to FIT assessment criteria). However, verbal reports from matrons and in-charges report that many staff are 'afraid' to come to work and the data reported through FIT may reflect the number of staff on the payroll and not the number of staff who were attending for work[14].
- As a standard, we expected facilities to have all technical staff trained on IPC and EVD, and all non-technical staff trained on IPC. However, the BEmONC facilities in 6 districts did not meet this standard. Specifically:
  - Among 65 CHCs, 58 had at least 1 member of technical staff trained on IPC, and 42 had more than 1 trained
  - Among 65 CHCs, 61 had at least 1 member of technical staff trained on EVD, and 42 had more than 1 trained.

The availability of supplies to implement IPC measures rated better: less than half (*n*=31) of facilities assessed fully met the standard set (with adequate supplies of waste containers for sharps, examination gloves, chlorine, liquid soap and IPC guidelines); however most facilities had adequate supplies of sharps disposal containers and chlorine. Overall, the level of preparedness at CEmONCs is higher than at BEmONC facilities and among BEmONCs, all districts performed poorly with regard to meeting the standard for examination gloves (at least 150 pairs). Availability of liquid soap was a problem in Moyamba and WA Rural at the time of this data collection.

Using three proxy indicators to assess general capacity to manage suspected cases of Ebola (with Ebola guidelines available, availability of an isolation space with a member of health staff trained in Ebola), only the PCM Hospital in Western Area achieved a 'green' traffic light status meeting all three criteria. Overall, hospitals were only marginally more prepared that CHCs assessed and districts, which had been affected by Ebola earlier in the outbreak were prepared. Most facilities had copies of Ebola guidance, even if staff had not been trained.

Over-riding all these issues is the matter of availability of health workers. Up to the 25th of February 2015, close to 300 health workers in Sierra Leone had been infected and 221 had lost their lives due to Ebola (WHO, 2015c) (WHO, 2015), including at least 11 doctors and 1 midwife (Kilmarx et al., 2014). This loss of health providers further compounds the fact that pre-Ebola EmONC facilities, particularly CHCs which should provide basic EmONC, did not meet the minimum staffing criteria.

Moreover, data from the qualitative study (objective 2) highlighted the challenging situation for health providers. Although health providers in Western Area Rural and Moyamba reported feeling better equipped with knowledge and equipment to manage suspected Ebola cases at the time of the interviews compared to earlier on in the epidemic, they remained fearful of Ebola infection. Interviews highlighted concerns that patients- especially pregnant women- may be hiding symptoms of Ebola to avoid being isolated, thus putting health workers at increased risk.

> *There are some pregnant women and other women who come to the facility, knowing fully well that she has touched the sick or dead person, she will keep that as a secret and will completely deny all the questions posed on her from the questionnaire meant for screening… before coming to the hospital, if they had noticed any changes in their body temperature, they will go to a drug store, buy some medicine and drink it.*

[14]Personal communication with S. Nam from a FIT Assessor, January 20th 2015.

So by the time they visit the health centre, their body temperature will be normal and we will hardly detect any sign of Ebola. (HCW, W/A Rural)

Community members reported noticing improvements in infrastructure of facilities and a belief that training of health workers for Ebola had improved in response to the outbreak. They reported that this has resulted in growing confidence among community members and encouraged use of maternal and child health services by providing reassurance to the community. Notably, community members reported that this was in improvement from the pre-Ebola compared to the post-outbreak scenario, as these quotes from men (as the main decision-makers in health-seeking behaviour) show:

…, I see a little bit of improvement…I saw a wire fence built to separate those that are suspected of Ebola so that we will get your treatment. There are most of the test which are not done in the hospital for now, like urine, stool and HIV test, all those places are closed for now. (Male FGD participant, Western Area Rural)

The situation [before Ebola] was really bad, because even in the government hospital, patients were not treated in whatever situation be it Ebola or not, but now understanding is flowing being that they have received some training which has led to the treatment of people in the hospitals.(Male FGD participant, W/A Rural).

There was also an expression among key informants that the Ebola outbreak had brought lapses in practice to awareness and that this had sparked positive behaviour changes among health workers, including more collaborative working relationships:

…We have certain work principles, for instance, we have been used to recap needles whereby you get yourself infected if not done carefully. Because of improper procedures nurses get infected. During the Ebola training our attentions were drawn to other diseases that the methods and procedures used on Ebola patients should be the same…(HCW, Moyamba)

Since the Ebola outbreak…we [the nurses] saw that there was need to work as a team and if you fail to work as a team you will have problems. Before Ebola Virus Disease, Nurses malice each other, for instance, in the Ebola setting you will have a colleague health worker as a partner whilst in a holding or treatment centre you do not dress alone as you and your partner work together by supervising each other dress neatly and correctly, so if you do not work in one accord you will have problems. (HCW, Moyamba)

5.3 Utilisation of RMNCAH services in the context of EVD

This section presents findings from the quantitative analysis conducted under objective 5, by following the different steps in the methodology described in the Methods section and in annex 7.

Reproductive, Maternal Newborn & Child Health Service Uptake (including family planning)

Figure 6 shows the actual number of RMNCH visits recorded in HMIS between January 2013 and September 2014 for all of Sierra Leone. These trends need to be interpreted with caution: firstly, because the graph aggregates the number of visits across districts, negative changes in one district are "cancelled out" by positive changes in another district. Secondly, there are number of missing data points for some months and some districts (the total number for each service is noted in the legend of Figure 6), particularly in later months, which accentuates the impression of a negative trend.

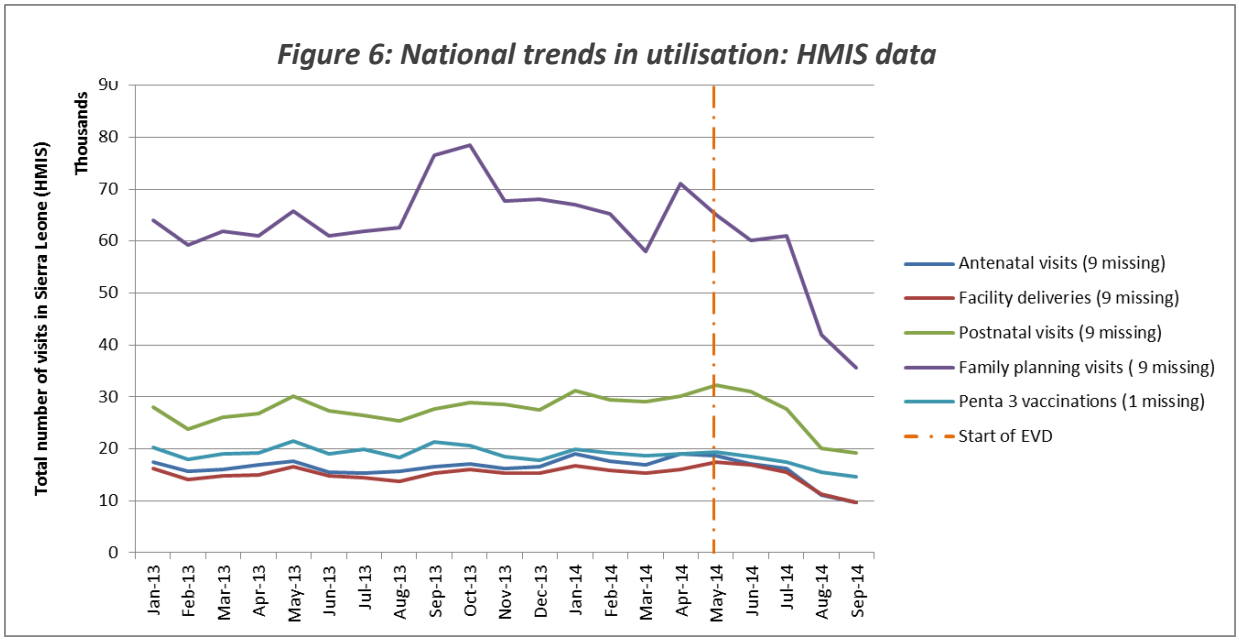


Figure 7 shows the average number of predicted visits per district as modelled using segmented regression analysis[15], based on HMIS data. Due to the fact that HMIS data was not available after September 2014 at the time of the analysis, the flat line from September 2014 to April 2015 represents an assumption that service utilisation remained at September levels for the rest of the year.

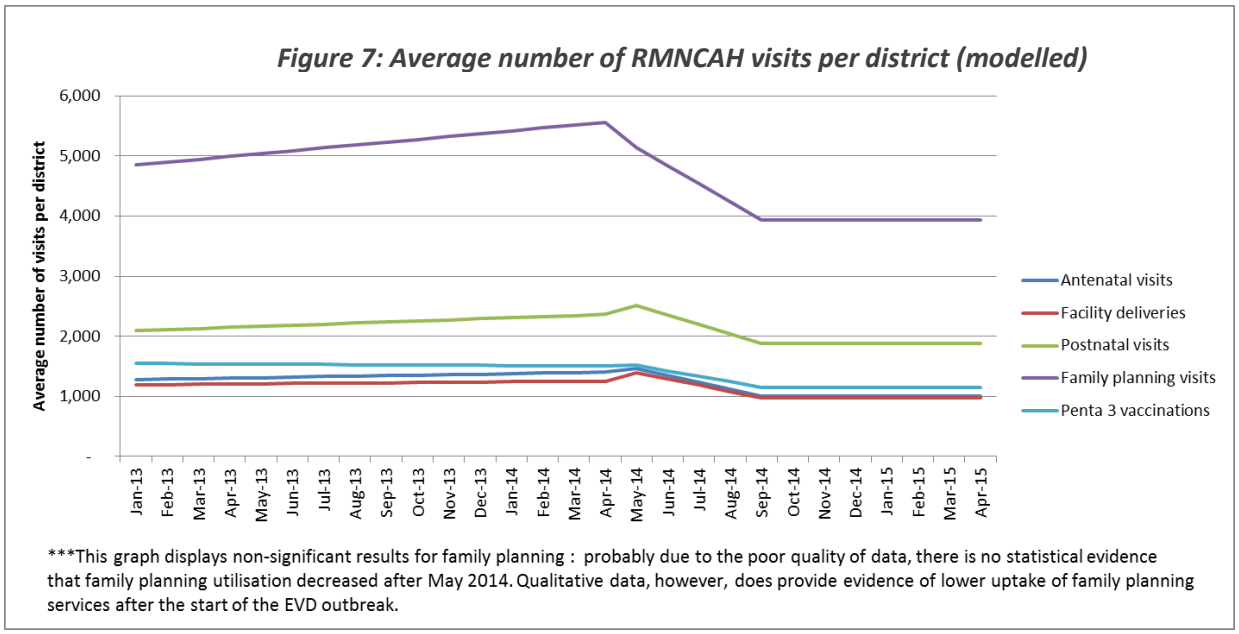


Figure 8 shows the total amount by which average district utilisation decreased after the start of the Ebola epidemic over the period for which data is available[16]. This analysis is based on the modelled data pictured in Figure 7. For example, it shows us that based on available data, we estimate that the number of facility deliveries decreased by 30% on average between May and September 2014. All services were substantially affected, but the number of antenatal care visits and facility deliveries seem to have suffered a particularly high decline. The graph shows results at a national level only, though analysis was also conducted in three districts with sufficient data points.

[15]See p.43-45 of Annex 7 describing the methodology and findings for Objectives 5 &6 in more detail for an explanation of how this method overcomes the biases above

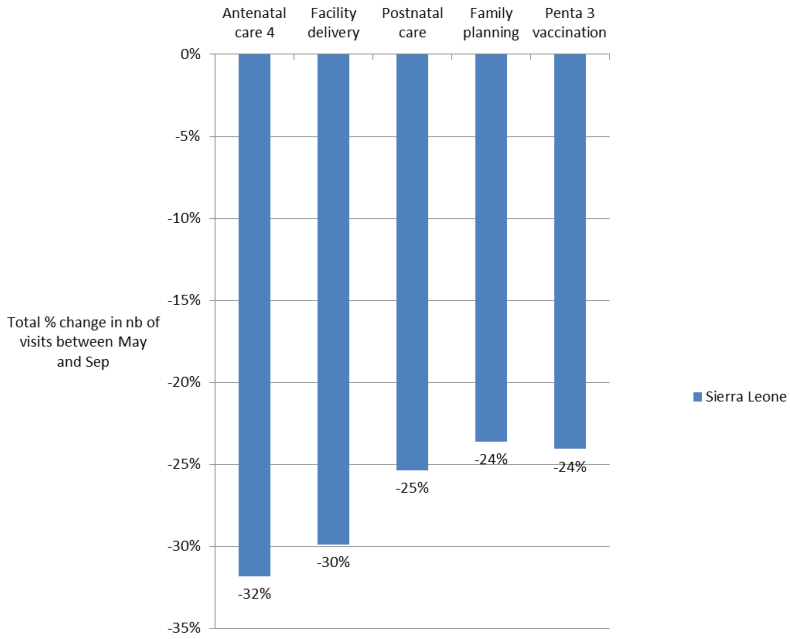
[16] Please refer to p.49 of Annex 7 for tables with exact percentages

At district level, we found that poor data quality and the lack of sufficient data points after the start of the outbreak meant that few districts had conclusive results for any of the RMNCH services analysed. Those districts that did have robust results were those where the outbreak started early, and which therefore had more post-outbreak data points available, namely: Kenema, Kailahun and Port Loko.

For the three districts analysed (not shown), the negative impact of the EVD outbreak on service utilisation was large, with Kailahun being particularly affected.

Figure 9, below, shows estimated national population coverage[17] of key interventions used in the impact modelling (see next section):

Figure 8: Total % change in number of health care visits between May and September 2014



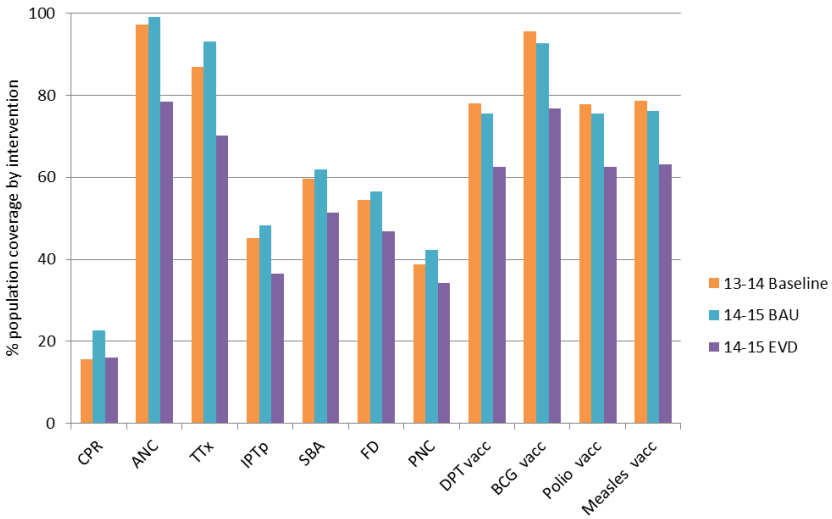
***This graph displays non-significant results for family planning : probably due to the poor quality of data, there is no statistical evidence that family planning utilisation decreased after May 2014. Qualitative data, however, does provide evidence of lower uptake of family planning services after the start of the EVD outbreak.

- May 13- April 14 ("13-14 Baseline"): coverage as measured by the 2013 DHS
- May 14 - April 15 ("14-15 BAU"): modelled coverage that would have occurred if there had been no Ebola outbreak
- May 14 - April 15 ("14-15 EVD"): modelled coverage in the context of the Ebola outbreak.

We can see that for most services, population coverage of essential RMNCH services in the context of the Ebola outbreak (in purple) is not only lower than the coverage that would have occurred without Ebola (in blue), but also lower than baseline coverage in the previous year (in orange). Table 1 over page, which shows the percentage difference between 14-15 coverage in the Ebola context compared to 13-14 baseline coverage and 14-15 'business as usual' coverage, confirms this finding.

Figure 9: National Population Coverage

Baseline; 'Business as Usual' scenario ; EVD scenario



***This graph displays non-significant results for family planning : probably due to the poor quality of data, there is no statistical evidence that family planning utilisation decreased after May 2014. Qualitative data, however, does provide evidence of lower uptake of family planning services after the start of the EVD outbreak.

[17] Please refer to p. 56-59 of Annex 7 for tables with exact percentages and results for each of the three districts under study.

Table 1: Percentage decrease in population coverage as a result of Ebola

% decrease in coverage	CPR	ANC	TTx	IPTp	SBA	FD	PNC	DPT vacc	BCG vacc	Polio vacc	Measles vacc
EVD 14-15 compared to baseline 13'-14'	3%	-19%	-19%	-19%	-14%	-14%	-11%	-20%	-20%	-20%	-20%
EVD 14-15 compared to business as usual 14'-15'	-29%	-21%	-25%	-25%	-17%	-17%	-19%	-17%	-17%	-17%	-17%

5.4 Impact of EVD Outbreak on RMNCH Outcomes

5.4.1 Projected impact

This section presents findings from objective 6 of this study. Figures 10.1-10.4, over page, show the estimated number of maternal, newborn and child deaths and unplanned pregnancies in the year 14-15 had the Ebola outbreak not occurred (in blue) as well as the number of "additional" deaths and unplanned pregnancies predicted due to lower service utilisation seen during the Ebola outbreak (in red).

We found a large impact on maternal and newborn deaths across all localities, though Kailahun showed the greatest impact of all, across all health outcomes. We found very low impact on child deaths, due to having only modelled the impact of a change in vaccinations, as opposed to a change in access to curative interventions[18].

5.4.2 Impact perceived

The HMIS does not collect data on adolescent pregnancies limiting the ability to estimate the impact of reduction of service use on teenage pregnancies. However, evidence from the qualitative analysis (objective 1 and 2) reveals how adolescent FGD participants reported hearing many stories of school colleagues becoming pregnant:

> *Some were about to take their Basic Education Certificate Examination and then the Ebola broke out. They could no longer take these exams they however resorted into involved in sexual activities.* (Adolescent female, W/A Rural)

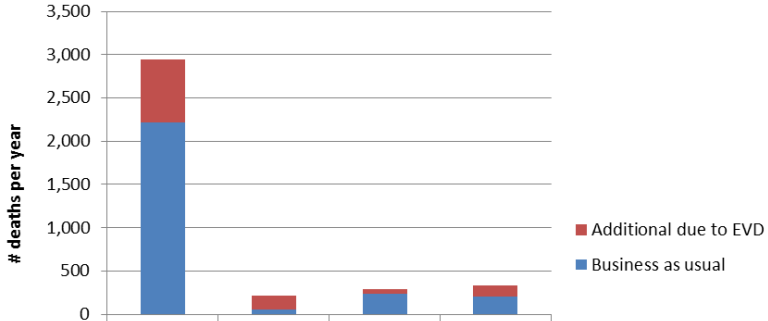
> *Before Ebola, there were schools going on, so there is not much time for school-going children to idling around. Unlike now that there're no schools going on they have more time for their boyfriends. Also when schools were up and running some will reflect that oh! I have to go to school so let me take my time otherwise I become pregnant and that will affect my education; I have to go to school. So there's great difference now with regard to teenage pregnancy than when Ebola was not yet here.* (Adolescent female, W/A Rural)

> *One of my colleagues is now pregnant as a result of this close down of schools. Unfortunately for her she is not staying with her parents… Now she is just going up and down and there is no one to take care of her.* (Adolescent female, W/A Rural)

In general, adolescent pregnancies were perceived to lead to the end of a girls' education. However, one young girl described that a peer's pregnancy was not considered a major issue now, as the baby would have grown up before schools reopen, allowing the peer to continue her education (continued on page 22):

[18] Please refer to p.51 of Annex 7 for further details on this result

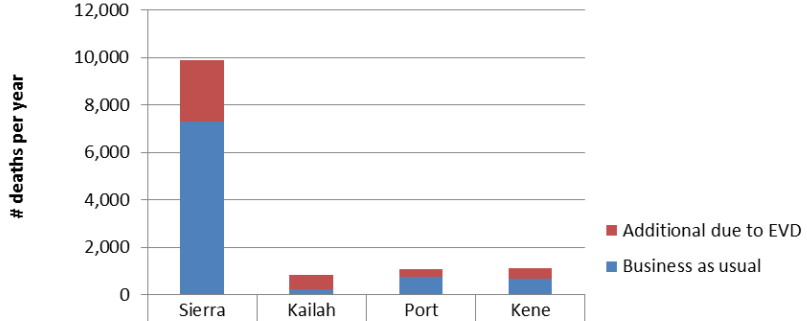
Figure 10.1 Estimated maternal deaths
May 2014 - April 2015



	Sierra Leone	Kailahun	Port Loko	Kenema
Additional due to EVD	735	158	55	128
Business as usual	2,213	56	240	207

*The model uses non-significant results for family planning and vaccination coverage

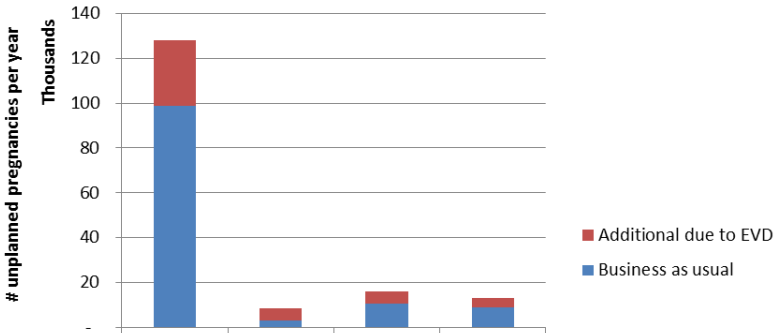
Figure 10.2 Estimated newborn deaths
May 2014-April 2015



	Sierra Leone	Kailahun	Port Loko	Kenema
Additional due to EVD	2,562	581	317	445
Business as usual	7,305	246	757	677

*The model uses non-significant results for family planning and vaccination coverage

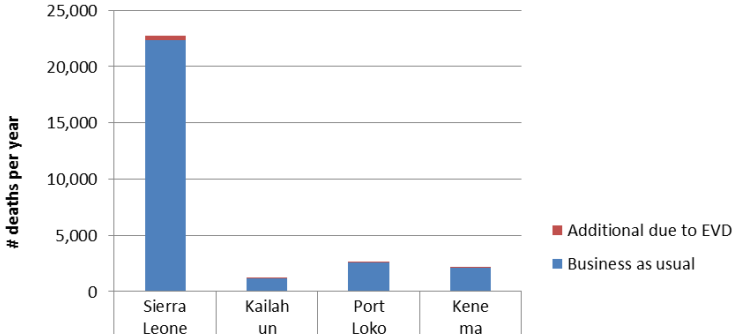
Figure 10.3 Estimated unplanned Pregnancies
May 2014 - April 2015



	Sierra Leone	Kailahun	Port Loko	Kenema
Additional due to EVD	29,034	5,288	5,402	3,947
Business as usual	98,886	3,080	10,670	9,038

*The model uses non-significant results for family planning and vaccination coverage

Figure 10.4 Estimated children Deaths (1-59 Months)
May 2014-April 2015



	Sierra Leone	Kailahun	Port Loko	Kenema
Additional due to EVD	419	48	78	35
Business as usual	22,328	1,186	2,551	2,137

*The model uses non-significant results for family planning and vaccination coverage
**The model did not include impact of EVD on curative interventions for child health and so very likely is underestimating the impact on child deaths

> *There is a colleague of mine … and when schools were closed she became pregnant and had to run away to Kailahun thinking that when school reopens come September she will attend not knowing that Ebola was just around the corner. However she can still continue her school when she comes back as her child would have grown up before school reopens.* (Adolescent female, W/A Rural)

Some key informants supported these perceptions, citing an increase in adolescent pregnancies as well as reduced access to family planning among adolescents. Various health workers also expressed concern that adolescents may seek abortions from "quack doctors", or attempt to induce abortions themselves, resulting in serious health complications or death.

> *With the Ebola outbreak we are experiencing that many of the children are now becoming pregnant…Some decide to abort the pregnancy, there was a girl who came to the facility but I was not able to handle her own case, I referred her to Doctor X at X hospital, her uterus was badly damage that there was no way out but to remove the entire uterus and she is a young girl her age is around 18 to 19 years…* (HCW, W/A Rural)

On the other hand, there was an indication that adolescents have reduced their sexual relationships since the Ebola outbreak. Numerous interviews identified that the common rule presently is "don't touch" and many adolescents are fearful of sexual transmission of Ebola; as a result, some respondents reported perceived cessation of sexual activities and relationships among adolescents.

> *Now there is no love issue because somebody's boyfriend might have Ebola and you don't know then you sleep with that person. Through that way someone will get the virus and will spread it. Now we have seen that the love issue among adolescent have reduced. There are some who were not afraid or ashamed of their elders but now thank God it has reduced.* (HCW, W/A Rural)

Nevertheless, it is concerning that adolescent FGD participants reported stories of young girls having sex with men to help support themselves during the outbreak.

> *When the country was locked down for three days…Our parent were unable to meet to our daily needs, because of that, most of our friends went out there to have sex with men so that they can sustain themselves.*(Adolescent female, Moyamba).

6. Discussion &Recommendations

Findings from this study support assertions made by others (Delamou, Hammonds, Caluwaerts, Utz, & Delvaux, 2014; Dynes et al., 2015), that indirect negative effects of Ebola on utilisation of reproductive health services are based primarily upon fear of contracting Ebola among health workers and women from one another highlighting the lack of trust in the health system to provide adequate protection of its own staff and users. Among health care workers, this fear results in desertion of already understaffed health facilities or in fear of examining patients, particularly fear of women in labour, because the life-saving interventions include handling of blood and body fluids from women whose Ebola status is often unknown. Health facility assessments reveal that health staff often do not have access to adequate protection and lack training in IPC and Ebola case management. At present, real-time screening for Ebola with a rapid result turnaround is not feasible for some EmONC facilities; together with the lack of real-time diagnostic capacity, the inability to differentiate between Ebola and other febrile diseases and complications arising in pregnancy, the fear of contracting Ebola at a health facility can prevent provision of care and inhibits users seeking reproductive health services. The combination of these issues has led to people experiencing denial of care for women suspected to be in labour, and inability to access other RMNCAH services. Notably, the readiness to provide adolescent and youth-friendly services is lacking in many facilities.

Health service utilisation has dropped as a result of these factors, and our modelling shows that if the level of service utilisation observed in the wake of the outbreak were to continue after December, this would result in a significant burden on health outcomes. Comparing modelled RMNAC health outcomes in the current Ebola outbreak to a hypothetical situation without Ebola, we found there would be an average of 22% more maternal deaths and 25% more newborn deaths in Sierra Leone over the year May 2014 - April 2015. Additionally, in three districts for which there is adequate HMIS data (Kailahun, Port

Loko and Kenema), we might also expect to see a higher burden of unplanned pregnancies, with estimates ranging from an increase of 44% in Kenema, to 172% in Kailahun when compared to the 'business as usual' scenario.

Limitations

Limitations to the qualitative study, objectives 1 and 2, include those typical to the methods, particularly the potential bias of acquiescent responses from key informants, particularly among TBAs responses to issues related to home births (in light of local by-laws that prohibit TBAs from performing home depart to deliveries). As with all research, resource limitations affected the scope of the primary data collected: only two focus groups were held among very young adolescents (10-14 years) although two more included women aged 18-24 years; and the study took place in only two of Sierra Leone's 14 districts both in the Western Region; however, findings here are consistent and build upon findings from other recent studies on the same topics(Dynes et al., 2015).

In both the background literature review conducted in preparation of the qualitative work, and for objective 3, we were limited by the lack of available evidence from the Ebola specific context in western Africa. For objectives 4, 5 and 6, we relied upon secondary data due to the limited resources and were limited by the availability and quality of data through: a) secondary data from FIT assessments with missing variables, and b) poor quality, late availability and lack of age-disaggregated HMIS data to assess the effect of the Ebola context on RMNCAH service utilisation and thus, on RMNCAH outcomes.

Based on the findings of this study and bearing in mind these limitations, the next section highlights key discussion points and outlines key implications arising from them that support strategic planning to mitigate further negative RMNCAH in the context of Ebola. We focus on the need to immediately strengthen RMNCAH preparedness to react effectively and immediately to viral haemorragic fever outbreaks both now and in the future, which will in turn partly contribute to rebuilding trust among communities to use services alongside addressing issues of trust in health workers.

General

Infection prevention must be a priority, even more so in the context of a highly infectious disease epidemic. Health workers should feel safe and should be able to keep their clients safe in the health setting and this needs urgent attention. In most districts, the level of supply of examination gloves, IPC and PPE available was below WHO-recommended levels and this needs more investigation. Importantly, findings from similar studies suggest that infection prevention training and additional protective equipment, such as hand-washing stations with chlorinated water, can provide reassurance to community members and encourage them to RMNCAH care at government facilities (Dynes, 2015). **Human resources:** Health facilities are understaffed to be able to deliver quality RMNCAH services.

Mistrust of health care workers intentions: Issues of women and children being turned away or refused services are on-going and remain barriers to seeking RMNCAH care, especially for women in labour(Black, 2014; Dynes et al., 2015; Milland & Bolkan, 2015). As found in other research, our study also identifies misconceptions related to health facilities and health staff since the Ebola outbreak (Dynes et al., 2015). There is also a crucial need to eliminate negative rumours or misunderstandings and build trust between community members and health care workers. Mis-perceptions that need to be addressed include rumours of health workers injecting patients, as well as women's misunderstanding of PPE and safety protocols continues to limit women's use of RMNCAH care. Additionally, apprehension about disrespectful care or neglectful care is an important and prevalent deterrent for women seeking care and some community members express powerlessness to address these issues and lack of awareness of what accountability mechanisms exist to address issues related to poor quality of care. Improved communication between communities and health providers is vital to dispelling rumours and rebuilding trust.

General Recommendations

1. **Infection Prevention**: Health and allied workers need to be trained and refreshed in correct use of PPEs and management of suspected Ebola cases.
2. **Training for health care workers**: Health workers need to be equipped with skill and competence in order to feel confident about identifying possible cases of Ebola through providing them with specialised Ebola case management training, and in providing them with protective equipment.
3. **Real-time assessment of facilities**: capacity of facilities needs to be monitored using as close to real-time data as possible to ensure PPE items which are low on stock can be replenished. The QuIC-RH-EVD approach could be used together with the App developed under Objective 4 of this study to enable rapid gap analysis and allocation of resources.
4. **Continued sensitisation** should continue involving trusted and influential figures, to encourage RMNCAH care-seeking at government facilities and reassure communities that government facilities are safe. Sensitisation should involve women who have had positive experiences. These women could be mobilised and have important roles encouraging other women in the communities to use facilities. Women who use health care services could be mobilised and play a role of champion in community sensitisation, encouraging other women to access government facilities for RMNCAH care.
5. **Health workers need to be provided with messages** to explain all safety and screening procedures to patients to provide reassurance that:
   - PPEs prevent the spread of Ebola by protecting health care workers and enabling them to continue providing vital care to women and their children.
   - HCWs have been trained in IPC to promote the idea that facilities are safe.
6. **Strengthen accountability mechanisms:**
   - ***for facility users***: Effective complaints procedures for issues related to health facilities need to be made accessible to community members, galvanizing the support and status of local influencers within the community.
   - ***For staff***: to support speedy action by facility staff to address issues to mitigate or reverse situations where their working environment exposes them to unnecessary risk of Ebola and enables them to safely manage RMNCAH users who present with potential Ebola symptoms.
   - ***Identify champions and positive case studies***: to promote learning from good practice, identify and develop communications on facilities and health workers where positive stories about sustaining enabling environments for: a) safe provision of quality RMNCAH services and b) sustained utilization of services has been achieved.

Maternal, neonatal and child health

Women's vulnerability due to pregnancy: Findings in this study are supported by findings from others that women in labour are being triaged out of the formal and into the informal health system, as health workers are fearful of coming into contact with fluids of women with unknown Ebola status and are reluctant to treat pregnant women (Boseley, 2014; Chastain, 2014),Dynes et al., 2015). Further, women with Ebola are more likely to suffer from heavier bleeding and it is assumed that their immunity is less able to fight the virus. There is an urgent need to identify how best to care for women in labour, especially those suspected of suffering from Ebola. At present, only one specialist Ebola unit has EmONC capacity in the country(Fofana, 2015). Caring for women in labour and with Ebola raises several ethical issues, but this should spur on implementation of interventions, including giving urgent consideration to:

- **Improving EVD testing and turn-around-time of Ebola results:** Health care workers need to access to faster and more accurate EVD testing and diagnosis to facilitate earlier triage decisions;
- How and where best to provide **specialist Ebola EmONC care** (specialist staff deployed when required or based in district hospitals);

- **Innovations & commodities**: Whether to consider issuing misoprostol and home delivery kits to pregnant women.

To mitigate the greater need for potential EmONC, health providers and community members were concerned to encourage more women to attend for antenatal care visits, and health workers especially were concerned to encourage women to seek care early so they could identify complications and manage them to mitigate potentially life-threatening emergencies. Prior to the Ebola outbreak, pregnant women who delivered in facilities often received food items or supplies for their babies.
Need for modern family planning methods: it is difficult to ascertain the real effect of Ebola on uptake of family planning services based on data from the HMIS. However, findings from the qualitative data reveal that there are reasons that inhibit women from using modern family planning methods including recognition of the potential transmission of Ebola and concurrent sexual partners and importantly, a stated desire to avoid pregnancy in order to avoid risking a complicated pregnancy when accessing maternal health services is challenging.

Infants and children: An additional concern raised from the qualitative study relates to how best to care for unaccompanied children, particularly babies. Health workers, social workers and community leaders urgently need guidance based on evidence or best practice that clarifies how to care for infants whose mothers are deceased or too unwell to feed their babies, and for babies whose mothers develop signs of Ebola when the infant does not. This care needs to extend into the community to ensure that children and infants discharged from Ebola care centres have safe homes to return to where guardians are equipped and resourced to care for them. Development partners will need to be provided with evidence of this need to encourage adequate investment in this sector.

Recommendations to improve MNCH care seeking-behaviour

1. **National debates** need to be organised to:
   - ***Explore innovations in commodities and interventions for community-based distribution*** that show promise in reducing mortality and morbidity needs to be reviewed; for example oral misoprostol to reduce risk of postpartum haemorrhage(see annex 7 for case study). This would be particularly important to consider in this context where safe blood donation is uncertain or unavailable.
   - ***EmONC Ebola expertise*:** Investigate the epidemiology of Ebola and identifying whether there is a need to establish EmONC centres with specialist EmONC and Ebola expertise and preparedness planning to establish rapid response teams who can provide this expertise for new hot spots of Ebola as they occur now and in the post-acute Ebola phase.
   - ***Explore how best to manage and care for infants and children*** in Ebola care centres and after discharge who are unaccompanied and develop clear guidelines for this. This will require in-depth investigation and assessment to ensure guidance is evidence-based and context-specific.
2. **Strengthening referral mechanisms**: particularly transport to facilities with specialist Ebola EmONC capacity and raising awareness of where women can go for EmONC where trained staff are confident in caring for women in labour.
3. **Incentives** such as food items or supplies for newborn babies were often offered prior to the Ebola outbreak for women who delivered in facilities.
4. **Better information for better results:** the challenges to reliable and up-to-date health service statistics need to be addressed including by ensuring that key RMNCAH indicators are routinely collected in all health facilities, disaggregated by age, collated through the DHIS2 and remain disaggregated by age at district level; indicators should include those specified in the UN's Commission on Information and Accountability (CoIA).

Adolescent and youth-friendly services

The **data from HMIS** that was used as a secondary data source in this study does not routinely collect data about adolescent pregnancies, or of RMNCAH services disaggregated by age to allow extrapolation of data relevant to adolescents. However, the qualitative data collected through this FGDs and KIIs for this study reveals important issues relevant to the reproductive and sexual health of adolescents. Whilst adolescents demonstrated good knowledge of the need for family planning to prevent unintended pregnancies, they lacked **access to correct and reliable information on modern methods** of family planning and of where to access these. Of notable concern is the adolescents reports of **lack of condom use**, which has been found in other studies (IPPF, Forward, & PPASL, 2011; Nam, Juana, Missah, Brown, & Grellier, 2013). There remains a great opportunity to market condoms and improve awareness of the benefits of dual protection to prevent STIs as well as unwanted pregnancy. This, along with reports from adolescents, women and health workers of perceived increases the number of adolescents becoming pregnant contribute to contribute to concerns about rising teenage pregnancies and risk of exposure to STIs.

Findings from this study supports assertions made by other studies(Nam et al., 2013) that youths prefer to receive information from peers, through school education programmes and radio shows. In this study, the previous school based sensitisation was reported by adolescents to have been an important source of trusted information on SRH. In addition, a study by MSSL found that using community behaviour change agents to provide counselling and community awareness of the days when services would be available created a strong increase in client uptake among young clients, alongside removal of user fees (MSI, 2013).

Other issues affecting youths' ability or desire to access YFS noted from this study corroborated by other studies, and include: the limited number of facilities equipped with expertise in youth-friendly approaches(Hera, ULB, & Focus 1000, 2014), amenable and approachable staff (Barry, 2010)and facility infrastructure to afford privacy and confidentiality of youths who attend facilities for SRH services (HERA, ULB, & Focus 1000, 2014).

In the context of the Ebola outbreak, communities are very concerned that increasing numbers of girls are becoming pregnant and that sexual exploitation could increase, as more girls are kept at home, orphaned, or sent to live in non-Ebola areas with relatives. A Plan report in December 2014 interviewed youth aged 12 -18 and found that restrictions on movement and gatherings meant that schools are closed and family incomes are dwindling and as a result, older girls were taking over caring roles, getting married early, or engaging in sex either out of idleness or economic need(Plan, 2013).

Recommendations to improve adolescents' care seeking-behaviour

1. **Age disaggregated data** on reproductive and sexual health needs to be reflected in the HMIS and the UN family is in a strong position to advocate and lead in supporting the MOHS in achieving this along with support from other development partners.
2. **Community outreach and sensitisation on SRH for youths** need to be revitalised to encourage adolescents to continue using modern family planning methods and accessing health facilities, drawing upon methods known to be preferred and trusted among youths, notably using peer educators or youth-change agents.
3. **School-based programming** was an important access point for adolescents before the Ebola outbreak, both in terms of provision of family planning and positive relationships with health workers. This must be harnessed effectively once schools reopen across the country.
4. Community distribution of modern family planning methods: Re-establishing community distribution outside of hospital settings, in both Moyamba and Western Area Rural District, could be beneficial and allow adolescents and young women to safely and discreetly seek family planning.
5. **Encouraging condom use**: Increasing condom use among adolescents remains a challenge; there is

a need for innovation in messaging on the benefits of protection against STIs as well as unwanted pregnancy. This could include participatory research on service design and messaging with youths.

6. **Rebuilding trust between health workers and adolescents**: Improving relationships between adolescents and health workers is vital in promoting adolescents' use of health facilities, requiring investment in training more RMNCH health workers in provision of youth-friendly services. Methods to motivate health workers to adhere to YFS approaches need to be considered, and could include performance-based payments or involvement in user-feedback surveys.

7. Conclusion

Before the Ebola outbreak there had been reported improvements in service utilisation and uptake, as much as doubling of some services, between the 2008 and 2013 Demographic and Health Surveys. The extremely high maternal and neonatal mortality ratios and rates that had not shown similar improvements over this period, point to the lack of quality of RMNCAH services available. This hypothesis is supported by findings from facility assessments that the intense pressure placed on the health system due to Ebola exacerbates low readiness and availability of essential items and enablers in facilities.

The public health emergency has exposed the fragility of the health system and its lack of resilience to cope with this 'shock'. The findings from this study highlight some key issues to be taken into consideration for planning in the future to mitigate further detrimental effects on RMNCAH. This includes prioritising immediate provision of PPEs and IPC training to health and allied workers to help restore trust between providers and users. There is also an urgent need to provide emergency obstetric and neonatal care for women suspected of having Ebola, but this is fraught with difficult ethical issues about safety of health workers and patients. Meeting the maternal health needs during the on-going epidemic will require continual assessment of how the risk to healthcare workers can be minimised, enabling them to safely continue caring for their patients. These ethical issues should not impede implementation of interventions to care for women, and we need to consider whether innovations such as the use of misoprostol for haemorrhage can reduce mortality in this setting.

At present, estimates suggest that Sierra Leone health workforce has the capacity to meet only 24% of the reproductive health care needs across the continuum of care(UNFPA, 2014). In the longer term, securing long-term investments in professional education is essential to train and retain adequate numbers of health workers to meet the RMNCAH needs. This will include continued scale up of interventions to reduce unwanted pregnancies, alongside massive scale up of training of doctors, midwives and nurses and efforts to understand reasons for, and reduce attrition(UNFPA, 2014).

The concentration of donor presence and concerns about global health security create an opportunity to identify new and renewed interest among development partners. Donors need to be persuaded to work hand-in-hand with the Government, notably the Ministry of Health and Sanitation, to invest more heavily in strengthening the health system. This is crucial both to improve capacity to cope with future outbreaks of viral infections, but also to support more sustained, longer term investments in RMNCAH.

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Annex 1: Methods for background literature review

We conducted a background literature review which collated and synthesised evidence available about three issues as specified in objective 1 and 2 in order to inform development of the qualitative research tools and the subsequent analysis of focus group discussions (FGD) and key informant interviews (KII),including evidence arising from recent studies emerging from the Ebola affected region and since the onset of Ebola:

- RMNCH health-seeking behaviour related themes for haemorrhagic disease in sub-Saharan Africa;
- Adolescent reproductive health seeking behaviour;
- Socio-cultural practices of women being caregivers in Sierra Leone.

Academic articles were retrieved using a structured strategy on the Pubmed databases and a keyword search with truncation was performed. Only articles in English, published after 1994 were included. Search terms included combinations of 'Sierra Leone', 'maternal', 'newborn', 'child', 'family planning', 'contraception', 'sexual health', 'reproductive health' and 'health care seeking. 33 results were brought up by the searches overall, with 8 meeting the inclusion and exclusion criteria.

In addition to reviewing academic sources, grey literature was searched to find newspaper articles, blog posts, and situational analyses, which provided additional insight into the influence of the current EVD outbreak on RMNCAH care seeking behaviour. Due to the limited findings, grey literature was not limited to experiences in Sierra Leone, but instead included findings from other countries in West Africa affected by the current EVD outbreak.

Adolescents

Recognising that adolescents face particular barriers to accessing RMNCAH services, literature on this group was reviewed separately.

Searches were conducted via PubMed, Google Scholar, Google News and Google to pick up journal articles, NGO reports, and news coverage of adolescent sexual and reproductive health care seeking in Sierra Leone. Search terms included combinations of 'Sierra Leone', 'Ebola', 'youth', 'young', 'adolescent', 'adolescence', 'sexual health', 'reproductive health' and 'health care seeking'. Where more than 600 sources came up, pages of results from each search were scanned until the contents were deemed irrelevant. Once appropriate sources giving comment on adolescent sexual and reproductive health care seeking in Sierra Leone either before or after the Ebola Virus Disease (EVD) outbreak were determined, a search of relevant bibliographic and related article links were searched to ensure as wide a coverage of the literature as possible. Sources were excluded if they were published before 1994, inaccessible or were published in a language other than English. Over 479,464 results were brought up by the searches overall, with 33 meeting the inclusion and exclusion criteria, 19 concerning adolescent health/ health-seeking before the EVD outbreak and 14 concerning it after the EVD outbreak. The former category consists predominantly of NGO reports, while the latter consists almost exclusively of media reports, due to the lack of systematic research available post-outbreak.

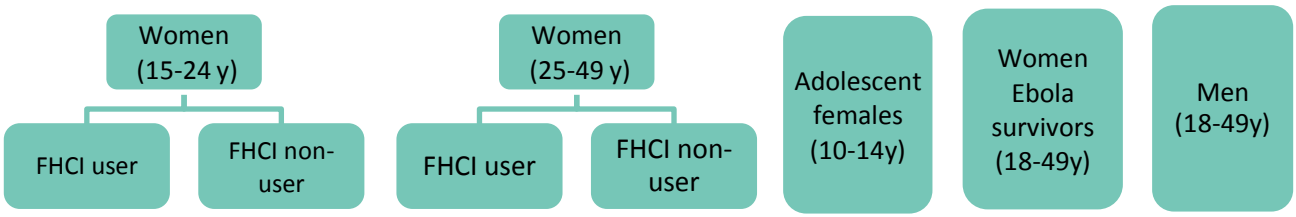
Annex 2: Elaboration of Methods for Objective 1 & 2

Focus group discussions (FGDs) and key informant interviews (KII) were conducted in the Western Area Rural and Moyambadistricts for Objective 1 and 2 of this study. These districts were selected to provide access to sampling from rural and peri-urban settings and from a high prevalence setting and that were feasible within the time frame and budget envelope. A purposive sampling strategy[19] was used to select all participants in both districts; this was overseen by a community engagement specialist who has strong links with numerous communities.

Focus Group Discussions (FGDs)

In each district, seven FGDs were conducted with the same population subgroups, namely, women of reproductive age (15-24 years), adolescent females (10-14 years), and men (25 to 42 years). Women of reproductive age were stratified by those who had used a government facility for free health care initiative (FHCI) service since July 2014 and those who had not used FHCI services in this same time; this enabled exploration of differences in attitudes and behaviours of those who are using FHCI services during the Ebola outbreak and those are not. Women FGD groups were also disaggregated by age, to encourage an environment, which was more likely to put participants at, ease with their peers. Separate FGDs were conducted with adolescents, based on concerns that this group was not accessing reproductive health services and that adolescent pregnancies were increasing[20]. A FGD was held with men, based on the recognition that women and adolescents are often not the decision makers in the household (de Koning, Jalloh-Vos, Kok, Jalloh, & Herschderfer, 2013; Scott et al., 2014). A further FGD was conducted with female Ebola survivors (18 to 61 years) to improve understanding of the RMNCAH care needs and challenges for women who have recently recovered from Ebola. Figure 1 illustrates the population subgroups:

Figure 1 - FGD Population Subgroups



There were 100 FGD participants in total, of which 47 were from Western Area Rural District and 53 were from Moyamba District. The majority of participants were Muslim (80%) and the two most common ethnic groups were Mende and Temene, comprising 31% of participants each; this distribution is similar to population characteristics at a national level (Statistics Sierra Leone (SSL) and ICF International, 2014). Education levels were quite low, with one in three participants having no education at all. Following the trend seen at the national level, men had higher levels of education as compared to women (Statistics Sierra Leone (SSL) and ICF International, 2014).

Methodology

Tools: FGDs and KIIs were directed by topic guides, which were developed based on the literature review in collaboration with an in-house anthropologist with expertise in reproductive health and on evidence gathered from E4A and other partners' activities. Topic guides were agreed with the UNFPA project steering committee, with specific topic guides developed key informants and for women, men, adolescent girls, and female Ebola survivors.

[19] Purposive sampling is non-probably sampling technique, in which participants are selected based on the purpose of the study and the knowledge of the population

[20] Correspondence with UNFPA steering committee

Data collection: Experienced data collectors led FGDs and KII in both districts. One facilitator and one note taker led each FGD, and later transcribed and translated findings. Each FGD was composed of 6-8 participants and lasted around 2 hours. Each KII was about one hour in duration.

FGD and KII were recorded using a digital and analogue recorder and detailed field notes were taken to ensure high quality of data and to mitigate loss of a recording. The recordings were transcribed into English using direct translation (rather than interpretation) adhering to strict confidentiality clauses as specified in transcribe contracts

Data analysis: Data were analysed manually by a qualitative researcher at Options, with oversight and quality assurance by an Options Technical Lead and an in-house anthropologist. The findings were incorporated into the final synthesis report for validation and were reviewed internally by a second Options' anthropologist for quality assurance purposes.

The theory arising from the analysis was grounded, that is, based on the evidence and data as it arises from the interviews and focus groups. Interview transcripts were coded following sufficient familiarising with the data, based on a coding scheme which was built up inductively from the dataset. Recurring patterns and ideas were coded into categories and codes and new codes were added if a new theme emerged which was not captured by the current coding scheme. The coding was a dynamic process and took place through regular debriefings among team members to guide development of themes and categories, and was collated in a final electronic database.

In addition, the use of verbatim quotes was relied upon to convey key concepts to the readers.

Detailed description of participants for FGDs and KIIs for Objective 1 & 2

Equal numbers of women users[21] and non-users were included in the FGDs (31 in each). The mean age of users was slightly older than non-users, at 24.4 years and 28.6 years, respectively. The level of education was higher among users than non-users, with almost three quarters of non-users having no education, in contrast to around one in three users.

The female adolescent sample consisted of 16 individuals, eight from each district. All participants had some level of education and all but three of the participants had completed primary education. None of the adolescent participants were parents.

Nine female Ebola survivors were included, four from Western Area Rural and five from Moyamba. Six of the eight participants were parents, with three having children under five. Education levels among Ebola survivors were similar to the overall FGD participant characteristics: one participant had completed secondary education, three participants had only completed primary, and four had no education.

13 males were included in FGDs. All male participants had completed some form of education and almost half (46%) had completed at least secondary education. Two men had also completed Arabic education. All but two of the participants were married and over half (54%) had children aged under five years.

[21] "Users" refers to women who have used a government facility for free health care initiative (FHCI) services since July 2004; "non-users" are women who have not used these services since July 2004

Table 1: Characteristics of focus group participants, as a proportion by location

Location		W/A Rural (%)	Moyamba(%)	**Total** (%)
Total number of participants[a]		47	53	100
Mean age, years (range)		24.5 (11 – 61)	26.7 (12 – 49)	25.7 (11 – 61)
Sex				
	Male	11%	15%	13%
	Female	89%	85%	87%
Marital Status	**Single**	37%	42%	39%
	Married	61%	53%	57%
	Widowed	2%	6%	4%
Religion[b]	**Muslim**	88%	70%	80%
(Based on available data, n=61; WRA n=27, M n=34)	**Christian**	12%	30%	20%
Ethnicity[b]				
(based on available data, n=61; WRA n=27, M n=34)	**Mende**	47%	11%	31%
	Temene	35%	26%	31%
	Limba	3%	26%	13%
	Fula	15%	11%	13%
	Other[c]	0%	26%	11%
Level of highest education achieved:				
	Started primary but did not complete	11%	8%	9%
	Completed primary	30%	51%	41%
	Completed secondary	11%	2%	6%
	Completed tertiary	4%	4%	4%
	Other (e.g. Arabic)	0%	4%	2%
	None	43%	32%	37%
Occupation:				
	Unemployed, not working	20%	45%	33%
	Professional/technical/managerial	9%	6%	7%
	Clerical	0%	0%	0%
	Sales and service	15%	28%	22%
	Skilled manual	4%	0%	2%
	Unskilled manual	0%	0%	0%
	Domestic service, paid	7%	0%	3%
	Agriculture	24%	0%	11%
	Student	22%	21%	21%
	Other	0%	0%	0%
Parental status:				
	Has children	74%	77%	76%
	Mean number of children	2.4	2.8	2.6

The sum of percentages for each characteristic, by location, may not necessarily add to 100% due to rounding.
[a]One Ebola survivor from Western Area rural was interviewed individually and socio-demographic data not available. Proportions for all characteristics, excluding religion and ethnicity, are based on data from 46 participants in Western Area Rural and 53 participants in Moyamba.
[b]Religion and ethnicity was available for only 61 participants. Proportions based on data from these 61 participants.
[c] Other ethnic groups were individually 3% of the respondents or less and included:Kono, Loko, Madingo, Sharbro.

Key Informant Interviews (KII)

In each district, 28 KIIs were conducted with health providers of different cadre, from various facilities. In Western Area Rural District, interviews were conducted in community health centres (CHC) in the communities of Campbell Town, Waterloo, John Thorpe, Lumpa, Hastings, and Rokel. In Moyamba District, interviews were conducted in public, private, and NGO-run facilities in Rotifunk, Moyamba Town, and Moyamba Junction. The number and cadre of informantsare illustrated in Table 2 over page.

Table 2: Number and cadre of key informants interviewed in each district			
Cadre	**Number (Moyamba)**	**Number (W/A Rural)**	**Total**
Maternal Child Health Aide (MCHA)	0	5	5
State-Educated Community Health Nurse (SECHN)	<5	<5	5
Traditional Birth Attendant (TBA)	<5	<5	5
Community Health Officer (CHO)	<5	<5	4
Midwife	<5	<5	2
Community Health Assistant (CHA)	<5	<5	2
Doctor	<5	<5	2
Volunteer Nurse	<5	<5	1
Nursing Aide	<5	<5	1
MSI staff member	<5	<5	1
Total	**14**	**14**	**28**
*Please note that in order to ensure confidentiality and following international best practice, we have notstated thenumber per cadre when this is less than 5 to avoid unintended disclosure of identity.			

Annex 3: Methods and detailed findings from a review of evidence on Emerging RMNCAH service gaps (Objective 3)

Objectives

This review assesses recent quantitative evidence available outside of this study on the availability of essential RMNCAH resources in Sierra Leone in terms of health services, human resources, and commodities. This includes identifying emerging RMNCAH service gaps and estimating their magnitude throughout the outbreak, including treatment and care of pregnant women and adolescents (EmONC, management of childhood diseases, etc.), as well as preventative care such as antenatal care (ANC), postnatal care (PNC), facility-based deliveries, family planning, and immunisation. The findings will be examined in light of the findings that will be reported under component 4 of the wider study.

Methods

A non-systematic review of key documents relating to the provision and use of RMNCAH services in Sierra Leone was conducted. A non-systematic literature review of quantitative evidence was conducted on the availability of essential RMNCAH resources and service uptake in Sierra Leone and provided a background to the current understanding of changes in service utilisation. A non-systematic literature review has been selected as many of the reports which we needed to include on this method were grey literature not readily available through on-line literature search strategies that are now commonly used for structured literature reviews. Thus, we used our on-the-ground knowledge and contacts in Sierra Leone to gather reports and presentations summarising findings from surveys that have taken place since the Ebola outbreak and that are relevant to this study. We also searched on line using Google and PubMed academic libraries to source additional information to identify published papers on service utilisation in Sierra Leone). The review included evidence from the onset of the Ebola outbreak exploring changes in terms of health services, human resources, and commodities.

The evidence presented in this report is taken from eight studies outlined in Table 1, including literature obtained via personal communication.

Table 1: Reports and articles included in the literature review for component 3

	Title of report/article	First author, year of publication	Dates the data covers
1	Sierra Leone Health Facilities Survey 2014: Revised Preliminary Findings	UNICEF, 2014	May – October 2014
2	Ebola virus disease in health care workers – Sierra Leone, 2014	Kilmarx, 2014	August – October 2014
3	A Rapid Assessment of Health Facilities for availability of RMNCAH Services in context of EVD	UNFPA, 2014	December 2014
4	Sierra Leone Demographic and Health Survey 2013	Statistics Sierra Leone, 2014	June – September 2013
5	MoHS data on Ebola and health workers (number of health workers and those that have succumbed to Ebola as of 18th December, 2014)	Kamara, 2014 (personal communication)	May – December 2014
6	WHO Ebola Situation Reports	WHO, 2014/2015	August 2014 – January 2015
7	Multi-Year Annual Survey to Monitor Programme Effectiveness of the "Improving Reproductive Maternal and Newborn Health (IRMNH) Programme"	HERA, 2014	May – June 2014
8	Rapid Assessment of Ebola Infection Prevention and Control Needs — Six Districts, Sierra Leone, October 2014	Pathmanathan, 2014	October 2014

Findings

The findings of the literature review are structured below according to four areas: 1) human resources; 2) RMNCAH services; 3) commodities; and 4) closure of health facilities.

1. Human resources

Based on the World Health Organization's (WHO) Ebola situation report on 21st January 2015, the cumulative number of Ebola cases among health workers in Sierra Leone is 296, with 221 deaths (WHO, 2015).

As of 18th December 2014, 2.2% of Sierra Leone's health personnel had died due to Ebola, i.e. 146 of 6603 total health personnel (Kamara, 2014). The number of deaths due to Ebola by health care worker (HCW) cadre, based on MoHS data, are outlined in Table 2.

Table 2: Number of deaths due to Ebola by HCW cadre, as of 18th December 2014

	Doctors	CHAs	CHOs	PH nurses	Nurse anaesthetist	Opthalmic nurse
Before Ebola	170	150	403	47	56	12
No. deaths due to Ebola	11	4	11	0	1	0

	Midwives	SRN	SECHN	MCH Aide	Nursing aide
Before Ebola	206	72	2751	1848	888
No. deaths due to Ebola	1	1	60	32	25

Source: Kamara, 2014

As of 31st Oct 2014, 199 of total 3,854 confirmed Ebola cases in Sierra Leone were among HCWs (Kilmarx, 2014). Both the proportion and number of confirmed cases among HCWs peaked in August 2014, and the highest number and percentage of confirmed cases among HCWs was in Kenema District (primarily from Kenema General Hospital). Kilmarx (2014) estimated that the incidence of confirmed EVD infection was 100 times higher in HCWs than in non-HCWs in Sierra Leone at that time (based on the number of HCWs in the National Health Strategic Plan 2010–2015 published in 2009).

Kilmarx (2014) also found that around 1 in 10 (12%) of HCW Ebola patients were dead at the time of reporting, which the authors suggest reflects inadequate access to medical care, case identification, and contact tracing.

2. RMNCAH services

Table 3 outlines the decline in utilisation of key RMNCAH services between May and September 2014, at peripheral health unit (PHU) level, based on data available from the UNICEF Health Facilities Survey, 2014 presentation. As far as we are aware, the in depth report from this is not yet available.

Table 3: Utilisation of key RMNCAH services at national level, 2013 to 2014

RMNCAH service	ANC4	Facility delivery	Penta 3	U5 children treated for malaria
Change over time between May-Sept 2014, national level (UNICEF, 2014)	-27%	-23%	-21%	-39%
2013 DHS national level coverage (SSL, 2014)	76%	54%	78%	37%*

Source: UNICEF, 2014; SSL, 2014 (p.111; p.114; p.129; p.186)
* % children with fever who took any ACT

Across Sierra Leone, the proportion of pregnant women who visited PHUs for their fourth antenatal care (ANC4) visit fell by 27% between May and September 2014 (UNICEF, 2014). The greatest drop across all districts was in Kambia, where ANC4 fell by 48%. Prior to the EVD outbreak, progress had been made on

increasing the uptake of antenatal care. According to the 2013 Demographic and Health Survey, more than three-quarters (76%) of women attended four or more antenatal care visits (SSL, 2014, p.111).

Similarly, the proportion of pregnant women who delivered in a PHU fell by 23% nationally between May and September 2014 (UNICEF, 2014). The districts with the greatest fall in deliveries were Port Loko and Kambia, each with a 41% decline in facility-based deliveries. However, prior to the EVD outbreak, progress had been made on increasing the uptake of deliveries in health facilities. According to the 2013 Sierra Leone Demographic and Health Survey, more than half of births (54.4%) took place in a health facility (SSL, 2014, p.114).

Nationally, the proportion of children who visited PHUs for key childhood immunisations (Penta 3) also declined by 21% between May and September 2014. Kambia district had the greatest drop of 49% (UNICEF, 2014). Through the same period, the proportion of under-five children treated for malaria fell by 39%.

UNICEF also found that more than two in five PHUs (41%) did not have ambulances on call for the referral of patients. However, almost 40% of PHUs had other means of transport available, such as motorbikes and boats.

Readiness to provide family planning

In October 2014, the percentage of district PHUs with injectables available ranged from 52% to 98% (UNICEF, 2014). Table 3(right) shows the proportion of government PHUs and hospitals surveyed in May/June 2014 that had no stock-outs of each method of contraception in the previous six months.

In terms of staff training, the UNFPA report, *Rapid Assessment of Health Facilities for availability of RMNCAH Services in context of EVD*, found that less than half of State Enrolled Community Health Nurses (SECHNs) and Maternal and Child Health Aides (MCHA) surveyed have been trained on family planning counselling (UNFPA, 2014, p.17).

Table 3: Percentage of government PHUs and hospitals with no stock-outs of method in previous six months

Method of contraception	% surveyed government facilities
Combined oral pill	80
Combined injectable	80
Progesterone-only injectable	56
IUD	72
Implant	75
Male Condom	82
Female condom	70
Spermicide	55
Female sterilisation	61
Vasectomy	63

Source: HERA, 2014, p.5

Readiness to provide youth friendly services

Based on HERA's 2014 survey, conducted between May and June, only a third (33%) of all (visited) facilities had at least one member of staff trained in youth-friendly services (HERA et al., 2014, p.7). This ranged from 55% of CHCs to 2% of MCH posts (Ibid.).

Further, only 11 of the 110 facilities assessed in the survey had been upgraded to provide overall youth-friendly services (Ibid., p.6). This means that 10% of facilities were able to meet *all* of the following components for provision of :

i. At least one trained health worker in adolescents and youth sexual and reproductive health
ii. Honoured privacy and confidentiality
iii. Education material for adolescents on reproductive health issues available onsite.

Findings from the UNFPA report also identify key weaknesses in staff training on youth friendly services. For example, only 38% of midwives, 16% of SECHNsand 4% of MCHAs surveyed had been trained on adolescent sexual health (UNFPA, 2014, p.17).

Readiness to provide reproductive health (RH) services in the context of Ebola

Infection prevention and control (IPC) measures take centre stage in reducing mortality and morbidity and even more so in light of reducing transmission of Ebola. The need to protect workers and patients in health facilities from contracting or transmitting Ebola and other infectious diseases is pivotal and there is an essential need to provide health workers with: safe water and sanitation facilities; adequate personal

protective equipment (PPEs); and training on management of suspected ebola cases; training on correct use of PPEs and training in safe waste management.

In terms of hand-washing, the UNICEF survey of PHUs conducted in October 2014 found that 98% of PHUs had water and 92% had soap for hand-washing (UNICEF, 2014). However, less than one in ten facilities had chlorine available.

UNICEF also found that not all health or non-health personnel working at PHUs had received training on EVD. For example, while more than 50% of nurses, midwives, MCHAs, and community health officers had received EVD training; around two out of every three other health personnel [22] and four in five non-health personnel [23] had *not* received this training.

PHUs also reported other challenges that were faced in delivery of services due to Ebola, including lack of PPEs, fear and misconception (reported among 100% of facilities in 8 districts) (UNICEF, 2014, slide 53).

These gaps in readiness are supported by findings from an assessment of the IPC needs in six districts in Sierra Leone, conducted by members of the CDC Ebola Response Team in October 2014 (Pathmanathan, 2014). This study identified insufficient numbers or absence of PPEs, safe patient transport, trained HCWs, and standardized IPC protocols. For example, only half (3) of the districts surveyed reported that HCWs had received basic training on IPC, including PPE use.

3. Commodities

Based on findings from UNICEF's Health Facilities Survey in October 2014, on average, around 80% of PHUs had each of the seven essential drugs[24] available in stock at the time of visit. Across districts, the proportion of PMTCT-providing PHUs stocked with both test kits and antiretroviral therapy, ART, ranged from 4% (Kenema) to 54% (Pujehun and Bo).

4. Closure of health facilities

On the day the UNICEF survey was conducted (October 2014), 48 out of the 1,185 PHU health facilities were closed (i.e. 4.1% of PHU health facilities, covering 263,196 people). The districts with the highest proportion of closed health facilities in the first half of October 2014 were Bombali (8.5% of the district's PHUs), Western Area (7.4% of the district's PHUs), and Bonthe (8.8% of the district's PHUs).The most common reason reported for current closure was lack of staff; almost half (45.8%) of closed PHUs reported that there were 'no staff' available. Other reasons reported for closure of facilities included quarantine, no patients, and no supplies.

[22] The presentation does not specify what cadres are included in the category 'Other health personnel'.
[23] The report does not specify who is included in the category 'Non-health personnel'.
[24] Amoxicillin, ACT, ORS, Zinc sulphate, Magnesium sulphate, injectables (contraception), Oxytocin.

Annex 4: Outline of items for domains assessed for QUIC-RH-EVD in December 2014

(adapted from FIT, QuIC-FIT and WHO standards (WHO, 2014a; WHO, 2014b)

Description	Items assessed
Domain 1. Staff Readiness	
Assesses facility staff (health and non-health staff)have been trained in infection prevention and control (IPC) methods since the onset of the Ebola outbreak.	• Have all health staff at facility received training on IPC • Have all non-healthstaff at facility received training on IPC • Have all health workers been trained in case identification and management of Ebola
Domain2. IPC Supplies	
Assesses whether the facility has adequate supplies (minimum numbers) of IPC equipment to reduce risk of onward transmission of Ebola from patients – facility staff – patients.	Do you have minimum supplies of: • Sharps bin on maternity W/Ad (1) • utility gloves (min. 30) • Exam gloves (min. 150 pairs) • Chlorine (any) • Liquid soap • Guidelines on how to prepare chlorine for different uses
Domain 3. Personal Protective Equipment	
Assesses whether the facility has a minimum number of items to enable personal protection of facility staff against contracting Ebola. One item (utility gloves) are the same as those assessed in enabler 2 and Additional A (denoted by [a]), but as per WHO standards, this is assessed here to give a clear picture of readiness.	Do you have minimum supplies of: • Boots / shoe covers (100 pairs) • Disposable non-permeablegowns (min. 30) • Head covers (min. 50) • Goggle and mask or face shield (min. 50) • utility gloves (min. 30) [a] • Heavy duty aprons (min. 10) • Waterproof boots • Exam gloves (min. 150 pairs) [a]
Domain 4. Ability to manage suspected Ebola cases	
Assesses proxy for staff confidence and facility readiness to manage RMNCAH or other users who may have Ebola-like symptoms. (item denoted by [b] also included in enabler 1, staff readiness)	• Guidelines on identification and management of suspected Ebola cases available • Dedicated area available for suspected Ebola cases • Staff training on Ebola identification [b]

Description	Items assessed
Additional Domain A. Ability to maintain RMNCH services	
Assesses facility readiness and availability through key proxy indicators to obtain snapshot of capacity to provide RMNCH services	Do you have: **FP** • Contraceptive pills • IUCD insertion kit **Maternity** • A designated ambulance for maternity cases (non-Ebola suspected cases – available within 2 hours) • All 4 tracer maternity drugs (oxytocin, MgSO4, gentamycin, ampicillin) • Exam. gloves (at least 150 pairs) [a] **Child health** • Penta 3 vaccine • Measles vaccine • ORS
Additional Domain B. Youth friendly services	
Assesses facility readiness to provide youth-friendly services according to the Government's standards. (This data not available through FIT or QuIC-FIT, so data collected on 20-21 January 2015)	• Does your facility have any staff trained in youth-friendly services? • Are IEC materials available for ARH? • Do you have either a private consultation room for adolescents or a special place for counselling adolescents?
Additional Domain C. Laboratory	
Assesses readiness of laboratories to provide services and protect lab staff from Ebola (Lab RMNCH readiness assessed and reported through FIT)	Are the following available in the lab: • Water – veronica bucket or tap • Soap • Chlorine • Examination gloves
Additional Domain D. Infrastructure	
Assesses availability of facility readiness to provide safe water and sanitation to dispose safely of contaminated waste and enable hand washing.	• Running water (FIT) or veronica bucket • Waste pit – 2 m deep with fence [or could have incinerator question] – maybe take from FIT

Annex 5: Development of an Android App for QuIC-RH-EVD

Overview: An android application (App) has been developed to support the data and analysis for assessing facility availability and readiness to provide RMNCAH services in the context of Ebola. Data from the QuIC-RMNCAH-EVD data can be entered and analysed through a QuIC mobile phone App which can be used on any android device. To ensure feedback of results is rapid the QuIC App auto-generates the traffic-light scores on the mobile phone. These results can be shared with health workers at the end of the data collection call so health facility staff are the first to know how well their facility performed.

The App can be finalised once stakeholders in country have agreed upon the items and domains to be collected and the types names and location of facilities to be assessed in future are agreed.

The DfID-funded Evidence for Action, E4A, programme in Sierra Leone is supported by both DfID and NORAD to collect, analyse and disseminate EmONC readiness data using the "QuIC FIT" approach. This approach is coherent with the FIT approach but adopts a different methodology and uses proxy measures to assess ability to perform EmONC signal functions, as well as assessing proxy measures to assess facility enablers. The approach is based on collecting data by telephone and using an android application called CommCare to collate data. This data is then transformed into scorecards. Following a period of testing and orientation, real-time QuIC FIT EmONC data has been available quarterly from 3 districts of Sierra Leone – the focal districts for the E4A programme (Kenema, Bonthe, Koinadugu) – and one additional district, Western Rural, since early 2014. QuIC FIT is implemented in partnership with the MoHS, which had been developing a roadmap for expanding QuIC FIT and integrating results more thoroughly into RCH Directorate monitoring and planning activities.

Following the onset of Ebola, development of the roadmap stalled and the MoHSQuIC FIT Coordinator was shifted onto Ebola surveillance activities. Despite this, the QuIC FIT Research Lead at E4A continued telephone collection of QuIC FIT EmONC data. In July 2014, nationwide district level FIT assessments were undertaken for the first time in a year. Ebola meant that FIT could not be provided for Kenema district, so QuIC FIT data was used instead – contributing to the first combined FIT and QUIC FIT report. This strengthened awareness within the wider MoHS of the potential of the QuIC FIT approach as an alternative to face-to-face data collection.

The QuIC FIT has been adapted to create the QuIC EVD. QuIC EVD is designed to:

- Provide a context specific, cost-effective, fast, consistent and responsive health facility data collection system to improve readiness to manage Ebola and availability of resources for RMNCAH in all 78 designated EmONC health facilities in Sierra Leone.
- Provide fast, frequent and accurate data on Ebola and RMNCAH readiness in all 78 EmONC designated health facilities in Sierra Leone.
- Share and communicate easy-to-interpret EVD preparedness and RMNCAH readiness results in ways which prompt immediate action to improve service readiness by MoHS, district officials, health facilities, partners, communities and other RMNCAH stakeholders.

As part of this exercise, the QuIC FIT Facility Readiness mobile phone application has been adapted into a QuIC EVD and RMNCAH mobile application to collect and upload data into a database. This data can be reported in a scorecard or dashboard format providing a national picture of EmONC facilities' readiness to deliver RMNCAH services in the context of Ebola. This will enable the collection of data from the 78 EmONC designated health facilities over a 5-7 day period, which can be made into scorecards and disseminated electronically and in print form within 5 days of collection, via existing Ebola and RMNCAH information networks (e.g. Ebola Operations Centres, DHMTs, UNICEF, partners and other stakeholders).

Annex 6: Findings from the RH-EVD-QuIC analysis, December 2014 to January 2015 (Objective 4)

Scorecard showing RMNCH readiness and availability of 78 EmONC-designated facilities in Sierra Leone in December 2014, by facility, based on 8 criteria

DISTRICT	HEALTH FACILITY	RMNCH SERVICES
Bo	**Bo Govt Hospital**	6
	Dambala CHC	6
	Jemdeh CHC	6
	Koribondo CHC	7
	Ngalu	7
	Sunduya	7
Bombali	**Makeni Govt hospital**	
	Bat Kanu	2
	Binkolo CHC	5
	Kagbere CHC	7
	Kalangba CHC	6
	Kamabai CHC	6
Bonthe	**Bonthe Govt Hospital**	4
	Bendu Cha	5
	Gambia	3
	Madina	7
	Tihun (Jennifer Sargie)	5
	Yonni CHC	7
Kailahun	**Govt Hospital**	7
	Buedu CHC	8
	Daru CHC	8
	Jojoma CHC	4
	Koindu	6
	Pendumbu CHC	7
Kambia	**Kambia Govt hospital**	
	Baimu Munu CHC	8
	Kamasa CHC	8
	Kukuna	6
	Mambolo CHC	7
	Mapotelon CHC	1
Kenema	**Kenema Govt Hospital**	6
	Baoma chc	7
	Gegbwema	8
	Joru CHC	7
	Largo CHC	7
	Lewima (or Levuma)	7
Koinadugu	**Kabala Govt**	5
	Bendugu CHC (Mongo CHC)	7
	Kondembaia	7
	Kurubola	7
	Sinkunia CHC	6
	Yiffin CHC	7

DISTRICT	HEALTH FACILITY	RMNCH SERVICES
Kono	**Koidu Govt Hospital**	6
	Gandarhun CHC	7
	Kayuma CHC	6
	Kombagedeh	7
	Kongama CHC	6
	Serafe CHC	7
Moyamba	**Govt Hospital**	4
	Gbangbatoke CHC	6
	Moyamba Junction CHC	7
	Rotifunk CHC	4
	Shenge CHC	7
	Taiama CHC	5
Portloko	**Govt Hospital**	
	Lunsar CH	3
	Mange CHC	6
	Masiaka CHC	8
	Petifu CHC	6
	Rogbere	4
Pujehun	**Pujehan Govt Hospital**	
	Bumpeh	6
	Gbandapi	5
	Potoru CHC	5
	Sahn CHC	6
	Zimi CHC	7
Tonkolili	**Tonkolili Govt Hospital**	
	Bumba CHC	7
	Hinistas CHC	5
	Makali CHC	6
	Masimgbi CHC	7
	Yele CHC	7
W/A Rural	**PCM Hospital**	6
	Goderich CHC	5
	Hastings CHC	5
	Regent CHC	6
	Ross Road CHC	7
	Waterloo CHC	5

KEY:

	8
	6-7
	4-5
	0-3
	Insufficient data to score

Scorecard showing Youth Friendly Services readiness and availability among 78 EmONC-designated facilities in Sierra Leone in January[25]2015, based on 3 criteria

DISTRICT	HEALTH FACILITY	YOUTH FRIENDLY SERVICES
Bo	**Bo Govt Hospital**	2
	Dambala CHC	2
	*Jemdeh CHC	3
	Koribondo CHC	2
	Ngalu	
	*Sunduya	2
Bombali	**Makeni Govt hospital**	2
	Bat Kanu	2
	Binkolo CHC	2
	Kagbere CHC	3
	Kalangba CHC	3
	Kamabai CHC	2
Bonthe	**Bonthe Govt Hospital**	2
	Bendu Cha	3
	Gambia	3
	Madina	3
	Tihun (Jennifer Sargie)	3
	Yonni CHC	3
Kailahun	**Govt Hospital**	2
	Buedu CHC	2
	Daru CHC	1
	Jojoma CHC	2
	Koindu	1
	Pendumbu CHC	2
Kambia	**Kambia Govt hospital**	1
	Baimu Munu CHC	1
	Kamasa CHC	2
	Kukuna	2
	Mambolo CHC	1
	Mapotelon CHC	2
Kenema	**Kenema Govt Hospital**	1
	Baoma CHC	3
	*Gegbwema	
	Joru CHC	2
	*Largo CHC	3
	*Lewima (or Levuma)	3
Koinadugu	**Kabala Govt**	2
	Bendugu CHC (Mongo CHC)	0
	Kondembaia	2
	Kurubola	0
	Sinkunia CHC	3
	Yiffin CHC	1

DISTRICT	HEALTH FACILITY	YOUTH FRIENDLY SERVICES
Kono	**Koidu Govt Hospital**	2
	Gandarhun CHC	2
	Kayuma CHC	3
	Kombagedeh	1
	Kongama CHC	
	Serafe CHC	2
Moyamba	**Govt Hospital**	3
	Gbangbatoke CHC	1
	Moyamba Junction CHC	3
	*Rotifunk CHC	2
	*Shenge CHC	3
	*Taiama CHC	2
Portloko	**Govt Hospital**	
	Lunsar CH	1
	Mange CHC	3
	Masiaka CHC	3
	Petifu CHC	3
	Rogbere	1
Pujehun	**Pujehan Govt Hospital**	1
	Bumpeh	1
	Gbandapi	1
	Potoru CHC	1
	Sahn CHC	1
	Zimi CHC	0
Tonkolili	**Tonkolili Govt Hospital**	2
	Bumba CHC	0
	Hinistas CHC	0
	Makali CHC	2
	Masimgbi CHC	2
	Yele CHC	3
W/A Rural	**PCM Hospital**	0
	Goderich CHC	3
	*Hastings CHC	3
	Regent CHC	3
	Ross Road CHC	0
	*Waterloo CHC	1

KEY:

	3
	2
	1
	0
	Insufficient data to score

Facilities marked with an asterix (*) are one of the 19 facilities across Sierra Leone that have been upgraded to deliver Adolescent Friendly Heath Services. This sample includes 10 of the upgraded facilities, of which 5 rated green, 3 rated yellow, 1 rated amber, and 1 had insufficient data to score in this assessment. The remaining 59 facilities included in the sample are EmONCs that are not designated AYFS; this assessment of their youth friendly readiness is based on more loosely defined criteria, outlined in Annex 4. UNFPA also noted that only two CEmONCs in Sierra Leone formally offer youth friendly services (Makeni and Kenema). All the data reported here are based on responses by a contact at each health facility.

[25]Data for 'Youth Friendly Services' were collected in January 2015; for all other domains were collected in December 2014.

Annex 7: Elaboration of Methods and Findings to identify emerging RMNCAH service gaps, estimate their magnitude throughout the outbreak and to estimate the impact of the reduction of access to Reproductive Health services to EVD (Objectives 5 & 6)

Introduction

This report is prepared as an annex to the *Synthesis Report for Rapid assessment of Ebola impact on reproductive health services and service seeking behaviour in Sierra Leone* and needs to be framed in the context of the overall study background and objectives. The purpose of this report is to provide details of the methods and findings to achieve two objectives as set out in the terms of reference for the whole study, ie.

Objective 5: Identify emerging RMNCAH service gaps and estimate their magnitude throughout the outbreak; and

Objective 6: Estimate the impact of the reduction of access to Reproductive Health services because of the EVD Outbreak on maternal mortality, infant mortality, and unplanned pregnancies.

The findings are taken into consideration in light of the whole study, and inform the discussion and recommendations as presented in the synthesis report.

Objectives

Objective 5: Identify emerging RMNCAH service gaps and estimate their magnitude throughout the outbreak

Objectives 3 and 4 are analysed the extent to which inputs to the health system have deteriorated over the course of the outbreak, and whether this has hampered health facilities' ability to provide EMONC signal functions. Following on from there, Objective 5 analyses whether and the extent to which the outbreak has caused a decrease in population coverage of key RMNAH interventions. As demonstrated in Objective 1, this may have been caused by women's fear of contracting EVD through contamination in health facilities, women's understanding that the quality of routine services would have decreased as a consequence of the outbreak (as shown in objectives 3 and 4), or as a result of women being turned away from services by providers unable to keep general services going in the midst of the EVD crisis.

Objective 6: Estimate the impact of the reduction of access to Reproductive Health services because of the EVD Outbreak on maternal mortality, infant mortality, and unplanned pregnancies

Objective 6 calculates the impact of reduced population coverage on the number maternal, newborn and children's deaths, as well as unplanned pregnancies. It demonstrates that the EVD epidemic has not only resulted in direct morbidity and mortality as a result of the virus itself, but has also caused deteriorations in reproductive, maternal, newborn, child and adolescent health through decreased utilisation of health services.

Methods

Methods for objective 5

Objective 5 aims to calculate the extent to which population coverage of key RMNCAH interventions has decreased as a result of the EVD epidemic. The optimal way of calculating this would have been

to conduct a large household survey such as the Demographic and Health Surveys (DHS) in the months after the Ebola outbreak to ask women whether they accessed RMNCAH interventions, and to compare findings with the DHS conducted in June-October 2013.

Given the timescale, resources, and infection risks, this was not possible. Instead, we assumed that the change in the number of RMNCAH-related health visits reported in HMIS after the outbreak compared to before the outbreak was representative of the change in population coverage for RMNCAH services.

Assessing before/after trends in the number of RMNCAH visits as reported in HMIS
We first had to establish whether there had, in fact, been a drop in utilisation of key RMNCAH services as a result of the outbreak. A simple comparison of utilisation levels, as obtained from HMIS, between the pre-EVD period and the post-EVD period 2013 and September 2014 could not answer this question because of the following factors. Firstly, it is possible that there are seasonal variations in utilisation that are independent of the outbreak, for example due to the rainy season from June to October. Secondly, utilisation might have been increasing or decreasing independently of the outbreak. Thirdly, HMIS data quality is poor, causing variations that are not connected to the outbreak.

In order to circumvent these issues, we used a statistical technique called linear regression analysis, which attempts to specify the relationship between two variables by plotting them against each other and drawing a line that best fits the available data. In this case, because we were interested in the impact of an event, the EVD outbreak, which started at a specific point in time, we used a more specific technique called segmented linear regression (Lagarde, 2011). This technique involves calculating two lines of best fit: one describing trends before the start of the outbreak, and one describing trends after the start of the outbreak. Regression analysis enables us to draw conclusions based on limited and imperfect data. However it also uses statistical techniques to estimate the extent to which such conclusions are reliable and likely to reflect the reality of the situation. This extent is expressed through the concept of statistical significance – where a result is not statistically significant, we cannot be confident that the trends we observe reflect an underlying reality.

We therefore conducted a segmented linear regression analysis on the number of RMNCAH visits delivered in each district, estimating the change in the level and trend in the number of visits held after the start of the EVD outbreak (set depending on when the first case was reported in each district according to WHO, and in May for the national analysis). The 5 RMNCAH services selected from the HMIS data were chosen for their importance in enabling good health outcomes for women and children: antenatal care visits, facility delivery, postnatal care visits, family planning visits, and Penta 3 vaccinations. Data was obtained from HMIS, for each district (Western Area was a single district), for each month between January 2013 and September 2014. We conducted such analysis for each district[26] and each service separately, using each of the districts' data only, and subsequently conducted a country wide analysis[27] which included all districts' data points for that

[26]**Technical detail**: Using a Ordinary Least Square (OLS) regression with segmented analysis as described above. Where a Durbin-Watson test showed there was auto-correlation between the error terms (i.e. where data points in subsequent months were likely to be predicted by previous months), we used a Prais estimator to correct this.
[27]**Technical detail**: For the country-wide analysis, we did not use an OLS regression but a random effects model with segmented analysis. This is important because OLS assumes that each observation is independent, whereas here data points from a specific district over time are more likely to be similar than data points from other districts. A random effects model controls for this, while also allowing for the fact that the impact of the

service together. Before conducting analysis, we also conducted quality checks by observing trends in each district and excluded outliers in the data using expert review.

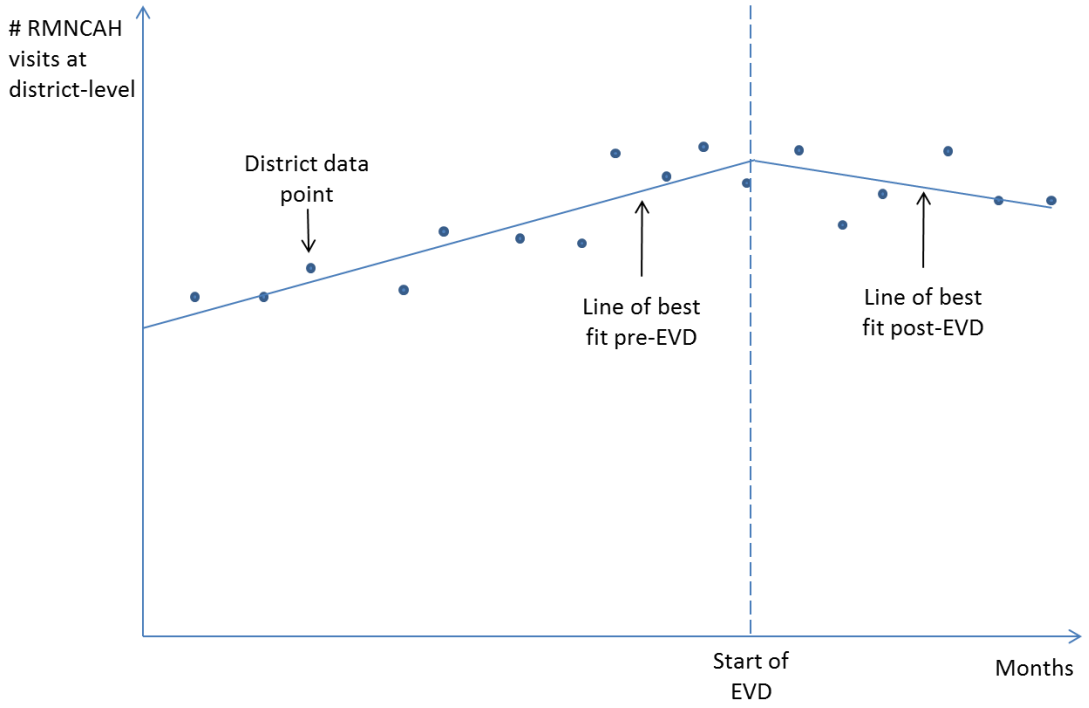


Figure 10: Diagram illustrating use of segmented regression analysis

Calculating the average number of RMNCAH visits in the year before and the year after Ebola
In order to translate the change in the number of RMNCAH visits as a result of the EVD epidemic into population coverage, we first had to use the results from the regression analysis in order to compute an average level of utilisation in the year before the epidemic compared to average utilisation after the epidemic, for each of the 5 services. Summarising results year by year was important in order to be able to feed the results of objective 5 into objective 6, where the impact model works on the basis of yearly demographic projections. We defined the pre-epidemic year as May 2013-April 2014 and the post epidemic year as May 2014-April 2015. The average utilisation was calculated using a simple mean, i.e. level of utilisation in each month divided by the number of months. In order to circumvent the data quality issues, the average was calculated not on the basis of actual observed data, but on the data predicted by the line of best fit. Finally, as we did not have data for October 2014-April 2015, it was assumed that the number of visits conducted in each of those months was equal to the number of visits conducted in September. We believe this is a fairly conservative assumption as there has been more health system investment in the months since September which we suspect have improved utilisation.

Calculating population coverage in the post-ebola year
Ultimately, we were interested in understanding not the change in utilisation as reported in HMIS, but the change in population coverage, as that is what matters for health outcomes. We already knew the levels of population coverage of the key RMNCAH interventions in the time before the EVD epidemic, as a DHS was conducted in June-October 2013. In order to calculate population coverage

epidemic on utilisation is partly accounted for by unobserved differences between districts. We used a Hausman test to verify the appropriateness of a random effects model.

after the EVD epidemic, we started by dividing the pre- and post-Ebola year utilisation levels by the number of the target population in that year, which was obtained from the 2012 UN Population Prospects and regional demographic assumptions on abortions, miscarriages and stillbirths. For example, the number of facility deliveries was divided by the number of women delivering in that year.

If the HMIS perfectly captured all facility deliveries in the country, this would have been enough to estimate population coverage in that year. However users of private services may not be reported or low data quality may mean that some users go unreported. We therefore decided to use the change in "number of visits divided by target population" and to apply that change to the baseline population coverage in order to deduce the post-ebola population coverage.

The validity of this approach relies on an assumption that while population coverage and the number of RMNCAH visits reported in HMIS are not equal, the reasons why they are not equal (data quality, private sector use), stay constant over time. Furthermore, such a methodology ignores the fact that population coverage as measured in DHS reflects coverage over the past 3 years. As a result, baseline coverage for 2013 may in fact be higher than what is reported in DHS, on the assumption that uptake of facility delivery has increased between 2010 and 2013. This means that when we apply a percentage change to this lower-than-reality baseline, the number of percentage points difference between pre- and post- Ebola situation will be lower than reality (although the proportional difference will be the same).

Population coverage of what?

As explained above, we had HMIS utilisation data from 5 tracer services: antenatal care, facility delivery, postnatal care, family planning, and Penta 3 vaccinations. The change in the number of visits for a tracer service was applied to the coverage of interventions as described below in Table 1. For example, the change in the number of ANC4 visits was applied not only to the change in the population-level coverage of ANC 4 visits but also to the change in coverage of a number of other interventions. This was done firstly in order to make best use of the LiST model, which computes impact on the basis of many interventions, more than we had data for, and secondly to relate the number of visits (e.g. family planning visits) to an indicator which we could directly use in LiST, (i.e. the contraceptive prevalence rate).

Table 1: HMIS tracer categories and corresponding interventions

HMIS categories	Coverage categories
Family Planning	Contraceptive Prevalence Rate (modern methods)
ANC4	ANC from skilled provider
ANC4	ANC 4
ANC4	Tetanus Toxoid (2+ injections)
ANC4	Intermittent Preventive Treatment of Malaria in Pregnancy (2+ doses at ANC)
Facility delivery	Skilled Birth Attendance
Facility delivery	Facility Delivery
PNC	Clean Postnatal Practices/Baby attends PNC within 2 days
Penta 3	DPT Vaccine
Penta 3	BCG Vaccine
Penta 3	Polio Vaccine
Penta 3	Measles Vaccine

Summary of methods for objective 6

We modelled the impact of the change in population-level coverage between the pre-ebola and post-ebola years by using the Lives Saved Tool (LiST) and FamPlan (which is part of the same software package: Spectrum). Spectrum, developed by the Futures Institute and the John Hopkins School of Public Health, is publicly available. It calculates the change in impact of population coverage levels of key RMNCH interventions on maternal, newborn and child mortality and on demographic outcomes. LiST does this through applying the life-saving effectiveness and coverage of given interventions to background demographic projections, which are influenced by the data inputted into FamPlan.

Comparing impact to a business as usual scenario
It is important to note at this stage that we were not interested in the higher number of deaths in the post-Ebola year compared to the pre-Ebola year, but rather the number of deaths in the post-Ebola year compared to a hypothetical situation where the tragic Ebola epidemic had not occurred. The distinction matters because in the absence of the Ebola epidemic, coverage levels for 2014-2015 would likely have been greater than coverage levels for 2013-2014. Therefore merely comparing post- and pre-situations actually underestimates the true impact of the Ebola epidemic.

In order to calculate coverage (and therefore deaths) in the 2014-2015 "business as usual scenario", we assumed that the pre-Ebola trend calculated using segment linear regression, as described above, continued into the following year. We used the continuation of this trend to predict the average number of RMNCAH visits for the year 2014-2015, which was then converted to population coverage using the methods described above.

Within LiST, we therefore inputted the relevant measures of population coverage into LiST in order to calculate two scenarios for each type of service and in each locality, over the period 2013/14 and 2014/15: "Business as usual" and "Ebola epidemic". The impact of the EVD epidemic was the difference in deaths (or unplanned pregnancies) between 2014/15 business as usual scenario and the 2014/15 Ebola epidemic scenario.

Estimating unplanned pregnancies
Neither the FamPlan nor the LiST tool enables a direct calculation of unplanned pregnancies. Rather, from inputting the contraceptive prevalence rate, FamPlan can calculate unmet need for modern family planning services. We converted unmet need to the number of unplanned pregnancies using the following formula:

Unplanned pregnancies[28] = (A) Women who are using contraceptives but whose contraceptives fail + (A) Women who do not use contraception, do not want to get pregnant, and who do get pregnant

(A) Women whose contraceptives' fail = ∑ [WRA * Prevalence of Method x * (1 - Effectiveness of method x)]
(B) Women who have an unmet need who become pregnant = WRA * % unmet need * pregnancy rate (31%)

[28]Where ∑ means "Sum" and WRA stands for Women of Reproductive Age. Number of WRA was obtained from the LIST background demographic projections; prevalence of methods and effectiveness of methods was obtained from LIST default data; the pregnancy rate in the absence of contraception is a common global assumption.

Findings[29]

Findings for Objective 5

Impact of EVD epidemic on number of RMNCAH visits

Country level

At the country-level, the regression analysis showed that for all five tracer services except family planning services, there was a negative change in the trend of the number of health care visits after the start of the EVD epidemic. Results for family planning services were not statistically significant, meaning that there is no statistical evidence to show that the trend in the number of family planning visits changed after the start of the EVD epidemic.

We believe that the lack of significance for family planning services is due to the very wide variation in the number of services reported in HMIS both before and after the epidemic, which is likely due to poor data quality.

Health care service	Predicted value in May 2014	Average decrease, per month, per district, in the number of visits between May and September 2014	Predicted average % decrease in the number of visits between May and June 2014[30]
Antenatal care 4th visit	1,470	-117	-8%
Facility delivery	1,393	-104	-7%
Postnatal care visit	2,519	-160	-6%
Family planning visit	4,802	Change not significant	Change not significant
Penta 3 vaccination	1,572	-88	-6%

District level

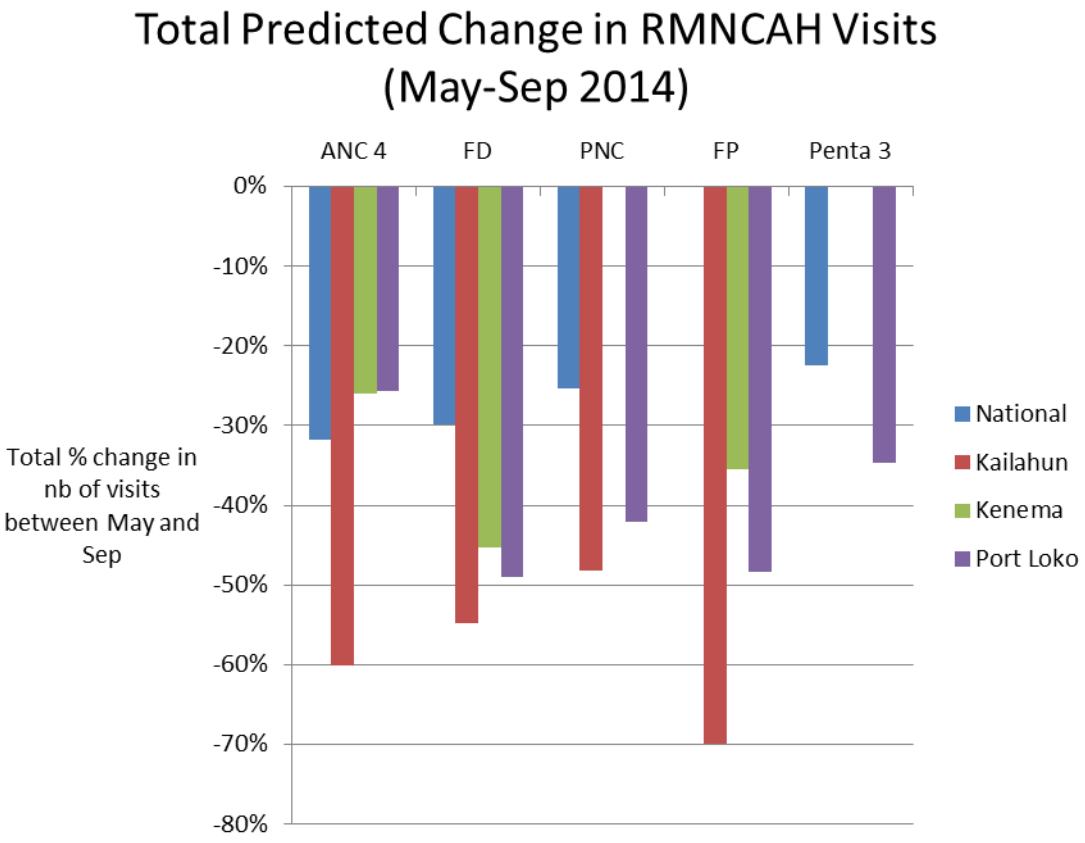
Few districts showed statistically significant results for any health care service (see Annex 1). This is not surprising, in that the analysis at the district level had many fewer data points (thereby making it harder to establish a statistical pattern); many districts had very few data points after the start of the epidemic, either because they were missing data for August or September, or because the EVD outbreak was declared in the later months.

Furthermore, the timing at which the outbreak was specified in the analysis matters for the results. While we expected to see a decrease in the number of visits as soon as the first case of EVD was reported in that district, it may be that utilisation had started to fall before then (as a consequence of general fear of EVD in the country) or later (as a result of one's close friends and family contracting the virus, or as a result of health professionals turning away patients due to fear or lack of resources). It may be that such factors introduced "fuzziness" into the statistical analysis.

[29] Findings are based on statistically significant results only. Please see Appendix 4 for findings that include non-statistically significant results

[30] The percentage change will change month on month because predicted change is expressed as an absolute value – i.e. it is predicted that the number of ANC 4 visits will decrease by 117 visits every month, implying that the percentage change will increase over time because the baseline to which it is applied will decrease over time.

Districts with strong, statistically significant results were Kailahun, Kenema, and Port Loko, where the outbreak was declared early and where, as a result, more data points were available for the estimation of the "post-EVD" trend. Results for these districts are reported below. Where results were significant, we can see that the negative impact of the EVD outbreak on uptake of RMNCAH services was large, with Kailahun being particularly affected. Across services, the impact varies according to the locality. However it appears that facility delivery has been highly affected both nation-wide and in the selected district s.



Source data for "Total Predicted Change in RMNCAH visits, (May 2014-Spetember 2014)"

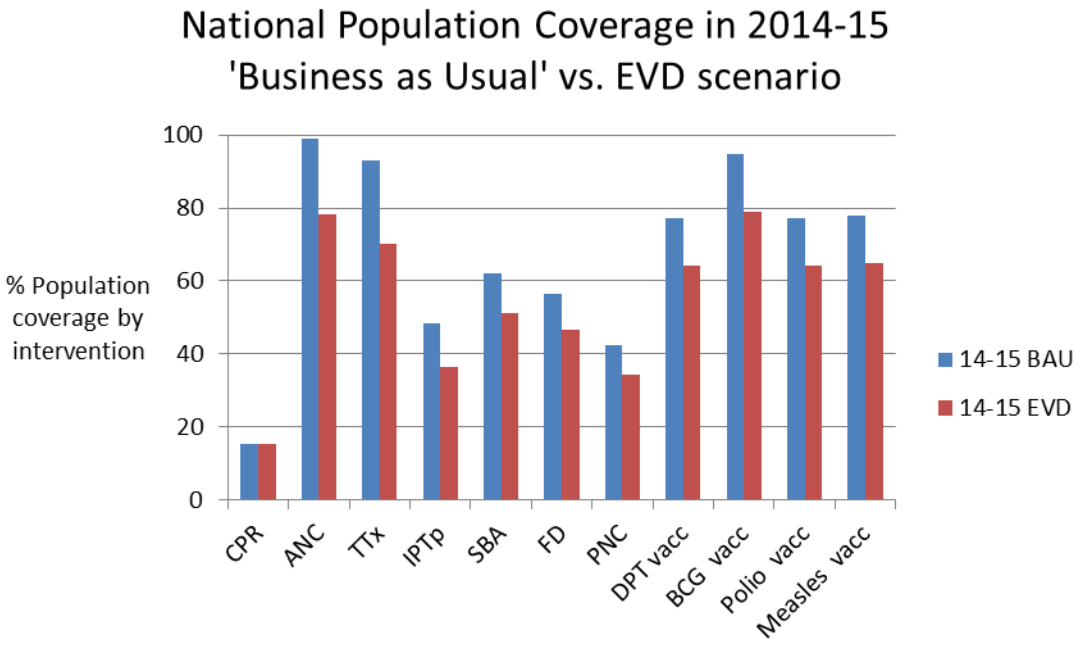
	Sierra Leone	Kailahun	Kenema	Port Loko
ANC 4	-32%	-60%	-26%	-26%
FD	-30%	-55%	-45%	-49%
PNC	-25%	-48%	0	-42%
FP	0	-70%	-36%	-48%
Penta 3	-23%	0	0	-35%

Impact of EVD epidemic on population coverage

We calculated the impact of the EVD epidemic on population coverage nation-wide and in each of the three districts. The results shown in the graph below (see Annex 2 for similar graphs by district) estimate what would be the average population-level coverage (as if measured by DHS) for the year starting in May 2014 and ending in April 2015, under a "business as usual" scenario (i.e. continuing

the positive trends seen previously to the outbreak) compared to an "EVD scenario" (i.e. coverage decreases in line with the number of health care visits divided by population.

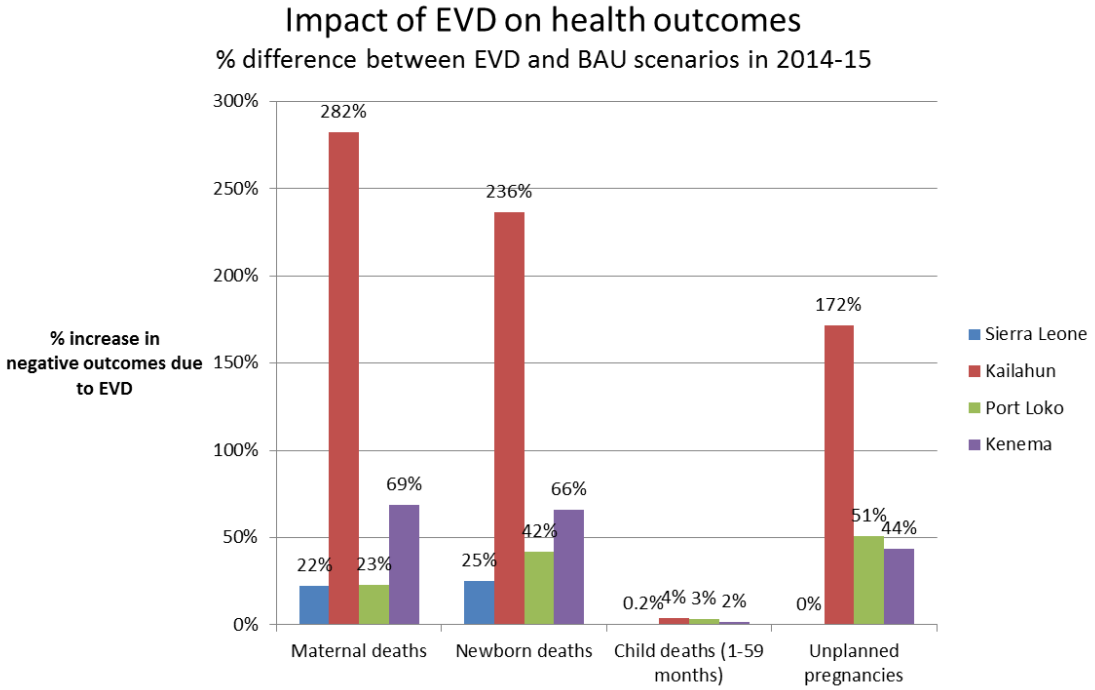
The main reason why the impact appears smaller here than in the previous section is that the change between the baseline (13/14) and the impact year (14/15), (not shown here), is calculated with respect to an annual average. The average for the year 13/14 is lower than the May 2014 value, and the average for the year 14/15 is higher than the September 2014 value, resulting in less distance between the two values. For example, the difference between May 14 and Sep 14 is a 30% decrease in the national analysis, while the difference between the average for 13/14 and 14/15 in the EVD scenario is a 13% decrease. Note that the difference between the average for 13/14 and 14/15 in the Business as Usual (BAU) scenario is a 4% increase, meaning that the difference between EVD and BAU is 17%. The graph below shows no impact for Contraceptive Prevalence Rate as a result of the change in the number of family planning visits not being significant.



Theme six findings

Impact of EVD epidemic on maternal, newborn, and child deaths, and unplanned pregnancies

The impact of the EVD epidemic on health outcomes is shown in the bar graphs below. We see a large impact for maternal and newborn deaths in all localities, and a large impact for unplanned pregnancies at the district level (no impact at national level due to lack of significance). Kailahun saw the biggest impacts proportionally speaking, due to large changes in utilisation and therefore in population coverage. % Difference for each health outcome between 2014/15 under the EVD scenario vs. the business as usual scenario, is shown for each locality in Annex 3.

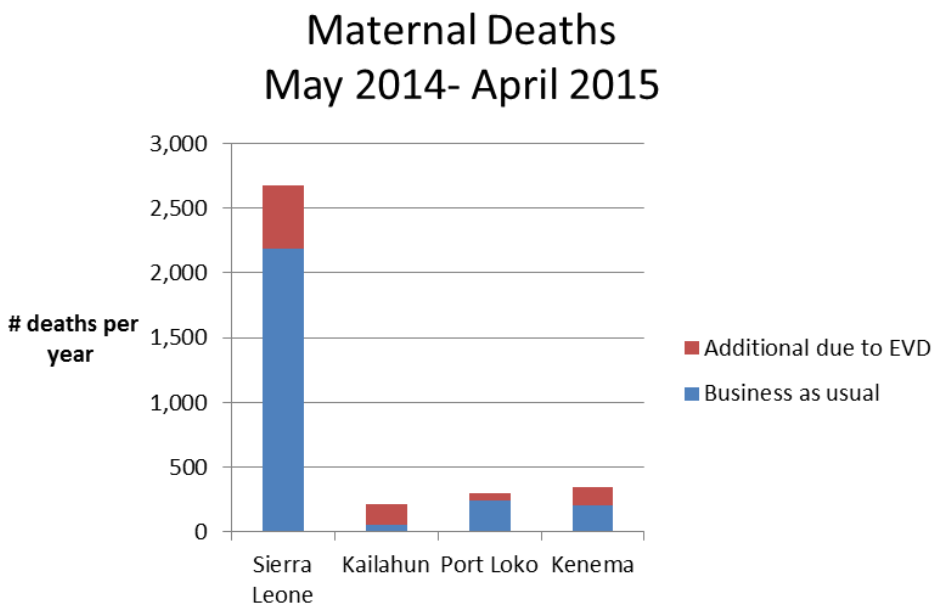


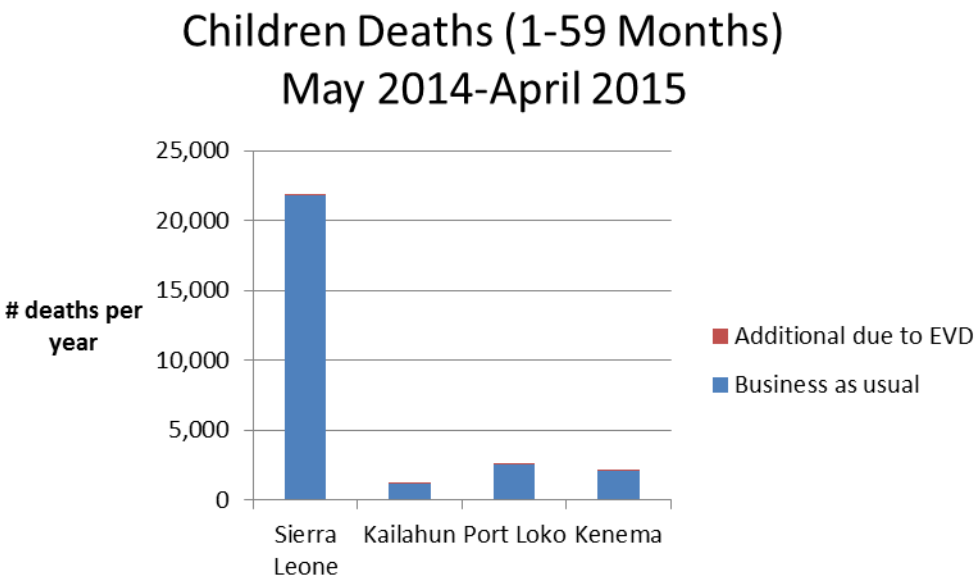
Interpreting results

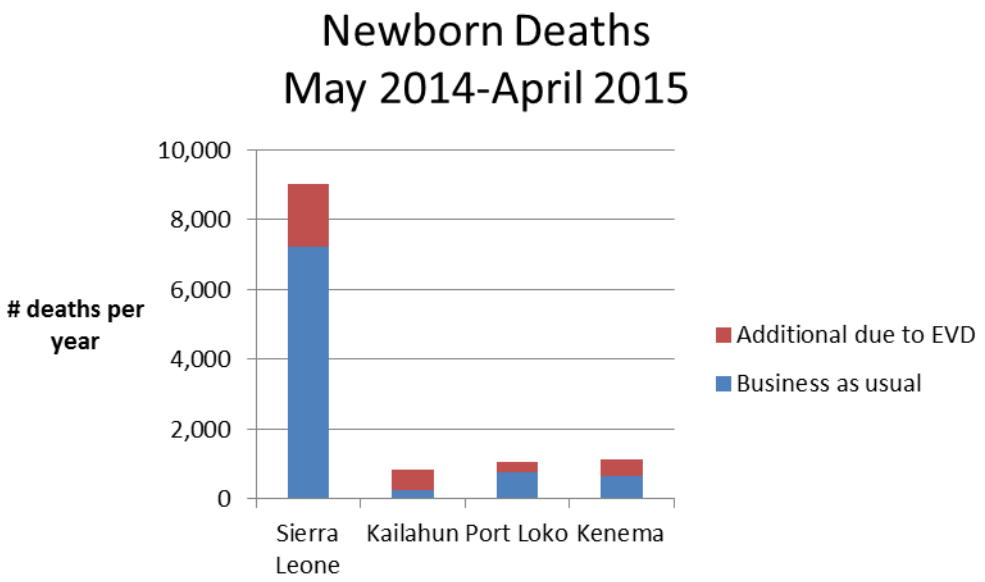
The final impact for each locality and health outcome was affected by the extent to which the level of coverage for each service was reduced in the EVD scenario compared to the 'business as usual' scenario. This varied by service, and in each locality. The final impact also depended on the level of effectiveness of each service and the susceptibility of the population to the cause of death addressed by that service – for example, if the level of coverage for a given service had dramatically reduced, but that service was not very effective at saving lives, or the population was not susceptible to dying from the cause it was addressing, then the impact on outcomes was low.

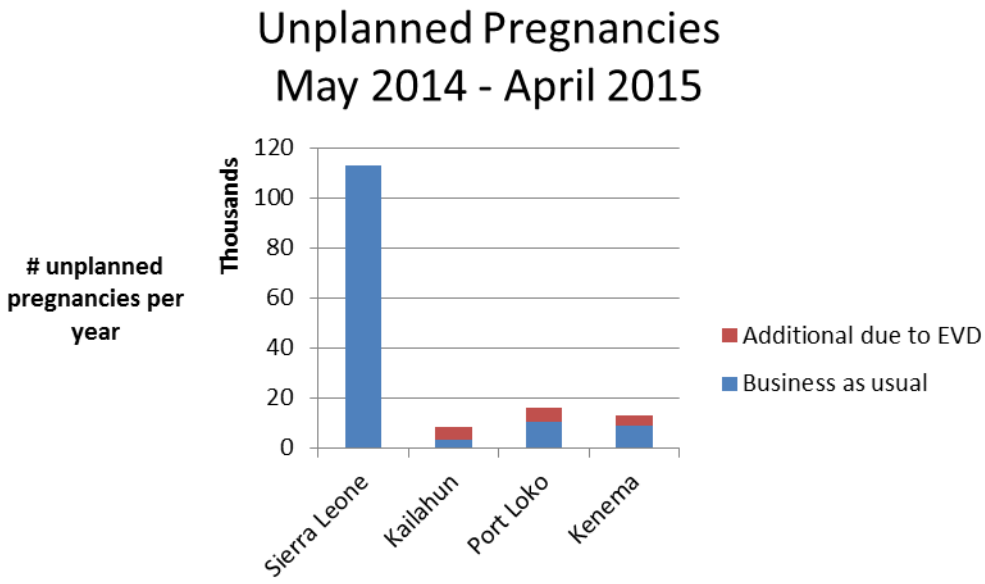
For example, the main causes of death for children are malaria, pneumonia and diarrhoea, meaning that while vaccines are important, the fact that we did not model a decrease in the coverage of curative interventions was a limitation to capturing the full effect of the EVD epidemic on child deaths. It was a challenge to use HMIS data on the number of curative visits for child health in our analysis as distinguishing EVD from non-EVD visits would have been extremely challenging. As a result, the estimated impact on child deaths as a result of lower utilisation of routine child health services is not very reliable.

The number of deaths was calibrated on the basis of (1) baseline mortality, which was retrieved from the 2013 DHS and (2) population projections from the UN Population Prospects 2012. There might therefore be some differences between the numbers below and commonly accepted levels of deaths in-country, which is why it is best to interpret the results in terms of the degree of change rather than in absolute values.


Maternal Deaths
May 2014- April 2015
deaths per year
3,000
2,500
2,000
1,500
1,000
500
0
Sierra Leone
Kailahun
Port Loko
Kenema
Additional due to EVD
Business as usual


Children Deaths (1-59 Months)
May 2014-April 2015
deaths per year
25,000
20,000
15,000
10,000
5,000
0
Sierra Leone
Kailahun
Port Loko
Kenema
Additional due to EVD
Business as usual





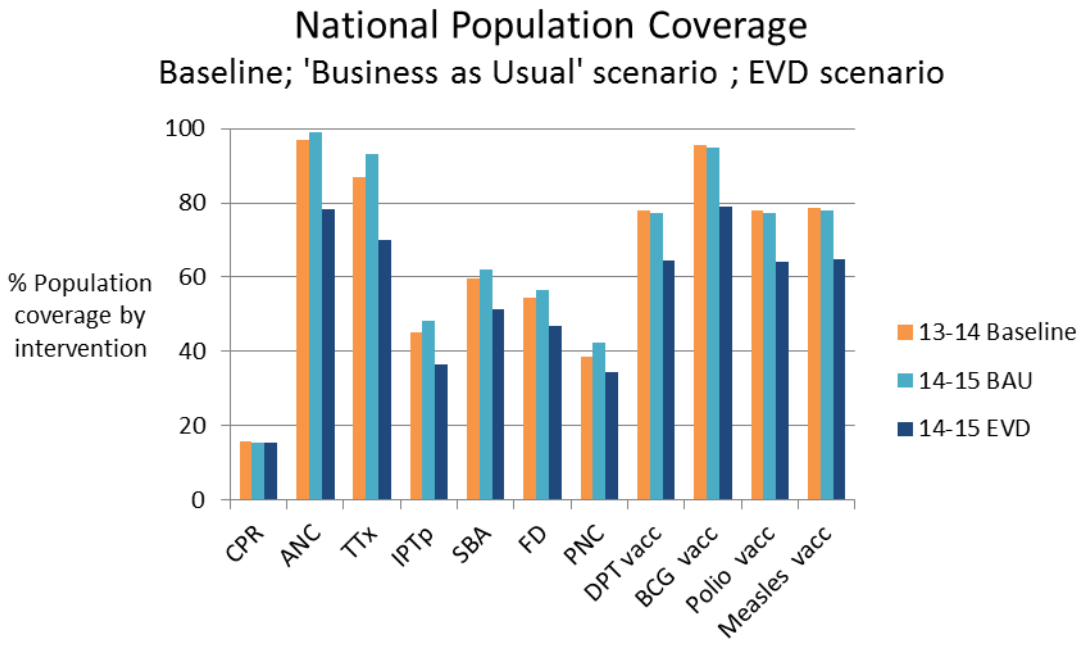
The discussion and implications for this report are incorporated to the synthesis report.

Appendix 1showing direction and statistical significance of change in utilisation by district and service

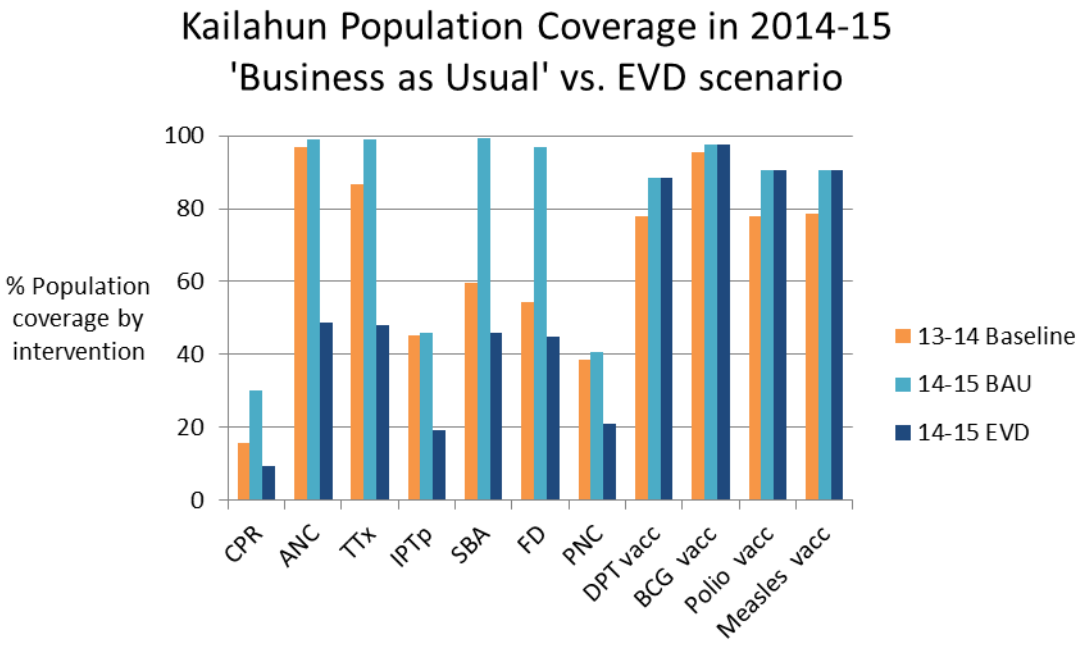
District	Service	Level direction	Slope direction	Level significance	Slope significance
Bo	anc4	Negative	Negative	No	No
Bo	deliveries	Positive	Negative	Yes	Yes
Bo	pnc	Positive	Negative	No	No
Bo	fp	Negative	Negative	No	Yes
Bo	penta3	Negative	Negative	No	No
Bombali	anc4	Positive	Negative	No	Yes
Bombali	deliveries	Positive	Negative	No	No (v.close)
Bombali	pnc	Negative	Negative	No	No
Bombali	fp	Positive	Negative	No	Yes
Bombali	penta3	Negative	Negative	No	No
Bonthe	anc4	Negative	Positive	Yes	No
Bonthe	deliveries	Negative	Negative	No	No
Bonthe	pnc	Negative	Negative	No	No
Bonthe	fp	Negative	Negative	No	No
Bonthe	penta3	Negative	Positive	Yes	No
Kailahun	anc4	Positive	Negative	No	Yes
Kailahun	deliveries	Positive	Negative	No	Yes
Kailahun	pnc	Positive	Negative	No	Yes
Kailahun	fp	Positive	Negative	No	Yes
Kailahun	penta3	Negative	Negative	No	No
Kambia	anc4	Negative	Omitted	No	Omitted
Kambia	deliveries	Negative	Omitted	Yes	Omitted
Kambia	pnc	Negative	Omitted	No	Omitted
Kambia	fp	Negative	Omitted	No	Omitted
Kambia	penta3	Negative	Omitted	Yes	Omitted
Kenema	anc4	Negative	Negative	No	Yes
Kenema	deliveries	Negative	Negative	No	Yes
Kenema	pnc	Negative	Positive	No	No
Kenema	fp	Negative	Negative	No	Yes
Kenema	penta3	Negative	Positive	No (v.close)	No
Koinadugu	anc4	Negative	Negative	No	No
Koinadugu	deliveries	Negative	Positive	No	No
Koinadugu	pnc	Negative	Negative	No	No
Koinadugu	fp	Negative	Positive	No	No
Koinadugu	penta3	Negative	Positive	No	No
Kono	anc4	Positive	Negative	No	Yes
Kono	deliveries	Negative	Positive	No	No
Kono	pnc	Positive	Negative	No	No
Kono	fp	Positive	Negative	No	No
Kono	penta3	Positive	Negative	No	Yes

District	Service	Level direction	Slope direction	Level significance	Slope significance
Moyamba	anc4	Negative	Negative	No	No
Moyamba	deliveries	Positive	Negative	No	No
Moyamba	pnc	Positive	Negative	No	No (v. close)
Moyamba	fp	Positive	Negative	No	No
Moyamba	penta3	Positive	Negative	No	No
Port Loko	anc4	Positive	Negative	No	Yes
Port Loko	deliveries	Positive	Negative	No	Yes
Port Loko	pnc	Positive	Negative	No	Yes
Port Loko	fp	Positive	Negative	No	Yes
Port Loko	penta3	Positive	Negative	No	Yes
Pujehun	anc4	Negative	Omitted	Yes	Omitted
Pujehun	deliveries	Positive	Omitted	Yes	Omitted
Pujehun	pnc	Negative	Omitted	Yes	Omitted
Pujehun	fp	Positive	Omitted	No	Omitted
Pujehun	penta3	Negative	Positive	No	No
Tonkolili	anc4	Negative	Positive	Yes	No
Tonkolili	deliveries	Positive	Negative	Yes	Yes
Tonkolili	pnc	Negative	Positive	Yes	No
Tonkolili	fp	Negative	Positive	No	No
Tonkolili	penta3	Negative	Negative	No	No
Western Area total	anc4	Positive	Negative	No	No
Western Area total	deliveries	Positive	Negative	No	No
Western Area total	pnc	Positive	Negative	No	No (v. close)
Western Area total	fp	Positive	Positive	No	No
Western Area total	penta3	Positive	Negative	No	No

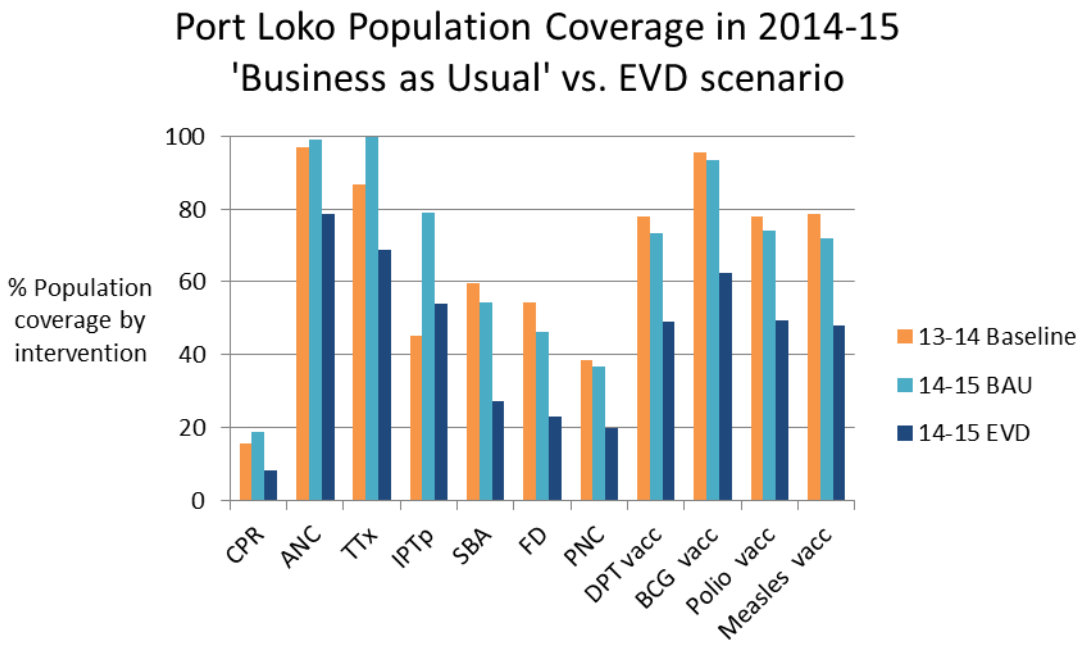
Appendix2 showing difference in population coverage between 'business as usual' and EVD scenarios



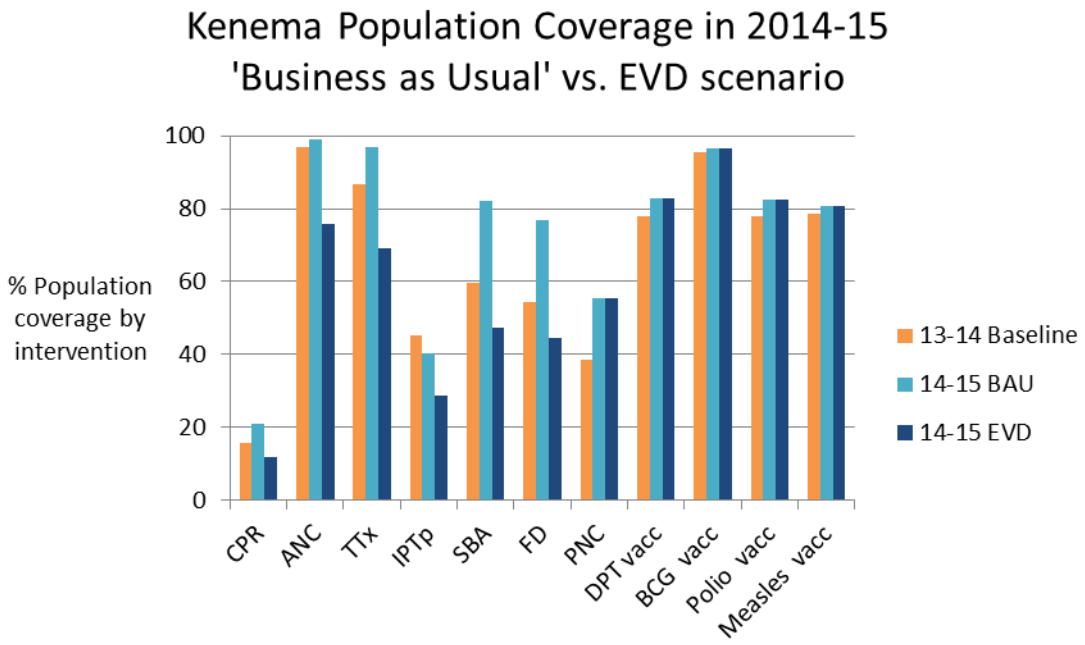
	National coverage		
	13-14 Baseline	14-15 BAU	14-15 EVD
CPR	15.6	15.2	15.2
ANC	97.1	99.0	78.4
TTx	86.9	93.0	70.1
IPTp	45.1	48.3	36.4
SBA	59.7	61.9	51.3
FD	54.4	56.4	46.8
PNC	38.7	42.3	34.3
DPT vacc	77.9	77.3	64.3
BCG vacc	95.6	94.9	78.9
Polio vacc	77.8	77.2	64.2
Measles vacc	78.6	78.0	64.9



	Kailahun		
	13-14 Baseline	14/15 CFT	14/15 Actual
CPR	15.6	30.0	9.5
ANC	97.1	99.0	48.6
TTx	86.9	99.0	48.0
IPTp	45.1	45.9	19.2
SBA	59.7	99.4	45.9
FD	54.4	97.1	44.8
PNC	38.7	40.6	21.1
DPT vacc	77.9	88.4	88.4
BCG vacc	95.6	97.6	97.6
Polio vacc	77.8	90.5	90.5
Measles vacc	78.6	90.6	90.6



	Port Loko		
	13-14 Baseline	14/15 CFT	14/15 Actual
CPR	15.6	18.9	8.4
ANC	97.1	99.0	78.5
TTx	86.9	99.9	68.7
IPTp	45.1	78.8	54.2
SBA	59.7	54.3	27.1
FD	54.4	46.2	23.1
PNC	38.7	37.0	19.9
DPT vacc	77.9	73.5	49.1
BCG vacc	95.6	93.4	62.4
Polio vacc	77.8	74.0	49.4
Measles vacc	78.6	72.0	48.1



	Kenema		
	13-14 Baseline	14/15 CFT	14/15 Actual
CPR	15.6	21.1	12.0
ANC	97.1	99.0	76.0
TTx	86.9	96.9	69.2
IPTp	45.1	40.3	28.8
SBA	59.7	82.2	47.4
FD	54.4	77.0	44.4
PNC	38.7	55.4	55.4
DPT vacc	77.9	82.7	82.7
BCG vacc	95.6	96.6	96.6
Polio vacc	77.8	82.6	82.6
Measles vacc	78.6	80.9	80.9

Appendix3 showing the % difference in health outcomes in EVD vs. Business as Usual scenarios

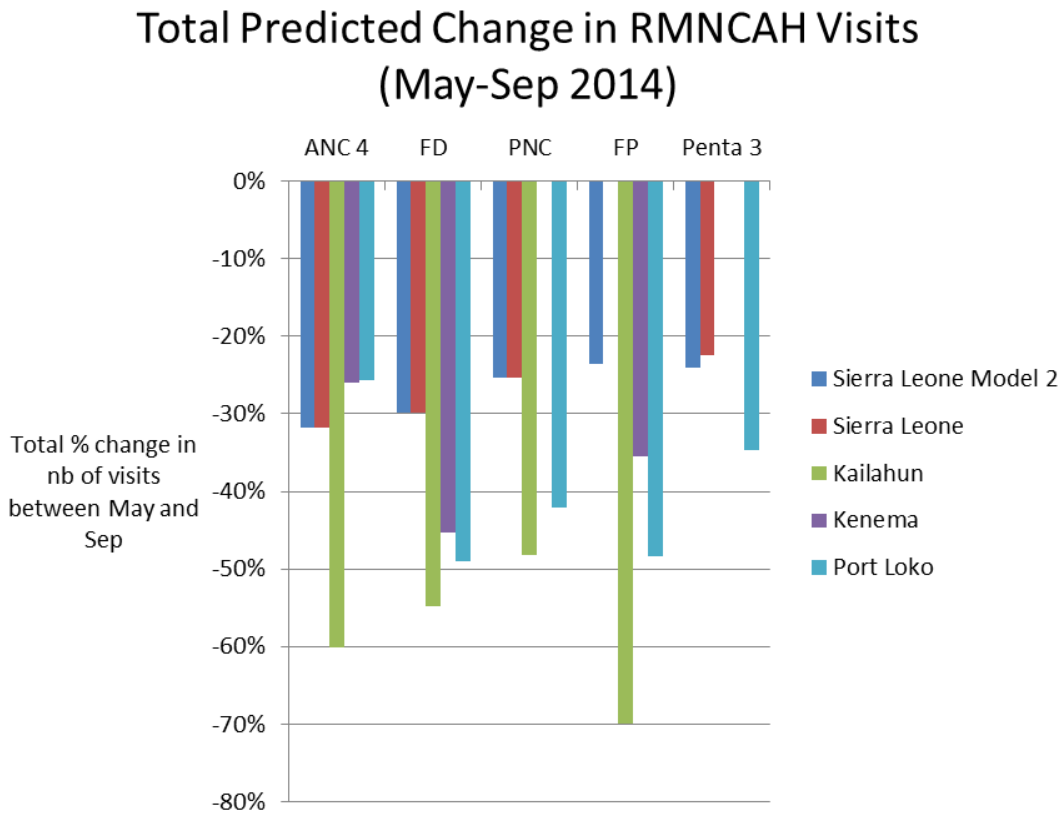
	Maternal deaths	Newborn deaths	Children deaths (1 to 59 months)	Unplanned pregnancies
Sierra Leone	+22%	+25%	+0.2%	+0%
Kailahun	+282%	+236%	+4%	+172%
Port Loko	+23%	+42%	+3%	+51%
Kenema	+69%	+66%	+2%	+44%

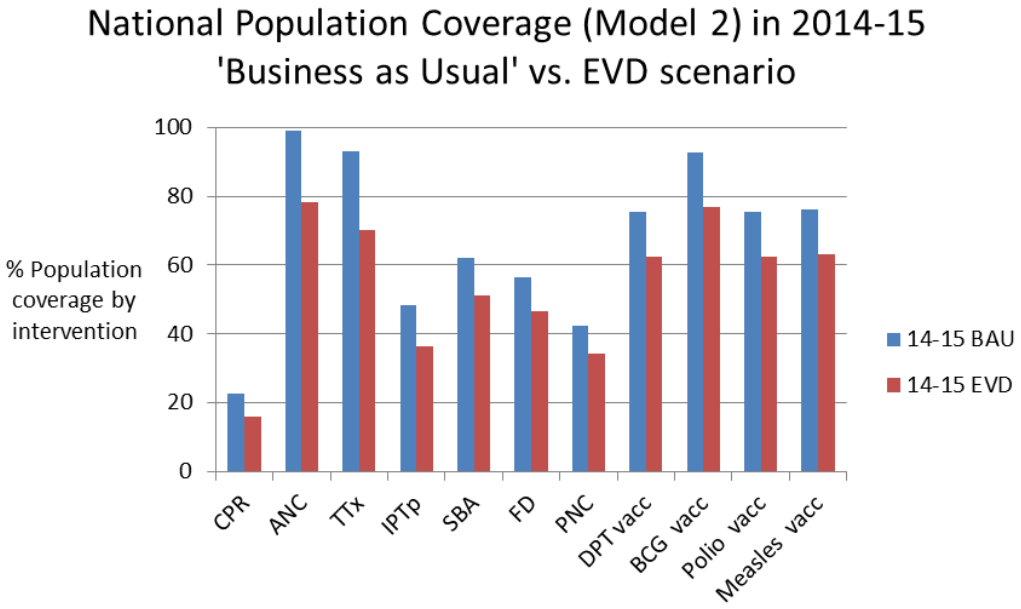
This percentage difference was calculated according to: (Additional due to EVD)/EVD scenario * 100 – see input numbers below.

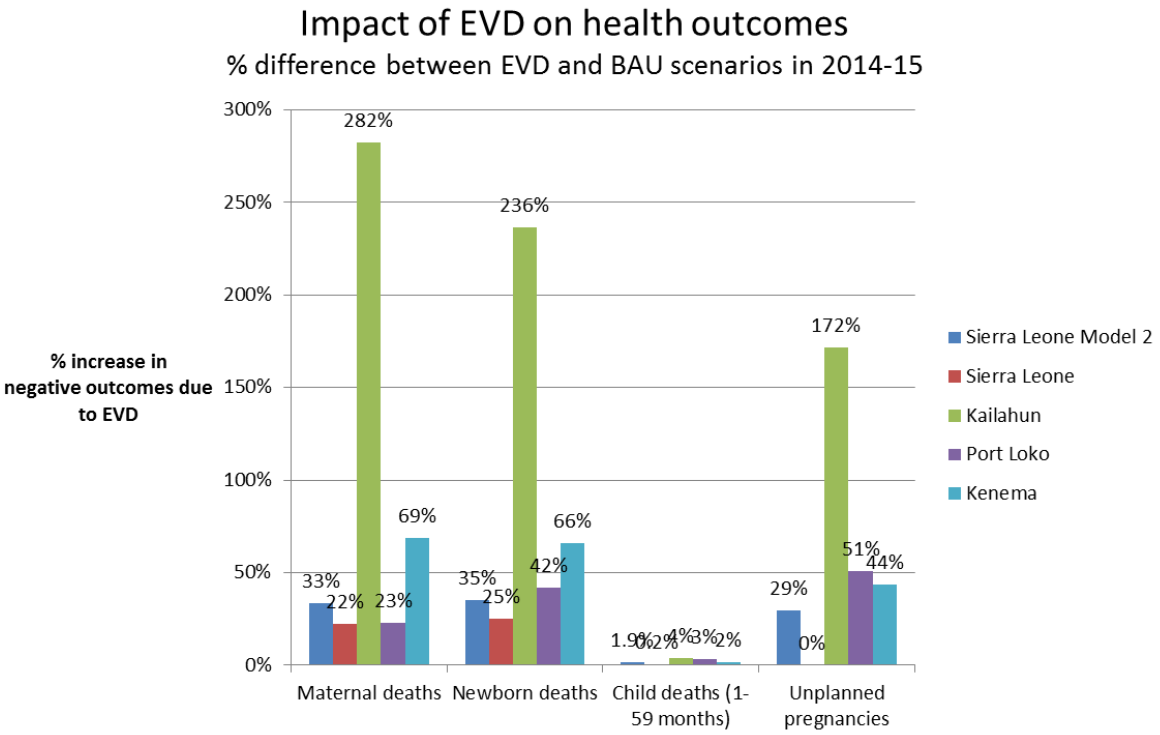
Maternal deaths		
	Business as usual	Additional due to EVD
Sierra Leone	2,191	487
Kailahun	56	158
Port Loko	240	55
Kenema	207	142
Newborn deaths		
	Business as usual	Additional due to EVD
Sierra Leone	7,224	1,810
Kailahun	246	581
Port Loko	757	317
Kenema	677	445
Children deaths 1 to 59 months		
	Business as usual	Additional due to EVD
Sierra Leone	21,850	48
Kailahun	1,186	48
Port Loko	2,551	78
Kenema	2,137	35
Unplanned pregnancies		
	Business as usual	Additional due to EVD
Sierra Leone	113,020	0
Kailahun	3,080	5,288
Port Loko	10,670	5,402
Kenema	9,038	3,947

Appendix4 showing non-statistically significant results (Model 2)

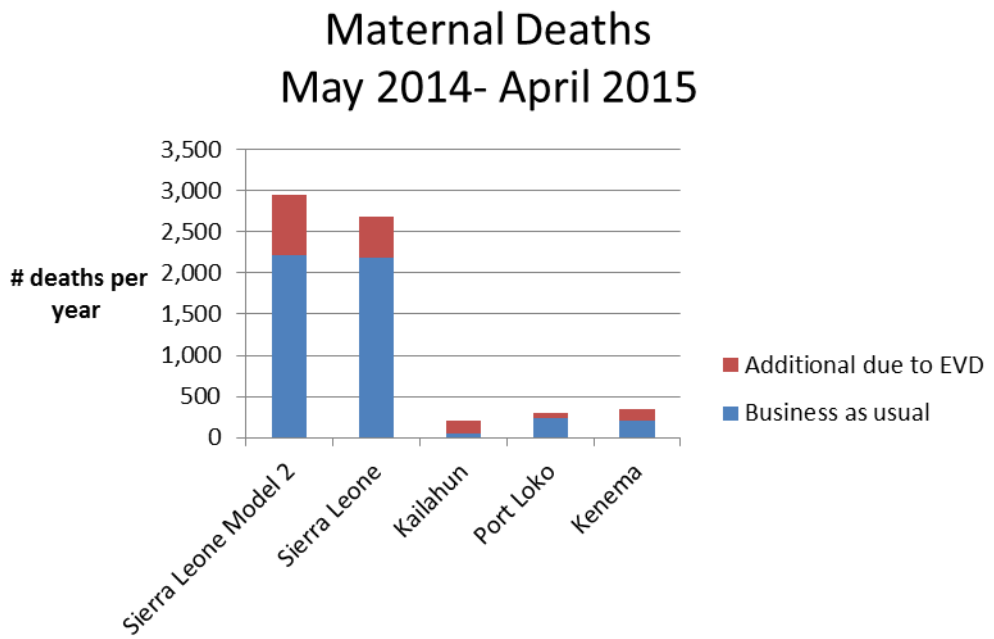
Model 2 includes all trends, even non-significant ones. It is not reliable as it is including trends that are not statistically different from zero: i.e. we don't know if they are due to chance or whether they reflect the underlying reality. In terms of population coverage, model 2 is different from the normal model of Sierra Leone with respect to family planning coverage and vaccination coverage. As a result, model 2 shows larger impacts on maternal deaths, newborn deaths, vaccination coverage, and unplanned pregnancies.



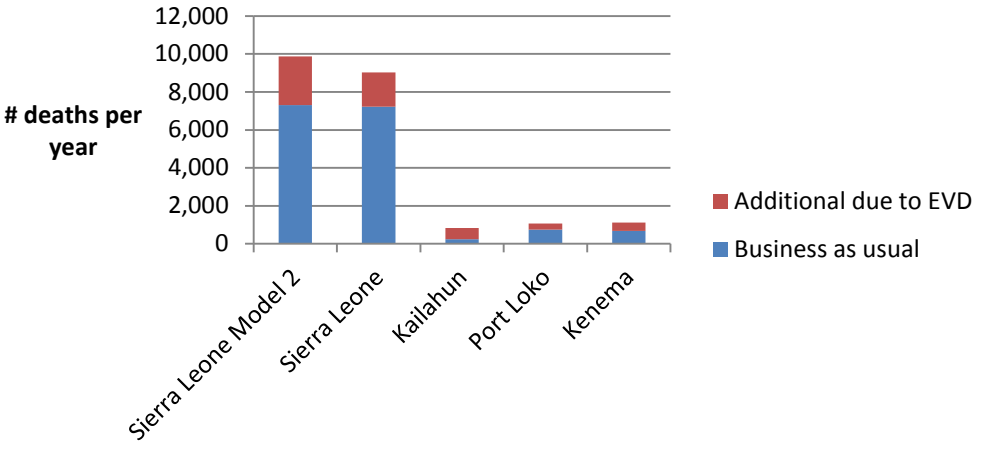




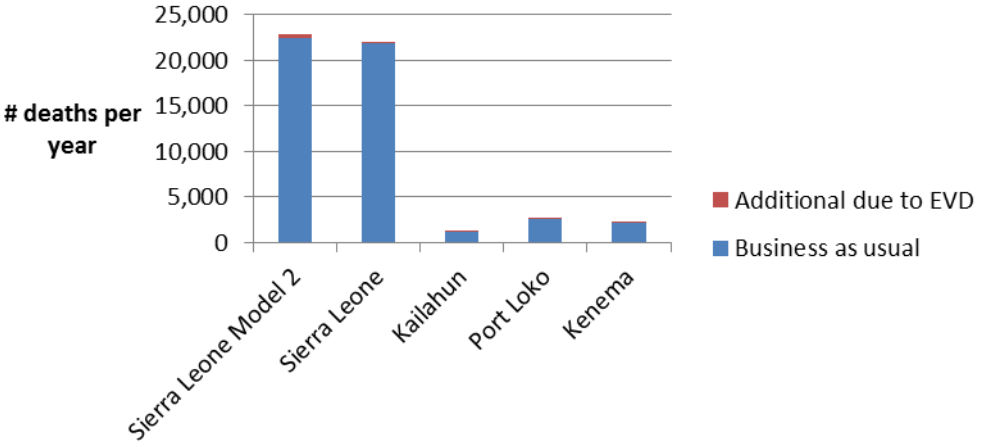
	Maternaldeaths	Newborndeaths	Child deaths (1-59 months)	Unplannedpregnancies
Sierra Leone Model 2	33%	35%	1.9%	29%
Sierra Leone	22%	25%	0.2%	0%
Kailahun	282%	236%	4%	172%
Port Loko	23%	42%	3%	51%
Kenema	69%	66%	2%	44%



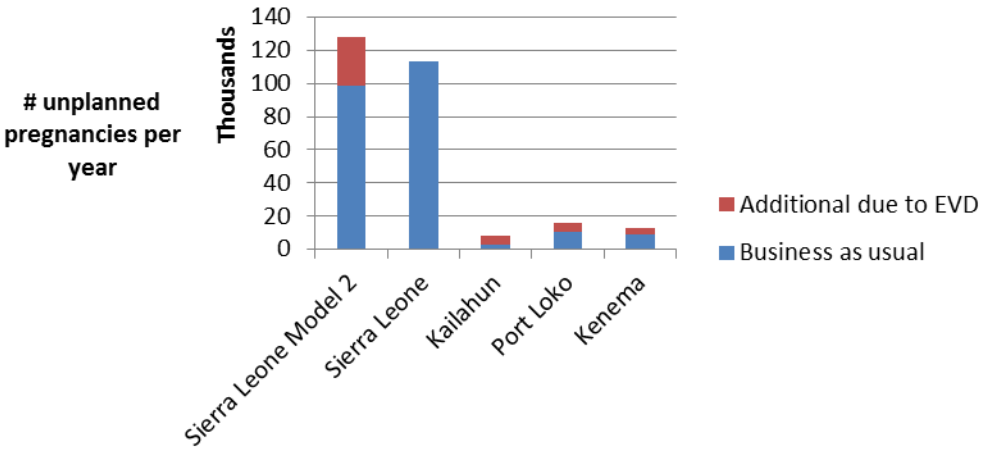
Newborn Deaths
May 2014-April 2015



Children Deaths (1-59 Months)
May 2014-April 2015



Unplanned Pregnancies
May 2014 - April 2015



Annex 8: Case Study for community-based distribution of misoprostol for the prevention of postpartum haemorrage

Advance distribution of misoprostol for the prevention of postpartum hemorrhage in South Sudan

Smith, J. M., Dimiti, A., Dwivedi, V., Ochieng, I., Dalaka, M., Currie, S., Luka, E. E., Rumunu, J., Orero, S., Mungia, J., McKaig, C. (2014).*International Journal of Gynecology and Obstetrics*

More than one third of maternal deaths in Africa are caused by excessive bleeding after childbirth (postpartum hemorrhage, PPH). To reduce the risk of PPH, a contraction-inducing drug (uterotonic) is recommended for all women during the third stage of labour. The preferred uterotonic – oxytocin – is not always suitable in low-resource settings since it requires sterile equipment, skilled assistance, and refrigeration. Instead, the heat-stable and cost-effective drug misoprostol can be used for PPH prevention, as recommended by the WHO Essential Medicines List.

This study by Smith et al (2014) explores whether high uterotonic coverage is achievable in the low resource and post-conflict setting of South Sudan as part of a PPH prevention programme.

Methods

The study, carried out between October 2012 and March 2013, focused on the South Sudan Ministry of Health PPH prevention programme. It aimed to prevent PPH in home-based and facility-based births.

The PPH prevention strategy for home births involved the distribution of misoprostol to pregnant women during prenatal and home visits at around 32 weeks of the pregnancy. Female home health promoters also provided education and counselling on PPH and how to take misoprostol.

The PPH prevention programme for health facilities emphasised 'active management of the third stage of labour' (AMTSL). This involved the use of uterotonics (misoprostol or oxytocin) and manual removal of the placenta. Data was collected using interviews, home visits, and clinic registers.

Key findings

- A total of 927 pregnancies were reported during the study, of which 85% received advance distribution of misoprostol. Around 4 in 5 women who received misoprostol before birth received it from a home health promoter, while 18% received it at prenatal care.
- Over half (58%) of all births were delivered at home, of which 99% took auterotonic (misoprostol). Of the women giving birth at health facilities, almost nine in ten received uterotonics (mainly oxytocin). Overall uterotonic coverage in childbirth was therefore 94%.
- Women's knowledge about misoprostol did not significantly differ at follow-up based on the source of information (prenatal care provider vs. home health promoter).
- There were no reports of 'serious' adverse events, obstetric complications or referrals to a health facility among women who took misoprostol at home. Any reported minor adverse effects lasted no longer than one hour.
- More than nine out of ten women (94%) were satisfied with use of misoprostol**.**

Conclusions & recommendations

- Safe and high coverage of uterotonics for PPH prevention can be achieved in low-resource and post-conflict settings even where they have not been available previously.
- Misoprostol can be used for PPH prevention through self-administration at home-based births and at facility-based births where few skilled birth attendants are available.
- High distribution and usage rates of misoprostol are best achieved through (1) home visits to deliver the medicine late in pregnancy and (2) emphasising the use of AMTSL (active management of the third stage of labour) at facility-based deliveries.